APPENDICES

For the

Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area

Appendix A History of the Fishery Management Plan

The Fishery Management Plan (FMP) for Bering Sea and Aleutian Islands (BSAI) Groundfish was implemented on January 1, 1982. Since that time it has been amended over seventy times, and its focus has changed from the regulation of mainly foreign fisheries to the management of fully domestic fisheries. The FMP was substantially reorganized in Amendment 83. Outdated catch data or other scientific information, and obsolete references, were also removed or updated.

Section A.1 contains a list of amendments to the FMP since its implementation in 1982. A detailed account of each of the FMP amendments, including its purpose and need, a summary of the analysis and implementing regulations, and results of the amendment, is contained in Appendix C to the *Final Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries*, published by National Marine Fisheries Service (NMFS) in 2004.

A.1 Amendments to the FMP

<u>Amendment 1</u>, implemented January 1, 1984, supersedes Amendments 2 and 4:

1. Established a multi-year, multi-species optimum yield for the groundfish complex.
2. Established a framework procedure for determining and apportioning total allowable catch (TAC), reserves, and domestic annual harvest (DAH).
3. Eliminated the “Misty Moon” grounds south of the Pribilof Islands from the Winter Halibut Savings Area.
4. Allowed experimental year-round domestic trawling in the Winter Halibut Savings Area that will be closely monitored to the extent possible.
5. Allowed year-round domestic trawling in the Bristol Bay Pot Sanctuary and year-round domestic longlining in the Winter Halibut Savings Area.
6. Closed the Petrel Bank area to foreign trawling from July 1 through June 30.
7. Established the Resource Assessment Document as the biological information source for management purposes.
8. Specified that the fishing and FMP year is the calendar year.

<u>Amendment 1a</u>, implemented January 2, 1982:

Set a chinook salmon prohibited species catch (PSC) limit of 55,250 fish for the foreign trawl fisheries for 1982.

<u>Amendment 2</u>, implemented January 12, 1982:

1. For <u>Yellowfin Sole</u>, increased DAH to 26,000 mt from 2,050 mt, increased joint venture processing (JVP) 25,000 mt from 850 mt, and decreased total allowable level of foreign fishing (TALFF) by 24,150 mt.
2. For <u>Other Flatfish</u>, increased DAH to 4,200 mt from 1,300 mt, increased JVP to 3,000 mt from 100 mt, and decreased TALFF by 2,900 mt.
3. For <u>Pacific Cod</u>, decreased maximum sustainable yield to 55,000 mt from 58,700 mt, increased equilibrium yield to 160,000 mt from 58,700 mt, increased acceptable biological catch to 160,000 mt from 58,700 mt, increased optimum yield to 78,700 mt from 58,700 mt, increased reserves to 3,935 mt from 2,935 mt, increased domestic annual processing (DAP) to 26,000 mt from 7,000 mt, and increased DAH to 43,265 mt from 24,265 mt.

Amendment 3, implemented July 4, 1983, supersedes Amendments 1a and 5:

1. Established procedures for reducing the incidental catch of halibut, salmon, king crab and Tanner crab by the foreign trawl fisheries.
2. Established a Council policy on the domestic groundfish fisheries and their incidental catch of prohibited species.

Amendment 4, implemented May 9, 1983, supersedes Amendment 2:

1. For Pollock, increased JVP for Bering Sea to 64,000 mt from 9,050 mt, increased DAH to 74,500 mt from 19,550 mt, and decreased TALFF to 875,500 mt from 930,450 mt.
2. For Yellowfin Sole, increased JVP to 30,000 mt from 25,000 mt, increased DAH to 31,200 mt from 26,200 mt, and decreased TALFF to 79,950 mt from 84,950 mt.
3. For Other Flatfish, increased JVP to 10,000 mt from 3,000 mt, increased DAH to 11,200 mt from 4,200 mt, and decreased TALFF to 46,750 mt from 53,750 mt.
4. For Atka Mackerel, increased JVP to 14,500 mt from 100 mt, increased DAH to 14,500 mt from 100 mt, and decreased TALFF to 9,060 mt from 23,460 mt.
5. For Other Species, increased JVP to 6,000 mt from 200 mt, increased DAH to 7,800 mt from 2,000 mt, and decreased TALFF to 65,648 mt from 68,537 mt. Also corrected acceptable biological catch to 79,714 mt, optimum yield to 77,314 mt, and reserves to 3,866 mt.
6. For Pacific Cod, increased equilibrium yield and acceptable biological catch to 168,000 mt from 160,000 mt, increased optimum yield to 120,000 mt from 78,700 mt, increased reserves to 6,000 mt from 3,935 mt, and increased TALFF to 70,735 mt from 31,500 mt.
7. For Other Rockfish, assigned DAP of 1,100 mt to BSAI area combined. This caused no change in total DAP. (This conformed FMP with federal regulations.)
8. For Pacific Ocean Perch, assigned DAP of 550 mt to Bering Sea and 550 mt to Aleutians but caused no change in total DAP. Also assigned JVP of 830 mt to Bering Sea and 830 mt to Aleutians without changing total JVP. (This conformed FMP with federal regulations.)
9. For Sablefish, assigned JVP of 200 mt to Bering Sea and 200 mt to Aleutians without changing total JVP. (This conformed FMP with federal regulations.) Changed maximum sustainable yield to 11,600 mt in Bering Sea and 1,900 mt in Aleutians to eliminate inconsistencies with annexes.
10. Changed foreign fisheries restrictions to allow trawling outside 3 miles north of the Aleutian Islands between 170E30' W. and 172E W. longitude, and south of the Aleutian Islands between 170E W. and 172E W. longitude; and to allow longlining outside 3 miles west of 170E W. longitude.

Amendment 5, withdrawn from Secretarial review.

Amendment 6, disapproved by NMFS on December 8, 1983:

Would have established a fishery development zone for exclusive use by U.S. fishing vessels where no foreign directed fishing is permitted.

Amendment 7, implemented August 31, 1983:

Modified the December 1 to May 31 depth restriction on the foreign longline fisheries in the Winter Halibut Savings Area.

Amendment 8, implemented February 24, 1984, supplements Amendment 3:

Established 1984 and 1985 salmon PSCs for the foreign trawl fishery. This amendment was a regulatory amendment which fell within the purview of Amendment 3 and did not require formal Secretarial approval.

Amendment 9, implemented December 1, 1985:

1. Require all catcher/processors that hold their catch for more than two weeks to check in and check out by radio from a regulatory area/district and to provide a written catch report weekly to the NMFS Regional Office.
2. Incorporated habitat protection policy.
3. Established definition for directed fishing as 20 percent or more of the catch.

Amendment 10, implemented March 16, 1987:

1. Established Bycatch Limitation Zones for domestic and foreign fisheries for yellowfin sole and other flatfish (including rock sole); an area closed to all trawling within Zone 1; red king crab, *C. bairdi* Tanner crab, and Pacific halibut PSC limits for DAH yellowfin sole and other flatfish fisheries; a *C. bairdi* PSC limit for foreign fisheries; and a red king crab PSC limit and scientific data collection requirement for U.S. vessels fishing for Pacific cod in Zone 1 waters shallower than 25 fathoms.
2. Revised the weekly reporting requirement for catcher/processors and mothership/processors.
3. Established explicit authority for reapportionment between DAP and JVP fisheries.
4. Established inseason management authority.

Amendment 11, implemented December 30, 1987:

1. Established a schedule for seasonal release of joint venture pollock apportionments in 1988 and 1989 (expires December 31, 1989).
2. Revised the definition of prohibited species.
3. Revised the definition of acceptable biological catch and added definitions for threshold and overfishing.

Amendment 11a, implemented April 6, 1988:

Augmented the current domestic catcher/processor and mothership/ processor reporting requirements with at-sea transfer information and modify the weekly reporting requirements.

Amendment 12, implemented May 26, 1989:

1. Revised federal permit requirements to include all vessels harvesting and processing groundfish from the EEZ.
2. Establish a PSC limit procedure for fully utilized groundfish species taken incidentally in JVP and TALFF fisheries.
3. Removed July 1 deadline for Stock Assessment and Fishery Evaluation Report (SAFE).
4. Established rock sole as a target species distinct from the “other flatfish” group.

Amendment 12a, implemented September 3, 1989, replaced Amendment 10:

Established a bycatch control procedure to limit the incidental take of *C. bairdi* Tanner crab, red king crab, and halibut in groundfish fisheries.

Amendment 13, implemented January 1, 1990:

1. Allocated sablefish in the Bering Sea and the Aleutian Islands Management Subareas.
2. Established a procedure to set fishing seasons on an annual basis by regulatory amendment.
3. Established groundfish fishing closed zones near the Walrus Islands and Cape Peirce.
4. Established a new data reporting system.

5. Established a new observer program.
6. Clarified the Secretary's authority to split or combine species groups within the target species management category by a framework procedure.

Amendment 14, implemented January 1, 1991:

1. Prohibited roe-stripping of pollock; and established Council policy that the pollock harvest is to be used for human consumption to the maximum extent possible;
2. Divided the pollock TAC into two seasonal allowances: roe-bearing ("A" season) and non roe-bearing ("B" season). The percentage of the TAC allocated to each allowance shall be determined annually during the TAC specifications process.

Amendment 15, approved by the Secretary on January 29, 1993, implemented March 15, 1995:

1. Established an Individual Fishing Quota (IFQ) program for directed fixed gear sablefish fisheries in the Bering Sea and Aleutian Islands management areas.
2. Established a Western Alaska Community Development Quota (CDQ) Program.

Amendment 16, implemented January 1, 1991, replaced Amendment 12a:

1. Extended the effective date of Amendment 12a (originally scheduled to expire December 31, 1990) with the following three changes:

a) PSC apportionments would be established for the DAP rock sole and deep water turbot/arrowtooth flounder fisheries;

b) PSC limits could be seasonally apportioned; and

c) An interim incentive program established to encourage vessels to avoid excessive bycatch rates.

2. Established a definition of overfishing;
3. Established procedures for interim TAC specifications; and
4. Provided for fishing gear restrictions to be modified by regulatory amendments.

Amendment 16a, implemented July 12, 1991.

1. Established inseason authority to temporarily close statistical areas, or portions thereof, to reduce high prohibited species bycatch rates.
2. Provided authority to the Regional Administrator, in consultation with the Council, to set a limit on the amount of the pollock TACs that may be taken with other than pelagic trawl gear.
3. Established a framework for determining an annual herring PSC limit as 1 percent of the estimated herring biomass, attainment of which triggers trawl closures in three Herring Savings Areas.

Amendment 17, implemented April 24, 1992:

1. Authorize the NMFS Regional Administrator to approve exempted fishing permits after consultation with the Council.
2. Establish a unique Bogoslof District as part of the Bering Sea subarea, for which a pollock harvest quota would be annually specified. Fishing for pollock in the remaining parts of the Bering Sea subarea will be unaffected by any closure of the Bogoslof District.

Amendment 18, implemented June 1, 1992 and revised Amendment 18 on December 18, 1992:

1. The Pollock TAC in the BSAI, after subtraction of the reserve, is allocated between inshore and offshore components during the years 1992 through 1995. The inshore component receives 35 percent of the pollock TAC, and the offshore component receives 65 percent.

2. A Catcher Vessel Operational Area (CVOA) is established to limit access to pollock within the area to catcher vessels delivering to the inshore component. This area is between 163E W. and 168E W. longitude, south of 56E N. latitude, and north of the Aleutian Islands. During the 1992 "B" season, the offshore component will not be allowed to fish within the CVOA.
3. Half of the amount of BSAI pollock assigned to the nonspecific reserve (7.5 percent of the BSAI TAC) is allocated as Western Alaska CDQ Program.

<u>Amendment 19,</u> implemented September 23, 1992, supplemented Amendment 16:

1. Revise time and area closure (hotspot) authority in the BSAI to authorize, by regulatory amendment, the establishment of time and area closures to reduce bycatch rates of prohibited species. Any closure of an area would require a determination by the Secretary, in consultation with the Council.
2. Expand the Vessel Incentive Program to include all trawl fisheries in the BSAI.
3. Delay opening of all trawl fisheries in the BSAI until January 20. The opening date for non-trawl fisheries, including hook and line, pot and jigging, will continue to be January 1.
4. Establish, for the 1992 season only, a halibut PSC limit of 5,033 mt for the BSAI trawl fishery. Also, a 750 mt halibut PSC mortality limit for the non-trawl fisheries will be established for one year.
5. Establish new halibut and crab PSC apportionment categories. A trawl fishery category closes when it reaches a PSC bycatch allowance allocated to that category.
6. Establish new fishery definitions. The fishery definitions for both the Vessel Incentive Program and the PSC allowance limits would be the same. The definitions of fisheries for these programs would be as follows:
    a) Mid-water pollock if pollock is ∃ to 95 percent of the total catch.
    b) Other targets determined by the dominate species in terms of retained catch.
    c) For the BSAI, a flatfish fishery consisting of rocksole, yellowfin sole, and other flatfish (excluding Greenland turbot and arrowtooth flounder) will be defined and then subdivided into three fisheries. If yellowfin sole accounts for at least 70% of the retained flatfish catch, it is a yellowfin sole fishery. Otherwise, it is a rock sole or other flatfish fishery depending on the which is dominant in terms of retained catch.
7. To allow more effective enforcement of directed fishery closures and to further limit trawl bycatch amounts of halibut after a halibut PSC bycatch allowance has been reached, changes to Directed Fishing Standards include:
    a) Directed fishing standards would be seven percent of the aggregate amounts of GOA and BSAI groundfish other than pollock, that are caught while fishing for pollock with pelagic trawl gear.
    b) For purposes of the directed fishing rule, the operator of a vessel is engaged in a single fishing trip, from the date when fishing commences or continues in an area after the effective date of a notice prohibiting directed fishing in that area, until the first date on which at least one of following occurs: 1) a weekly reporting period ends; 2) the vessel enters or leaves a reporting area for which an area specific TAC or directed fishing standard is established; or 3) any fish or fish product is offloaded or transferred from that vessel.

<u>Amendment 20,</u> implemented January 19, 1992:

Prohibit trawling year round in the BSAI within 10 nautical miles of 27 Steller sea lion rookeries. In addition, five of these rookeries will have 20 nautical mile trawl closures during the pollock "A" season. These closures will revert back to 10 nautical miles when the "A" season is over, either on or before April 15.

<u>Amendment 21,</u> implemented March 17, 1993, superseded Amendment 16:

Established FMP authority to specify trawl and non-trawl gear halibut bycatch mortality limits by regulatory amendment.

Amendment 21a, implemented January 20, 1995:

Established a Pribilof Islands Habitat Conservation Area.

Amendment 21b, implemented November 29, 1995:

Established trawl closure areas called the Chinook Salmon Savings Areas.

Amendment 22, implemented December 22, 1992:

Established trawl test areas for the testing of trawl gear in preparation of the opening of fishing seasons. Fishermen are allowed to test trawl gear when the BSAI would otherwise be closed to trawling.

Amendment 23, implemented August 10, 1995 and effective on September 11, 1995:

Created a moratorium on harvesting vessels entering the BSAI groundfish fisheries other than fixed gear sablefish after January 1, 1996. The vessel moratorium will last until the Council replaces or rescinds the action, but in any case will end on December 31, 1998. The Council extended the moratorium to January 1, 1999 under Amendment 59. The Council may however extend the moratorium up to 2 additional years, if a permanent limited access program is imminent.

Amendment 24, implemented February 28, 1994, and effective through December 31, 1996:

1. Established the following gear allocations of BSAI Pacific cod TAC as follows: 2 percent to vessels using jig gear; 44.1 percent to vessels using hook-and-line or pot gear, and 53.9 percent to vessels using trawl gear.
2. Authorized the seasonal apportionment of the amount of Pacific cod allocated to gear groups. Criteria for seasonal apportionments and the seasons authorized to receive separate apportionments will be set forth in regulations.

Amendment 25, implemented May 20, 1994, superseded Amendment 21:

Eliminated the primary halibut bycatch mortality limit established for the trawl gear fisheries (3,300 mt). The overall bycatch mortality limit established for these fisheries (3,775 mt) remained unchanged.

Amendment 26, implemented July 24, 1996:

Established a Salmon Donation Program that authorizes the voluntary retention and distribution of salmon taken as bycatch in the groundfish trawl fisheries off Alaska to economically disadvantaged individuals.

Amendment 27, implemented October 6, 1994, superseded Amendments 13 and 18, repealed and replaced by Amendment 47:

Implemented language changes to the Fishery Management Plans to indicate that observer requirements under the FMPs are contained in the North Pacific Fisheries Research Plan.

Amendment 28, implemented August 11, 1993, supplemented Amendment 20:

Established three districts in the Aleutian Islands management subarea for purposes of distributing the groundfish TACs spatially.

Amendment 29, not submitted.

Amendment 30, implemented September 23, 1994, revised Amendment 18:

Raised the CDQ allocation limit for qualified applicants from 12 to 33 percent.

Amendment 31, implemented November 7, 1994, revised Amendment 15:

Implemented the Modified Block plan to prevent excessive consolidation of the halibut and sablefish fisheries, and clarifies the transfer process for the IFQ program.

Amendment 32, implemented February 23, 1996, revised Amendment 15:

Established a one-time transfer of halibut and sablefish IFQ for CDQ.

Amendment 33, implemented July 26, 1996, revised Amendment 15:

Allowed freezing of non-IFQ species when fishing sablefish IFQ.

Amendment 34, implemented January 30, 1994:

Allocated Atka mackerel to vessels using jig gear. Annually, up to 2 percent of the TAC specified for this species in the eastern Aleutian Islands District/Bering Sea subarea will be allocated to vessels using jig gear in this area.

Amendment 35, implemented August 1, 1995:

Established a trawl closure area called the *Chum Salmon Savings Area*.

Amendment 36, implemented April 16, 1998:

Defined a forage fish species category and authorized that the management of this species category be specified in regulations in a manner that prevents the development of a commercial directed fishery for forage fish which are a critical food source for many marine mammal, seabird and fish species.

Amendment 37, implemented January 1, 1997

Established a non-pelagic trawl closure area called the *Red King Crab Savings Area*, a trawl closure area called the Nearshore Bristol Bay Trawl Closure, and revised the red king crab PSC limits.

Amendment 38, implemented January 1, 1996, superseded Amendment 18:

Extended provision of Amendment 18, inshore/offshore allocation and modified the Catcher Vessel Operating Area.

Amendment 39, implemented January 1, 1999, except for some parts on January 1, 2000, replaced Amendment 23 and revised Amendment 18:

1. Created a license program for vessels targeting groundfish in the BSAI, other than fixed gear sablefish that is pending regulatory implementation. The license program will replace the vessel moratorium and will last until the Council replaces or rescinds the action.
2. Allocated 7.5 percent of groundfish TACs to the CDQ multispecies fishery.

Amendment 40, implemented January 21, 1998:

Established PSC limits for *C. opilio* crab in trawl fisheries and a snow crab bycatch limitation zone.

Amendment 41, implemented April 23, 1997, revised Amendment 12a:

Revised the *C. bairdi* Tanner crab PSC limit in Zones 1 and 2.

Amendment 42, implemented August 16, 1996, revised Amendment 15

Increased sweep-up levels for small quota share blocks for sablefish managed under the sablefish and halibut IFQ program.

Amendment 43, implemented December 20, 1996, revised Amendment 15:

Established sweep-up provisions to consolidate very small quota share blocks for halibut and sablefish.

Amendment 44, implemented January 9, 1997, revised Amendment 16:

Established a more conservative definition of overfishing.

Amendment 45, implemented January 21, 1999, superseded Amendment 38:

Reauthorized the pollock CDQ allocation.

Amendment 46, implemented January 1, 1997, superseded Amendment 24:

Replaced the three year Pacific cod allocation established with Amendment 24, with the following gear allocations in BSAI Pacific cod: 2 percent to vessels using jig gear; 51 percent to vessels using hook-and-line or pot gear; and 47 percent to vessels using trawl gear. The trawl apportionment will be divided 50 percent to catcher vessels and 50 percent to catcher processors. These allocations as well as the seasonal apportionment authority established in Amendment 24 will remain in effect until amended.

Amendment 47, not submitted.

Amendment 48, implemented December 8, 2004:

1. Revised the harvest specifications process.
2. Changed the title of the FMP.
3. Update the FMP to reflect current groundfish fisheries.

Amendment 49, implemented January 3, 1998:

Implemented an Increased Retention/Increased Utilization Program for pollock and Pacific cod beginning January 1, 1998 and rock sole and yellowfin sole beginning January 1, 2003.

Amendment 50, implemented July 13, 1998, revised Amendment 26:

Established a Prohibited Species Donation Program that expands the Salmon Donation Program to include halibut taken as bycatch in the groundfish trawl fisheries off Alaska to economically disadvantaged individuals.

Amendment 51, partially implemented January 20, 1999, superseded Amendment 38:

Replaced the three year inshore/offshore allocation established with Amendment 38, with the following allocations of BSAI pollock after subtraction of reserves: 39 percent inshore; 61 percent offshore. That portion of the Bering Sea inshore "B" season allocation which is equivalent to 2.5 percent of the BSAI pollock TAC, after subtraction of reserves, shall be made available only to vessels under 125 ft length overall for delivery to the inshore sector, prior to the Bering Sea "B" season, starting on or about August 25. Any overages or underages will be subtracted/added as part of the inshore "B" season. The rules and regulations pertaining to the CVOA shall remain the same, except that during the "B" season, operations in the CVOA will be restricted to catcher vessels delivering to the inshore sector. These allocations will remain in effect until December 31, 2001, unless replaced by another management regime approved by the Secretary.

Amendment 52, not submitted.

Amendment 53, implemented July 22, 1998:

Allocates shortraker and rougheye rockfish TAC 70 percent to trawl fisheries and 30 percent to non-trawl fisheries.

Amendment 54, implemented April 29, 2002, revised Amendment 15:

Revised use and ownership provisions of the sablefish IFQ program.

Amendment 55, implemented April 26, 1999:

Implemented the Essential Fish Habitat (EFH) provisions contained in the Magnuson-Stevens Fishery Conservation and Management Act and 50 CFR 600.815. Amendment 55 describes and identifies EFH fish habitat for BSAI groundfish and describes and identifies fishing and non-fishing threats to BSAI groundfish EFH, research needs, habitat areas of particular concern, and EFH conservation and enhancement recommendations.

Amendment 56, implemented March 8, 1999, revised Amendment 44:

Revised the overfishing definition.

Amendment 57, implemented June 15, 2000, revised Amendment 37 and Amendment 40:

1. Prohibited the use of nonpelagic trawl gear in the directed pollock fishery.
2. Reduced the PSC limit for red king crab by 3,000 animals.

Amendment 58, implemented November 13, 2000, revised Amendment 21b:

Revised Chinook Salmon Savings Areas trawl closure areas.

Amendment 59, implemented January 19, 1999, superseded Amendment 23:

Extended the vessel moratorium through December 31, 1999.

Amendment 60, implemented October 24, 2001 and January 1, 2002; superseded Amendment 59:

1. Required that the vessel would be a specific characteristic of the license and could not be severed from it.
2. Authorized license designations for the type of gear to harvest LLP groundfish as either “trawl” or “non-trawl” gear (or both).
3. Rescinded the requirement that CDQ vessels hold a crab or groundfish license.
4. Added a crab recency requirement which requires one landing during 1/1/96-2/7/98 in addition to the general license and area endorsement qualifications.
5. Allowed limited processing (1 mt) for vessels less than 60 ft LOA with catcher vessel designations.

Amendment 61, implemented January 21, 2000, conformed the FMP with the American Fisheries Act (AFA) of 1998 that:

1. Removed excess capacity in the offshore pollock sector through the retirement of 9 factory trawlers.
2. Established U.S. ownership requirements for the harvest sector vessels.
3. Established specific allocations of the BSAI pollock quota as follows - 10 percent to the western Alaska CDQ Program, with the remainder allocated 50 percent to the onshore sector, 40 percent to the offshore sector, and 10 percent to the mothership sector.
4. Identified the specific vessels and processors eligible to participate in the BSAI pollock fisheries
5. Established the authority and mechanisms by which the pollock fleet can form fishery cooperatives.
6. Established specific measures to protect the non-AFA (non-pollock) fisheries from adverse impacts resulting from the AFA or pollock fishery cooperatives.

Amendment 62, approved by the Council in October 2002, reviewed by the Council in April 2008, revised Amendment 61:

Updates the use restrictions on the Bering Sea Catcher Vessel Operational Area to reflect the changes in the American Fisheries Act.

Amendment 63, pending.

Amendment 64, implemented September 1, 2000, revised Amendment 46:

Allocated the Pacific cod Total Allowable Catch to the jig gear (2 percent), fixed gear (51 percent), and trawl gear (47 percent) sectors.

Amendment 65, implemented July 28, 2006:

Identified four specific sites as habitat areas of particular concern, and established management measures to reduce potential adverse effects of fishing. The sites are: Aleutian Islands Coral Habitat Protection Areas and the Alaska Seamount Habitat Protection Areas, in which the use of bottom contact gear is prohibited; and the Bowers Ridge Habitat Conservation Zone, in which the use of mobile bottom contact gear is prohibited.

Amendment 66, implemented April 6, 2002:

Exempted squid from the CDQ Program.

Amendment 67, implemented May 15, 2002, revised Amendment 39:

Established participation and harvest requirements to qualify for a BSAI Pacific cod fishery endorsement for fixed gear vessels.

Amendment 68, not submitted.

Amendment 69, implemented March 13, 2003, revised Amendment 61:

Allows an inshore pollock cooperative to contract with AFA catcher vessels that are qualified for the inshore sector, but outside their cooperative, to harvest the cooperative's pollock allocation.

Amendment 70, not submitted.

Amendment 71, not submitted.

Amendment 72, implemented August 28, 2003, revised Amendment 15:

Required a verbal departure report instead of a vessel clearance requirement for vessels with IFQ halibut or sablefish leaving the jurisdiction of the Council.

Amendment 73, implemented December 31, 2008

Remove dark rockfish (*S. ciliatus*) from the FMP, which allows the State of Alaska to manage this species.

Amendment 74, unassigned.

Amendment 75, partially implemented May 29, 2003, revised Amendment 49:

Delayed indefinitely the implementation of the flatfish retention and utilization requirements.

Amendment 76, not submitted.

Amendment 77, implemented January 1, 2004, revised Amendment 64:

Implemented a Pacific cod fixed gear allocation between hook and line catcher processors (80 percent), hook and line catcher vessels (0.3 percent), pot catcher processors (3.3 percent), pot catcher vessels (15 percent), and catcher vessels (pot or hook and line) less than 60 feet (1.4 percent).

Amendment 78, implemented July 28, 2006, supersedes Amendment 55:

1. Refined and updated the description and identification of EFH for managed species.
2. Revised approach for identifying Habitat Areas of Particular Concern within EFH, by adopting a site-based approach.

3. Established a new area (Aleutian Islands Habitat Conservation Area) in which non-pelagic trawling is prohibited, to protect sensitive habitats from potential adverse effects of fishing.

Amendment 79, implemented on August 31, 2005.

Implemented a groundfish retention standard in the non-AFA trawl catcher-processor fleet.

Amendment 80, implemented on July 26, 2007, superseded Amendments 49 and 75:

1. Allocates non-pollock groundfish in the BSAI among trawl sectors
2. Creates a limited access privilege program to facilitate the formation of harvesting cooperative in the non-American Fisheries Act trawl catcher/processor sector.

Amendment 81, implemented August 27, 2004:

Revised the management policy and objectives.

Amendment 82, implemented February 24, 2005:

1. Created separate Chinook Salmon PSC limits for the Bering Sea and Aleutian Islands subareas, and modified the closures when the PSC limits are attained.
2. Allocated the non-CDQ directed pollock fishery in the AI subarea to the Aleut Corporation for the purpose of economic development in Adak, Alaska.

Amendment 83, implemented June 13, 2005:

1. Updated the FMP's descriptive sections, technically edited the language, and reorganized the content of the FMP.
2. Required the TAC for a species or species complex to be equal or less than ABC.

Amendment 84, implemented on June 22, 2007:

Established the salmon bycatch intercooperative agreement which allows vessels participating in the directed fisheries for pollock in the Bering Sea to utilize their internal cooperative structure to reduce salmon bycatch using a method called the ''voluntary rolling hotspot system.''

Amendment 85, partially implemented on March 5, 2007, superseded Amendments 46 and 77:

Implemented a gear allocation among all non-CDQ fishery sectors participating in the directed fishery for Pacific cod. After deduction of the CDQ allocation, the Pacific cod TAC is apportioned to vessels using jig gear (1.4 percent); catcher processors using trawl gear listed in Section 208(e)(1)-(20) of the AFA (2.3 percent); catcher processors using trawl gear as defined in Section 219(a)(7) of the Consolidated Appropriations Act, 2005 (Public Law 108-447) (13.4 percent); catcher vessels using trawl gear (22.1 percent); catcher processors using hook-and-line gear (48.7 percent); catcher vessels ≥60' LOA using hook-and-line gear (0.2 percent); catcher processors using pot gear (1.5 percent); catcher vessels ≥60' LOA using pot gear (8.4 percent); and catcher vessels <60' LOA that use either hook-and-line gear or pot gear (2.0 percent).

Amendment 86, implemented January 1, 2013, revised Amendment 13:

1. Modified the observer program to include vessels and processors of all sizes, including the commercial halibut sector.
2. Established two coverage categories for all vessels and processors: <100% observer coverage and ≥100% observer coverage.
3. Modified the observer program such that vessels in the <100% observer coverage category are subject to an ex-vessel value based fee not to exceed 2%, and are required to carry an observer as determined by NMFS. Vessels and processors in the ≥100% observer coverage category obtain

observer coverage by contracting directly with observer providers, to meet coverage requirements in regulation.

Amendment 87, (CDQ eligibility) recommended by the Council in April 2006, but not yet approved by the Secretary of Commerce, superseded by 2006 MSA amendments.

Amendment 88 implemented on February 19, 2008:

Revised the Aleutian Islands Habitat Conservation Area to close additional waters near Buldir Island and to open waters near Agattu Island to nonpelagic trawl gear.

Amendment 89 implemented on May 19, 2008:

1. Established new habitat conservation areas (HCA) (Bering Sea HCA; St. Matthew Island HCA; St. Lawrence Island HCA; and Nunivak Island, Etolin Strait, and Kuskokwim Bay HCA) in which nonpelagic trawling is prohibited, to protect bottom habitat from potential adverse effects of fishing.
2. Established the Northern Bering Sea Research Area in which nonpelagic trawling is prohibited except under an exempted fishing permit that is consistent with a research plan approved by the Council to study the effects of nonpelagic trawling on the management of crab species, marine mammals, ESA-listed species, and subsistence needs for Western Alaska communities.

Amendment 90 implemented on March 16, 2009:

Allowed unlimited post-delivery transfers of cooperative quota

Amendment 91 implemented on September 29, 2010 revised Amendment 84:

Established the Bering Sea Chinook Salmon Bycatch Management Program to revise the Chinook salmon prohibited species catch limit in the Bering Sea pollock fishery, to provide a higher cap to vessel owners and CDQ groups participating in an incentive plan agreement, and to provide for transferable Chinook salmon PSC allocations under certain circumstances.

Amendment 92 implemented on March 11, 2009 revised Amendment 60:

1. Revoked Bering Sea and Aleutian Islands area endorsements on trawl groundfish licenses unless the license met historical trawl groundfish landings criteria.
2. Created a limited number of new AI endorsements on non-AFA trawl catcher vessel licenses; new AI endorsements earned on licenses with a <60' MLOA are severable and transferable from the overall license.

Amendment 93, implemented on December 5, 2011:

Modified the criteria for forming and participating in an Amendment 80 harvesting cooperative by—

1. Reducing the minimum number unique persons and licenses required to form a harvesting cooperative from 3 persons and 9 licenses to 2 persons and 7 licenses, and
2. Requiring that for the 2014 fishing year and thereafter, a person assign all QS permits either to one or more cooperatives or to the limited access fishery, but not to both during the same calendar year (Beginning 2014).

Amendment 94, implemented September 17, 2010, partly revises Amendment 89:

1. Required use of modified nonpelagic trawl gear in the Bering Sea flatfish nonpelagic trawl fishery to reduce the potential impact of nonpelagic trawl gear on bottom habitat.
2. Created the Modified Gear Trawl Zone, in which anyone fishing with nonpelagic trawl gear must use modified nonpelagic trawl gear.

3. Revised the northern and southern boundaries of the Northern Bering Sea Research Area, and the eastern boundary of the St Matthew Island Habitat Conservation Area.
4. Removed reference to the Crab and Halibut Protection Zone which was superseded by the Nearshore Bristol Bay Trawl Closure.
5. Renumbered figures and tables in the FMP and corrected cross-references.
6. Updated the Community Development Quota eligibility list to be consistent with the Magnuson-Stevens Act.

Amendment 95, implemented on November 5, 2010:

Moves skates from the other species category to the target species category.

Amendment 96, implemented on November 5, 2010:

1. Places species groups managed under the other species category into the target species category and removes the other species category from the FMP.
2. Places target species in the fishery, which requires annual catch limits, accountability measures, and the description of essential fish habitat (EFH) and 5-year review of EFH information for listed species and species groups.
3. Revises the FMP to describe current practices for setting annual catch limits and the use of accountability measures to ensure annual catch limits are not exceeded, as required by National Standard 1 guidelines.
4. Removes the nonspecified species category from the FMP
5. Establishes an Ecosystem Component category and places Prohibited Species and Forage Fish Species in this category.

Amendment 97, implemented on October 31, 2012:

Established a process for the owners of originally qualifying Amendment 80 vessels to replace each trawl catcher/processor vessels for any purpose, limited the length of Amendment 80 replacement vessels, established up to a one-for-one replacement; restricted replaced vessels from entering an Amendment 80 fishery, and established sideboard limits of zero for all BSAI and GOA groundfish fisheries for Amendment 80 vessels not assigned to the Amendment 80 fishery.

Amendment 98, implemented on October 31, 2013, revised Amendment 78:

1. Revise EFH description and identification by species, and update life history, distribution, and habitat association information, based on the 2010 EFH 5-year review.
2. Update description of EFH impacts from non-fishing activities, and EFH conservation recommendations for non-fishing activities.
3. Revise the timeline associated with the HAPC process to a 5-year timeline.
4. Update EFH research priority objectives.

Amendment 99, implemented on January 6, 2014 (effective February 6, 2014):

Allows holders of license limitation program (LLP) licenses endorsed to catch and process Pacific cod in the Bering Sea/Aleutian Islands hook-and-line fisheries to use their LLP license on larger newly built or existing vessels by:

1. Increasing the maximum vessel length limits of the LLP license, and
2. Waiving vessel length, weight, and horsepower limits of the American Fisheries Act.

Amendment 100, implemented on August 14, 2014, effective on January 1, 2015:

Adds grenadiers to the ecosystem component category in section 3.1.2 and in Table 3-1.

Amendment 102, implemented on February 14, 2014:

1. Created a Community Quota Entity Program in halibut IFQ regulatory area 4B and the sablefish Aleutian Islands regulatory area.
2. Allows individual fishing quota derived from D share halibut quota share to be fished on category C vessels in Area 4B

Amendment 103, implemented December 2, 2014:

Revise the Pribilof Islands Habitat Conservation Zone to close to fishing for Pacific cod with pot gear (in addition to the closure to all trawling).

Amendment 104, implemented on January 9, 2015:

1. Establishes Six Areas of Skate Egg Concentration as HAPCs.

Amendment 105, implemented on September 23, 2014:
Modifies the annual harvest specifications process to:

1. Create an ABC surplus and an ABC reserve for flathead sole, rock sole, and yellowfin sole and allocate the ABC reserve for each species.
2. Enable Amendment 80 cooperatives and Western Alaska Community Development Quota (CDQ) groups to exchange harvest quota of one or two of three flatfish species (flathead sole, rock sole, or yellowfin sole) for an equivalent amount of their allocation of the ABC reserve of one other of these species.

Amendment 106, implemented September 12, 2014, revised Amendment 61 and conformed the FMP to section 602 of the Coast Guard Authorization Act of 2010 that:

Specified the conditions under which the owners of AFA vessels could rebuild AFA vessels, replace AFA vessels, and remove AFA catcher vessels that are members of inshore cooperatives from the Bering Sea directed pollock fishery.

Amendment 107, implemented January 5, 2015:

Identified open transit areas through the walrus protection areas at Round Island and Cape Peirce, northern Bristol Bay, Alaska.

Amendment 108, implemented on May 5, 2015:

This amendment corrects an omission in the FMP text that establishes vessel length limits for small vessels exempted from the license limitation program (LLP) in the Bering Sea and Aleutian Islands Management Area (BSAI) groundfish fishery. This amendment makes the FMP text consistent with the original intent of the LLP, operations in the fisheries, and Federal regulations.

Amendment 109, implemented on May 4, 2016:

Revised provisions regarding the Western Alaska CDQ Program to update information and to facilitate increased participation in the groundfish CDQ fisheries (primarily Pacific cod) by:

1. Exempting CDQ group-authorized catcher vessels greater than 32 ft LOA and less than or equal to 46 ft LOA using hook-and-line gear from License Limitation Program license requirements while groundfish CDQ fishing,

2. Modifying observer coverage category language to allow for the placement of catcher vessels less than or equal to 46 ft LOA using hook-and-line gear into the partial observer coverage category while groundfish CDQ fishing, and

3. Updating CDQ community population information, and making other miscellaneous editorial revisions to CDQ Program-related text in the FMP.

Amendment 110, implemented on June 10, 2016 revised Amendment 91 and Amendment 84:

Changed the Bering Sea Chinook Salmon Bycatch Management Program into the Bering Sea Salmon Bycatch Management Program by: (1) adding two new Chinook salmon PSC limits in the Bering Sea pollock fishery for years of low Chinook salmon abundance, (2) incorporating chum salmon avoidance incentives into the incentive plan agreements, (3) enacting more stringent measures for avoiding Chinook salmon bycatch, and (4) removing Amendment 84 management measures.

Amendment 111, implemented on April 27, 2016, revised Amendment 80:

1. Reduced halibut mortality PSC limits for the Non-AFA Trawl Catcher Processor (Amendment 80), BSAI trawl limited access, and CDQ sectors.

2. Established a halibut mortality PSC limit in the FMP for the Non-Trawl sector that was previously only in regulation.

Amendment 112, implemented on March 29, 2016:

Revised regulations governing the basis for NMFS to place small catcher/processors in the partial observer coverage category in the North Pacific Groundfish and Halibut Observer Program (Observer Program) in the Gulf of Alaska and the Bering Sea and Aleutian Islands Management Area.

Amendment 113, implemented on November 23, 2016:

1. Reserves up to 5,000 mt of TAC in the AI non-CDQ Pacific cod fishery exclusively for harvest by vessels directed fishing for AI Pacific cod for processing by Aleutian Islands shoreplants from January 1 until March 15.
2. Limits the amount of the trawl CV sector's BSAI Pacific cod A-season allocation that can be caught in the Bering Sea subarea before March 21.
3. Imposes the Aleutian Islands Catcher Vessel Harvest Set-Aside if NMFS is notified in advance as specified in regulations implementing the FMP amendment and certain performance measures are met.

Amendment 114, implemented on September 7, 2017, revised Amendment 86:

Authorizes NMFS to place electronic monitoring systems for collecting at-sea data on vessels in the partial coverage category of the North Pacific Observer Program.

Amendment 115, implemented on July 5, 2018, revised Amendment 98:

1. Revises EFH descriptions and identification by species, and update life history, distribution, and habitat association information, based on the 2016 EFH 5-year review.

2. Updates the model used to determine fishing effects on EFH, and description of EFH impacts from fishing activities.

3. Updates descriptions of EFH impacts from non-fishing activities, and EFH conservation recommendations for non-fishing activities.

Amendment 116, implemented on November 5, 2018:

Allows holders of a license limitation program (LLP) license endorsed to catch groundfish in the BSAI with trawl gear to use their LLP license to catch and deliver to a mothership BSAI TLAS yellowfins sole.

Amendment 117, implemented on August 6, 2018:

Adds squids to the ecosystem component category in section 3.1.2 and in Table 3-1. Removes squids from target species category “In the Fishery” in section 3.1.2 and in Table 3-1.

Amendment 118 implemented on February 7, 2020:

Allows retention of halibut in pot gear in the BSAI IFQ or CDQ halibut or IFQ or CDQ sablefish fishery.

Amendment 119, implemented on March 23, 2020:

Requires that the operator of a catcher vessel using hook-and-line, pot, or jig gear participating in groundfish or halibut fisheries in Federal waters retain and land all rockfish. (Sebastes and Sebastolobus species) caught.

Amendment 120, implemented on January 20, 2020:

Allows holders of a groundfish license limitation program (LLP) license endorsed to receive and process Pacific cod harvested by catcher vessels directed fishing using trawl gear in the BSAI non-Community Development Quota Program Pacific cod fishery in the BSAI to use their groundfish LLP license to receive and process Pacific cod harvested by catcher vessels directed fishing using trawl gear in the BSAI non-Community Development Quota Program Pacific cod fishery. Prohibits all Amendment 80 vessels not designated on an Amendment 80 QS permit and an Amendment 80 LLP license or on an Amendment 80 LLP/QS license from receiving and processing Pacific cod harvested by a vessels directed fishing for Pacific cod in the BSAI.

Amendment 121, implemented on January 5, 2022:

Adds sculpins to the ecosystem component category in section 3.1.2 and in Table 3-1. Removes sculpins from target species category “In the Fishery” in section 3.1.2 and in Table 3-1.

Amendment 122, implemented on September 7, 2023, removes Amendment 113:

Implements the Pacific cod Trawl Cooperative Program (PCTC Program) and removes vacated provisions of Amendment 113.

Amendment 123, implemented on September 20, 2024, revised Amendment 80:

1. Revised the static Amendment 80 PSC limit of 1,745 mt to a procedure where the PSC limit is determined annually based on the most recent survey values for the IPHC setline survey index in Area 4ABCDE (WPUE) and the NMFS EBS trawl survey index (t) using the following look-up table:

		EBS shelf trawl survey index (t)	
		Low ≤ 150,000	**High ≥ 150,000**
IPHC setline survey index in Area ABCDE (WPUE)	**High ≥ 11,000**	1,745 mt	1,745 mt
	Medium 8,000-10,999	1,396 mt	1,571 mt
	Low 6,000-7,999	1,309 mt	1,396 mt
	Very Low < 6,000	1,134 mt	1,134 mt

Amendment 124, implemented on June 23, 2023 and amends Amendments 15 and 102:

1. Updated fix gear types to include jig gear as an authorized gear for the harvest of sablefish IFQ snf CDQ in the BSAI.
2. Remove reference to specific residency requirements and lease provisions for the CQE program and defer to regulations.

Amendment 126, implemented on August 28, 2024, revising Amendment 86:

Allows the use of electronic monitoring systems to meet observer coverage requirements for vessels in the full observer coverage category. Specifies that tender vessels may be required to carry electronic monitoring to meet monitoring objectives aboard vessels in the full or partial coverage category.

Amendment 127, implemented on July 15, 2024, revised Amendment 126:

1. Revise EFH description and maps by species, and update life history, distribution, and habitat association information (EFH component 1), based on the 2023 EFH 5-year Review.
2. Update the model used to determine fishing effects on species' core EFH areas, and the evaluation of EFH impacts from fishing activities (EFH component 2).
3. Update description of EFH impacts from non-fishing activities, and EFH conservation recommendations for non-fishing activities (EFH component 4).
4. Update the research and information needs (EFH component 9).

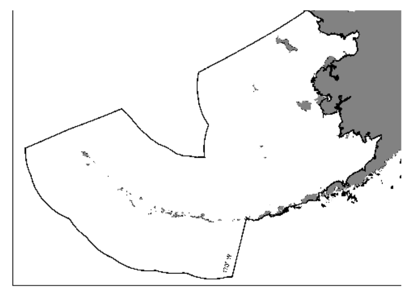
Appendix B Geographical Coordinates of Areas Described in the Fishery Management Plan

This appendix describes the geographical coordinates for the areas described in the Fishery Management Plan (FMP). This appendix divides the descriptions into three types: Bering Sea and Aleutian Islands (BSAI) management area, subareas, and districts (Section B.1), closed areas (Section B.2), and prohibited species bycatch (PSC) bycatch limitation zones (Section B.3).

B.1 Management Area, Subareas, and Districts

Management Area

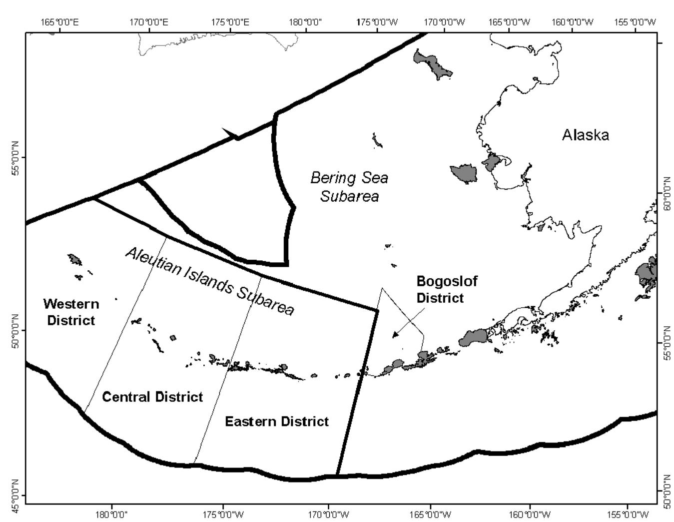
The management area for the BSAI groundfish FMP is the United States (U.S.) Exclusive Economic Zone (EEZ) of the Bering Sea, including Bristol Bay and Norton Sound, and that portion of the North Pacific Ocean adjacent to the Aleutian Islands which is between 170° W. longitude and the U.S.-Russian Convention Line of 1867. To the north, the management area is bounded by the Bering Strait.



Subareas

Two subareas are described in Section 3.1 of the FMP and are defined as follows:

Bering Sea subarea:	The area of the EEZ east of 170° W. longitude that is north of the Aleutian Islands, and the area of the EEZ west of 170E W. longitude that is north of 55° N. latitude.
Aleutian Islands subarea:	The area of the EEZ west of 170°W. longitude and south of 55°N. latitude.



Districts

The Bering Sea subarea contains one district, defined as follows:

Bogoslof District:	The area of the EEZ east of 170° W. longitude, west of 167° W. longitude, south of the straight line connecting the coordinates (55E46' N., 170° W.) and (54°30' N., 167° W.), and north of the Aleutian Islands.

The Aleutian Islands subarea is divided into three districts, defined as follows:

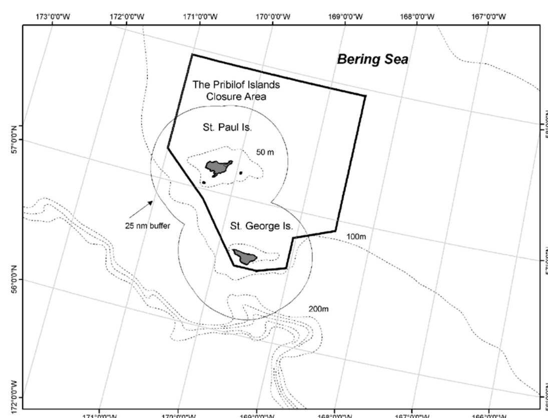
Eastern District:	That part of the Aleutian Islands subarea between 170° W. longitude and 177° W. longitude.
Central District:	That part of the Aleutian Islands subarea between 177° W. longitude and 177° E. longitude.
Western District:	That part of the Aleutian Islands subarea west of 177° E. longitude.

B.2 Closed Areas

Specific areas of the BSAI are closed to some or all fishing during certain times of the year and are described in Section 3.5.2 of the FMP.

Pribilof Islands Habitat Conservation Area

Trawling and fishing for Pacific cod with pot gear are prohibited at all times in the EEZ within the area bounded by a straight line connecting the following pairs of coordinates in the following order:



(57°57.0' N., 168° 30.0' W.)
(56° 55.2' N., 168° 30.0' W.)
(56° 48.0' N., 169° 2.4' W.)
(56° 34.2' N., 169° 2.4' W.)
(56° 30.0' N., 169° 25.2' W.)
(56° 30.0' N., 169° 44.1' W.)
(56° 55.8' N., 170° 21.6' W.)
(57° 13.8' N., 171° 0.0' W.)
(57° 57.0' N., 171° 0.0' W.)
(57° 57.0' N., 168° 30.0' W.)

Chum Salmon Savings Area

Trawling is prohibited from August 1 through August 31 within the area bounded by a straight line connecting the following pairs of coordinates in the order listed:

(56°00' N., 167°00' W.)

(56°00' N., 165°00' W.)

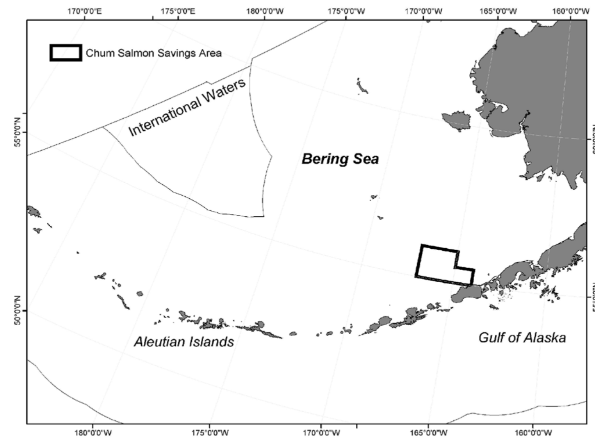
(55°30' N., 165°00' W.)

(55°30' N., 164°00' W.)

(55°00' N., 164°00' W.)

(55°00' N., 167°00' W.)

(56°00' N., 167°00' W.)



Trawling is also prohibited for the remainder of the period September 14 through October 14 upon the attainment of an 'other salmon' bycatch limit; see Section B.3.

Red King Crab Savings Area

Non-pelagic trawling is prohibited year round within the area bounded by a straight line connecting the following pairs of coordinates in the order listed below:

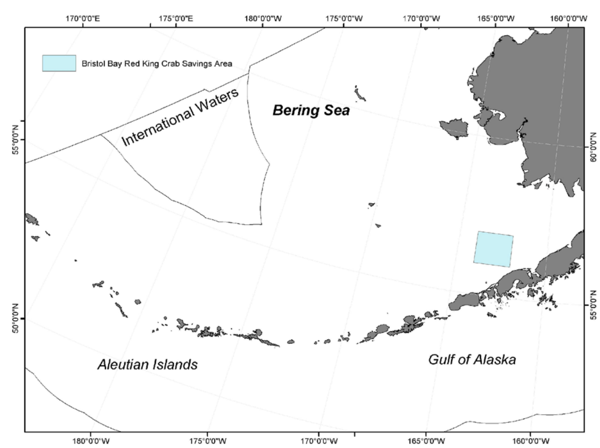
(56° N., 162° W.)

(56° N., 164° W.)

(57° N., 164° W.)

(57° N., 162° W.)

(56° N., 162° W.)

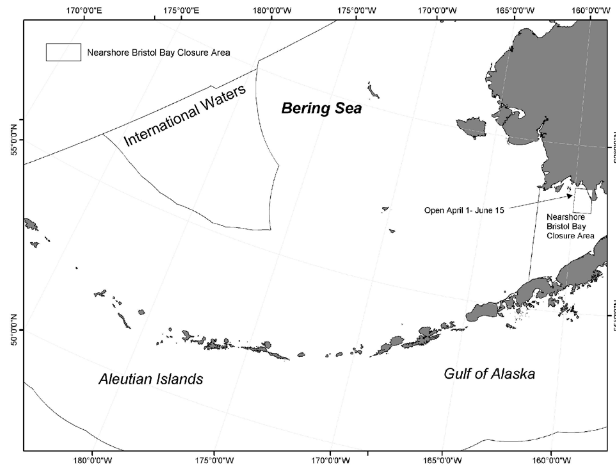


with the exception that a subarea of the Red King Crab Savings Area between 56°00' N. and 56°10' N. latitude and 162° W. and 164° W. longitude may be opened as outlined in Section 3.5.2.1.

Nearshore Bristol Bay Trawl Closure

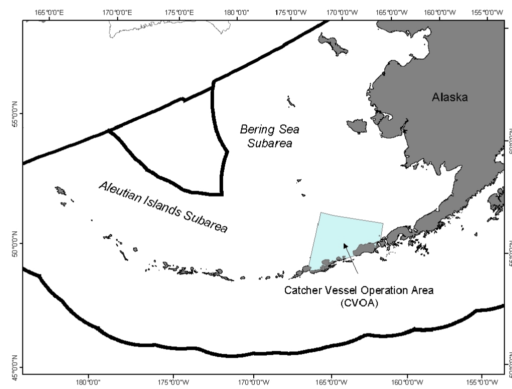
All trawling is prohibited year round in Bristol Bay east of 162° W. longitude, except the subarea bounded by a straight line connecting the following pairs of coordinates in the order listed below that is open to trawling during the period April 1 to June 15 each year:

(58°00' N., 160°W.)
(58°43' N., 160° W.)
(58°43' N., 159° W.)
(58°00' N., 159° W.)
(58°00' N., 160° W.)



Catcher Vessel Operational Area (CVOA)

The CVOA is defined as the area of the BSAI east of 167°30' W. longitude, west of 163° W. longitude, south of 56° N. latitude, and north of the Aleutian Islands. The CVOA shall be in effect during the pollock “B” season from September 1 until the date that closes the inshore component “B” season allocation to directed fishing. Vessels in the offshore component or vessels catching pollock for processing by the offshore component are prohibited from conducting directed fishing for pollock in the CVOA unless they are participating in a CDQ fishery.



Alaska Seamount Habitat Protection Area (ASHPA)

Bottom contact gear fishing is prohibited in the portion of the Alaska Seamount Habitat Protection Area located in the BSAI. Coordinates for this habitat protection area are listed in the table below.

Name	Latitude			Longitude		
Bowers Seamount	54	9.00	N	174	52.20	E
	54	9.00	N	174	42.00	E
	54	4.20	N	174	42.00	E
	54	4.20	N	174	52.20	E

Note: The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates is connected to the first set of coordinates by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Aleutian Islands Habitat Conservation Area (AIHCA)

Nonpelagic trawl gear fishing is prohibited in the AIHCA. Note: Unless otherwise footnoted (see footnotes at end of table), each area is delineated by connecting in order the coordinates listed by straight lines. Except for the Amlia North/Seguam donut and the Buldir donut, each area delineated in the table is open to nonpelagic trawl gear fishing. The remainder of the entire Aleutian Islands subarea and the areas delineated by the coordinates for the Amlia North/Seguam and Buldir donuts are closed to nonpelagic trawl gear fishing, as specified at § 679.22. Unless otherwise noted, the last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Name	Latitude			Longitude			Footnote
Islands of 4 Mountains North	52	54.00	N	170	18.00	W	
	52	54.00	N	170	24.00	W	
	52	42.00	N	170	24.00	W	
	52	42.00	N	170	18.00	W	
Islands of 4 Mountains West	53	12.00	N	170	0.00	W	
	53	12.00	N	170	12.00	W	
	53	6.00	N	170	12.00	W	
	53	6.00	N	170	30.00	W	
	53	0.00	N	170	30.00	W	
	53	0.00	N	170	48.00	W	
	52	54.00	N	170	48.00	W	
	52	54.00	N	170	54.00	W	
	52	48.00	N	170	54.00	W	
	52	48.00	N	170	30.00	W	
	52	54.00	N	170	30.00	W	
	52	54.00	N	170	24.00	W	
	53	0.00	N	170	24.00	W	
	53	0.00	N	170	0.00	W	
Yunaska I South	52	24.00	N	170	30.00	W	
	52	24.00	N	170	54.00	W	
	52	12.00	N	170	54.00	W	
	52	12.00	N	170	30.00	W	
Amukta I North	52	54.00	N	171	6.00	W	
	52	54.00	N	171	30.00	W	
	52	48.00	N	171	30.00	W	
	52	48.00	N	171	36.00	W	
	52	42.00	N	171	36.00	W	
	52	42.00	N	171	12.00	W	
	52	48.00	N	171	12.00	W	
	52	48.00	N	171	6.00	W	
Amukta Pass North	52	42.00	N	171	42.00	W	
	52	42.00	N	172	6.00	W	
	52	36.00	N	172	6.00	W	
	52	36.00	N	171	42.00	W	
Amlia North/Seguam	52	42.00	N	172	12.00	W	
	52	42.00	N	172	30.00	W	
	52	30.00	N	172	30.00	W	
	52	30.00	N	172	36.00	W	
	52	36.00	N	172	36.00	W	
	52	36.00	N	172	42.00	W	
	52	39.00	N	172	42.00	W	
	52	39.00	N	173	24.00	W	
	52	36.00	N	173	30.00	W	
	52	36.00	N	173	36.00	W	
	52	30.00	N	173	36.00	W	
	52	30.00	N	174	0.00	W	
	52	27.00	N	174	0.00	W	
	52	27.00	N	174	6.00	W	
	52	23.93	N	174	6.00	W	1
	52	13.71	N	174	6.00	W	
	52	12.00	N	174	6.00	W	
	52	12.00	N	174	0.00	W	
	52	9.00	N	174	0.00	W	
	52	9.00	N	173	0.00	W	
	52	6.00	N	173	0.00	W	

Name	Latitude			Longitude			Footnote
	52	6.00	N	172	45.00	W	
	51	54.00	N	172	45.00	W	
	51	54.00	N	171	48.00	W	
	51	48.00	N	171	48.00	W	
	51	48.00	N	171	42.00	W	
	51	54.00	N	171	42.00	W	
	52	12.00	N	171	42.00	W	
	52	12.00	N	171	48.00	W	
	52	18.00	N	171	48.00	W	
	52	18.00	N	171	42.00	W	
	52	30.00	N	171	42.00	W	
	52	30.00	N	171	54.00	W	
	52	24.00	N	171	54.00	W	
	52	24.00	N	172	0.00	W	
	52	12.00	N	172	0.00	W	
	52	12.00	N	172	42.00	W	
	52	18.00	N	172	42.00	W	
	52	18.00	N	172	37.13	W	2
	52	18.64	N	172	36.00	W	
	52	24.00	N	172	36.00	W	
	52	24.00	N	172	12.00	W	6
Amlia North/Seguam donut	52	33.00	N	172	42.00	W	5
	52	33.00	N	173	6.00	W	5
	52	30.00	N	173	6.00	W	5
	52	30.00	N	173	18.00	W	5
	52	24.00	N	173	18.00	W	5
	52	24.00	N	172	48.00	W	5
	52	30.00	N	172	48.00	W	5
	52	30.00	N	172	42.00	W	5, 7
Atka/Amlia South	52	0.00	N	173	18.00	W	
	52	0.00	N	173	54.00	W	
	52	3.08	N	173	54.00	W	2
	52	6.00	N	173	58.00	W	
	52	6.00	N	174	6.00	W	
	52	0.00	N	174	18.00	W	
	52	0.00	N	174	12.00	W	
	51	54.00	N	174	12.00	W	
	51	54.00	N	174	18.00	W	
	52	6.00	N	174	18.00	W	
	52	6.00	N	174	21.86	W	1
	52	4.39	N	174	30.00	W	
	52	3.09	N	174	30.00	W	1
	52	2.58	N	174	30.00	W	
	52	0.00	N	174	30.00	W	
	52	0.00	N	174	36.00	W	
	51	54.00	N	174	36.00	W	
	51	54.00	N	174	54.00	W	
	51	48.00	N	174	54.00	W	
	51	48.00	N	173	24.00	W	
	51	54.00	N	173	24.00	W	
	51	54.00	N	173	18.00	W	
Atka I North	52	30.00	N	174	24.00	W	
	52	30.00	N	174	30.00	W	
	52	24.00	N	174	30.00	W	
	52	24.00	N	174	48.00	W	
	52	18.00	N	174	48.00	W	
	52	18.00	N	174	54.00	W	
	52	12.00	N	174	54.00	W	

Name	Latitude			Longitude			Footnote
	52	12.00	N	175	18.00	W	
	52	1.14	N	175	18.00	W	1
	52	2.19	N	175	12.00	W	
	52	6.00	N	175	12.00	W	
	52	6.00	N	174	55.51	W	1
	52	6.00	N	174	54.04	W	
	52	6.00	N	174	48.00	W	
	52	12.00	N	174	48.00	W	
	52	12.00	N	174	26.85	W	1
	52	12.94	N	174	18.00	W	
	52	16.80	N	174	18.00	W	1
	52	17.06	N	174	18.00	W	
	52	17.64	N	174	18.00	W	1
	52	18.00	N	174	19.12	W	
	52	18.00	N	174	20.04	W	1
	52	19.37	N	174	24.00	W	
Atka I South	52	0.68	N	175	12.00	W	2
	52	0.76	N	175	18.00	W	
	52	0.00	N	175	18.00	W	
	52	0.00	N	175	12.00	W	
Adak I East	52	12.00	N	176	36.00	W	
	52	12.00	N	176	0.00	W	
	52	2.59	N	176	0.00	W	1
	52	1.79	N	176	0.00	W	
	52	0.00	N	176	0.00	W	
	52	0.00	N	175	48.00	W	
	51	57.74	N	175	48.00	W	1
	51	55.48	N	175	48.00	W	
	51	54.00	N	175	48.00	W	
	51	54.00	N	176	0.00	W	1
	51	53.09	N	176	6.00	W	
	51	51.40	N	176	6.00	W	1
	51	49.67	N	176	6.00	W	
	51	48.73	N	176	6.00	W	1
	51	48.00	N	176	6.36	W	
	51	48.00	N	176	9.82	W	1
	51	48.00	N	176	9.99	W	
	51	48.00	N	176	16.19	W	1
	51	48.00	N	176	24.71	W	
	51	48.00	N	176	25.71	W	1
	51	45.58	N	176	30.00	W	
	51	42.00	N	176	30.00	W	
	51	42.00	N	176	33.92	W	1
	51	41.22	N	176	42.00	W	
	51	30.00	N	176	42.00	W	
	51	30.00	N	176	36.00	W	
	51	36.00	N	176	36.00	W	
	51	36.00	N	176	0.00	W	
	51	42.00	N	176	0.00	W	
	51	42.00	N	175	36.00	W	
	51	48.00	N	175	36.00	W	
	51	48.00	N	175	18.00	W	
	51	51.00	N	175	18.00	W	
	51	51.00	N	175	0.00	W	
	51	57.00	N	175	0.00	W	
	51	57.00	N	175	18.00	W	
	52	0.00	N	175	18.00	W	
	52	0.00	N	175	30.00	W	

Name	Latitude			Longitude			Footnote
	52	3.00	N	175	30.00	W	
	52	3.00	N	175	36.00	W	
Cape Adagdak	52	6.00	N	176	12.44	W	
	52	6.00	N	176	30.00	W	
	52	3.00	N	176	30.00	W	
	52	3.00	N	176	42.00	W	
	52	0.00	N	176	42.00	W	
	52	0.00	N	176	46.64	W	
	51	57.92	N	176	46.51	W	1
	51	54.00	N	176	37.07	W	
	51	54.00	N	176	18.00	W	
	52	0.00	N	176	18.00	W	
	52	0.00	N	176	12.00	W	
	52	2.85	N	176	12.00	W	1
	52	4.69	N	176	12.44	W	
Cape Kiguga/Round Head	52	0.00	N	176	53.00	W	
	52	0.00	N	177	6.00	W	
	51	56.06	N	177	6.00	W	1
	51	54.00	N	177	2.84	W	
	51	54.00	N	176	54.00	W	
	51	48.79	N	176	54.00	W	1
	51	48.00	N	176	50.35	W	
	51	48.00	N	176	43.14	W	1
	51	55.69	N	176	48.59	W	
	51	55.69	N	176	53.00	W	
Adak Strait South	51	42.00	N	176	55.77	W	
	51	42.00	N	177	12.00	W	
	51	30.00	N	177	12.00	W	
	51	36.00	N	177	6.00	W	
	51	36.00	N	177	3.00	W	
	51	39.00	N	177	3.00	W	
	51	39.00	N	177	0.00	W	
	51	36.00	N	177	0.00	W	
	51	36.00	N	176	57.72	W	3
Bay of Waterfalls	51	38.62	N	176	54.00	W	
	51	36.00	N	176	54.00	W	
	51	36.00	N	176	55.99	W	3
Tanaga/Kanaga North	51	54.00	N	177	12.00	W	
	51	54.00	N	177	19.93	W	
	51	51.71	N	177	19.93	W	
	51	51.65	N	177	29.11	W	
	51	54.00	N	177	29.11	W	
	51	54.00	N	177	30.00	W	
	51	57.00	N	177	30.00	W	
	51	57.00	N	177	42.00	W	
	51	54.00	N	177	42.00	W	
	51	54.00	N	177	54.00	W	
	51	50.92	N	177	54.00	W	1
	51	48.00	N	177	46.44	W	
	51	48.00	N	177	42.00	W	
	51	42.59	N	177	42.00	W	1
	51	45.57	N	177	24.01	W	
	51	48.00	N	177	24.00	W	
	51	48.00	N	177	14.08	W	4
Tanaga/Kanaga South	51	43.78	N	177	24.04	W	1
	51	42.37	N	177	42.00	W	
	51	42.00	N	177	42.00	W	
	51	42.00	N	177	50.04	W	1

Name	Latitude			Longitude			Footnote
	51	40.91	N	177	54.00	W	
	51	36.00	N	177	54.00	W	
	51	36.00	N	178	0.00	W	
	51	38.62	N	178	0.00	W	1
	51	42.52	N	178	6.00	W	
	51	49.34	N	178	6.00	W	1
	51	51.35	N	178	12.00	W	
	51	48.00	N	178	12.00	W	
	51	48.00	N	178	30.00	W	
	51	42.00	N	178	30.00	W	
	51	42.00	N	178	36.00	W	
	51	36.26	N	178	36.00	W	1
	51	35.75	N	178	36.00	W	
	51	27.00	N	178	36.00	W	
	51	27.00	N	178	42.00	W	
	51	21.00	N	178	42.00	W	
	51	21.00	N	178	24.00	W	
	51	24.00	N	178	24.00	W	
	51	24.00	N	178	12.00	W	
	51	30.00	N	178	12.00	W	
	51	30.00	N	177	24.00	W	
Amchitka Pass East	51	42.00	N	178	48.00	W	
	51	42.00	N	179	18.00	W	
	51	45.00	N	179	18.00	W	
	51	45.00	N	179	36.00	W	
	51	42.00	N	179	36.00	W	
	51	42.00	N	179	39.00	W	
	51	30.00	N	179	39.00	W	
	51	30.00	N	179	36.00	W	
	51	18.00	N	179	36.00	W	
	51	18.00	N	179	24.00	W	
	51	30.00	N	179	24.00	W	
	51	30.00	N	179	0.00	W	
	51	25.82	N	179	0.00	W	
	51	25.85	N	178	59.00	W	
	51	24.00	N	178	58.97	W	
	51	24.00	N	178	54.00	W	
	51	30.00	N	178	54.00	W	
	51	30.00	N	178	48.00	W	
	51	32.69	N	178	48.00	W	1
	51	33.95	N	178	48.00	W	
Amatignak I	51	18.00	N	178	54.00	W	
	51	18.00	N	179	5.30	W	1
	51	18.00	N	179	6.75	W	
	51	18.00	N	179	12.00	W	
	51	6.00	N	179	12.00	W	
	51	6.00	N	179	0.00	W	
	51	12.00	N	179	0.00	W	
	51	12.00	N	178	54.00	W	
Amchitka Pass Center	51	30.00	N	179	48.00	W	
	51	30.00	N	180	0.00	W	
	51	24.00	N	180	0.00	W	
	51	24.00	N	179	48.00	W	
Amchitka Pass West	51	36.00	N	179	54.00	E	
	51	36.00	N	179	36.00	E	
	51	30.00	N	179	36.00	E	
	51	30.00	N	179	45.00	E	
	51	27.00	N	179	48.00	E	

Name	Latitude			Longitude			Footnote
	51	24.00	N	179	48.00	E	
	51	24.00	N	179	54.00	E	
Petrel Bank	52	51.00	N	179	12.00	W	
	52	51.00	N	179	24.00	W	
	52	48.00	N	179	24.00	W	
	52	48.00	N	179	30.00	W	
	52	42.00	N	179	30.00	W	
	52	42.00	N	179	36.00	W	
	52	36.00	N	179	36.00	W	
	52	36.00	N	179	48.00	W	
	52	30.00	N	179	48.00	W	
	52	30.00	N	179	42.00	E	
	52	24.00	N	179	42.00	E	
	52	24.00	N	179	36.00	E	
	52	12.00	N	179	36.00	E	
	52	12.00	N	179	36.00	W	
	52	24.00	N	179	36.00	W	
	52	24.00	N	179	30.00	W	
	52	30.00	N	179	30.00	W	
	52	30.00	N	179	24.00	W	
	52	36.00	N	179	24.00	W	
	52	36.00	N	179	18.00	W	
	52	42.00	N	179	18.00	W	
	52	42.00	N	179	12.00	W	
Rat I/Amchitka I South	51	21.00	N	179	36.00	E	
	51	21.00	N	179	18.00	E	
	51	18.00	N	179	18.00	E	
	51	18.00	N	179	12.00	E	
	51	23.77	N	179	12.00	E	1
	51	24.00	N	179	10.20	E	
	51	24.00	N	179	0.00	E	
	51	36.00	N	178	36.00	E	
	51	36.00	N	178	24.00	E	
	51	42.00	N	178	24.00	E	
	51	42.00	N	178	6.00	E	
	51	48.00	N	178	6.00	E	
	51	48.00	N	177	54.00	E	
	51	54.00	N	177	54.00	E	
	51	54.00	N	178	12.00	E	
	51	48.00	N	178	12.00	E	
	51	48.00	N	178	17.09	E	1
	51	48.00	N	178	20.60	E	
	51	48.00	N	178	24.00	E	
	52	6.00	N	178	24.00	E	
	52	6.00	N	178	12.00	E	
	52	0.00	N	178	12.00	E	
	52	0.00	N	178	11.01	E	1
	52	0.00	N	178	5.99	E	
	52	0.00	N	177	54.00	E	
	52	9.00	N	177	54.00	E	
	52	9.00	N	177	42.00	E	
	52	0.00	N	177	42.00	E	
	52	0.00	N	177	48.00	E	
	51	54.00	N	177	48.00	E	
	51	54.00	N	177	30.00	E	
	51	51.00	N	177	30.00	E	
	51	51.00	N	177	24.00	E	
	51	45.00	N	177	24.00	E	

Name	Latitude			Longitude			Footnote
	51	45.00	N	177	30.00	E	
	51	48.00	N	177	30.00	E	
	51	48.00	N	177	42.00	E	
	51	42.00	N	177	42.00	E	
	51	42.00	N	178	0.00	E	
	51	39.00	N	178	0.00	E	
	51	39.00	N	178	12.00	E	
	51	36.00	N	178	12.00	E	
	51	36.00	N	178	18.00	E	
	51	30.00	N	178	18.00	E	
	51	30.00	N	178	24.00	E	
	51	24.00	N	178	24.00	E	
	51	24.00	N	178	36.00	E	
	51	30.00	N	178	36.00	E	
	51	24.00	N	178	48.00	E	
	51	18.00	N	178	48.00	E	
	51	18.00	N	178	54.00	E	
	51	12.00	N	178	54.00	E	
	51	12.00	N	179	30.00	E	
	51	18.00	N	179	30.00	E	
	51	18.00	N	179	36.00	E	
Amchitka I North	51	42.00	N	179	12.00	E	
	51	42.00	N	178	57.00	E	
	51	36.00	N	178	56.99	E	
	51	36.00	N	179	0.00	E	
	51	33.62	N	179	0.00	E	2
	51	30.00	N	179	5.00	E	
	51	30.00	N	179	18.00	E	
	51	36.00	N	179	18.00	E	
	51	36.00	N	179	12.00	E	
Pillar Rock	52	9.00	N	177	30.00	E	
	52	9.00	N	177	18.00	E	
	52	6.00	N	177	18.00	E	
	52	6.00	N	177	30.00	E	
Murray Canyon	51	48.00	N	177	12.00	E	
	51	48.00	N	176	48.00	E	
	51	36.00	N	176	48.00	E	
	51	36.00	N	177	0.00	E	
	51	39.00	N	177	0.00	E	
	51	39.00	N	177	6.00	E	
	51	42.00	N	177	6.00	E	
	51	42.00	N	177	12.00	E	
Buldir	52	6.00	N	177	12.00	E	
	52	6.00	N	177	0.00	E	
	52	12.00	N	177	0.00	E	
	52	12.00	N	176	54.00	E	
	52	9.00	N	176	54.00	E	
	52	9.00	N	176	48.00	E	
	52	0.00	N	176	48.00	E	
	52	0.00	N	176	36.00	E	
	52	6.00	N	176	36.00	E	
	52	6.00	N	176	24.00	E	
	52	12.00	N	176	24.00	E	
	52	12.00	N	176	12.00	E	
	52	18.00	N	176	12.00	E	
	52	18.00	N	176	30.00	E	
	52	24.00	N	176	30.00	E	
	52	24.00	N	176	0.00	E	

Name	Latitude			Longitude			Footnote
	52	18.00	N	176	0.00	E	
	52	18.00	N	175	54.00	E	
	52	6.00	N	175	54.00	E	
	52	6.00	N	175	48.00	E	
	52	0.00	N	175	48.00	E	
	52	0.00	N	175	54.00	E	
	51	54.00	N	175	54.00	E	
	51	54.00	N	175	36.00	E	
	51	42.00	N	175	36.00	E	
	51	42.00	N	175	30.00	E	
	51	36.00	N	175	30.00	E	
	51	36.00	N	175	36.00	E	
	51	30.00	N	175	36.00	E	
	51	30.00	N	175	42.00	E	
	51	36.00	N	175	42.00	E	
	51	36.00	N	176	0.00	E	
	52	0.00	N	176	0.00	E	
	52	0.00	N	176	6.00	E	
	52	6.00	N	176	6.00	E	
	52	6.00	N	176	12.00	E	
	52	0.00	N	176	12.00	E	
	52	0.00	N	176	30.00	E	
	51	54.00	N	176	30.00	E	
	51	54.00	N	177	0.00	E	
	52	0.00	N	177	0.00	E	
	52	0.00	N	177	12.00	E	
Buldir donut	51	48.00	N	175	48.00	E	5
	51	48.00	N	175	42.00	E	5
	51	45.00	N	175	42.00	E	5
	51	45.00	N	175	48.00	E	5, 7
Buldir Mound	51	54.00	N	176	24.00	E	
	51	54.00	N	176	18.00	E	
	51	48.00	N	176	18.00	E	
	51	48.00	N	176	24.00	E	
Buldir West	52	30.00	N	175	48.00	E	
	52	30.00	N	175	36.00	E	
	52	36.00	N	175	36.00	E	
	52	36.00	N	175	24.00	E	
	52	24.00	N	175	24.00	E	
	52	24.00	N	175	30.00	E	
	52	18.00	N	175	30.00	E	
	52	18.00	N	175	36.00	E	
	52	24.00	N	175	36.00	E	
	52	24.00	N	175	48.00	E	
Tahoma Canyon	52	0.00	N	175	18.00	E	
	52	0.00	N	175	12.00	E	
	51	42.00	N	175	12.00	E	
	51	42.00	N	175	24.00	E	
	51	54.00	N	175	24.00	E	
	51	54.00	N	175	18.00	E	
Walls Plateau	52	24.00	N	175	24.00	E	
	52	24.00	N	175	12.00	E	
	52	18.00	N	175	12.00	E	
	52	18.00	N	175	0.00	E	
	52	12.00	N	175	0.00	E	
	52	12.00	N	174	42.00	E	
	52	6.00	N	174	42.00	E	
	52	6.00	N	174	36.00	E	

Name	Latitude			Longitude			Footnote
	52	0.00	N	174	36.00	E	
	52	0.00	N	174	42.00	E	
	51	54.00	N	174	42.00	E	
	51	54.00	N	174	48.00	E	
	52	0.00	N	174	48.00	E	
	52	0.00	N	174	54.00	E	
	52	6.00	N	174	54.00	E	
	52	6.00	N	175	18.00	E	
	52	12.00	N	175	24.00	E	
Semichi I	52	30.00	N	175	6.00	E	
	52	30.00	N	175	0.00	E	
	52	36.00	N	175	0.00	E	
	52	36.00	N	174	48.00	E	
	52	42.00	N	174	48.00	E	
	52	42.00	N	174	33.00	E	
	52	36.00	N	174	33.00	E	
	52	36.00	N	174	24.00	E	
	52	39.00	N	174	24.00	E	
	52	39.00	N	174	0.00	E	
	52	42.00	N	173	54.00	E	
	52	45.16	N	173	54.00	E	1
	52	46.35	N	173	54.00	E	
	52	54.00	N	173	54.00	E	
	52	54.00	N	173	30.00	E	
	52	48.00	N	173	30.00	E	
	52	48.00	N	173	36.00	E	
	52	40.00	N	173	36.00	E	
	52	40.00	N	173	25.00	E	
	52	30.00	N	173	25.00	E	
	52	33.00	N	173	40.00	E	
	52	33.00	N	173	54.00	E	
	52	18.00	N	173	54.00	E	
	52	18.00	N	174	30.00	E	
	52	30.00	N	174	30.00	E	
	52	30.00	N	174	48.00	E	
	52	24.00	N	174	48.00	E	
	52	24.00	N	175	6.00	E	
Agattu South	52	18.00	N	173	54.00	E	
	52	18.00	N	173	24.00	E	
	52	9.00	N	173	24.00	E	
	52	9.00	N	173	36.00	E	
	52	6.00	N	173	36.00	E	
	52	6.00	N	173	54.00	E	
Attu I North	53	3.00	N	173	24.00	E	
	53	3.00	N	173	6.00	E	
	53	0.00	N	173	6.00	E	
	53	0.00	N	173	24.00	E	
Attu I West	52	54.00	N	172	12.00	E	
	52	54.00	N	172	0.00	E	
	52	48.00	N	172	0.00	E	
	52	48.00	N	172	12.00	E	
Stalemate Bank	53	0.00	N	171	6.00	E	
	53	0.00	N	170	42.00	E	
	52	54.00	N	170	42.00	E	
	52	54.00	N	171	6.00	E	

Note: Unless otherwise footnoted, each area is delineated by connecting in order the coordinates listed by straight lines. Except for the Amlia North/Seguam donut and the Buldir donut, each area delineated in the table is open to nonpelagic trawl gear fishing. The remainder of the entire Aleutian Islands subarea and the areas delineated by the coordinates for the Amlia North/Seguam and Buldir donuts are closed to nonpelagic trawl gear fishing, as specified at § 679.22. Unless otherwise noted, the last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

[1]The connection of these coordinates to the next set of coordinates is by a line extending in a clockwise direction from these coordinates along the shoreline at mean lower-low water to the next set of coordinates.
[2]The connection of these coordinates to the next set of coordinates is by a line extending in a counter clockwise direction from these coordinates along the shoreline at mean lower-low water to the next set of coordinates.
[3]The connection of these coordinates to the first set of coordinates for this area is by a line extending in a clockwise direction from these coordinates along the shoreline at mean lower-low water to the first set of coordinates.
[4]The connection of these coordinates to the first set of coordinates for this area is by a line extending in a counter clockwise direction from these coordinates along the shoreline at mean lower-low water to the first set of coordinates.
[5] The area specified by this set of coordinates is closed to fishing with non-pelagic trawl gear.
[6] This set of coordinates is connected to the first set of coordinates listed for the area by a straight line.
[7]The last coordinate for the donut is connected to the first set of coordinates for the donut by a straight line.

Aleutian Islands Coral Habitat Protection Areas (AICHPAs)

The use of bottom contact gear is prohibited in the AICHPAs. The coordinates for the areas are listed in the table below. Note: Each area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Area Number	Name	Latitude			Longitude		
1	Great Sitkin Is	52	9.56	N	176	6.14	W
		52	9.56	N	176	12.44	W
		52	4.69	N	176	12.44	W
		52	6.59	N	176	6.12	W
2	Cape Moffett Is	52	0.11	N	176	46.65	W
		52	0.10	N	176	53.00	W
		51	55.69	N	176	53.00	W
		51	55.69	N	176	48.59	W
		51	57.96	N	176	46.52	W
3	Adak Canyon	51	39.00	N	177	0.00	W
		51	39.00	N	177	3.00	W
		51	30.00	N	177	3.00	W
		51	30.00	N	177	0.00	W
4	Bobrof Is	51	57.35	N	177	19.94	W
		51	57.36	N	177	29.11	W
		51	51.65	N	177	29.11	W
		51	51.71	N	177	19.93	W
5	Ulak Is	51	25.85	N	178	59.00	W
		51	25.69	N	179	6.00	W
		51	22.28	N	179	6.00	W
		51	22.28	N	178	58.95	W
6	Semisopochnoi Is	51	53.10	N	179	53.11	E
		51	53.10	N	179	46.55	E
		51	48.84	N	179	46.55	E
		51	48.89	N	179	53.11	E

Bowers Ridge Habitat Conservation Zone (BRHCZ)

The use of mobile bottom contact gear is prohibited in the BRHCZ. The areas are described in the table below.

Area number	Name	Latitude			Longitude		
1	Bowers Ridge	55	10.50	N	178	27.25	E
		54	54.50	N	177	55.75	E
		54	5.83	N	179	20.75	E
		52	40.50	N	179	55.00	W
		52	44.50	N	179	26.50	W
		54	15.50	N	179	54.00	W
2	Ulm Plateau	55	5.00	N	177	15.00	E
		55	5.00	N	175	60.00	E
		54	34.00	N	175	60.00	E
		54	34.00	N	177	15.00	E

Note: Each area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Bering Sea Habitat Conservation Area

Nonpelagic trawl gear fishing is prohibited in Bering Sea Habitat Conservation Area. Coordinates for this habitat conservation area are listed in the table below. The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Latitude			Longitude		
179	19.95	W	59	25.15	N
177	51.76	W	58	28.85	N
175	36.52	W	58	11.78	N
174	32.36	W	58	8.37	N
174	26.33	W	57	31.31	N
174	0.82	W	56	52.83	N
173	0.71	W	56	24.05	N
170	40.32	W	56	1.97	N
168	56.63	W	55	19.30	N
168	0.08	W	54	5.95	N
170	0.00	W	53	18.24	N
170	0.00	W	55	0.00	N
178	46.69	E	55	0.00	N
178	27.25	E	55	10.50	N
178	6.48	E	55	0.00	N
177	15.00	E	55	0.00	N
177	15.00	E	55	5.00	N
176	0.00	E	55	5.00	N
176	0.00	E	55	0.00	N
172	6.35	E	55	0.00	N
173	59.70	E	56	16.96	N

St. Matthew Island Habitat Conservation Area

Nonpelagic trawl gear fishing is prohibited in St. Matthew Island Habitat Conservation Area. Coordinates for this habitat conservation area are listed in the table below. The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Longitude			Latitude		
171	45.00	W	60	54.00	N
171	45.00	W	60	6.15	N
174	0.50	W	59	42.26	N
174	24.98	W	60	9.98	N
174	1.24	W	60	54.00	N

St. Lawrence Island Habitat Conservation Area

Nonpelagic trawl gear fishing is prohibited in St. Lawrence Island Habitat Conservation Area. Coordinates for this habitat conservation area are listed in the table below. The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Longitude			Latitude		
168	24.00	W	64	0.00	N
168	24.00	W	62	42.00	N
172	24.00	W	62	42.00	N
172	24.00	W	63	57.03	N
172	17.42	W	64	0.01	N

Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area

Nonpelagic trawl gear fishing is prohibited in Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area. Coordinates for this habitat conservation area are listed in the table below. The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Longitude			Latitude		
165	1.54	W	60	45.54	N*
162	7.01	W	58	38.27	N
162	10.51	W	58	38.35	N
162	34.31	W	58	38.36	N
162	34.32	W	58	39.16	N
162	34.23	W	58	40.48	N
162	34.09	W	58	41.79	N
162	33.91	W	58	43.08	N
162	33.63	W	58	44.41	N
162	33.32	W	58	45.62	N
162	32.93	W	58	46.80	N
162	32.44	W	58	48.11	N
162	31.95	W	58	49.22	N
162	31.33	W	58	50.43	N
162	30.83	W	58	51.42	N
162	30.57	W	58	51.97	N
163	17.72	W	59	20.16	N
164	11.01	W	59	34.15	N
164	42.00	W	59	41.80	N
165	0.00	W	59	42.60	N
165	1.45	W	59	37.39	N
167	40.20	W	59	24.47	N
168	0.00	W	59	49.13	N
167	59.98	W	60	45.55	N

* The boundary extends in a clockwise direction from this set of geographic coordinates along the shoreline at mean lower-low tide line to the next set of coordinates.

Northern Bering Sea Research Area

Nonpelagic trawl gear fishing in the Northern Bering Sea Research Area is prohibited, except as allowed through exempted fishing permits under 50 CFR 679.6 and described in section 3.5.2.1.12. The area is delineated by connecting the coordinates in the order listed by straight lines. The last set of coordinates for each area is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Longitude			Latitude		
168	7.41	W	65	37.91	N*
165	1.54	W	60	45.54	N
167	59.98	W	60	45.55	N
169	00.00	W	60	35.50	N
169	00.00	W	61	00.00	N
171	45.00	W	61	00.00	N
171	45.00	W	60	54.00	N
174	1.24	W	60	54.00	N
176	13.51	W	62	6.56	N
172	24.00	W	63	57.03	N
172	24.00	W	62	42.00	N
168	24.00	W	62	42.00	N
168	24.00	W	64	0.00	N
172	17.42	W	64	0.01	N
168	58.62	W	65	30.00	N
168	58.62	W	65	49.81	N**

* The boundary extends in a clockwise direction from this set of geographic coordinates along the shoreline at mean lower-low tide line to the next set of coordinates.

** Intersection of the 1990 United States/Russia Maritime Boundary Line and a line from Cape Prince of Wales to Cape Dezhneva (Russia) that defines the boundary between the Chukchi and Bering Seas.

Modified Gear Trawl Zone

Owners and operators of vessels using nonpelagic trawl gear in the Modified Gear Trawl Zone must use modified nonpelagic trawl gear, regardless of target species, as described in Section 3.4.2 for the Bering Sea subarea flatfish fishery. The area is delineated by connecting the coordinates below, in the order listed, by straight lines. The last set of coordinates is connected to the first set of coordinates for the area by a straight line. The projected coordinate system is North American Datum 1983, Albers.

Longitude			Latitude		
171	45.00	W	61	00.00	N
169	00.00	W	61	00.00	N
169	00.00	W	60	35.48	N
171	45.00	W	60	06.15	N

B.3 PSC Limitation Zones

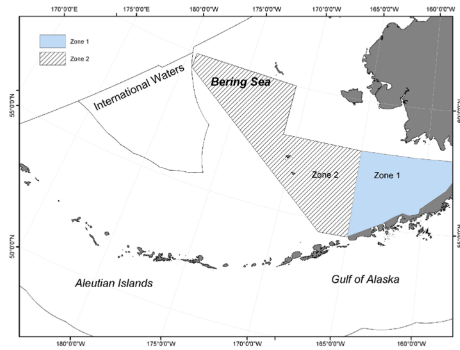
Specific areas of the management area are closed to some or all fishing during certain times of the year on attainment of a species-specific bycatch cap. These areas are described in Section 3.6.2.2 of the FMP.

Zones 1 and 2

Zones 1 and 2 are closed to directed fishing when the crab bycatch caps are attained in specified fisheries.

Zone 1: area bounded by 165° W. longitude and 58° N. latitude extending east to the shore.

Zone 2: area bounded by 165° W. longitude, north to 58° N., then west to the intersection of 58° N. and 171° W. longitude, then north to 60° N., then west to 179°20' W. longitude, then south to 59°25' N. latitude, then diagonally extending on a straight line southeast to the intersection of 167° W. longitude and 54°30' N. latitude, and then extending eastward along 54°30' N. latitude to 165° W. longitude.



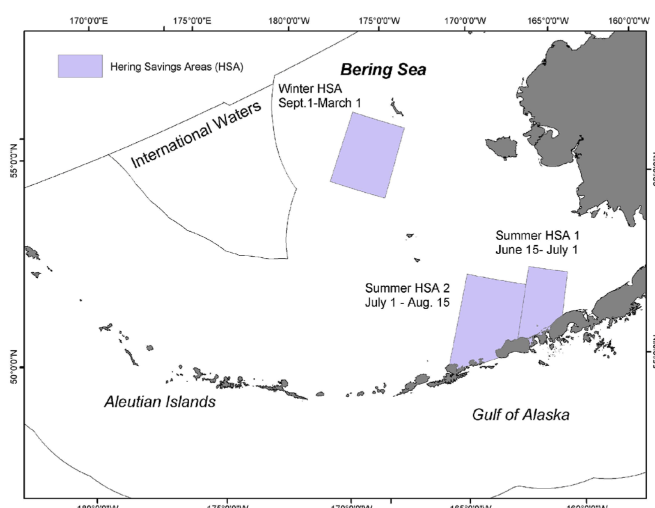
Herring Savings Areas

The herring savings areas are all located within the Bering Sea subarea and are defined as follows:

Summer Herring Savings Area 1: area south of 57° N. latitude and between 162° W. and 164° W. longitude from 12:00 noon Alaska Local Time (ALT) June 15 through 12:00 noon ALT July 1 of a fishing year

Summer Herring Savings Area 2: area south of 56°30' N. latitude and between 164° W. and 167° W. longitude from 12:00 noon ALT July 1 through 12:00 noon ALT August 15 of a fishing year

Winter Herring Savings Area: area between 58° N. and 60° N. latitude and between 172° W. and 175° W. longitude from 12:00 noon ALT September 1 through 12:00 noon ALT March 1 of the succeeding fishing year



Chum Salmon Savings Area

Upon the attainment of the "other salmon" catch limit, trawling is prohibited for the remainder of the period September 1 through October 14 within the area bounded by a straight line connecting the following pairs of coordinates in the order listed:

(56°00' N., 167° W.)

(56°00' N., 165° W.)

(55°30' N., 165° W.)

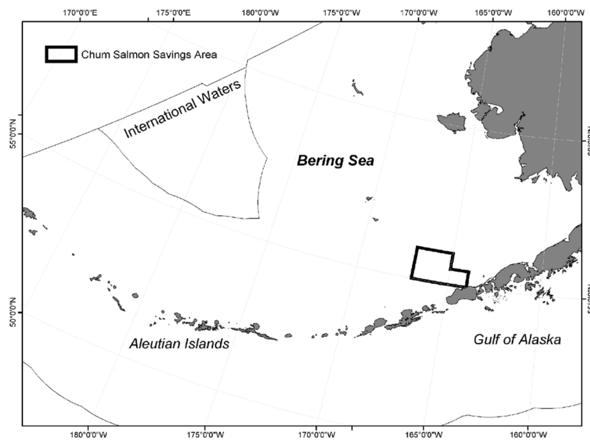
(55°30' N., 164° W.)

(55°00' N., 164° W.)

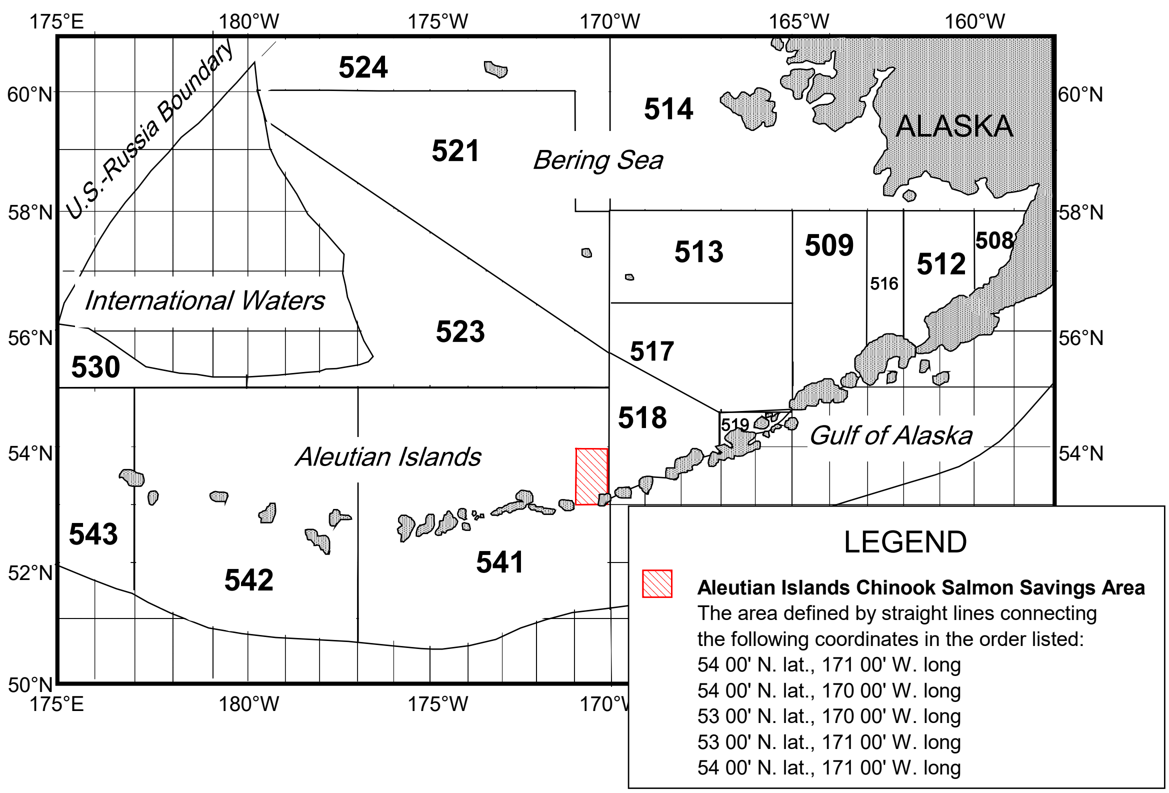
(55°00' N., 167° W.)

(56°00' N., 167° W.)

Trawling is also prohibited absolutely in the area from August 1 through August 31; see description in Section B.2 above.



Aleutian Islands Chinook Salmon Savings Area



C. Opilio Bycatch Limitation Zone (COBLZ)

Defined as that portion of the Bering Sea subarea north of 56°30' N. latitude and west of a line connecting the following coordinates in the order listed:

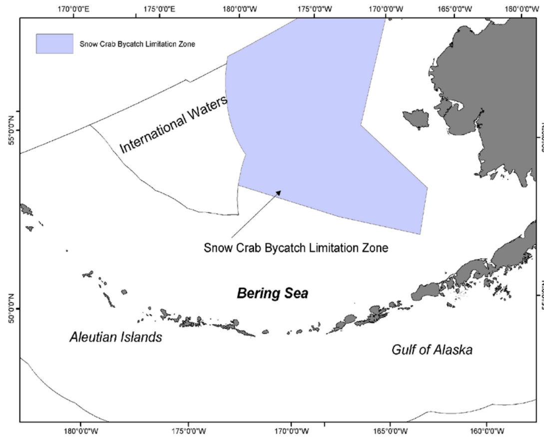
(56°30' N., 165° W.)

(58°00' N., 165° W.)

(59°30' N., 170° W.)

and north along 170° W. longitude to its intersection with the U.S.-Russia boundary.

Upon attainment of the COBLZ bycatch allowance of *C. opilio* crab specified for a particular fishery category, the COBLZ will be closed to directed fishing for each category for the remainder of the year or for the remainder of the season.



Appendix C Summary of the American Fisheries Act and Subtitle II

C.1 Summary of the American Fisheries Act (AFA) Management Measures

On October 21, 1998, the President signed into law the American Fisheries Act (AFA) that superseded the previous inshore/offshore management regime for Bering Sea and Aleutian Islands (BSAI) pollock adopted under Amendment 18 and extended under Amendments 23 and 51. With respect to the fisheries off Alaska, the AFA required several new management measures: 1) regulations that limit access into the fishing and processing sectors of the pollock fishery and that allocate pollock to such sectors, 2) regulations governing the formation and operation of fishery cooperatives in the pollock fishery, 3) regulations to protect other fisheries from spillover effects from the AFA, and 4) regulations governing catch measurement and monitoring in the pollock fishery.

The AFA, as enacted in 1998, is a complex piece of legislation with numerous provisions that affect the management of the groundfish and crab fisheries off Alaska. The AFA is divided into two subtitles. *Subtitle I – Fisheries Endorsements* includes nationwide United States (U.S.) ownership and vessel length restrictions for U.S. vessels with fisheries endorsements. These requirements are implemented by the Maritime Administration and the U.S. Coast Guard under the Department of Transportation and Department of Homeland Security, respectively. *Subtitle II – Bering Sea Pollock Fishery* contains measures related to the management of BSAI pollock fishery.

Since 1998, Congress has amended the AFA several times. Most notably, in 2004 certain provisions of the AFA regarding the Aleutian Islands directed pollock fishery were superseded by the Consolidated Appropriations Act of 2004, as further described in section 3.7.3 of the FMP, and in 2010, Congress amended the AFA to identify conditions under which the owner of an AFA vessel may rebuild or replace the vessel and conditions under which the owner of an AFA catcher vessel that is a member of an inshore cooperative may remove the vessel from the cooperative.

Key provisions of the AFA, as enacted in 1998, are listed below.

- A requirement that owners of all U.S. flagged fishing vessels comply with a 75 percent U.S. controlling interest standard.
- A prohibition on the entry of any new fishing vessels into U.S. waters that exceed 165 ft registered length, 750 gross registered tons, or 3,000 shaft horsepower.
- The buyout of nine pollock catcher/processors and the subsequent scrapping of eight of these vessels through a combination of $20 million in federal appropriations and $75 million in direct loan obligations.
- A new allocation scheme for BSAI pollock that allocates 10 percent of the BSAI pollock total allowable catch (TAC) to the Community Development Quota (CDQ) Program, and after allowance for incidental catch of pollock in other fisheries, allocates the remaining TAC as follows: 50 percent to vessels harvesting pollock for processing by inshore processors, 40 percent to vessels harvesting pollock for processing by catcher/processors, and 10 percent to vessels harvesting pollock for processing by motherships.

- A fee of six-tenths (0.6) of one cent for each pound round weight of pollock harvested by catcher vessels delivering to inshore processors for the purpose of repaying the $75 million direct loan obligation.
- A prohibition on entry of new vessels and processors into the BSAI pollock fishery. The AFA lists by name vessels and processors and/or provides qualifying criteria for those vessels and processors eligible to participate in the non-CDQ portion of the BSAI pollock fishery.
- An increase in observer coverage and scale requirements for AFA catcher/processors.
- New standards and limitations for the creation of fishery cooperatives in the catcher/ processor, mothership, and inshore industry sectors.
- A quasi-individual fishing quota program under which National Marine Fisheries Service grants individual allocations of the inshore BSAI pollock TAC to inshore catcher vessel cooperatives that form around a specific inshore processor and agree to deliver at least 90 percent of their pollock catch to that processor.
- The establishment of harvesting and processing restrictions (commonly known as “sideboards”) on fishermen and processors who have received exclusive harvesting or processing privileges under the AFA, to protect the interests of fishermen and processors who have not directly benefitted from the AFA.
- A 17.5 percent excessive share harvesting cap for BSAI pollock and a requirement that the Council develop excessive share caps for BSAI pollock processing and for the harvesting and processing of other groundfish.

Certain provisions of the AFA regarding the Aleutian Islands directed pollock fishery were superseded by the Consolidated Appropriations Act of 2004, as further described in section 3.7.3 of the FMP.

C.2 Summary of Amendments to AFA in the Coast Guard Authorization Act of 2010

On October 15, 2010, the President signed into law the Coast Guard Authorization Act of 2010, Pub. L. 111-281. Title VI of the Act was entitled The Maritime Safety Act of 2010. Section 602 of Title VI, entitled “Vessel Size Limits,” amended section 208(g) of the AFA relating to the rebuilding and the replacement of AFA vessels and added section 210(b)(7) allowing for the removal from the AFA fishery of AFA catcher vessels that are members of an AFA inshore fishery cooperative.

Under the original AFA in section 208(g), an owner of an AFA vessel could only replace an AFA vessel if the AFA vessel was lost physically or was lost constructively, which means that the vessel was so damaged that the cost of repair was greater than the value of the vessel. If an owner lost a vessel, the owner could only replace the vessel with a vessel of the same length, weight, or horsepower, unless the AFA vessel was less than the statutory thresholds in 46 U.S.C. 12113 for a vessel to receive a federal fishery endorsement: 165 feet registered length, 750 gross registered tons, and 3,000 shaft horsepower engine(s). If the AFA vessel was less than any of those thresholds, the owner of a lost AFA vessel could replace the lost vessel with a vessel ten percent greater in length, tonnage, or horsepower, up to those thresholds in each category. For AFA catcher vessels that were members of an inshore fishery cooperative, the original AFA had no mechanism whereby the owner of a catcher vessel could remove that vessel and direct NMFS to assign the catch history of the removed vessel to other vessels in the inshore cooperative.

The key provisions of the AFA amendments in the Coast Guard Authorization Act of 2010 that NMFS will implement in Amendment 106 to this FMP are listed below:

- The owner of a vessel which is designated on an AFA vessel permit may replace or rebuild the AFA vessel to improve vessel safety or improve operational efficiency, including fuel efficiency.
- The AFA rebuilt and the AFA replacement vessel will be eligible to participate in the fisheries in the EEZ off Alaska in the same manner as the vessel before rebuilding or before replacing, except where the AFA amendments specifically changed a condition of participation.
- The AFA rebuilt and the AFA replacement vessel may exceed the maximum length overall (MLOA) on the LLP groundfish license that authorizes the vessel to conduct directed groundfish fishing for license limitation groundfish in the Bering Sea or the Aleutian Islands, while the AFA rebuilt or AFA replacement vessel is fishing pursuant to that LLP license.
- The AFA rebuilt and the AFA replacement vessel are subject to the MLOA requirement on the LLP groundfish license that authorizes the vessel to conduct directed fishing for license limitation groundfish in the Gulf of Alaska, while the AFA rebuilt or AFA replacement vessel is fishing pursuant to that LLP license.
- The AFA amendments prohibit AFA rebuilt catcher vessels and AFA replacement catcher vessels from harvesting fish in any fishery managed under the authority of any regional fishery management council with two exceptions: [1] an AFA rebuilt or AFA replacement catcher vessel may participate in the Pacific whiting fishery, which is managed under the authority of the Pacific Council; and [2] an AFA rebuilt or AFA replacement catcher vessel may participate in a fishery managed under the authority of the North Pacific Fishery Management Council in conformity with the requirements for participating in a Council-managed fishery. The original AFA already imposed this restriction on AFA catcher/processors and motherships.
- The owner of an AFA catcher vessel that is a member of an AFA inshore cooperative may remove the vessel from the AFA fishery and direct NMFS to assign the catch history of the removed vessel to any other vessel or vessels in the AFA cooperative to which the removed vessel belonged, provided that the vessel or vessels that are assigned the catch history remain in the cooperative for at least one year after NMFS assigns the catch history to them.
- If an owner of an AFA catcher vessel removes an AFA catcher vessel, and the removed vessel had an exemption from AFA sideboard limitations, the removal of the vessel permanently extinguishes the exemption from AFA sideboard limitations.
- A vessel that is replaced or removed would be permanently ineligible for any permits to participate in any fishery in the EEZ off Alaska unless the replaced or removed vessel reenters the directed pollock fishery as an AFA replacement vessel.

C.3 American Fisheries Act: Subtitle II Bering Sea Pollock Fishery

SEC. 205. DEFINITIONS.

As used in this subtitle –

(1) the term "Bering Sea and Aleutian Islands Management Area" has the same meaning as the meaning given for such term in part 679.2 of title 50, Code of Federal Regulations, as in effect on October 1, 1998;

(2) the term "catcher/processor" means a vessel that is used for harvesting fish and processing that fish;

(3) the term "catcher vessel" means a vessel that is used for harvesting fish and that does not process pollock onboard;

(4) the term "directed pollock fishery" means the fishery for the directed fishing allowances allocated under paragraphs (1), (2), and (3) of section 206(b);

(5) the term "harvest" means to commercially engage in the catching, taking, or harvesting of fish or any activity that can reasonably be expected to result in the catching, taking, or harvesting of fish;

(6) the term "inshore component" means the following categories that process groundfish harvested in the Bering Sea and Aleutian Islands Management Area:

(A) shoreside processors, including those eligible under section 208(f); and

(B) vessels less than 125 feet in length overall that process less than 126 metric tons per week in round-weight equivalents of an aggregate amount of pollock and Pacific cod;

(7) the term "Magnuson-Stevens Act" means the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.);

(8) the term "mothership" means a vessel that receives and processes fish from other vessels in the exclusive economic zone of the United States and is not used for, or equipped to be used for, harvesting fish;

(9) the term "North Pacific Council" means the North Pacific Fishery Management Council established under section 302(a)(1)(G) of the Magnuson-Stevens Act (16 U.S.C. 1852(a)(1)(G));

(10) the term "offshore component" means all vessels not included in the definition of inshore component that process groundfish harvested in the Bering Sea and Aleutian Islands Management Area;

(11) the term "Secretary" means the Secretary of Commerce; and

(12) the term "shoreside processor" means any person or vessel that receives unprocessed fish, except catcher/processors, motherships, buying stations, restaurants, or persons receiving fish for personal consumption or bait.

SEC. 206. ALLOCATIONS.

(a) POLLOCK COMMUNITY DEVELOPMENT QUOTA. Effective January 1,1999, 10 percent of the total allowable catch of pollock in the Bering Sea and Aleutian Islands Management Area shall be allocated as a directed fishing allowance to the western Alaska community development quota program established under section 305(i) of the Magnuson-Stevens Act (16 U.S.C. 1855(i)).

(b) INSHORE/OFFSHORE. Effective January 1, 1999, the remainder of the pollock total allowable catch in the Bering Sea and Aleutian Islands Management Area, after the subtraction of the allocation under subsection (a) and the subtraction of allowances for the incidental catch of pollock by vessels harvesting other groundfish species (including under the western Alaska community development quota program) shall be allocated as directed fishing allowances as follows –

(1) 50 percent to catcher vessels harvesting pollock for processing by the inshore component;

(2) 40 percent to catcher/processors and catcher vessels harvesting pollock for processing by catcher/processors in the offshore component; and

(3) 10 percent to catcher vessels harvesting pollock for processing by motherships in the offshore component.

SEC. 207. BUYOUT.

(a) FEDERAL LOAN. Under the authority of sections 1111 and 1112 of title XI of the Merchant Marine Act, 1936 (46 U.S.C. App. 1279f and 1279g) and notwithstanding the requirements of section 312 of the Magnuson-Stevens Act (16 U.S.C. 1861a), the Secretary shall, subject to the availability of appropriations for the cost of the direct loan, provide up to $75,000,000 through a direct loan obligation for the payments required under subsection (d).

(b) INSHORE FEE SYSTEM. Notwithstanding the requirements of section 304(d) or 312 of the Magnuson-Stevens Act (16 U.S.C. 1854(d) and 1861a), the Secretary shall establish a fee for the repayment of such loan obligations which –

(1) shall be six-tenths (0.6) of one cent for each pound round-weight of all pollock harvested from the directed fishing allowance under section 206(b)(1); and

(2) shall begin with such pollock harvested on or after January 1, 2000, and continue without interruption until such loan obligation is fully repaid; and

(3) shall be collected in accordance with section 312(d)(2)(C) of the Magnuson-Stevens Act (16 U.S.C. 1861a(d)(2)(C)) and in accordance with such other conditions as the Secretary establishes.

(c) FEDERAL APPROPRIATION. Under the authority of section 312(c)(1)(B) of the Magnuson-Stevens Act (16 U.S.C. 1861a(c)(1)(B)), there are authorized to be appropriated $20,000,000 for the payments required under subsection (d).

(d) PAYMENTS. Subject to the availability of appropriations for the cost of the direct loan under subsection (a) and funds under subsection (c), the Secretary shall pay by not later than December 31, 1998–

(1) up to $90,000,000 to the owner or owners of the catcher/processors listed in paragraphs (1) through (9) of section 209, in such manner as the owner or owners, with the concurrence of the Secretary, agree, except that –

(A) the portion of such payment with respect to the catcher/processor listed in paragraph (1) of section 209 shall be made only after the owner submits a written certification acceptable to the Secretary that neither the owner nor a purchaser from the owner intends to use such catcher/processor outside the exclusive economic zone of the United States to harvest any stock of fish (as such term is defined in section 3 of the Magnuson-Stevens Act (16 U.S.C. 1802)) that occurs within the exclusive economic zone of the United States; and

(B) the portion of such payment with respect to the catcher/processors listed in paragraphs (2) through (9) of section 209 shall be made only after the owner or owners of such catcher/processors submit a written certification acceptable to the Secretary that such catcher/processors will be scrapped by December 31, 2000 and will not, before that date, be used to harvest or process any fish; and

(2)(A) if a contract has been filed under section 210(a) by the catcher/processors listed in section 208(e), $5,000,000 to the owner or owners of the catcher/processors listed in paragraphs (10) through (14) of such section in such manner as the owner or owners, with the concurrence of the Secretary, agree; or

(B) if such a contract has not been filed by such date, $5,000,000 to the owners of the catcher vessels eligible under section 208(b) and the catcher/processors eligible under paragraphs (1)

through (20) of section 208(e), divided based on the amount of the harvest of pollock in the directed pollock fishery by each such vessel in 1997 in such manner as the Secretary deems appropriate,

except that any such payments shall be reduced by any obligation to the federal government that has not been satisfied by such owner or owners of any such vessels.

(e) PENALTY. If the catcher/processor under paragraph (1) of section 209 is used outside the exclusive economic zone of the United States to harvest any stock of fish that occurs within the exclusive economic zone of the United States while the owner who received the payment under subsection (d)(1)(A) has an ownership interest in such vessel, or if the catcher/processors listed in paragraphs (2) through (9) of section 209 are determined by the Secretary not to have been scrapped by December 31, 2000 or to have been used in a manner inconsistent with subsection (d)(1)(B), the Secretary may suspend any or all of the federal permits which allow any vessels owned in whole or in part by the owner or owners who received payments under subsection (d)(1) to harvest or process fish within the exclusive economic zone of the United States until such time as the obligations of such owner or owners under subsection (d)(1) have been fulfilled to the satisfaction of the Secretary.

(f) PROGRAM DEFINED; MATURITY. For the purposes of section 1111 of the Merchant Marine Act, 1936 (46 U.S.C. App. 1279f), the fishing capacity reduction program in this subtitle shall be within the meaning of the term program as defined and used in such section. Notwithstanding section 1111(b)(4) of such Act (46 U.S.C. App. 1279f(b)(4)), the debt obligation under subsection (a) of this section may have a maturity not to exceed 30 years.

(g) FISHERY CAPACITY REDUCTION REGULATIONS. The Secretary of Commerce shall by not later than October 15, 1998 publish proposed regulations to implement subsections (b), (c), (d) and (e) of section 312 of the Magnuson-Stevens Act (16 U.S.C. 1861a) and sections 1111 and 1112 of title XI of the Merchant Marine Act, 1936 (46 U.S.C. App. 1279f and 1279g).

SEC. 208. ELIGIBLE VESSELS AND PROCESSORS.

(a) CATCHER VESSELS ONSHORE. Effective January 1, 2000, only catcher vessels which are –

(1) determined by the Secretary –

(A) to have delivered at least 250 metric tons of pollock; or

(B) to be less than 60 feet in length overall and to have delivered at least 40 metric tons of pollock,

for processing by the inshore component in the directed pollock fishery in any one of the years 1996 or 1997, or between January 1, 1998 and September 1, 1998;

(2) eligible to harvest pollock in the directed pollock fishery under the license limitation program recommended by the North Pacific Council and approved by the Secretary; and

(3) not listed in subsection (b),

shall be eligible to harvest the directed fishing allowance under section 206(b)(1) pursuant to a federal fishing permit.

(b) CATCHER VESSELS TO CATCHER/PROCESSORS. Effective January 1, 1999, only the following catcher vessels shall be eligible to harvest the directed fishing allowance under section 206(b)(2) pursuant to a federal fishing permit:

(1) AMERICAN CHALLENGER (United States official number 633219);

(2) FORUM STAR (United States official number 925863);

(3) MUIR MILACH (United States official number 611524);

(4) NEAHKAHNIE (United States official number 599534);

(5) OCEAN HARVESTER (United States official number 549892);

(6) SEA STORM (United States official number 628959);

(7) TRACY ANNE (United States official number 904859); and

(8) any catcher vessel –

(A) determined by the Secretary to have delivered at least 250 metric tons and at least 75 percent of the pollock it harvested in the directed pollock fishery in 1997 to catcher/processors for processing by the offshore component; and

(B) eligible to harvest pollock in the directed pollock fishery under the license limitation program recommended by the North Pacific Council and approved by the Secretary.

(c) CATCHERS VESSELS TO MOTHERSHIPS. Effective January 1, 2000, only the following catcher vessels shall be eligible to harvest the directed fishing allowance under section 206(b)(3) pursuant to a federal fishing permit:

(1) ALEUTIAN CHALLENGER (United States official number 603820);

(2) ALYESKA (United States official number 560237);

(3) AMBER DAWN (United States official number 529425);

(4) AMERICAN BEAUTY (United States official number 613847);

(5) CALIFORNIA HORIZON (United States official number 590758);

(6) MAR-GUN (United States official number 525608);

(7) MARGARET LYN (United States official number 615563);

(8) MARK I (United States official number 509552);

(9) MISTY DAWN (United States official number 926647);

(10) NORDIC FURY (United States official number 542651);

(11) OCEAN LEADER (United States official number 561518);

(12) OCEANIC (United States official number 602279);

(13) PACIFIC ALLIANCE (United States official number 612084);

(14) PACIFIC CHALLENGER (United States official number 618937);

(15) PACIFIC FURY (United States official number 561934);

(16) PAPADO II (United States official number 536161);

(17) TRAVELER (United States official number 929356);

(18) VESTERAALEN (United States official number 611642);

(19) WESTERN DAWN (United States official number 524423);

(20) any vessel –

(A) determined by the Secretary to have delivered at least 250 metric tons of pollock for processing by motherships in the offshore component of the directed pollock fishery in any one of the years 1996 or 1997, or between January 1, 1998 and September 1, 1998;

(B) eligible to harvest pollock in the directed pollock fishery under the license limitation program recommended by the North Pacific Council and approved by the Secretary; and

(C) not listed in subsection (b).

(d) MOTHERSHIPS. Effective January 1, 2000, only the following motherships shall be eligible to process the directed fishing allowance under section 206(b)(3) pursuant to a federal fishing permit:

(1) EXCELLENCE (United States official number 967502);

(2) GOLDEN ALASKA (United States official number 651041);

(3) OCEAN PHOENIX (United States official number 296779).

(e) CATCHER/PROCESSORS. Effective January 1, 1999, only the following catcher/processors shall be eligible to harvest the directed fishing allowance under section 206(b)(2) pursuant to a federal fishing permit:

(1) AMERICAN DYNASTY (United States official number 951307);

(2) KATIE ANN (United States official number 518441);

(3) AMERICAN TRIUMPH (United States official number 646737);

(4) NORTHERN EAGLE (United States official number 506694);

(5) NORTHERN HAWK (United States official number 643771);

(6) NORTHERN JAEGER (United States official number 521069);

(7) OCEAN ROVER (United States official number 552100);

(8) ALASKA OCEAN (United States official number 637856);

(9) ENDURANCE (United States official number 592206);

(10) AMERICAN ENTERPRISE (United States official number 594803);

(11) ISLAND ENTERPRISE (United States official number 610290);

(12) KODIAK ENTERPRISE (United States official number 579450);

(13) SEATTLE ENTERPRISE (United States official number 904767);

(14) US ENTERPRISE (United States official number 921112);

(15) ARCTIC STORM (United States official number 903511);

(16) ARCTIC FJORD (United States official number 940866);

(17) NORTHERN GLACIER (United States official number 663457);

(18) PACIFIC GLACIER (United States official number 933627);

(19) HIGHLAND LIGHT (United States official number 577044);

(20) STARBOUND (United States official number 944658); and

(21) any catcher/processor not listed in this subsection and determined by the Secretary to have harvested more than 2,000 metric tons of the pollock in the 1997 directed pollock fishery and determined to be eligible to harvest pollock in the directed pollock fishery under the license limitation program recommended by the North Pacific Council and approved by the Secretary, except that catcher/processors eligible under this paragraph shall be prohibited from harvesting in the aggregate a total of more than one-half (0.5) of a percent of the pollock apportioned for the directed pollock fishery under section 206(b)(2).

Notwithstanding section 213(a), failure to satisfy the requirements of section 4(a) of the Commercial Fishing Industry Vessel Anti-Reflagging Act of 1987 (Public Law 100-239; 46 U.S.C. 12108 note) shall not make a catcher/processor listed under this subsection ineligible for a fishery endorsement.

(f) SHORESIDE PROCESSORS. (1) Effective January 1, 2000 and except as provided in paragraph (2), the catcher vessels eligible under subsection (a) may deliver pollock harvested from the directed fishing allowance under section 206(b)(1) only to –

(A) shoreside processors (including vessels in a single geographic location in Alaska State waters) determined by the Secretary to have processed more than 2,000 metric tons round-weight of pollock in the inshore component of the directed pollock fishery during each of 1996 and 1997; and

(B) shoreside processors determined by the Secretary to have processed pollock in the inshore component of the directed pollock fishery in 1996 and 1997, but to have processed less than 2,000 metric tons round-weight of such pollock in each year, except that effective January 1, 2000, each such shoreside processor may not process more than 2,000 metric tons round-weight from such directed fishing allowance in any year;

(2) Upon recommendation by the North Pacific Council, the Secretary may approve measures to allow catcher vessels eligible under subsection (a) to deliver pollock harvested from the directed fishing allowance under section 206(b)(1) to shoreside processors not eligible under paragraph (1) if the total allowable catch for pollock in the Bering Sea and Aleutian Islands Management Area increases by more than 10 percent above the total allowable catch in such fishery in 1997, or in the event of the actual total loss or constructive total loss of a shoreside processor eligible under paragraph (1)(A).

(g) VESSEL REBUILDING AND REPLACEMENT.—

(1) IN GENERAL.—

(A) REBUILD OR REPLACE.—Notwithstanding any limitation to the contrary on replacing,

rebuilding, or lengthening vessels or transferring permits or licenses to a replacement vessel contained in sections 679.2 and 679.4 of title 50, Code of Federal Regulations, as in effect on the date of enactment of the Coast Guard Authorization Act of 2010 and except as provided in paragraph (4), the owner of a vessel eligible under subsection (a), (b), (c), (d), or (e), in order to improve vessel safety and operational efficiencies (including fuel efficiency), may rebuild or replace that vessel (including fuel efficiency) with a vessel documented with a fishery endorsement under section 12113 of title 46, United States Code.

(B) SAME REQUIREMENTS.—The rebuilt or replacement vessel shall be eligible in the same manner and subject to the same restrictions and limitations under such subsection as the vessel being rebuilt or replaced.

(C) TRANSFER OF PERMITS AND LICENSES.—Each fishing permit and license held by the owner of a vessel or vessels to be rebuilt or replaced under subparagraph (A) shall be transferred to the rebuilt or replacement vessel or its owner, as necessary to permit such rebuilt or replacement vessel to operate in the same manner as the vessel prior to the rebuilding or the vessel it replaced, respectively.

(2) RECOMMENDATIONS OF NORTH PACIFIC FISHERY MANAGEMENT COUNCIL.—The North Pacific Fishery Management Council may recommend for approval by the Secretary such conservation and management measures, including size limits and measures to control fishing capacity, in accordance with the Magnuson-Stevens Act as it considers necessary to ensure that this subsection does not diminish the effectiveness of fishery management plans of the Bering Sea and Aleutian Islands Management Area or the Gulf of Alaska.

(3) SPECIAL RULE FOR REPLACEMENT OF CERTAIN VESSELS.—

(A) IN GENERAL.—Notwithstanding the requirements of subsections (b)(2), (c)(1), and (c)(2) of section 12113 of title 46, United States Code, a vessel that is eligible under subsection (a), (b), (c), or (e) and that qualifies to be documented with a fishery endorsement pursuant to section 213(g) may be replaced with a replacement vessel under paragraph (1) if the vessel that is replaced is validly documented with a fishery endorsement pursuant to section 213(g) before the replacement vessel is documented with a fishery endorsement under section 12113 of title 46, Unites States Code.

(B) APPLICABILITY.—A replacement vessel under subparagraph (A) and its owner and mortgagee are subject to the same limitations under section 213(g) that are applicable to the vessel that has been replaced and its owner and mortgagee.

(4) SPECIAL RULES FOR CERTAIN CATCHER VESSELS.—

(A) IN GENERAL.—A replacement for a covered vessel described in subparagraph (B) is prohibited from harvesting fish in any fishery (except for the Pacific whiting fishery) managed under the authority of any Regional Fishery Management Council (other than the North Pacific Fishery Management Council) established under section 302(a) of the Magnuson-Stevens Act.

(B) COVERED VESSELS.—A covered vessel referred to in subparagraph (A) is—

(i) a vessel eligible under subsection (a), (b), or (c) that is replaced under paragraph (1); or

(ii) a vessel eligible under subsection (a), (b), or (c) that is rebuilt to increase its registered length, gross tonnage, or shaft horsepower.

(5) LIMITATION ON FISHERY ENDORSEMENTS.—Any vessel that is replaced under this subsection shall thereafter not be eligible for a fishery endorsement under section 12113 of title 46, United States Code, unless that vessel is also a replacement vessel described in paragraph (1).

(6) GULF OF ALASKA LIMITATIONS.—Notwithstanding paragraph (1), the Secretary shall prohibit from participation in the groundfish fisheries of the Gulf of Alaska any vessel that is rebuilt or replaced under this subsection and that exceeds the maximum length overall specified on the license that authorizes fishing for groundfish pursuant to the license limitation program under part 679 of title 50, Code of Federal Regulations, as in effect on the

date of enactment of the Coast Guard Authorization Act of 2010.

(7) AUTHORITY OF PACIFIC COUNCIL.—Nothing in this section shall be construed to diminish or otherwise affect the authority of the Pacific Council to recommend to the Secretary conservation and management measures to protect fisheries under its jurisdiction (including the Pacific whiting fishery) and participants in such fisheries from adverse impacts caused by this Act.

(h) ELIGIBILITY DURING IMPLEMENTATION. In the event the Secretary is unable to make a final determination about the eligibility of a vessel under subsection (b)(8) or subsection (e)(21) before January 1, 1999, or a vessel or shoreside processor under subsection (a), subsection (c)(21), or subsection (f) before January 1, 2000, such vessel or shoreside processor, upon the filing of an application for eligibility, shall be eligible to participate in the directed pollock fishery pending final determination by the Secretary with respect to such vessel or shoreside processor.

(i) ELIGIBILITY NOT A RIGHT. Eligibility under this section shall not be construed –

(1) to confer any right of compensation, monetary or otherwise, to the owner of any catcher vessel, catcher/processor, mothership, or shoreside processor if such eligibility is revoked or limited in any way, including through the revocation or limitation of a fishery endorsement or any federal permit or license;

(2) to create any right, title, or interest in or to any fish in any fishery; or

(3) to waive any provision of law otherwise applicable to such catcher vessel, catcher/processor, mothership, or shoreside processor.

SEC. 209. LIST OF INELIGIBLE VESSELS.

Effective December 31, 1998, the following vessels shall be permanently ineligible for fishery endorsements, and any claims (including relating to catch history) associated with such vessels that could qualify any owners of such vessels for any present or future limited access system permit in any fishery within the exclusive economic zone of the United States (including a vessel moratorium permit or license limitation program permit in fisheries under the authority of the North Pacific Council) are hereby extinguished:

(1) AMERICAN EMPRESS (United States official number 942347);

(2) PACIFIC SCOUT (United States official number 934772);

(3) PACIFIC EXPLOYER (United States official number 942592);

(4) PACIFIC NAVIGATOR (United States official number 592204);

(5) VICTORIA ANN (United States official number 592207);

(6) ELIZABETH ANN (United States official number 534721);

(7) CHRISTINA ANN (United States official number 653045);

(8) REBECCA ANN (United States official number 592205);

(9) BROWNS POINT (United States official number 587440).

SEC. 210. FISHERY COOPERATIVE LIMITATIONS.

(a) PUBLIC NOTICE. (1) Any contract implementing a fishery cooperative under section 1 of the Act of June 25, 1934 (15 U.S.C. 521) in the directed pollock fishery and any material modifications to any such contract shall be filed not less than 30 days prior to the start of fishing under the contract with the North Pacific Council and with the Secretary, together with a copy of a letter from a party to the contract requesting a business review letter on the fishery cooperative from the Department of Justice and any response to such request. Notwithstanding section 402 of the Magnuson-Stevens Act (16 U.S.C. 1881a) or any other provision of law, but taking into account the interest of parties to any such contract in protecting the confidentiality of proprietary information, the North Pacific Council and Secretary shall –

(A) make available to the public such information about the contract, contract modifications, or fishery cooperative the North Pacific Council and Secretary deem appropriate, which at a minimum shall include a list of the parties to the contract, a list of the vessels involved, and the amount of pollock and other fish to be harvested by each party to such contract; and

(B) make available to the public in such manner as the North Pacific Council and Secretary deem appropriate information about the harvest by vessels under a fishery cooperative of all species (including by catch) in the directed pollock fishery on a vessel-by-vessel basis.

(b) CATCHER VESSELS ONSHORE

(1) CATCHER VESSEL COOPERATIVES. Effective January 1, 2000, upon the filing of a contract implementing a fishery cooperative under subsection (a) which –

(A) is signed by the owners of 80 percent or more of the qualified catcher vessels that delivered pollock for processing by a shoreside processor in the directed pollock fishery in the year prior to the year in which the fishery cooperative will be in effect; and

(B) specifies, except as provided in paragraph (6), that such catcher vessels will deliver pollock in the directed pollock fishery only to such shoreside processor during the year in which the fishery cooperative will be in effect and that such shoreside processor has agreed to process such pollock,

the Secretary shall allow only such catcher vessels (and catcher vessels whose owners voluntarily participate pursuant to paragraph (2)) to harvest the aggregate percentage of the directed fishing allowance under section 206(b)(1) in the year in which the fishery cooperative will be in effect that is equivalent to the aggregate total amount of pollock harvested by such catcher vessels (and by such catcher vessels whose owners voluntarily participate pursuant to paragraph (2)) in the directed pollock fishery for processing by the inshore component during 1995, 1996, and 1997 relative to the aggregate total amount of pollock harvested in the directed pollock fishery for processing by the inshore component during such years and shall prevent such catcher vessels (and catcher vessels whose owners voluntarily participate pursuant to paragraph (2)) from harvesting in aggregate in excess of such percentage of such directed fishing allowance.

(2) VOLUNTARY PARTICIPATION. Any contract implementing a fishery cooperative under paragraph (1) must allow the owners of other qualified catcher vessels to enter into such contract after it is filed and before the calendar year in which fishing will begin under the same terms and conditions as the owners of the qualified catcher vessels who entered into such contract upon filing.

(3) QUALIFIED CATCHER VESSEL. For the purposes of this subsection, a catcher vessel shall be considered a qualified catcher vessel if, during the year prior to the year in which the fishery

cooperative will be in effect, it delivered more pollock to the shoreside processor to which it will deliver pollock under the fishery cooperative in paragraph (1) than to any other shoreside processor.

(4) CONSIDERATION OF CERTAIN VESSELS. Any contract implementing a fishery cooperative under paragraph (1) which has been entered into by the owner of a qualified catcher vessel eligible under section 208(a) that harvested pollock for processing by catcher/processors or motherships in the directed pollock fishery during 1995, 1996, and 1997 shall, to the extent practicable, provide fair and equitable terms and conditions for the owner of such qualified catcher vessel.

(5) OPEN ACCESS. A catcher vessel eligible under section 208(a) the catch history of which has not been attributed to a fishery cooperative under paragraph (1) may be used to deliver pollock harvested by such vessel from the directed fishing allowance under section 206(b)(1) (other than pollock reserved under paragraph (1) for a fishery cooperative) to any of the shoreside processors eligible under section 208(f). A catcher vessel eligible under section 208(a) the catch history of which has been attributed to a fishery cooperative under paragraph (1) during any calendar year may not harvest any pollock apportioned under section 206(b)(1) in such calendar year other than the pollock reserved under paragraph (1) for such fishery cooperative.

(6) TRANSFER OF COOPERATIVE HARVEST. A contract implementing a fishery cooperative under paragraph (1) may, notwithstanding the other provisions of this subsection, provide for up to 10 percent of the pollock harvested under such cooperative to be processed by a shoreside processor eligible under section 208(f) other than the shoreside processor to which pollock will be delivered under paragraph (1).

(7) FISHERY COOPERATIVE EXIT PROVISIONS.—

(A) FISHING ALLOWANCE DETERMINATION.—For purposes of determining the aggregate percentage of directed fishing allowances under paragraph (1), when a catcher vessel is removed from the directed pollock fishery, the fishery allowance for pollock for the vessel being removed—

(i) shall be based on the catch history determination for the vessel made pursuant to section 679.62 of title 50, Code of Federal Regulations, as in effect on the date of enactment of the Coast Guard Authorization Act of 2010; and

(ii) shall be assigned, for all purposes under this title, in the manner specified by the owner of the vessel being removed to any other catcher vessel or among other catcher vessels participating in the fishery cooperative if such vessel or vessels remain in the fishery cooperative for at least one year after the date on which the vessel being removed leaves the direct pollock fishery.

(B) ELIGIBILITY FOR FISHERY ENDORSEMENT.—Except as provided in subparagraph (C), a vessel that is removed pursuant to this paragraph shall be permanently ineligible for a fishery endorsement, and any claim (including relating to catch history) associated with such vessel that could qualify any owner of such vessel for any permit to participate in any fishery within the exclusive economic zone of the United States shall be extinguished, unless such removed vessel is thereafter designated to replace a vessel to be removed pursuant to this paragraph.

(C) LIMITATIONS ON STATUTORY CONSTRUCTION.—Nothing in this paragraph shall be construed—

(i) to make the vessels AJ (United States official number 905625), DONA MARTITA (United States official number 651751), NORDIC EXPLORER (United States official number 678234), and PROVIDIAN (United States official number 1062183) ineligible for a fishery endorsement or any permit necessary to participate in any fishery under the authority of the New England Fishery Management Council or the Mid-Atlantic Fishery Management Council established, respectively, under

subparagraphs (A) and (B) of section 302(a)(1) of the Magnuson-Stevens Act; or

(ii) to allow the vessels referred to in clause (i) to participate in any fishery under the authority of the Councils referred to in clause (i) in any manner that is not consistent with the fishery management plan for the fishery developed by the Councils under section 303 of the Magnuson-Stevens Act.

(c) CATCHER VESSELS TO CATCHER/PROCESSORS. Effective January 1, 1999, not less than 8.5 percent of the directed fishing allowance under section 206(b)(2) shall be available for harvest only by the catcher vessels eligible under section 208(b). The owners of such catcher vessels may participate in a fishery cooperative with the owners of the catcher/ processors eligible under paragraphs (1) through (20) of the section 208(e). The owners of such catcher vessels may participate in a fishery cooperative that will be in effect during 1999 only if the contract implementing such cooperative establishes penalties to prevent such vessels from exceeding in 1999 the traditional levels harvested by such vessels in all other fisheries in the exclusive economic zone of the United States.

(d) CATCHER VESSELS TO MOTHERSHIPS

(1) PROCESSING. Effective January 1, 2000, the authority in section 1 of the Act of June 25, 1934 (48 STAT. 1213 and 1214; 15 U.S.C. 521 et seq.) shall extend to processing by motherships eligible under section 208(d) solely for the purposes of forming or participating in a fishery cooperative in the directed pollock fishery upon the filing of a contract to implement a fishery cooperative under subsection (a) which has been entered into by the owners of 80 percent or more of the catcher vessels eligible under section 208(c) for the duration of such contract, provided that such owners agree to the terms of the fishery cooperative involving processing by the motherships.

(2) VOLUNTARY PARTICIPATION. Any contract implementing a fishery cooperative described in paragraph (1) must allow the owners of any other catcher vessels eligible under section 208(c) to enter such contract after it is filed and before the calendar year in which fishing will begin under the same terms and conditions as the owners of the catcher vessels who entered into such contract upon filing.

(e) EXCESSIVE SHARES.

(1) HARVESTING. No particular individual, corporation, or other entity may harvest, through a fishery cooperative or otherwise, a total of more than 17.5 percent of the pollock available to be harvested in the directed pollock fishery.

(2) PROCESSING. Under the authority of section 301(a)(4) of the Magnuson-Stevens Act (16 U.S.C. 1851(a)(4)), the North Pacific Council is directed to recommend for approval by the Secretary conservation and management measures to prevent any particular individual or entity from processing an excessive share of the pollock available to be harvested in the directed pollock fishery. In the event the North Pacific Council recommends and the Secretary approves an excessive processing share that is lower than 17.5 percent, any individual or entity that previously processed a percentage greater than such share shall be allowed to continue to process such percentage, except that their percentage may not exceed 17.5 percent (excluding pollock processed by catcher/processors that was harvested in the directed pollock fishery by catcher vessels eligible under section 208(b)) and shall be reduced if their percentage decreases, until their percentage is below such share. In recommending the excessive processing share, the North Pacific Council shall consider the need of catcher vessels in the directed pollock fishery to have competitive buyers for the pollock harvested by such vessels.

(3) REVIEW BY MARITIME ADMINISTRATION. At the request of the North Pacific Council or the Secretary, any individual or entity believed by such Council or the Secretary to have exceeded the percentage in either paragraph (1) or (2) shall submit such information to the Administrator of the Maritime Administration as the Administrator deems appropriate to allow the Administrator to determine whether such individual or entity has exceeded either such percentage. The Administrator shall make a finding as soon as practicable upon such request and shall submit such finding to the North Pacific Council and the Secretary. For the purposes of this subsection, any entity in which 10 percent or more of the interest is owned or controlled by another individual or entity shall be considered to be the same entity as the other individual or entity.

(f) LANDING TAX JURISDICTION. Any contract filed under subsection (a) shall include a contract clause under which the parties to the contract agree to make payments to the State of Alaska for any pollock harvested in the directed pollock fishery which is not landed in the State of Alaska, in amounts which would otherwise accrue had the pollock been landed in the State of Alaska subject to any landing taxes established under Alaska law. Failure to include such a contract clause or for such amounts to be paid shall result in a revocation of the authority to form fishery cooperatives under section 1 of the Act of June 25, 1934 (15 U.S.C. 521 et seq.).

(g) PENALTIES. The violation of any of the requirements of this subtitle or any regulation or permit issued pursuant to this subtitle shall be considered the commission of an act prohibited by section 307 of the Magnuson-Stevens Act (16 U.S.C. 1857), and sections 308, 309, 310, and 311 of such Act (16 U.S.C. 1858, 1859, 1860, and 1861) shall apply to any such violation in the same manner as to the commission of an act prohibited by section 307 of such Act (16 U.S.C. 1857). In addition to the civil penalties and permit sanctions applicable to prohibited acts under section 308 of such Act (16 U.S.C. 1858), any person who is found by the Secretary, after notice and an opportunity for a hearing in accordance with section 554 of title 5, United States Code, to have violated a requirement of this section shall be subject to the forfeiture to the Secretary of Commerce of any fish harvested or processed during the commission of such act.

SEC. 211. PROTECTIONS FOR OTHER FISHERIES; CONSERVATION MEASURES.

(a) GENERAL. The North Pacific Council shall recommend for approval by the Secretary such conservation and management measures as it determines necessary to protect other fisheries under its jurisdiction and the participants in those fisheries, including processors, from adverse impacts caused by this Act or fishery cooperatives in the directed pollock fishery.

(b) CATCHER/PROCESSOR RESTRICTIONS.

(1) GENERAL. The restrictions in this subsection shall take effect on January 1, 1999 and shall remain in effect thereafter except that they may be superseded (with the exception of paragraph (4)) by conservation and management measures recommended after the date of the enactment of this Act by the North Pacific Council and approved by the Secretary in accordance with the Magnuson-Stevens Act.

(2) BERING SEA FISHING. The catcher/processors eligible under paragraphs (1) through (20) of section 208(e) are hereby prohibited from, in the aggregate –

(A) exceeding the percentage of the harvest available in the offshore component of any Bering Sea and Aleutian Islands groundfish fishery (other than the pollock fishery) that is equivalent to the total harvest by such catcher/processors and the catcher/processors listed in section 209 in the fishery in 1995, 1996, and 1997 relative to the total amount available to be harvested by the offshore component in the fishery in 1995, 1996, and 1997;

(B) exceeding the percentage of the prohibited species available in the offshore component of any Bering Sea and Aleutian Islands groundfish fishery (other than the pollock fishery) that is equivalent to the total of the prohibited species harvested by such catcher/processors and the catcher/processors listed in section 209 in the fishery in 1995, 1996, and 1997 relative to the total amount of prohibited species available to be harvested by the offshore component in the fishery in 1995, 1996, and 1997.

(C) fishing for Atka mackerel in the eastern area of the Bering Sea and Aleutian Islands and from exceeding the following percentages of the directed harvest available in the Bering Sea and Aleutian Islands Atka mackerel fishery –

(i) 11.5 percent in the central area; and

(ii) 20 percent in the western area.

(3) BERING SEA PROCESSING. The catcher/processors eligible under paragraphs (1) through (20) of section 208(e) are hereby prohibited from –

(A) processing any of the directed fishing allowances under paragraphs (1) or (3) of section 206(b); and

(B) processing any species of crab harvested in the Bering Sea and Aleutian Islands Management Area.

(4) GULF OF ALASKA. The catcher/processors eligible under paragraphs (1) through (20) of section 208(e) are hereby prohibited from –

(A) harvesting any fish in the Gulf of Alaska;

(B) processing any groundfish harvested from the portion of the exclusive economic zone off Alaska known as area 630 under the fishery management plan for Gulf of Alaska groundfish; or

(C) processing any pollock in the Gulf of Alaska (other than as by catch in non-pollock groundfish fisheries) or processing, in the aggregate, a total of more than 10 percent of the cod harvested from areas 610, 620, and 640 of the Gulf of Alaska under the fishery management plan for Gulf of Alaska groundfish.

(5) FISHERIES OTHER THAN NORTH PACIFIC. The catcher/processors eligible under paragraphs (1) through (20) of section 208(e) and motherships eligible under section 208(d) are hereby prohibited from harvesting fish in any fishery under the authority of any regional fishery management council established under section 302(a) of the Magnuson-Stevens Act (16 U.S.C. 1852(a)) other than the North Pacific Council, except for the Pacific whiting fishery, and from processing fish in any fishery under the authority of any such regional fishery management council other than the North Pacific Council, except in the Pacific whiting fishery, unless the catcher/processor or mothership is authorized to harvest or process fish under a fishery management plan recommended by the regional fishery management council of jurisdiction and approved by the Secretary.

(6) OBSERVERS AND SCALES. The catcher/processors eligible under paragraphs (1) through (20) of section 208(e) shall –

(A) have two observers onboard at all times while groundfish is being harvested, processed, or received from another vessel in any fishery under the authority of the North Pacific Council; and

(B) weight its catch on a scale onboard approved by the National Marine Fisheries Service while harvesting groundfish in fisheries under the authority of the North Pacific Council.

This paragraph shall take effect on January 1, 1999 for catcher/processors eligible under paragraphs (1) through (20) of section 208(e) that will harvest pollock allocated under section 206(a) in 1999, and shall take effect on January 1, 2000 for all other catcher/processors eligible under such paragraphs of section 208(e).

(c) CATCHER VESSEL AND SHORESIDE PROCESSOR RESTRICTIONS.

(1) REQUIRED COUNCIL RECOMMENDATIONS. By not later than July 1, 1999, the North Pacific Council shall recommend for approval by the Secretary conservation and management measures to –

(A) prevent the catcher vessels eligible under subsections (a), (b), and (c) of section 208 from exceeding in the aggregate the traditional harvest levels of such vessels in other fisheries under the authority of the North Pacific Council as a result of fishery cooperatives in the directed pollock fisheries; and

(B) protect processors not eligible to participate in the directed pollock fishery from adverse effects as a result of this Act or fishery cooperatives in the directed pollock fishery.

If the North Pacific Council does not recommend such conservation and management measures by such date, or if the Secretary determines that such conservation and management measures recommended by the North Pacific Council are not adequate to fulfill the purposes of this paragraph, the Secretary may by regulation restrict or change the authority in section 210(b) to the extent the Secretary deems appropriate, including by preventing fishery cooperatives from being formed pursuant to such section and by providing greater flexibility with respect to the shoreside processor or shoreside processors to which catcher vessels in a fishery cooperative under section 210(b) may deliver pollock.

(2) BERING SEA CRAB AND GROUNDFISH.

(A) Effective January 1, 2000, the owners of the motherships eligible under section 208(d) and the shoreside processors eligible under section 208(f) that receive pollock from the directed pollock fishery under a fishery cooperative are hereby prohibited from processing, in the aggregate for each calendar year, more than the percentage of the total catch of each species of crab in directed fisheries under the jurisdiction of the North Pacific Council than facilities operated by such owners processed of each such species in the aggregate, on average, in 1995, 1996, and 1997. For the purposes of this subparagraph, the term facilities means any processing plant, catcher/processor, mothership, floating processor, or any other operation that processes fish. Any entity in which 10 percent or more of the interest is owned or controlled by another individual or entity shall be considered to be the same entity as the other individual or entity for the purposes of this subparagraph.

(B) Under the authority of section 301(a)(4) of the Magnuson-Stevens Act (16 U.S.C. 1851(a)(4)), the North Pacific Council is directed to recommend for approval by the Secretary conservation and management measures to prevent any particular individual or entity from harvesting or processing an excessive share of crab or of groundfish in fisheries in the Bering Sea and Aleutian Islands Management Area.

(C) The catcher vessels eligible under section 208(b) are hereby prohibited from participating in a directed fishery for any species of crab in the Bering Sea and Aleutian Islands Management Area unless the catcher vessel harvested crab in the directed fishery for that species

of crab in such Area during 1997 and is eligible to harvest such crab in such directed fishery under the license limitation program recommended by the North Pacific Council and approved by the Secretary. The North Pacific Council is directed to recommend measures for approval by the Secretary to eliminate latent licenses under such program, and nothing in this subparagraph shall preclude the Council from recommending measures more restrictive than under this paragraph.

(3) FISHERIES OTHER THAN NORTH PACIFIC.

(A) By not later than July 1, 2000, the Pacific Fishery Management Council established under section 302(a)(1)(F) of the Magnuson-Stevens Act (16 U.S.C. 1852 (a)(1)(F)) shall recommended for approval by the Secretary conservation and management measures to protect fisheries under its jurisdiction and the participants in those fisheries from adverse impacts caused by this Act or by any fishery cooperatives in the directed pollock fishery.

(B) If the Pacific Council does not recommend such conservation and management measures by such date, or if the Secretary determines that such conservation and management measures recommended by the Pacific Council are not adequate to fulfill the purposes of this paragraph, the Secretary may by regulation implement adequate measures including, but not limited to, restrictions on vessels which harvest pollock under a fishery cooperative which will prevent such vessels from harvesting Pacific groundfish, and restrictions on the number of processors eligible to process Pacific groundfish.

(d) BYCATCH INFORMATION. Notwithstanding section 402 of the Magnuson-Stevens Act (16 U.S.C. 1881a), the North Pacific Council may recommend and the Secretary may approve, under such terms and conditions as the North Pacific Council and Secretary deem appropriate, the public disclosure of any information from the groundfish fisheries under the authority of such Council that would be beneficial in the implementation of section 301(a)(9) or section 303(a)(11) of the Magnuson-Stevens Act (16 U.S.C. 1851(a)(9) and 1853(a)(11)).

(e) COMMUNITY DEVELOPMENT LOAN PROGRAM. Under the authority of title XI of the Merchant Marine Act, 1936 (46 U.S.C. App. 1271 et seq.), and subject to the availability of appropriations, the Secretary is authorized to provide direct loan obligations to communities eligible to participate in the western Alaska community development quota program established under section 304(i) of the Magnuson-Stevens Act (16 U.S.C. 1855(i)) for the purposes of purchasing all or part of an ownership interest in vessels and shoreside processors eligible under subsections (a), (b), (c), (d), (e), or (f) of section 208. Notwithstanding the eligibility criteria in section 208(a) and section 208(c), the LISA MARIE (United States official number 1038717) shall be eligible under such sections in the same manner as other vessels eligible under such sections.

SEC. 212. RESTRICTION ON FEDERAL LOANS.

Section 302(b) of the Fisheries Financing Act (46 U.S.C. 1274 note) is amended –

(1) by inserting "(1)" before "Until October 1, 2001" ; and

(2) by inserting at the end the following new paragraph:

"(2) No loans may be provided or guaranteed by the Federal Government for the construction or rebuilding of a vessel intended for use as a fishing vessel (as defined in section 2101 of title 46, United States Code), if such vessel will be greater than 165 feet in registered length, of more than 750 gross registered tons (as measured under chapter 145 of title 46) or 1,900 gross registered tons as measured under chapter 143 of that title, or have an engine or engines capable of producing a total

of more than 3,000 shaft horsepower, after such construction or rebuilding is completed. This prohibition shall not apply to vessels to be used in the menhaden fishery or in tuna purse seine fisheries outside the exclusive economic zone of the United States or the area of the South Pacific Regional Fisheries Treaty.".

SEC. 213. DURATION.

(a) GENERAL. Except as otherwise provided in this title, the provisions of this title shall take effect upon the date of the enactment of this Act. There are authorized to be appropriated $6,700,000 per year to carry out the provisions of this Act through fiscal year 2004.

(b) EXISTING AUTHORITY. Except for the measures required by this subtitle, nothing in this subtitle shall be construed to limit the authority of the North Pacific Council or the Secretary under the Magnuson-Stevens Act.

(c) CHANGES TO FISHERY COOPERATIVE LIMITATIONS AND POLLOCK CDQ ALLOCATION. The North Pacific Council may recommend and the Secretary may approve conservation and management measures in accordance with the Magnuson-Stevens Act –

(1) that supersede the provisions of this subtitle, except for section 206 and 208, for conservation purposes or to mitigate adverse effects in fisheries or on owners of fewer than three vessels in the directed pollock fishery caused by this title or fishery cooperatives in the directed pollock fishery, provided such measures take into account all factors affecting the fisheries and are imposed fairly and equitably to the extent practicable among and within the sectors in the directed pollock fishery;

(2) that supersede the allocation in section 206(a) for any of the years 2002, 2003, and 2004, upon the finding by such Council that the western Alaska community development quota program for pollock has been adversely affected by the amendments in this subtitle; or

(3) that supersede the criteria required in paragraph (1) of section 210(b) to be used by the Secretary to set the percentage allowed to be harvested by catcher vessels pursuant to a fishery cooperative under such paragraph.

(d) REPORT TO CONGRESS. Not later than October 1, 2000, the North Pacific Council shall submit a report to the Secretary and to Congress on the implementation and effects of this Act, including the effects on fishery conservation and management, on bycatch levels, on fishing communities, on business and employment practices of participants in any fishery cooperatives, on the western Alaska community development quota program, on any fisheries outside of the authority of the North Pacific Council, and such other matters as the North Pacific Council deems appropriate.

(e) REPORT ON FILLET PRODUCTION. Not later than June 1, 2000, the General Accounting Office shall submit a report to the North Pacific Council, the Secretary, and the Congress on whether this Act has negatively affected the market for fillets and fillet blocks, including through the reduction in the supply of such fillets and fillet blocks. If the report determines that such market has been negatively affected, the North Pacific Council shall recommend measures for the Secretary's approval to mitigate any negative effects.

(f) SEVERABILITY. If any provision of this title, an amendment made by this title, or the application of such provision or amendment to any person or circumstance is held to be unconstitutional, the remainder of this title, the amendments made by this title, and the application of the provisions of such to any person or circumstance shall not be affected thereby.

(g) INTERNATIONAL AGREEMENTS. In the event that any provision of section 12102(c) or section 31322(a) of title 46, United States Code, as amended by this Act, is determined to be inconsistent with an existing international agreement relating to foreign investment to which the United States is a party with respect to the owner or mortgagee on October 1, 2001 of a vessel with a fishery endorsement, such provision shall not apply to that owner or mortgagee with respect to such vessel to the extent of any such inconsistency. The provisions of section 12102(c) and section 31322(a) of title 46, United States Code, as amended by this Act, shall apply to all subsequent owners and mortgagees of such vessel, and shall apply, notwithstanding the preceding sentence, to the owner on October 1, 2001 of such vessel if any ownership interest in that owner is transferred to or otherwise acquired by a foreign individual or entity after such date.

Appendix D Life History Features and Habitat Requirements of Fishery Management Plan Species

This appendix describes habitat requirements and life histories of the groundfish species managed by this fishery management plan. Each species or species group is described individually, however, summary tables that denote habitat associations (Table D-1), biological associations (Table D-2), and predator-prey associations (Table D-3) are also provided.

In each individual section, a species-specific table summarizes habitat. The following abbreviations are used in these habitat tables to specify location, position in the water column, bottom type, and other oceanographic features.

Location

BAY = nearshore bays, with depth if appropriate (e.g., fjords)
BCH = beach (intertidal)
BSN = basin (>3,000 m)
FW = freshwater
ICS = inner continental shelf (1–50 m)
IP = island passes (areas of high current), with depth if appropriate
LSP = lower slope (1,000–3,000 m)
MCS = middle continental shelf (50–100 m)
OCS = outer continental shelf (100–200 m)
USP = upper slope (200–1,000 m)

Water column

D = demersal (found on bottom)
N = neustonic (found near surface)
P = pelagic (found off bottom, not necessarily associated with a particular bottom type)
SD/SP = semi-demersal or semi-pelagic, if slightly greater or less than 50% on or off bottom

General

NA = not applicable
U = unknown
EBS = eastern Bering Sea
GOA = Gulf of Alaska
EFH = essential fish habitat

Bottom Type

C = coral
CB = cobble
G = gravel
K = kelp
M = mud
MS = muddy sand
R = rock
S = sand
SAV = subaquatic vegetation (e.g., eelgrass, not kelp)
SM = sandy mud

Oceanographic Features

CL = thermocline or pycnocline
E = edges
F = fronts
G = gyres
UP = upwelling

Life Stage

A = adult
S = subadult
SEJ = settled early juvenile
L = larvae
E = eggs

Table D.1 Summary of habitat associations for BSAI groundfish.

BSAI Groundfish		Nearshore				Shelf			Slope						Stratum Reference							Location							Physical Oceano-graphy					Substrate													Structure										Community Associations												Oceano-graphic Properties			
						Inner	Middle	Outer	Upper		Intermediate		Lower	Basin												Pelagic																																														
Species	Life Stage	Freshwater	Estuarine	Intertidal	Subtidal	1-50m	51-100m	101-200m	201-300m	301-500m	501-700m	701-1000m	1001-3000m	>3000m	Shallows	Island Pass	Bay/Fjord	Bank	Flat	Edge	Gully	Surface	Near surface	Semi-demersal	Demersal	1-200m (epi)	201-1000m (meso)	>1000m (bathy)	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bath)	Organic Debris	Mud	Sand	Gravel	Mud & sand	Mud & gravel	Sand & mud	Gravel & mud	Gravel & sand	Gravel & sand & mud	Gravel & mud & sand	Cobble	Rock	Bars	Sinks	Slumps/Rockfalls/Debris	Channels	Ledges	Pinnacles	Seamounts	Reefs	Vertical Walls	Man-made	Algal Cover	Anenomes	Enchinoderms	Soft Coral	Hard Coral	Mollusca	Drift Algae/Kelp	Kelp	Polychaetes	Sea Grasses	Sea Onions	Tunicates	Temperature (Celsius)	Salinity (ppt)	Oxygen Conc (ppm)	Life Stage
Alaska Plaice	A					x	x	x																	x										x	x				x																																A
	S					x	x	x																	x										x	x				x																																S
	SEJ					x	x																		x										x	x				x																																SEJ
	L					x	x	x																		x					x																																										L
	E					x	x	x																		x																																															E
Arrowtooth Flounder	A					x	x	x	x	x	x														x										x	x	x			x																																A
	S					x	x	x																	x										x	x	x			x																																S
	SEJ					x	x																		x										x	x	x			x																																SEJ
	L					x	x	x	x	x																x					x																																										L
	E					x	x	x	x	x															x																																															E
Atka Mackerel	A					x	x	x	x							x							x	x	x				x			x	x			x	x								x	x								x							x			x					3-5	>17		A
	S																					x	x																																																3-12			S
	L																					x	x																																																2-12			L
	E					x	x	x								x									x												x								x	x																		x					3-10			E
Flathead Sole/ Bering Flounder Complex	A					x	x	x	x																x								x		x	x	x			x		x																															A
	S					x	x	x																	x										x	x	x			x		x																															S
	SEJ					x	x																		x											x	x																																				SEJ
	L					x	x	x																		x					x									x																																	L
	E					x	x	x																		x																																															E
Greenland Turbot	A							x	x	x	x	x	x							x	x				x										x	x	x		x																																			A
	S					x	x																		x										x	x			x																																		S
	SEJ																								x										x	x			x																																		SEJ
	L					x	x	x	x	x																x					x																																										L
	E					x	x	x	x	x																x																																															E
Kamchatka Flounder	A						x	x	x	x	x	x													x										x	x	x			x																																A
	S						x	x	x	x															x										x	x	x			x																																S
	SEJ						x	x																	x										x	x	x			x																																SEJ
	L						x	x	x	x																	x																																													L
	E						x	x	x	x																																																															E
Northern Rock Sole	A					x	x	x																	x										x	x				x																																A
	S					x	x																		x										x	x				x																																S
	SEJ					x																			x										x	x				x																																SEJ
	L					x	x	x																		x					x																																										L
	E					x	x	x																	x																																																E
Northern Rockfish	A						x	x										x							x																				x	x																										A
	S						x	x										x	x						x																				x	x																										S
	SEJ																									x																																															SEJ
	L																																																																								L

Table D.2 (cont) Summary of habitat associations for BSAI groundfish.

BSAI Groundfish	Life Stage	Nearshore				Shelf			Slope						Stratum Reference						
Species		Freshwater	Estuarine	Intertidal	Subtidal	Inner 1-50m	Middle 51-100m	Outer 101-200m	Upper 201-300m	301-500m	Intermediate 501-700m	701-1000m	Lower 1001-3000m	Basin >3000m	Shallows	Island Pass	Bay/Fjord	Bank	Flat	Edge	Gully
Octopus	A			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
	S																				
	SEJ																				
	L																				
	E																				
Other Flatfish Complex	A					x	x	x	x	x	x	x									
	S					x	x	x	x	x											
	SEJ					x	x														
	L					x	x	x	x	x											
	E					x	x	x	x	x											
Other Rockfish Complex	A							x	x	x	x	x	x					x		x	x
	S						x	x	x									x		x	
	SEJ																				
	L																				
	E																				
Pacific Cod	A					x	x	x	x	x					x	x	x	x	x	x	x
	S					x	x	x	x	x					x	x	x	x	x	x	x
	SEJ				x	x	x	x							x	x	x	x	x	x	x
	L					x	x	x							x	x	x	x	x	x	x
	E																				
Pacific Ocean Perch	A							x	x	x								x	x	x	x
	S						x	x	x												
	SEJ					x	x	x													
	L																				
Rougheye/Blackspotted Rockfish	A								x	x						x				x	
	S															x					
	SEJ						x	x	x	x	x	x									
	L																				
Sablefish	A								x	x	x	x	x				x				x
	S							x	x	x	x						x				x
	SEJ					x	x	x									x				
	L						x	x	x	x	x	x	x	x							
	E								x	x	x	x	x	x							
Shark Complex	A			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	S																				
	SEJ																				
	E																				

BSAI Groundfish	Life Stage	Location							Physical Oceano-graphy					Substrate												
Species		Surafce	Near surface	Semi-demersal	Demersal	Pelagic 1-200m (epi)	Pelagic 201-1000m (meso)	Pelagic >1000m (bathy)	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bath)	Organic Debris	Mud	Sand	Gravel	Mud & sand	Mud & gravel	Sand & mud	Gravel & mud	Gravel & sand	Gravel & sand & mud	Gravel & mud & sand	Cobble	Rock
Octopus	A				x	x	x																			
	S																									
	SEJ																									
	L																									
	E																									
Other Flatfish Complex	A				x										x	x			x	x						
	S				x										x	x			x	x						
	SEJ				x										x	x			x	x						
	L					x					x				x	x										
	E					x																				
Other Rockfish Complex	A				x												x								x	x
	S				x												x									x
	SEJ					x																				
	L					x																				
	E					x																				
Pacific Cod	A			x	x										x	x	x	x	x	x	x	x	x	x	x	
	S			x	x										x	x	x	x	x	x	x	x	x	x	x	
	SEJ			x	x										x	x	x	x	x	x	x	x	x	x		
	L					x																				
	E				x																					
Pacific Ocean Perch	A			x	x	x			x						x	x	x	x							x	x
	S														x	x	x	x							x	x
	SEJ			x	x	x	x	x	x								x								x	x
	L		x	x		x	x		x																	
Rougheye/Blackspotted Rockfish	A				x								x		x	x	x	x	x	x	x	x	x	x	x	x
	S				x																					
	SEJ		x																							
	L						x																			
Sablefish	A				x				x						x	x	x								x	x
	S				x				x						x	x	x								x	x
	SEJ				x	x	x		x																	
	L	x	x						x																	
	E					x	x		x																	
Shark Complex	A	x	x	x	x	x	x							x	x	x	x	x	x	x	x	x	x	x	x	x
	S																									
	SEJ																									
	E																									

BSAI Groundfish	Life Stage	Structure										Community Associations												Oceano-graphic Properties			Life Stage
Species		Bars	Sinks	Slumps/Rockfalls/Debris	Channels	Ledges	Pinnacles	Seamounts	Reefs	Vertical Walls	Man-made	Algal Cover	Anemones	Enchinoderms	Soft Coral	Hard Coral	Mollusca	Drift Algae/Kelp	Kelp	Polychaetes	Sea Grasses	Sea Onions	Tunicates	Temperature (Celsius)	Salinity (ppt)	Oxygen Conc (ppm)	
Octopus	A																										A
	S																										S
	SEJ																										SEJ
	L																										L
	E																										E
Other Flatfish Complex	A																										A
	S																										S
	SEJ																										SEJ
	L																										L
	E																										E
Other Rockfish Complex	A							x																			A
	S															x											S
	SEJ																										SEJ
	L																										L
	E																										E
Pacific Cod	A																										A
	S																				x						S
	SEJ																										SEJ
	L																										L
	E																							3-6	13-23	2-3	E
Pacific Ocean Perch	A														x												A
	S							x																			S
	SEJ							x																			SEJ
	L																										L
Rougheye/Blackspotted Rockfish	A							x								x											A
	S																										S
	SEJ																										SEJ
	L																										L
Sablefish	A							x																			A
	S																										S
	SEJ																										SEJ
	L																										L
	E																										E
Shark Complex	A																										A
	S																										S
	SEJ																										SEJ
	E																										E

Table D.3 (cont) Summary of habitat associations for BSAI groundfish.

BSAI Groundfish		Nearshore				Shelf			Slope						Stratum Reference							Location						
						Inner	Middle	Outer	Upper		Intermediate		Lower	Basin												Pelagic		
Species	Life Stage	Freshwater	Estuarine	Intertidal	Subtidal	1-50m	51-100m	101-200m	201-300m	301-500m	501-700m	701-1000m	1001-3000m	>3000m	Shallows	Island Pass	Bay/Fjord	Bank	Flat	Edge	Gully	Surfce	Near surface	Semi-demersal	Demersal	1-200m (epi)	201-1000m (meso)	>1000m (bathy)
Shortraker Rockfish	A								x	x										x					x			
	S																								x			
	SEJ						x	x	x	x	x	x	x	x									x					
	L																										x	
Skate Complex	A			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x			x	x			
	S																											
	SEJ																											
	E							x	x																			
Walleye Pollock	A						x	x	x	x				x		x	x	x	x	x	x		x	x	x	x	x	
	S					x	x	x								x	x	x	x	x	x		x	x	x	x		
	L						x	x								x	x	x	x	x	x		x	x	x	x		
	E						x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x		x		
Yellowfin Sole	A					x	x																		x			
	S					x	x																		x			
	SEJ					x																			x			
	L					x	x																			x		
	E					x	x																			x		

BSAI Groundfish		Physical Oceano-graphy					Substrate													Structure										Community Associations												Oceano-graphic Properties			
Species	Life Stage	Upwelling areas	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bath)	Organic Debris	Mud	Sand	Gravel	Mud & sand	Mud & gravel	Sand & mud	Gravel & mud	Gravel & sand	Gravel & sand & mud	Gravel & mud & sand	Cobble	Rock	Bars	Sinks	Slumps\Rockfalls\Debris	Channels	Ledges	Pinnacles	Seamounts	Reefs	Vertical Walls	Man-made	Algal Cover	Anenomes	Enchinoderms	Soft Coral	Hard Coral	Mollusca	Drift Algae\Kelp	Kelp	Polychaetes	Sea Grasses	Sea Onions	Tunicates	Temperature (Celsius)	Salinity (ppt)	Oxygen Conc (ppm)	Life Stage
Shortraker Rockfish	A					x		x	x	x	x	x	x	x	x	x	x	x	x							x								x											A
	S																																												S
	SEJ																																												SEJ
	L																																												L
Skate Complex	A																																												A
	S																																												S
	SEJ																																												SEJ
	E																																												E
Walleye Pollock	A	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x																								**2-10**			A
	S	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x																								**2-10**			S
	L	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x																											L
	E	x	x	x	x																																								E
Yellowfin Sole	A							x	x				x																																A
	S							x	x				x																																S
	SEJ							x	x				x																																SEJ
	L																																												L
	E																																												E

Table D.4 Summary of reproductive traits for BSAI groundfish.

BSAI Groundfish	Life Stage	Reproductive Traits																										
		Age at Maturity				Fertilization/Egg Development					Spawning Behavior						Spawning Season											
		Female		Male																								
Species		50%	100%	50%	100%	External	Internal	Oviparous	Aplacental	Viviparous	Batch Spawner	Broadcast Spawner	Egg Case Deposition	Nest Builder	Egg/Young Guarder	Egg/Young Bearer	January	February	March	April	May	June	July	August	September	October	November	December
Alaska Plaice	A	6-7				x													x	x	x							
Arrowtooth Flounder	A	5		4		x											x	x	x	x							x	x
Atka Mackerel	A	3.6		3.6		x					x			x	x							x	x	x	x	x		
Flathead Sole/ Bering Flounder Complex	A	9.7				x					x						x	x	x	x								
Greenland Turbot	A	5-10				x						x					x	x	x							x	x	x
Kamchatka Flounder	A	10		10		x											x	x	x								x	x
Northern Rock Sole	A	9				x					x						x	x	x									
Northern Rockfish	A	8.2					x			x	x																	
Octopus	A						x				x			x	x													
Other Flatfish Complex	A	350-439 mm		350-439 mm		x											x	x	x	x	x	x	x	x				
Other Rockfish Complex	A	11-12					x			x	x							x				x						
Pacific Cod	A	5	20	5	20	x						x						x	x	x								
Pacific Ocean Perch	A	9.1					x			x	x							x	x	x	x							
Rougheye/ Blackspotted Rockfish	A	24.5					x			x	x							x	x	x	x							
Sablefish	A	585 mm		585 mm		x						x					x	x	x									
Shark Complex	A						x		x							x												
Shortraker Rockfish	A						x			x	x							x	x	x	x	x	x	x				
Skate Complex	A						x	x					x															
Walleye Pollock	A	3-4		3-4		x						x						x	x	x	x							
Yellowfin Sole	A	10.1				x					x										x	x	x					

Table D.5 Summary of predator and prey associations for BSAI groundfish

BSAI Groundfish — Predator to

Species	Life Stage	Algae	Plants	Plankton	Zooplankton	Diatoms	Sponges	Eusphausiid	Hydroids	Amphipoda	Copepods	Starfish	Polychaetes	Squid	Philodae (gunnels)	Bivalves	Mollusks	Crustaceans	Ophiuroids (brittle stars)	Shrimps, mysidacae	Shrimps, Panaeid	Sand lance	Osmerid (eulachon)	Herring	Myctophid (lantern fishes)	Cottidae (sculpins)	Arrowtooth	Rockfish	Salmon	Pacific cod	Pollock	Halibut	Deepsea smelt
Alaska Plaice	A																																
	S																																
	SEJ																																
	L																																
	E																																
Arrowtooth Flounder	A												x	x				x	x	x				x	x						x		
	S												x					x	x	x				x	x						x		
	SEJ				x																												
	L	x		x																													
	E																																
Atka Mackerel	A							x			x														x								
	S							x			x																						
	L										x																						
	E																																
Flathead Sole/ Bering Flounder Complex	A							x		x	x		x			x	x	x	x			x	x								x		
	S							x		x	x		x			x	x	x	x												x		
	SEJ				x								x			x			x												x		
	L	x		x																													
	E																																
Greenland Turbot	A							x				x	x	x		x	x	x	x	x		x	x	x	x				x	x	x		
	S							x				x	x	x		x	x	x	x	x		x	x	x	x				x	x	x		
	SEJ				x																												
	L	x		x																													
	E																																
Kamchatka Flounder	A							x		x			x	x				x		x											x		
	S							x		x			x					x		x													
	SEJ				x																												
	L	x		x																													
	E																																
Northern Rock Sole	A									x			x			x	x																
	S									x			x			x	x																
	SEJ				x																												
	L	x		x																													
	E																																
Northern Rockfish	A							x			x																						
	S																																
	SEJ																																
	L																																

BSAI Groundfish — Prey of

Species	Life Stage	Jellyfish	Starfish	Chaetognaths (arrowworm	Crab	Herring	Salmon	Pollock	Pacific cod	Ling cod	Rockfish	Rock Sole	Flathead Sole	Yellowfin sole	Arrowtooth flounder	Hailbut	Salmon Shark	Pacific sleeper shark	Northern Fur Seal	Harbor Seal	Steller sea lion	Dalls Porpoise	Beluga whale	Killer Whale	Minke whale	Baird's beaked shale	Sperm whale	Eagles	Murres	Puffin	Kittiwake	Gull	Terrestrial Mammals
Alaska Plaice	A																																
	S																																
	SEJ																																
	L																																
	E																																
Arrowtooth Flounder	A																																
	S							x	x																								
	SEJ																																
	L																																
	E																																
Atka Mackerel	A								x						x	x			x	x	x	x			x								
	S																		x		x								x	x			
	L																																
	E																																
Flathead Sole/ Bering Flounder Complex	A								x				x		x	x																	
	S																																
	SEJ																																
	L																																
	E																																
Greenland Turbot	A								x																								
	S																																
	SEJ							x	x					x																			
	L																																
	E																																
Kamchatka Flounder	A																																
	S							x	x						x	x																	
	SEJ																																
	L																																
	E																																
Northern Rock Sole	A																																
	S							x	x					x		x																	
	SEJ																																
	L																																
	E																																
Northern Rockfish	A																																
	S																																
	SEJ																																
	L																																

BSAI Groundfish		Predator to																																	Prey of																															
Species	Life Stage	Algae	Plants	Plankton	Zooplankton	Diatoms	Sponges	Eusphausiid	Hydroids	Amphipoda	Copepods	Starfish	Polychaetes	Squid	Philodae (gunnels)	Bivalves	Mollusks	Crustaceans	Ophiuroids (brittle stars)	Shrimps, mysidacae	Shrimps, Panaeid	Sand lance	Osmerid (eulachon)	Herring	Myctophid (lantern fishes)	Cottidae (sculpins)	Arrowtooth	Rockfish	Salmon	Pacific cod	Pollock	Halibut	Deepsea smelt	Life Stage	Jellyfish	Starfish	Chaetognaths (arrowwom	Crab	Herring	Salmon	Pollock	Pacific cod	Ling cod	Rockfish	Rock Sole	Flathead Sole	Yellowfin sole	Arrowtooth flounder	Hailbut	Salmon Shark	Pacific sleeper shark	Northern Fur Seal	Harbor Seal	Steller sea lion	Dalls Porpoise	Beluga whale	Killer Whale	Minke whale	Baird's beaked shale	Sperm whale	Eagles	Murres	Puffin	Kittiwake	Gull	Terrerstrial Mammals
Octopus	A															x	x	x	x	x		x				x		x		x		x		A							x	x	x	x		x	x		x			x	x	x		x										
	S																																	S																																
	SEJ																																	SEJ																																
	L		x	x							x																							L																																
	E																																	E																																
Other Flatfish Complex	A							x		x			x				x	x																A								x						x																		
	S							x		x			x				x	x																S								x						x																		
	SEJ																																	SEJ																																
	L	x		x																														L																																
	E																																	E																																
Other Rockfish Complex	A							x												x						x								A																																
	S																																	S																																
	SEJ																																	SEJ																																
	L																																	L																																
	E																																	E																																
Pacific Cod	A				x		x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		A															x	x		x		x		x	x	x								
	S				x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		S								x						x	x	x		x		x		x	x	x								
	SEJ				x			x		x	x		x	x		x	x	x	x	x		x		x	x	x	x	x		x	x	x		SEJ							x	x						x	x	x		x		x		x	x	x					x			
	L																																	L							x	x						x																		
	E																																	E																																
Pacifc Ocean Perch	A							x																										A															x																	
	S							x			x																							S																																
	SEJ																																	SEJ						x																										
	L			x	x																													L																																
Rougheye/ Blackspotted Rockfish	A													x						x					x									A																																
	S																																	S																																
	SEJ																																	SEJ																																
	L																																	L																																
Sablefish	A							x	x	x	x		x	x				x		x			x	x		x	x		x	x	x			A																																
	S							x	x	x	x		x	x				x		x			x	x		x	x		x	x	x			S						x									x											x						
	SEJ							x		x	x		x	x	x			x		x				x					x					SEJ																																
	L				x						x																							L																																
	E																																	E																																
Shark Complex	A							x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	A																x	x	x		x			x									
	S							x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	S									x						x	x	x	x	x	x			x									
	SEJ							x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	SEJ									x						x	x	x	x	x	x			x									
	E																																	E																																

Table D.7 (cont) Summary of predator and prey associations for BSAI groundfish

Predator to

BSAI Groundfish Species	Life Stage	Algae	Plants	Plankton	Zooplankton	Diatoms	Sponges	Eusphausiid	Hydroids	Amphipoda	Copepods	Starfish	Polychaetes	Squid	Philodae (gunnels)	Bivalves	Mollusks	Crustaceans	Ophiuroids (brittle stars)	Shrimps, mysidacae	Shrimps, Panaeid	Sand lance	Osmerid (eulachon)	Herring	Myctophid (lantern fishes)	Cottidae (sculpins)	Arrowtooth	Rockfish	Salmon	Pacific cod	Pollock	Halibut	Deepsea smelt
Shortraker Rockfish	A													x						x					x								
	S																																
	SEJ																																
	L																																
Skate Complex	A									x		x	x					x		x		x		x		x	x	x	x	x	x	x	
	S																																
	SEJ																																
	E																																
Walleye Pollock	A				x			x			x			x						x		x	x	x	x		x			x	x	x	
	S				x			x			x			x						x		x	x	x	x		x			x	x	x	
	SEJ				x			x			x									x		x	x										
	L				x			x			x																						
	E																																
Yellowfin Sole	A							x		x			x			x		x		x						x					x		
	S							x		x			x			x		x		x						x							
	SEJ				x																												
	L	x		x																													
	E																																

Prey of

BSAI Groundfish Species	Life Stage	Jellyfish	Starfish	Chaetognaths (arrowwom	Crab	Herring	Salmon	Pollock	Pacific cod	Ling cod	Rockfish	Rock Sole	Flathead Sole	Yellowfin sole	Arrowtooth flounder	Hailbut	Salmon Shark	Pacific sleeper shark	Northern Fur Seal	Harbor Seal	Steller sea lion	Dalls Porpoise	Beluga whale	Killer Whale	Minke whale	Baird's beaked shale	Sperm whale	Eagles	Murres	Puffin	Kittiwake	Gull	Terrestrial Mammals
Shortraker Rockfish	A																																
	S																																
	SEJ																																
	L																																
Skate Complex	A																																
	S																																
	SEJ																																
	E																																
Walleye Pollock	A								x						x	x	x		x	x	x												
	S							x	x						x	x			x	x	x				x				x	x	x		
	SEJ							x	x						x	x			x	x	x				x				x	x	x		
	L							x	x						x	x									x				x	x	x		
	E																																
Yellowfin Sole	A																																
	S								x							x																	
	SEJ								x							x																	
	L																																
	E																																

D.1 Alaska plaice (*Pleuronectes quadrituberculatus*)

Formerly a constituent of the "other flatfish" management category, Alaska plaice were split-out and are now managed as a separate stock.

D.1.1 Life History and General Distribution

Alaska plaice inhabit continental shelf waters of the North Pacific ranging from the Gulf of Alaska to the Bering and Chukchi Seas and in Asian waters as far south as Peter the Great Bay (Pertseva-Ostroumova 1961; Quast and Hall 1972). Adults exhibit a benthic lifestyle and live year round on the shelf and move seasonally within its limits (Fadeev 1965). From over-winter grounds near the shelf margins, adults begin a migration onto the central and northern shelf of the eastern Bering Sea, primarily at depths of less than 100 m. Spawning usually occurs in March and April on hard sandy ground (Zhang 1987). The eggs and larvae are pelagic and transparent and have been found in ichthyoplankton sampling in late spring and early summer over a widespread area of the continental shelf (Waldron and Favorite 1977). Eggs and larvae were primarily collected from depths < 200 m, with the majority occurring over bottom depths ranging 50–100 m. Eggs were present throughout the water column, though densities of preflexion stage larvae were concentrated at depths 10–20 m. There was no evidence of vertical migration for pre-flexion stages (Duffy-Anderson et al. 2010).

Fecundity estimates (Fadeev 1965) indicate female fish produce an average of 56 thousand eggs at lengths of 280 to 300 mm and 313 thousand eggs at lengths of 480 to 500 mm. The age or size at metamorphosis is unknown. The estimated length of 50 percent maturity is 319 mm (Tenbrink and Wildebuer 2015). Natural mortality rate estimates range from 0.19 to 0.22 (Wilderbuer and Zhang 1999).

D.1.2 Relevant Trophic Information

Groundfish predators include Pacific halibut (Novikov 1964) yellowfin sole, beluga whales, and fur seals (Salveson 1976).

D.1.3 Habitat and Biological Associations

<u>*Larvae*</u>: Planktonic larvae for at least 2 to 3 months until metamorphosis occurs, usually inhabiting shallow areas.

<u>*Settled Early Juveniles*</u>: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom current (Laman et al. 2022). Predicted abundance increased to the northeast in the survey area with increasing bottom temperature and northeasterly currents. The highest abundance of settled early juvenile Alaska plaice was predicted in Norton Sound and along the eastern margin of the EBS shelf survey area.

<u>*Subadults*</u>: The covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, bottom temperature, and sediment grain size (Laman et al. 2022) with higher abundance predicted along the inner shelf in cooler, shallower water over moderately fine sediment grain sizes.

<u>*Adults*</u>: Summertime feeding on sandy substrates of the eastern Bering Sea shelf. Wide-spread distribution mainly on the middle, northern portion of the shelf, feeding on polychaete, amphipods, and echiurids (Livingston and DeReynier 1996). Wintertime migration to deeper waters of the shelf margin to avoid extreme cold water temperatures. Feeding diminishes until spring after spawning. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, sediment grain size, and bottom temperature (Laman et al. 2022). Adult Alaska plaice abundance was predicted to be highest over the transition between the inner and middle shelf in the central EBS where bottom depths were shallower (~100 m), bottom temperatures were 2.5–3.0°C, and sediment grain sizes were finer.

Habitat and Biological Associations: Alaska plaice

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs		NA	spring and summer	ICS, MCS OCS	P			
Larvae	2–4 months?	U phyto/zoo plankton?	spring and summer	ICS, MCS	P			
Settled Early Juveniles/Subadults	up to 7 years	polychaete amphipods echiurids	all year	ICS, MCS	D	S, SM, MS, M		
Adults	7+ years	polychaete amphipods echiurids	spawning March–May	ICS, MCS	D	S, SM,MS, M		
			non-spawning and feeding June–February	ICS, MCS			ice edge	

D.1.4 Literature

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D.2 Arrowtooth flounder (*Atheresthes stomias*)

D.2.1 Life History and General Distribution

Arrowtooth flounder are distributed in North American waters from central California to the eastern Bering Sea on the continental shelf and upper slope.

Adults exhibit a benthic lifestyle and occupy separate winter and summer distributions on the eastern Bering Sea shelf. From over-winter grounds near the shelf margins and upper slope areas, adults begin a migration onto the middle and outer shelf in April or early May each year with the onset of warmer water temperatures. A protracted and variable spawning period may range from as early as September through March (Rickey 1994, Hosie 1976). Total fecundity may range from 250,000 to 2,340,000 oocytes (Zimmerman 1997). Larvae have been found from ichthyoplankton sampling over a widespread area of the eastern Bering Sea shelf in April and May (Waldron and Vinter 1978, Kendall and Dunn 1985). The age or size at metamorphosis is unknown. Juveniles are separate from the adult population, remaining in shallow areas until they reach the 100 to 150 mm range (Martin and Clausen 1995). The estimated age at 50 percent maturity is 7.6 years (480 mm) for females collected from the Bering Sea (Stark 2012). The natural mortality rate used in stock assessments differs by sex and is estimated at 0.2 for females and 0.35 for males (Turnock et al. 2009, Wilderbuer et al. 2010, Shotwell et al. 2020).

D.2.2 Relevant Trophic Information

Arrowtooth flounder are very important as a large, and abundant predator of other groundfish species.

D.2.3 Habitat and Biological Associations.

Larvae: Planktonic larvae for at least 2 to 3 months until metamorphosis occurs.

Settled Early Juveniles: Juveniles usually inhabit shallow areas until about 100 mm in length. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were location, bottom depth, and bottom temperature (Laman et al. 2022). The highest abundances of this life stage were predicted over the central and southern portions of the outer shelf domain at bottom water temperatures greater than 5°C and bottom depths less than 150 m. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, tidal current maximum, and bottom currents (Harris et al. 2022). In general, predicted abundance was high in locations that were farther east, with shallow depths (<150 m) and with weak tides (Fig. 5). Predicted abundance was highest in shallow, sheltered inshore areas, particularly those near Unalaska Island (Fig. 5), though secondary pockets of high abundance were also predicted near Atka Island and Agattu Island.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). Their highest abundance was predicted over the central and southern portions of the outer and middle shelf domains at depths around 200 m and water temperatures above 5°C. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Harris et al. 2022). Like early juveniles, subadult ATF were associated with weak tidal forces and weak bottom currents. Based on the covariates, abundance should be highest in the eastern and central AI and at depths between 100 m and 300 m.

Adults: Widespread distribution mainly on the middle and outer portions of the continental shelf, feeding mainly on walleye pollock and other miscellaneous fish species when arrowtooth flounder attain lengths greater than 300 mm. Wintertime migration to deeper waters of the shelf margin and upper continental slope to avoid extreme cold water temperatures and for spawning. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). Adult abundance was highest in the southern EBS over the middle shelf and shelf break and along the shelf break in the north near the heads of Navarin and Pervenets Canyons at depths between 300 and 400 m at bottom water temperatures greater than 5°C. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, current, and current variability (Harris et al. 2022). Adult ATF are predicted to be abundant in moderately deep waters, in the eastern AI, and at locations with weak bottom currents.

Habitat and Biological Associations: Arrowtooth flounder

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs		NA	winter, spring?	ICS, MCS, OCS	P			
Larvae	2–3 months?	U phyto/zoo plankton?	spring summer?	BAY, ICS, MCS, OCS	P			
Settled Early Juveniles	to 2 yrs	euphausiids crustaceans amphipods pollock	all year	ICS, MCS	D	GMS		
Subadults	males 2–4 yrs females 2–5 yrs	euphausiids crustaceans amphipods pollock	all year	ICS, MCS, OCS, USP	D	GMS		
Adults	males 4+ yrs females 5+ yrs	pollock misc. fish Gadidae sp. euphausiids	spawning Nov–March	MCS, OCS, USP	D	GMS		
			non-spawning April–Oct					

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D.3 Atka mackerel (*Pleurogrammus monopterygius*)

D.3.1 Life History and General Distribution

Atka mackerel are distributed along the continental shelf across the North Pacific Ocean and Bering Sea from Asia to North America. On the Asian side they extend from the Kuril Islands to Provideniya Bay; moving eastward, they are distributed throughout the Komandorskiye and Aleutian Islands, north along the eastern Bering Sea shelf, and through the Gulf of Alaska to southeast Alaska. They are most abundant along the Aleutian Islands.

Adult Atka mackerel occur in large localized aggregations usually at depths less than 200 m and generally over rough, rocky, and uneven bottom near areas where tidal currents are swift. Associations with corals and sponges have been observed for Aleutian Islands Atka mackerel. Adults are semi-demersal, displaying strong diel behavior with vertical movements away from the bottom occurring almost exclusively during the daylight hours, presumably for feeding, and little to no movement at night (when they are closely associated with the bottom). Atka mackerel are a substrate-spawning fish with male parental care. Single or multiple clumps of adhesive eggs are laid on rocky substrates in individual male territories within nesting colonies where males brood eggs for a protracted period. Nesting colonies are widespread across the continental shelf of the Aleutian Islands and western Gulf of Alaska down to bottom depths of 144 m. Possible factors limiting the upper and lower depth limit of Atka mackerel nesting habitat include insufficient light penetration and the deleterious effects of unsuitable water temperatures, wave surge, or high densities of kelp and green sea urchins. The spawning phase begins in late July, peaks in early September, and ends in mid-October. After spawning ends, territorial males with nests continue to brood egg masses until hatching. Eggs develop and hatch in 40 to 45 days, releasing planktonic larvae which have been found up to 800 km from shore. Little is known of the distribution of young Atka mackerel prior to their appearance in trawl surveys and the fishery at about age 2 to 3 years. Atka mackerel exhibit intermediate life history traits. R-traits include young age at maturity (approximately 50 percent are mature at age 3.6), fast growth rates, high natural mortality (mortality equals 0.3) and young average and maximum ages (about 5 and 15 years, respectively). K-selected traits include low fecundity (only about 30,000 eggs/female/year, large egg diameters (1 to 2 mm) and male nest-guarding behavior).

Average length at 50% maturity in the Aleutian Islands is 344 mm (McDermott and Lowe 1997).

D.3.2 Relevant Trophic Information

Atka mackerel are consumed by a variety of piscivores, including groundfish (e.g., Pacific cod, Pacific halibut, and arrowtooth flounder), marine mammals (e.g., northern fur seals and Steller sea lions), and seabirds (e.g., thick-billed murres, tufted puffins, and short-tailed shearwaters). Adult Atka mackerel consume a variety of prey, but principally calanoid copepods and euphausiids. Predation on Atka mackerel eggs by cottids and other hexagrammids is prevalent during the spawning season as is cannibalism by other Atka mackerel.

D.3.3 Habitat and Biological Associations

Eggs: Adhesive eggs are deposited in nests built and guarded by males on rocky substrates or on kelp in shallow water.

Larvae: Planktonic larvae have been found up to 800 km from shore, usually in upper water column (neuston), but little is known of the distribution of Atka mackerel until they are about 2 years old and appear in fishery and surveys.

Subadults: The covariates contributing the most to the final SDM EFH map for this life stage in the AI were Geographic position and bottom depth (Harris et al. 2022), though tidal maximum and current variability also contributed. In general, high abundance was predicted in farther west longitudes, shallow depths, and moderate tidal currents.

Adults: Adults occur in localized aggregations usually at depths less than 200 m and generally over rough, rocky and uneven bottom near areas where tidal currents are swift. Associations with corals and sponges have been observed for Aleutian Islands Atka mackerel. Adults are semi-demersal/pelagic during much of the year, but the males become demersal during spawning; females move between nesting and offshore feeding areas. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, local slope, and bottom temperature (Laman et al. 2022). Adult Atka mackerel were predicted along the shelf break and over the southern EBS at depths around 250 m with relatively shallow slopes at bottom temperatures around 5°C. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Harris et al. 2022). Bottom current, current variability, and tidal maximum also accounted for a substantial faction of the deviance explained. Adult Atka mackerel are predicted to be abundant at shallow depths, favoring farther west areas in the AI.

Habitat and Biological Associations: Atka mackerel

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	40–45 days	NA	summer	IP, ICS, MCS	D	G, R, K, CB	U	develop 3–15 °C optimum 3.9–10.5 °C
Larvae	up to 6 mos	U copepods?	fall–winter	U	U, N?	U	U	2–12 °C optimum 5–7 °C
Subadults	½–2 yrs of age	U copepods & euphausiids ?	all year	U	N	U	U	3–5 °C
Adults	3+ yrs of age	copepods euphausiids meso-pelagic fish (myctophids)	spawning (June–Oct)	ICS and MCS, IP	D (males) SD females	G, R, CB, K	F, E	3–5 °C all stages >17 ppt only
			non-spawning (Nov–May)	MCS and OCS, IP	SD/D all sexes			
			tidal/diurnal, year-round?	ICS, MCS, OCS, IP	D when currents high/day SD slack tides/night			

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D.4 Flathead sole/Bering flounder complex

Species Complex Summary

In the Bering Sea, the management category “flathead sole” is represented as a two-species complex consisting of true flathead sole (*Hippoglossoides elassodon*) and its close congener, Bering flounder (*H. robustus*), which is morphologically similar (McGilliard 2017). EBS trawl survey estimates of flathead sole and Bering flounder biomass indicate the latter comprises less than 3 percent of the combined biomass of these two species. Subadults of both species are found over most of the EBS shelf with exceptions around Nunivak Island, Norton Sound, and off the EBS shelf break. Distribution and abundance of both species is predicted to be highest in the southern EBS with elevated abundance along the U.S.-Russia Convention Line in the north.

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D.4.1 Bering flounder (*Hippoglossoides robustus*)

D.4.1.1 Life History and General Distribution

Bering flounder range from the EBS into the Chukchi and western Bering Seas at depths ranging form 18-425 m (Mecklenburg et al. 2002). An affinity for colder water temperatures has been attributed to Bering flounder when compared with flathead sole (Stark 2011).

D.4.1.2 Relevant Trophic Information

There is insufficient information on Bering flounder predator or prey relationships.

D.4.1.3 Habitat and Biological Associations

Subadults: The highest abundance of subadult Bering flounder can be found over the middle shelf at the U.S.-Russian Convention Line at depths around 150 m, water temperatures around 0°C, and over relatively flat bottom. Fewer subadult Bering flound are found in the southern EBS, and they are more common over the inner, middle, and outer shelf domains to the north. The covariates contributing the most to the final SDM EFH map for this life stage were Geographic position, bottom temperature, bottom depth, and tidal maximum (Laman et al. 2022). Their highest abundance was predicted over the middle shelf at the U.S.-Russia Convention line at depths around 150 m, water temperatures around 0°C, and over relatively flat bottom.

Adults: Similar to subadults, adult Bering flounder abundance may be highest on the middle shelf near the U.S.-Russia Convention Line at depths around 150 m and bottom water temperatures around 0°C, with fewer adults in the souther EBS and more over the inner, middle, and outer shelf domains to the north. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). Predicted abundance was highest on the middle shelf near the U.S.-Russia Convention Line at depths around 150 m and bottom water temperatures around 0°C.

D.4.1.4 Literature

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D.4.2 Flathead sole (*Hippoglossoides elassodon*)

D.4.2.1 Life History and General Distribution

Flathead sole are distributed from northern California, off Point Reyes, northward along the west coast of North America, and throughout the Gulf of Alaska and the Bering Sea, the Kuril Islands and possibly the Okhotsk Sea (Hart 1973).

Adults exhibit a benthic lifestyle and occupy separate winter spawning and summertime feeding distributions on the eastern Bering Sea shelf and in the Gulf of Alaska. From over-winter grounds near the shelf margins, adults begin a migration onto the mid- and outer continental shelf in April or May each year for feeding. The spawning period may start as early as January but is known to occur in March and April, primarily in deeper waters near the margins of the continental shelf. Eggs are large (2.75 to 3.75 mm) and females have egg counts ranging from about 72,000 (200 mm fish) to almost 600,000 (380 mm fish). Eggs hatch in 9 to 20 days depending on incubation temperatures within the range of 2.4 to 9.8°C (Forrester and Alderdice 1967) and have been found in ichthyoplankton sampling on the southern portion of the Bering Sea shelf in April and May (Waldron 1981). Larvae absorb the yolk sac in 6 to 17 days but the extent of their distribution is unknown. Size at metamorphosis is 18 to 35 mm (Matarese et al. 2003). Juveniles less than age 2 have not been found with the adult population, remaining in shallow areas. Age at 50 percent maturity is 9.7 years (Stark 2004). The natural mortality rate used in recent stock assessments is 0.2 for both sexes (Monnahan and Haehn 2020).

D.4.2.2 Relevant Trophic Information

Groundfish predators include Pacific cod, Pacific halibut, arrowtooth flounder, and cannibalism by large flathead sole, mostly on fish less than 200 mm standard length (Livingston and DeReynier 1996).

D.4.2.3 Habitat and Biological Associations

Larvae: Planktonic larvae for an unknown time period until metamorphosis occurs, usually inhabiting shallow areas.

Settled Early Juveniles: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom temperature, and sediment grain size (Laman et al. 2022) which was highest to the south and west over the outer shelf domain in waters shallower than 200 m with warmer bottom temperatures over increasingly coarse sediment grain sizes. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, BPI, and tidal maximum (Harris et al. 2022). In general, the ensemble predicts high abundance in the far east and far west of the AI in areas of moderate to shallow depth, weak tidal currents, and a low BPI.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, sediment grain size, and bottom temperature (Laman et al. 2022). Predictions of numerical abundance increased to the south and west in the study area at depths around 300 m over increasing sediment grain sizes and bottom temperatures. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, tidal maximum, current speed, and current variability (Harris et al. 2022). In general, the ensemble model predicted high abundance in patches around the major islands, and in areas with depths between 100 and 200 m, weak tidal currents, and currents that run in north or south directions.

Adults: Winter spawning and summer feeding on sand and mud substrates of the continental shelf. Widespread distribution mainly on the middle and outer portion of the shelf, feeding mainly on ophiuroids, tanner crab, osmerids, bivalves, and polychaete (Pacunski 1990). In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom temperature, and sediment grain size (Laman et al. 2022) which was highest in the south and west of the EBS in depths shallower than 300 m with increasing bottom temperatures and sediment grain sizes. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, tidal maximum, and current (Harris et al. 2022). Adult flathead sole are predicted to be abundant in 100-250 m deep waters and areas with a low tidal maximum and southerly currents.

Habitat and Biological Associations: Flathead sole

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	9–20 days	NA	winter	ICS, MCS, OCS	P			
Larvae	U	U phyto/zoo plankton?	spring summer	ICS, MCS, OCS	P			
Settled Early Juveniles	to 2 yrs	polychaete bivalves ophiuroids	all year	MCS, ICS	D	S, M		
Subadults	age 3–9 yrs	polychaete bivalves ophiuroids pollock and Tanner crab	all year	MCS, ICS, OCS	D	S, M	Juveniles	
Adults	age 9–30 yrs	polychaete bivalves ophiuroids pollock and Tanner crab	spawning Jan–April	MCS, OCS, ICS	D	S, M	ice edge	
			non-spawning May–December					

D.4.2.4 Literature

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D.5 Greenland turbot (*Reinhardtius hippoglossoides*)

D.5.1 Life History and General Distribution

Greenland turbot has an amphiboreal distribution, occurring in the North Atlantic and North Pacific. In the North Pacific, species abundance is centered in the eastern Bering Sea and, secondly, in the Aleutian Islands. On the Asian side, they occur in the Gulf of Anadyr along the Bering Sea coast of Russia, in the Okhotsk Sea, around the Kurile Islands, and south to the east coast of Japan to northern Honshu Island (Hubbs and Wilimovsky 1964, Mikawa 1963, Shuntov 1965). Adults exhibit a benthic lifestyle, living in deep waters of the continental slope but are known to have a tendency to feed off the sea bottom. During their first few years as immature fish, they inhabit relatively shallow continental shelf waters (less than 200 m) until about age 4 or 5 before joining the adult population (200 to 1,000 m or more, Templeman 1973). Adults appear to undergo seasonal shifts in depth distribution moving deeper in winter and shallower in summer (Chumakov 1970, Shuntov 1965). Spawning is reported to occur in winter in the eastern Bering Sea and may be protracted starting in September or October and continuing until March with an apparent peak period in November to February (Shuntov 1965, Bulatov 1983). Females spawn relatively small numbers of eggs with fecundity ranging from 23,900 to 149,300 for fish 830 mm and smaller in the Bering Sea (D'yakov 1982).

Eggs and early larval stages are benthypelagic (Musienko 1970). In the Atlantic Ocean, larvae (100 to 180 mm) have been found in benthypelagic waters which gradually rise to the pelagic zone in correspondence to absorption of the yolk sac which is reported to occur at 15 to 18 mm with the onset of feeding (Pertseva-

Ostroumova 1961). The period of larval development extends from April to as late as August or September (Jensen 1935) which results in an extensive larval drift and broad dispersal from the spawning waters of the continental slope. Metamorphosis occurs in August or September at about 70 to 80 mm in length at which time the demersal life begins. Juveniles are reported to be quite tolerant of cold temperatures to less than 0 °C (Hognestad 1969) and have been found on the northern part of the Bering Sea shelf in summer trawl surveys (Alton et al. 1988).

The age of 50 percent maturity is estimated to range from 5 to 10 years (D'yakov 1982, 600 mm used in stock assessment) and a natural mortality rate of 0.112 has been used in the most recent stock assessments (Barbeaux et al. 2015). The approximate upper size limit of juvenile fish is 590 mm.

D.5.2 Relevant Trophic Information

Groundfish predators include Pacific cod, pollock, and yellowfin sole, mostly on fish ranging from 20 to 50 mm standard length (probably age 0).

D.5.3 Habitat and Biological Associations

Larvae: Planktonic larvae for up to 9 months until metamorphosis occurs, usually with a widespread distribution inhabiting shallow waters.

Settled Early Juveniles/Subadults: Juveniles live on the continental shelf until about age 4 or 5 feeding primarily on euphausiids, polychaetes, and small walleye pollock. The covariates contributing the most to the final SDM EFH map for the subadult life stage (older juveniles) in the EBS were geographic position, bottom temperature, bottom depth, and sediment grain size (Laman et al. 2022). Ensemble-predicted subadult Greenland turbot abundance was highest over the outer shelf domain and upper continental slope in the northern part of the EBS in cooler bottom temperatures (< 2°C), depths around 450 m, and over coarser bottom sediments.

Adults: Inhabit continental slope waters with annual spring/fall migrations from deeper to shallower waters. In the Bering Sea diet consists of primarily walleye pollock, squid, crustaceans, and other miscellaneous fish species. In the Aleutian Islands although there is walleye pollock in the diet, there is a higher proportion of squid and Atka mackerel. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, bottom temperature, ROMS current variation, and sediment grain size (Laman et al. 2022), and predicted abundance was highest at depths around 500 m along the continental slope with relatively stable bottom currents and coarser sediment grain sizes. In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth (Harris et al. 2022). In general, abundance was expected to be higher in locations with high bottom depth, low temperature, weak currents, and farther west.

Habitat and Biological Associations: Greenland turbot

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs		NA	winter	OCS, MCS	SD, SP			
Larvae	8–9 months	U phyto/zoo plankton?	spring summer	OCS, ICS MCS	P			
Settled Early Juveniles/Subadults	1–5 yrs	euphausiids polychaetes small pollock	all year	ICS, MCS OCS, USP	D, SD	MS, M		
Adults	5+ years	pollock small fish	spawning Nov–February	OCS, USP LSP	D, SD	MS, M		
			non-spawning March–Oct	USP, LSP				

D.5.4 Literature

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D.6 Kamchatka flounder (*Atheresthes evermani*)

D.6.1 Life History and General Distribution

Kamchatka flounder (*Atheresthes evermani*) is a large-bodied flatfish found from the Sea of Okhotsk through the Bering Sea and into the western Gulf of Alaska (Zimmermann and Goddard 1996). In U.S. waters, they occur in high concentrations in the western Aleutians, generally declining in abundance east of there (Bryan et. al. 2018). The species is morphologically similar to the more common arrowtooth flounder (*A. stomias*) and the two species were not routinely distinguished in assessment surveys until 1992 (Bryan et al. 2018). The majority of Kamchatka flounder become sexually mature at a relatively large size (L_{50} = 550 mm; Stark 2012b), and can eventually grow to be 860 mm or more. This species was managed as a stock complex with arrowtooth flounder until 2011, when the start of a directed fishery prompted the development of separate management plans (Bryan et. al. 2018).

D.6.2 Relevant Trophic Information

Given its large size and predatory habits, this species is thought to be an important part of the marine food web and is a major predator of juvenile walleye pollock (*Gadus chalcogrammus*; Yang and Livingston 1986).

D.6.3 Habitat and Biological Associations

<u>Subadults</u>: Subadult Kamchatka flounder is often found north of Atka and Adak Islands, as well as around Agattu Island in the AI. Subadults show a preference for areas on the northern side of the islands, and seem to occupy habitats where the 100 m depth contour runs close to the shore. In the EBS, subadults are most common over the EBS outer shelf domain and upper continental slope. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and bottom temperature (Laman et al. 2022). Ensemble-predicted abundance of subadult Kamchatka flounder was highest over the outer shelf domain and along the EBS shelf break at depths around 450 m with increasing bottom temperatures. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom current (Harris et al. 2022). In general, high abundance was predicted for areas farther west, with northerly currents, and with bottom depths between 150 and 300 m.

<u>Adults</u>: Contrary to subadults, adult Kamchatka flounder appear in high densities around the deep passes in the AI island chain, including around Seguam Island and to the east and west of Rat Islands. The majority of adults are found at depths greater than 300 m, and typically close to 100 percent at depths greater than 300 m. In the EBS, adults are common on the upper continental slope and are also over the outer shelf domain in the northern portion of the EBS. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Laman et al. 2022). Ensemble-predicted adult Kamchatka flounder abundance was highest on the upper continental slope at depths around 500 m. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position,

bottom current covariates, and terrain aspect (Harris et al. 2022). High abundance was associated with increasing bottom depth, western longitudes, southerly currents, and north-facing terrain.

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D.7 Northern rock sole (*Lepidopsetta polyxystra*)

D.7.1 Life History and General Distribution

Members of the genus *Lepidopsetta* are distributed from California waters north into the Gulf of Alaska and Bering Sea to as far north as the Gulf of Anadyr. The distribution continues along the Aleutian Islands westward to the Kamchatka Peninsula and then southward through the Okhotsk Sea to the Kurile Islands, Sea of Japan, and off Korea. Centers of abundance occur off the Kamchatka Peninsula (Shubnikov and Lisovenko 1964), British Columbia (Forrester and Thompson 1969), the central Gulf of Alaska, and in the southeastern Bering Sea (Alton and Sample 1976). Two forms were found to exist in Alaska by Orr and Matarese (2000), a southern rock sole (*L. bilineatus*) and a northern rock sole (*L. polyxystra*). Resource assessment trawl surveys indicate that northern rock sole comprise more than 95 percent of the Bering Sea population. Adults exhibit a benthic lifestyle and, in the eastern Bering Sea, occupy separate winter (spawning) and summertime feeding distributions on the continental shelf. Northern rock sole spawn during the winter and early spring period of December through March. Soviet investigations in the early 1960s established two spawning concentrations: an eastern concentration north of Unimak Island at the mouth of Bristol Bay and a western concentration eastward of the Pribilof Islands between 55°30' N. and 55°0' N. and approximately 165°2' W. (Shubnikov and Lisovenko, 1964). Rock sole spawning in the eastern and western Bering Sea was found to occur at depths of 125 to 250 m, close to the shelf/slope break. Spawning females deposit a mass of eggs which are demersal and adhesive (Alton and Sample 1976). Fertilization is believed to be external. Incubation time is temperature dependent and may range from 6.4 days at 11 °C to about 25 days at 2.9 °C (Forrester 1964). Newly hatched larvae are pelagic and have occurred sporadically in eastern Bering Sea plankton surveys (Waldron and Vinter 1978). Kamchatka larvae are reportedly 20 mm in length when they assume their side-swimming, bottom-dwelling form (Alton and Sample 1976). Norcross et al. (1996) and Cooper et al. (2014) found newly settled larvae in the 40 to 50 mm size range. Forrester and Thompson (1969) report that by age 1 they are found with adults on the continental shelf during summer, but this has not been observed in the eastern Bering Sea.

In the springtime, after spawning, rock sole begin actively feeding and commence a migration to the shallow waters of the continental shelf. This migration has been observed on both the eastern (Alton and Sample 1976) and western (Shvetsov 1978) areas of the Bering Sea. During this time they spread out and form much less dense concentrations than during the spawning period. Summertime trawl surveys indicate most of the population can be found at depths from 50 to 100 m (Armistead and Nichol 1993). The movement from winter/spring to summer grounds is in response to warmer temperatures in the shallow waters and the distribution of prey on the shelf seafloor (Shvetsov 1978). In September, with the onset of cooling in the northern latitudes, rock sole begin the return migration to the deeper wintering grounds. Fecundity varies with size and was reported to be 450,00 eggs for fish 420 mm long. Northern rock sole mature (L_{50}) at about 309 mm (Stark 2012). Larvae are pelagic but their occurrence in plankton surveys in the eastern Bering Sea were rare in the early 1960s (Musienko 1963). However, ichthyoplankton surveys conducted since the early 2000s have captured northern rock sole larvae (Lanksbury et al. 2007). Juveniles are separate from the adult population, remaining in shallow areas until they reach age 1 (Forrester 1969). The estimated age of 50 percent maturity is 9 years (approximately 350 mm) for southern rock sole females and 7 years for northern rock sole females (Stark and Somerton 2002). Natural mortality rate is believed to range from 0.18 to 0.20.

D.7.2 Relevant Trophic Information

Groundfish predators include Pacific cod, walleye pollock, skates, Pacific halibut, and yellowfin sole, mostly on fish ranging from 50 to 150 mm standard length.

D.7.3 Habitat and Biological Associations

Larvae: Planktonic larvae for at least 2 to 3 months until metamorphosis occurs.

Settled Early Juveniles: Juveniles inhabit shallow areas at least until age 1. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and bottom temperature (Laman et al. 2022). Settled early juvenile NRS abundance was predicted to be highest over the central and southern portions of the EBS inner shelf domain in shallow depths and warmer bottom temperatures. In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth along with bottom current, terrain aspect, tidal maximum, and geographic position (Harris et al. 2022). In general, predicted abundance was high in shallow locations with southerly currents, northwest-facing terrain, and weak tides.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and bottom temperature (Laman et al. 2022). Ensemble-predicted subadult NRS abundance was highest in Bristol Bay and along the Alaska Peninsula in shallower water and bottom temperatures around 3°C. In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth (Harris et al. 2022). Predicted abundance was highest in shallow locations, consistent south westerly currents, and locations farther west in the AI like Attu Island and the Rat Islands.

Adults: Summertime feeding on primarily sandy substrates of the eastern Bering Sea shelf. Widespread distribution mainly on the middle and inner portion of the shelf, feeding on bivalves, polychaete, amphipods, and miscellaneous crustaceans. Wintertime migration to deeper waters of the shelf margin for spawning and to avoid extreme cold water temperatures, feeding diminishes. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and sediment grain size (Laman et al. 2022). The highest adult NRS abundances were predicted in shallower, warmer waters along the inner shelf around Bristol Bay and in the vicinities of the Pribilofs and St. Matthew Island. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, current, and current variability (Harris et al. 2022). Adult northern rock sole were predicted to be abundant in shallow waters in the western AI and favor locations with low variability westerly bottom currents.

Habitat and Biological Associations: Rock sole

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs		NA	winter	OCS	D			
Larvae	2–3 months?	U phyto/zoo plankton?	winter/spring	OCS, MCS, ICS	P			
Settled Early Juveniles	to 3.5 yrs	polychaete bivalves amphipods misc. crustaceans	all year	BAY, ICS	D	S G		
Subadult s	to 9 years	polychaete bivalves amphipods misc. crustaceans	all year	BAY, ICS, MCS, OCS	D	S, SM,MS G		
Adults	9+ years	polychaete bivalves amphipods misc. crustaceans	feeding May–September	MCS, ICS	D	S,SM,M S,M G		
			spawning Dec.–April	OCS			ice edge	

D.7.4 Literature

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D.8 Northern rockfish (*Sebastes polyspinus*)

D.8.1 Life History and General Distribution

Northern rockfish range from northern British Columbia through the Gulf of Alaska and Aleutian Islands to eastern Kamchatka, including the Bering Sea. The species is most abundant from about Portlock Bank in the central Gulf of Alaska to the western end of the Aleutian Islands. Within this range, adult fish appear to be concentrated at discrete, relatively shallow offshore banks of the outer continental shelf. The preferred depth range is approximately 75 to 125 m in the Gulf of Alaska, and approximately 100 to 150 m in the Aleutian Islands. The fish appear to be semipelagic, and along the EBS slope they have been observed to move into the water column during the day and onto the bottom at night. In common with many other rockfish species, northern rockfish tend to have a localized, patchy distribution, even within their preferred habitat, and most of the population occurs in aggregations. Summer bottom trawl surveys conducted by the Alaska Fisheries Science Center indicate that high density BSAI catches occurred primarily in the western Aleutian Islands, with large differences in density between high and low density catches. Species distribution models indicate that abundance of adult northern rockfish inthe AI was high, especially near seamounts in Buldir Strait and Stalemate Bank. Northern rockfish are not commonly encountered in the eastern Bering Sea during sumnmer surveys, although species distribution models indicate that predicted adult abundance in the EBS is highest on the shelf break between Bering Canyon and Pribilof Canyon. Most of what is known about northern rockfish is based on data collected during the summer months from the commercial fishery or in research surveys. Consequently, there is little information on seasonal movements or changes in distribution for this species.

Life history information on northern rockfish is extremely sparse. The fish are assumed to be viviparous, as are other *Sebastes*, with internal fertilization and incubation of eggs. Northern rockfish can show skipped spawning in some years, although this is less common in larger individuals. The length of 50% maturity for AI northern rockfish is estimated at 277 mm (Tenbrink and spencer 2013). Observations during research surveys in the Gulf of Alaska suggest that parturition (larval release) occurs in the spring, and is mostly completed by summer. Pre-extrusion larvae have been described, but field-collected larvae cannot be identified to species at present. Length of the larval stage is unknown, but the fish apparently metamorphose to a pelagic juvenile stage, which also has been described. There is no information on when the juveniles become benthic or what habitat they occupy. Older juveniles are found on the continental shelf, generally at locations inshore of the adult habitat.

Northern rockfish have a low population growth rate, with a low rate of natural mortality (estimated at 0.5), a relatively old age at 50 percent maturity (8.2 years for females in the Aleutian Islands), and an old maximum age of 74 years in the Aleutian Islands. No information on fecundity is available for AI northern rockfish, although estimates in the Gulf of Alaska ranged from 110 - 165 oocytes/g, depending on season of sampling.

D.8.2 Relevant Trophic Information

Although no comprehensive food study of northern rockfish has been done, several smaller studies have all shown euphausiids to be the predominant food item of adults in both the Gulf of Alaska and Bering Sea. Copepods, hermit crabs, and shrimp have also been noted as prey items in much smaller quantities.

Predators of northern rockfish have not been documented, but likely include species that are known to consume rockfish in Alaska, such as Pacific halibut, sablefish, Pacific cod, and arrowtooth founder.

D.8.3 Habitat and Biological Associations

Eggs: No information known, except that parturition probably occurs in the spring.

Larvae: No information known.

Pelagic/Settled Early Juveniles: No information known for small juveniles (less than 200 mm), except that juveniles apparently undergo a pelagic phase immediately after metamorphosis from the larval stage. Larger juveniles have been taken in bottom trawls at various localities of the continental shelf, usually inshore of the adult fishing grounds.

Subadults: The covariates contributing the most to the final SDM EFH map for this life stage in the AI were geographic position, bottom depth, and current (Harris et al. 2022). Predicted, abundance increased farther west in the AI and in shallow depths and southerly currents.

Adults: Commercial fishery and research survey data have indicated that adult northern rockfish are primarily found over hard, rocky, or uneven bottom of offshore banks of the outer continental shelf at depths of 75 to 200 m. Generally, the fish appear to be semipelagic, extending into the water column, and most of the population occurs in large aggregations. There is no information on seasonal migrations. Northern rockfish often co-occur with dusky rockfish. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and bottom current vector (Laman et al. 2022). Adult northern rockfish were predicted to be present in higher abundance along the shelf break from the Bering Canyon to north of Pribilof Canyon in waters shallower than 300 m with variable northerly bottom currents and decreasing tidal maxima. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Harris et al. 2022). According to the model, abundance is expected to increase from east to west, in depths between 100 and 200 m, and with strong but variable southerly currents.

Habitat and Biological Associations: Northern Rockfish

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	U	NA	U	NA	NA	NA	NA	NA
Larvae	U	U	spring–summer?	U	P (assumed)	NA	U	U
Pelagic/ Settled Early Juveniles	from end of larval stage to ?	U	all year	MCS, OCS	P? (early juvenile only), D	U (juvenile< 200 mm); substrate (juvenile> 200 mm)	U	U
Subadults	to 8 yrs	U	all year	OCS	D	CB, R	U	U
Adults	8 – 57 years of age	euphausiids	U, except that larval release is probably in the spring in the Gulf of Alaska	OCS, USP	SD/SP	CB, R	U	U

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D.9 Octopuses

There are at least seven species of octopuses currently identified from the Bering Sea (Jorgensen 2009). The species most abundant at depths less than 200m is the giant Pacific octopus *Enteroctopus dofleini* (formerly *Octopus dofleini*). Several species are found primarily in deeper waters along the shelf break and slope, including, *Sasakiopus salebrosus, Benthoctopus leioderma, Benthoctopus oregonensis*, *Graneledone* *boreopacifica,* and the cirrate octopus *Opisthoteuthis* cf *californiana. Japetella diaphana* is also reported from pelagic waters of the Bering Sea. Preliminary evidence (Conners and Jorgensen 2008) indicates that octopuses taken as incidental catch in groundfish fisheries are primarily *Enteroctopus dofleini*. This species has been extensively studied in British Columbia and Japan, and is used as the primary indicator for the assemblage. Species identification of octopuses in the Bering Sea and Gulf of Alaska (GOA) has changed since the previous EFH review and is still developing. The state of knowledge of octopuses in the Bering Sea and Aleutian Islands (BSAI), including the true species composition, is very limited.

D.9.1 Life History and General Distribution

Octopuses are members of the molluscan class Cephalopoda, along with squid, cuttlefish, and nautiloids. The octopuses (order Octopoda) have only eight appendages or arms and unlike other cephalopods, they lack shells, pens, and tentacles. There are two groups of Octopoda, the cirrate and the incirrate. The cirrate have cirri and are by far less common than the incirrate, which contain the more traditional forms of octopus. Octopuses are found in every ocean in the world and range in size from less than 200 mm (total length) to over 3 m (total length); the latter is a record held by *Enteroctopus dofleini*.

In the Bering Sea octopuses are found from subtidal waters to deep areas near the outer slope (Conners et al. 2014). The highest diversity is along the shelf break region where three to four species of octopus can be collected in approximately the same area. The highest diversity is found between 200 m and 750 m. The observed take of octopus from both commercial fisheries and Alaska Fisheries Science Center Resource Assessment and Conservation Engineering Division surveys indicates few octopus occupy federal waters of Bristol Bay and the inner front region. Some octopuses have been observed in the middle front, especially in the region south of the Pribilof Islands. The majority of observed commercial and survey hauls containing octopus are concentrated in the outer front region and along the shelf break, from the horseshoe at Unimak Pass to the northern limit of the federal regulatory area. Octopuses have been observed throughout the western GOA and Aleutian Islands chain. Of the octopus species found in shallower waters, the distribution between state waters (within three miles of shore) and federal waters remains unknown. *Enteroctopus dofleini* in Japan undergo seasonal depth migrations associated with spawning; it is unknown whether similar migrations occur in Alaskan waters.

In general, octopus life spans are either 1 to 2 years or 3 to 5 years depending on species. Life histories of six of the seven species in the Bering Sea are largely unknown. *Enteroctopus dofleini* has been studied in waters of northern Japan and western Canada, but reproductive seasons and age/size at maturity in Alaskan waters are still undocumented. General life histories of the other six species are inferred from what is known about other members of the genus.

E. dofleini samples collected during research in the Bering Sea indicate that *E. dofleini* are reproductively active in the fall with peak spawning occurring in the winter to early spring months. Like most species of octopods, *E. dofleini* are terminal spawners, dying after mating (males) and the hatching of eggs (females) (Jorgensen 2009). *E. dofleini* within the Bering Sea have been found to mature between 10 to 13 kg with 50% maturity values of 12.8 kg for females and 10.8 kg for males (Brewer and Norcross 2013). *E. dofleini* are problematic to age due to a documented lack of beak growth checks and soft chalky statoliths (Robinson and Hartwick 1986). Therefore the determination of age at maturity is difficult for this species. In Japan this species is estimated to mature at 1.5 to 3 years and at similar size ranges (Kanamaru and Yamashita 1967, Mottet1975). Within the Bering Sea, female *E. dofleini* show significantly larger gonad weight and maturity in the fall months (Brewer and Norcross 2013). Due to differences in the timing of peak gonad development between males and females it is likely that females have the capability to store sperm. Fecundity for this species in the Gulf of Alaska ranges from 40,000 to 240,000 eggs per female with an average fecundity of 106,800 eggs per female (Conrath and Conners 2014). Hatchlings are approximately 3.5 mm. Mottet (1975) estimated survival to 6 mm at 4% while survival to 10 mm was estimated to be 1%; mortality at the 1 to 2 year stage is also estimated to be high (Hartwick, 1983). Since the highest mortality occurs during the larval stage it is likely that ocean conditions have the largest effect on the number of *E. dofleini* in the Bering Sea and large fluctuations in numbers of *E. dofleini* should be expected. Based on larval data, *E. dofleini* is the only octopus in the Bering Sea with a planktonic larval stage.

Sasakiopus salebrosus is a small benthic octopus recently identified from the Bering Sea slope in depths ranging from 200 to1200 m (Jorgensen 2010). It was previously identified in surveys as *Benthoctopus sp*. or as *Octopus sp. n.* In recent groundfish surveys of the Bering Sea slope this was the most abundant octopus collected; multiple specimens were collected in over 50% of the tows. *Sasakiopus salebrosus* is a small-sized species with a maximum total length < 250 mm. Mature females collected in the Bering Sea carried 100 to 120 eggs (Laptikhovsky 1999). Hatchlings and paralarvae have not been collected or described (Jorgensen 2009).

Benthoctopus leioderma is a medium sized species, with a maximum total length of approximately 600 mm. Its life span is unknown. It occurs from 250 to 1400 m and is found throughout the shelf break region. It is a common octopus and often occurs in the same areas where *E. dofleini* are found. The eggs are brooded by the female but mating and spawning times are unknown. Members of this genus in the North Pacific Ocean have been found to attach their eggs to hard substrate under rock ledges and crevices (Voight and Grehan 2000). *Benthoctopus* tend to have small numbers of eggs (< 200) that develop into benthic hatchlings.

Benthoctopus oregonensis is larger than *B. leioderma*, with a maximum total length of approximately 1 m. This is the second largest octopus in the Bering Sea and based on size could be confused with *E. dofleini*. We know very little about this species of octopus. Other members of this genus brood their eggs and we would assume the same for this species. The hatchlings are demersal and likely much larger than those of *E. dofleini*. The samples of *B. oregonensis* all come from deeper than 500 m. This species is the least collected incirrate octopus in the Bering Sea and may occur in depths largely outside of the sampling range of AFSC surveys.

Graneledone boreopacifica is a deep water octopus with only a single row of suckers on each arm (the other benthic incirrate octopuses have two rows of suckers). It is most commonly collected north of the Pribilof Islands but occasionally is found in the southern portion of the shelf break region. This species has been shown to occur at hydrothermal vent habitats and prey on vent fauna (Voight 2000). Samples of *G. boreopacifica* all come from deeper than 650 m and this deep water species has not been found on the continental shelf. *Graneledone* species have also been shown to individually attach eggs to hard substrate and brood their eggs throughout development. Recently collected hatchlings of this species were found to be very large (55 mm long) and advanced (Voight 2004) and this species has been shown to employ multiple paternity (Voight and Feldheim 2009).

Opisthoteuthis californiana is a cirrate octopus with fins and cirri (on the arms). It is common in the Bering Sea but would not be confused with *E. dofleini*. It is found from 300 to 1100 m and likely common over the abyssal plain. *Opisthoteuthis californiana* in the northwestern Bering Sea have been found to have a protracted spawning period with multiple small batch spawning events. Potential fecundity of this species was found to range from 1,200 to 2,400 oocytes (Laptikhovsky 1999). There is evidence that *Opisthoteuthis* species in the Atlantic undergo 'continuous spawning' with a single, extended period of egg maturation and a protracted period of spawning (Villanueva 1992). Other details of its life history remain unknown.

Japetella diaphana is a small pelagic octopus. Little is known about members of this family. In Hawaiian waters gravid females are found near 1,000 m and brooding females near 800 m. Hatchlings have been observed to be about 3 mm mantle length (Young 2008). This is not a common octopus in the Bering Sea and would not be confused with *E. dofleini*.

D.9.2 Relevant Trophic Information

Octopus are eaten by pinnipeds (principally Steller sea lions, and spotted, bearded, and harbor seals) and a variety of fishes, including Pacific halibut and Pacific cod (Yang 1993). When small, octopods eat planktonic and small benthic crustaceans (mysids, amphipods, copepods). As adults, octopus eat benthic crustaceans (crabs) and molluscs (clams). Large octopuses are also able to catch and eat benthic fishes; the Seattle

Aquarium has documented a giant Pacific octopus preying on a 4-foot dogfish. . The pelagic larvae of *E. dofleini* are presumed to prey on planktonic zooplankton.

D.9.3 Habitat and Biological Associations

Eggs: shelf, *E. dofleini* lays strings of eggs in cave or den in boulders or rubble, which are guarded by the female until hatching. The exact habitat needs and preferences for denning are unknown.

Larvae: pelagic for *Enteroctopus dofleini*, demersal for other octopus species.

Pelagic/Settled Early Juveniles: semi-demersal; widely dispersed on shelf, upper slope

Subadults and Adults: demersal, widely dispersed on shelf and upper slope, preferentially among rocks, cobble, but also on sand/mud. In the EBS, the covariates contributing the most to the final SDM EFH map for all life stages combined were geographic position, bottom depth, ROMS bottom current, and bottom temperature (Laman et al. 2022). The predicted abundance of giant octopus was highest along the EBS shelf break and upper continental slope in depths around 300 m with northerly bottom currents and increasing bottom temperatures. In the AI, the covariate contributing the most to the final SDM EFH map for all life stages combined was presence of sponges, though a variety of other covariates contributed such as bottom depth, geographic position, bottom temperature, currents, and tidal maximum (Harris et al. 2022). Predicted abundance was high in areas with moderate depth and in patches near Atka, Adak, and the Rat islands.

Habitat and Biological Associations: *Octopus dofleini*, *O. gilbertianus*

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	U (1–2 months?)	NA	spring–summer ?	U, ICS, MCS	P*,D	R, G?	U	euhaline waters
Pelagic/Settled Early juveniles	U	zooplankton	summer –fall?	U, ICS, MCS, OCS, USP	D, SD	U	U	euhaline waters
Subadults and Adults	3–5 yrs for *E.dofleini,* 1–2 yrs for other species	crustaceans, mollusks, fish	all year	ICS, MCS, OCS, USP	D	R, G, S, MS?	U	euhaline waters

D.9.4 Literature

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D.10 Other Flatfish complex

The Other flatfish complex includes:

Butter sole,
Deepsea sole,
Dover sole,
English sole,
Longhead dab,
Rex sole,
Sakhalin sole,
Southern rock sole, and
Starry flounder.

Species Complex Summary

The other flatfish stock complex in the BSAI (Conners et al. 2016, Wilderbuer and Nichol 2015) represents eight flatfish species (butter sole, deepsea sole, Dover sole, longhead dab, rex sole, Sakhalin sole, and starry flounder). Species in this complex are commonly found over the inner shelf on the eastern margin of the EBS and along the Alaska Peninsula, as well as in association with the shelf break and outer shelf domain. In the Bering Sea region, starry flounder is the most abundant species, but it is largely absent from the AI. In contrast, rex sole is the most common species in this complex in the AI, and it constitutes a majority of the “other flatfish” catch. Rex sole and southern rock sole are typically caught in the eastern AI and can appear in very high densitities, whereas Dover sole is primarily caught in deeper water and further west, and rarely more than a few fish at at time. Because of these traits, EFH maps for the complex tend to favor the more numerous species.

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D.10.1 Butter sole (*Isopsetta isolepis*)

D.10.1.1 Life History and General Distribution

Butter sole (*Isopsetta isolepis*) range from the southeastern Bering Sea and Aleutian Islands at Amchitka Island to southern California over soft bottom habitats in relatively shallow (< 150 m) water (Mecklenburg et al. 2002). In EBS RACE-GAP summer bottom trawl surveys, butter sole are not uncommon in catches from southeastern Bristol Bay and have been collected as far north as the waters around St. Matthew Island. There is no directed fishery for butter sole in the EBS and they are managed in the “other flatfishes” stock complex

(Wilderbuer and Nichol 2015). Length-based definitions of ontogenetic stages of butter sole were not available so all life stages collected are modeled in composite for EFH of this species.

D.10.1.2 Relevant Trophic Information

There is insufficient information on butter sole predator or prey relationships.

D.10.1.3 Habitat and Biological Associations

Subadults/Adults: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom currents, bottom temperature, and sediment size (Laman et al. 2022). The predicted abundance of butter sole was highest along the Alaska Peninsula at depths of 200 m and in areas with warm temperatures or fine sediments.

D.10.1.4 Literature

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D.10.2 Deepsea sole (*Embassichthys bathybius*)

D.10.2.1 Life History and General Distribution

Deepsea sole (*Embassichthys bathybius*) is a deep-dwelling (320–1433 m) flatfish species ranging from Japan to southern California and the Bering Sea and reaches a maximum length of 470 mm F.L (Mecklenberg et al. 2002). In RACE-GAP EBS summer bottom trawl surveys, they occur only on the upper continental slope in depths greater than 500 m. Little is known of their biology and life history (Orlov and Tokranov 2007) and they are uncommon in RACE-GAP bottom trawl catches. There is no directed fishery for deepsea sole in the EBS and they are managed in composite in the “other flatfishes” stock complex in the BSAI (Wilderbuer and Nichol 2015).

D.10.2.2 Relevant Trophic Information

There is insufficient information on deepsea sole predator or prey relationships.

D.10.2.3 Habitat and Biological Associations

Adults: The covariates contributing the most to the final SDM EFH map for this life stage in the EBS were bottom depth and currents (i.e., ROMS bottom current and variability) (Laman et al. 2022). The predicted abundance of deepsea sole was highest at around 600 m depth on the continental slope with moderately variable northerly bottom currents.

D.10.2.4 Literature

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D.10.3 Dover sole (*Microstomus pacificus*)

D.10.3.1 Life History and General Distribution

Dover sole are distributed in deep waters of the continental shelf and upper slope from northern Baja California to the Bering Sea and the western Aleutian Islands (Hart 1973, Miller and Lea 1972), and exhibit a widespread distribution throughout the Gulf of Alaska. Adults are demersal and are mostly found in water deeper than 300 meters. The spawning period off Oregon is reported to range from January through May (Hunter et al. 1992). Spawning in the Gulf of Alaska has been observed from January through August, with a peak period in May (Hirschberger and Smith 1983). Eggs have been collected in neuston and bongo nets in the summer, east of Kodiak Island (Kendall and Dunn 1985), but the duration of the incubation period is unknown. Larvae were captured in bongo nets only in summer over mid-shelf and slope areas (Kendall and Dunn 1985). The age or size at metamorphosis is unknown but the pelagic larval period is known to be protracted and may last as long as two years (Markle et al. 1992). Pelagic postlarvae as large as 48 mm have been reported and the young may still be pelagic at 100 mm (Hart 1973). Dover sole are batch spawners and Hunter et al. (1992) concluded that the average 1 kg female spawns its 83,000 advanced yolked oocytes in about nine batches. Maturity studies from Oregon indicate that females were 50 percent mature at 330 mm total length. Juveniles less than 250 mm are rarely found with the adult population from bottom trawl surveys (Martin and Clausen 1995). The natural mortality rate used in recent stock assessments is 0.2 (Turnock et al. 1996).

D.10.3.2 Relevant Trophic Information

Groundfish predators include Pacific cod and most likely arrowtooth flounder.

D.10.3.3 Habitat and Biological Associations

Larvae: Planktonic larvae for up to 2 years until metamorphosis occurs

Early Juveniles: Early juvenile distribution is unknown.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and sediment size (Laman et al. 2022). Subadult Dover sole abundance was predicted over the middle and outer shelf domains of the southern EBS, extending into the Bering Canyon and on to the continental slope at depths around 400 m with coarser bottom sediments and low bottom currents. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and current vector (Harris et al. 2022). Predicted abundance was highest around Petrel Bank.

Adults: Winter and spring spawning and summer feeding on soft substrates (combination of sand and mud) of the continental shelf and upper slope. Shallower summer distribution mainly on the middle to outer portion of the shelf and upper slope, feeding mainly on polychaete, annelids, crustaceans, and molluscs (Livingston and Goiney 1983). In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and bottom currents (Laman et al. 2022). In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and current (Harris et al. 2022). The ensemble predicted higher abundance around Petrel Bank, and higher abundance with increasing depth and in places with variable, southerly bottom currents.

Habitat and Biological Associations: Dover sole

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano - graphic Features	Other
Eggs		NA	spring summer	ICS? MCS, OCS, UCS	P			
Larvae	up to 2 years	U phyto/ zooplankton?	all year	ICS? MCS, OCS, UCS	P			
Early Juveniles	to 3 years	polychaetes amphipods annelids	all year	MCS? ICS?	D	S, M		
Subadults	3–5 years	polychaetes amphipods annelids	all year	MCS? ICS?	D	S, M		
Adults	5+ years	polychaetes amphipods annelids molluscs	spawning Jan–August non-spawning July–Jan	MCS, OCS, UCS	D	S, M		

D.10.3.4 Literature

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D.10.4 English sole (*Parophrys vetulus*)

D.10.4.1 Life History and General Distribution

English sole (*Parophrys vetulus*) is a moderately-sized flatfish that reaches an adult size of up to 630 mm FL in RACE-GAP bottom trawl surveys. It is found from the central AI to Baja California and in the Bering Sea (Hart 1973). Little is known about English sole life history in Alaska, but along the coasts of Oregon and Washington, the spawning season lasts from September to April (Krygier and Pearcy 1986), and juveniles spend their first year in nursery areas near estuaries before eventually spreading out along the coast (Gunderson et al. 1990). No settled early juveniles (< 140 mm FL; Yeung and Cooper 2020) and very few subadults (< 230 mm FL; L_{50}; Sampson and Al-Jufaily 1998) were captured in the AI bottom trawl survey, and only adults had sufficient data to construct a species distribution model. In the BSAI region, English sole are managed as part of the Other Flatfish stock complex and do not receive a species-specific fishing target (Monnahan 2020).

D.10.4.2 Relevant Trophic Information

There is insufficient information on English sole predator or prey relationships.

D.10.4.3 Habitat and Biological Associations

Adults: The small number of English sole catches in the AI are almost all near shore around Unalaska Island, making presence easy to predict. It is hard to say if this distribution pattern should be expected to be consistent over time with so few occurrences, however. The covariates contributing the most to the final SDM EFH map for this life stage were weak currents, weak tides, shallow water, and warm temperatures (Harris et al. 2022). Predicted abundance is highest near shore around Unalaska and Umnak Islands, and low below 100 m depth. Predicted encounter probabilities for adult English sole were high in a few places near Unalaska Island and zero over most of the AI region.

D.10.4.4 Literature

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D.10.5 Longhead dab (*Limanda proboscidea*)

D.10.5.1 Life History and General Distribution

Longhead dab (*Limanda proboscidea*) range from the Beaufort Sea off Point Barrow to the Sea of Okhotsk and into Bristol Bay north of Unimak Pass over soft bottom habitats in waters shallower than 100 m (Mecklenburg et al. 2002). They reach a reported maximum length of 410 mm and their life history is not well described. Length at maturity has not been reported for longhead dabs so for this species collected from

RACE-GAP summer bottom trawl surveys they are modeled as a single, combined life stage. Longhead dabs are managed in aggregate as part of the BSAI "other flatfish" stock complex (Conners et al. 2017).

D.10.5.2 Relevant Trophic Information

There is insufficient information on longhead dab predator or prey relationships.

D.10.5.3 Habitat and Biological Associations

Adults: The covariate contributing the most to the final SDM EFH map for this life stage in the EBS was geographic position alone (Laman et al. 2022). Abundance of longhead dab was predicted to be highest on the inner shelf from Nunivak Island south into Bristol Bay at depths shallower than 300 m in bottom water temperatures around 3°C.

D.10.5.4 Literature

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D.10.6 Rex Sole (*Glyptocephalus zachirus*)

D.10.6.1 Life History and General Distribution

Rex sole (*Glyptocephalus zachirus*) are distributed from Baja California to the Bering Sea and western Aleutian Islands (Hart 1973, Miller and Lea 1972), and are widely distributed throughout the Gulf of Alaska. Adults exhibit a benthic lifestyle and are generally found in water deeper than 300 meters. From over-winter grounds near the shelf margins, adults begin a migration onto the mid- and outer continental shelf in April or May each year. The spawning period off Oregon is reported to range from January through June with a peak in March and April (Hosie and Horton 1977). Spawning in the Gulf of Alaska was observed from February through July, with a peak period in April and May (Hirschberger and Smith 1983). Eggs have been collected in neuston and bongo nets mainly in the summer, east of Kodiak Island (Kendall and Dunn 1985), but the duration of the incubation period is unknown. Larvae were captured in bongo nets only in summer over midshelf and slope areas (Kendall and Dunn 1985). Fecundity estimates from samples collected off the Oregon coast ranged from 3,900 to 238,100 ova for fish 240 to 590 mm (Hosie and Horton 1977). The age or size at metamorphosis is unknown. Maturity studies from Oregon indicate that males were 50 percent mature at 160 mm and females at 240 mm. Abookire (2006) estimated the female length at 50 percent maturity from Gulf of Alaska samples at 350 mm and 5.6 years. Juveniles less than 150 mm are rarely found with the adult population. The natural mortality rate used in recent stock assessments is 0.17 (Wilderbuer et al. 2010).

The approximate upper size limit of juvenile fish is 150 mm for males and 230 mm for females.

D.10.6.2 Relevant Trophic Information

Groundfish predators include Pacific cod and most likely arrowtooth flounder. Adult rex sole feed mainly on polychaete, amphipods, euphausids and snow crabs.

D.10.6.3 Habitat and Biological Associations

Larvae: Planktonic larvae for an unknown time period (at least 8 months from October through May) until metamorphosis occurs.

Settled Early Juveniles: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, tidal maximum, and pennatulacean (Laman et al. 2022). Settled early juvenile rex sole were predicted over the outer EBS shelf domain near the shelf break in shallower depths.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, ROMS bottom current, and bottom temperature (Laman et al. 2022), where ensemble-predicted subadult rex sole abundance was highest along the EBS shelf break in depths around 300 m with northeasterly bottom currents and bottom temperatures around 4°C. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Harris et al. 2022). Abundance was predicted to be higher at more eastern longitudes, at depths between 150 and 300 m, in weak currents, and at a low tidal maximum.

Adults: Spring spawning and summer feeding on a combination of sand, mud and gravel substrates of the continental shelf. Widespread distribution mainly on the middle and outer portion of the shelf. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were Geographic position, bottom depth, and ROMS bottom currents (Laman et al. 2022). Predicted adult rex sole abundance was highest over the outer EBS shelf domain at the head of the Bering Canyon and northward focused on the shelf break in depths around 350 m with northerly bottom currents. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth, though current, tidal maximum, and slope aspect were also important (Harris et al. 2023). Like subadults, adult rex sole are predicted to be abundant in the eastern AI and are associated with areas with weak bottom currents and deeper habitats, with high abundances south of Unalaska Island.

Habitat and Biological Associations: Rex sole

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs		NA	Feb–May	ICS? MCS, OCS	P			
Larvae	U	U phyto/zoo plankton?	spring summer	ICS? MCS, OCS	P			
Settled Early Juveniles /Subadults	2 years	polychaete amphipods euphausiids Tanner crab	all year	MCS, ICS, OCS	D	G, S, M		
Adults	2+ years	polychaete amphipods euphausiids Tanner crab	spawning Feb–May non-spawning May–January	MCS, OCS USP MCS, OCS, USP	D	G, S, M		

D.10.6.4 Literature

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D.10.7 Sakhalin sole (*Limanda sakhalinensis*)

D.10.7.1 Life History and General Distribution

Sakhalin sole (*Limanda sakhalinensis*) range from the Chukchi Sea to the southeastern Bering Sea and to Russia over soft bottom habitats in relatively shallow (<100 m) water (Mecklenburg et al. 2002) and their biology is not well known (Yusupov et al. 2020). In EBS RACE-GAP summer bottom trawl surveys, Sakhalin sole are primarily collected in the northern half of the survey area north of the Pribilof Islands in less than 200 m water. For this species we separated the subadult and adult life stages by the L_{50} for females (196 mm) reported by Yusupov et al. (2020) in the northern Sea of Okhotsk. Sakhalin sole are managed in aggregate with the “other flatfish” stock complex in the BSAI (Conners et al. 2017) and are typically caught as bycatch in directed flatfish and Pacific cod fisheries.

D.10.7.2 Relevant Trophic Information

There is insufficient information on Sakhalin sole predator or prey relationships.

D.10.7.3 Habitat and Biological Associations

Subadults: Subadult Sakhalin sole are distributed from the central middle EBS shelf domain into the NBS and were most abundant in EBS RACE-GAP summer bottom trawl survey catches (1982–2019) to the southwest of St. Lawrence Island. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and tidal maximum (Laman et al. 2022). Abundance for this species life stage is predicted to be highest in the NBS south and west of St. Lawrence Island with decreasing bottom temperatures and tidal maxima. Encounter probabilities for subadult Sakhalin sole are highest around St. Lawrence Island in the NBS but are near zero in the remainder of the EBS study area.

Adults: Adult Sakhalin sole are primarily distributed in the NBS and are most abundant in EBS RACE-GAP summer bottom trawl survey catches (1982–2019) to the southwest of St. Lawrence Island. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, tidal maximum, current, and bottom depth (Laman et al. 2022). Abundance for this species life stage is predicted to be highest in the NBS southwest of St. Lawrence Island over a range of tidal maxima at depths around 150 m with bottom temperatures approaching 0°C. Encounter probabilities for adult Sakhalin sole are highest around St. Lawrence Island in the NBS but are near zero in the remainder of the EBS study area.

D.10.7.4 Literature

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D.10.8 Southern rock sole (*Lepidopsetta bilineata*)

D.10.8.1 Life History and General Distribution

Southern rock sole (*Lepidopsetta bilineata*) is found in coastal waters from the eastern Aleutian Islands to Baja California (Orr and Matarese 2000). The species is morphologically similar to northern rock sole (*L. polyxstra*) and the two were not routinely distinguished in groundfish surveys until 1996. There is broad overlap between the two species in the Gulf of Alaska and the eastern Aleutian Islands. Adults may grow to as much as 580 mm total length (Orr and Matarese 2000), and females become mature at approximately 300 mm T.L. Compared to northern rock sole, there has been comparatively little research specific to southern rock sole, and the species are often confounded in older literature. In the BSAI region, almost all catch of southern rock sole is from the eastern Aleutian Islands, and it is managed as a minor part of the much more numerous and commercially valuable northern rock sole stock (Wilderbuer & Nichol 2018).

D.10.8.2 Relevant Trophic Information

There is insufficient information on southern rock sole predator or prey relationships.

D.10.8.3 Habitat and Biological Associations

Subadults: The covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Harris et al. 2022). In general, high abundance of subadults is predicted by shallow water, being further east, a rocky substrate, and relatively weak currents southwesterly currents. Predicted abundance is highest in the eastern Aleutian Islands, particularly around Unalaska Island.

Adults: The covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Harris et al. 2022). Southern rock sole adults are predicted to be abundant in shallow water and in eastern areas. Similar to subadults, predicted abundance is highest in the eastern Aleutians Islands, particularly around Unalaska Island.

D.10.8.4 Literature

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D.10.9 Starry flounder (*Platichthys stellatus*)

D.10.9.1 Life History and General Distribution

Starry flounder (*Platichthys stellatus*) range from the Beaufort Sea to Southern California, typically over soft bottom habitats in relatively shallow (<100 m) water (Mecklenburg et al. 2002). In catches from EBS RACE-GAP summer bottom trawl surveys, starry flounder are typically caught over the inner domain of the EBS shelf from Bristol Bay to Norton Sound. This euryhaline species is capable of tolerating a wide range of salinities and has been collected from marine to essentially freshwater environments (Orcutt 1950, Ralston 2005). Orcutt (1950) reported a settled early juvenile length range of 20–150 mm along with a reproductive maturity for female starry flounder in California at 3 years and 350 mm T.L. We used this length to separate subadult and adult starry flounder in our analyses. There were insufficient settled early juvenile starry flounder in EBS bottom trawl catches to parameterize an SDM for this life stage. This species is managed in aggregate with the "other flatfish" stock complex in the BSAI (Conners et al. 2017).

D.10.9.2 Relevant Trophic Information

There is insufficient information on southern starry flounder predator or prey relationships.

D.10.9.3 Habitat and Biological Associations

Subadults: Subadult starry flounder are distributed close to shore throughout the EBS inner shelf domain. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, ROMS bottom current, sediment grain size, and curature (Laman et al. 2023). Abundance of subadult starry flounder is predicted to be highest in Norton Sound with warming bottom temperatures, northerly currents, finer sediment grain sizes, and little terrain curvature.

Adults: Adult starry flounder are primarily distributed along shore in the EBS over the inner shelf. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, bottom depth, and sediment grain size (Laman et al. 2023). Adult starry flounder abundance is predicted to be highest in Norton Sound with increasing bottom temperatures and decreasing bottom depths over finer sediment grain sizes.

D.10.9.4 Literature

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D.11 Other Rockfish complex

The Other Rockfish Complex includes:

Dusky rockfish,
Harlequin rockfish, and
Shortspine thornyhead.

Species Complex Summary

The "other rockfish stock complex" in the Bering Sea (Sullivan et al. 2020) is comprised of shortspine and longspine thornyheads (*Sebastolobus alascanus* and *S. altivelis*) and essentially all other rockfish species (Genus *Sebastes*) occuring in the region that are not Pacific ocean perch (*S. alutus*), northern rockfish (*S. polyspinis*), rougheye rockfish (*S. aleutianus*), the rougheye/blackspotted rockfish complex (Conners et al. 2016), or shortraker rockfish (*S. borealis*). The other rockfishes in this stock complex are uncommon in the EBS but represent a broad geographic distribution (north of Zhemchug Canyon to the eastern and western Aleutian Islands) and range of depths (1–1,500 m; Love et al. 2002, Mecklenburg et al. 2002).

Literature

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D.11.1 Dusky rockfish (*Sebastes variabilis*)

D.1.1.1 Life History and General Distribution

In 2004, Orr and Blackburn described two distinct species that were being labeled as a single species (*Sebastes ciliatus*) with two color varieties: dark and light dusky rockfish. What was labeled as the light dusky rockfish is now considered to be a distinct species *Sebastes variabilis* and is commonly referred to as dusky rockfish. Dusky rockfish range from central Oregon through the North Pacific Ocean and Bering Sea in Alaska and Russia to Japan. The center of abundance for dusky rockfish appears to be the Gulf of Alaska (Reuter 1999). The species is much less abundant in the Aleutian Islands and Bering Sea (Reuter and Spencer 2002). Adult dusky rockfish have a very patchy distribution, and are usually found in large aggregations at specific localities of the outer continental shelf. These localities are often relatively shallow offshore banks. Because the fish are taken with bottom trawls, they are presumed to be mostly demersal. Whether they also have a pelagic distribution is unknown, but there is no evidence of a pelagic tendency based on the information available at present. Most of what is known about dusky rockfish is based on data collected during the summer months from the commercial fishery or in research surveys. Consequently, there is little information on seasonal movements or changes in distribution for this species.

Life history information on dusky rockfish is extremely sparse. The fish are assumed to be viviparous, as are other *Sebastes*, with internal fertilization and incubation of eggs. Observations during research surveys in the Gulf of Alaska suggest that parturition (larval release) occurs in the spring, and is probably completed by summer. Another, older source, however, lists parturition as occurring "after May." Pre-extrusion larvae have been described, but field-collected larvae cannot be identified to species at present. Length of the larval stage, and whether a pelagic juvenile stage occurs, are unknown. There is no information on habitat and abundance of young juveniles (less than 250 mm fork length), as catches of these have been virtually nil in research surveys. Even the occurrence of older juveniles has been very uncommon in surveys, except for one year. In this latter instance, older juveniles were found on the continental shelf, generally at locations inshore of the adult habitat.

Dusky rockfish is a slow growing species, with a low rate of natural mortality estimated at 0.09. However, it appears to be faster growing than many other rockfish species. Maximum age is 49 to 59 years. Dusky rockfish become mature (L_{50}) around 365 mm (Chilton et al. 2010). The approximate upper size limit for juvenile fish is 470 mm for females; unknown for males, but presumed to be slightly smaller than for females based on what is commonly the case in other species of *Sebastes*.

D.11.1.1 Relevant Trophic Information

Although no comprehensive food study of dusky rockfish has been done, one smaller study in the Gulf of Alaska showed euphausiids to be the predominate food item of adults. Larvaceans, cephalopods, pandalid shrimp, and hermit crabs were also consumed.

Predators of dusky rockfish have not been documented, but likely include species that are known to consume rockfish in Alaska, such as Pacific halibut, sablefish, Pacific cod, and arrowtooth founder.

D.11.1.2 Habitat and Biological Associations

Eggs: Internal fertilization and live birth are common to *Sebaastes* sp. (Chilton 2010).

Settled Early Juveniles: No information known for small juveniles less than 250 mm fork length.

Subadults: Larger juveniles have been taken infrequently in bottom trawls at various localities of the continental shelf, usually inshore of the adult fishing grounds. The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and bottom currents (Harris et al. 2022). The associate with shallower depths and places with south to southeasterly currents in the eastern AI. Predicted abundance was highest around Unalaksa Island, though localized areas of high abundance are also predicted near Umnak and Amchitka Islands.

Adults: Commercial fishery and research survey data suggest that adult dusky rockfish are primarily found over reasonably flat, trawlable bottom of offshore banks of the outer continental shelf at depths of 75 to 200 m. Type of substrate in this habitat has not been documented. During submersible dives on the outer shelf (40 to 50 m) in the eastern Gulf, dusky rockfish were observed in association with rocky habitats and in areas with extensive sponge beds where adult dusky rockfishes were observed resting in large vase sponges (V. O'Connell, ADFG, personal communication). Generally, the fish appear to be demersal, and most of the population occurs in large aggregations. Dusky rockfish are the most highly aggregated of the rockfish species caught in Gulf of Alaska trawl surveys. Outside of these aggregations, the fish are sparsely distributed. Because the fish are taken with bottom trawls, they are presumed to be mostly demersal. Whether they also have a pelagic distribution is unknown, but there is no evidence of a pelagic tendency based on the information available at present. There is no information on seasonal migrations. Dusky rockfish often co-occur with northern rockfish.

The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom currents, and slope (Harris et al. 2022). Adults associated with bottom depths between 100-200 m, a slope of at least 5°, and strong southerly currents. Similar to subadults, areas of high abundance for adult dusky rockfish are south of Unalaska Island and Umnak Island.

Habitat and Biological Associations: Dusky Rockfish

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	U	NA	U	NA	NA	NA	NA	NA
Larvae	U	U	spring–summer?	U	P (assumed)	NA	U	U
Settled Early Juveniles	U	U	all year	ICS, MCS, OCS,	U (small juvenile< 250 mm): D? (larger juvenile)	U (juvenile<250 mm); Trawlable substrate? (juvenile>250 mm)	U	U
Subadults	U	U	U	U	U	CB, R, G	U	observed associated with *primnoa* coral
Adults	Up to 49–50 years.	euphausiids	U, except that larval release may be in the spring in the Gulf of Alaska	OCS, USP	SD, SP	CB, R, G	U	observed associated with large vase type sponges

D.11.1.3 Literature

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D.11.2 Harlequin rockfish (*Sebastes variegatus*)

D.11.2.1 Life History and General Distribution

Harlequin rockfish (*Sebastes variegatus*) is found from the Oregon coast to the western Aleutian Islands (Love et al. 2002). Harlequin rockfish is one of the smaller species and becomes mature at a length of 230 mm and achieves a maximum size of 420 mm (Rooper 2008). This species becomes mature at a relatively young age for sebastid rockfishes (4.5 years), but can still live as long as 72 years (Tribuzio and Echave 2019). One complication for the assessment of this species is that it often has preference for habitat that is untrawlable using standard RACE-GAP survey gear, including areas that are rocky or have a high density of structure forming invertebrates such as corals (Conrath et al. 2019). Harlequin rockfish may be particularly susceptible to this problem, as in multiple studies they were found to be closely associated with the bottom or amidst rocks (Johnson et al. 2003, Jones et al. 2012).

D.11.2.2 Relevant Trophic Information

There is insufficient information on southern harlequin rockfish predator or prey relationships.

D.11.2.3 Habitat and Biological Associations

Adults: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom currents, BPI, slope angle, and slope aspect (Harris et al. 2022). Predicted abundance was highest along the edge of the continental slope, particularly south of Unalaska and Umnak islands.

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D.11.3 Shortspine thornyhead (*Sebastolobus alascanus*)

D.11.3.1 Life History and General Distribution

Thornyhead rockfish of the northeastern Pacific Ocean are comprised of two species, the shortspine thornyhead (*Sebastolobus alascanus*) and the longspine thornyhead (*S. altivelis*). The longspine thornyhead is not common in the Bering Sea and Aleutian Islands. The shortspine thornyhead is a demersal species which inhabits deep waters from 93 to 1,460 m from the Bering Sea to Baja California. This species is common throughout the Gulf of Alaska, eastern Bering Sea, and Aleutian Islands. The population structure of shortspine thornyheads, however, is not well defined. Thornyhead rockfish are slow-growing and long-lived with maximum age in excess of 50 years and maximum size greater than 750 mm and 2 kg. Thornyheads spawn buoyant masses of eggs during the late winter and early spring that resemble bilobate "balloons" which float to the surface (Pearcy 1962). Juvenile shortspine thornyhead rockfish have a pelagic period of about 14 to 15 months and settle out on the shelf (100 m) at about 22 to 27 mm (Moser 1974). The approximate upper size limit of juvenile fish is 27 mm at the pelagic stage, and 60 mm at the benthic stage (Moser 1974). Fifty percent of female shortspine thornyheads are sexually mature at about 215 mm (Pearson and Gunderson 2003).

D.11.3.2 Relevant Trophic Information

Shortspine thornyhead rockfish prey mainly on epibenthic shrimp and fish. Yang (1996, 2003) showed that shrimp were the top prey item for shortspine thornyhead rockfish in the Gulf of Alaska; whereas, cottids were the most important prey item in the Aleutian Islands region. Differences in abundance of the main prey between the two areas might be the main reason for the observed diet differences. Predator size might by another reason for the difference since the average shortspine thornyhead in the Aleutian Islands area was larger than that in the Gulf of Alaska (334 mm vs 297 mm).

D.11.3.3 Habitat and Biological Associations

Eggs: Eggs float in masses of various sizes and shapes. Frequently the masses are bilobed with the lobes 150 to 610 mm in length, consisting of hollow conical sheaths containing a single layer of eggs in a gelatinous matrix. The masses are transparent and not readily observed in the daylight. Eggs are 1.2 to 1.4 mm in diameter with a 0.2 mm oil globule. They move freely in the matrix. Complete hatching time is unknown but is probably more than 10 days.

Larvae: Three day-old larvae are about 3 mm long and apparently float to the surface. It is believed that the larvae remain in the water column for about 14 to 15 months before settling to the bottom.

Settled Early Juveniles: Very little information is available regarding the habitats and biological associations of younger juvenile shortspine thornyheads.

Subadults: In the EBS, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth alone,which predicted high subadult SST abundance along the continental slope in depths around 450 m (Laman et al. 2022). In the AI, the covariates contributing the most to the final SDM EFH map for this life stage was also bottom depth alone (Harris et al. 2022). High abundances were predicted along the slope south of Unalaska Island.

Adults: Adults are demersal and can be found at depths ranging from about 90 to 1,500 m. Groundfish species commonly associated with thornyheads include: arrowtooth flounder (*Atheresthes stomias*), Pacific ocean perch (*Sebastes alutus*), sablefish *(Anoplopoma fimbria*), rex sole (*Glyptocephalus zachirus*), Dover sole (*Microstomus pacificus*), shortraker rockfish (*Sebastes borealis*), rougheye rockfish (*Sebastes aleutianus*), and grenadiers (family Macrouridae). Two congeneric thornyhead species, the longspine thornyhead (*Sebastolobus altivelis*) and a species common off of Japan, broadbanded thornyhead, *S. macrochir*, are infrequently encountered in the Gulf of Alaska.

In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Laman et al. 2023). Adult SST abundance was high on the continental slope at depths around 600 m. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Harris et al. 2022).Highest abundances were predicted along the continental slope houth of Unalaska Island.

Habitat and Biological Associations: Thornyhead Rockfish

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	U	U	spawning: late winter and early spring	U	P	U	U	
Larvae	<15 months	U	early spring through summer	U	P	U	U	
Settled Early Juveniles/ Subadults	> 15 months when settling to bottom occurs (?)	U shrimp, amphipods, mysids, euphausiids?	U	MCS, OCS, USP	D	M, S, R, SM, CB, MS, G	U	
Adults	U	shrimp fish (cottids), small crabs	year-round?	MCS, OCS, USP, LSP	D	M, S, R, SM, CB, MS, G	U	

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D.12 Pacific cod (*Gadus macrocephalus*)

D.12.1 Life History and General Distribution

Pacific cod (*Gadus macrocephalus*) is a transoceanic species, occurring at depths from shoreline to 500 m. The southern limit of the species' distribution is about 34° N. latitude, with a northern limit of about 65° N. latitude. Adults are largely demersal and form aggregations during the peak spawning season, which extends approximately from February through April. Pacific cod eggs are demersal and adhesive. Eggs hatch in about 16 to 28 days. Pacific cod larvae undergo metamorphosis at about 25 to 35 mm. Juvenile Pacific cod start appearing in trawl surveys at a fairly small size, as small as 100 mm in the eastern Bering Sea. Pacific cod can grow to be more than a meter in length, with weights in excess of 10 kg. The instantaneous rate of natural mortality is currently estimated to be 0.35 in the Bering Sea and Aleutian Islands (BSAI). Approximately 50 percent of Pacific cod are mature by age 5 in the BSAI. The maximum recorded age of a Pacific cod is 17 years in the BSAI.

Some studies of Pacific cod in the Gulf of Alaska and also some studies of Atlantic cod suggest that young-of-the-year individuals are dependent on eelgrass, but this does not appear to be the case in the EBS. In contrast to other parts of the species' range, where sheltered embayments are key nursery grounds, habitat use of age 0 Pacific cod in the EBS seems to occur along a gradient from coastal-demersal (bottom depths < 50 m) to shelf-pelagic (bottom depths 60-80 m), although densities near the coastal waters of the Alaska peninsula are much higher than elsewhere. Evidence of density-dependent habitat selection at the local scale has been found, but there is no consistent shift in distribution of juvenile Pacific cod in response to interannual climate variability.

Adult Pacific cod are widely distributed across the EBS, to depths of 500 m, and are routinely captured in every stratum of the annual EBS shelf bottom trawl survey. However, adult Pacific cod do display temperature preferences, and EBS shelf bottom trawl survey catch rates in excess of 50 kg/ha are seldom observed inside the 0 degree bottom temperature isotherm. On average, adult Pacific cod are strongly associated with the seafloor. However, diel vertical migration has also been observed, with patterns varying significantly by location, bottom depth, and time of year (daily depth changes averaging 8 m).

Pacific cod in the EBS form large spawning aggregations. Spawning concentrations have been observered north of Unimak Island, in the vicinity of the Pribilof Islands, at the shelf break near Zhemchug Canyon, and adjacent to islands in the central and western Aleutian Islands along the continental shelf. It has been speculated that variations in spawning time may be temperature-related, and temperature impacts on survival and hatching of eggs and development of embryos and larvae have been demonstrated.

D.12.2 Relevant Trophic Information

Age 0 (juvenile) Pacific cod in the EBS have been shown to consume primarily age 0 walleye pollock, euphausiids, large copepods, snow and Tanner crab larvae, sea snails, and arrow worms. This diet may vary with temperature, with high proportions of age 0 walleye pollock during warm years and a shift to euphausiids and large copepods during cool years. For comparison to other parts of the species' range, age 0 Pacific cod in the Gulf of Alaska have been found to prey mainly on small calanoid copepods, mysids, and gammarid amphipods; and near the Kuril Islands and Kamchatka, age 0 walleye pollock have been found to play a major role in the diet of juvenile Pacific cod.

Adult Pacific cod in the EBS have been shown to be significant predators of snow and Tanner crab in the eastern Bering Sea. Based on stomach contents of adult Pacific cod sampled in annual EBS shelf bottom trawl surveys from 1997-2001, hermit crab, snow crab, Tanner crab, walleye pollock, eelpout, and fishery offal all contributed at least 5% of the diet by weight in at least one survey year, with walleye pollock being by far the most important prey item by weight (average across years = 45%). For comparison to other parts of the species' range, adult Pacific cod in the western Gulf of Alaska have been shown to consume primarily eelpouts, Tanner crab, crangonid shrimp, hermit crab, and polychaetes.

Predators of Pacific cod include halibut, salmon shark, northern fur seals, sea lions, harbor porpoises, various whale species, and tufted puffin.

D.12.3 Habitat and Biological Associations

Egg/Spawning: Spawning takes place in the sublittoral-bathyal zone (40 to 290 m) near the ocean floor. Eggs sink to the bottom after fertilization, and are somewhat adhesive. Optimal temperature for incubation is 3 to

6 C, optimal salinity is 13 to 23 ppt, and optimal oxygen concentration is from 2 to 3 ppm to saturation. Little is known about the optimal substrate type for egg incubation.

Larvae: Larvae are epipelagic, occurring primarily in the upper 45 m of the water column shortly after hatching, moving downward in the water column as they grow.

Settled Early Juveniles: Juveniles occur mostly over the inner continental shelf at depths of 60 to 150 m. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). Predicted abundance was highest over the inner shelf and around St. Matthew Island at shallower depths cooler bottom water temperatures. Comparing the maps of early juvenile Pacific cod population growth potential and condition to the EFH map suggests that the highest growth potential and best condition for this life stage in the EBS corresponded to the EFH hot spots within the larger EFH area.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were Bottom depth, geographic position, bottom temperature, and sediment grain size (Laman et al. 2022). The highest abundance was predicted on the middle shelf around 150 m and at bottom temperatures near 2°C. In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth (Harris et al. 2022). In general, predicted abundance was high in locations less than 250 m depth, with westerly currents and a sloping bottom.

Adults: Adults occur in depths from the shoreline to 500 m. Average depth of occurrence tends to vary directly with age for at least the first few years of life, with mature fish concentrated on the outer continental shelf. Preferred substrate is soft sediment, from mud and clay to sand. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, bottom temperature, and geographic position with the highest abundance predicted over the outer shelf domain from Pribilof Canyon north in waters shallower than 200 m at bottom temperatures around 3°C (Laman et al. 2022). In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Harris et al. 2022). They occurred in places shallower than 300 m with somewhat rocky substrates.

Habitat and Biological Associations: Pacific cod

Stage - EFH Level	Duration or Size	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	16-28 days	NA	winter–spring	U	D	M, SM, MS ,S	U	optimum 3–6°C optimum salinity 13–23 ppt
Larvae	U77-132 days, to 35 mm	NA	winter–spring	MCS, OCS	P	M, SM, MS, S	U	
Palagic/Settled Early Juveniles	to 90 mm	small calanoid copepods, mysids, gammarid amphipods	winter-spring	ICS, MCS, OCS	D	M, SM, MS, S	U	
Subadults	to 580mm	invertebrates, pollock, flatfish, fishery discards,	all year	ICS, MCS, OCS	D	M, SM, MS, S, CB, G, SAV	U	
Adults	>800 mm	pollock, flatfish, fishery discards, crab	spawning (Feb-Apr)	ICS, MCS, OCS	D	M, SM, MS, S, CB, G	U	
			non-spawning (May-Jan)	ICS, MCS, OCS				

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D.13 Pacific ocean perch (*Sebastes alutus*)

D.13.1 Life History and General Distribution

Pacific ocean perch (*Sebastes alutus*) has a wide distribution in the North Pacific from southern California around the Pacific rim to northern Honshu Island, Japan, including the Bering Sea. The species appears to be most abundant in northern British Columbia, the Gulf of Alaska, and the Aleutian Islands. Pacific ocean perch display diel movements, coming off bottom during the day. Adults are found primarily offshore along the continental slope in depths of 180 to 420 m. Seasonal differences in depth distribution have been noted by many investigators. In the summer, adults inhabit shallower depths, especially those between 180 m and 300 m. In the fall, the fish apparently migrate farther offshore to depths of approximately 300 to 420 m. They reside in these deeper depths until about May, when they return to their shallower summer distribution. This seasonal pattern is probably related to summer feeding and winter spawning. Although small numbers of Pacific ocean perch are dispersed throughout their preferred depth range on the continental slope, most of the population occurs in patchy, localized aggregations. Pacific ocean perch is a semipelagic species, and along the EBS slope they have been observed to move into the water column during the day and onto the bottom at night.

Species distribution modeling indicates that high abundances of early juveniles and subadults in the AI are associated with complex habitats and seamounts, whereas adults are associated with high slopes. Pacific ocean perch are less commonly observed in summer surveys along the EBS slope than along the AI slope, Predicted abundance from EBS species distribution models for early juveniles was higher north of Pribilof Canyon in areas with sponges; predicted abundance of EBS subadults and adults was predicted o be high at depths near 300 m.

There is much uncertainty about the life history of Pacific ocean perch, although generally more is known than for other rockfish species. The species appears to be viviparous, with internal fertilization and the release of live young. Insemination occurs in the fall, and sperm are retained within the female until fertilization takes place approximately 2 months later. The eggs develop and hatch internally, and parturition (release of larvae) occurs in April and May. Information on early life history is very sparse, especially for the first year of life. Positive identification of Pacific ocean perch larvae is not possible at present, but the larvae are thought to be pelagic and to drift with the current. Transformation to an adult form and the assumption of a demersal existence may take place within the first year. Small juveniles probably reside in relatively shallow areas of mixed sand and boulder substrates, and by age 3 begin to migrate to deeper offshore waters of the continental shelf. As they grow, they continue to migrate deeper, eventually reaching the continental slope, where they attain adulthood.

Pacific ocean perch has a low population growth rate, with a low rate of natural mortality (estimated at 0.06), a relatively old age at 50 percent maturity (9 years for females in the Aleutian Islands), and a very old maximum age of 104 years in Aleutian Islands. Despite their viviparous nature, the fish is relatively fecund with number of eggs per female in Alaska ranging from 10,000 to 300,000, depending upon size of the fish.

D.13.2 Relevant Trophic Information

All food studies of Pacific ocean perch have shown them to be overwhelmingly planktivorous. Small juveniles eat mostly calanoid copepods, whereas larger juveniles and adults consume euphausiids as their major prey items. Adults, to a much lesser extent, may also eat small shrimp and squids. It has been suggested that Pacific ocean perch and walleye pollock compete for the same euphausiid prey. Consequently, the large removals of Pacific ocean perch by foreign fishermen in the Gulf of Alaska in the 1960s may have allowed walleye pollock stocks to greatly expand in abundance.

Documented predators of adult Pacific ocean perch include Pacific halibut and sablefish, and it is likely that Pacific cod and arrowtooth flounder also prey on Pacific ocean perch. Pelagic juveniles are consumed by salmon, and benthic juveniles are eaten by lingcod and other large demersal fish.

D.13.3 Habitat and Biological Associations

Eggs: Little information is known. Insemination is thought to occur after adults move to deeper offshore waters in the fall. Parturition is reported to occur from 20 to 30 m off the bottom at depths of 360 to 400 m.

Larvae: Little information is known. Earlier information suggested that after parturition, larvae rise quickly to near surface, where they become part of the plankton. Data from British Columbia indicates that larvae may remain at depths greater than 175 m for some period of time (perhaps two months), after which they slowly migrate upward in the water column.

Pelagic Early Juveniles: After metamorphosis from the larval stage, juveniles may reside in a pelagic stage for an unknown length of time. They eventually become demersal.

Settled Early Juveniles: At age 1 through 5 probably live in very rocky shallower areas. Afterward, they move to progressively deeper waters of the continental shelf. Juvenile Pacific ocean perch are associated with boulders, sponges, and upright coral, and these habitat structures may play an important role for this life stage.

In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, sponge presence, and BPI (Laman et al. 2022). Predicted abundance was highest along the shelf break and upper continental slope from Pribilof Canyon northward where sponges were present and bathymetric features were relatively flat. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and bottom currents (Harris et al. 2022). Abundance was predicted in locations farther west in 100 – 3—m depths with corals and sponges.

Subadults: Move to progressively deeper waters of the continental shelf. Older juveniles (subadults) are often found together with adults at shallower locations of the continental slope in the summer months. Juvenile Pacific ocean perch are associated with boulders, sponges, and upright coral, and these habitat structures may play an important role for this life stage. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Laman et al. 2022). Ensemble-predicted subadult Pacific ocean perch abundance was highest along the shelf break and upper continental slope at around 300 m. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Harris et al. 2022).

Adults: Commercial fishery data have consistently indicated that adult Pacific ocean perch are found in aggregations over reasonably smooth, trawlable bottom of the continental slope. Generally, they are found in shallower depths (180 to 250 m) in the summer, and deeper (300 to 420 m) in the fall, winter, and early spring. In addition, POP on the EBS slope have been observed to move into the water column during the day, and onto the bottom at night. The best information available at present suggests that adult Pacific ocean perch are a semipelagic species that prefer a flat, pebbled substrate along the continental slope.

In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Laman et al. 2022). The highest adult Pacific ocean perch abundance was predicted along the shelf break and on to the upper continental slope at depths around 300 m. In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth alone with high abundances predicted at moderate epths of 200 – 300 m (Harris et al. 2022).

Habitat and Biological Associations: Pacific ocean perch

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	Internal incubation ; ~90 d	NA	Winter	NA	NA	NA	NA	NA
Larvae	U; assumed between 60 and 180 days	U; assumed to be micro-zooplankton	spring–summer	MCS, OCS, USP, LSP, BSN	P	NA	U	U
Settled Early Juveniles /Subadults	3–6 months to 10 years	early juvenile: calanoid copepods; late juvenile: euphausiids	All year	MCS, OCS, USP	P? (early juv. only), D	R (<age 3)	U	U
Adults	10–98 years of age	euphausiids	insemination (fall); fertilization, incubation (winter); larval release (spring); feeding in shallower depths (summer)	OCS, USP	SD/SP	CB, G, M?, SM?, MS?	U	U

D.13.4 Literature

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D.14 Rougheye rockfish (*Sebastes aleutianus*) and Blackspotted rockfish (*Sebastes melanostictus*)

D.14.1 Life History and General Distribution

Fish in Alaska previously referred to as rougheye rockfish have recently been recognized as consisting of two species, rougheye rockfish (*Sebastes aleutianus*) and blackspotted rockfish (*Sebastes melanostictus*) (Orr and Hawkins 2008). Most of the information on rougheye/blackspotted rockfish was obtained prior to recognition of blackspotted rockfish as a separate species, and thus refers to the two species complex. Love et al. (2002) reports that rougheye rockfish are found along the northwest slope of the eastern Bering Sea, throughout the Aleutian Islands, west to the Kamchatka Peninsula and Japan, and south to Point Conception, California, although this distribution likely reflects the combined blackspotted/rougheye group. Recent trawl surveys indicate that rougheye rockfish are uncommon in the Aleutian Islands, where the two species complex is predominately composed of blackspotted rockfish. Methods for distinguishing the two species from each other are still being refined, and are evaluated by verifying field IDs with genetic IDs.

Information for the larval and juvenile stages of rougheye/blackspotted rockfish is very limited. Rougheye/blackspotted rockfish are viviparous, as females release larvae rather than eggs. Parturition (the release of larvae) can occur from December through April (McDermott 1994). Identification of larvae can be made with genetic techniques (Gray et al. 2006), although this technique has not been used to produce a broad scale distribution of the larval stage. Species identification based on morphological characteristics is difficult because of overlapping characteristics among species, as few rockfishes species in the north Pacific have published descriptions of the complete larval developmental series. Subadult blackspotted and rougheye rockfish are found in Alaska Fisheries Science Center summer trawl surveys throughout the AI, but are less commonly observed in the EBS. Length frequency distributions from Aleutian Islands summer trawl survey indicate that small blackspotted/rougheye rockfish (less than 350 mm) are found throughout a range of depths but primarily in shallower water (200 to 300 m) than larger fish. As adults, rougheye/blackspotted rockfish occur primarily at depths from 300 to 500 m. These observations are consistent with species distribution models, which indicate subadults have a larger EFH area than adults because they extend to shallower depths. In the EBS, habitat models predicted higher densities in areas near the head of submarine canyons. In the AI, habitat models predict high densities in areas near ocean passes, with weak but variable currents.

Though relatively little is known about their biology and life history, rougheye/blackspotted rockfish appear to be *K*-selected with late maturation, slow growth, extreme longevity, and low natural mortality. Age at 50 percent maturity has been estimated at 20.3 years for female blackspotted/rougheye rockfish in the Gulf of Alaska (McDermott 1994), as this study occurred prior to recognition of blackspotted rougheye as a separate species. Conrath (2017) estimated maturity separately for the two species, and obtained lengths at 50% maturity of 450 mm for each species, and age of 50% maturity of 19.6 years for rougheye rockfish and 27.4 for blackspotted rockfish. Maturity information is not available for the Bering Sea and Aleutian Islands (BSAI) management area. A maximum age of 121 has been reported from sampling in the Aleutian Islands trawl survey.

D.14.2 Relevant Trophic Information

Pandalid and hippolytid shrimp are the largest components of the rougheye/blackspotted rockfish diet (Yang 1993, 1996, Yang and Nelson 2000). In a study of diet data collected from specimens from the Aleutian Islands trawl survey, Yang (2003) found that the diet of large rougheye/blackspotted rockfish had proportionally more fish (e.g., myctophids) than small rougheye/blackspotted, whereas smaller blackspotted/rougheye consumed proportionally more shrimp. It is uncertain the main predators of rougheye/blackspotted rockfish.

D.14.3 Habitat and Biological Associations

Eggs: The timing of reproductive events is apparently protracted. Parturition (the release of larvae) in the GOA may occur from March to May (Conrath 2017).

Larvae: Limited information is available regarding the habitats and biological associations of blackspotted/rougheye rockfish larvae, in part because of the difficulty of using morphological characteristics to identify blackspotted/rougheye rockfish larvae.

Settled Early Juveniles: Very little information is available regarding the habitats and biological associations of younger juvenile rougheye/blackspotted rockfish.

Subadults: Species distribution models indicate that subadult rougheye/blackspotted rockfish occur at shallower depths than adults (i.e., as shallow as 200 - 250 m). In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, bottom current, and slope (Laman et al. 2022). Abundance was highest at around 300 m over the southern outer shelf domain and upper continental slope with southeasterly bottom current over increasing slope. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, current, and current variability (Harris et al. 2022). Predicted abundances were high around 300 m depth and at areas along the edge of the continental slope between 300 – 500 m depth contours.

Adults: Adults are demersal and generally occur at depths between 300 m and 500 m. Submersible work in southeast Alaska indicates that rougheye/blackspotted rockfish were associated with habitats containing frequent boulders, steep slopes (more than 20°) and sand-mud substrates (Krieger and Ito 1999). Krieger and Wing (2002) found that large rockfish had a strong association with *Primnoa* spp. coral growing on boulders, and it is likely than many of these large rockfish were rougheye/blackspotted rockfish. Species distribution modeling indicates that high density areas in the AI are predicted to occur near ocean passes, with weak but variable currents.

In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and bottom current (Laman et al. 2022) and abundance was highest at depths around 400 m along the southern part of the upper continental slope with southwesterly bottom currents. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, current variability, and bottom temperature (Harris et al. 2022). Their distribution was similar to subadults with an ideal bottom depth around 300 m.

Habitat and Biological Associations: Rougheye and Blackspotted Rockfish

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	NA	NA	NA	NA	NA	NA	NA	
Larvae	U	U	parturition: Mar-May	U	probably P	NA	U	
Settled Early Juveniles	U	U	U	U, OCS, USP?	probably N	U	U	
Subadults	up to ~ 20 years	U	U	U, OCS, USP?	probably D	U	U	
Adults	> 20 years	shrimp squid myctophids	year-round?	OCS, USP	D	M, S, R, SM, CB, MS, G	U	

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D.15 Sablefish (*Anoplopoma fimbria*)

D.15.1 Life History and General Distribution

Sablefish are distributed from Mexico through the GOA to the Aleutian Chain, Bering Sea, along the Asian coast from Sagami Bay, and along the Pacific sides of Honshu and Hokkaido Islands and the Kamchatka Peninsula. Adult sablefish occur along the continental slope, shelf gullies, and in deep fjords such as Prince William Sound and southeast Alaska, at depths generally greater than 200 m. Adults are assumed to be demersal because they are caught in bottom trawls and with bottom longline gear. Spawning or very ripe sablefish are observed in late winter or early spring along the continental slope. Eggs are apparently released near the bottom where they incubate. After hatching and yolk adsorption, the larvae rise to the surface, where they have been collected with neuston nets. Larvae are oceanic through the spring and by late summer, small pelagic juveniles (100 to 150 mm) have been observed along the outer coasts of Southeast Alaska, where they move into shallow waters to spend their first winter. During most years, there are only a few places where juveniles have been found during their first winter and second summer. It is not clear if the juvenile distribution is highly specific or appears so because sampling is sparse. During the occasional times of large year-classes, the juveniles are easily found in many inshore areas during their second summer. They are typically 300 to 400 mm long during their second summer, after which they leave the nearshore bays. One or two years later, they begin appearing on the continental shelf and move to their adult distribution as late juveniles or mature adults (Hanselman et al. 2015).

While pelagic oceanic conditions determine the egg, larval, and juvenile survival through their first summer, juvenile sablefish spend 3 to 4 years in demersal habitat along the shorelines and continental shelf before they recruit to their adult habitat, primarily along the upper continental slope, outer continental shelf, and deep gullies. As juveniles in the inshore waters and on the continental shelf, they are subject to a myriad of factors that determine their ability to grow, compete for food, avoid predation, and otherwise survive to adulthood. A potential driver of recruitment is sea surface temperature (SST) using short-term projections (1-5 years) (Shotwell et al. 2014). Recruitment success did not appear to be directly related to the presence of El Niño or eddies, but these phenomena could potentially influence recruitment indirectly in years following their occurrence (Sigler et al. 2001). Evaluating the overlap of fisheries can provide predictors of sablefish recruitment as well. When evaluating predictors of sablefish recruitment for the Ecosystem and Socioeconomic Profile of the Sablefish stock in Alaska, the highest ranked variables were the summer juvenile sablefish CPUE from the ADF&G large mesh survey and the catch from the arrowtooth flounder fishery in the GOA (Shotwell et al. 2021). Sablefish recruitment has a weak relationship with spawning stock biomass, some of these factors may help explain and predict recruitment by determining the quality instead of the quantity of the annual spawning stock (Shotwell et al. 2021).

The estimated productivity and sustainable yield of the combined EBS, AI, and GOA sablefish stock have declined steadily since the late 1970s, but has rebuilt rapidly since the mid-2010s. There were episodic years of strong recruitment in the current physical regime starting in 1977. Over the last decade, there have been at least three extremely large and well above average year classes (i.e., in 2014, 2016, and 2017). The recent period of high recruitment could be related to environmental conditions, particularly marine heatwaves, which may provide an advantage to fast growing sablefish larvae that exhibit opportunistic feeding strategies during early life history stages (Shotwell et al. 2021).

Size ranges for EBS and AI sablefish life history stages are 150 - 399 mm fork length for settled early juveniles, 400 - 585 mm for subadults, and > 585 mm for adults (size at 50% maturity being 585 mm) (Sasaki 1985, Rodgveller et al. 2016, Pirtle et al. 2019).

D.15.2 Relevant Trophic Information

Larval sablefish feed on a variety of small zooplankton ranging from copepod nauplii to small amphipods. The epipelagic juveniles feed primarily on macrozooplankton and micronekton (i.e., euphausiids).

Gao et al. (2004) studied stable isotopes in otoliths of juvenile sablefish from Oregon and Washington and found that as the fish increased in size they shifted from midwater prey to more benthic prey. In nearshore southeast Alaska, juvenile sablefish (200-450 mm) diets included fish such as Pacific herring and smelts and invertebrates such as krill, amphipods and polychaete worms (Coutré et al. 2015). In late summer, juvenile sablefish also consumed post-spawning pacific salmon carcass remnants in high volume revealing opportunistic scavenging (Coutré et al. 2015). Young-of-the-year sablefish are commonly found in the stomachs of salmon taken in the Southeast Alaska troll fishery during the late summer. Nearshore residence during their second year provide the opportunity to feed on salmon fry and smolts during the summer months.

In their demersal stage, juvenile sablefish less than 600 mm feed primarily on euphausiids, shrimp, and cephalopods (Yang and Nelson 2000, Yang et al. 2006), while sablefish greater than 600 mm feed more on fish. Both juvenile and adult sablefish are considered opportunistic feeders. Fish most important to the sablefish diet include pollock, eulachon, capelin, Pacific herring, Pacific cod, Pacific sand lance, and some flatfish, with pollock being the most predominant (10 to 26 percent of prey weight, depending on year). Squid, euphausiids, pandalid shrimp, Tanner crabs, and jellyfish were also found; squid being the most important of the invertebrates (Yang and Nelson 2000, Yang et al. 2006). Feeding studies conducted in Oregon and California found that fish made up 76 percent of the adult sablefish diet (Laidig et al. 1997). Off the southwest coast of Vancouver Island, euphausiids were the dominant prey (Tanasichuk 1997). Among other groundfish in the GOA, the diet of sablefish overlaps mostly with that of large flatfish, arrowtooth flounder, and Pacific halibut (Yang and Nelson 2000). Nearshore residence during their second year provides the opportunity to feed on salmon fry and smolts during the summer months.

D.15.3 Habitat and Biological Associations

Settled Early Juveniles: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, ROMS bottom current, and presence of sea whips/sea pens (Laman et al. 2022). Predicted abundance was highest in the southern EBS along the Alaska Peninsula with increasing bottom temperatures, southerly flowing bottom currents, and where sea whips and sea pens were present.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom temperature, and bottom currents (Laman et al. 2022). Ensemble-predicted subadult sablefish abundance was highest over the outer shelf and upper continental slope near the head of the Bering Canyon at depths around 600 m with increasing bottom temperatures and with bottom currents generally flowing to the north east. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and bottom temperature (Harris et al. 2022). The ensemble predicted that abundance would be highest in areas east of 180°, with deeper depths and warmer bottom temperatures, and higher on the south side of the AI chain like south of Unalaska Island.

Adults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and ROMS bottom current, with the highest abundance predicted at around 700 m along the upper continental slope with current flow generally to the north and northeast (Laman et al. 2022). In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Harris et al. 2022). Similar to subadults, adult sablefish were predicted to be abundant in the eastern AI and in deep water and along the continental slope east of 180°.

Habitat and Biological Associations: Sablefish

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	14–20 days	NA	late winter–early spring: Dec–Apr	USP, LSP, BSN	P, 200–3,000 m	NA	U	
Larvae	up to 3 months	copepod nauplii, small copepodites	spring–summer: Apr–July	MCS, OCS, USP, LSP, BSN	N, neustonic near surface	NA	U	
Settled Early Juveniles	to 3 yrs	small prey fish, sandlance, salmon, herring, polychaete worms, krill, and salmon caracasess near stream mouths		OCS, MCS, ICS, during first summer, then observed in BAY, IP, till end of 2nd summer; not observed till found on shelf	P when offshore during first summer, then D, SD/SP when inshore	NA when pelagic. The bays where observed were soft bottomed, but not enough observed to assume typical.	U	
Subadults	3–5 yrs	opportunistic: other fish, shellfish, worms, jellyfish, fishery discards	all year	continental slope, and deep shelf gulleys and fjords.	caught with bottom tending gear. presumably D	varies	U	
Adults	5 yrs to 35+	opportunistic: other fish, shellfish, worms, squid, jellyfish, fishery discards	apparently year round, spawning movements (if any) are undescribed	continental slope, and deep shelf gulleys and fjords.	caught with bottom tending gear. presumably D	varies	U	

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D.16 Shark complex

The species representatives for sharks are:

Lamnidae:	Salmon shark (*Lamna ditropis*),
Squalidae:	Sleeper shark (*Somniosus pacificus*), and
	Spiny dogfish (*Squalus suckleyi*).

D.16.1 Life History and General Distribution

Sharks of the order Squaliformes (which includes the two families Lamnidae and Squalidae) are the higher sharks with five gill slits and two dorsal fins. Spiny dogfish are widely distributed throughout the North Pacific Ocean and are the representative species for the GOA shark complex. In the North Pacific, spiny dogfish may be most abundant in the GOA, with southeast Alaska the center of their abunance; they also occur in the Bering Sea. Spiny dogfish are pelagic species found at the surface and to depths of 700 m but mostly at 200 m or less on the shelf and the neritic zone; they are often found in aggregations. Spiny dogfish are aplacental viviparous. Litter size is proportional to the size of the female and range from 2 to 23 pups, with 10 average. Gestation may be 22 to 24 months. Young are 240 to 300 mm at birth, with growth initially rapid, then slows dramatically. Maximum adult size is about 1.6 m and 10 kg; maximum age is 80+ years. Fifty percent of females are mature at 970 mm and 36 years old; 50 percent of males are mature at 740 mm and 21 years old. Females give birth in shallow coastal waters, usually in September through January. Tagging experiments indicate local indigenous populations in some areas and widely migrating groups in others. They may move inshore in summer and offshore in winter.

Salmon sharks are large (up to 3 m in length), aplacental, viviparous (with small litters of one to four pups and embryos nourished by yolk sac and 5 oophagy), widely migrating sharks, with homeothermic capabilities and highly active predators (salmon and white sharks). Salmon sharks are distributed epipelagically along the shelf (can be found in shallow waters) from California through the Gulf of Alaska (GOA) to the northern Bering Sea and off Japan. In groundfish fishery and survey data, salmon sharks occur across much of the shelf in the Bering Sea, but near the coast to the outer shelf in the GOA, particularly near Kodiak Island. Salmon sharks are not commonly seen in Aleutian Islands.

The Pacific sleeper shark is distributed from California around the Pacific Rim to Japan and in the Bering Sea principally on the outer shelf and upper slope. However, they do often occur in near shore, and shallow waters in the GOA. Tagging data suggests that they spend a significant amount of time moving vertically through the water column. Adult Pacific sleeper shark have been reported as long as 7 m, however, size at maturity is unknown, as well as reproductive mode. Other members of the Squalidae are aplacental viviparous, and it is likely a safe assumption that Pacific sleeper shark are as well. In groundfish fishery and survey data, Pacific sleeper sharks are spread across a large portion of the shelf in the Bering Sea, but from the coast to the outer shelf in the GOA, particularly near Kodiak Island in Shelikof Strait, inside waters of Southeast Alaska and Prince William Sound.

D.16.2 Relevant Trophic Information

Sharks are top level predators in the GOA. The only likely predator would be larger fish, including larger sharks, or mammals preying on young/small sharks. Spiny dogfish are opportunistic generalist feeders, eating a wide variety of foods, including fish (smelts, herring, sand lance, and other small schooling fish), crustaceans (crabs, euphausiids, shrimp), and cephalopods (octopus). Salmon shark are believed to eat primarily fish, including salmon, herring, sculpins, and gadids. Pacific sleeper shark are predators of flatfish, cephalopods, rockfish, crabs, seals, and salmon and may also prey on pinnipeds.

D.16.3 Habitat and Biological Associations

Pelagic early juveniles: Salmon sharks and spiny dogfish are aplacental viviparous; reproductive strategy of Pacific sleeper sharks is not known. Spiny dogfish give birth in shallow coastal waters, while salmon sharks pupping grounds are located in the offshore transitional domain south of the GOA.

Subadults and /or Adults: Spiny dogfish are widely dispersed throughout the water column on shelf in the GOA, and along outer shelf in the eastern Bering Sea; apparently not as commonly found in the Aleutian Islands and not commonly at depths greater than 200 m.

Salmon sharks are found throughout the GOA, as well as the eastern Bering Sea and Aleutian Islands; epipelagic, primarily over shelf/slope waters in GOA, and outer shelf in the eastern Bering Sea. Salmon shark do exhibit seasonal abundances in areas with high density of salmon returns, such as Prince William Sound.

Pacific sleeper sharks are widely dispersed on shelf/upper slope in the GOA, and across the shelf in the eastern Bering Sea; generally demersal, but may utilize the full water column.

Habitat and Biological Associations: Sharks

Stage - EFH Level	Duration or Age	Diet/Prey	Season / Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs								
Salmon shark	9 mo gestation		Late spring pupping	Pelagic transition zone	P	NA	U	
Pacific sleeper shark	U		U	U	U	U	U	
Spiny dogfish	18-24 mo gestation		Fall/early winter pupping	Near shore bays	P/D	U	U	
Larvae	NA							
Juveniles and Adults								
Salmon shark	30+ years	fish (salmon, sculpins, and gadids)	all year	ICS, MCS, OCS, USP in GOA; OCS, USP in BSAI	P	NA	U	4-24°C
Pacific sleeper shark	U	omnivorous; flatfish, cephalopods, rockfish, crabs, seals, salmon, pinnipeds	all year	ICS, MCS, OCS, USP in GOA; OCS, USP in BSAI	D	U	U	
Spiny dogfish	80+ years	fish (smelts, herring, sand lance, and other small schooling fish), crustaceans (crabs, euphausiids, shrimp), and cephalopods (octopus)	all year	ICS, MCS, OCS in GOA; OCS in BSAI give birth ICS in fall/winter?	P/D	U	U	4–16°C

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D.17 Shortraker rockfish (*Sebastes borealis*)

D.17.1 Life History and General Distribution

Shortraker rockfish are found along the northwest slope of the eastern Bering Sea, throughout the Aleutian Islands and south to Point Conception, California. Information for the larval and juvenile stages of shortraker rockfish is very limited. Shortraker rougheye are viviparous, as females release larvae rather than eggs. Parturition (the release of larvae) can occur from February through August (McDermott 1994). Identification of larvae can be made with genetic techniques (Gray et al. 2006), although this technique has not been used to produce a broad scale distribution of the larval stage. Species identification based on morphological characteristics is difficult because of overlapping characteristics among species, as few rockfish species in the north Pacific have published descriptions of the complete larval developmental series. However, Kendall (2003) was able to identify archived *Sebastes* ichthyoplankton from the Gulf of Alaska to four distinct morphs.

One of the morphs consists solely of shortraker rockfish, although the occurrence of this morph was relatively rare (18 of 3,642 larvae examined). Post-larval and juvenile shortraker rockfish do occur in the Aleutian Islands trawl survey, but these data have not been spatially analyzed with respect to their habitat characteristics. As adults, shortraker rockfish occur primarily at depths from 300 to 500 m.

Though relatively little is known about their biology and life history, shortraker rockfish appear to be *K*-selected with late maturation, slow growth, extreme longevity, and low natural mortality. Age at 50 percent maturity has been estimated at 21.4 years for female shortraker rockfish in the Gulf of Alaska (Hutchinson 2004); maturity information is not available for the Bering Sea and Aleutian Islands (BSAI) management area. Hutchinson (2004) estimated a maximum age of 116 years. Shortraker rockfish are among the largest *Sebastes* species in Alaskan waters; samples as large as 1,090 mm have been obtained in Aleutian Islands trawl surveys.

D.17.2 Relevant Trophic Information

The limited information available suggests that the diet of shortraker rockfish consists largely of squid, shrimp, and myctophids. From data collected in the 1994 and 1997 Aleutian Islands trawl surveys, Yang (2003) also found that the diet of large shortraker rockfish had proportionally more fish (e.g. myctophids) than small shortrakers, whereas smaller shortrakers consumed proportionally more shrimp. It is uncertain the main predators of shortraker rockfish.

D.17.3 Habitat and Biological Associations

Egg/Spawning: The timing of reproductive events is apparently protracted. Parturition (the release of larvae) may occur from February through August (McDermott 1994), although Westrheim (1975) found that April was the peak month for parturition.

Larvae: Limited information is available regarding the habitats and biological associations of shortraker rockfish larvae, in part because of the difficulty of using morphological characteristics to identify shortraker rockfish larvae

Settled Early Juveniles: Very little information is available regarding the habitats and biological associations of younger juvenile shortraker rockfish.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, local slope, and geographic position, which was highest along the upper continental slope and EBS shelf break (Laman et al. 2022). In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth (Harris et al. 2022). Most shortraker rockfish were predicted deeper than 300 m, with the highest abundance occurring in scattered patches along the 500 m depth contour.

Adults: Adults are demersal and generally occur at depths between 300 m and 500 m. Krieger (1992) used a submersible to find that shortraker rockfish occurred over a wide range of habitats, with the highest density of fish on sand or sand or mud substrates. Additional submersible work in southeast Alaska indicates that rougheye/shortraker rockfish were associated with habitats containing frequent boulders, steep slopes (more than 20°) and sand-mud substrates (Krieger and Ito 1999). Krieger and Wing (2002) found that large rockfish had a strong association with *Primnoa* spp. coral growing on boulders, and it is likely that many of these large rockfish were shortraker rougheye.

In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, current, slope, and geographic position (Laman et al. 2022). Adult shortraker abundance was predicted to be highest along the upper continental slope and at the EBS shelf break in depths around 400 m with southerly flowing currents, steeper local slope, and bottom temperatures around 4°C. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, bottom currents, and slope (Harris et al. 2022). High abundances were predicted in locations with deeper water, below the 300 m depth contour, with southwesterly currents and a sloped bottom.

Habitat and Biological Associations: Shortraker and Rougheye Rockfish

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	NA	NA	NA	NA	NA	NA	NA	
Larvae	U	U	parturition: Feb–Aug	U	probably P	NA	U	
Settled Early Juveniles	U	U	U	U, MCS, OCS?	probably N	U	U	
Subadults	Up to ~ 20 years	U	U	U, MCS, OCS?	probably D	U	U	
Adults	> 20 years	shrimp squid myctophids	year-round?	OCS, USP	D	M, S, R, SM, CB, MS, G	U	

D.17.4 Literature

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D.18 Skate complex (*Rajidae*)

The skate complex is described below and the species in the complex are:

Alaska skate,
Aleutian skate,
Bering skate,
Big skate,
Mud skate, and
Whiteblotched skate.

Species Complex Summary

Skates (Rajidae) in the Bering Sea and Aleutian Islands (BSAI) occur in two main taxonomic groups: skates of the genus *Bathyraja* (soft nosed) and those of the genera *Raja* and *Beringraja* (hard nosed). *Bathyraja* skates make up the vast majority of the skate biomass in the BSAI. Skates are oviparous: fertilization is internal and eggs are encased in leathery, horned pouches. Eggcases are then deposited at highly localized nursery sites along the upper continal slope, where the embryos develop for up to 3.5 years. Nursery sites are small, have a high density of eggcases, and appear to be used over many years. Six sites have been designated as Habitat Areas of Particular Concern (HAPC) by the North Pacific Fishery Management Council, although no protections (i.e. fishing gear restrictions) were mandated for the sites. Adults and juveniles are demersal, and feed on bottom invertebrates and fish. The habitat utilized by skates depends on the species. The biomass of BSAI skates estimated from the survey more than doubled between 1982 and 1996 and has been stable since. The approximate upper size limit of juvenile fish is unknown.

Skates are managed in aggregate as members of the BSAI Skate Stock Complex. Alaska skate is the dominant species and is assessed separately, but harvest specifications are made for the complex as a whole (Ormseth 2020). Six skate species are included in this complex EBS (Alaska skate, Aleutian skate, Bering skate, big skate, mud skate, and whiteblotched skate) (Ormseth 2020).

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D.18.1 Alaska skate (*Bathyraja parmifera*)

D.18.1.1 Life History and General Distribution

Adult Alaska skates are mostly distributed at a depth of 50 to 200 m on the shelf in eastern Bering Sea (EBS), where it is the dominant skate species, and is less abundant in the Aleutian Islands (AI). In the EBS, Alaska skates appear to make ontogenetic migrations from the nursery sites on the upper slope to the inner EBS shelf, reaching the inner shelf at approximately the age of maturity (9 years). Adults then likely make long-distance seasonal movements for reproduction and feeding.

D.18.1.2 Relevant Trophic Information

Skates feed on bottom invertebrates (crustaceans, molluscs, and polychaetes) and fish. Adult skates have few or no predators, but juvenile skates (particularly those in the 20-30 cm size range) are preyed on by Pacific cod and Pacific halibut.

D.18.1.3 Habitat and Biological Associations

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). The highest abundances were predicted in the central EBS and northward over the inner and middle shelf in warmer, shallow water. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom current, and slope aspect (Harris et al. 2022). In general, high abundance of subadults is predicted by being located in the central part of the AI, in shallow depths, with weak bottom currents and steep terrain oriented towards the northeast.

Adults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom temperature, bottom depth, and geographic position (Laman et al. 2022). Adult abundance was highest at water temperatures around 5°C in shallower depths over the outer shelf. In the AI, a variety of covariates were important to the model, including geographic position, bottom depth, current, current variability, slope, and BPI (Harris et al. 2022). Predicted abundance of adults is highest in the central AI and above the 100 m depth contour. Adult Alaska skates encounter probability is usually highest close to shore and close to zero in most places greater than 300 m depth.

D.18.1.4 Literature

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D.18.2 Aleutian skate (*Bathyraja aleutica*)

D.18.2.1 Life History and General Distribution

The Aleutian skate is found mainly in the outer shelf and upper slope of the eastern Bering Sea and the Aleutian Islands at depths of 100 to 350 m. Aleutian skates mature slowly and do not reproduce until attaining a large size (> 1,320 mm), depositing their egg sacs in distinct nursery grounds (Ebert et al. 2007, Haas et al. 2016).

D.18.2.2 Relevant Trophic Information

Skates feed on bottom invertebrates (crustaceans, molluscs, and polychaetes) and fish. Adult skates have few or no predators, but juvenile skates (particularly those in the 20-30 cm size range) are preyed on by Pacific cod and Pacific halibut.

D.18.2.3 Habitat and Biological Associations

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, ROMS bottom current, and bottom depth, which had high abundance all along the upper continental slope with cross shelf currents toward the southwest (Laman et al. 2022). In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth, with higher abundance predicted in deeper and warmer water (Harris et al. 2022).

Adults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and sediment grain size, which predicted adult Aleutian skate numerical abundance to be highest along the shelf break with current flowing across shelf to the southwest (Laman et al. 2022). In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, current, geographic position, and tidal maximum (Harris et al. 2022). They were abundant in moderate and deeper water, and highest around Attu Island.

D.18.2.4 Literature

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D.18.3 Bering skate (*Bathyraja interrupta*)

D.18.3.1 Life History and General Distribution

The Bering skate (*Bathyraja interrupta*) is distributed from California to the Bering Sea over a wide range of depths (37–1372 m; Mecklenburg et al. 2002) and reaches a maximum length of 800 mm TL (Stevenson et al. 2007). Bering skates are only modeled and mapped for the EBS region.

D.18.3.2 Relevant Trophic Information

Skates feed on bottom invertebrates (crustaceans, molluscs, and polychaetes) and fish. Adult skates have few or no predators, but juvenile skates (particularly those in the 20-30 cm size range) are preyed on by Pacific cod and Pacific halibut.

D.18.3.3 Habitat and Biological Associations

Subadults: The covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and ROMS bottom current (Laman et al. 2022). Highest abundances were predicted along the shelf break in depths around 300 m with a northeast-flowing bottom current.

Adults: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, bottom current and sediment grain size (Laman et al. 2022). Adult Bering skate abundance was predicted to be highest along the shelf break in depths around 300°m over moderate sediment grain sizes (phi) with relatively little current flow.

D.18.3.4 Literature

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D.18.4 Big skate (*Beringraja binoculata*)

D.18.4.1 Life History and General Distribution

The big skate (*Beringraja binoculata*) ranges from the eastern Bering Sea and Aleutians Islands to Baja California though rarely south of Point Conception (Mecklenburg et al. 2002) and is one of the largest skates (maximum reported TL around 2.4 m). Though they are found between 3 and 800 m across their geographic range, they typically occur in waters shallower than 200 m over the Bering Sea shelf where they are uncommon.

D.18.4.2 Relevant Trophic Information

Skates feed on bottom invertebrates (crustaceans, molluscs, and polychaetes) and fish. Adult skates have few or no predators, but juvenile skates (particularly those in the 20-30 cm size range) are preyed on by Pacific cod and Pacific halibut.

D.18.4.3 Habitat and Biological Associations

Subadults: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). Subadult big skate were predicted along the Alaska Peninsula in warmer waters with slower, less variable bottom currents.

D.18.4.4 Literature

Laman, E. A., J. L. Pirtle, J. Harris, M. C. Siple, C. N. Rooper, T. P. Hurst, and C. L. Conrath. 2022. Advancing model-based essential fish habitat descriptions for North Pacific species in the Bering Sea. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-459, 538 p. https://doi.org/10.25923/y5gc-nk42

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D.18.5 Mud skate (*Bathyraja taranetzi*)

D.18.5.1 Life History and General Distribution

The mud skate (*Bathyraja taranetzi*) is the smallest species of skate commonly found in Alaska waters, with a maximum TL of 700 mm (Ebert 2005). This species is widely distributed across the north Pacific and ranges from the western GOA to the Kuril Islands (Stevenson et al. 2007).

D.18.5.2 Relevant Trophic Information

Skates feed on bottom invertebrates (crustaceans, molluscs, and polychaetes) and fish. Adult skates have few or no predators, but juvenile skates (particularly those in the 20-30 cm size range) are preyed on by Pacific cod and Pacific halibut.

D.18.5.3 Habitat and Biological Associations

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and ROMS bottom current (Laman et al. 2022). Subadult mud skates habitat was predicted around the Pribilof Islands and in submarine canyon heads along the continental slope at around 450 m depths with bottom currents flowing toward the northeast. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Harris et al. 2022). Cooler temperatures and a less rocky substrate are associated with high abundance of subadults. Predicted abundance was highest in the eastern and central AI, particularly around Seguam Pass, Amchitka Pass, and along the continental slope south of Atka Island.

Adults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, and currents (ROMS bottom current and current variability) (Laman et al. 2022). Adult mud skates were predicted near submarine canyon heads along the shelf break, in depths around 300 m, with cross-shelf currents flowing to the west and increasing tidal maxima. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and slope aspect (Harris et al. 2022). Adult mud skates were predicted to be abundant in deeper waters in the central AI, particularly around Amchitka Pass and along the continental slope south of Adak Island, and were often found on slopes that ascend in a northerly direction, such as those on the south side of the AI.

D.18.5.4 Literature

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D.18.6 Whiteblotched skate (*Bathyraja maculata*)

D.18.6.1 Life History and General Distribution

Whiteblotched skate (*Bathyraja maculata*) is a moderately large skate found from the western GOA to the Kuril Islands (Stevenson 2007). Whiteblotched skate is the dominant species of skate in the AI, representing over 50% of total skate biomass in the region (Ormseth 2018). Like many species in the genus *Bathyraja*, it is predominantly found along the continental slope, or near the interface between slope and shelf areas.

D.18.6.2 Relevant Trophic Information

Skates feed on bottom invertebrates (crustaceans, molluscs, and polychaetes) and fish. Adult skates have few or no predators, but juvenile skates (particularly those in the 20-30 cm size range) are preyed on by Pacific cod and Pacific halibut.

D.18.6.3 Habitat and Biological Associations

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position, with high abundances predicted along the continental slope in depths around 450 m an to the southwest of Nunivak (Laman et al. 2022). In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was geographic position, though current, current variability, bottom temperature, and tidal maximum were also important (Harris et al. 2022). Subadult abundance was predicted around Seguam Pass and at Stalemate Bank.

Adults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position with high abundances predicted along the upper continental slope and shelf break associated with submarine canyon systems along the shelf break in depths around 450 m (Laman et al. 2022). In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was geographic position, predicting high adult abundances in and around Seguam Pass, Stalemate Bank, and Amchitka Pass (Harris et al. 2022).

D.18.6.4 Literature

Harris, J., E. A. Laman, J. L. Pirtle, M. C. Siple, C. N. Rooper, T. P. Hurst, and C. L. Conrath. 2022. Advancing model-based essential fish habitat descriptions for North Pacific species in the Aleutian Islands. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-458, 406 p. https://doi.org/10.25923/ffnc-cg42

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D.19 Walleye pollock (*Gadus chalcogrammus*)

The eastern Bering Sea and Aleutian Islands pollock stocks are managed under the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (FMP). Pollock occur throughout the area covered by the FMP and straddle into the Canadian and Russian exclusive economic zone (EEZ), international waters of the central Bering Sea, and into the Chukchi Sea.

D.19.1 Life History and General Distribution

Pollock is the most abundant species within the eastern Bering Sea comprising 75 to 80 percent of the catch and 60 percent of the biomass.

Four stocks of pollock are recognized for management purposes: Gulf of Alaska, eastern Bering Sea, Aleutian Islands, and Aleutian Basin. For the contiguous sub-regions (i.e., areas adjacent to their management delineation), there appears to be some relationship among the eastern Bering Sea, Aleutian Islands, and Aleutian Basin stocks. Some strong year classes appear in all three places suggesting that pollock may expand from one area into the others or that discrete spawning areas benefit (in terms of recruitment) from similar environmental conditions. There appears to be stock separation between the Gulf of Alaska stocks and stocks to the north.

The most abundant stock of pollock is the eastern Bering Sea stock which is primarily distributed over the eastern Bering Sea outer continental shelf between approximately 70 m and 200 m. Information on pollock distribution in the eastern Bering Sea comes from commercial fishing locations, annual bottom trawl surveys and regular (every two or three years) echo-integration mid-water trawl surveys. There are also ancillary surveys for different life stages including those of the BASIS program (typically conducted in late summer and early fall) and some cooperative surveys with the Russian Federation scientists (typically covering the region a few hundred miles within the US zone from the Convention line).

The Aleutian Islands stock extends through the Aleutian Islands from 170° W. to the end of the Aleutian Islands (Attu Island), with the greatest abundance in the eastern Aleutian Islands (170° W. to Seguam Pass).

Most of the information on pollock distribution in the Aleutian Islands comes from regular (every two or three years) bottom trawl surveys. These surveys indicate that pollock are primarily located on the Bering Sea side of the Aleutian Islands, and have a spotty distribution throughout the Aleutian Islands chain, particularly during the summer months when the survey is conducted. Thus, the bottom trawl data may be a poor indicator of pollock distribution because a significant portion of the pollock biomass is likely to be unavailable to bottom trawls. Also, many areas of the Aleutian Islands shelf are untrawlable due to the rough bottom.

The Aleutian Basin stock appears to be distributed throughout the Aleutian Basin which encompasses the U.S. EEZ, Russian EEZ, and international waters in the central Bering Sea. This stock appears throughout the Aleutian Basin apparently for feeding, but concentrates near the continental shelf for spawning. The principal spawning location is thought to be near Bogoslof Island in the eastern Aleutian Islands, but data from pollock fisheries in the first quarter of the year indicate that there are other concentrations of deepwater spawning concentrations in the central and western Aleutian Islands. The Aleutian Basin spawning stock appears to be derived from migrants from the eastern Bering Sea shelf stock, and possibly some western Bering Sea pollock. Recruitment to the stock occurs generally around age 5 with younger fish being rare in the Aleutian Basin. Most of the pollock in the Aleutian Basin appear to originate from strong year classes also observed in the Aleutian Islands and eastern Bering Sea shelf region.

The Gulf of Alaska stock extends from southeast Alaska to the Aleutian Islands (170° W.), with the greatest abundance in the western and central regulatory areas (147° W. to 170° W.). Most of the information on pollock distribution in the Gulf of Alaska comes from annual winter echo-integration mid-water trawl surveys and regular (every two or three years) bottom trawl surveys. These surveys indicate that pollock are distributed throughout the shelf regions of the Gulf of Alaska at depths less than 300 m. The bottom trawl data may not provide an accurate view of pollock distribution because a significant portion of the pollock biomass may be pelagic and unavailable to bottom trawls. The principal spawning location is in Shelikof Strait, but other spawning concentrations in the Shumagin Islands, the east side of Kodiak Island, and near Prince William Sound also contribute to the stock.

In the southeastern Bering Sea and Aleutian Islands, peak pollock spawning occurs along the outer continental shelf around mid-March. North of the Pribilof Islands spawning occurs later (April and May) in smaller spawning aggregations. The deep spawning pollock of the Aleutian Basin appear to spawn slightly earlier, late February and early March.

Spawning occurs in the pelagic zone and eggs develop throughout the water column (70 to 80 m in the Bering Sea shelf). Development is dependent on water temperature. In the Bering Sea, eggs take about 17 to 20 days to develop at 4 °C in the Bogoslof area and 25.5 days at 2 °C on the shelf. Larvae are also distributed in the upper water column. In the Bering Sea the larval period lasts approximately 60 days. The larvae eat progressively larger naupliar stages of copepods as they grow and then small euphausiids as they approach transformation to juveniles (approximately 25 mm standard length). Fisheries-Oceanography Coordinated Investigations survey data indicate larval pollock may utilize the stratified warmer upper waters of the mid-shelf to avoid predation by adult pollock which reside in the colder bottom water.

At age 1 pollock are found throughout the eastern Bering Sea both in the water column and on the bottom depending on temperature. Age 1 pollock from strong year-classes appear to be found in great numbers on the inner shelf, and further north on the shelf than weak year classes which appear to be more concentrated on the outer continental shelf. From age 2 to 3 pollock are primarily pelagic during which time they are most abundant on the outer and mid-shelf northwest of the Pribilof Islands. As pollock reach maturity (age 4) in the Bering Sea, they appear to move from the northwest to the southeast shelf to recruit to the adult spawning population. Strong year-classes of pollock persist in the population in significant numbers until about age 12, and very few pollock survive beyond age 16. The oldest recorded pollock was age 31.

Growth varies by area with the largest pollock occurring on the southeastern shelf. On the northwest shelf the growth rate is slower. The upper size limit for juvenile pollock in the eastern Bering Sea is about 381 mm coinciding with the size of 50 percent maturity (Stahl and Kruse 2008). There is evidence that this varies over time.

D.19.2 Relevant Trophic Information

Pollock juveniles and newly maturing pollock primarily eat copepods and euphausiids. Older pollock become increasingly piscivorous, with pollock (cannibalism) comprising much of the diet in the Bering Sea. Most of the pollock consumed by pollock are age 0 and 1 pollock, and past research suggests that cannibalism can regulate year-class size. In some years, weak year-classes occur within the range of adults, while strong year-classes are those that are transported to areas outside the range of adult abundance.

Being the dominant species in the eastern Bering Sea, pollock is an important food source for other fish, marine mammals, and birds. On the Pribilof Islands hatching success and fledgling survival of marine birds has been tied to the availability of age 0 pollock to nesting birds.

D.19.3 Habitat and Biological Associations

Eggs: Pelagic on outer continental shelf generally over 100 to 200 m depth in Bering Sea.

Larvae: Pelagic outer to mid-shelf region in Bering Sea.

Pelagic Early Juveniles: Age 0 appears to be pelagic, as is age 2 and 3. Age 1 pelagic and demersal with a widespread distribution and no known benthic habitat preference.

Settled Early Juveniles: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom depth, tidal current maximum, and bottom temperature (Laman et al. 2022). Predicted abundance of settled early juvenile walleye pollock was highest over the middle shelf in the northern half of the EBS in depths shallower than 300 m with maximum tidal current around 0.5 kts (~30 cm/s) and decreasing bottom temperatures. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, terrain aspect, current, and bottom temperature (Harris et al. 2022). Predicted abundance was highest in the eastern AI, near-shore to Unalaska Island, with additional pockets of high abundance around Atka and Attu islands. Higher habitat-related growth potential was predicted to occur in the eastern AI.

Subadults: In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, and bottom depth (Laman et al. 2022). Ensemble-predicted subadult walleye pollock abundance was highest over the outer shelf in the northwest portion of the EBS in depths less than 200 m and at increasing bottom temperatures. In the AI, the covariate contributing the most to the final SDM EFH map for this life stage was bottom depth, with almost all subadults predicted above the 300 m depth contour (Harris et al. 2022). Estimated abundances were high in the far west around Attu Island and in the east around Unalaska Island.

Adults: Adults occur both pelagically and demersally on the outer and mid-continental shelf of the Gulf of Alaska, eastern Bering Sea and Aleutian Islands. In the eastern Bering Sea few adult pollock occur in waters shallower than 70 m. Adult pollock also occur pelagically in the Aleutian Basin. Adult pollock range throughout the Bering Sea in both the U.S. and Russian waters; however, the maps provided for this document detail distributions for pollock in the U.S. EEZ and the Aleutian Basin. In the EBS, the covariates contributing the most to the final SDM EFH map for this life stage were geographic position, bottom temperature, bottom depth, and current (Laman et al. 2022). Predicted adult walleye pollock abundance was highest over the middle shelf-outer shelf domain transition in the northern half of the EBS with increasing bottom temperatures and sediment grain sizes at depths around 150 m with current flowing to the southwest. In the AI, the covariates contributing the most to the final SDM EFH map for this life stage were bottom depth, geographic position, and current, with predicted abundamces between 200 – 300 m depths with southerly currents (Harris et al. 2022). Adult walleye pollock had high densities near Unimak Pass and in the eastern AI.

Habitat and Biological Associations: Walleye Pollock

Stage - EFH Level	Duration or Age	Diet/Prey	Season / Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	14 days at 5 °C	None	Feb–Apr	OCS, USP	P	NA	G?	
Larvae	60 days	copepod naupli and small euphausiids	Mar–Jul	MCS, OCS	P	NA	G? F	pollock larvae with jellyfish
Settled Early Juveniles /Subadults	0.4 to 4.5 years	pelagic crustaceans, copepods and euphausiids	Aug. +	OCS, MCS, ICS	P, SD	NA	CL, F	
Adults	4.5–16 years	pelagic crustaceans and fish	spawning Feb–Apr	OCS, BSN	P, SD	UNK	F UP	increasingly demersal with age.

D.19.4 Literature

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D.20 Yellowfin sole (*Limanda aspera*)

D.20.1 Life History and General Distribution

Yellowfin sole are distributed in North American waters from off British Columbia, Canada, (approximately latitude 49° N.) to the Chukchi Sea (about latitude 70° N.) and south along the Asian coast to about latitude 35° N. off the South Korean coast in the Sea of Japan. Adults exhibit a benthic lifestyle and occupy separate winter spawning and summertime feeding distributions on the eastern Bering Sea shelf. From over-winter grounds near the shelf margins, adults begin a migration onto the inner shelf in April or early May each year for spawning and feeding. A protracted and variable spawning period may range from as early as late May through August occurring primarily in shallow water. Fecundity varies with size and was reported to range from 1.3 to 3.3 million eggs for fish 250 to 450 mm long. Eggs have been found to the limits of inshore ichthyoplankton sampling over a widespread area to at least as far north as Nunivak Island. Larvae have been measured at 2.2 to 5.5 mm in July and 2.5 to 12.3 mm in late August and early September. The age or size at metamorphosis is unknown. Upon settlement in nearshore areas, juveniles preferentially select sediment suitable for feeding on meiofaunal prey and burrowing for protection. Juveniles are separate from the adult population, remaining in shallow areas until they reach approximately 150 mm. The estimated age of 50 percent maturity is 10.5 years (approximately 290 mm) for females based on samples collected in 1992 and 1993 and 10.14 from an updated study using 2012 collections. Natural mortality rate is believed to range from 0.12 to 0.16.

The approximate upper size limit of juvenile fish is 270 mm.

D.20.2 Relevant Trophic Information

Groundfish predators include Pacific cod, skates, and Pacific halibut, mostly on fish ranging from 70 to 250 mm standard length. Adult walleye pollock feed mainly on bivalves, polychaete, amphipods, and echiurids.

D.20.3 Habitat and Biological Associations

<u>*Larvae:*</u> Planktonic larvae for at least 2 to 3 months until metamorphosis occurs, usually inhabiting shallow areas.

<u>*Settled Early Juveniles*</u>: The covariates contributing the most to the final SDM EFH map for this life stage were geographic position and bottom depth (Laman et al. 2022). Settled early juvenile yellowfin sole abundance predictions were highest on the inner shelf around Nunivak Island in shallower waters.

<u>Subadults</u>: The covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position (Laman et al. 2022). Subadult YFS abundance predictions were highest over the EBS inner shelf domain south of Nunivak Island in shallower waters.

<u>Adults</u>: Summertime spawning and feeding on sandy substrates of the eastern Bering Sea shelf. Widespread distribution mainly on the middle and inner portion of the shelf, then a wintertime migration to deeper waters of the shelf margin to avoid extreme cold water temperatures. The covariates contributing the most to the final SDM EFH map for this life stage were bottom depth and geographic position, which predicted the highest abundances of adult YFS in shallower waters along the inner and middle shelf domains south of Nunivak Island and in to Bristol Bay (Laman et al. 2022).

Habitat and Biological Associations: Yellowfin sole

Stage - EFH Level	Duration or Age	Diet/Prey	Season/Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs		NA	summer	BAY, BCH	P			
Larvae	2–3 months?	U phyto/zoo plankton?	summer autumn?	BAY, BCH ICS	P			
Settled Early Juveniles	to 5.5 yrs	polychaete bivalves amphipods echiurids	all year	BAY, ICS OCS	D	S, SM		
Subadults	5.5 to 10 yrs	polychaete bivalves amphipods echiurids	all year	BAY, ICS OCS	D	S, SM, MS		
Adults	10+ years	polychaete bivalves amphipods echiurids	spawning/ feeding May–August non-spawning Nov–April	BAY BCH ICS, MCS OCS	D	S, SM, MS, M	ice edge	

D.20.4 Literature

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Appendix E Maps of Essential Fish Habitat

E.1 Outline

Maps of essential fish habitat are included in this section for the following species (life stage is indicated in parentheses) and EFH information levels (L) 1-3 for the eastern Bering Sea (EBS) and Aleutian Islands (AI) (see Harris et al. 2022 and Laman et al. 2022 for mapping methods):

Figure E-1 to E-8	Alaska plaice (egg, larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-1, subadult summer L2 E-2, adult summer L2 E-3; • egg summer L1 E-4, larvae summer L1 E-5; • adult fall L1 E-6, adult winter L1 E-7, adult spring L1 E-8.
Figure E-9 to E-22	Arrowtooth flounder (larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-9, subadult summer L2 E-10, adult summer L2 E-11; • larvae summer L1 E-12, adult fall L1 E-13, adult winter L1 E-14, adult spring L1 E-15. AI • settled early juvenile summer L2 E-16, subadult summer L2 E-17, adult summer L2 E-18; • larvae summer L1 E-19, adult fall L1 E-20, adult winter L1 E-21, adult spring L1 E-22.
Figure E-23 to E-33	Atka mackerel (egg, larvae, subadult, adult) EBS • adult summer L2 E-23; • larvae summer L1 E-24, adult fall L1 E-25, adult winter L1 E-26, adult spring L1 E-27. AI • subadult summer L2 E-28, adult summer L2 E-29; • egg summer L1 E-30, adult fall L1 E-31, adult winter L1 E-32, adult spring L1 E-33.
Figure E-34 to E-52	Flathead sole/Bering flounder complex (subadult, adult) EBS • subadult summer L2 E-34, adult summer L2 E-35.
Figure E-36 to E-37	Bering flounder (subadult, adult) EBS • subadult summer L2 E-36, adult summer L2 E-37.

Figure E-38 to E-52	Flathead sole (egg, larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-38, subadult summer L2 E-39, adult summer L2 E-40; • egg summer L1 E-41, larvae summer L1 E-42, adult fall L1 E-43, adult winter L1 E-44, adult spring L1 E-45. AI • settled early juvenile summer L2 E-46, subadult summer L2 E-47, adult summer L2 E-48; • egg summer L1 E-49, adult fall L1 E-50, adult winter L1 E-51, adult spring L1 E-52.
Figure E-53 to E-62	Greenland turbot (larvae, subadult, adult) EBS • subadult summer L2 E-53, adult summer L2 E-54; • larvae summer L1 E-55, adult fall L1 E-56, adult winter L1 E-57, adult spring L1 E-58. AI • adult summer L2 E-59; • adult fall L1 E-60, adult winter L1 E-61, adult spring L1 E-62.
Figure E-63 to E-72	Kamchatka flounder (subadult, adult) EBS • subadult summer L2 E-63, adult summer L2 E-64; • adult fall L1 E-65, adult winter L1 E-66, adult spring L1 E-67. AI • subadult summer L2 E-68, adult summer L2 E-69; • adult fall L1 E-70, adult winter L1 E-71, adult spring L1 E-72.
Figure E-73 to E-86	Northern rock sole (larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-73, subadult summer L2 E-74, adult summer L2 E-75; • larvae summer L1 E-76, adult fall L1 E-77, adult winter L1 E-78, adult spring L1 E-79. AI • settled early juvenile summer L2 E-80, subadult summer L2 E-81, adult summer L2 E-82; • larvae summer L1 E-83, adult fall L1 E-84, adult winter L1 E-85, adult spring L1 E-86.
Figure E-87 to E-94	Northern rockfish (adult) EBS • adult summer L2 E-87; • adult fall L1 E-88, adult winter L1 E-89, adult spring L1 E-90. AI • adult summer L2 E-91; • adult fall L1 E-92, adult winter L1 E-93, adult spring L1 E-94.

Figure E-95 to E-102	Octopus (adult) EBS • adult summer L2 E-95; • adult fall L1 E-96, adult winter L1 E-97, adult spring L1 E-98. AI • adult summer L1 E-99, adult fall L1 E-100, adult winter L1 E-101, adult spring L1 E-102.
Figure E-103 to E-132	Other flatfish complex (subadult, adult) EBS • subadult/adult summer L2 E-103. AI • subadult summer L2 E-104, adult summer L2 E-105.
Figure E-106	Butter sole (subadult/adult) EBS • subadult/adult summer L2 E-106.
Figure E-107	Deepsea sole (subadult/adult) EBS • subadult/adult summer L2 E-107.
Figure E-108 to E-114	Dover sole (subadult, adult) EBS • subadult summer L2 E-108, adult summer L2 E-109; • adult winter L1 E-110, adult spring L1 E-111. AI • subadult summer L2 E-112, adult summer L2 E-113; • adult spring L1 E-114.
Figure E-115	Longhead dab (subadult/adult) EBS • subadult/adult summer L2 E-115
Figure E-116 to E-128	Rex sole (egg, settled early juvenile, subadult, adult) EBS • settled early juvenile L2 E-116, subadult summer L2 E-117, adult summer L2 E-118; • egg summer L1 E-119, adult fall L1 E-120, adult winter L1 E-121, adult spring L1 E-122. AI • subadult summer L2 E-123, adult summer L2 E-124; • egg summer L1 E-125, adult fall L1 E-126, adult winter L1 E-127, adult spring L1 E-128.
Figure E-129 to E-130	Sakhalin sole (subadult, adult) EBS • subadult summer L2 E-129, adult summer L2 E-130.

Figure E-131 to E-132	Starry flounder (subadult, adult) EBS • subadult summer L2 E-131, adult summer L2 E-132.
Figure E-133 to E-153	Other rockfish complex (subadult/adult) AI • subadult/adult summer L2 E-133.
Figure E-134 to E-142	Dusky rockfish (subadult, adult) EBS • adult summer L1 E-134, adult fall L1 E-135, adult winter L1 E-136, adult spring L1 E-137. AI • subadult summer L2 E-138, adult summer L2 E-139. • adult fall L1 E-140, adult winter L1 E-141, adult spring L1 E-142.
Figure E-143	Harlequin rockfish (adult) AI • adult summer L2 E-143.
Figure E-144 to E-153	Shortspine thornyhead (subadult, adult) EBS • subadult summer L2 E-144, adult summer L2 E-145. • adult fall L1 E-146, adult winter L1 E-147, adult spring L1 E-148. AI • subadult summer L2 E-149, adult summer L2 E-150. • adult fall L1 E-151, adult winter L1 E-152, adult spring L1 E-153.
Figure E-154 to E-168	Pacific cod (larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-154, subadult summer L2 E-155, adult summer L2 E-156. • larvae summer L1 E-157, adult fall L1 E-158, adult winter L1 E-159, adult spring L1 E-160. • settled early juvenile summer L3 growth E-161, settled early juvenile L3 condition E-162. AI • subadult summer L2 E-163, adult summer L2 E-164. • larvae summer L1 E-165, adult fall L1 E-166, adult winter L1 E-167, adult spring L1 E-168.
Figure E-169 to E-182	Pacific ocean perch (larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-169, subadult summer L2 E-170, adult summer L2 E-171.

	• larvae summer L1 E-172, adult fall L1 E-173, adult winter L1 E-174, adult spring L1 E-175. AI • settled early juvenile summer L2 E-176, subadult summer L2 E-177, adult summer L2 E-178. • larvae summer L1 E-179, adult fall L1 E-180, adult winter L1 E-181, adult spring L1 E-182.
Figure E-183 to E-186	Rougheye/Blackspotted rockfish (subadult, adult) EBS • subadult summer L2 E-183, adult summer L2 E-184. AI • subadult summer L2 E-185, adult summer L2 E-186.
Figure E-187 to E-192	Rougheye rockfish (adult) EBS • adult fall L1 E-187, adult winter L1 E-188, adult spring L1 E-189. AI • adult fall L1 E-190, adult winter L1 E-191, adult spring L1 E-192.
Figure E-193 to E-203	Sablefish (settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-193, subadult summer L2 E-194, adult summer L2 E-195. • adult fall L1 E-196, adult winter L1 E-197, adult spring L1 E-198. AI • subadult summer L2 E-199, adult summer L2 E-200. • adult fall L1 E-201, adult winter L1 E-202, adult spring L1 E-203.
Figure E-204 to E-213	Shortraker rockfish (subadult, adult) EBS • subadult summer L2 E-204, adult summer L2 E-205. • adult fall L1 E-206, adult winter L1 E-207, adult spring L1 E-208. AI • subadult summer L2 E-209, adult summer L2 E-210. • adult fall L1 E-211, adult winter L1 E-212, adult spring L1 E-213.
Figure E-214 to E-217	Skate complex (subadult, adult) EBS • subadult summer L2 E-214, adult summer L2 E-215. AI • subadult summer L2 E-216, adult summer L2 E-217.

Figure E-218 to E-227	Alaska skate (subadult, adult) EBS • subadult summer L2 E-218, adult summer L2 E-219. • adult fall L1 E-220, adult winter L1 E-221, adult spring L1 E-222. AI • subadult summer L2 E-223, adult summer L2 E-224. • adult fall L1 E-225, adult winter L1 E-226, adult spring L1 E-227.
Figure E-228 to E-237	Aleutian skate (subadult, adult) EBS • subadult summer L2 E-228, adult summer L2 E-229. • adult fall L1 E-230, adult winter L1 E-231, adult spring L1 E-232. AI • subadult summer L2 E-233, adult summer L2 E-234. • adult fall L1 E-235, adult winter L1 E-236, adult spring L1 E-237.
Figure E-238 to E-239	Bering skate (subadult, adult) EBS • subadult summer L2 E-238, adult summer L2 E-239.
Figure E-240 to E-249	Mud skate (subadult, adult) EBS • subadult summer L2 E-240, adult summer L2 E-241. • adult fall L1 E-242, adult winter L1 E-243, adult spring L1 E-244. AI • subadult summer L2 E-245, adult summer L2 E-246. • adult fall L1 E-247, adult winter L1 E-248, adult spring L1 E-249.
Figure E-250 to E-253	Whiteblotched skate (subadult, adult) EBS • subadult summer L2 E-250, adult summer L2 E-251. AI • subadult summer L2 E-252, adult summer L2 E-253.
Figure E-254 to E-271	Walleye pollock (eggs, larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-254, subadult summer L2 E-255, adult summer L2 E-256. • eggs summer L1 E-257, larvae summer L1 E-258, adult fall L1 E-259, adult winter L1 E-260, adult spring L1 E-261. AI • settled early juvenile summer L2 E-262, subadult summer L2 E-263, adult summer L2 E-264.

	• eggs summer L1 E-265, larvae summer L1 E-266, adult fall L1 E-267, adult winter L1 E-268, adult spring L1 E-269. • settled early juvenile summer L3 growth E-270, settled early juvenile summer L3 condition E-271.
Figure E-272 to E-279	Yellowfin sole (eggs, larvae, settled early juvenile, subadult, adult) EBS • settled early juvenile summer L2 E-272, subadult summer L2 E-273, adult summer L2 E-274. • eggs summer L1 E-275, larvae summer L1 E-276, adult fall L1 E-277, adult winter L1 E-278, adult fall spring L1 E-279.

E.2 Essential Fish Habitat (EFH) Maps

The mapping requirements for EFH component 1 descriptions and identification are that some or all portions of the geographic range of the species are mapped (50 CFR 600.815(a)(1)). The EFH regulations provide an approach to organize the information necessary to describe and identify EFH, which should be designated at the highest level possible—

Level 1: Distribution data are available for some or all portions of the geographic range of the species.

Level 2: Habitat-related densities or relative abundance of the species are available.

Level 3: Growth, reproduction, or survival rates within habitats are available.

Level 4: Production rates by habitat are available. [Not available at this time.]

New maps of species' habitat-related abundance predicted from species distribution model (SDM) ensembles was used to map EFH Level 2 information for the 2023 EFH 5-year Review for settled early juveniles, subadults, and adults in the summer from their distribution and abundance in 1991-2019 in the Aleutian Islands (AI) (Harris et al. 2022) and in 1982-2019 in the eastern Bering Sea (EBS) (Laman et al. 2022). The new EFH Level 2 maps have replaced the summer SDM EFH maps for species' life stages from the 2017 EFH 5-year Review. EFH maps for other seasons (fall, winter, spring) from the 2017 5-year Review will remain.

The definition of EFH area in Alaska is the area containing 95% of the occupied habitat (NMFS 2005). Occupied habitat was defined as all locations where a species' life stage had an encounter probability greater than 5%, where encounter rates were derived from the SDM predictions and used to remove locations that had low encounter probabilities from inclusion in the EFH area (Harris et al. 2022, Laman et al. 2022). The new 2023 EFH maps are presented using percentile areas containing 95%, 75%, 50%, and 25% of the occupied habitat. Each of the EFH subareas describes a more focused partition of the total EFH area. The area containing 75% of the occupied habitat based on SDM predictions is referred to as the "principal EFH area." For the fishing effects analysis (EFH component 2), the area containing 50% of the occupied habitat is termed the "core EFH area". The areas containing the top 25% of the occupied area are referred to as "EFH hot spots". Mapping habitat percentiles for EFH subareas like these helps demonstrate the heterogeneity of fish distributions over available habitat within the larger area identified as EFH.

While EFH must be designated for each managed species, EFH may be designated for assemblages of species with justification or scientific rationale provided (50 CFR 600.815(a)(1)(iv)(E)). EFH maps from the 2023 5-year Review are presented for the first time for multi-species stock complexes using aggregated single species SDMs to serve as proxies for individual species in the stock complex where an SDM EFH map was not possible due to data limitations. In the following sections the EFH maps for the stock complex are presented first, followed by individual species in the stock complex where an EFH map was possible.

EFH Level 3 maps of habitat-related vital rates for settled early juveniles were mapped for the first time in the 2023 Review by combining spatial projections of temperature dependent growth and lipid accumulation (condition) rates with SDMs (Harris et al. 2022, Laman et al. 2022).

E.3 Figures

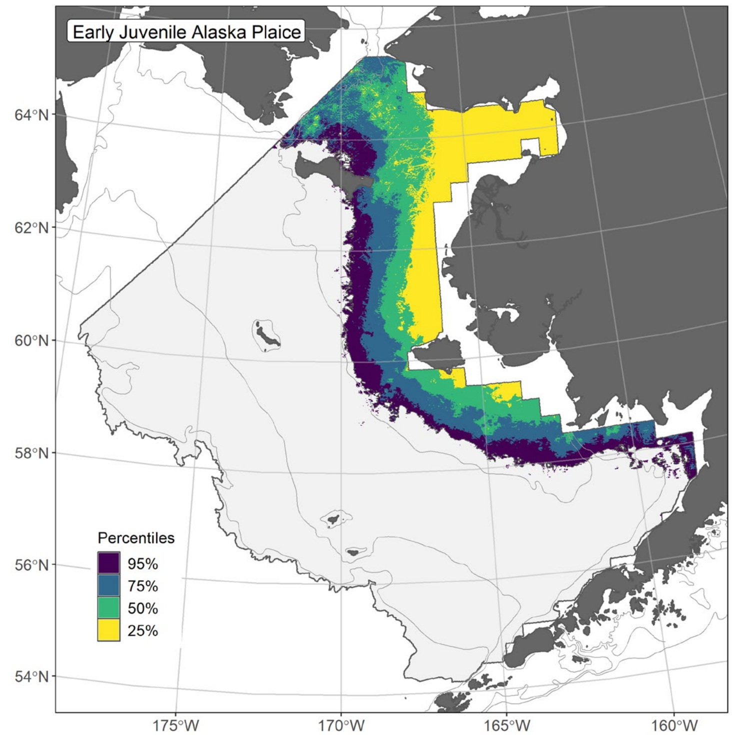

Figure E-1 EFH area of EBS settled early juvenile Alaska plaice, summer

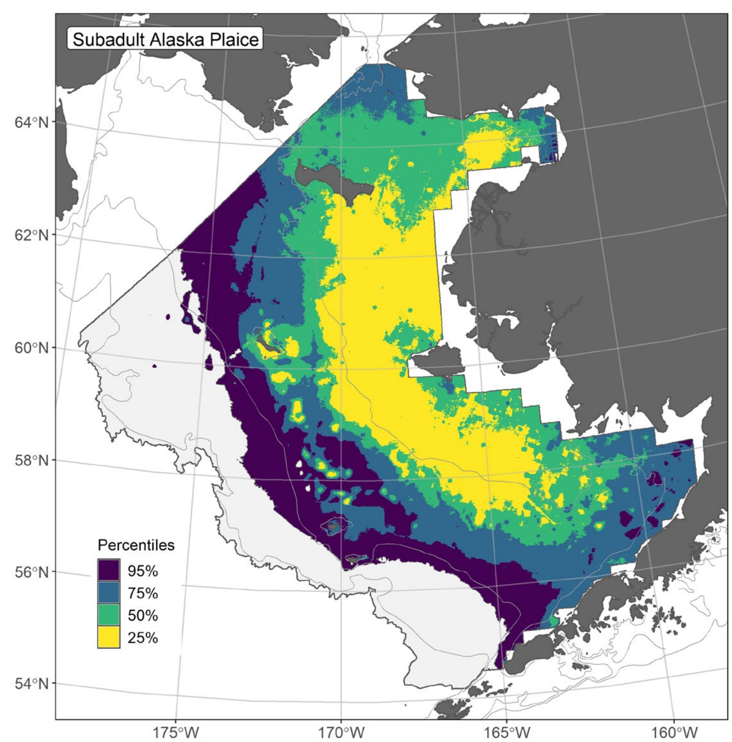

Figure E-2 EFH area of EBS subadult Alaska plaice, summer

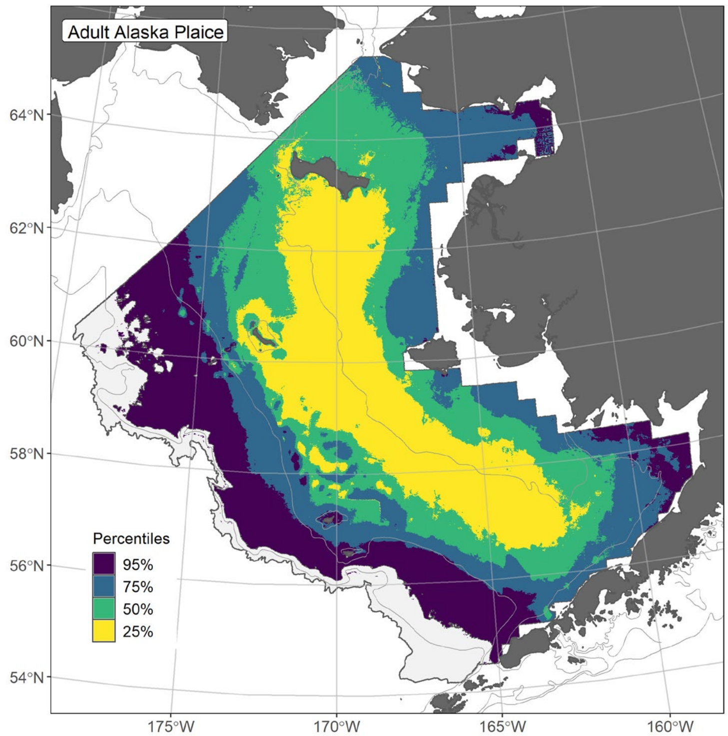

Figure E-3 EFH area of EBS adult Alaska plaice, summer

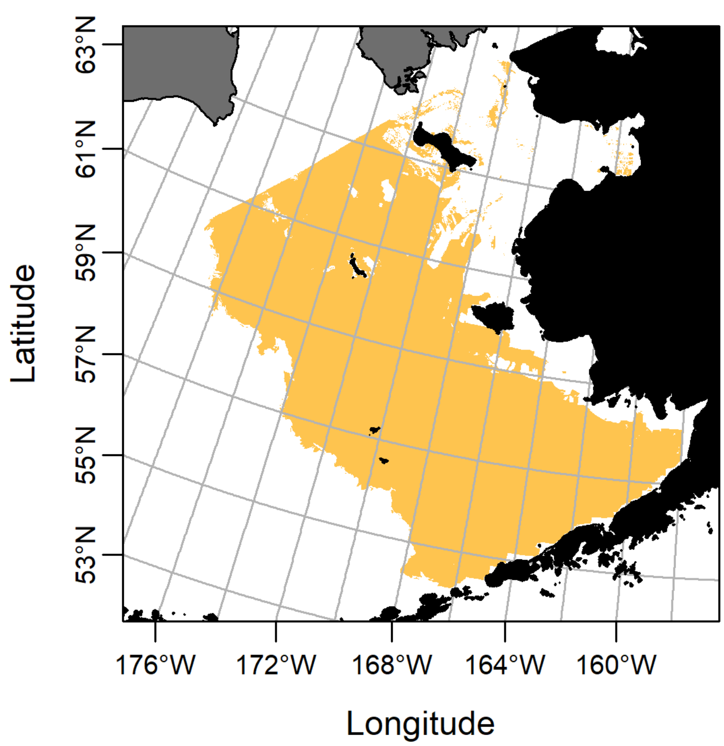

Figure E-4 EFH area of EBS Alaska plaice eggs, summer

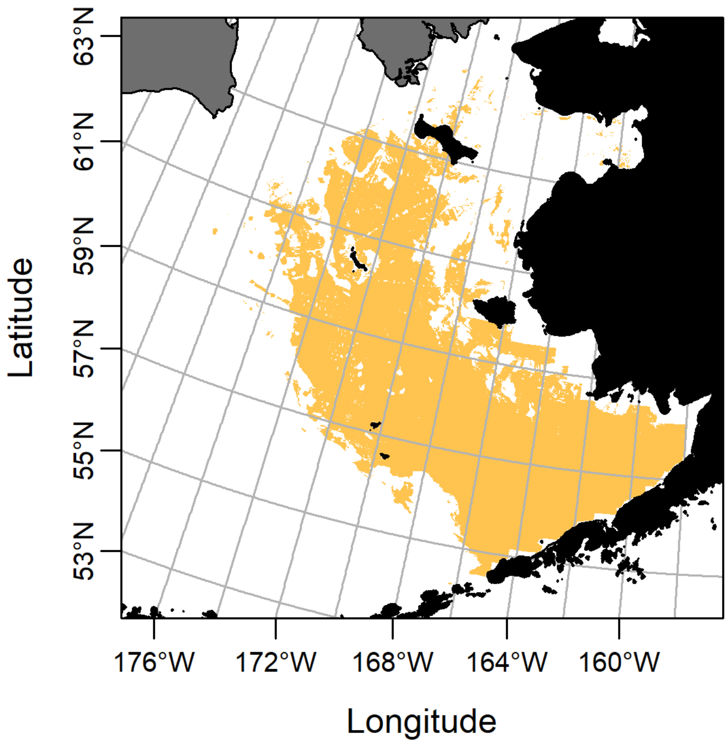

Figure E-5 EFH area of EBS Alaska plaice larvae, summer

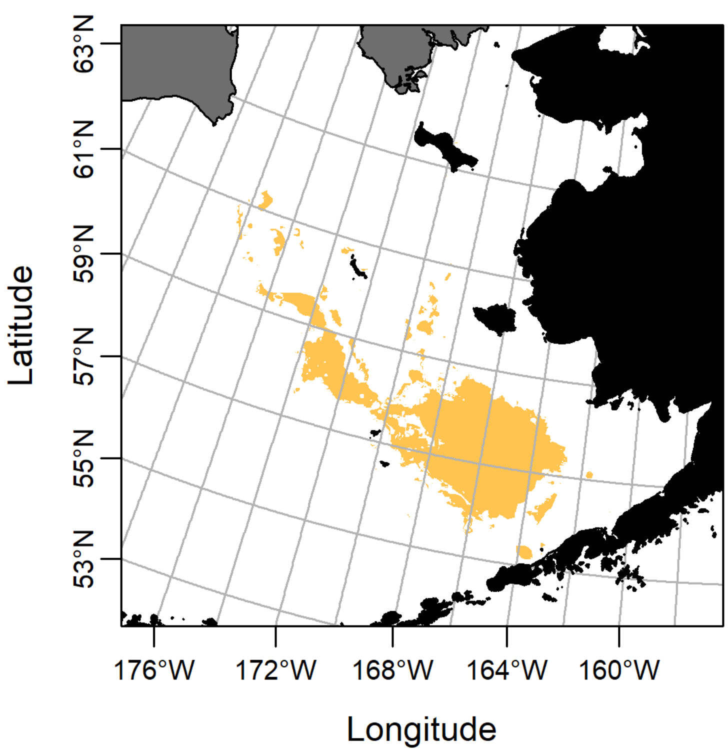

Figure E-6 EFH area of EBS adult Alaska plaice, fall

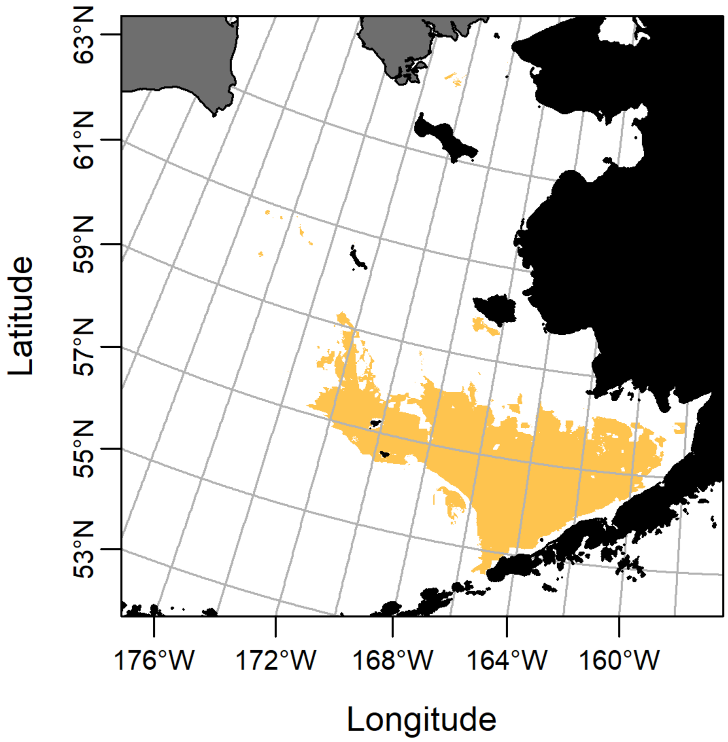

Figure E-7 EFH area of EBS adult Alaska plaice, winter

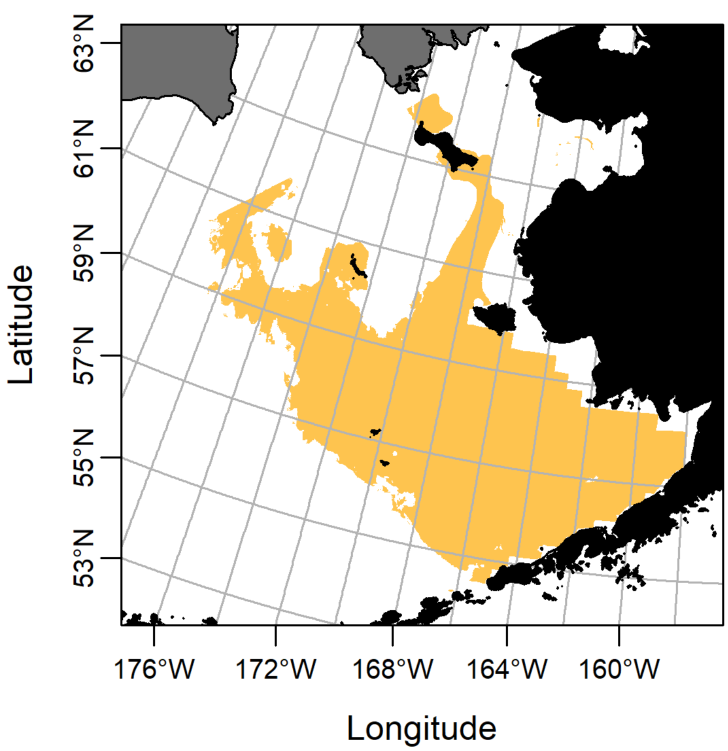

Figure E-8 EFH area of EBS adult Alaska plaice, spring

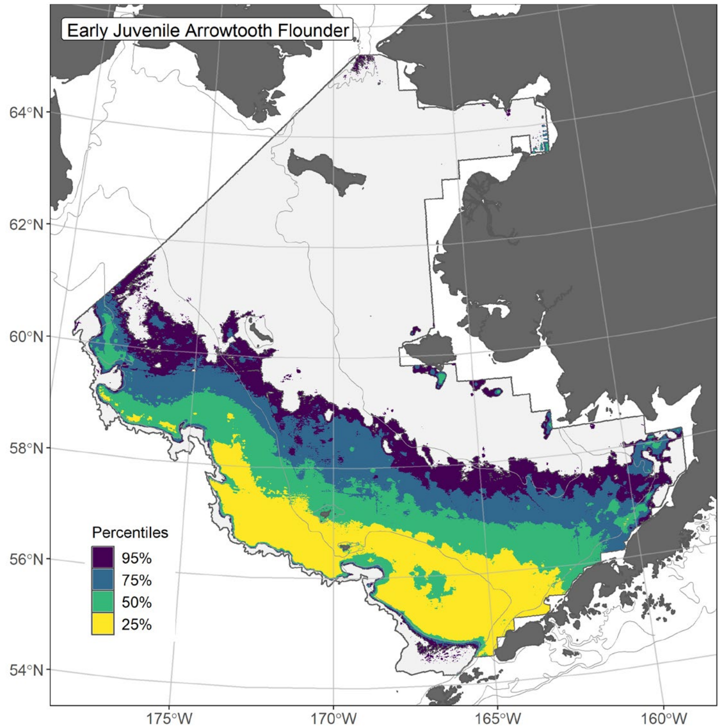

Figure E-9 EFH area of EBS settled early juvenile arrowtooth flounder, summer

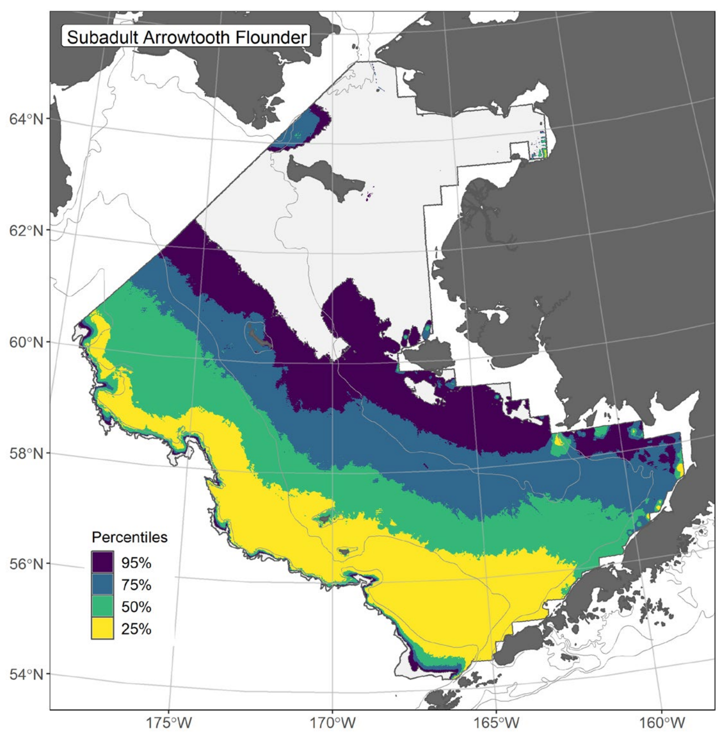

Figure E-10 EFH area of EBS subadult arrowtooth flounder, summer

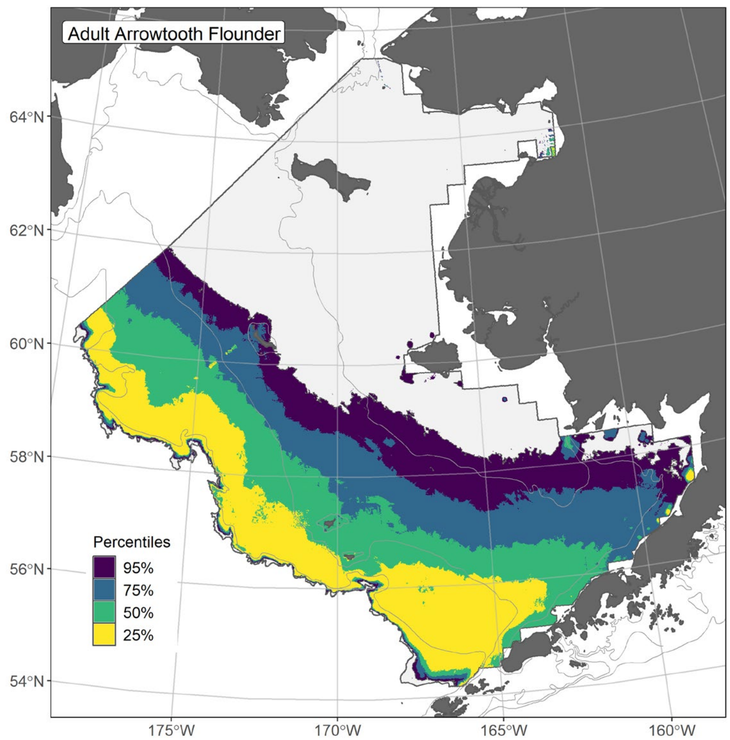

Figure E-11 EFH area of EBS adult arrowtooth flounder, summer

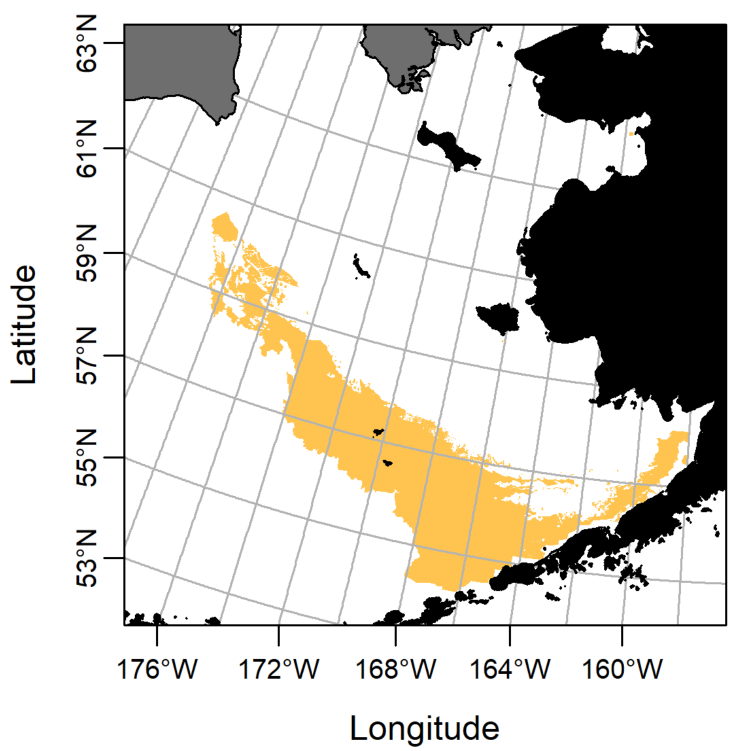

Figure E-12 EFH area of EBS arrowtooth flounder larvae, summer

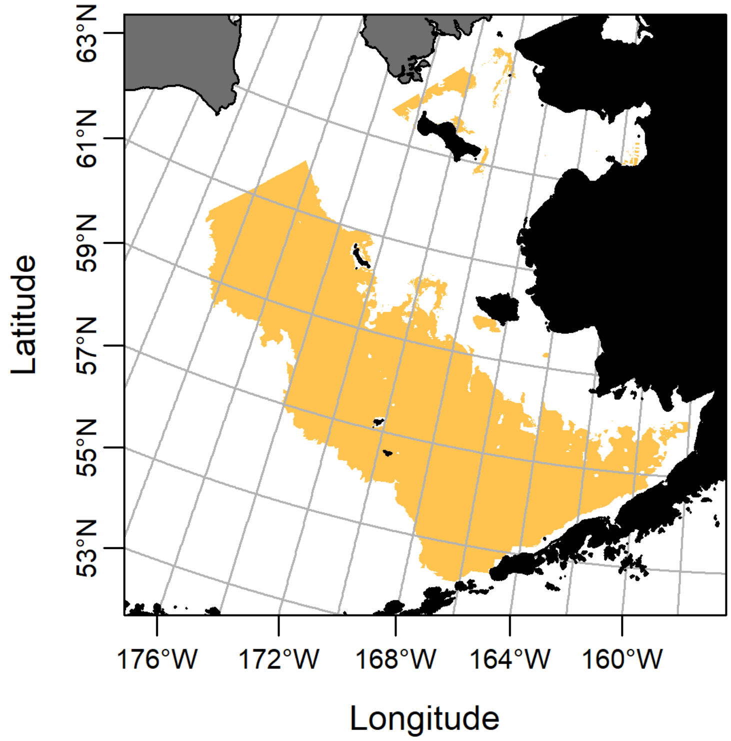

Figure E-13 EFH area of EBS adult arrowtooth flounder, fall

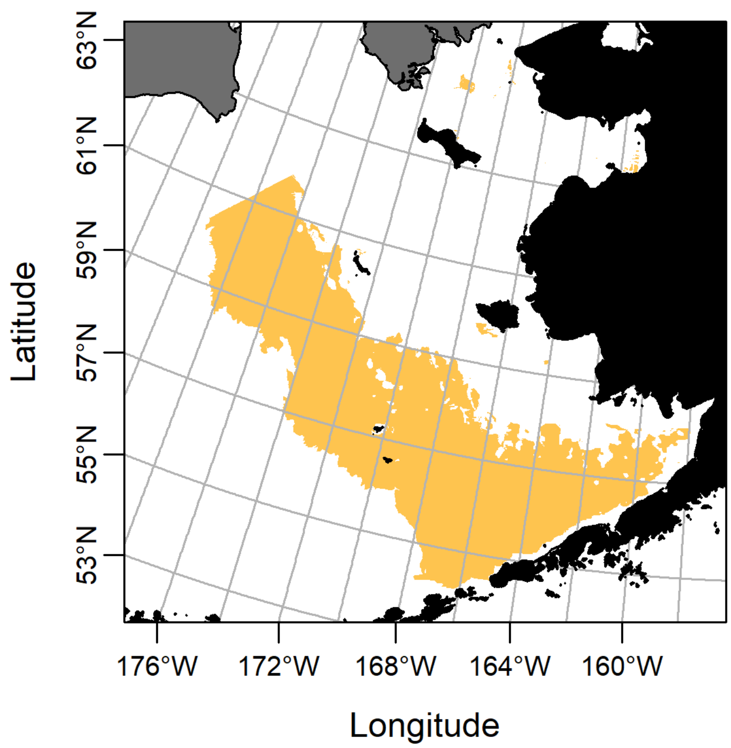

Figure E-14 EFH area of EBS adult arrowtooth flounder, winter

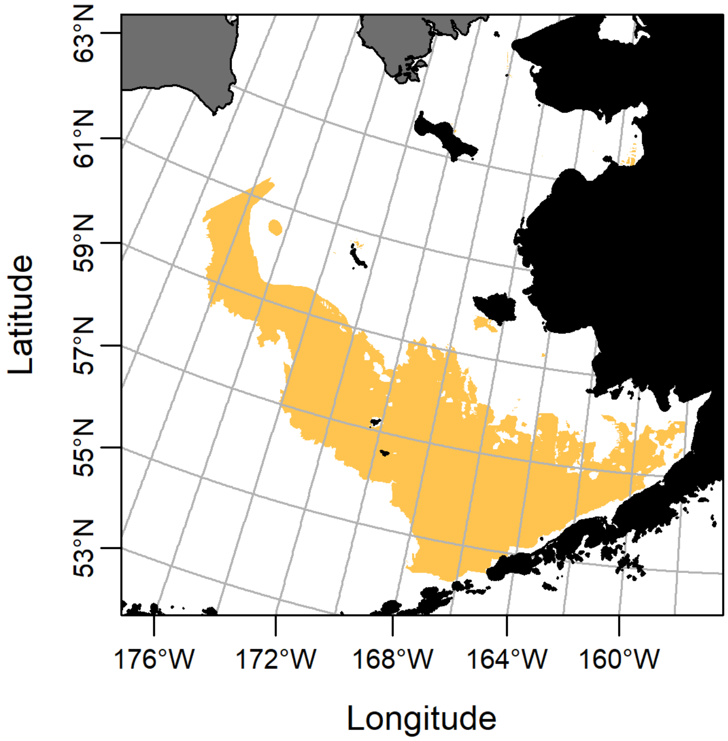

Figure E-15 EFH area of EBS adult arrowtooth flounder, spring

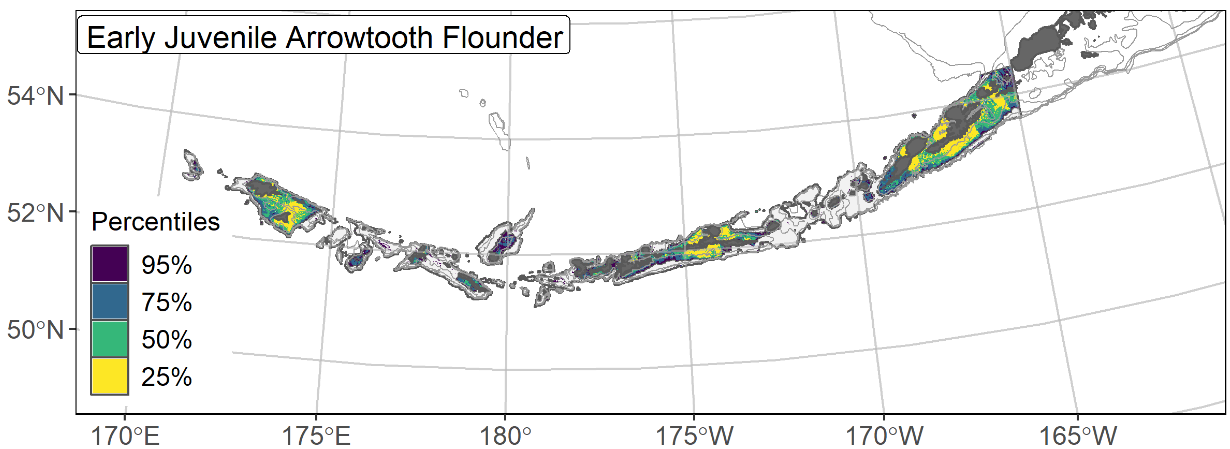

Figure E-16 EFH area of AI settled early juvenile arrowtooth flounder, summer

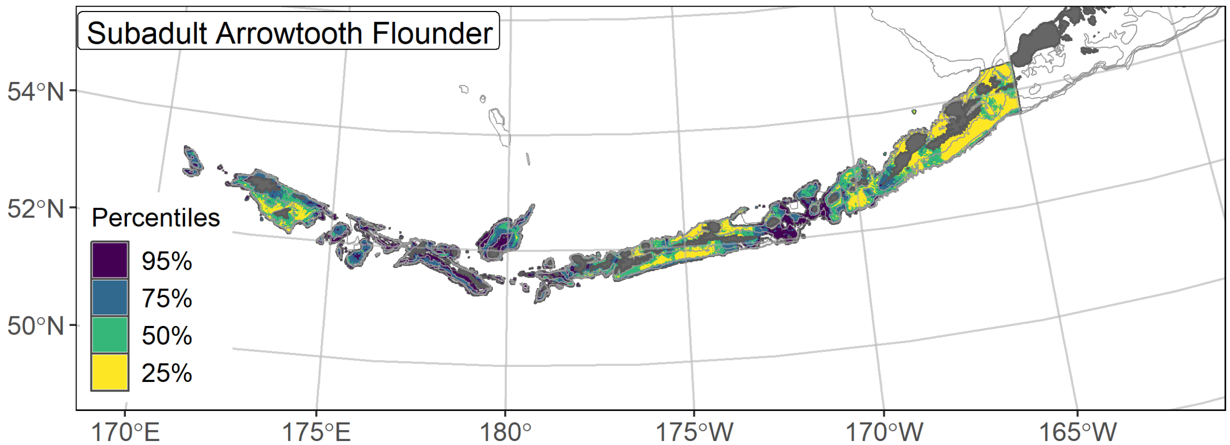

Figure E-17 EFH area of AI subadult arrowtooth flounder, summer

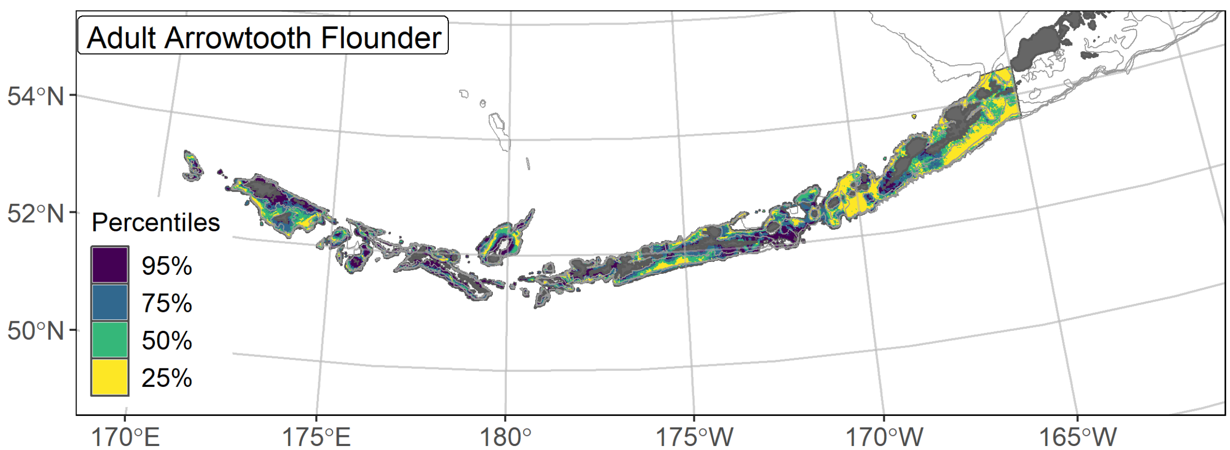

Figure E-18 EFH area of AI adult arrowtooth flounder, summer

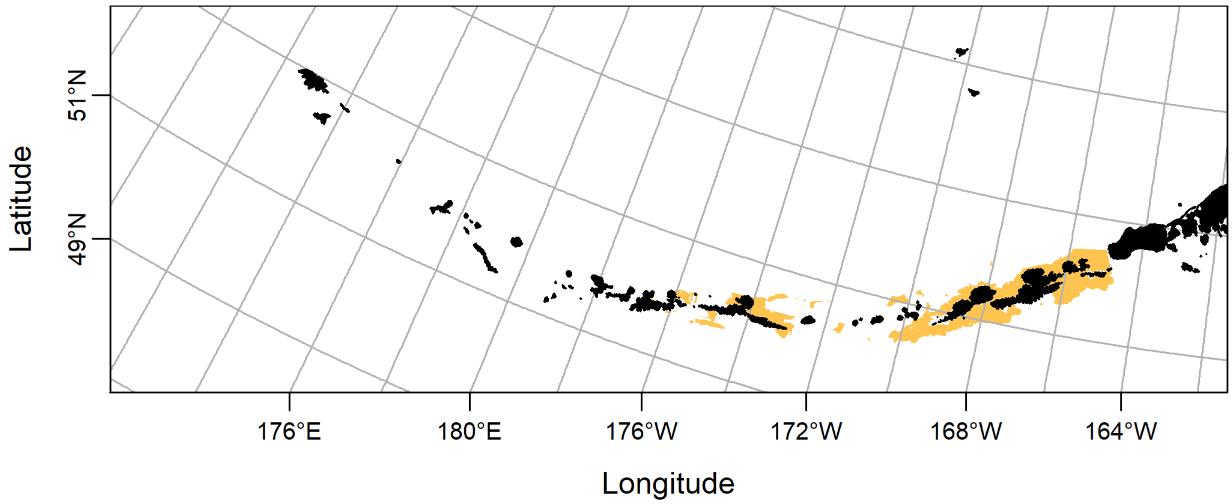

Figure E-19 EFH area of AI arrowtooth flounder larvae, summer

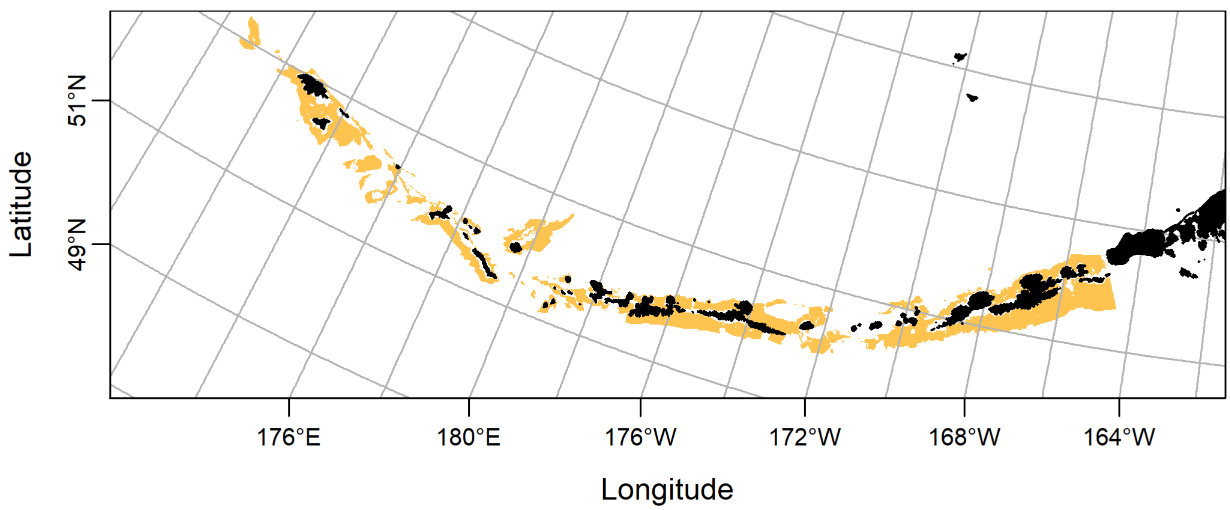

Figure E-20 EFH area of AI adult arrowtooth flounder, fall

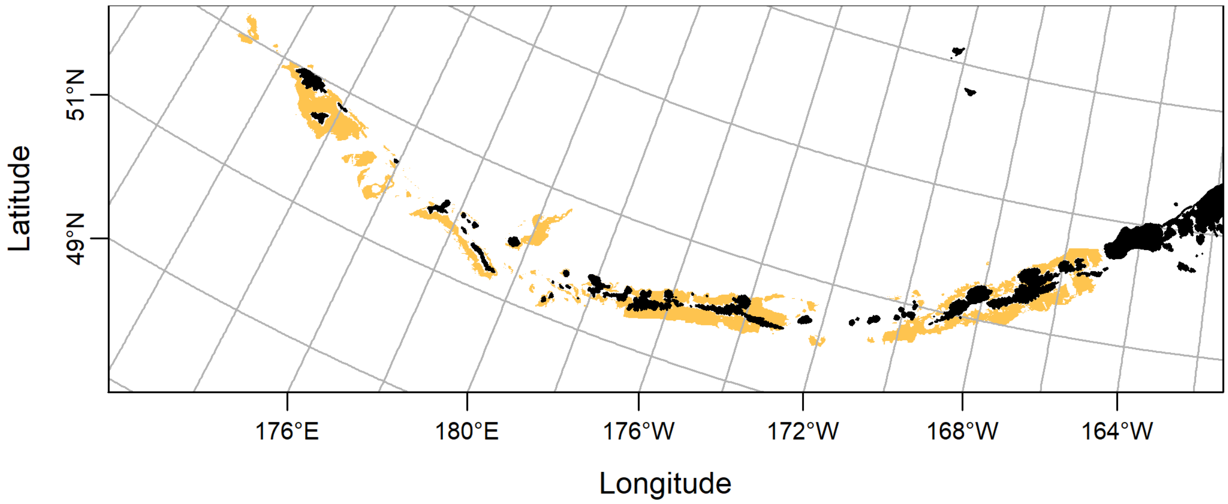

Figure E-21 EFH area of AI adult arrowtooth flounder, winter

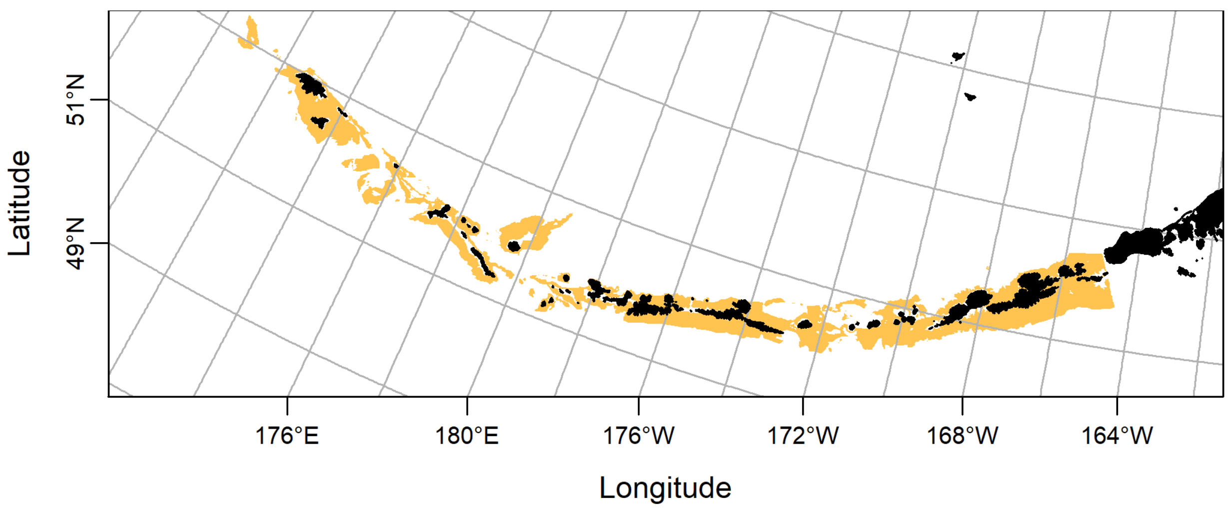

Figure E-22 EFH area of AI adult arrowtooth flounder, spring

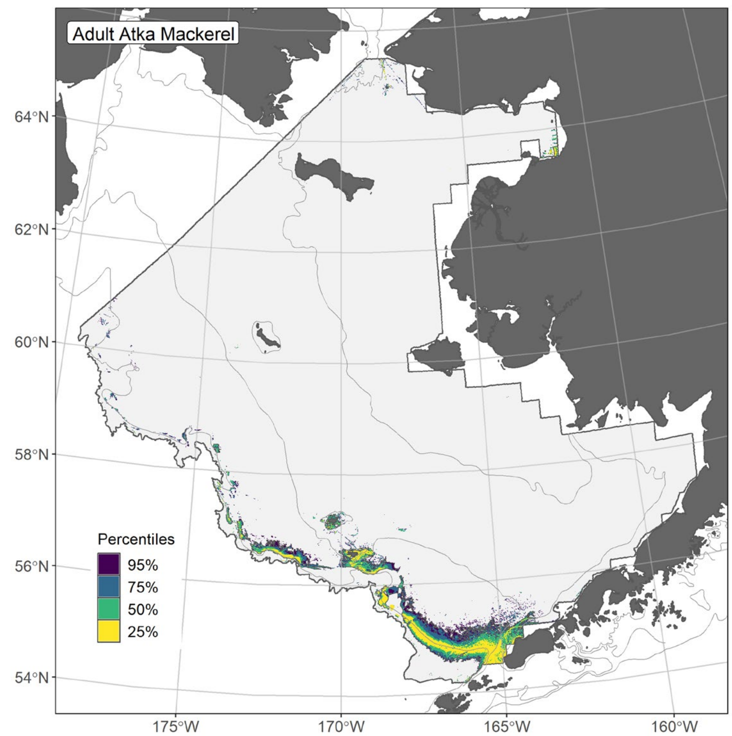

Figure E-23 EFH area of EBS adult Atka mackerel, summer

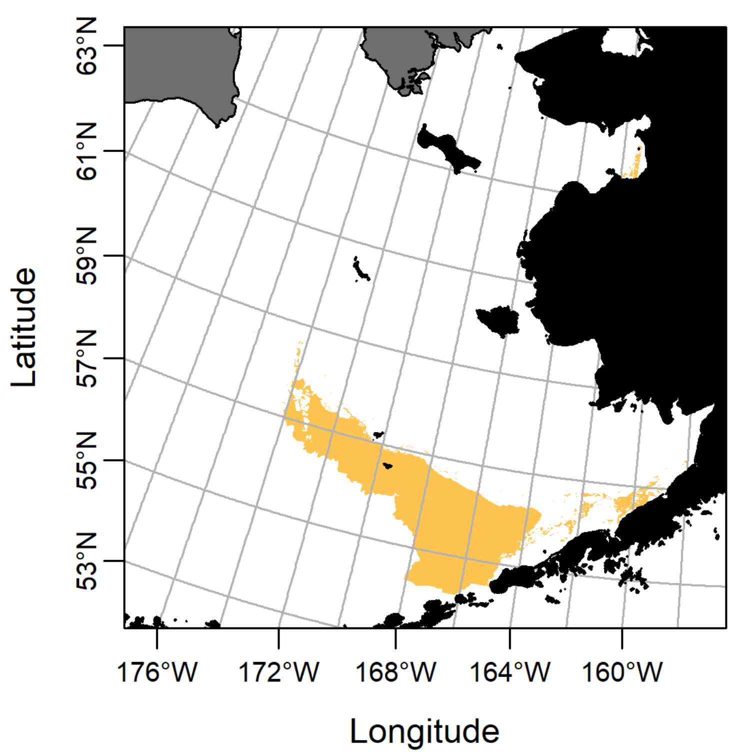

Figure E-24 EFH area of EBS Atka mackerel larvae, summer

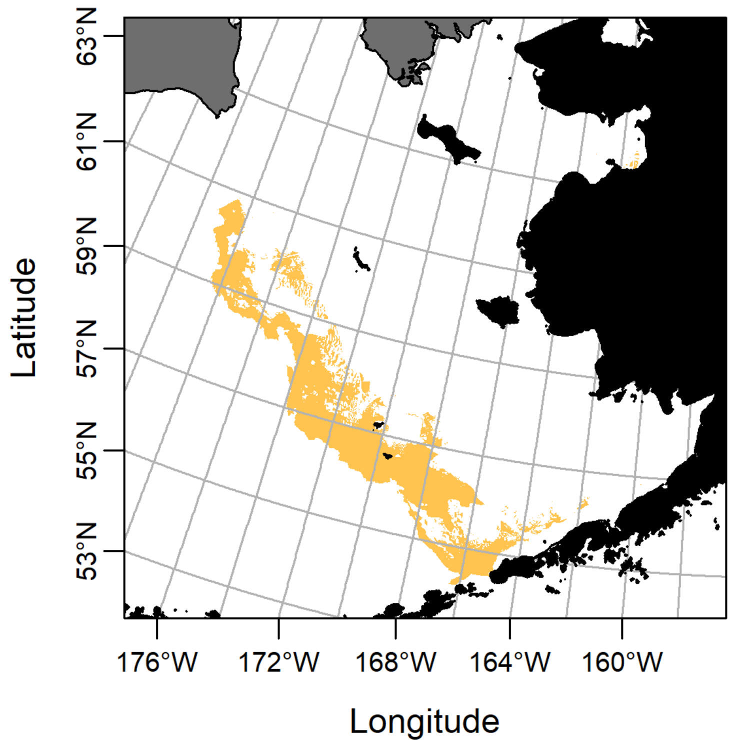

Figure E-25 EFH area of EBS adult Atka mackerel, fall

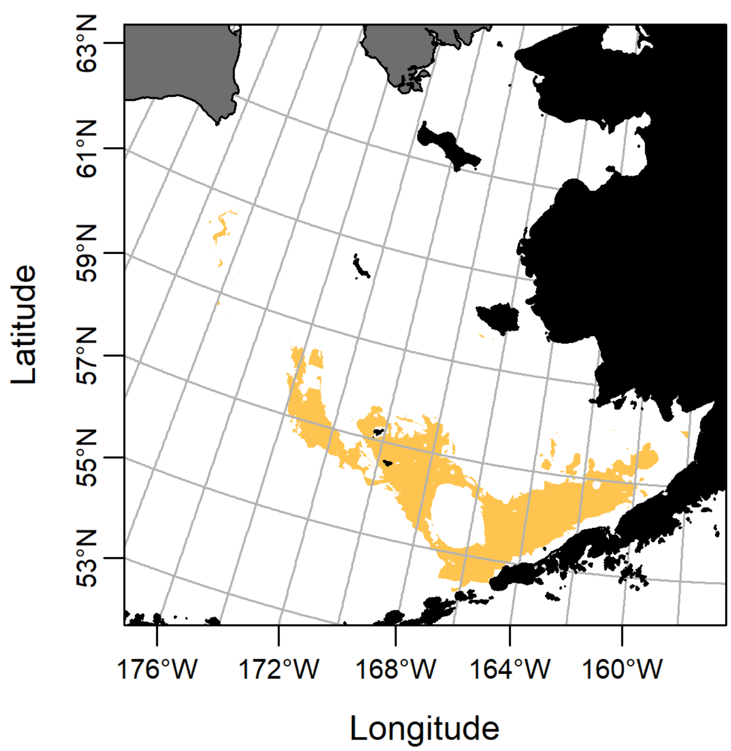

Figure E-26 EFH area of EBS adult Atka mackerel, winter

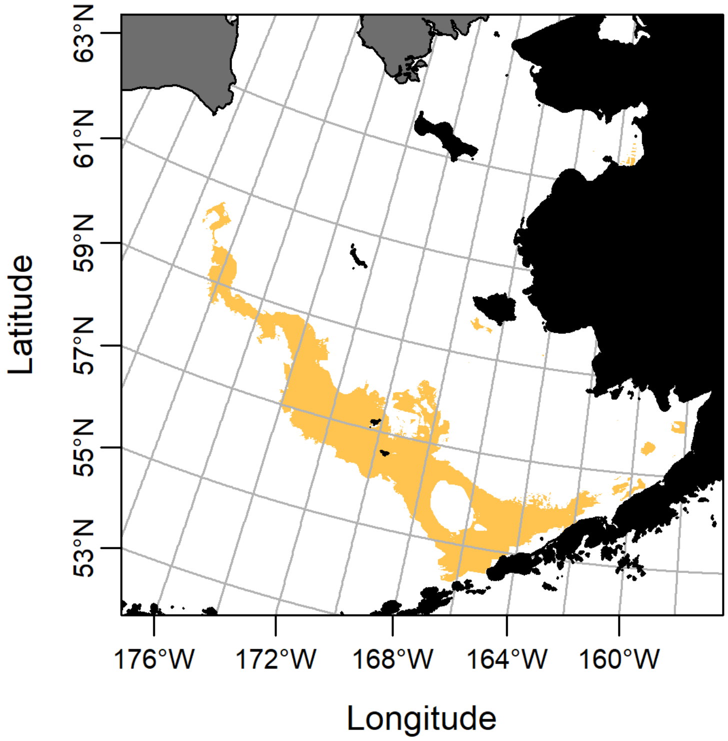

Figure E-27 EFH area of EBS adult Atka mackerel, spring

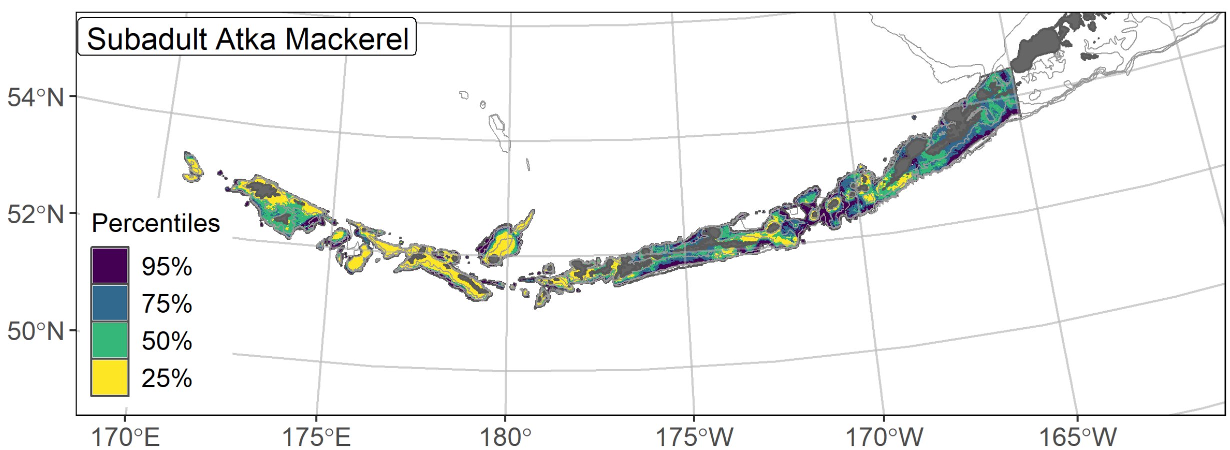

Figure E-28 EFH area of AI subadult Atka mackerel, summer

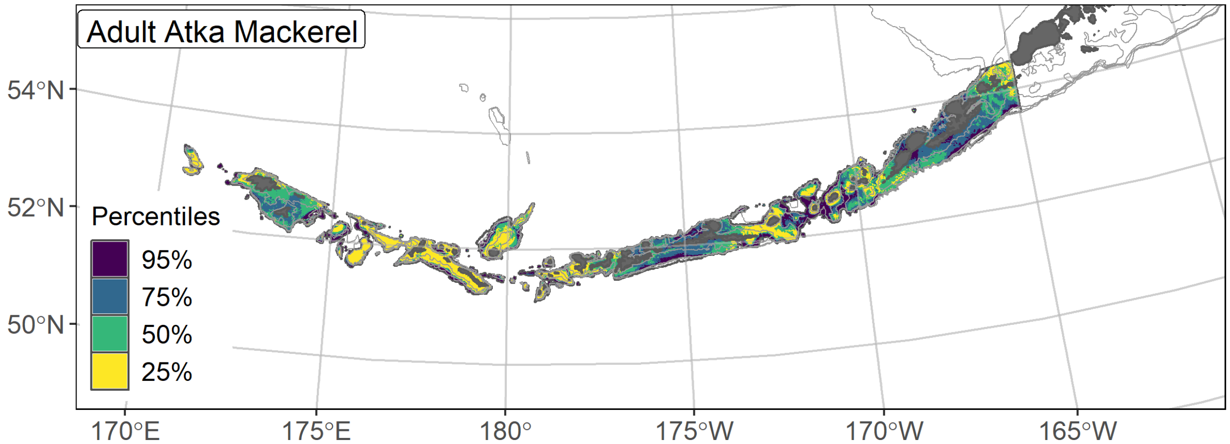

Figure E-29 EFH area of AI adult Atka mackerel, summer

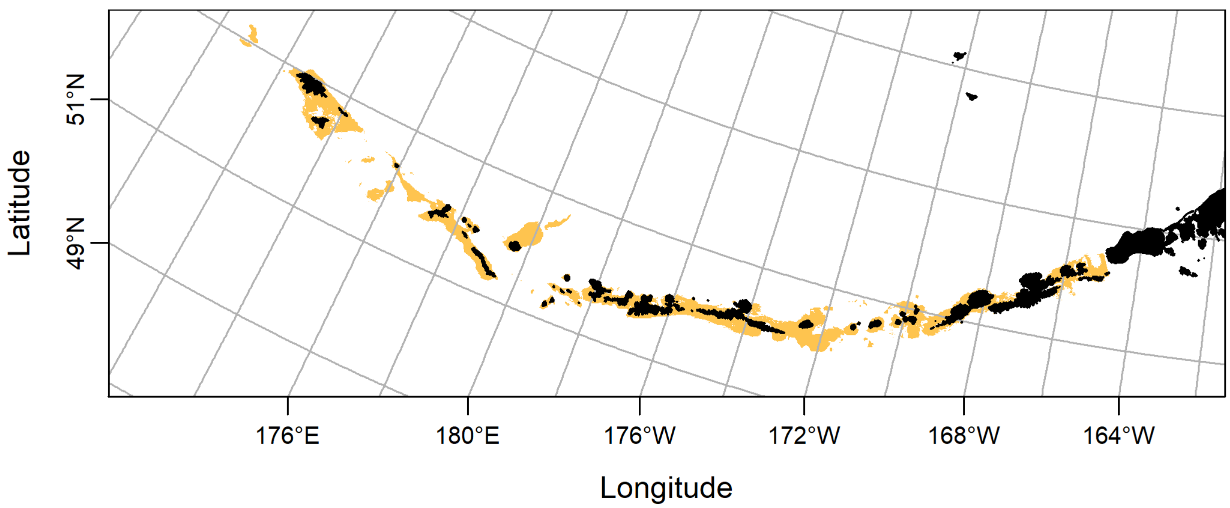

Figure E-30 EFH area of AI Atka mackerel eggs, summer

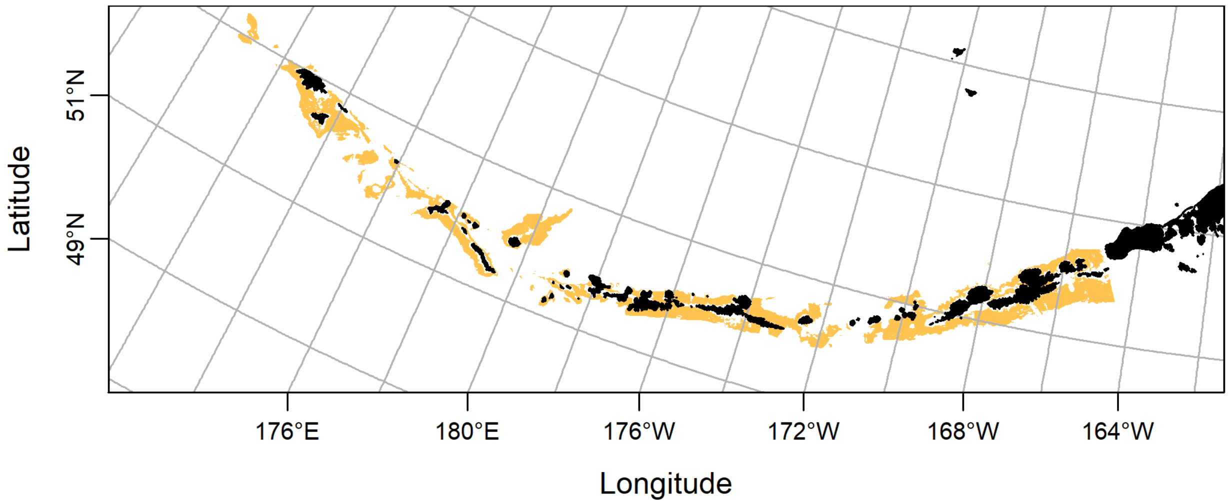

Figure E-31 EFH area of AI adult Atka mackerel, fall

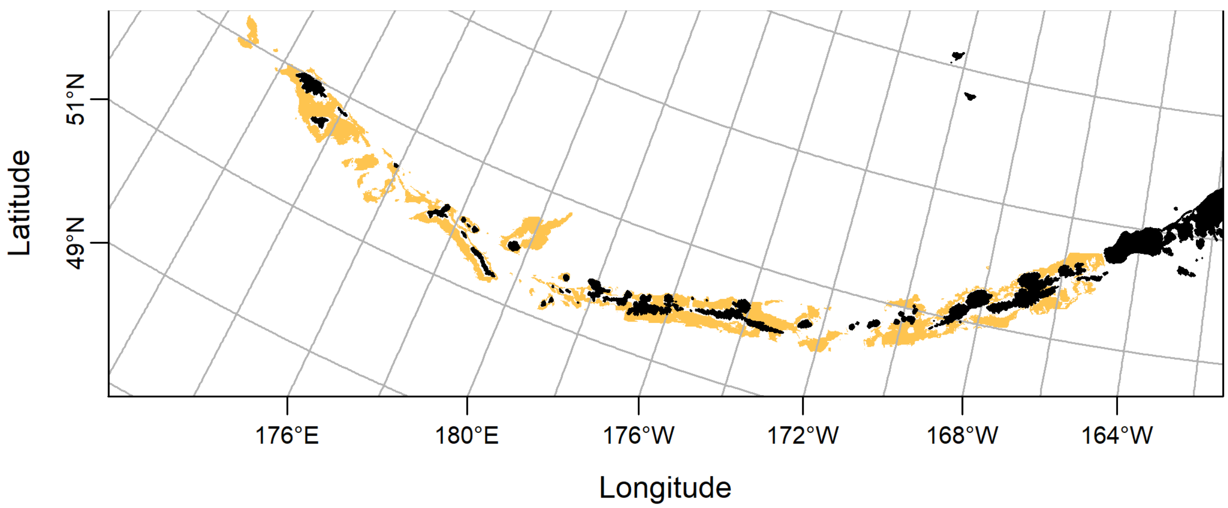

Figure E-32 EFH area of AI adult Atka mackerel, winter

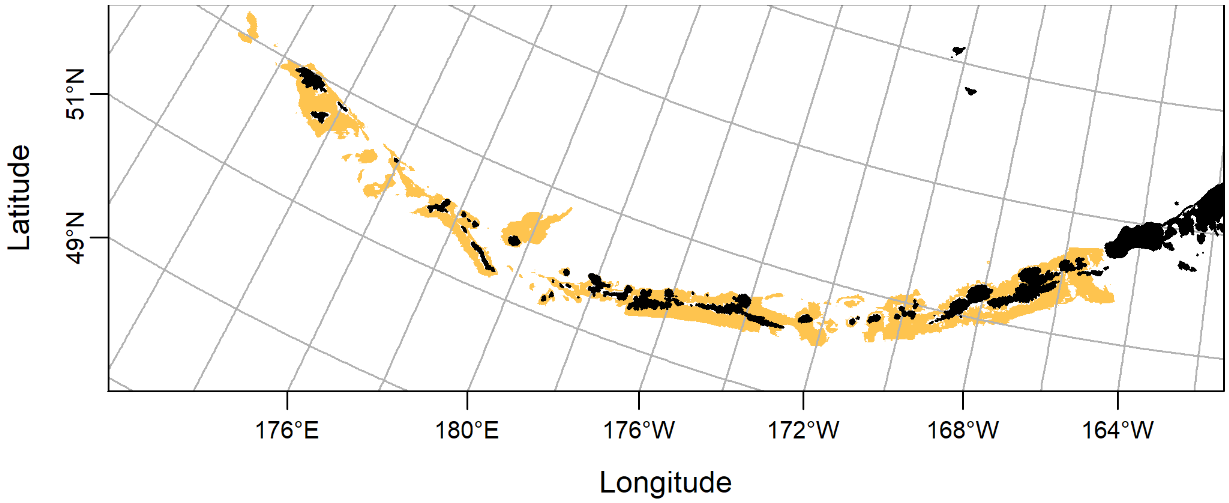

Figure E-33 EFH area of AI adult Atka mackerel, spring

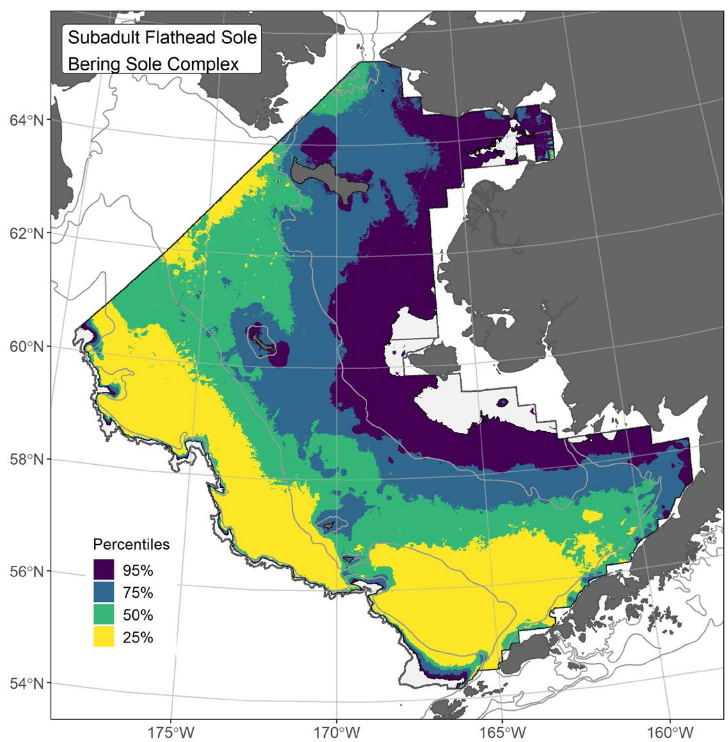

Figure E-34 EFH area of EBS subadult flathead sole/Bering flounder complex, summer

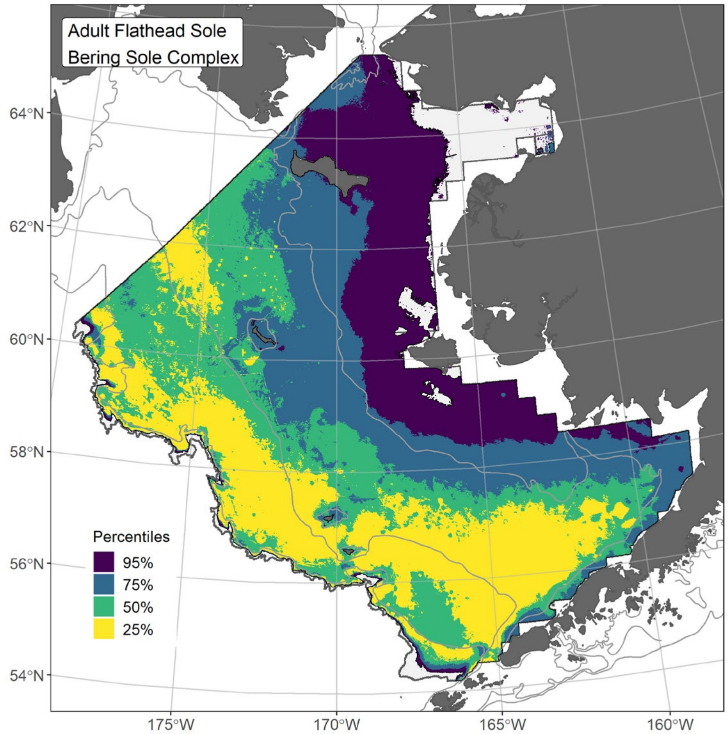

Figure E-35 EFH area of EBS adult flathead sole/Bering flounder complex, summer

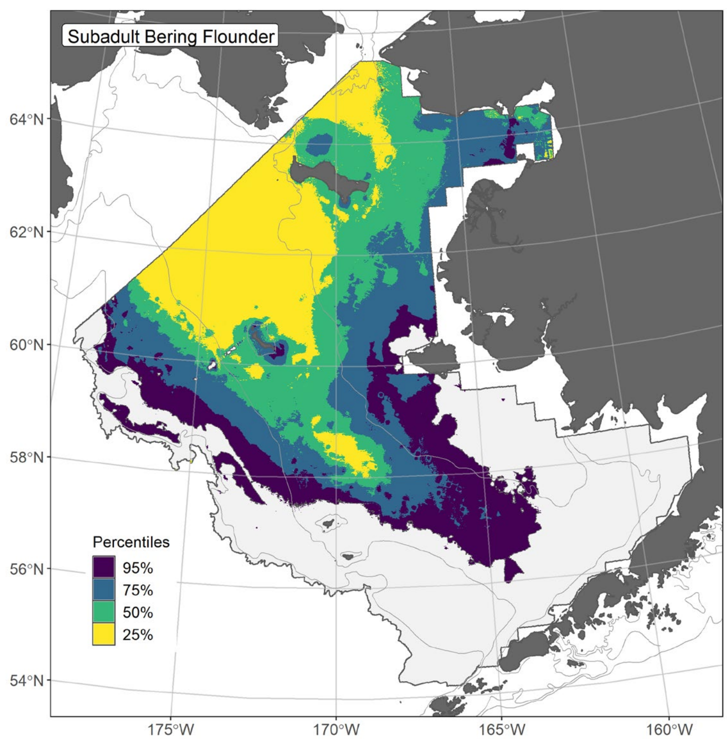

Figure E-36 EFH area of EBS subadult Bering flounder, summer

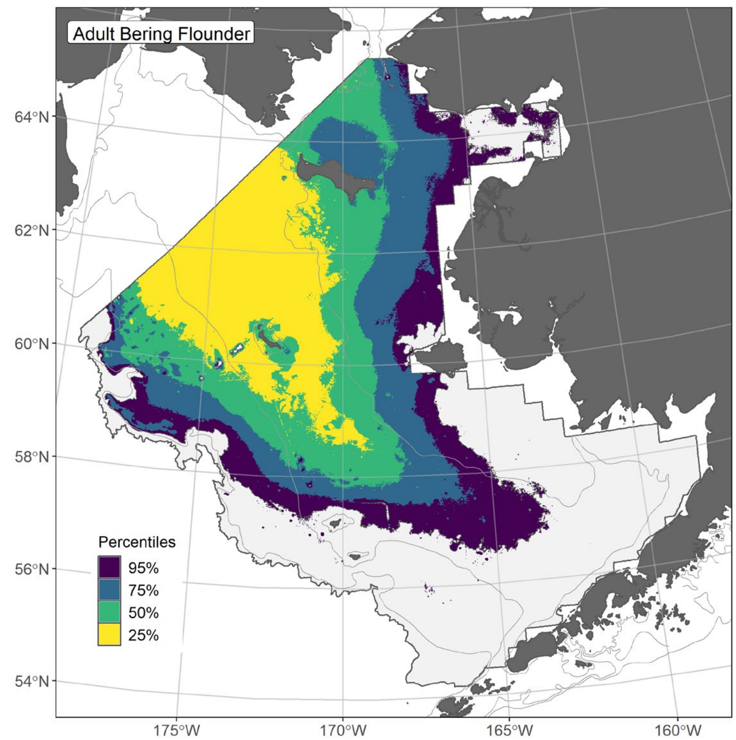

Figure E-37 EFH area of EBS adult Bering flounder, summer

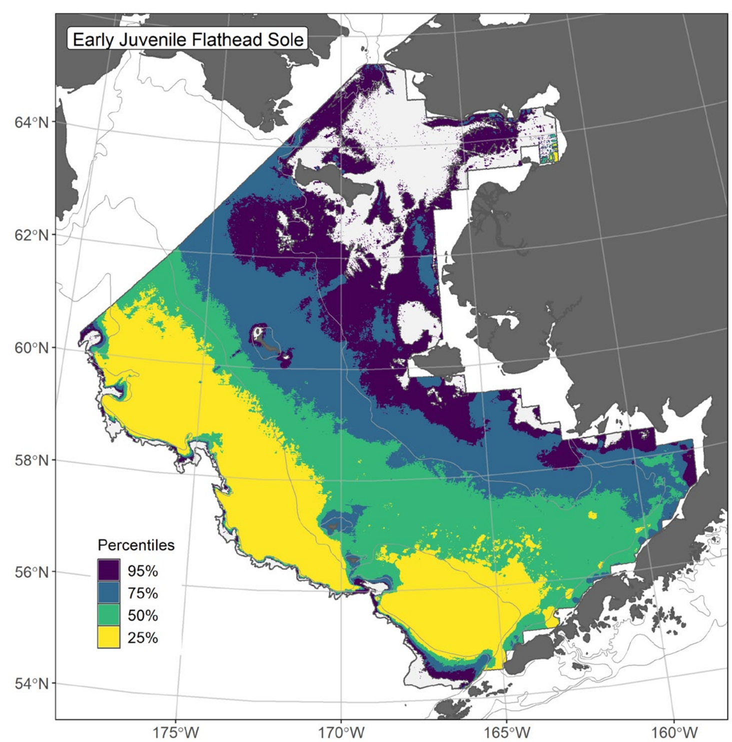

Figure E-38 EFH area of EBS settled early juvenile flathead sole, summer

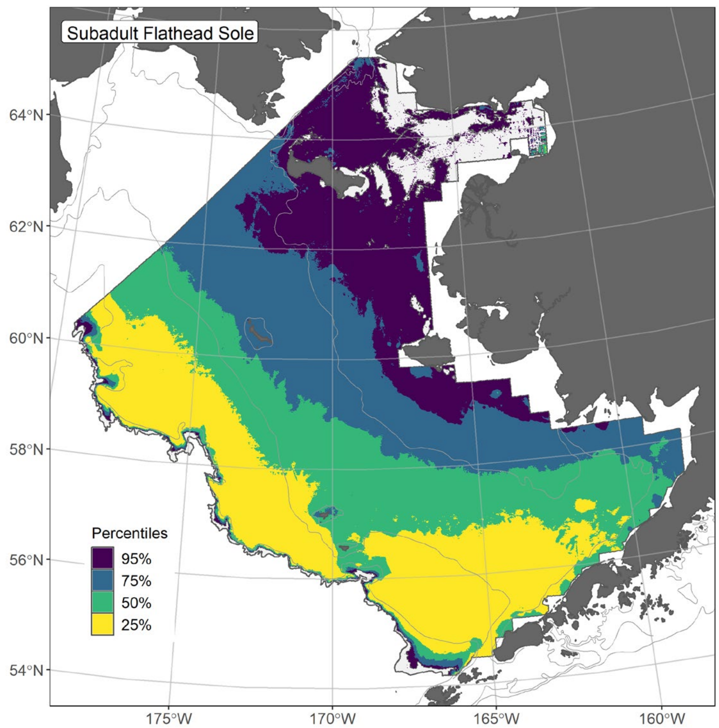

Figure E-39 EFH area of EBS subadult flathead sole, summer

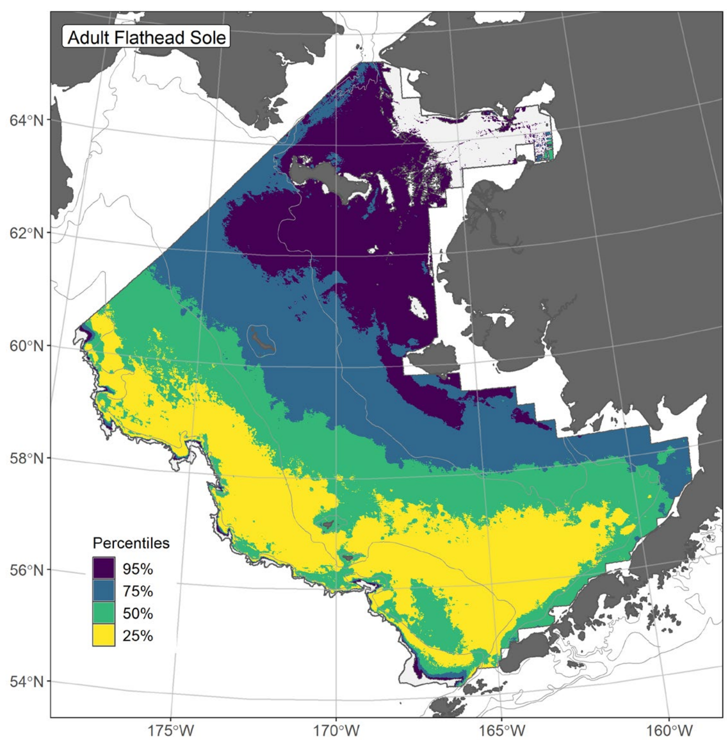

Figure E-40 EFH area of EBS adult flathead sole, summer

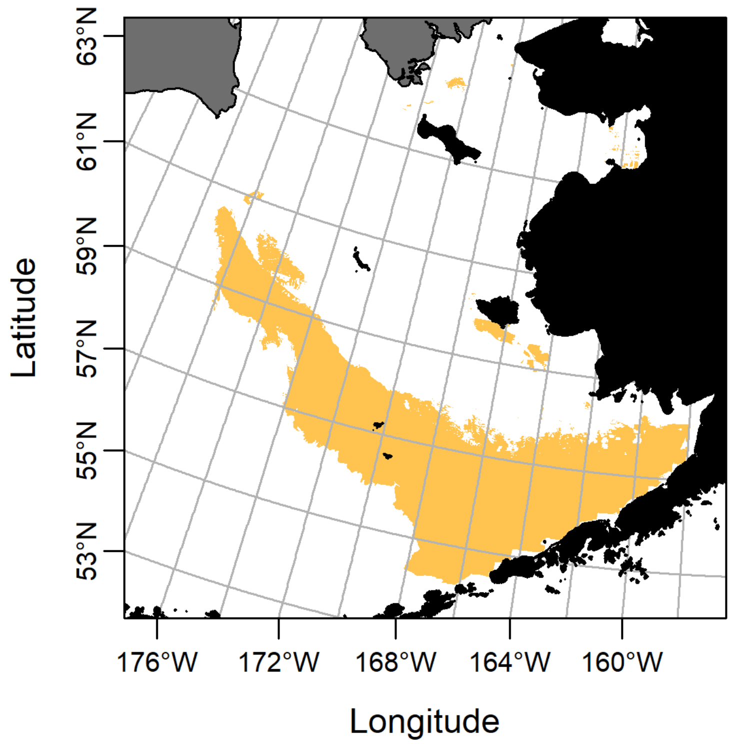

Figure E-41 EFH area of EBS flathead sole eggs, summer

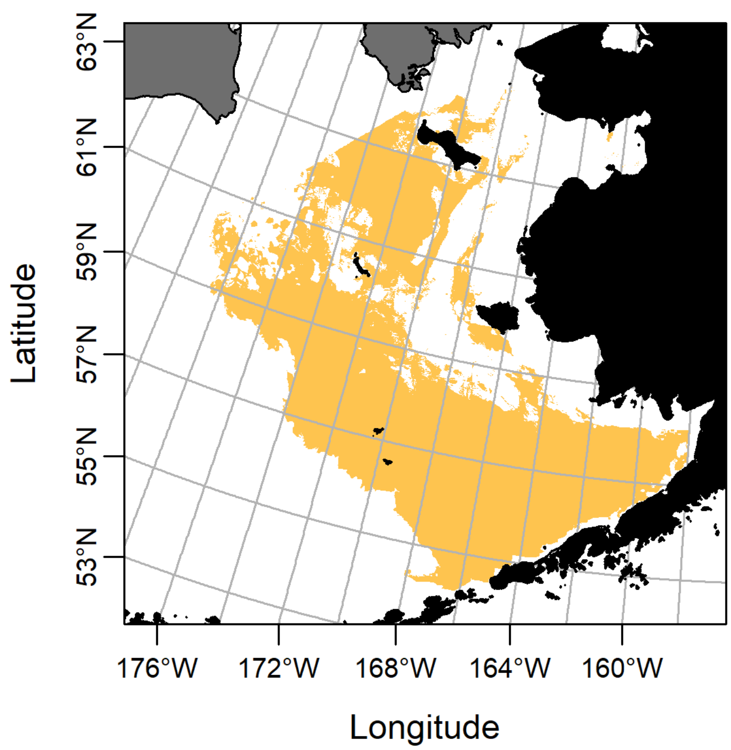

Figure E-42 EFH area of EBS flathead sole larvae, summer

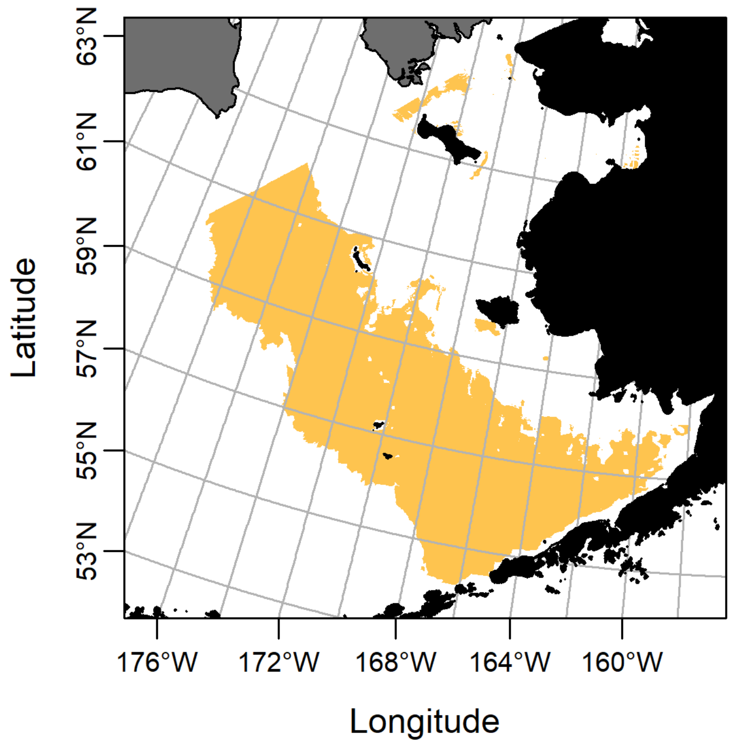

Figure E-43 EFH area of EBS adult flathead sole, fall

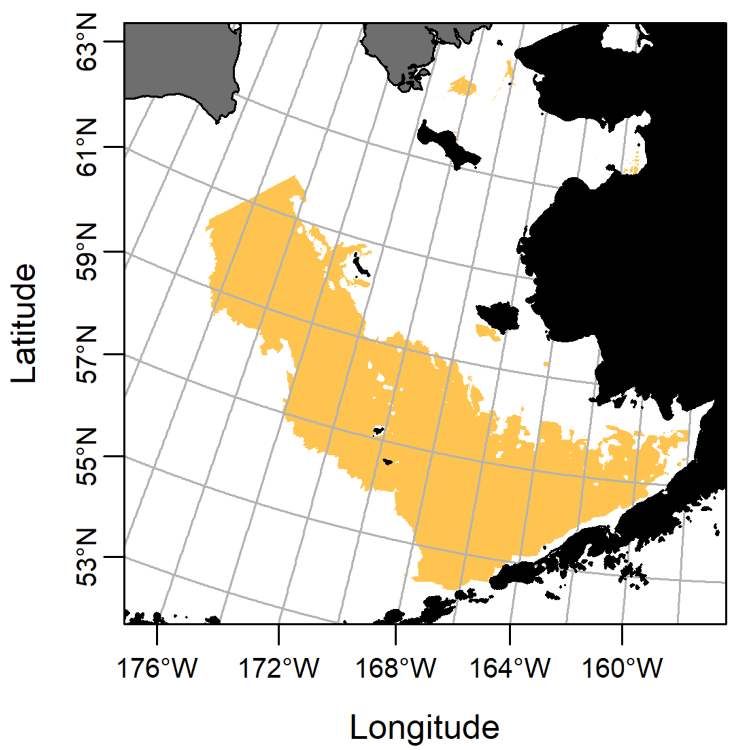

Figure E-44 EFH area of EBS adult flathead sole, winter

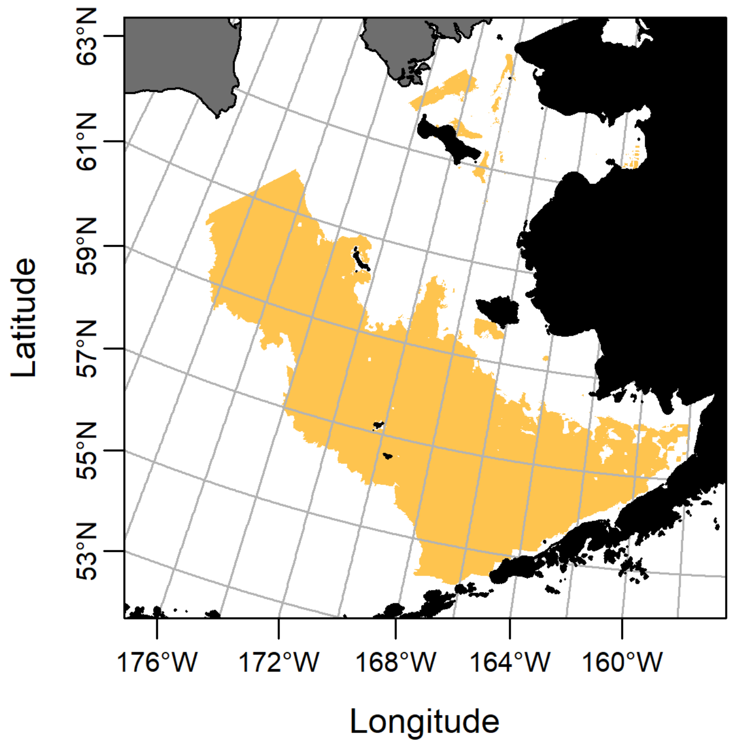

Figure E-45 EFH area of EBS adult flathead sole, spring

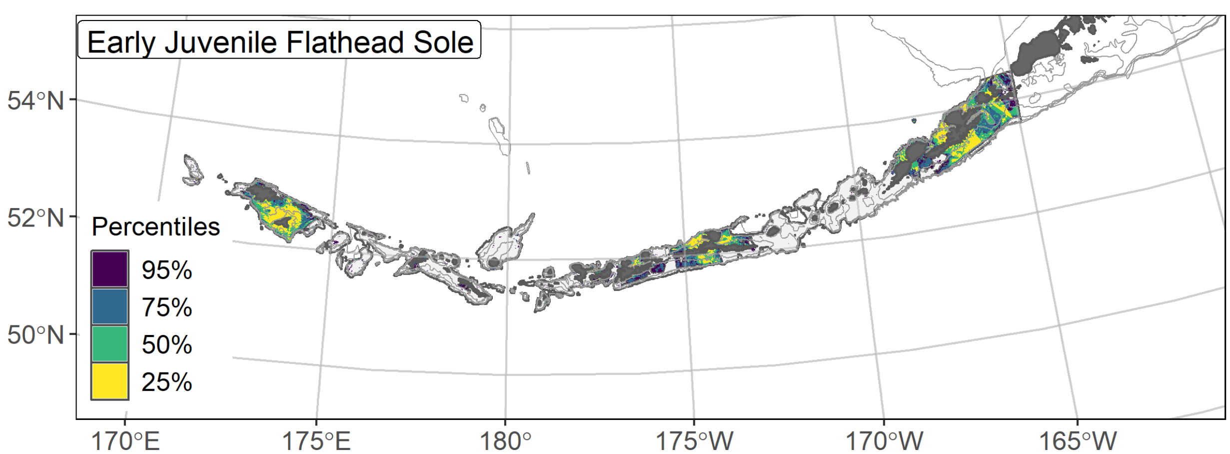

Figure E-46 EFH area of AI settled early juvenile flathead sole, summer

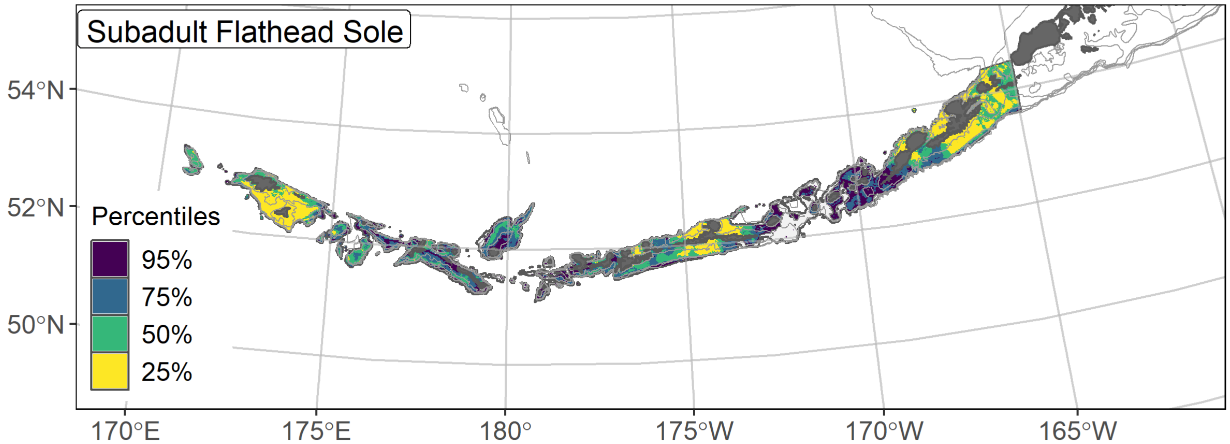

Figure E-47 EFH area of AI subadult flathead sole, summer

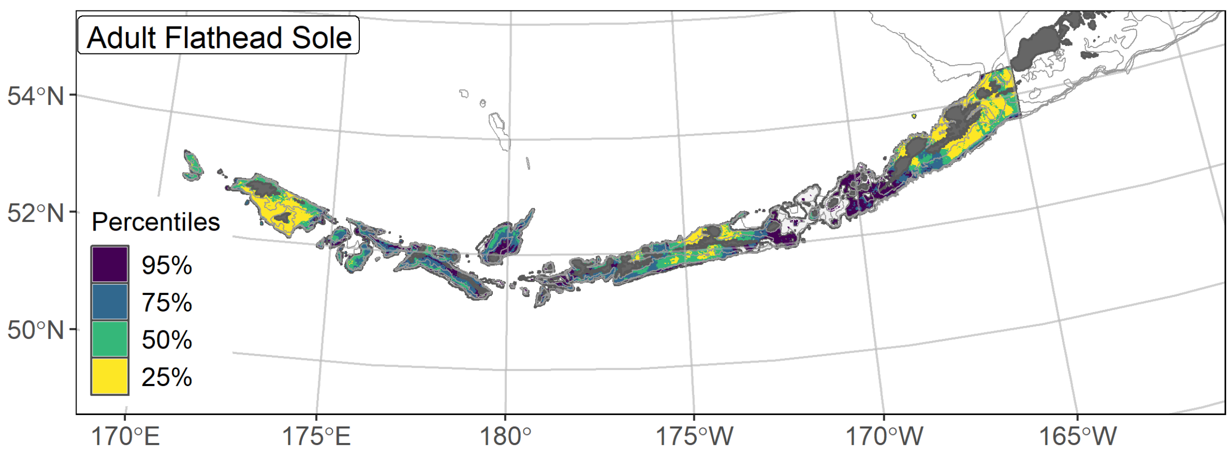

Figure E-48 EFH area of AI adult flathead sole, summer

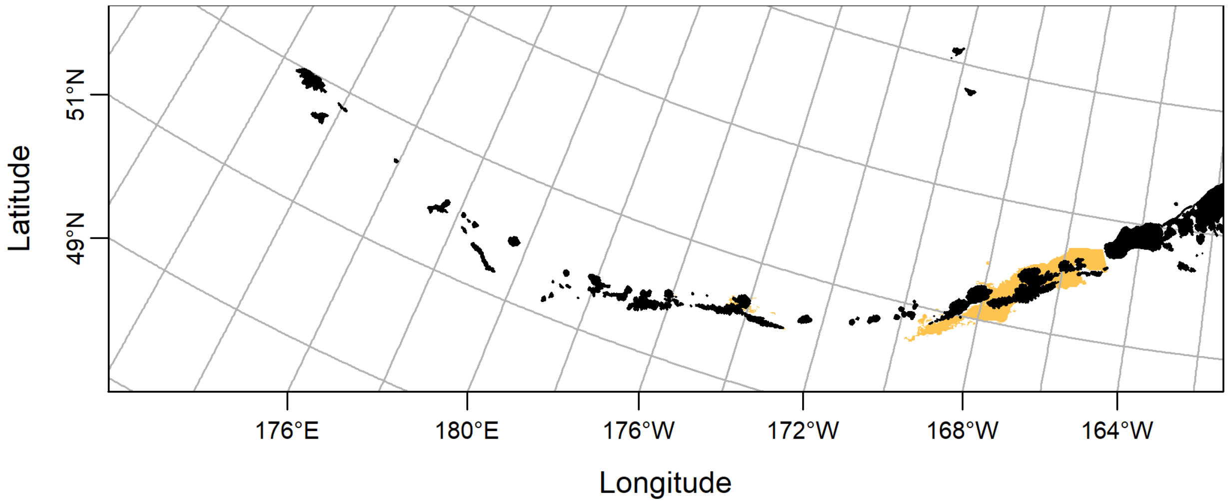

Figure E-49 EFH area of AI flathead sole eggs, summer

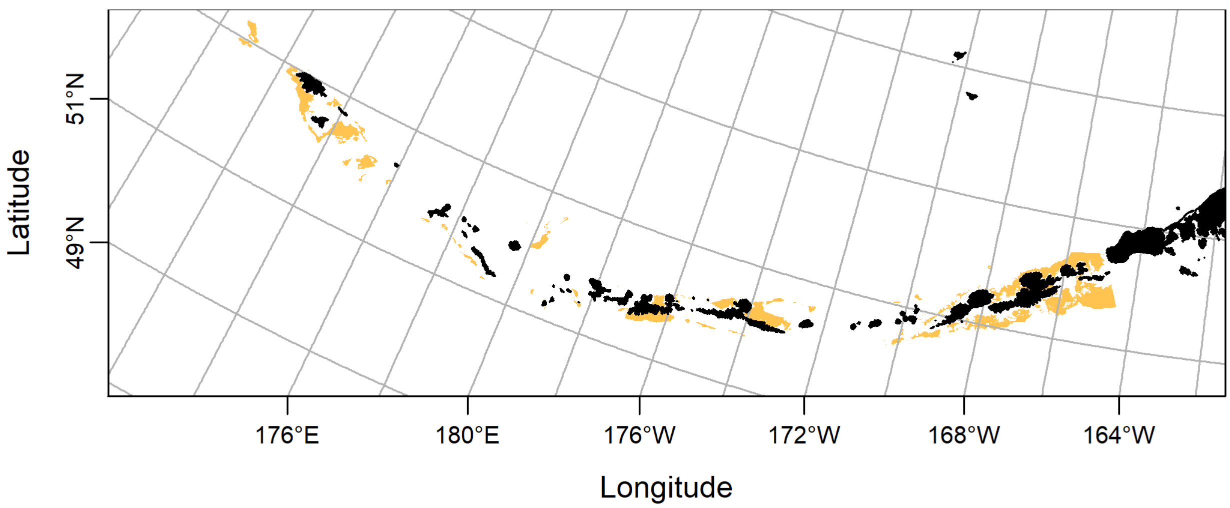

Figure E-50 EFH area of AI adult flathead sole, fall

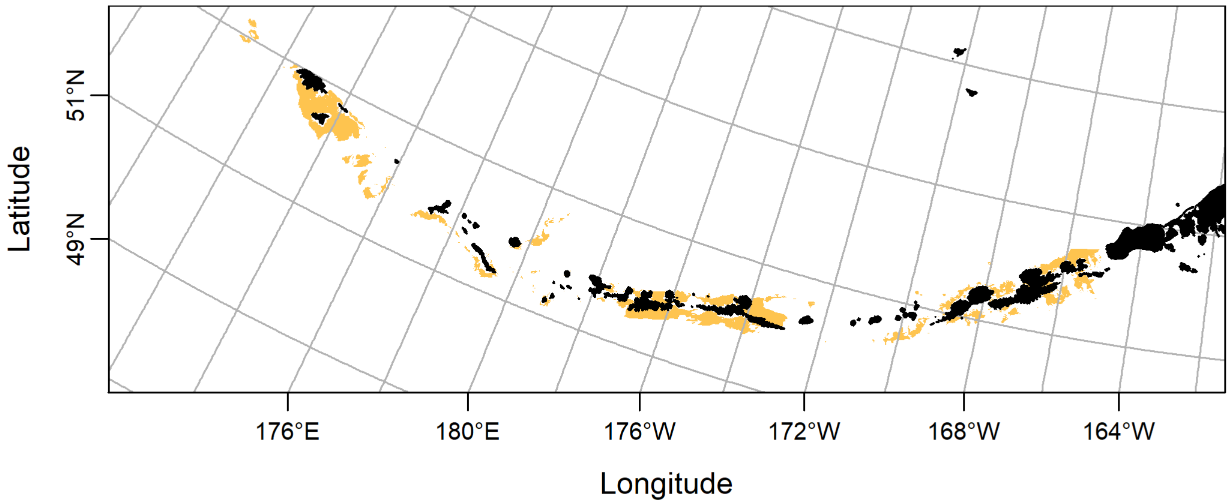

Figure E-51 EFH area of AI adult flathead sole, winter

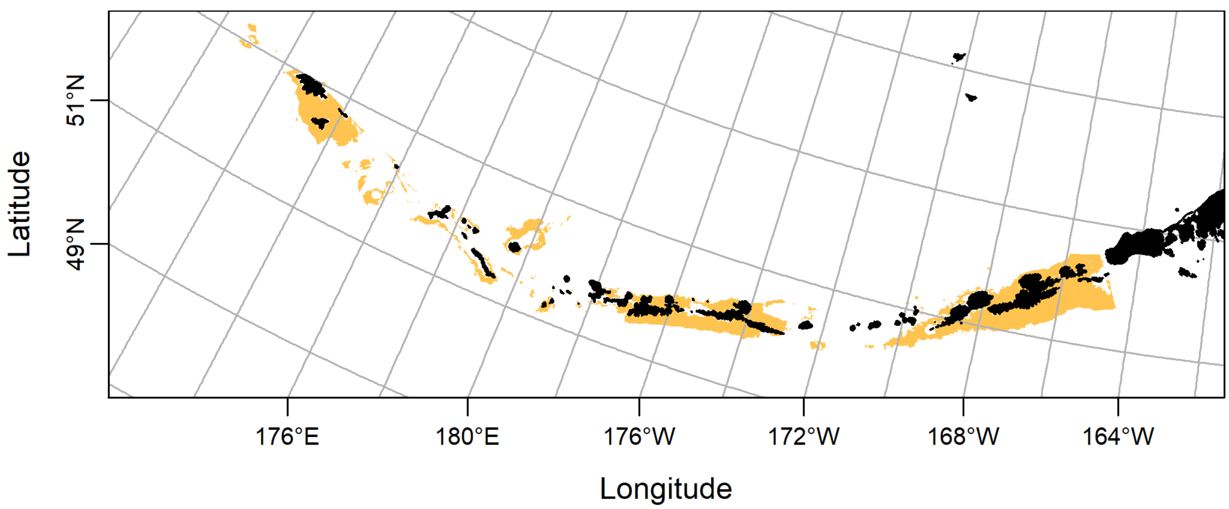

Figure E-52 EFH area of AI adult flathead sole, spring

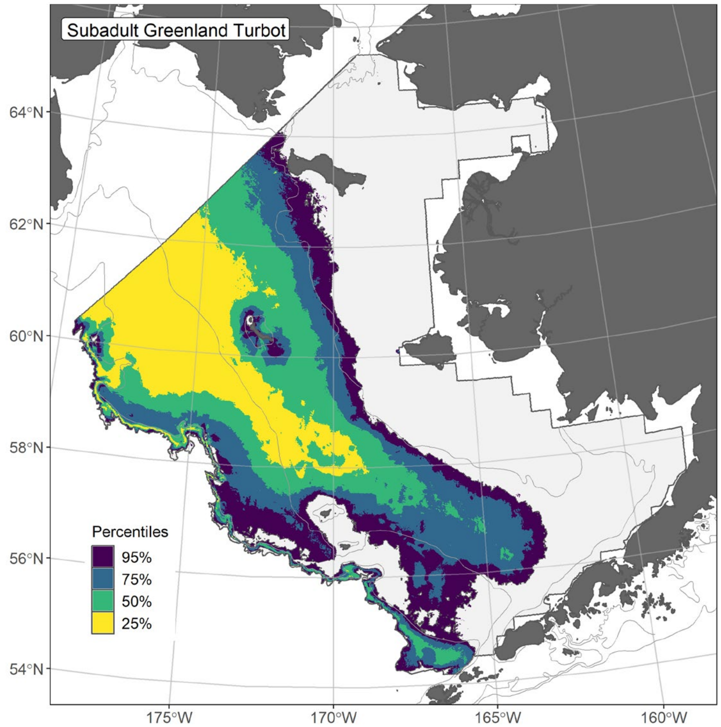

Figure E-53 EFH area of EBS subadult Greenland turbot, summer

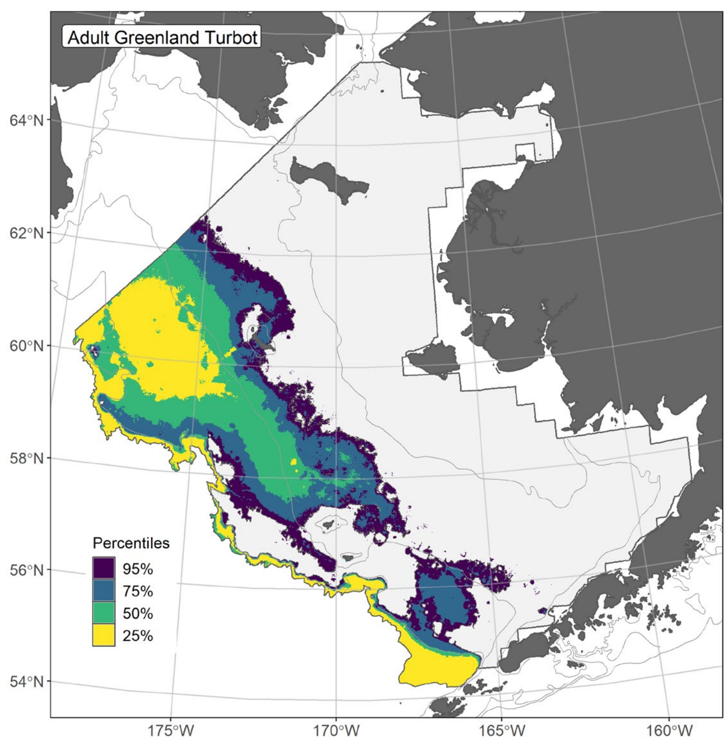

Figure E-54 EFH area of EBS adult Greenland turbot, summer

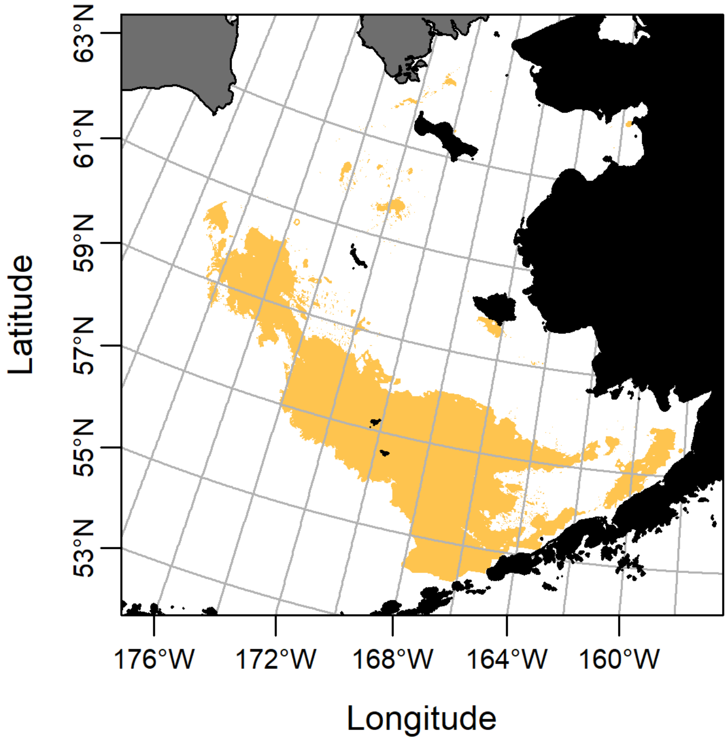

Figure E-55 EFH area of EBS Greenland turbot larvae, summer

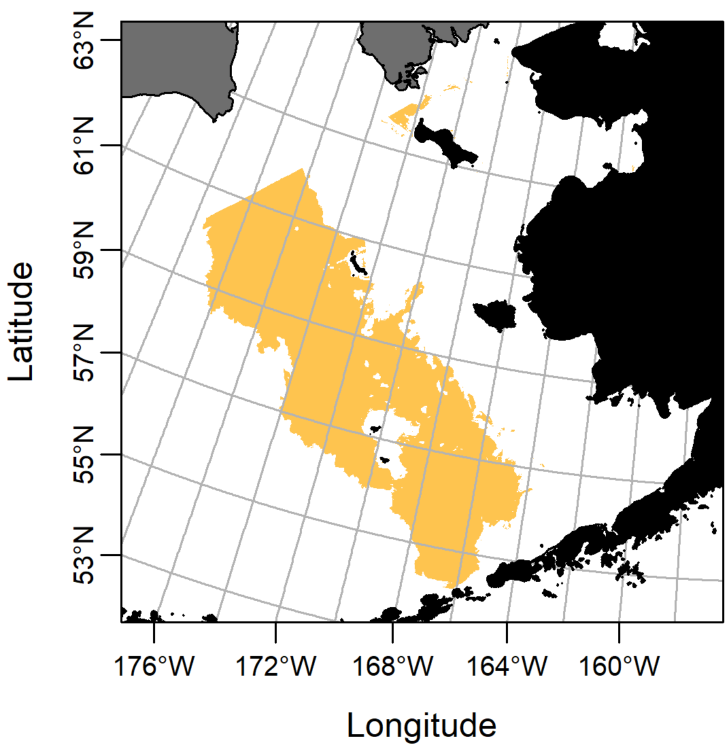

Figure E-56 EFH area of EBS adult Greenland turbot, fall

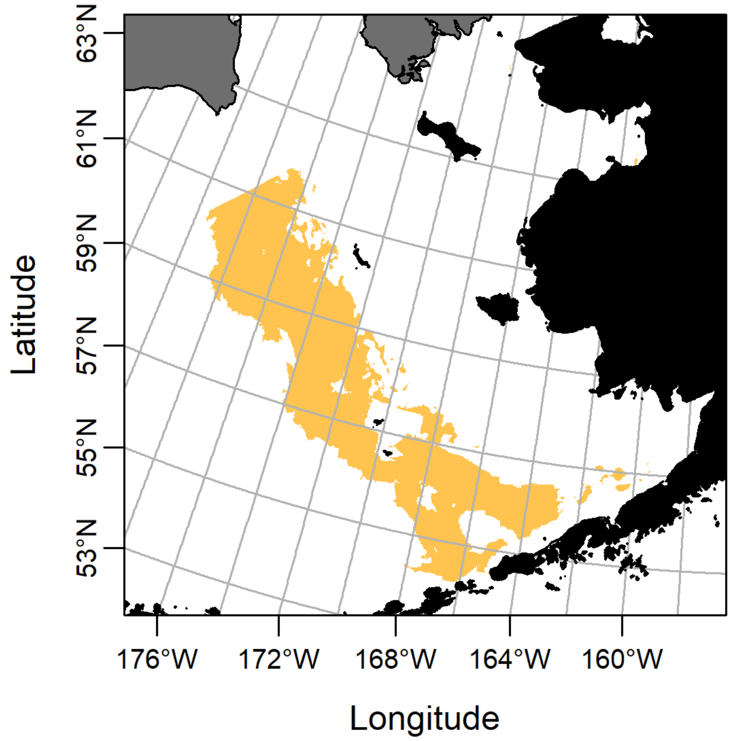

Figure E-57 EFH area of EBS adult Greenland turbot, winter

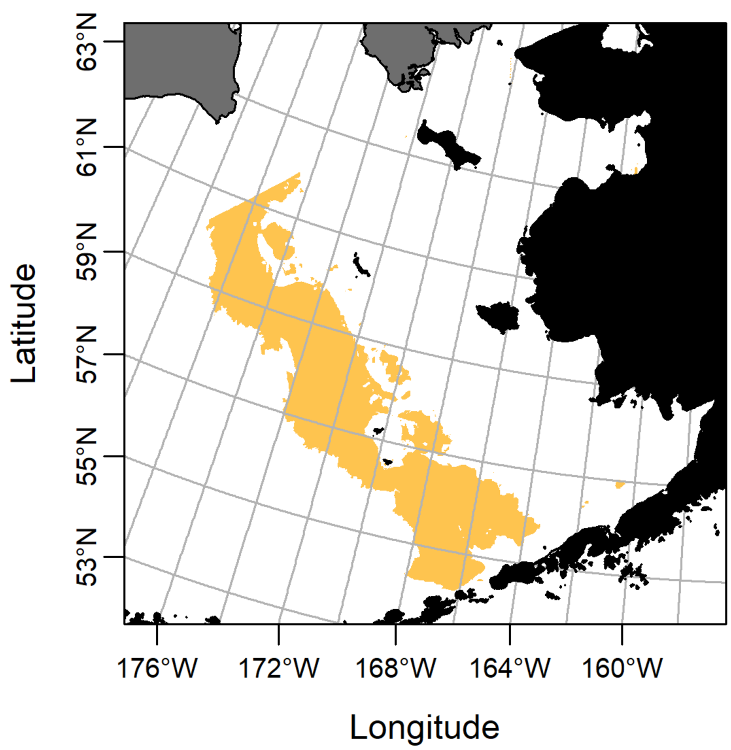

Figure E-58 EFH area of EBS adult Greenland turbot, spring

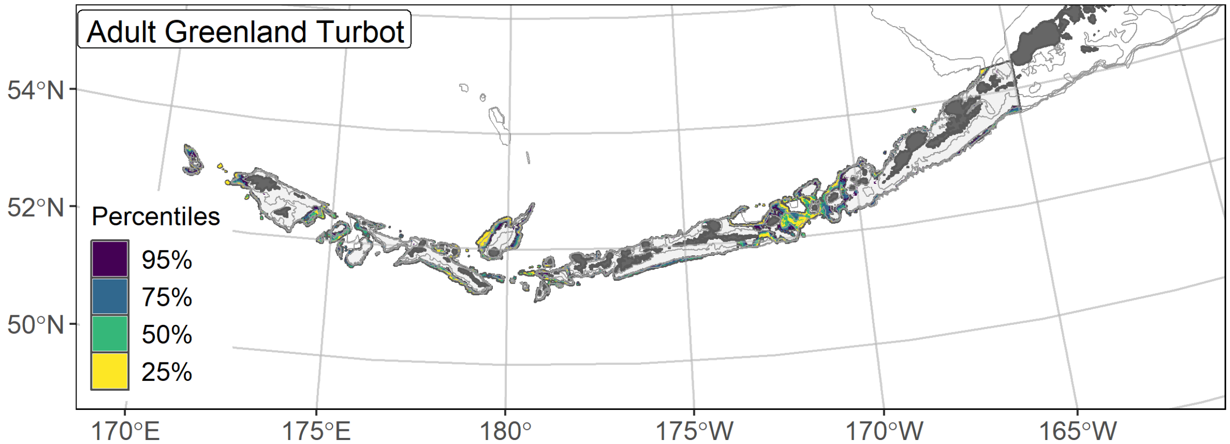

Figure E-59 EFH area of AI adult Greenland turbot, summer

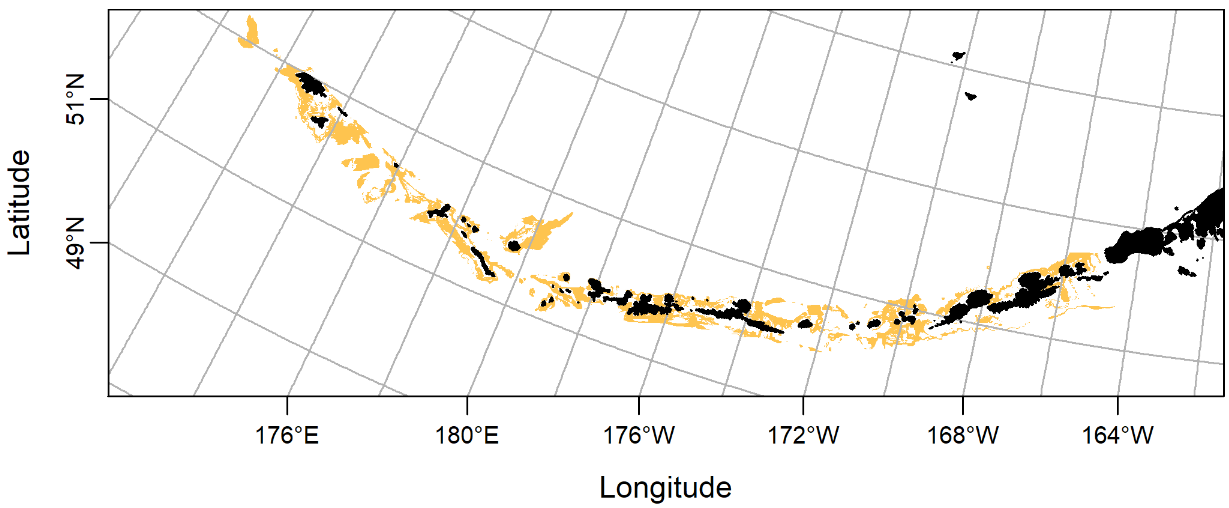

Figure E-60 EFH area of AI adult Greenland turbot, fall

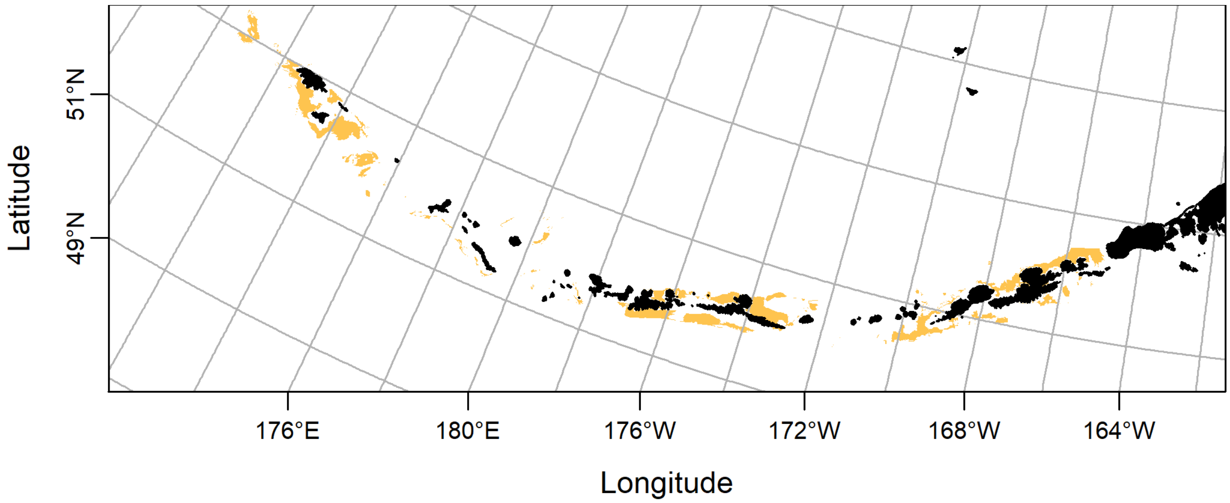

Figure E-61 EFH area of AI adult Greenland turbot, winter

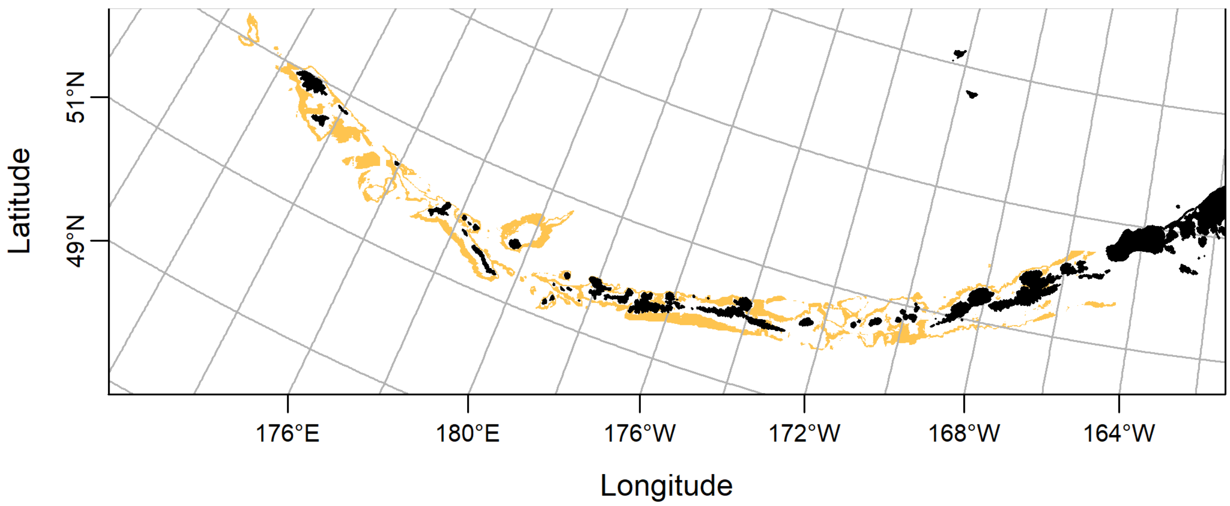

Figure E-62 EFH area of AI adult Greenland turbot, spring

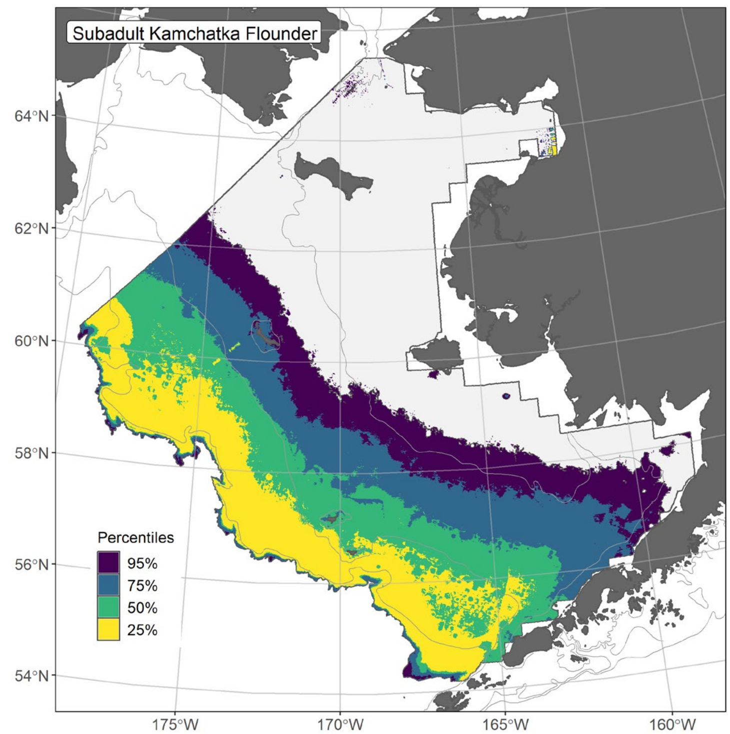

Figure E-63 EFH area of EBS subadult Kamchatka flounder, summer

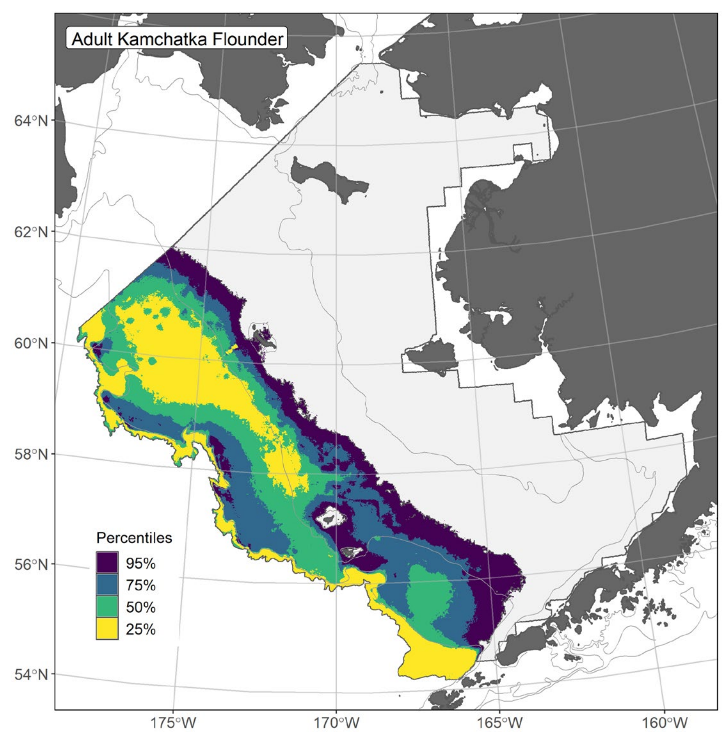

Figure E-64 EFH area of EBS adult Kamchatka flounder, summer

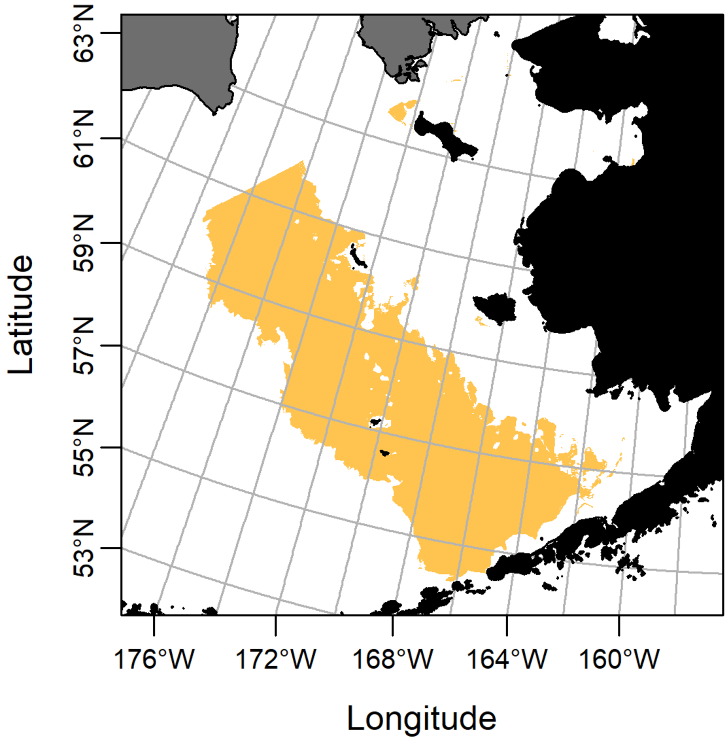

Figure E-65 EFH area of EBS adult Kamchatka flounder, fall

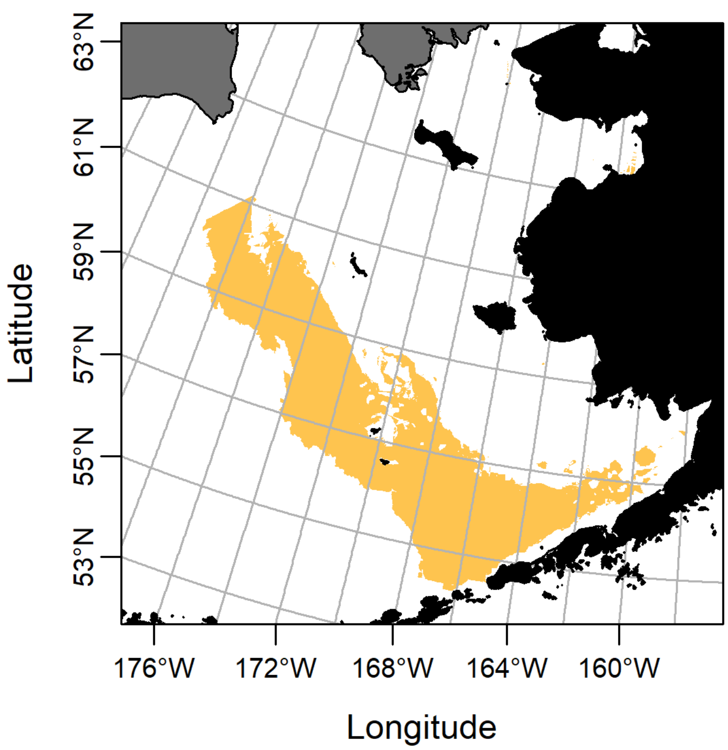

Figure E-66 EFH area of EBS adult Kamchatka flounder, winter

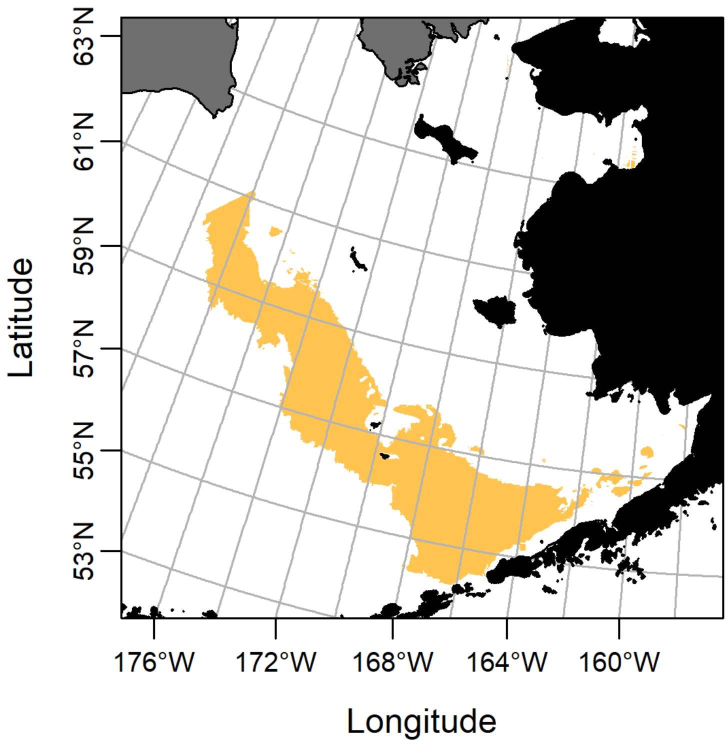

Figure E-67 EFH area of EBS adult Kamchatka flounder, spring

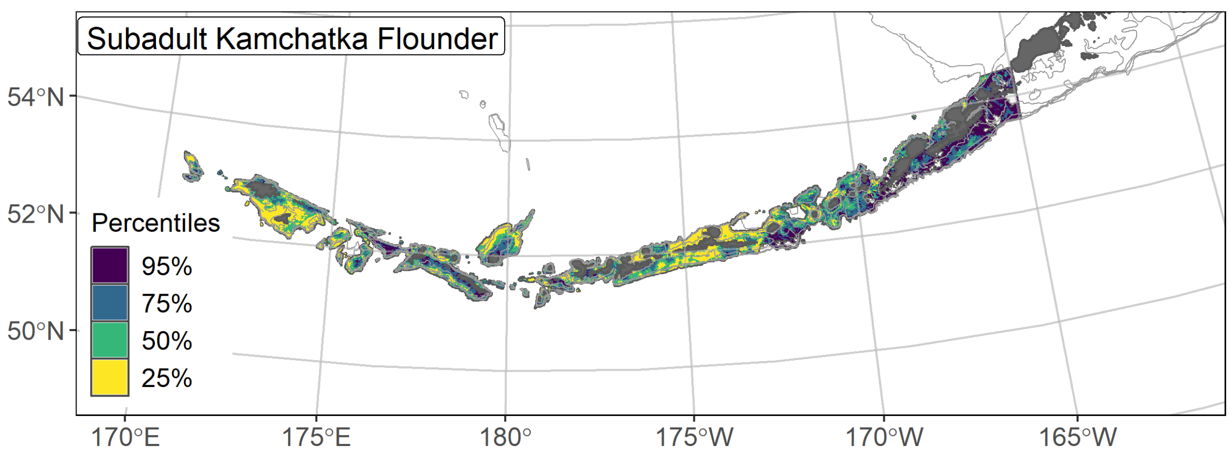

Figure E-68 EFH area of AI subadult Kamchatka flounder, summer

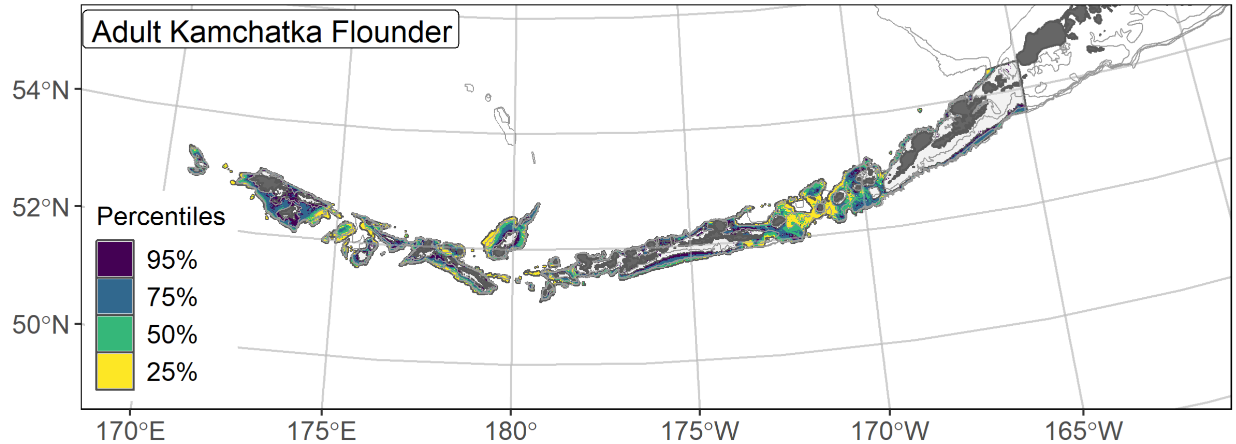

Figure E-69 EFH area of AI adult Kamchatka flounder, summer

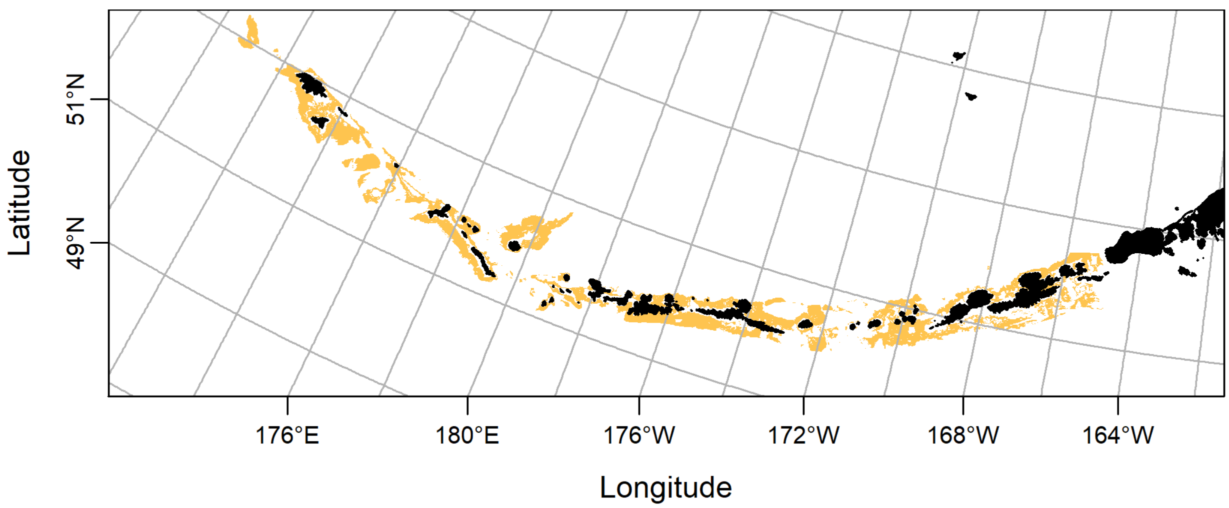

Figure E-70 EFH area of AI adult Kamchatka flounder, fall

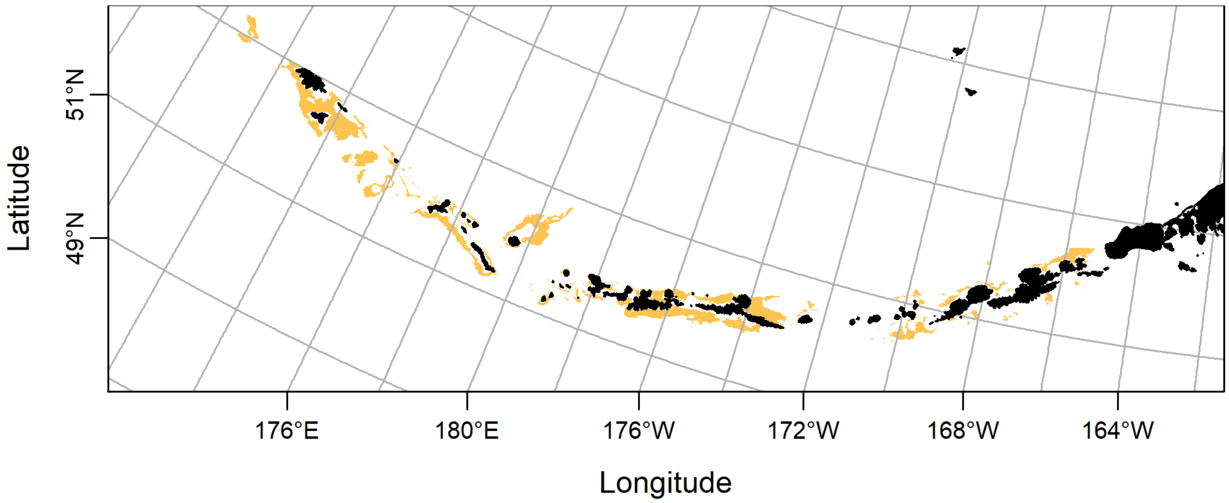

Figure E-71 EFH area of AI adult Kamchatka flounder, winter

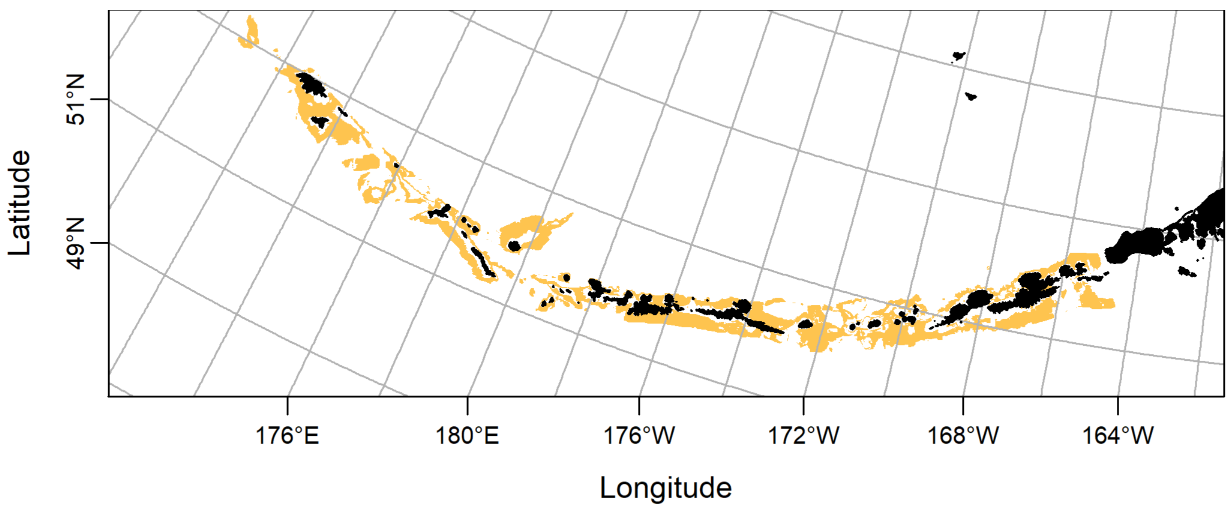

Figure E-72 EFH area of AI adult Kamchatka flounder, spring

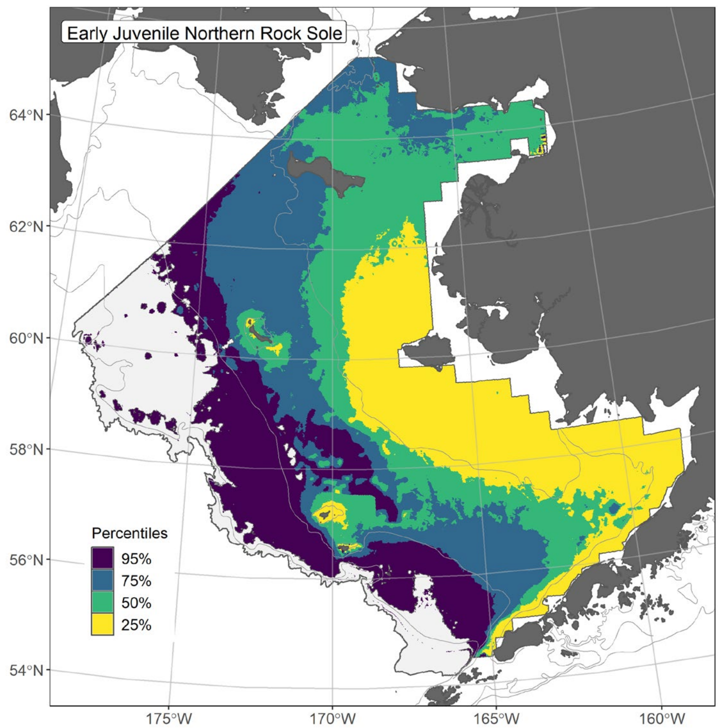

Figure E-73 EFH area of EBS settled early juvenile northern rock sole, summer

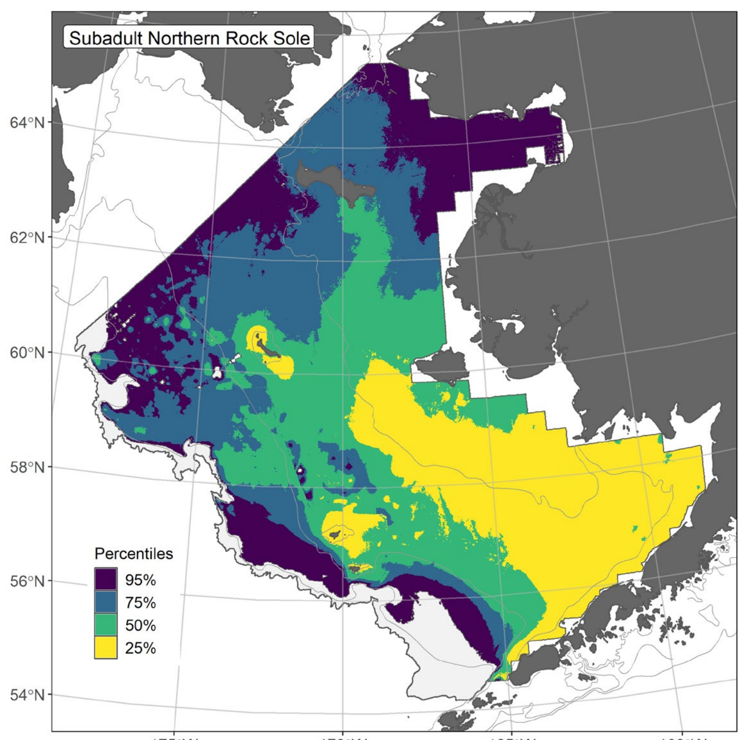

Figure E-74 EFH area of EBS subadult northern rock sole, summer

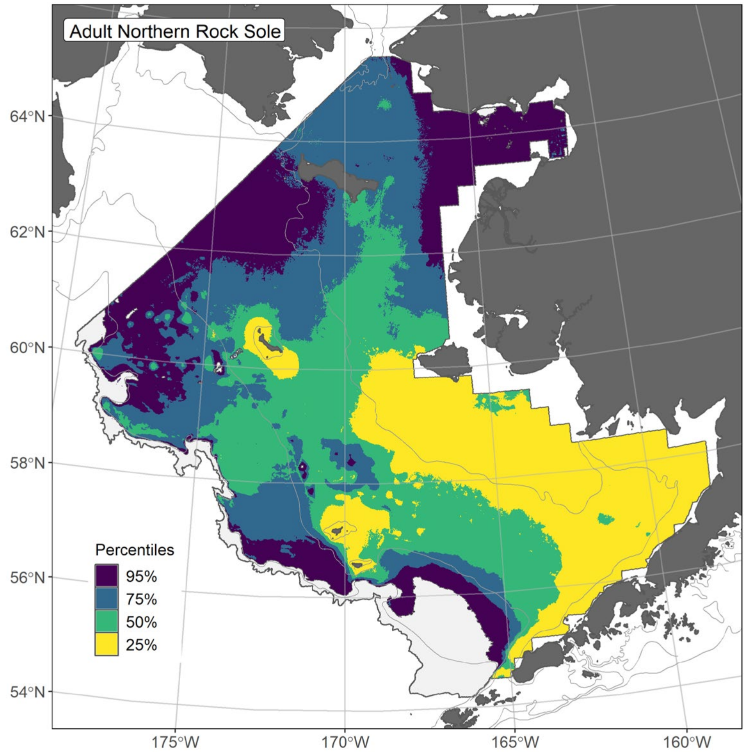

Figure E-75 EFH area of EBS adult northern rock sole, summer

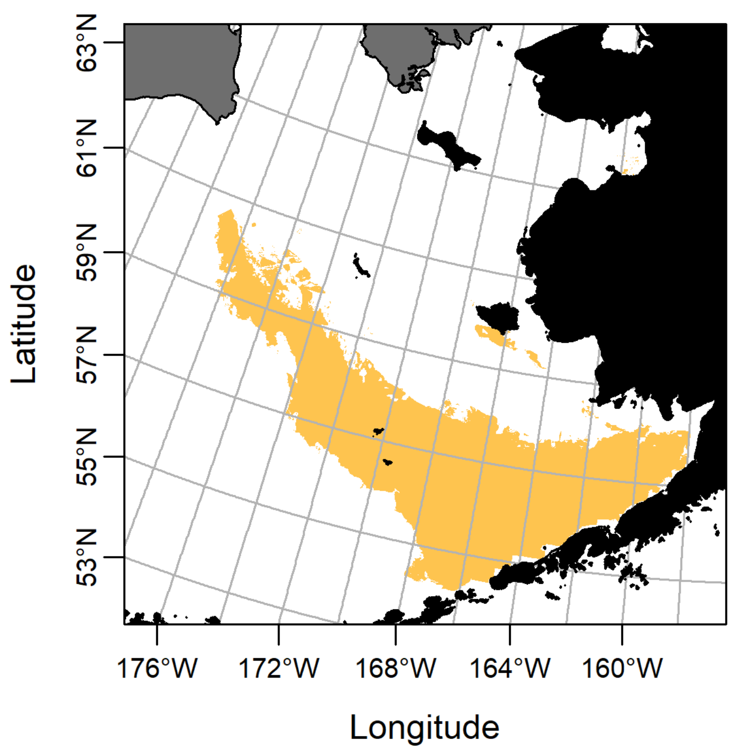

Figure E-76 EFH area of EBS larval northern rock sole, summer

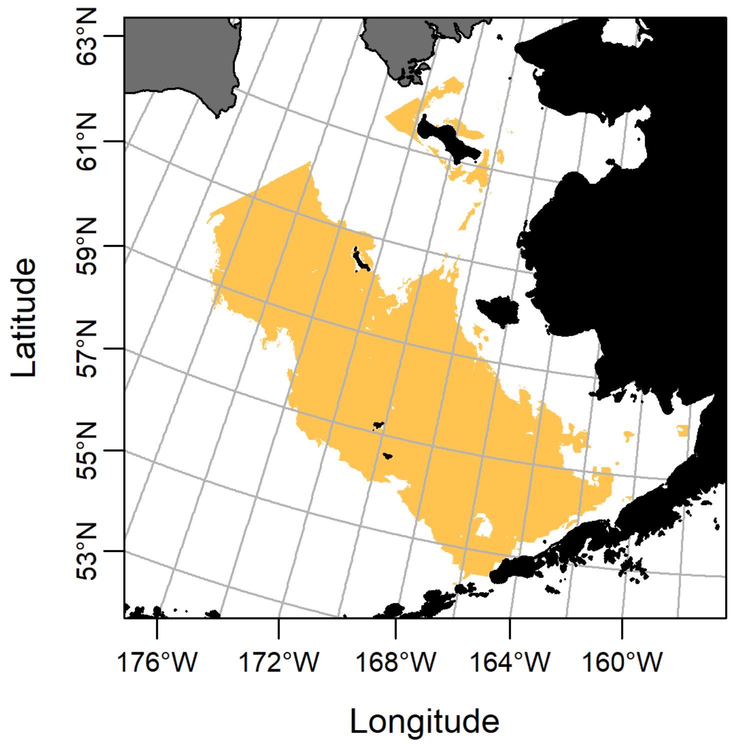

Figure E-77 EFH area of EBS adult northern rock sole, fall

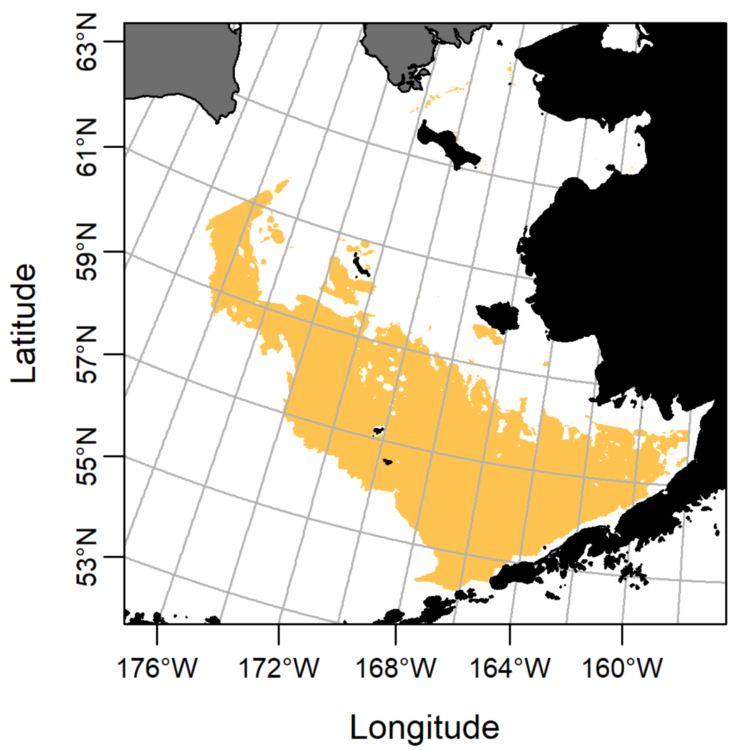

Figure E-78 EFH area of EBS adult northern rock sole, winter

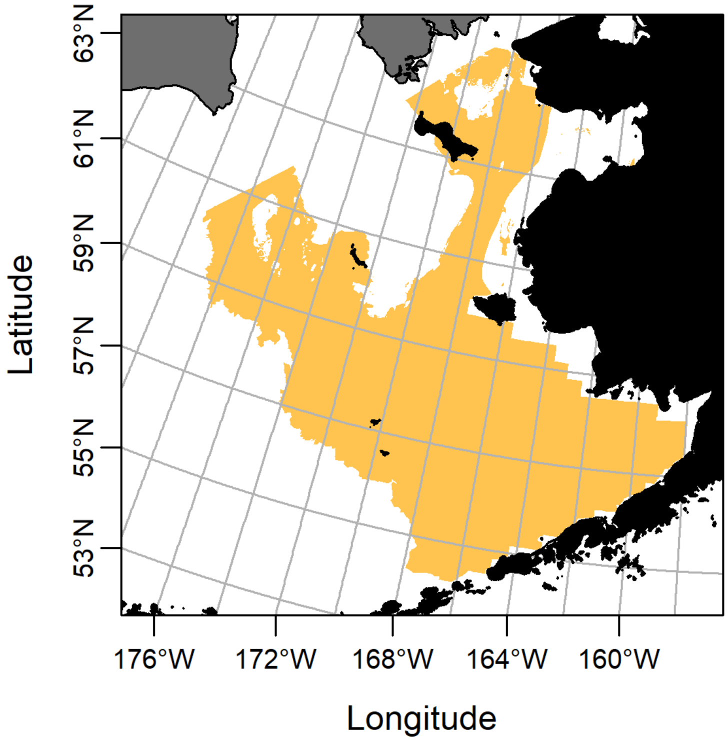

Figure E-79 EFH area of EBS adult northern rock sole, spring

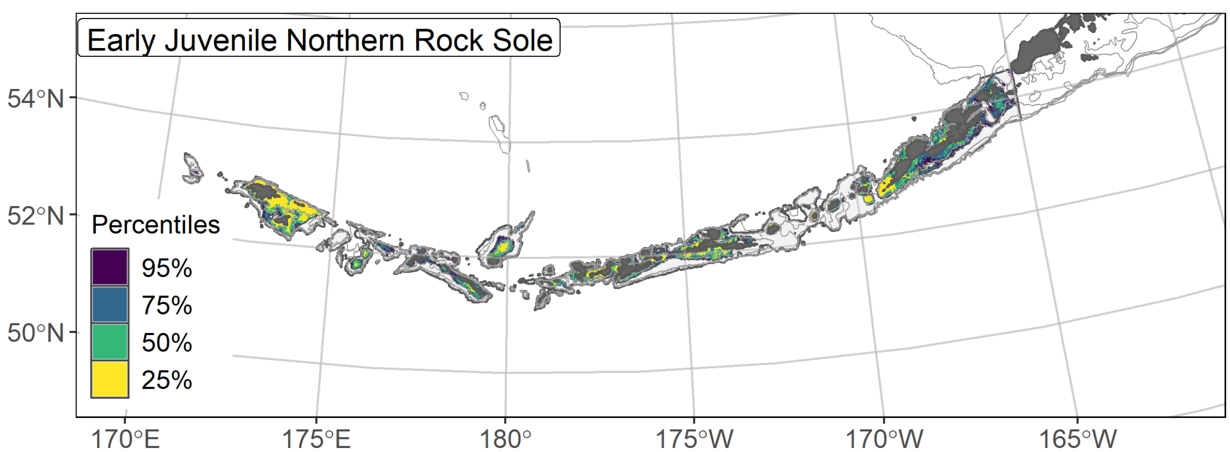

Figure E-80 EFH area of AI settled early juvenile northern rock sole, summer

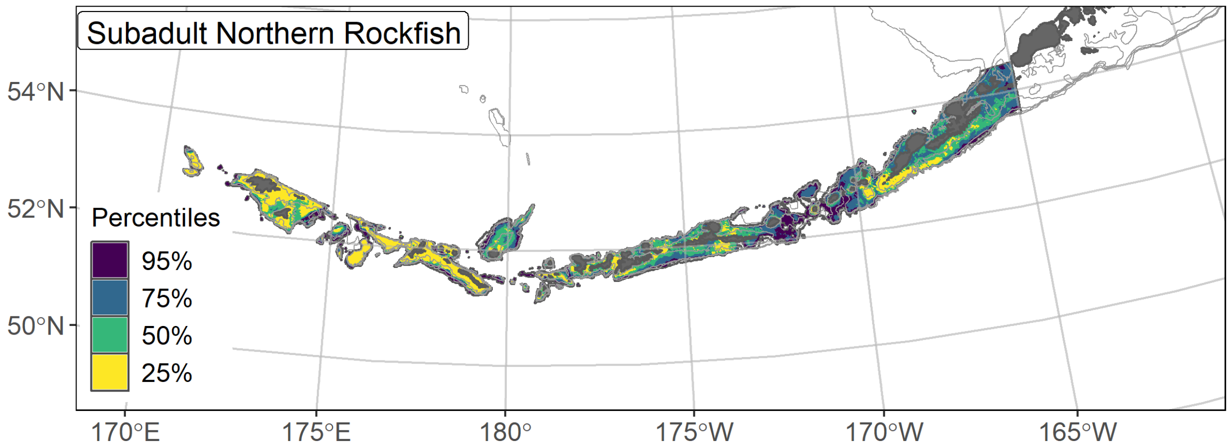

Figure E-81 EFH area of AI subadult northern rock sole, summer

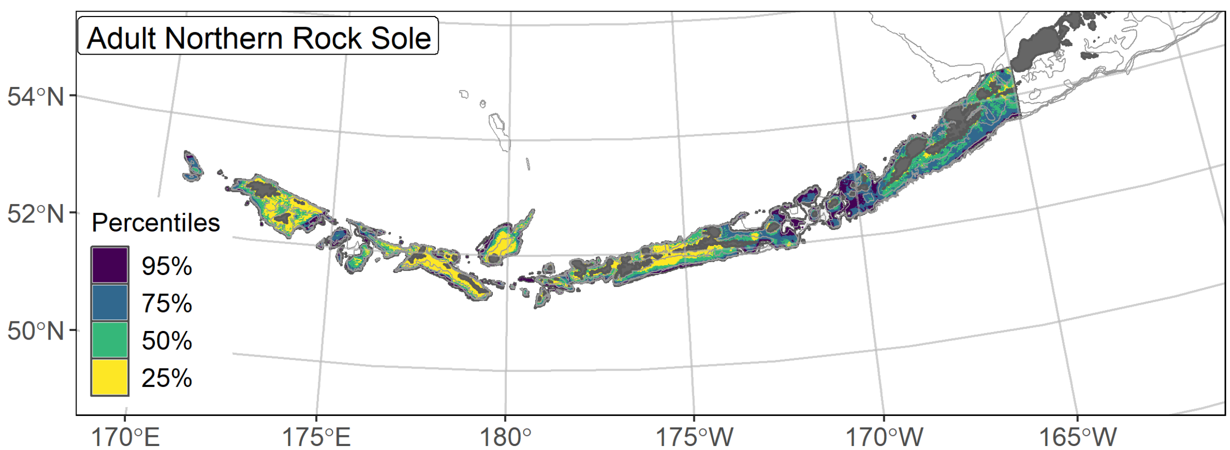

Figure E-82 EFH area of AI adult northern rock sole, summer

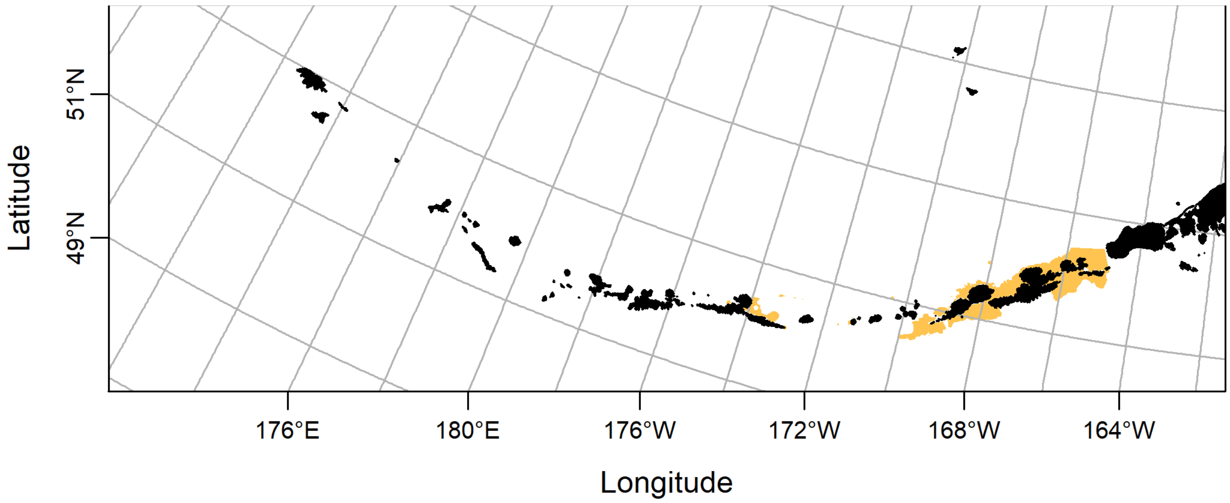

Figure E-83 EFH area of AI northern rock sole larvae, summer

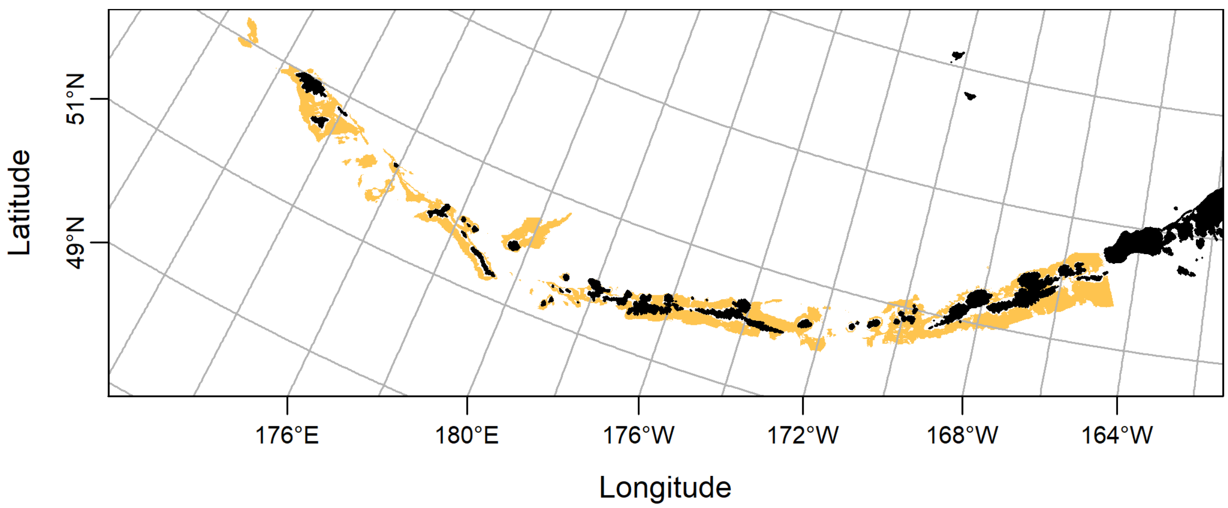

Figure E-84 EFH area of AI adult northern rock sole, fall

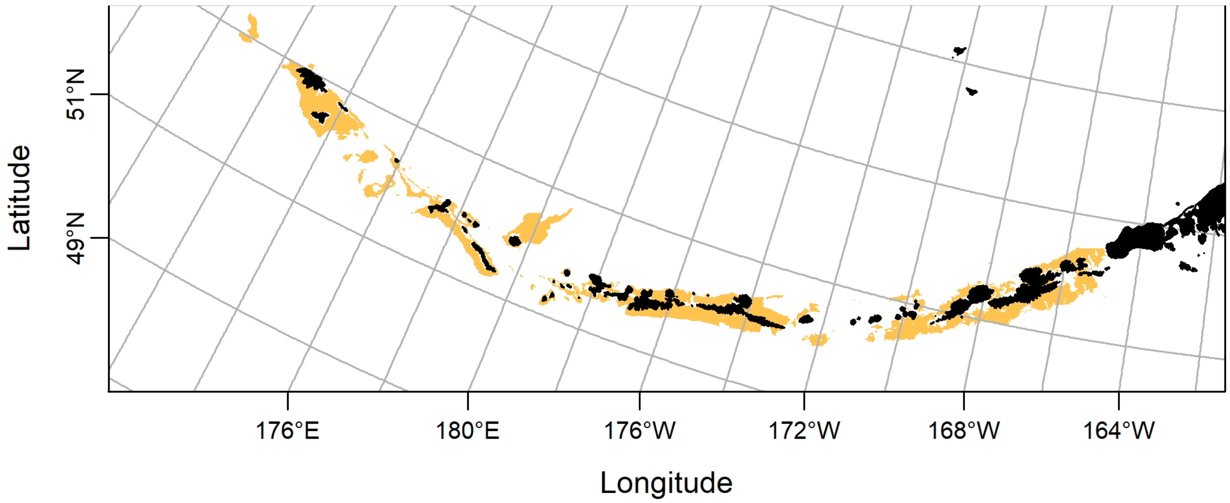

Figure E-85 EFH area of AI adult northern rock sole, winter

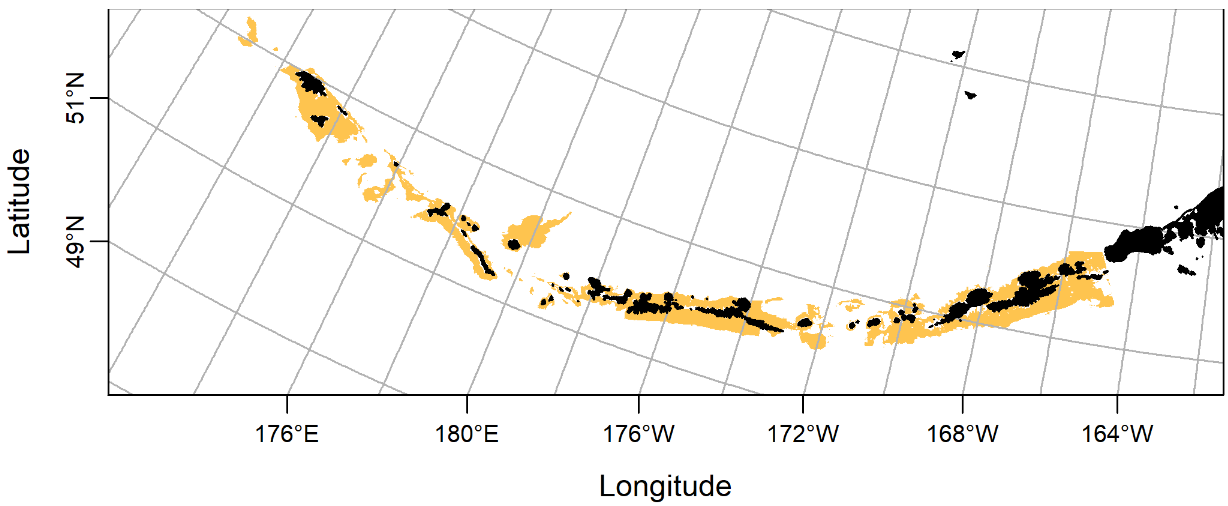

Figure E-86 EFH area of AI adult northern rock sole, spring

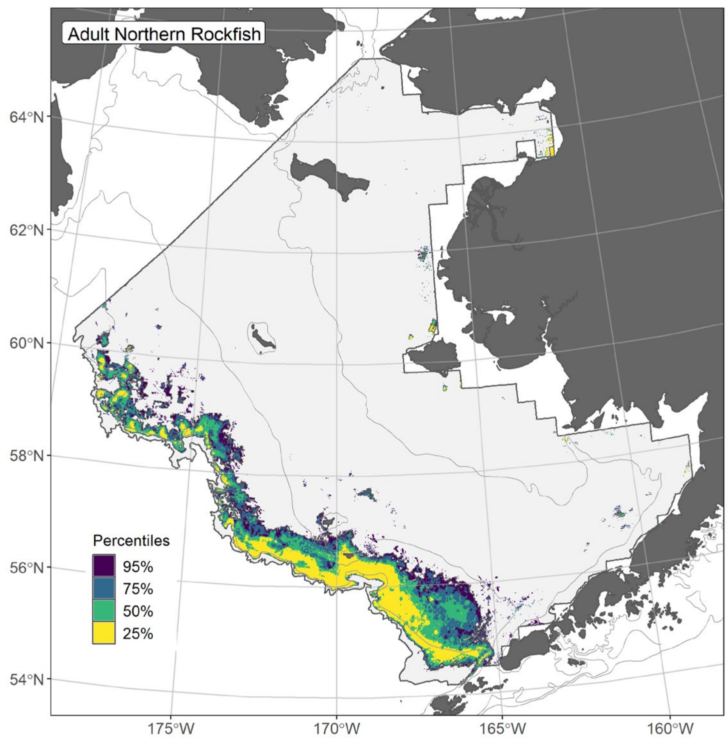

Figure E-87 EFH area of EBS adult northern rockfish, summer

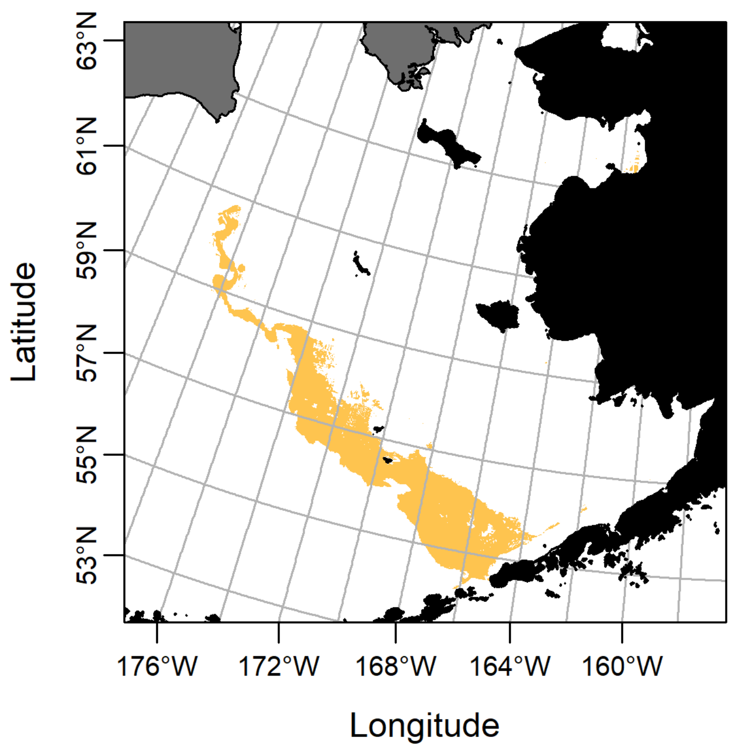

Figure E-88 EFH area of EBS adult northern rockfish, fall

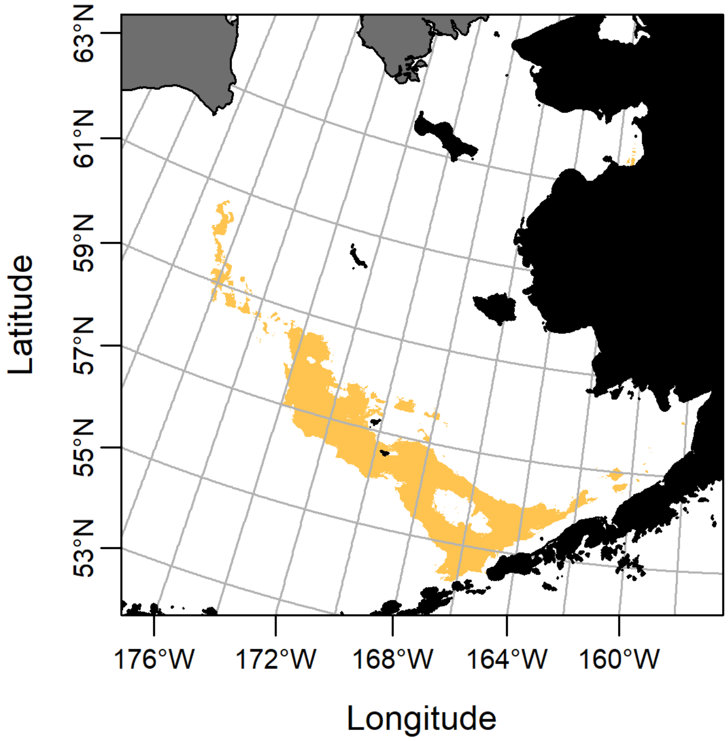

Figure E-89 **EFH area of EBS adult northern rockfish, winter**

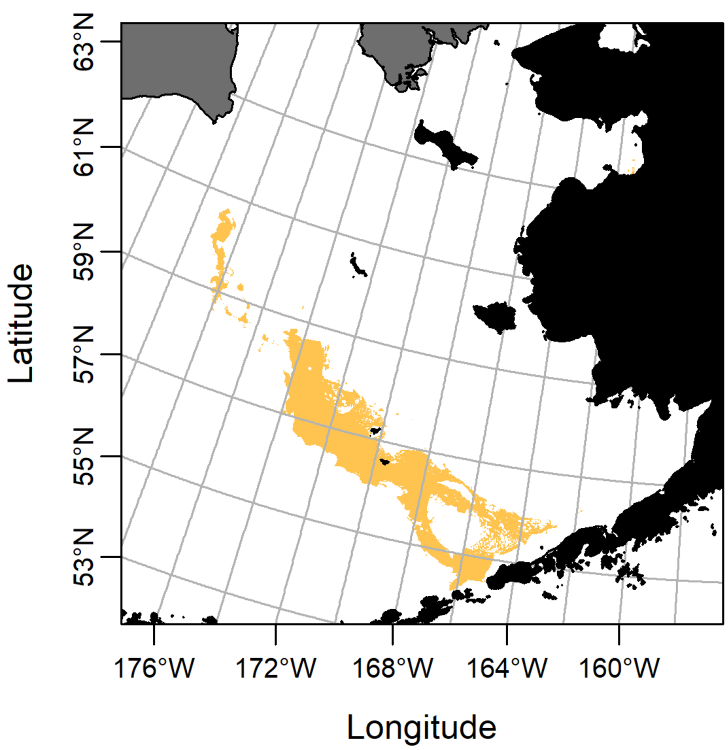

Figure E-90 **EFH area of EBS adult northern rockfish, spring**

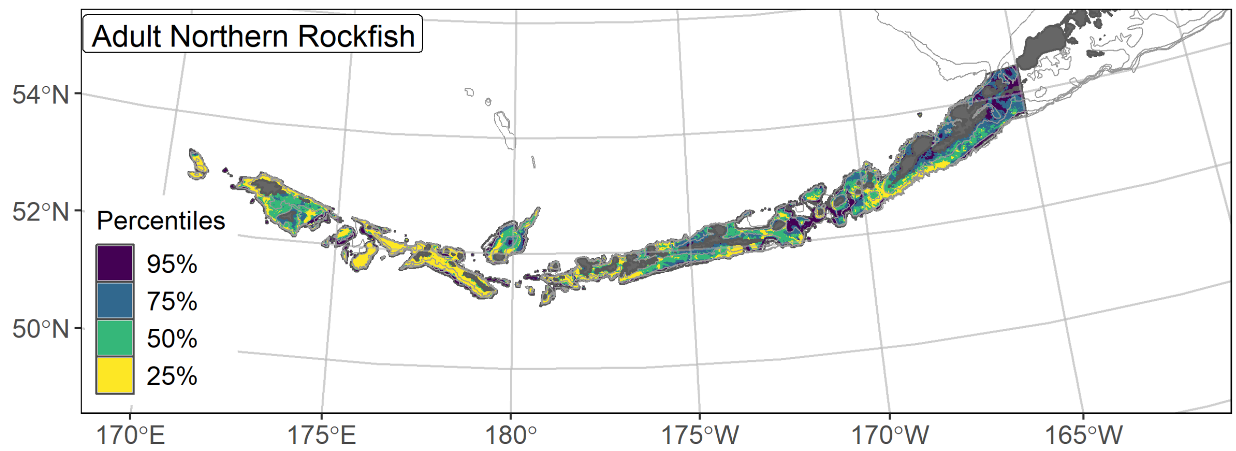

Figure E-91 EFH area of AI adult northern rockfish, summer

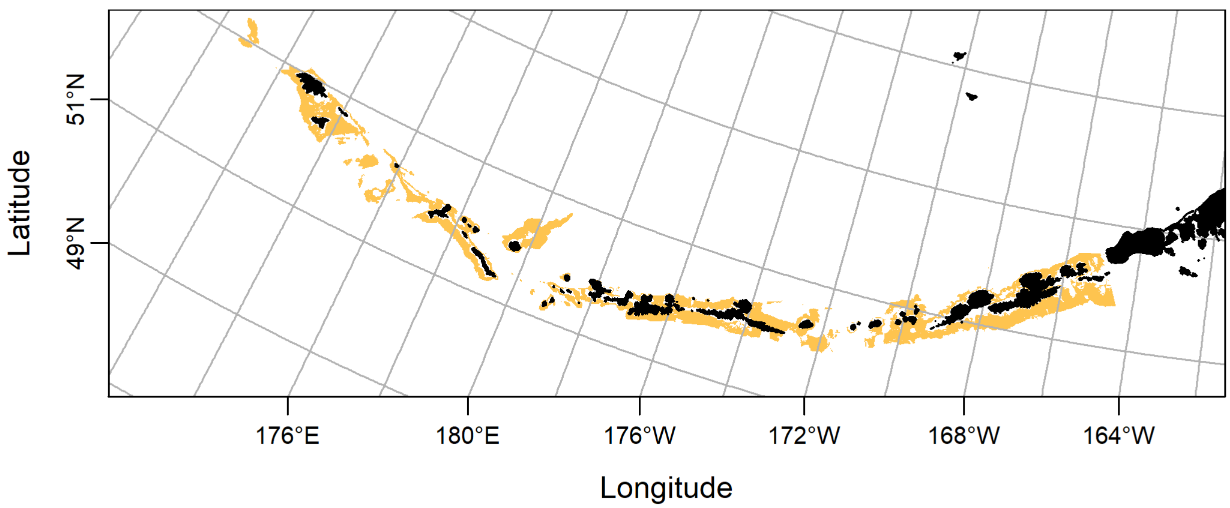

Figure E-92 EFH area of AI adult northern rockfish, fall

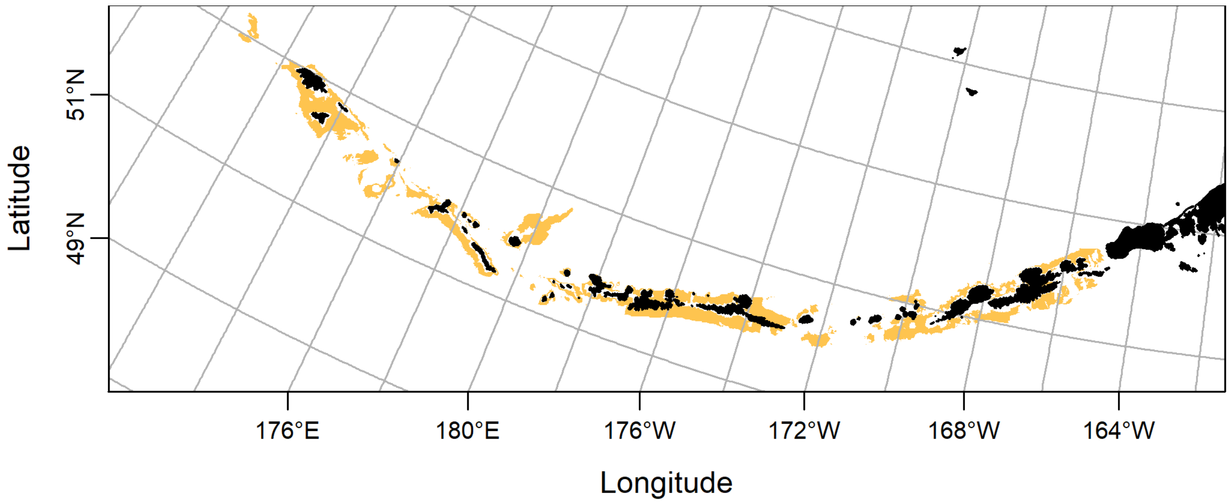

Figure E-93 EFH area of AI adult northern rockfish, winter

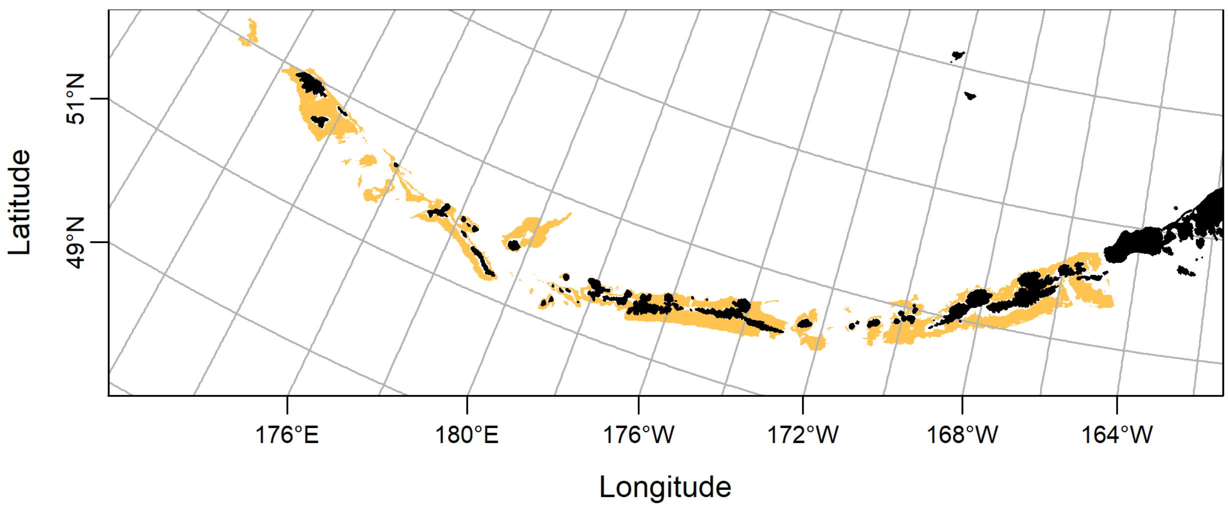

Figure E-94 EFH area of AI adult northern rockfish, spring

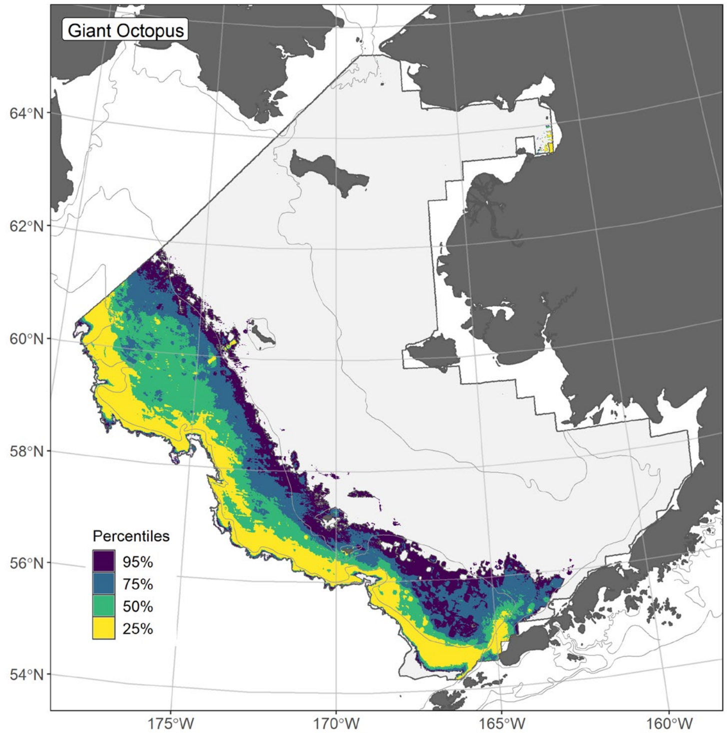

Figure E-95 EFH area of EBS adult giant octopus, summer

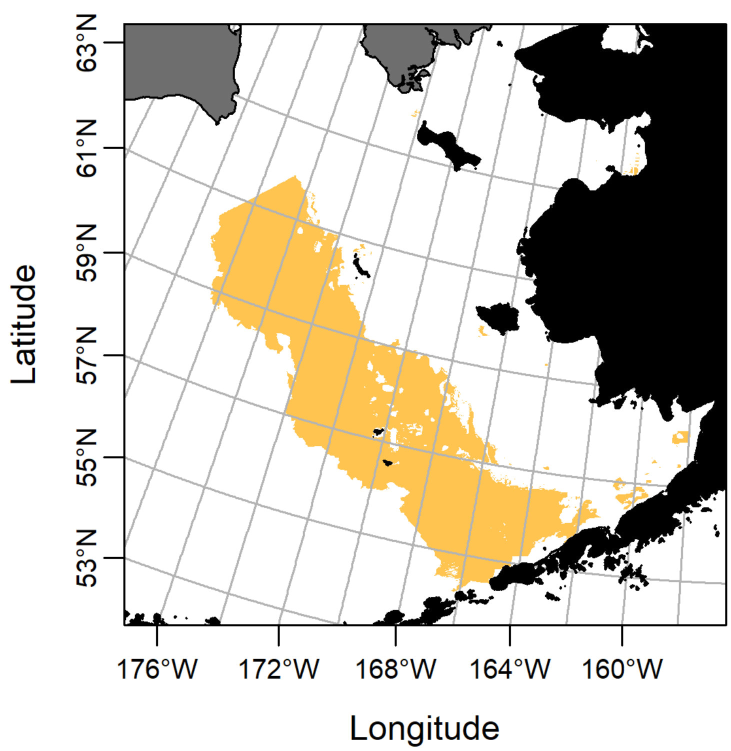

Figure E-96 EFH area of EBS adult giant octopus, fall

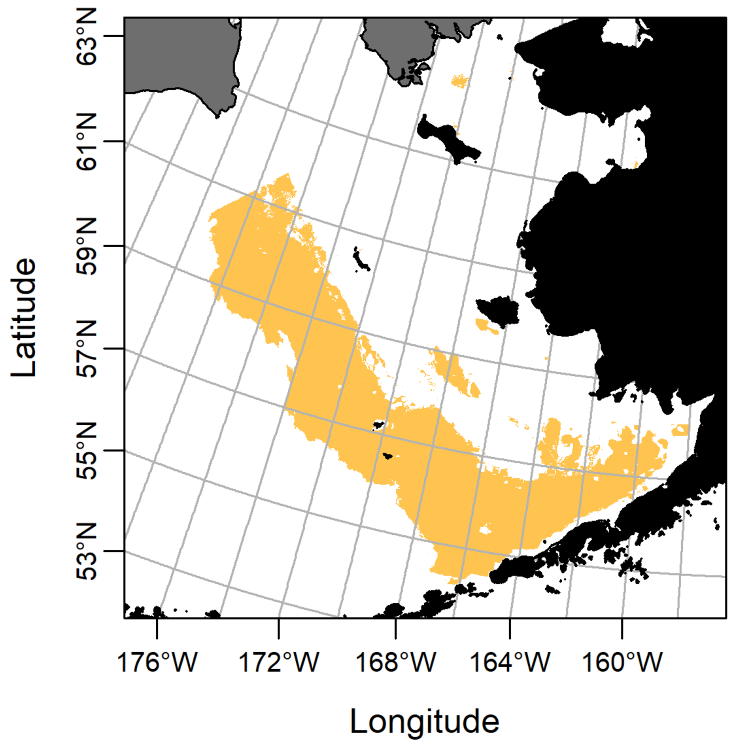

Figure E-97 EFH area of EBS adult giant octopus, winter

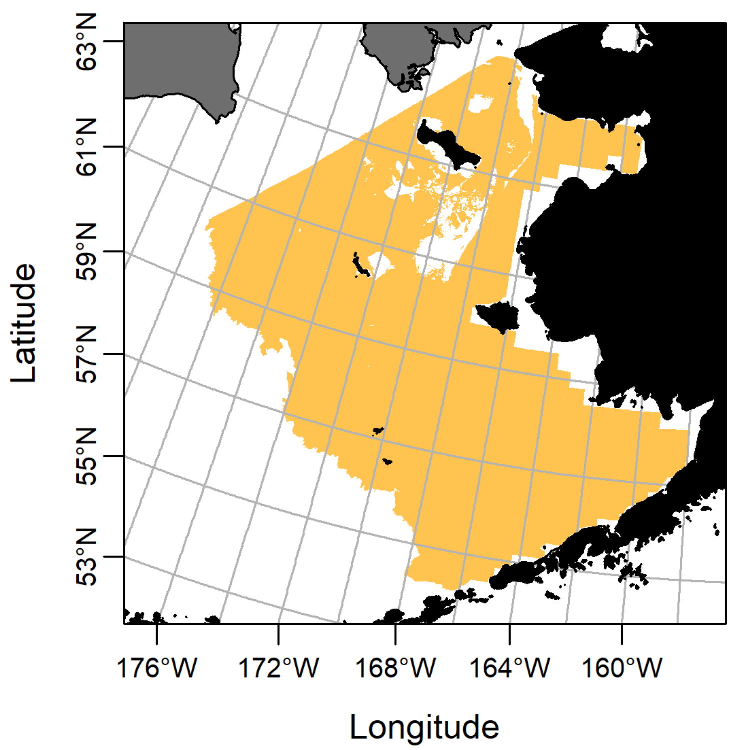

Figure E-98 EFH area of EBS adult giant octopus, spring

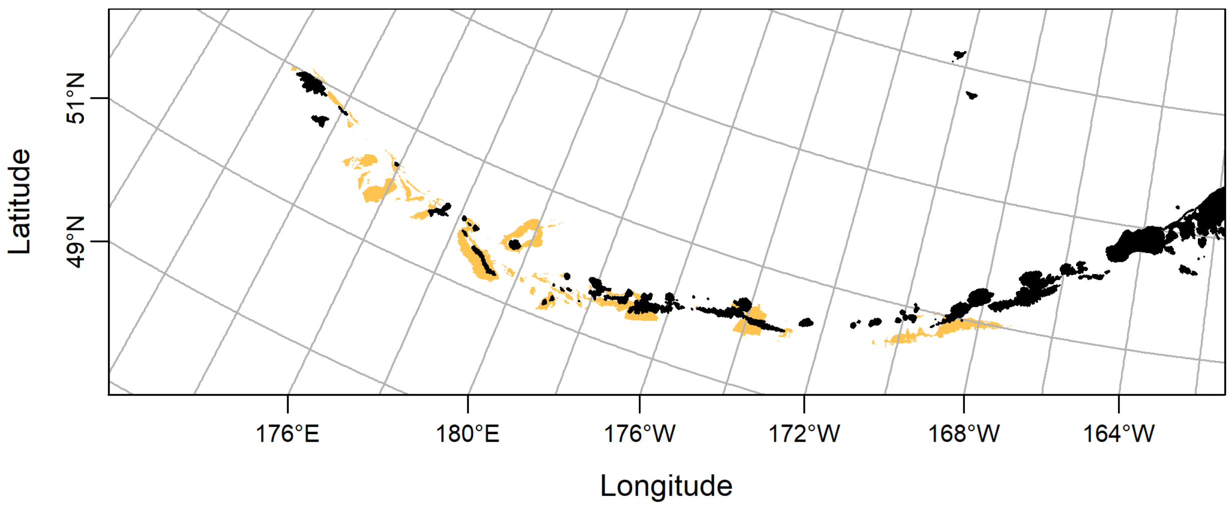

Figure E-99 EFH area of AI adult giant octopus, summer

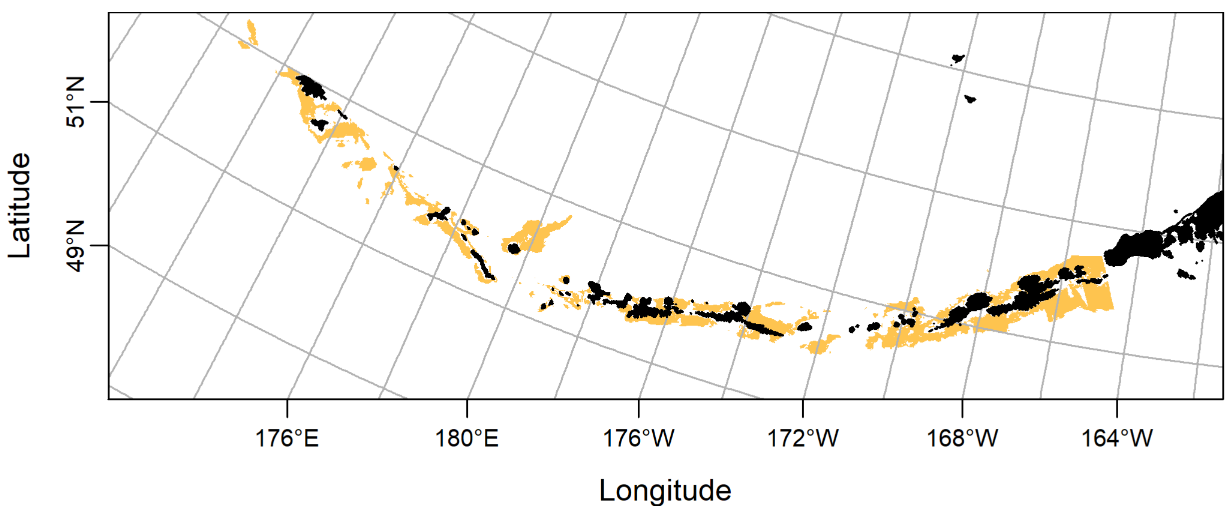

Figure E-100 EFH area of AI adult giant octopus, fall

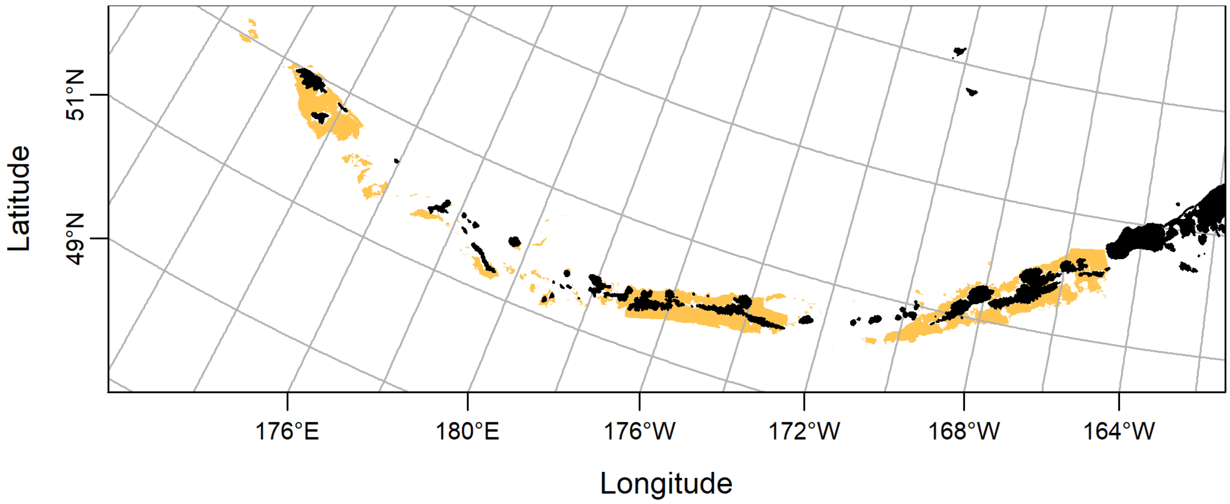

Figure E-101 EFH area of AI adult giant octopus, winter

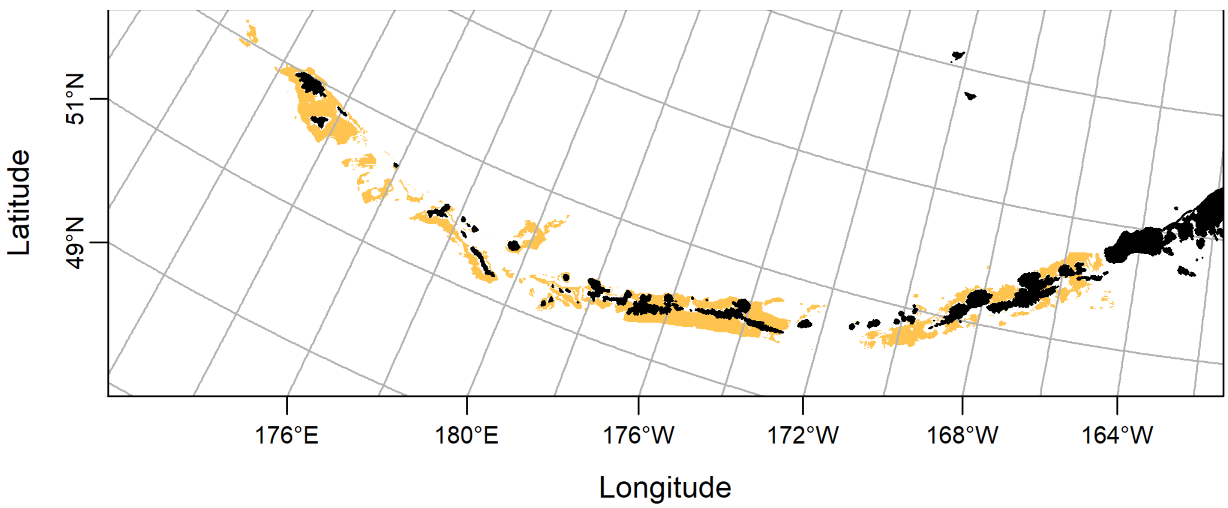

Figure E-102 EFH area of AI adult giant octopus, spring

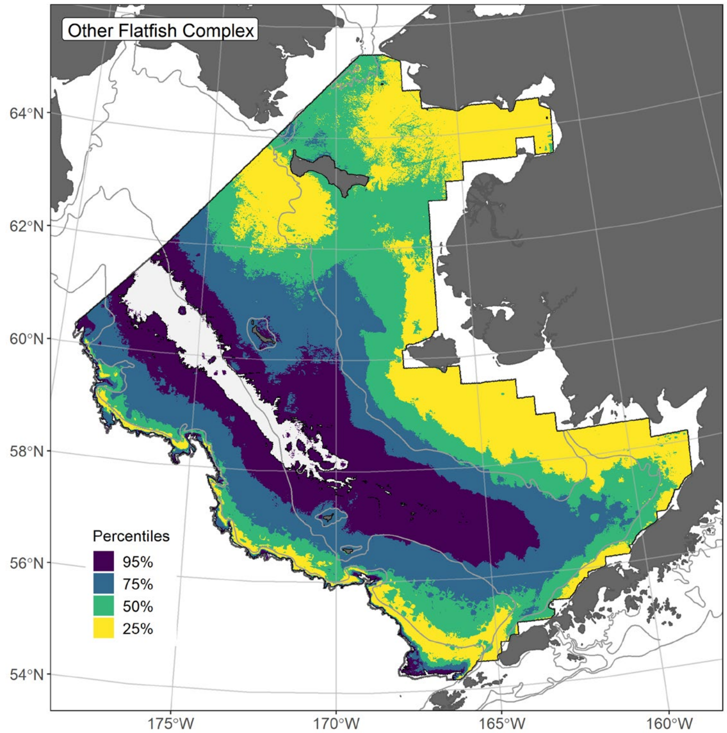

Figure E-103 EFH area of EBS subadult/adult other flatfish complex, summer

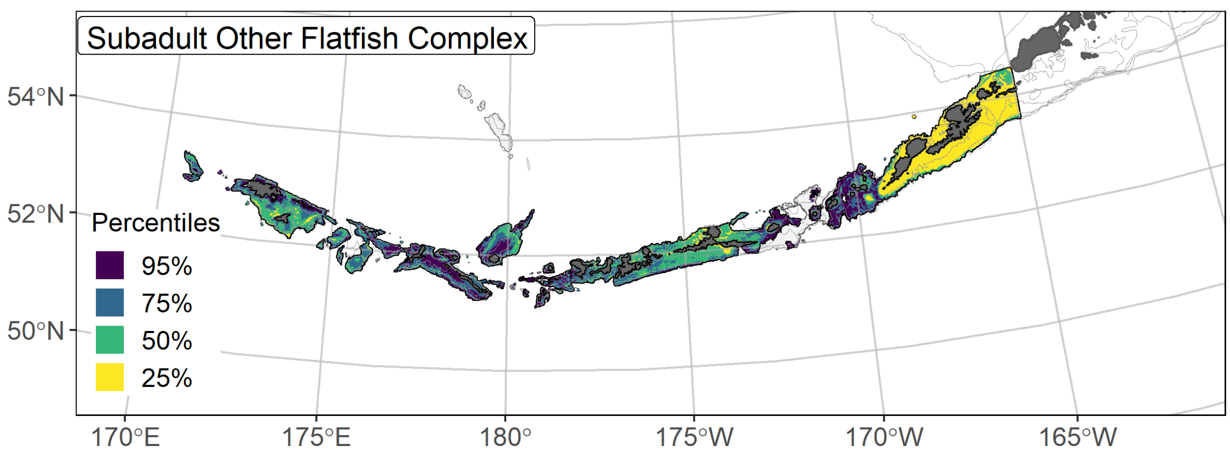

Figure E-104 EFH area of AI subadult other flatfish complex, summer

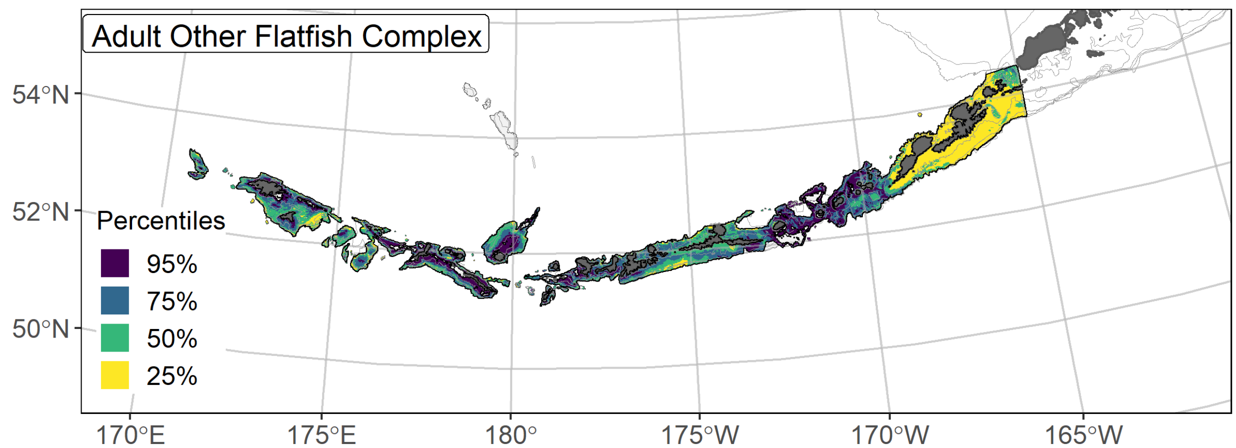

Figure E-105 EFH area of AI adult other flatfish complex, summer

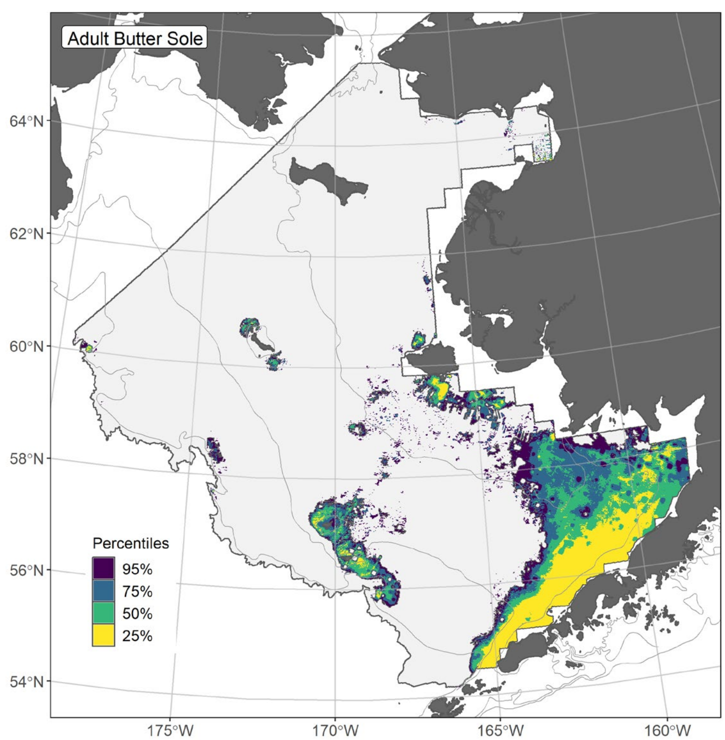

Figure E-106 EFH area of EBS subadult/adult butter sole, summer

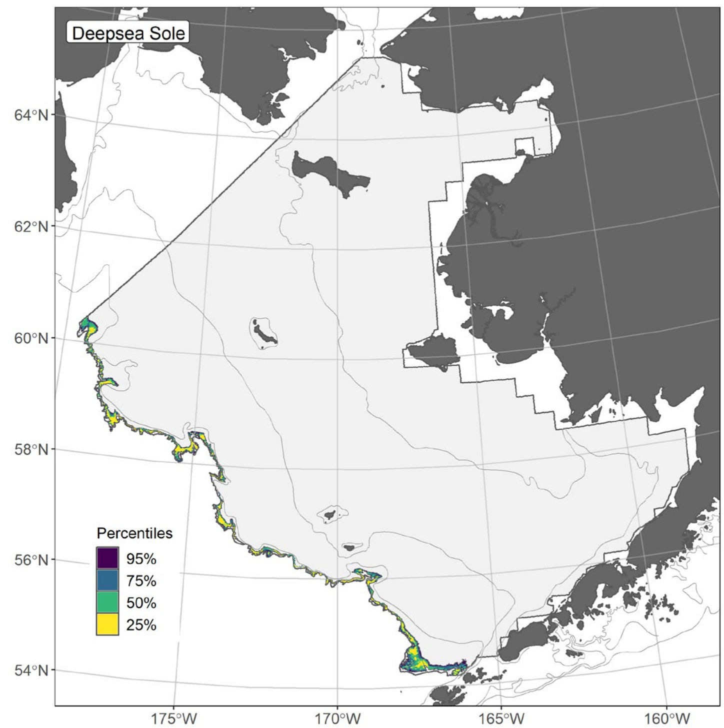

Figure E-107 EFH area of EBS subadult/adult deepsea sole, summer

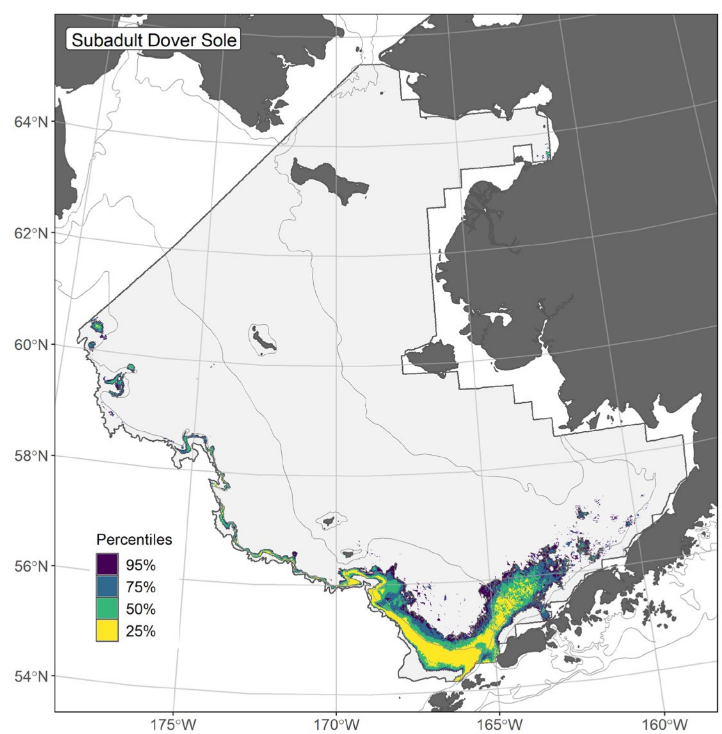

Figure E-108 EFH area of EBS subadult Dover sole, summer

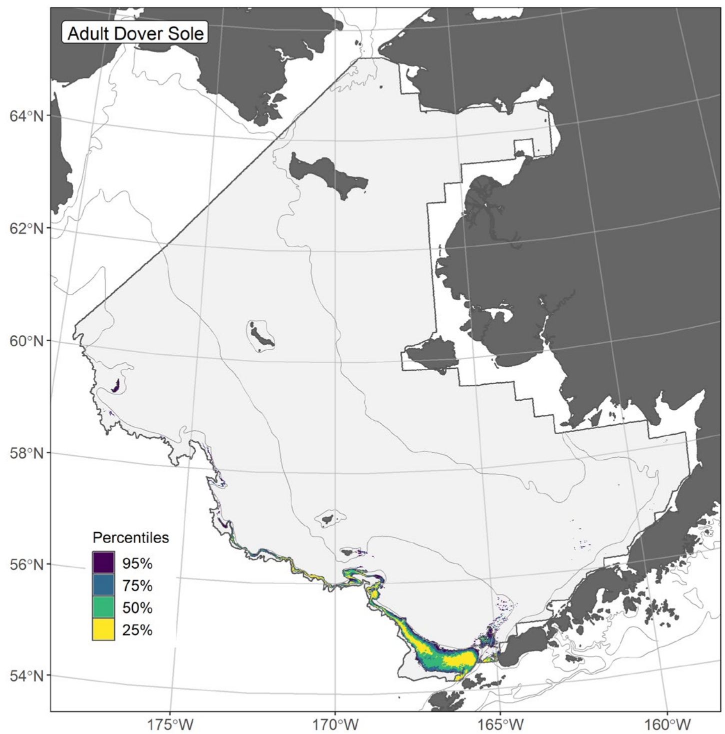

Figure E-109 EFH area of EBS adult Dover sole, summer

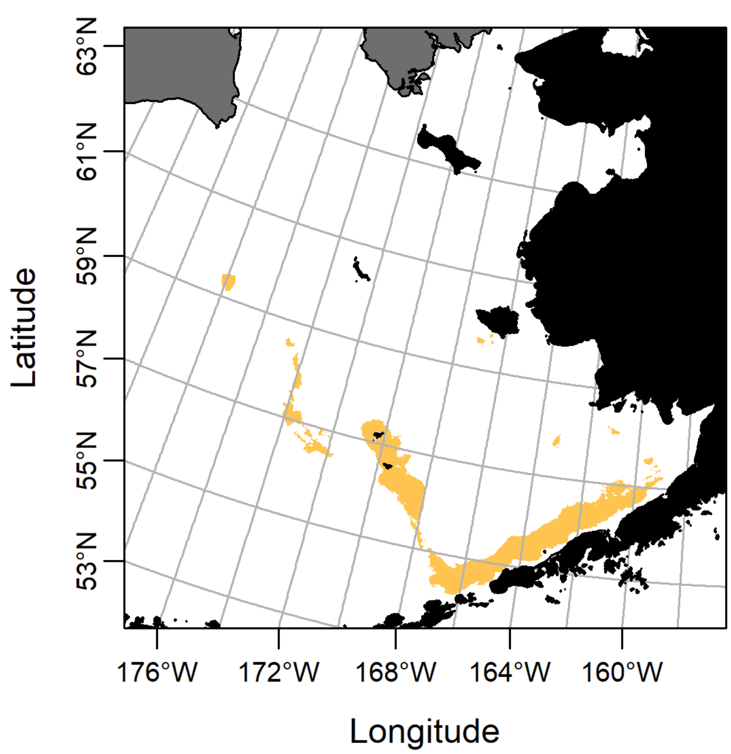

Figure E-110 EFH area of EBS adult Dover sole, winter

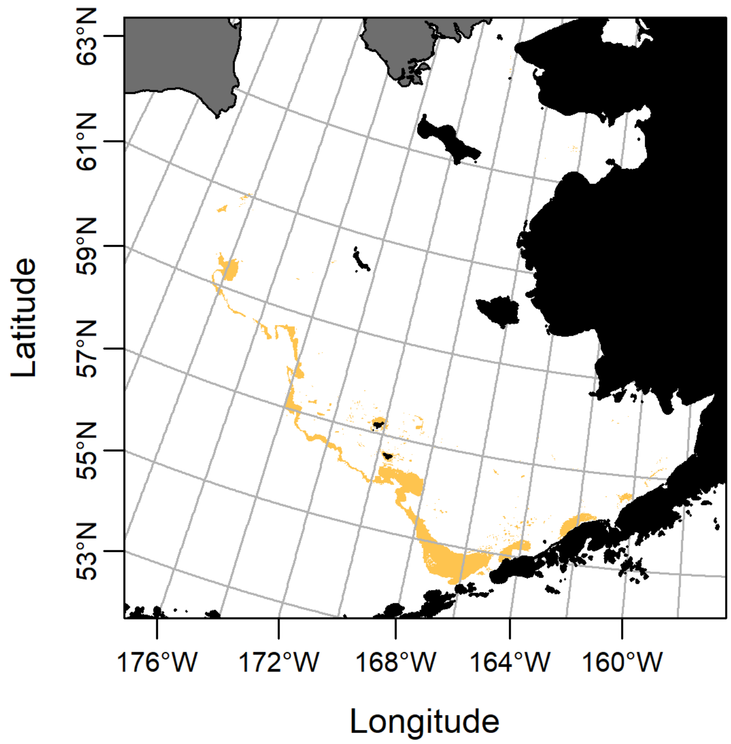

Figure E-111 EFH area of EBS adult Dover sole, spring

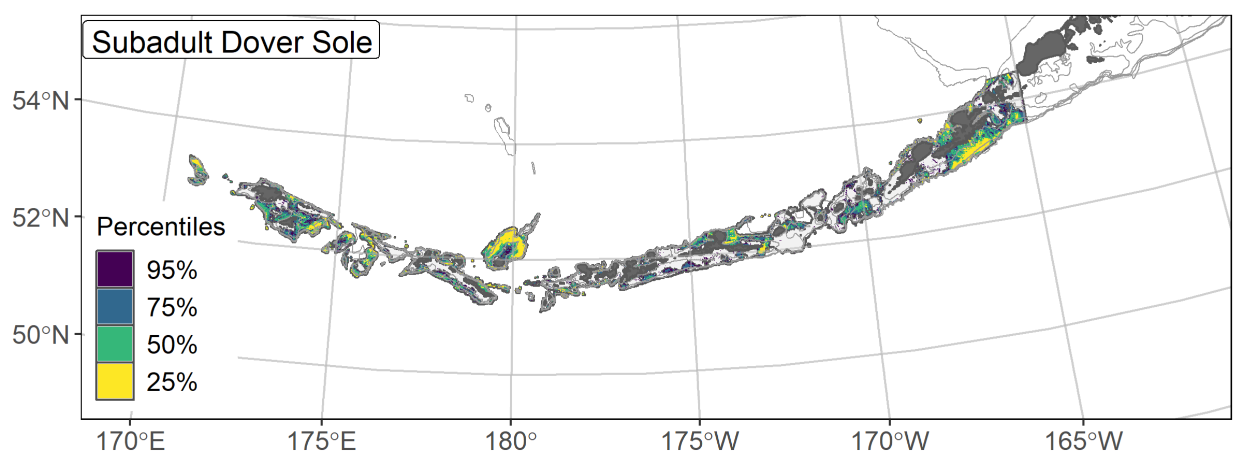

Figure E-112 EFH area of AI subadult Dover sole, summer

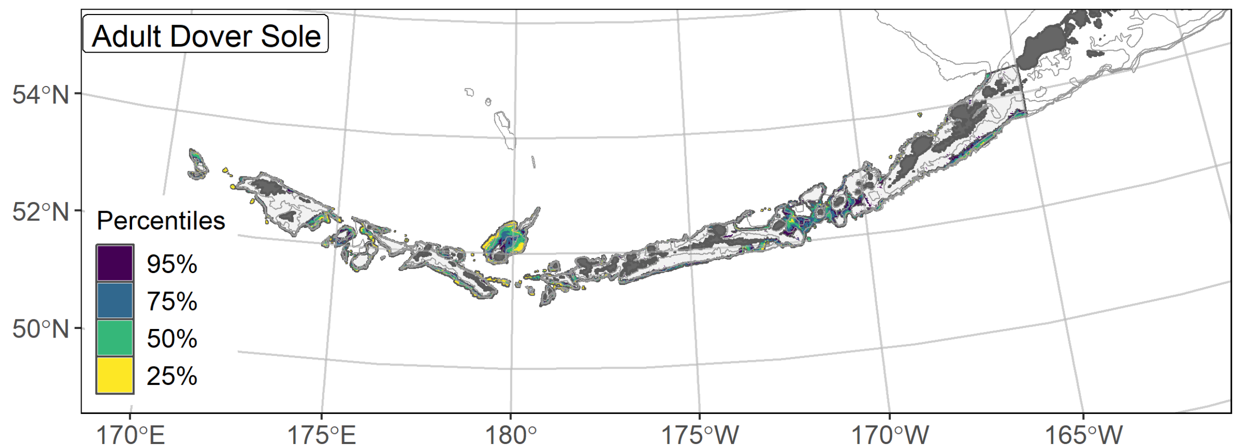

Figure E-113 EFH area of AI adult Dover sole, summer

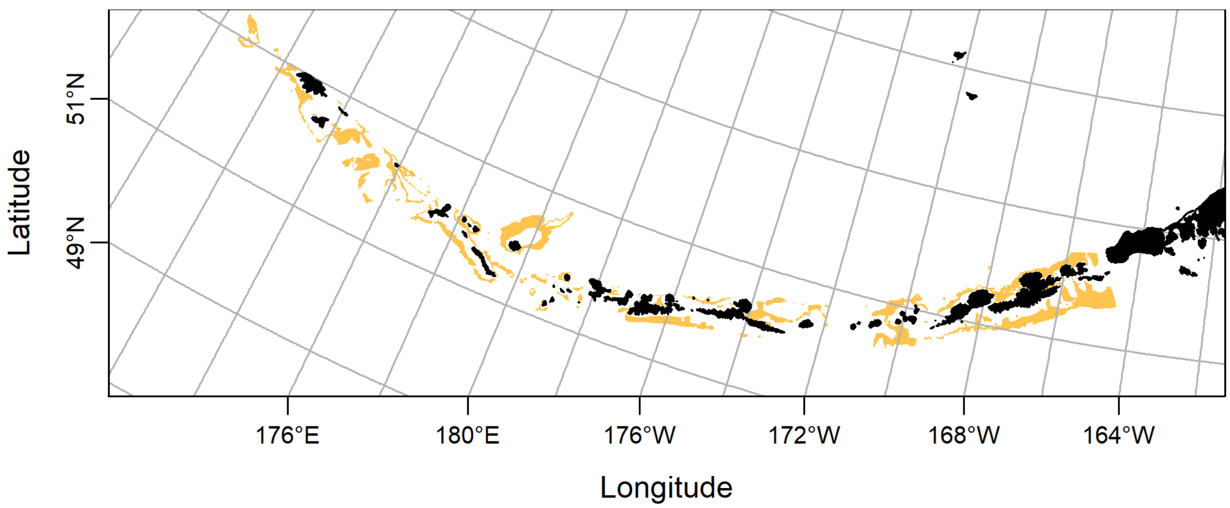

Figure E-114 EFH area of AI adult Dover sole, spring

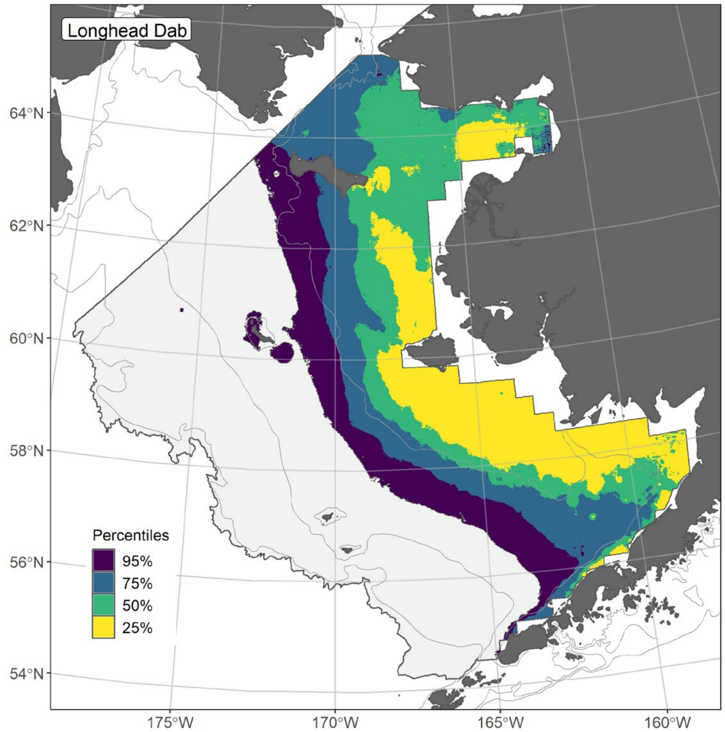

Figure E-115 EFH area of EBS subadult/adult longhead dab, summer

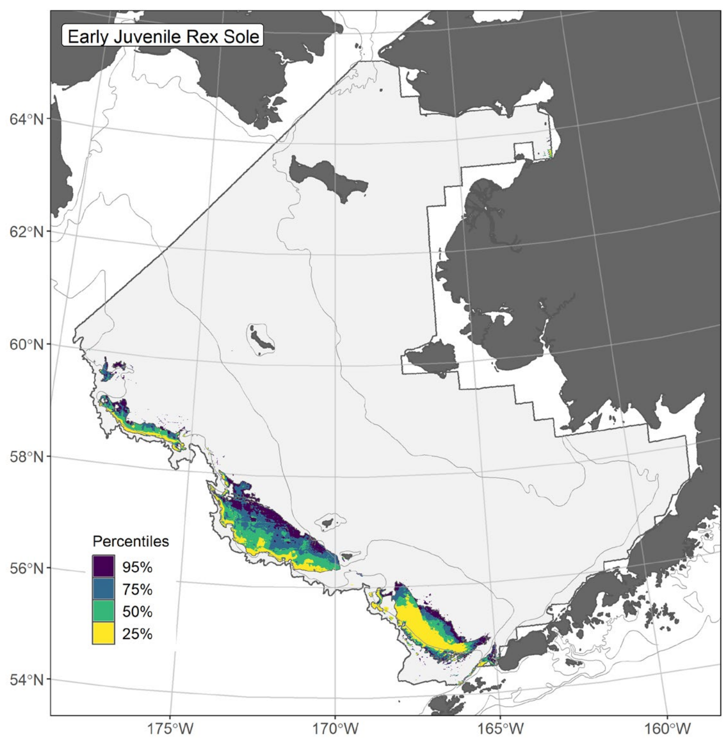

Figure E-116 EFH area of EBS settled early juvenile rex sole, summer

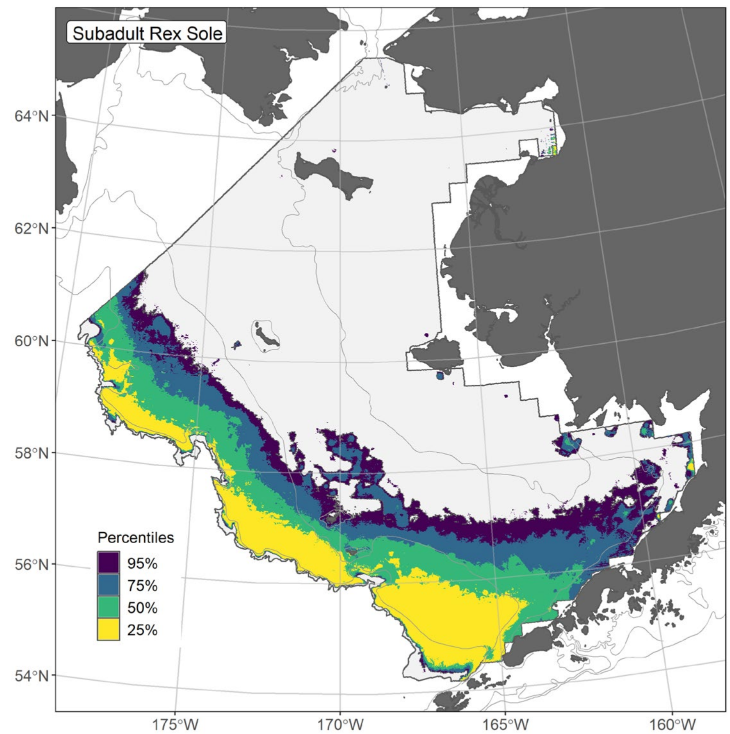

Figure E-117 EFH area of EBS subadult rex sole, summer

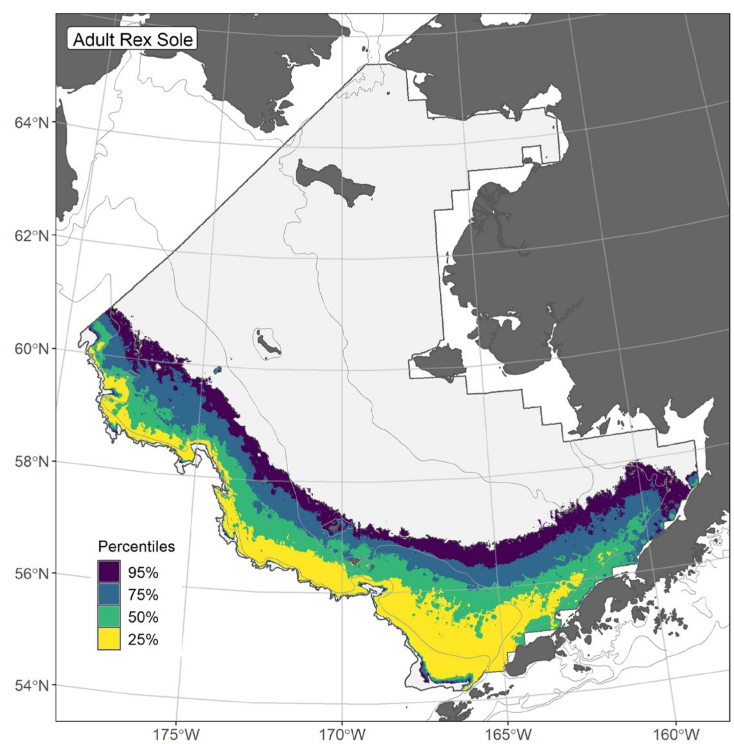

Figure E-118 EFH area of EBS adult rex sole, summer

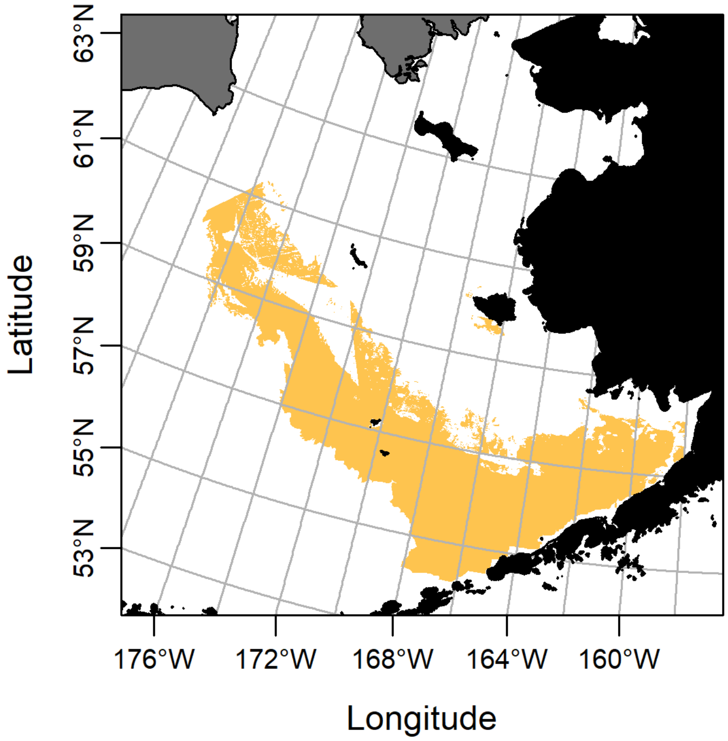

Figure E-119 EFH area of EBS rex sole eggs, summer

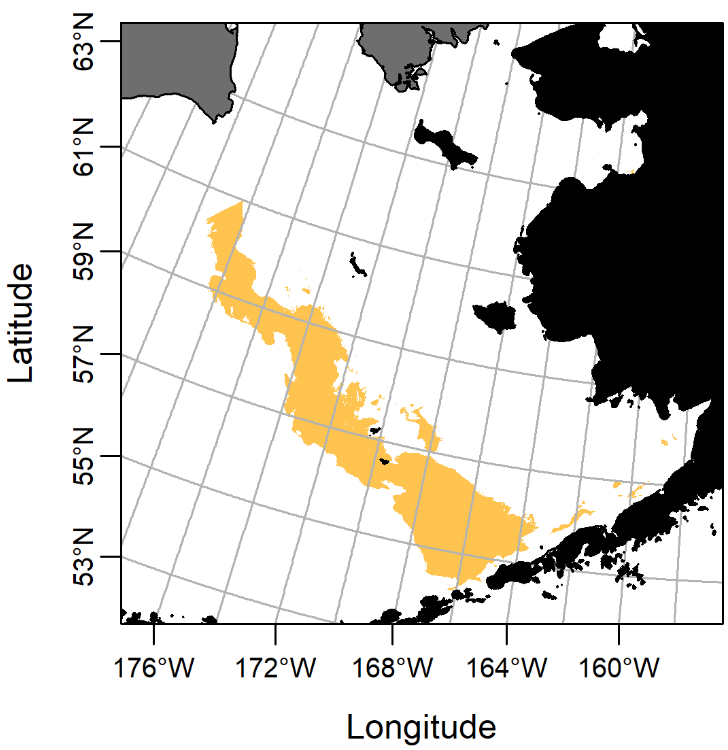

Figure E-120 EFH area of EBS adult rex sole, fall

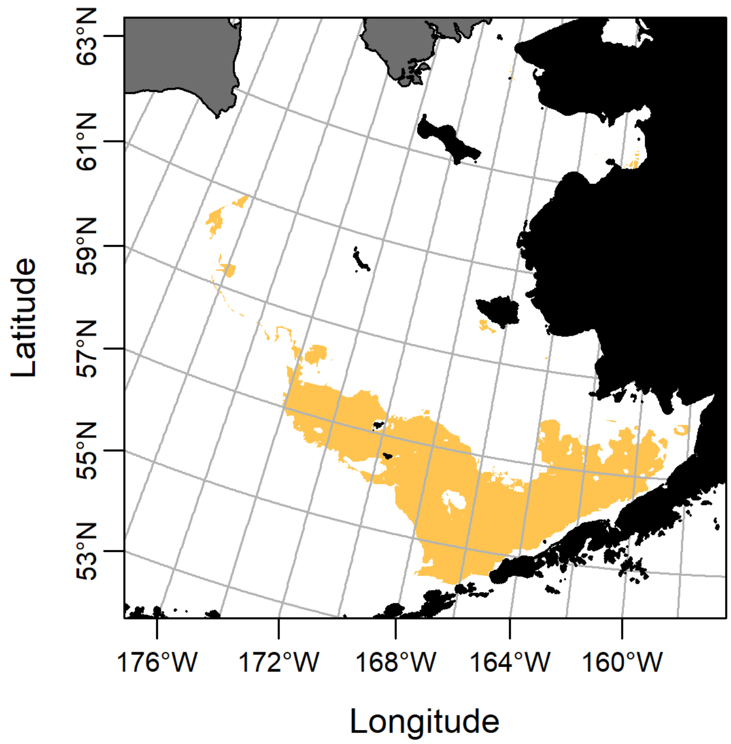

Figure E-121 EFH area of EBS adult rex sole, winter

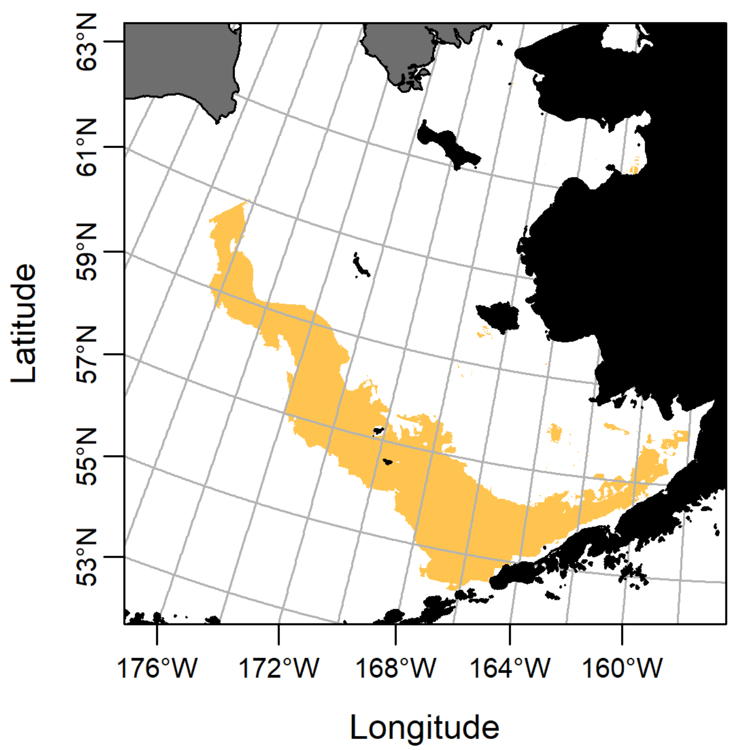

Figure E-122 EFH area of EBS adult rex sole, spring

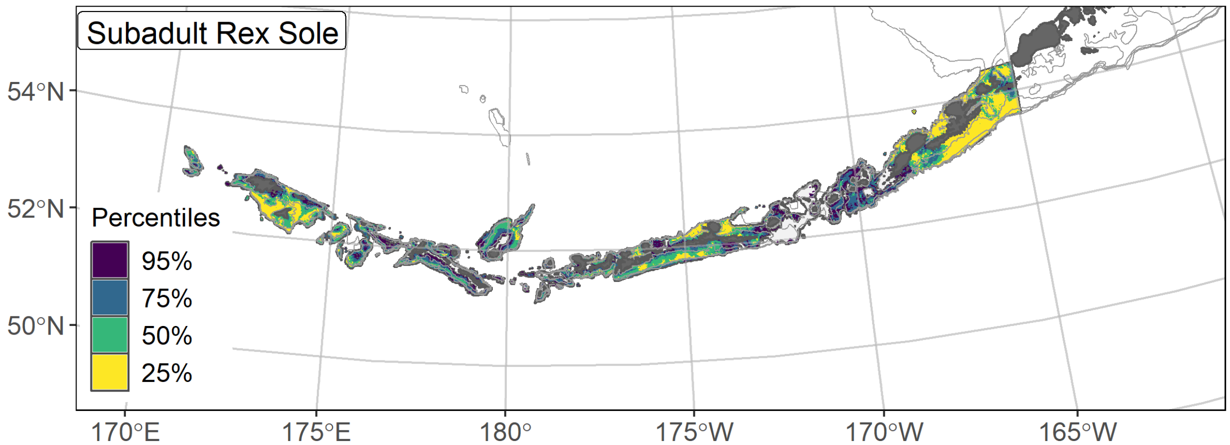

Figure E-123 EFH area of AI subadult rex sole, summer

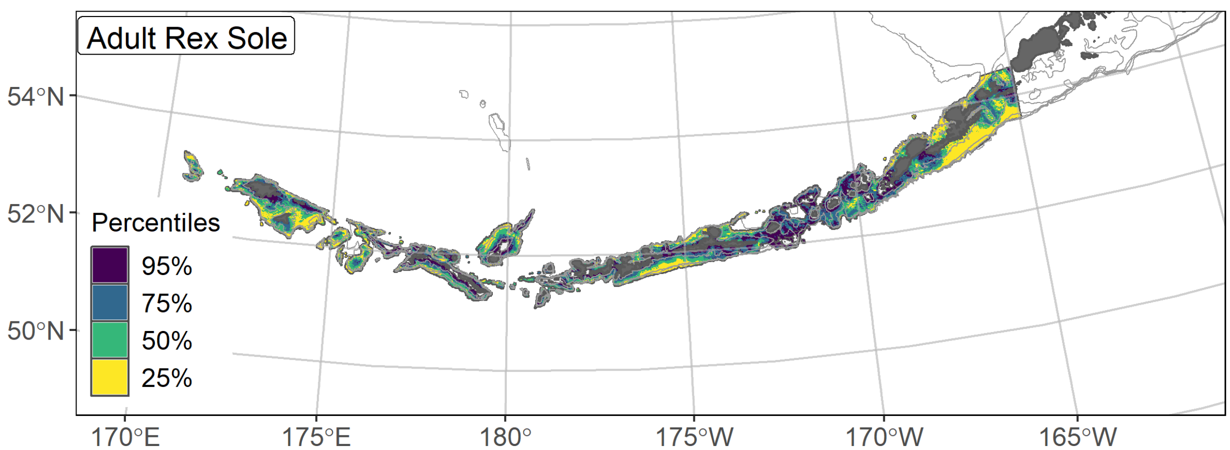

Figure E-124 EFH area of AI adult rex sole, summer

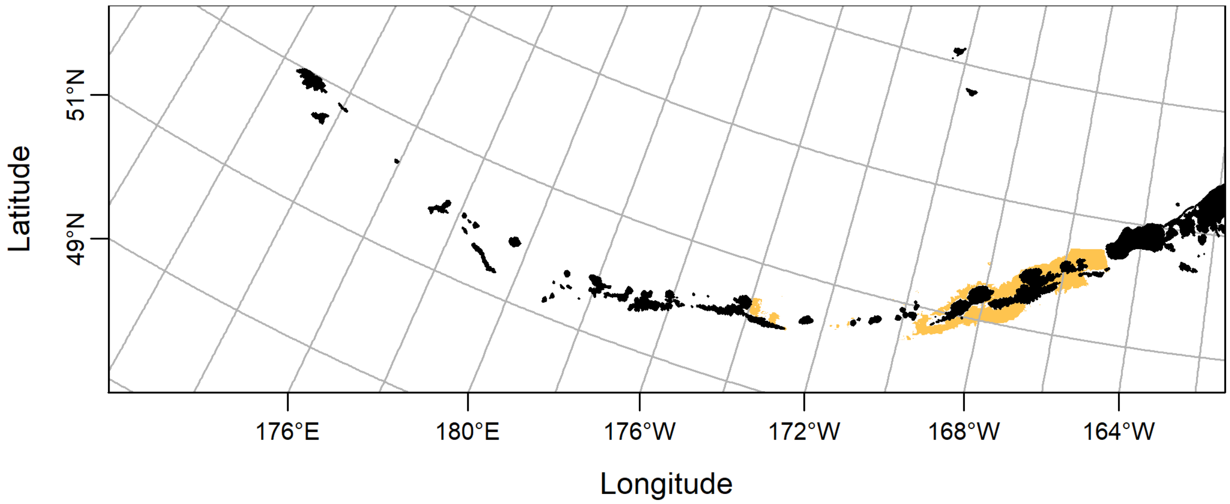

Figure E-125 EFH area of AI rex sole eggs, summer

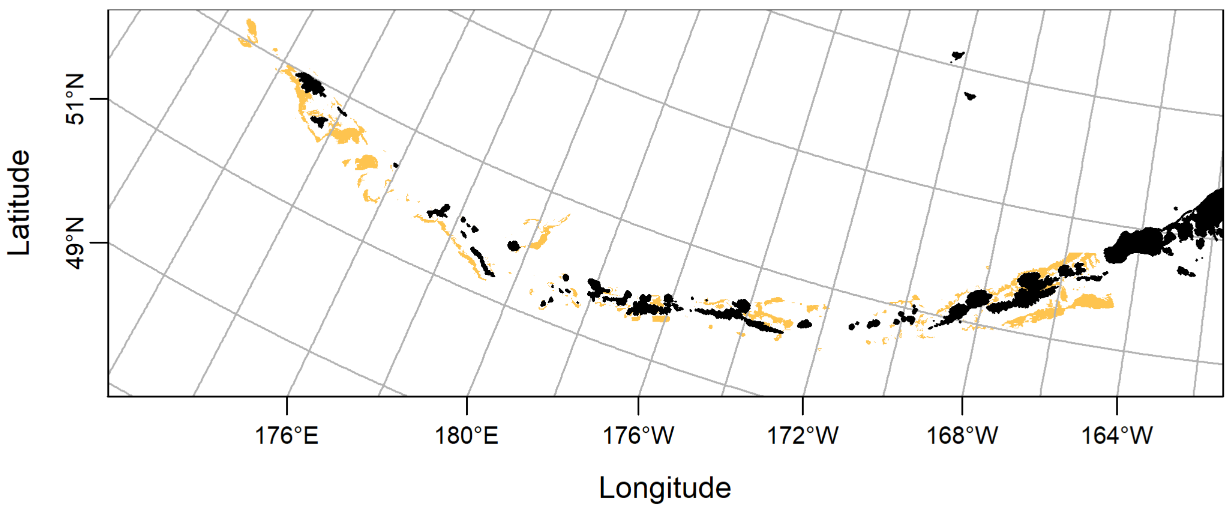

Figure E-126 EFH area of AI adult rex sole, fall

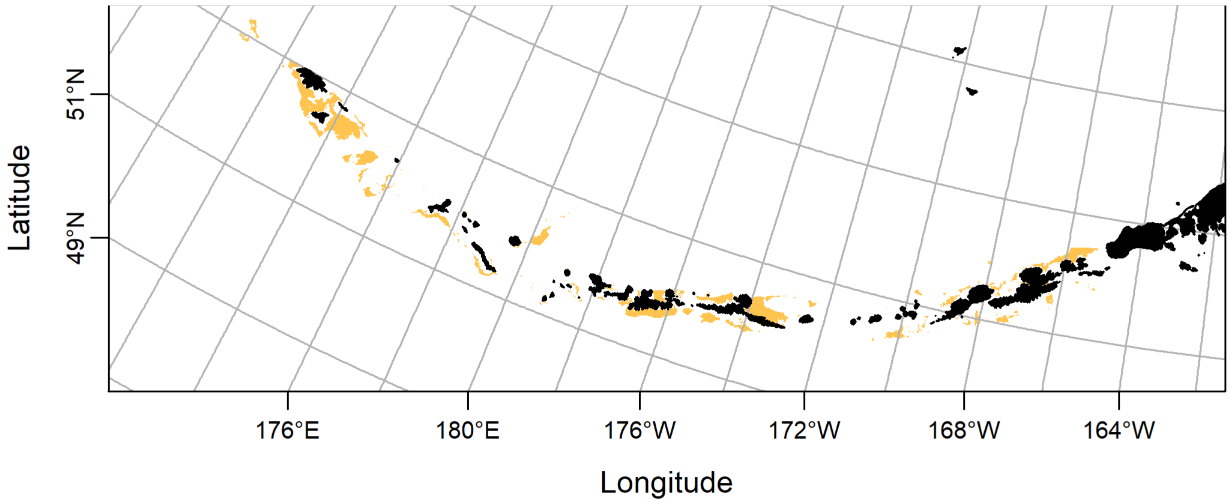

Figure E-127 EFH area of AI adult rex sole, winter

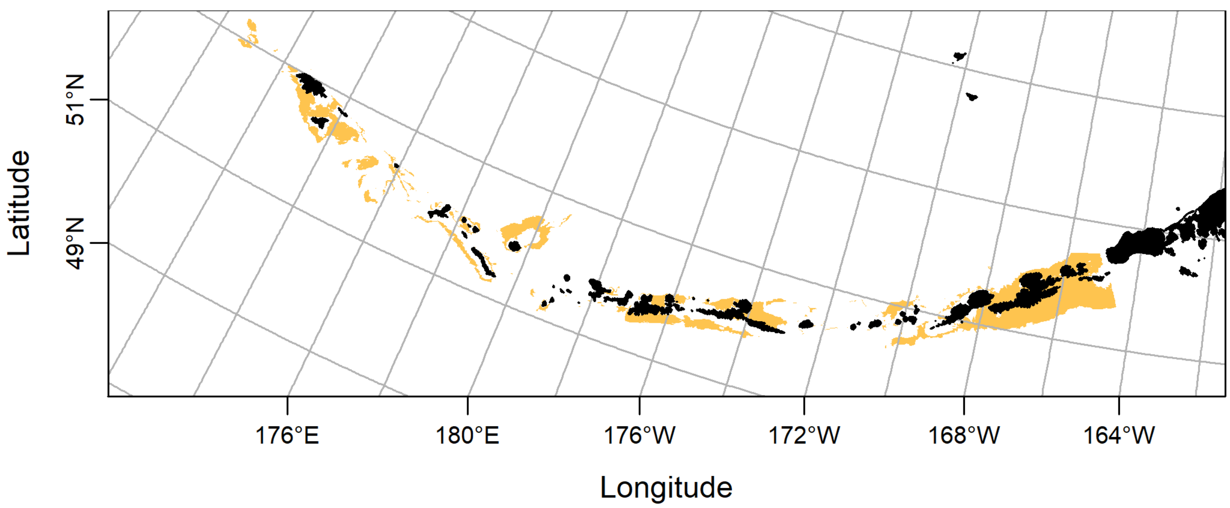

Figure E-128 EFH area of AI adult rex sole, spring

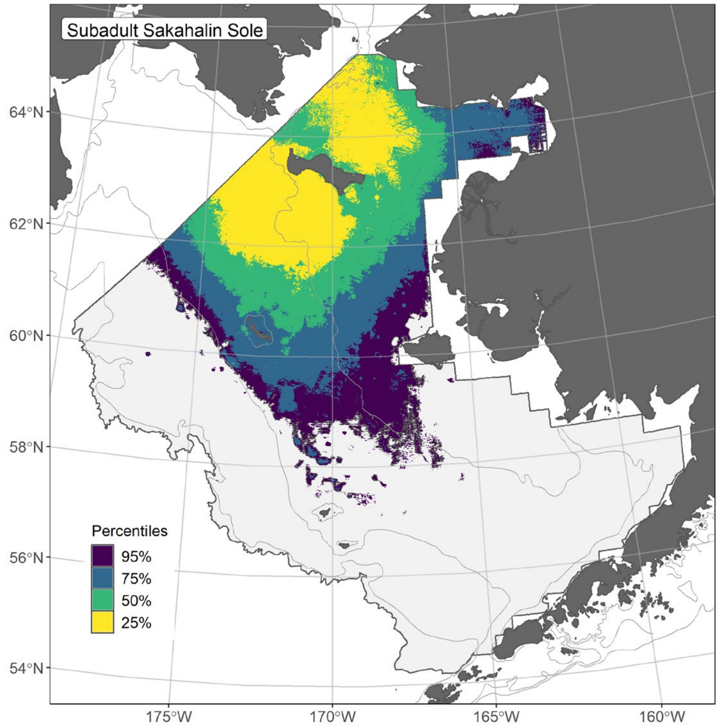

Figure E-129 EFH area of EBS subadult Sakhalin sole, summer

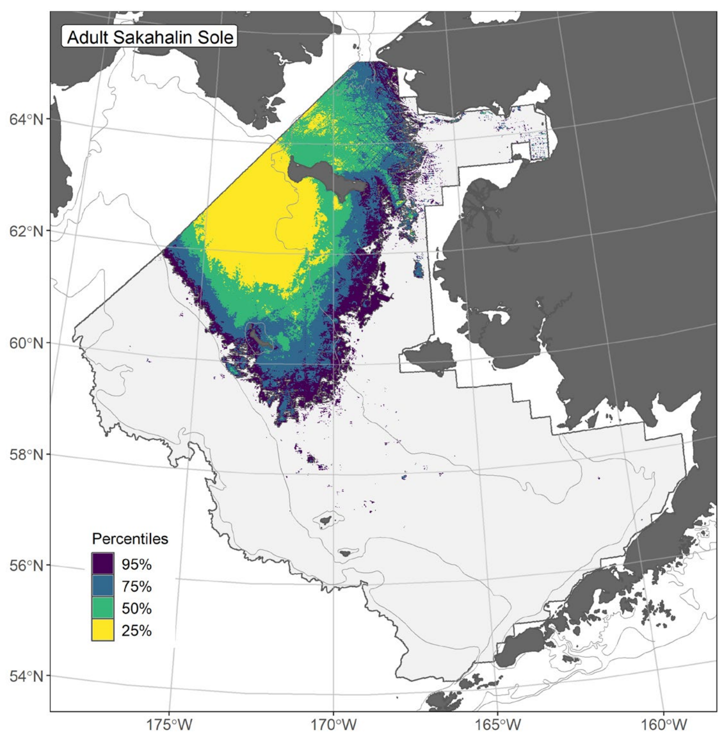

Figure E-130 EFH area of EBS adult Sakhalin sole, summer

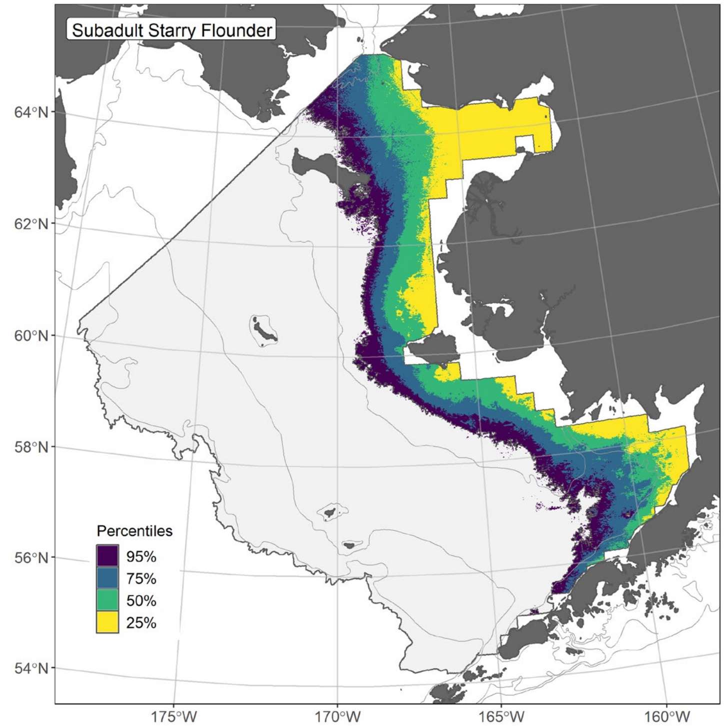

Figure E-131 EFH area of EBS subadult starry flounder, summer

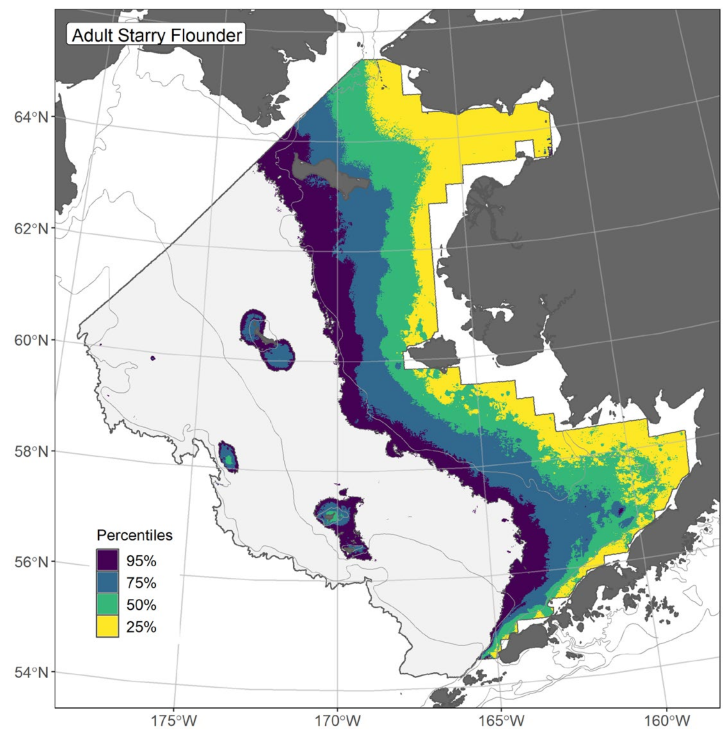

Figure E-132 EFH area of EBS adult starry flounder, summer

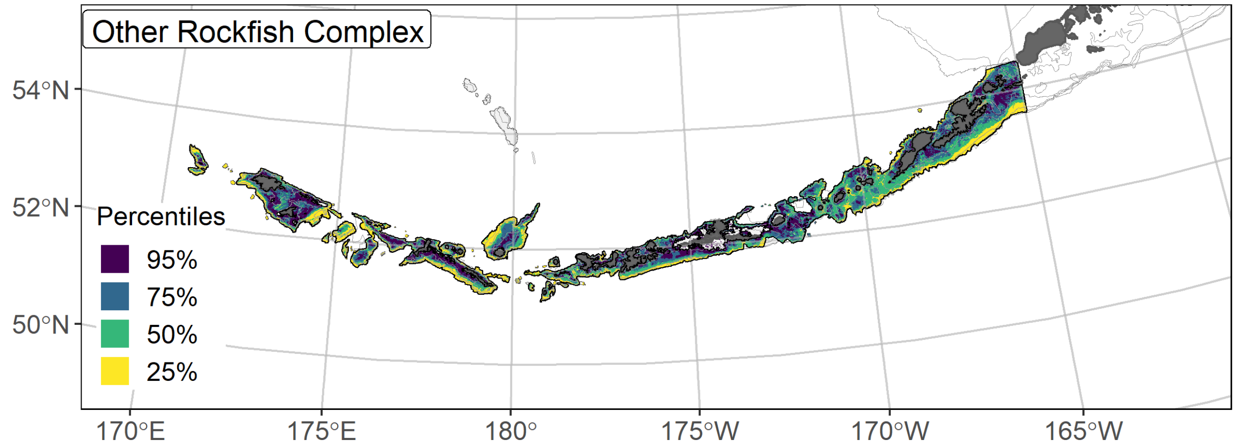

Figure E-133 EFH area of AI subadult/adult other rockfish complex, summer

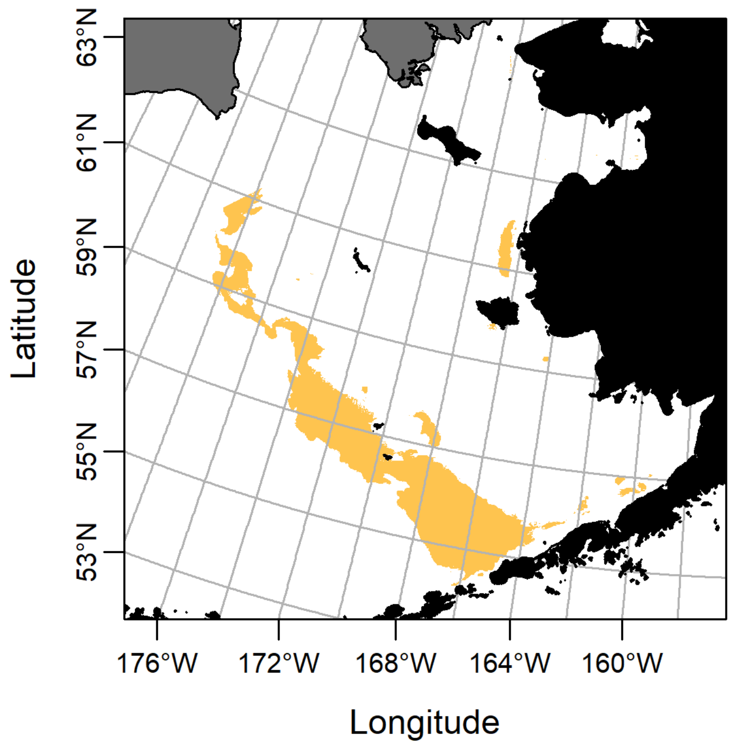

Figure E-134 EFH area of EBS of adult dusky rockfish, summer

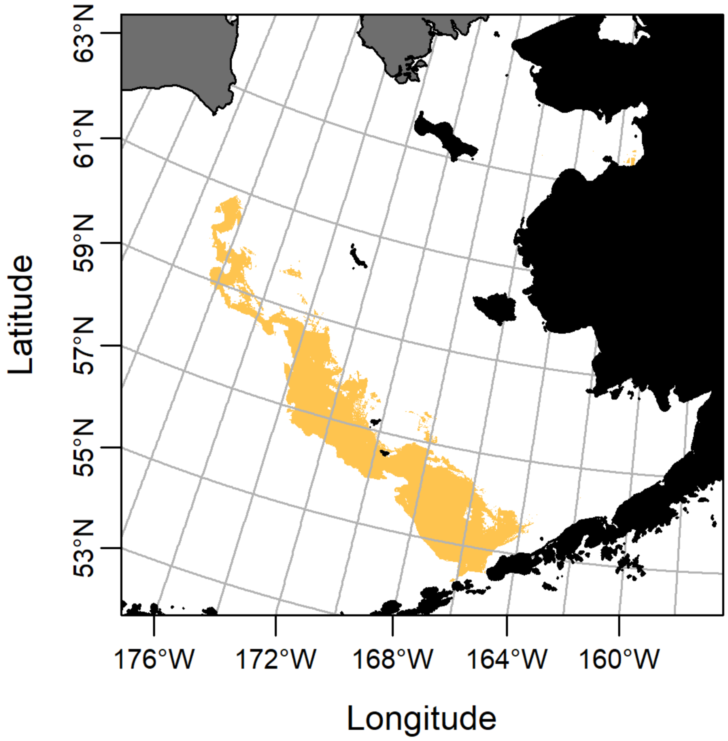

Figure E-135 EFH area of EBS adult dusky rockfish, fall

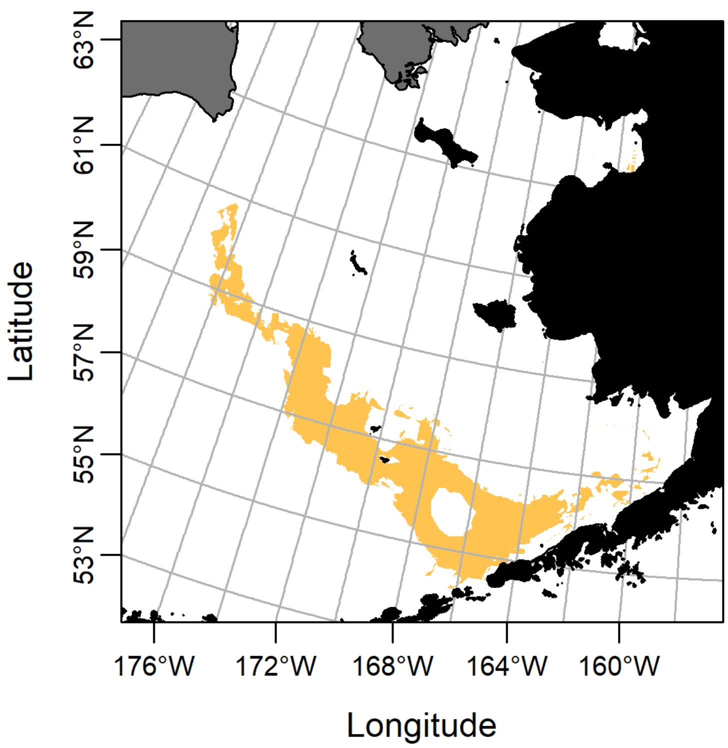

Figure E-136 EFH area of EBS adult dusky rockfish, winter

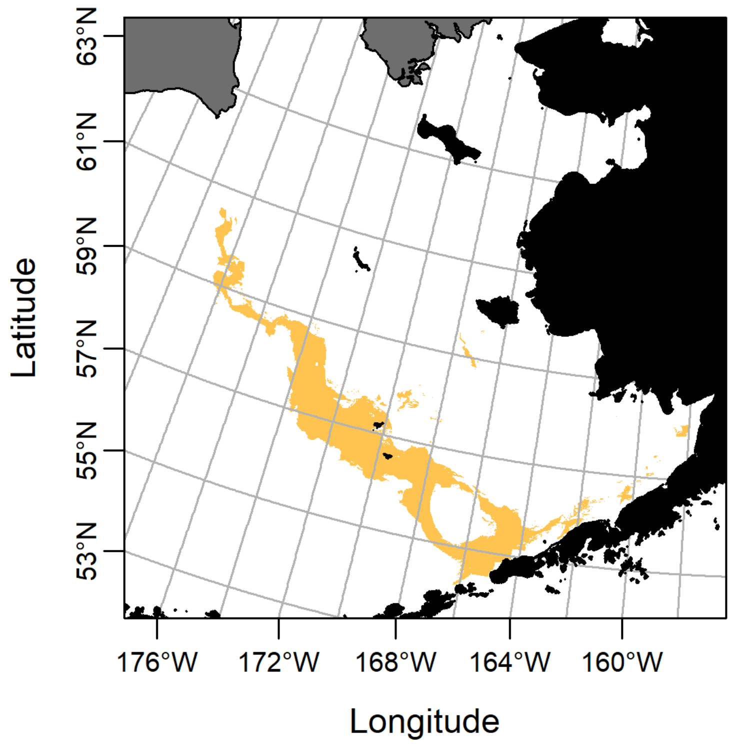

Figure E-137 EFH area of EBS adult dusky rockfish, spring

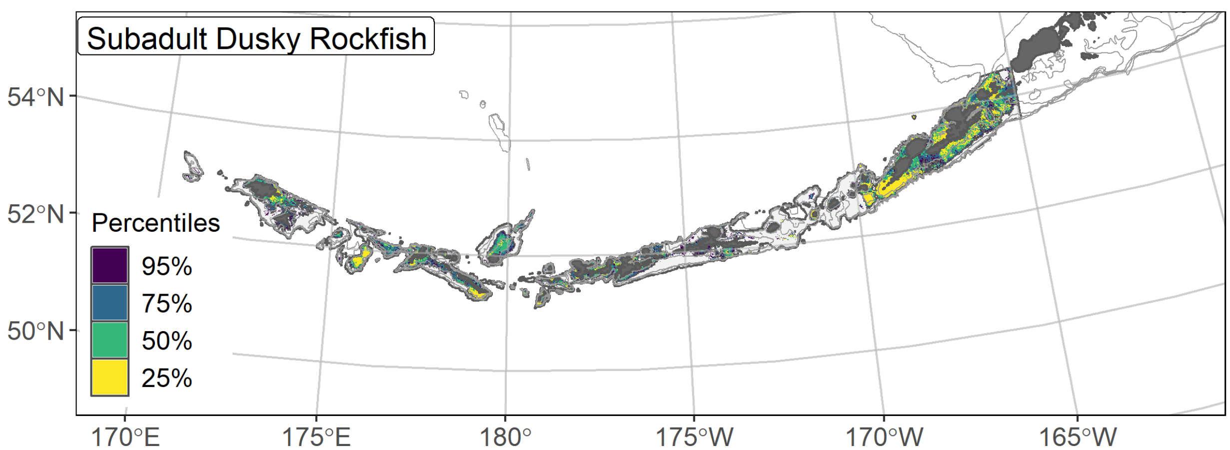

Figure E-138 EFH area of AI subadult dusky rockfish, summer

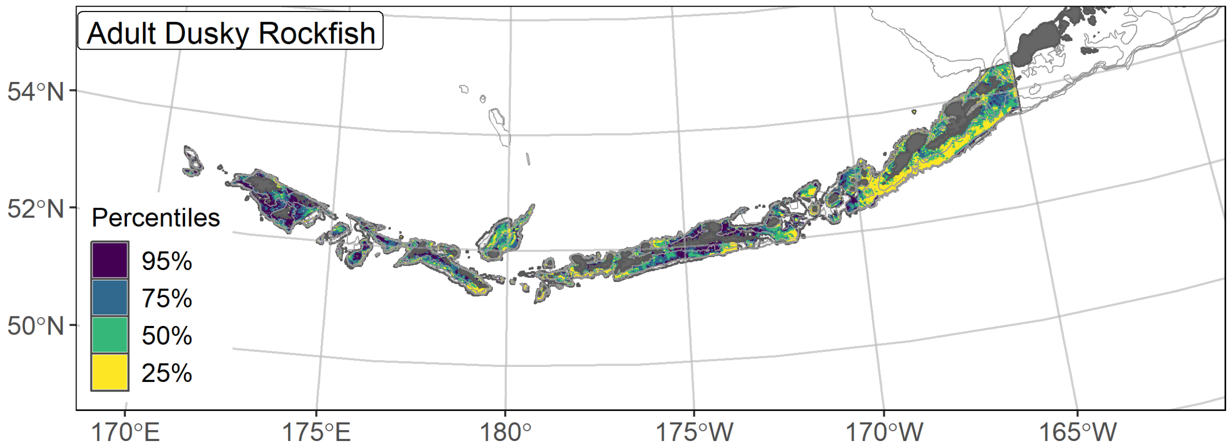

Figure E-139 EFH area of AI adult dusky rockfish, summer

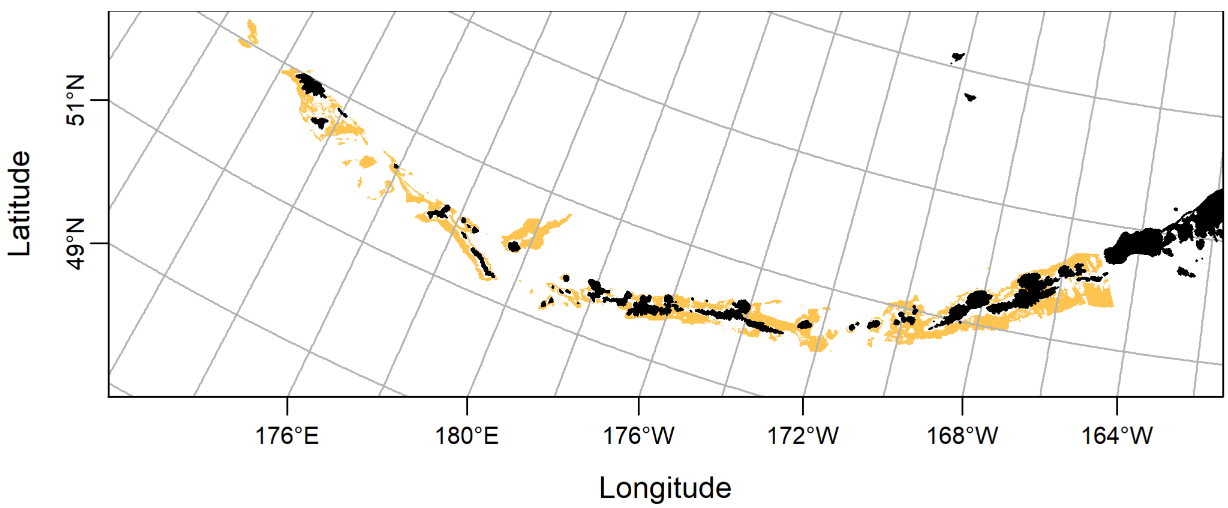

Figure E-140 EFH area of AI adult dusky rockfish, fall

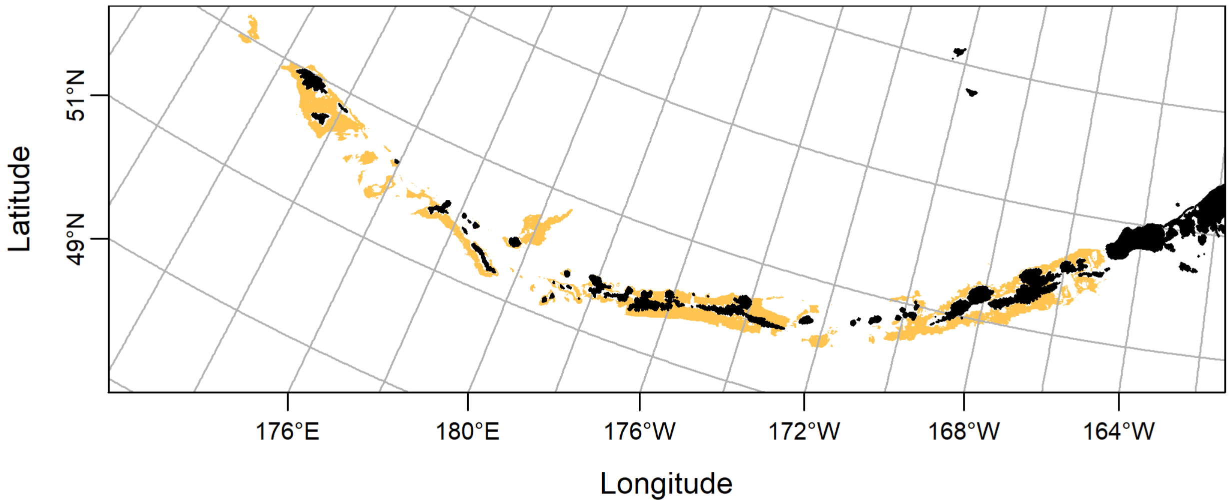

Figure E-141 EFH area of AI adult dusky rockfish, winter

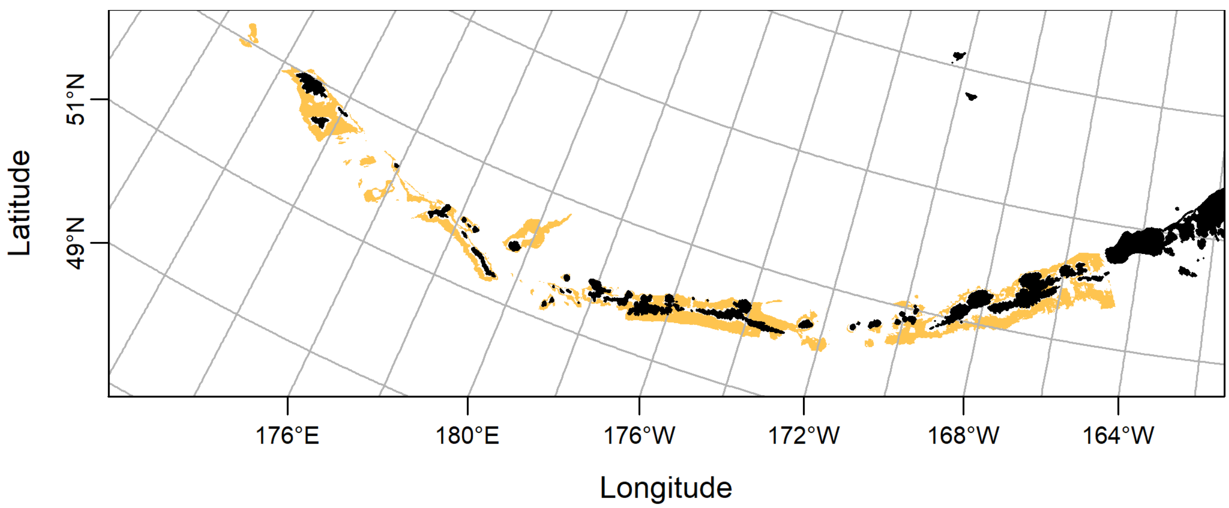

Figure E-142 EFH area of AI adult dusky rockfish, spring

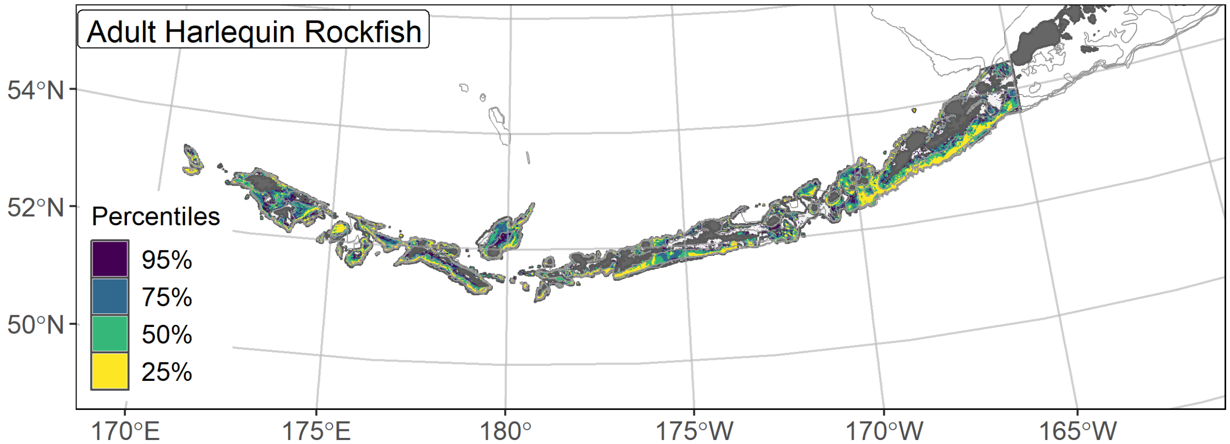

Figure E-143 EFH area of AI adult harlequin rockfish, summer

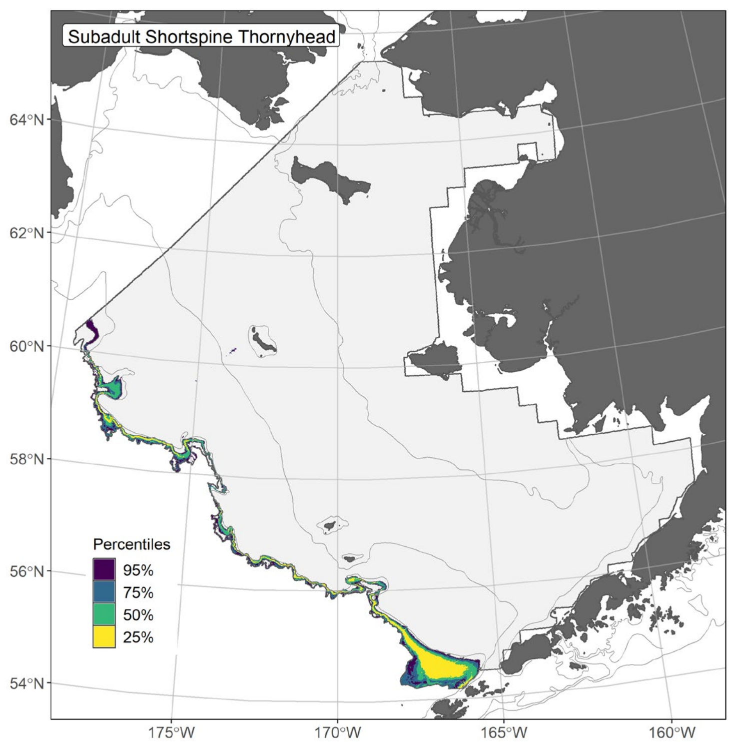

Figure E-144 EFH area of EBS subadult shortspine thornyhead rockfish, summer

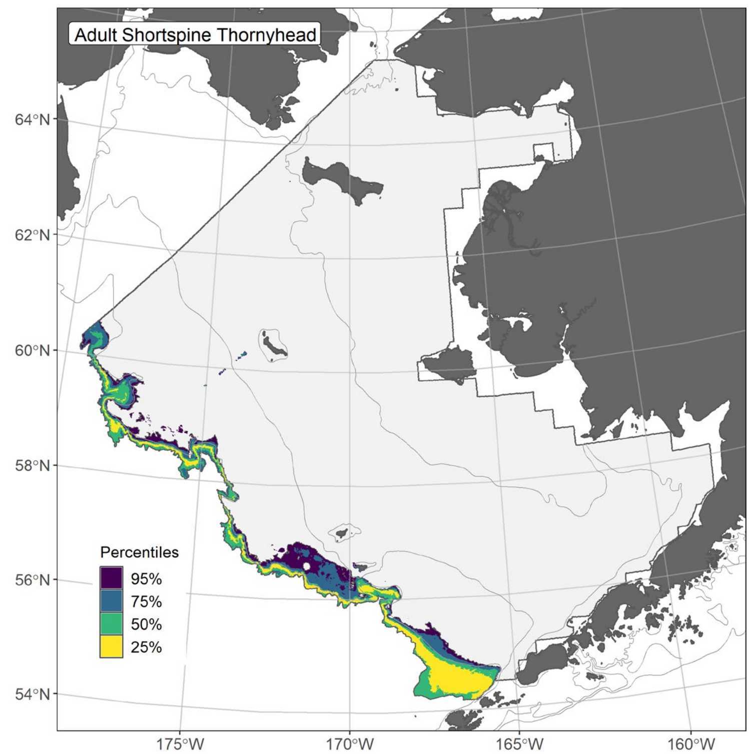

Figure E-145 EFH area of EBS adult shortspine thornyhead rockfish, summer

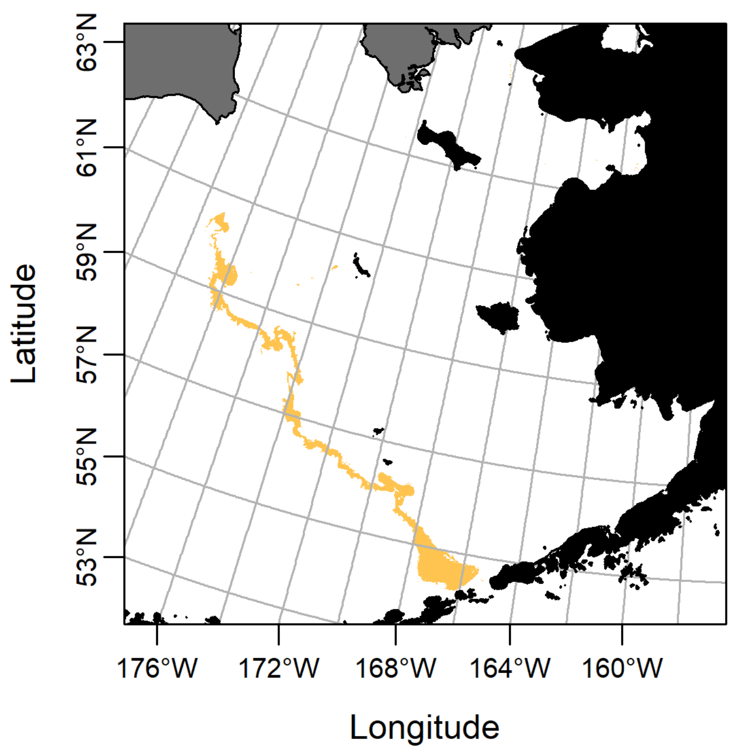

Figure E-146 EFH area of EBS adult shortspine thornyhead rockfish, fall

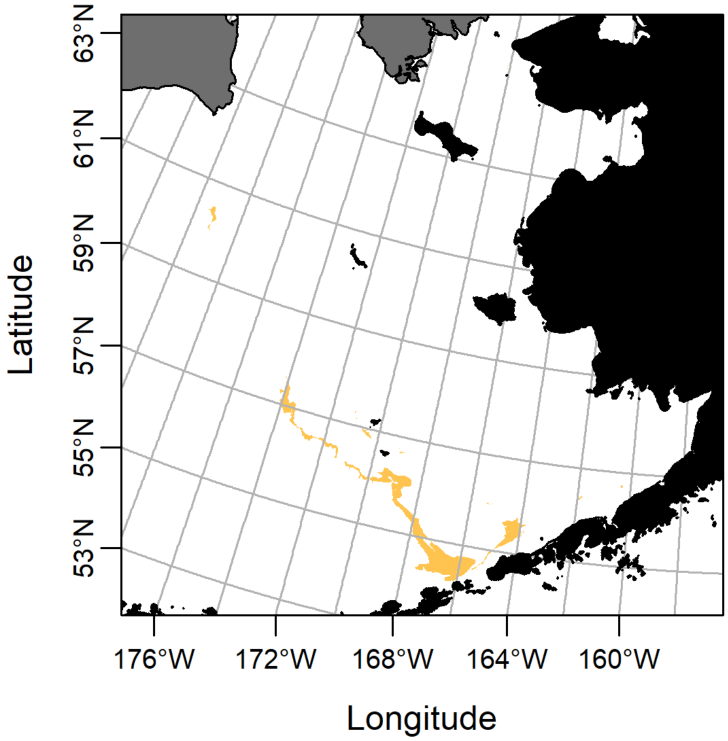

Figure E-147 EFH area of EBS adult shortspine thornyhead rockfish, winter

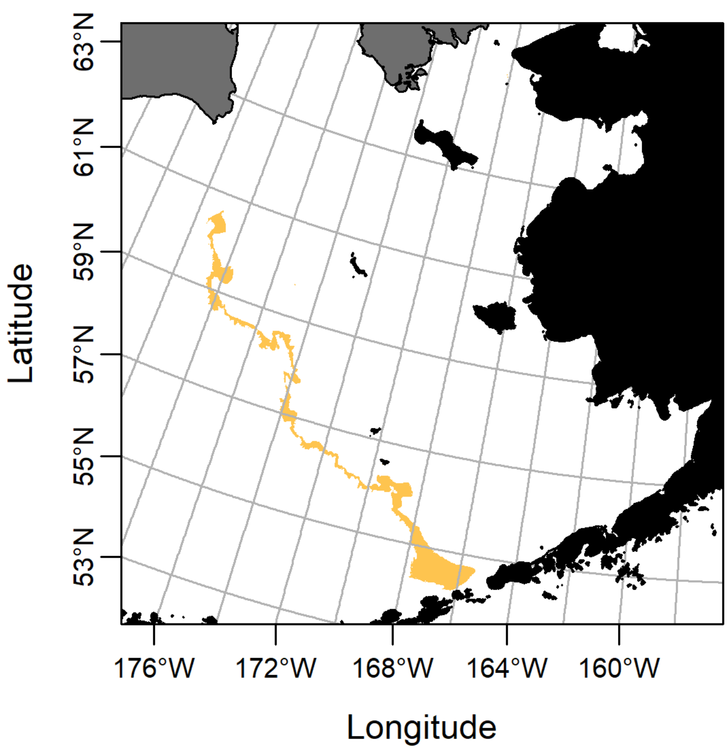

Figure E-148 EFH area of EBS adult shortspine thornyhead rockfish, spring

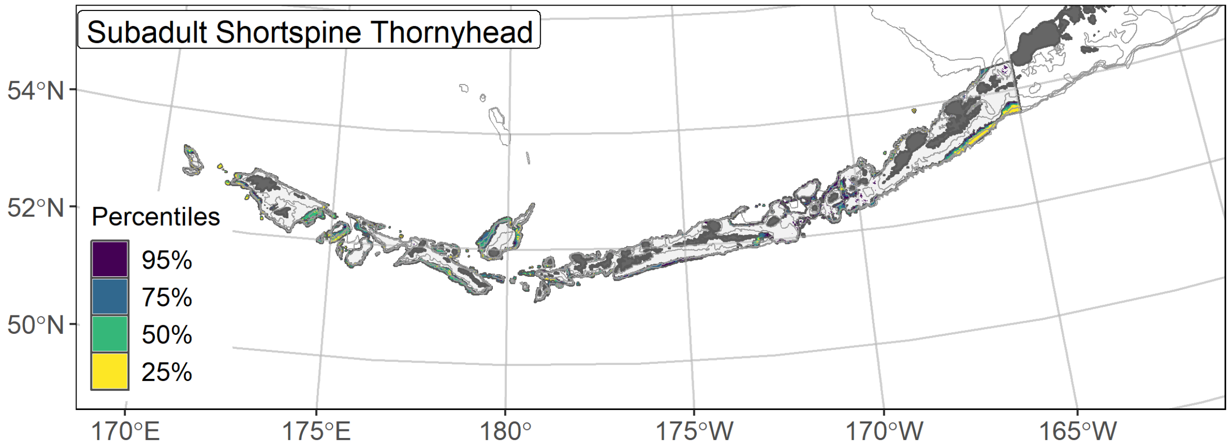

Figure E-149 EFH area of AI subadult shortspine thornyhead rockfish, summer

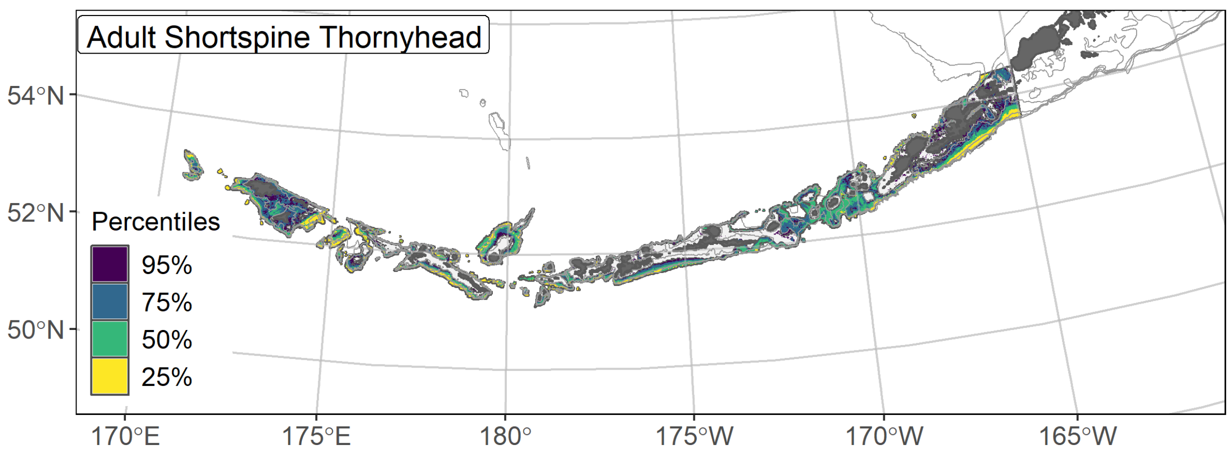

Figure E-150 EFH area of AI adult shortspine thornyhead rockfish, summer

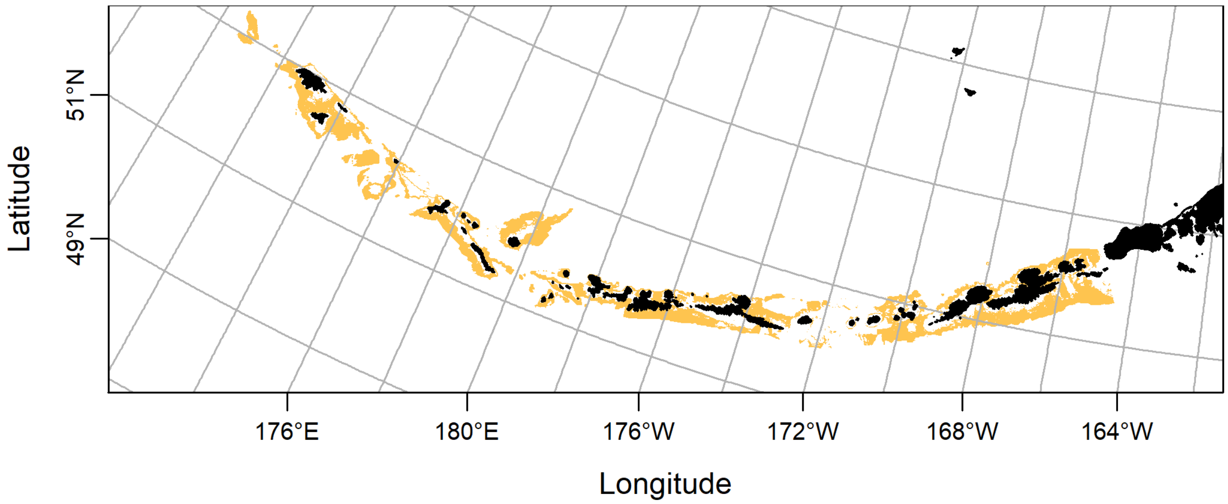

Figure E-151 EFH area of AI adult shortspine thornyhead rockfish, fall

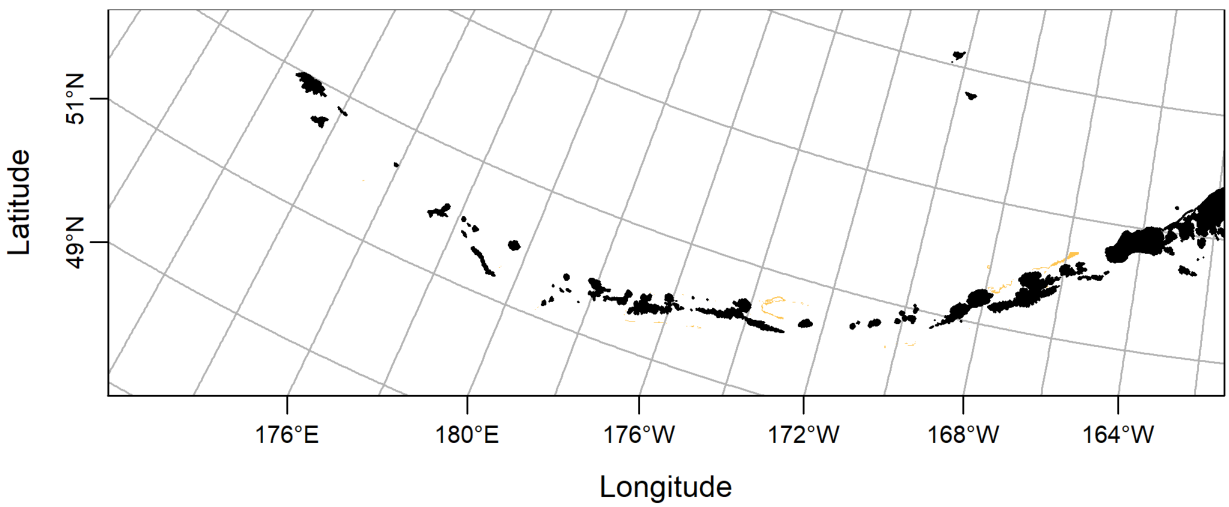

Figure E-152 EFH area of AI adult shortspine thornyhead rockfish, winter

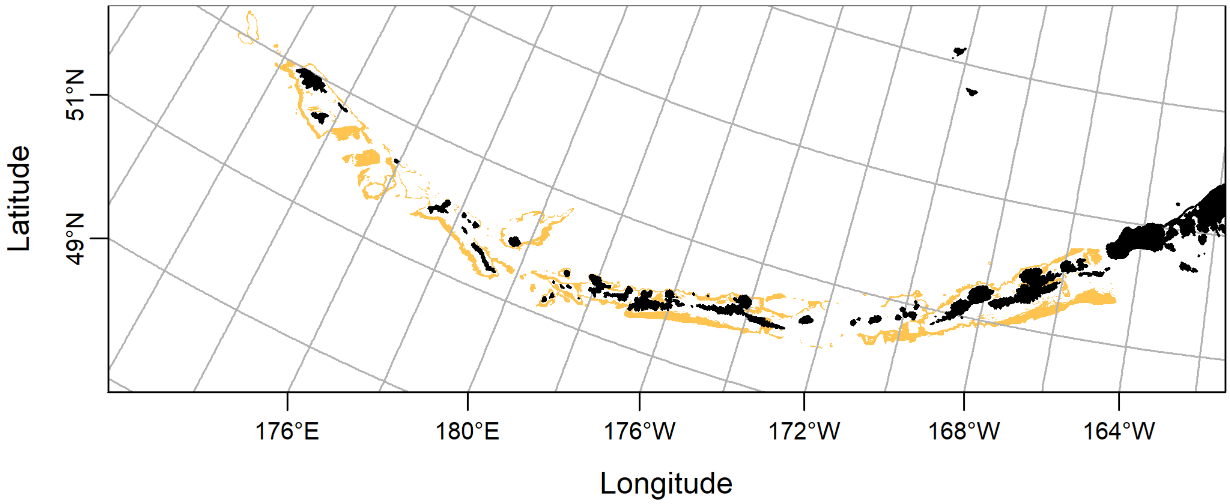

Figure E-153 EFH area of AI adult shortspine thornyhead rockfish, spring

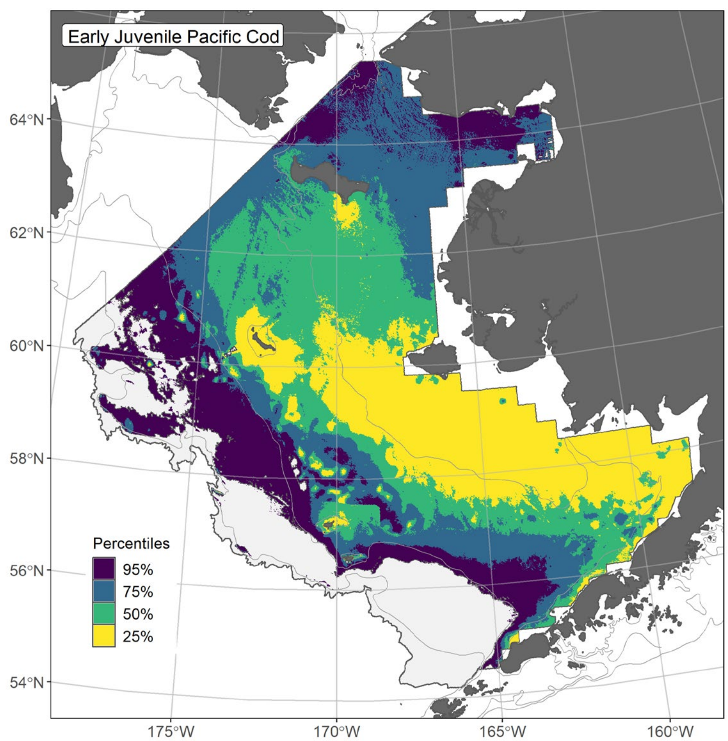

Figure E-154 EFH area of EBS settled early juvenile Pacific cod, summer

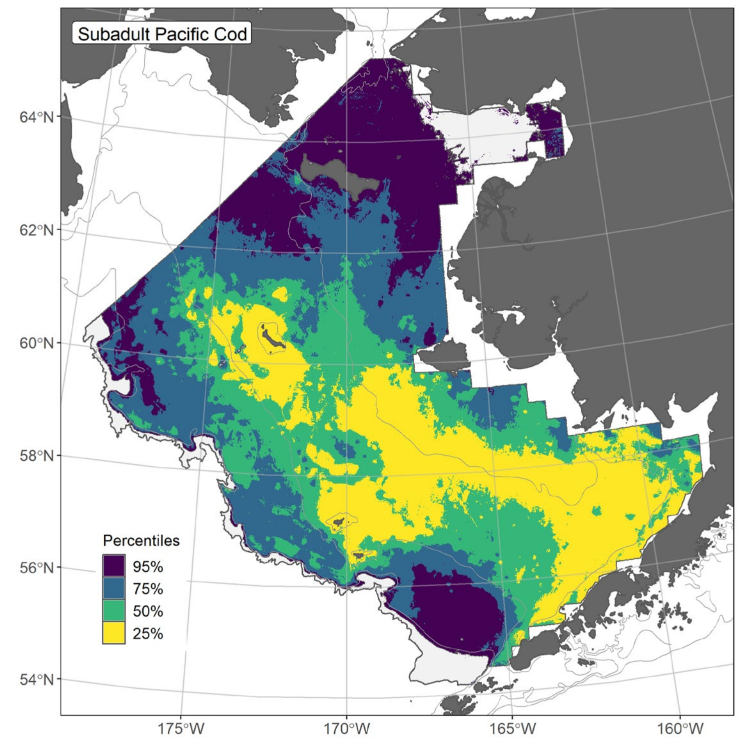

Figure E-155 EFH area of EBS subadult Pacific cod, summer

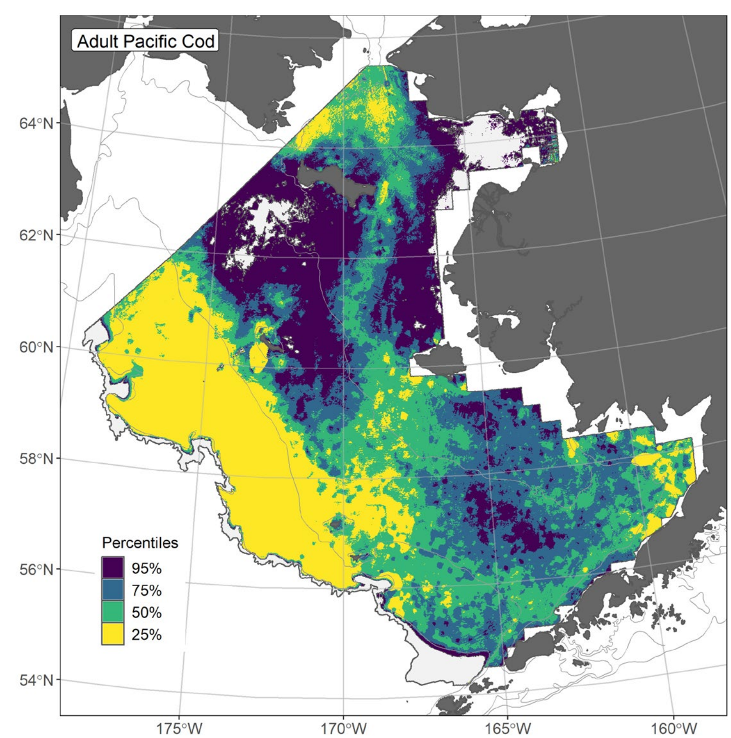

Figure E-156 EFH area of EBS adult Pacific cod, summer

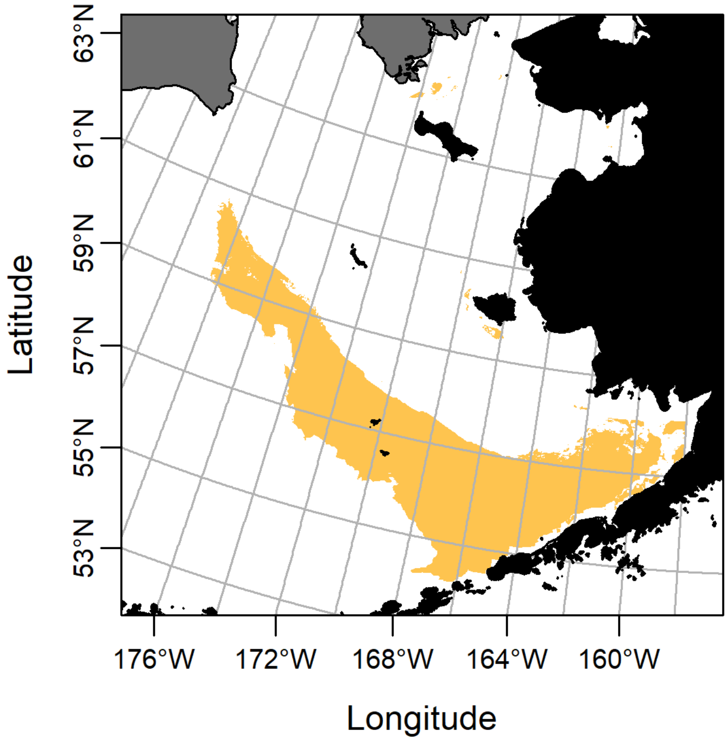

Figure E-157 EFH area of EBS Pacific cod larvae, summer

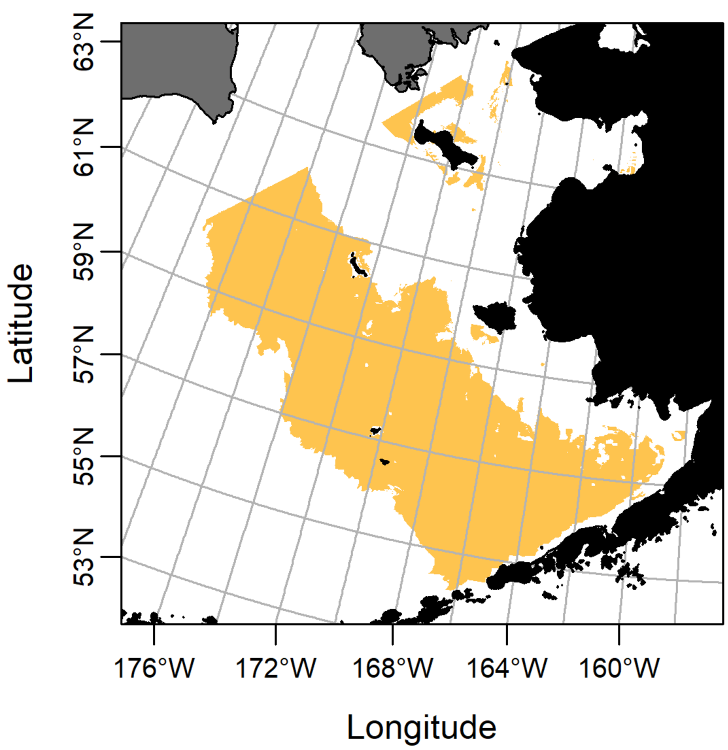

Figure E-158 EFH area of EBS adult Pacific cod, fall

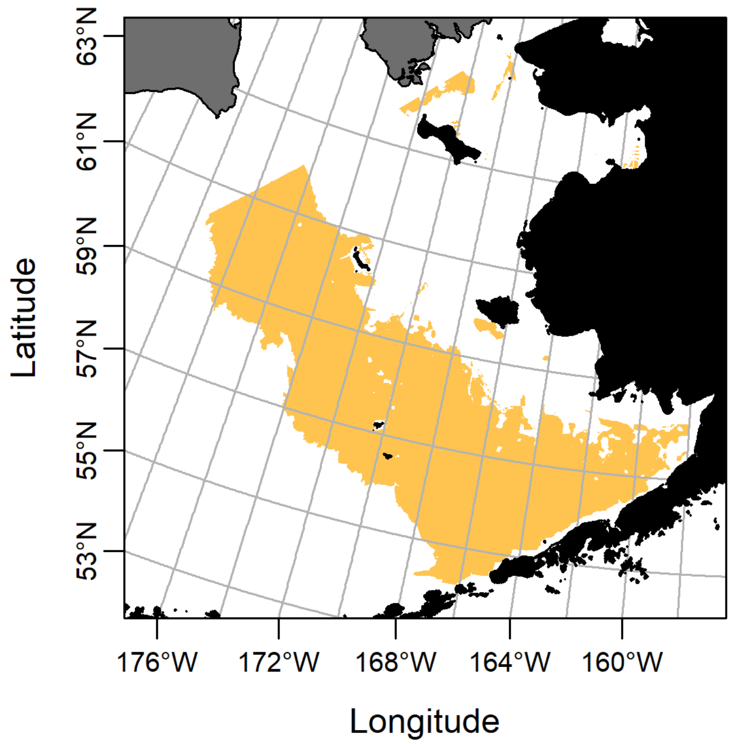

Figure E-159 EFH area of EBS adult Pacific cod, winter

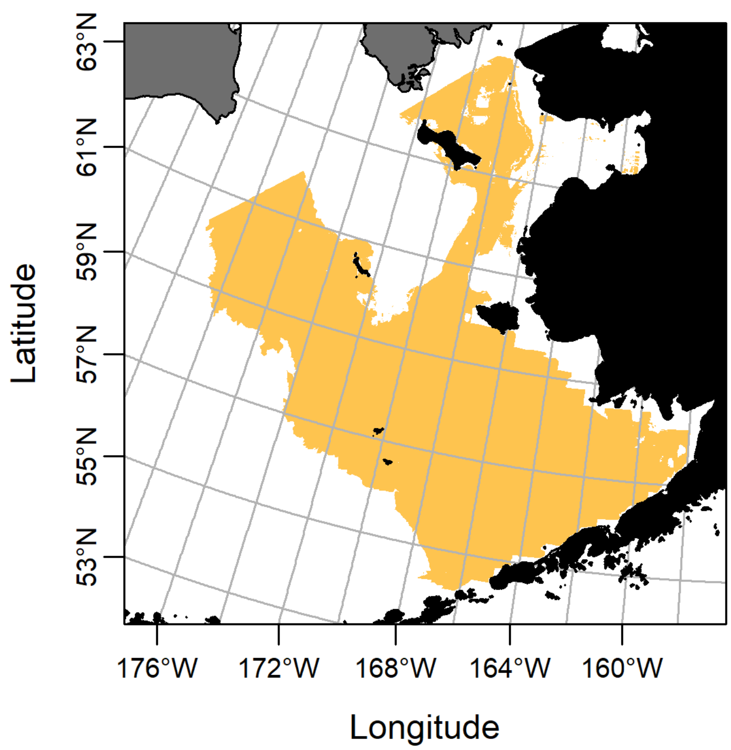

Figure E-160 EFH area of EBS adult Pacific cod, spring

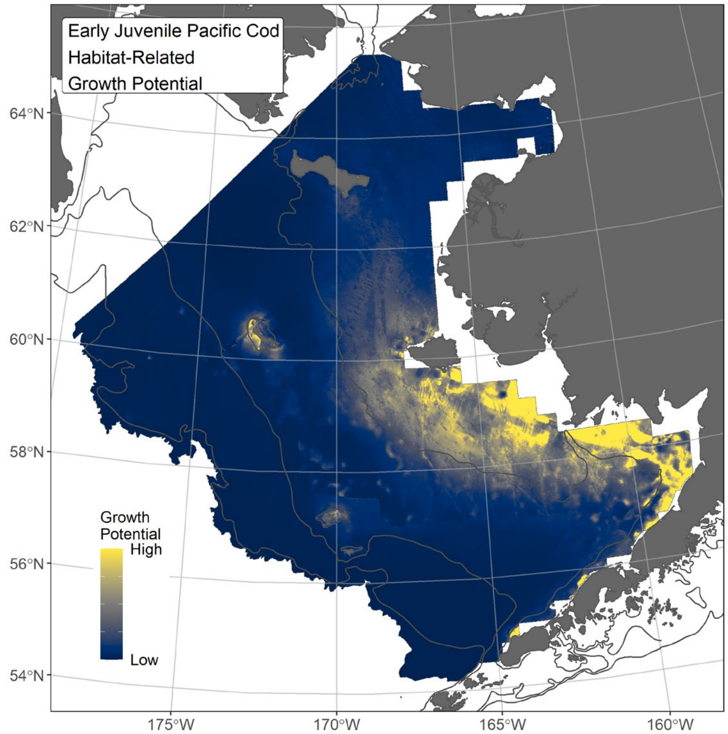

Figure E-161 EFH area of EBS settled early juvenile Pacific cod, habitat-related growth potential, summer

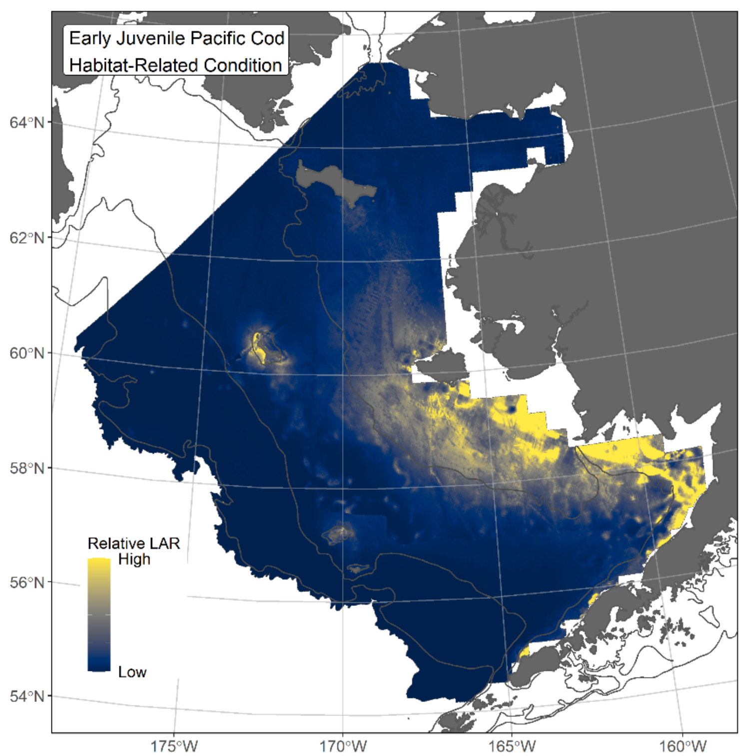

Figure E-162 EFH area of EBS settled early juvenile Pacific cod, habitat-related condition, summer

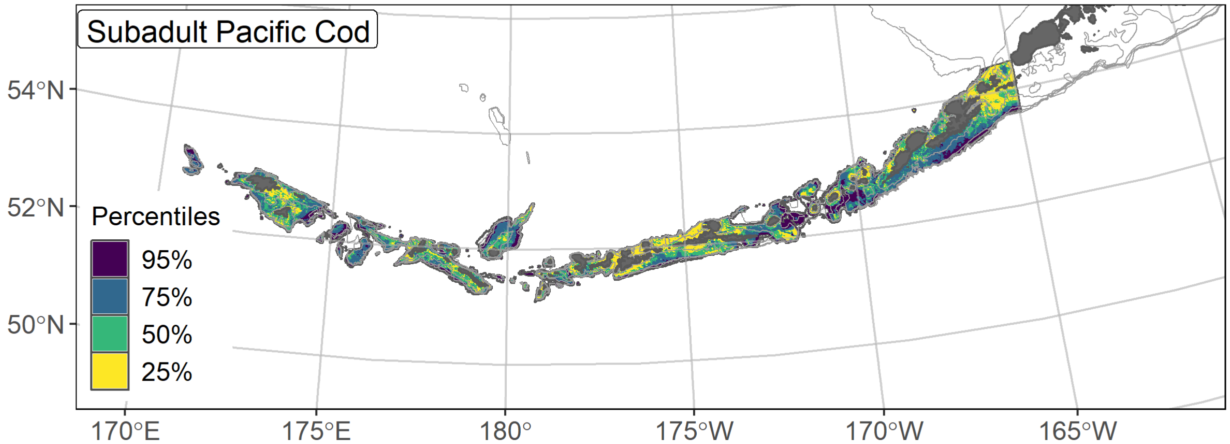

Figure E-163 EFH area of AI subadult Pacific cod, summer

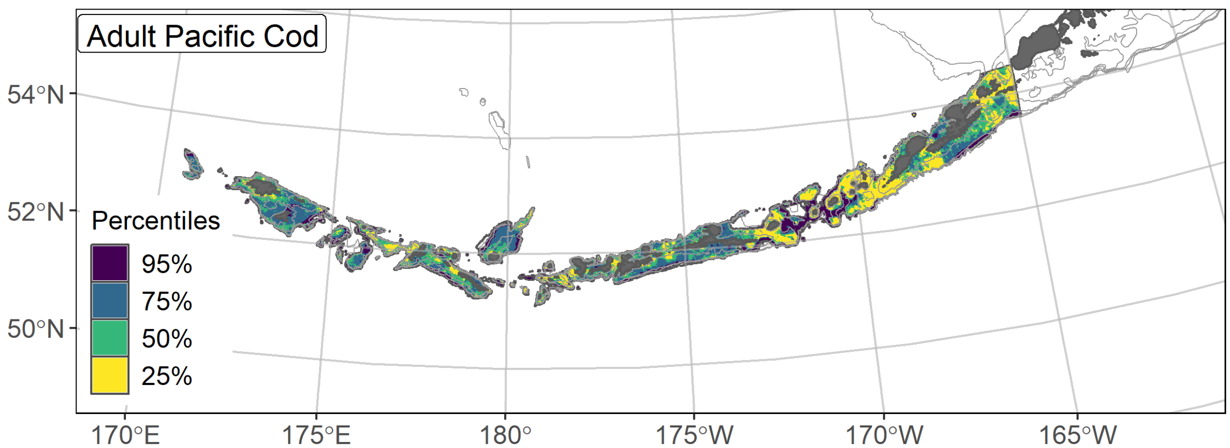

Figure E-164 EFH area of AI adult Pacific cod, summer

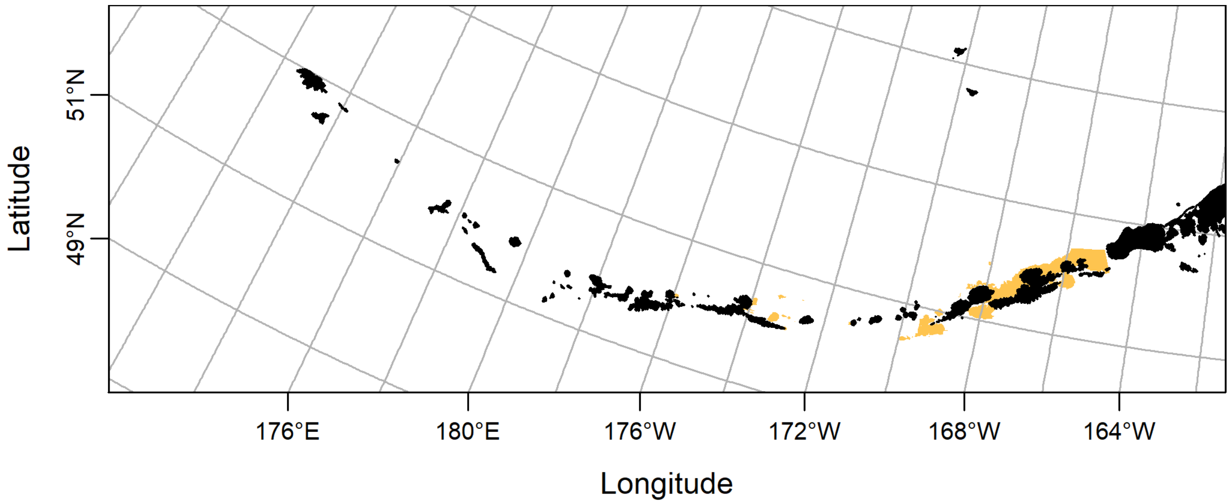

Figure E-165 EFH area of AI larvae Pacific cod, summer

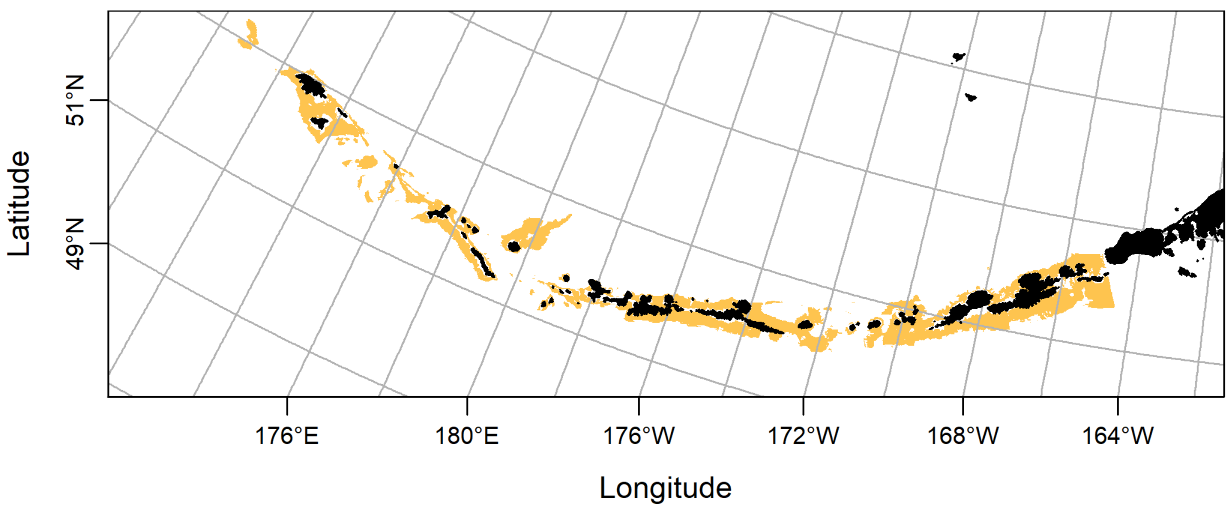

Figure E-166 EFH area of AI adult Pacific cod, fall

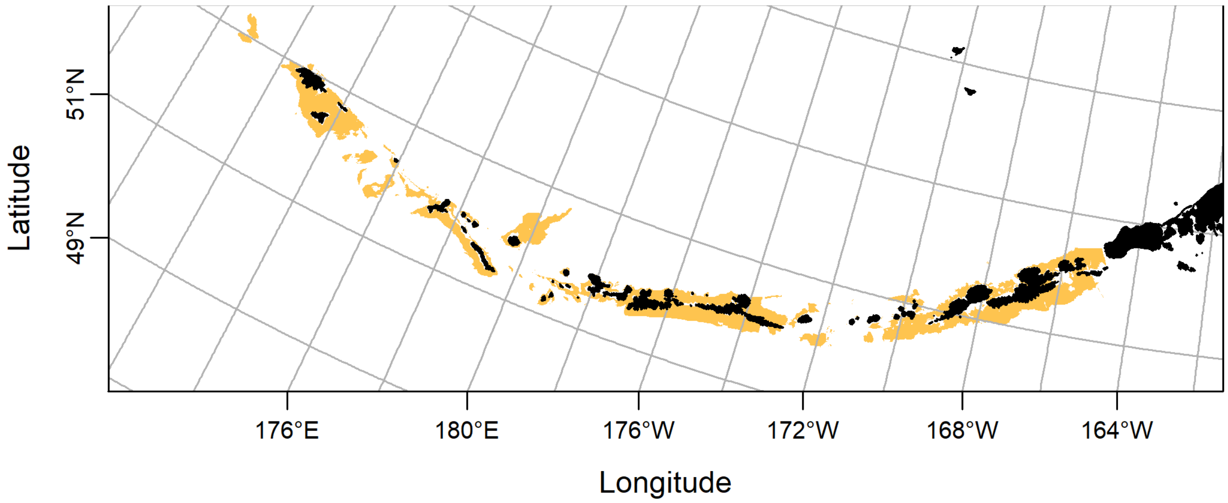

Figure E-167 EFH area of AI adult Pacific cod, winter

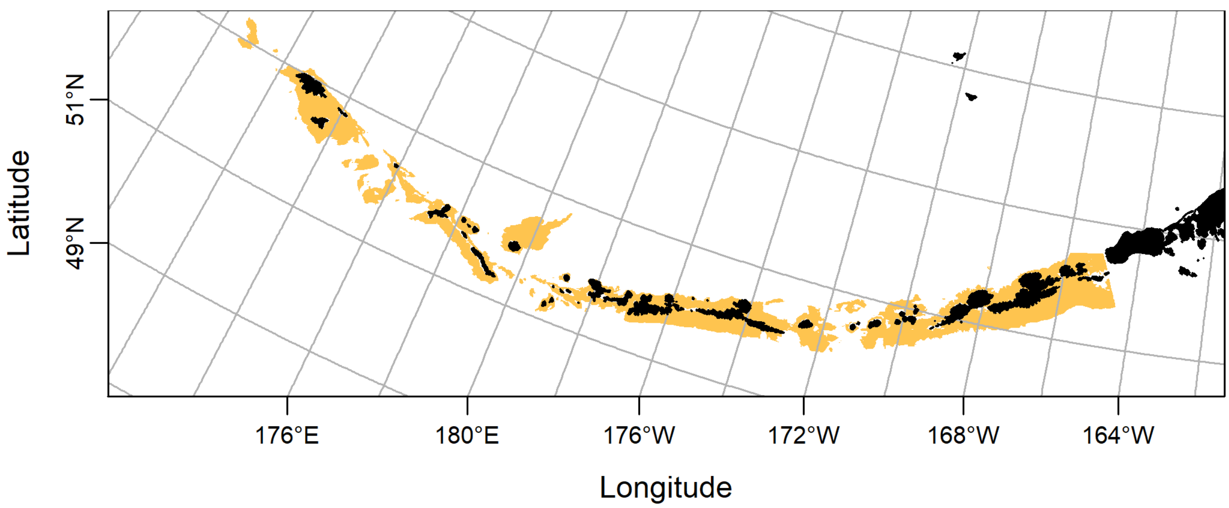

Figure E-168 EFH area of AI adult Pacific cod, spring

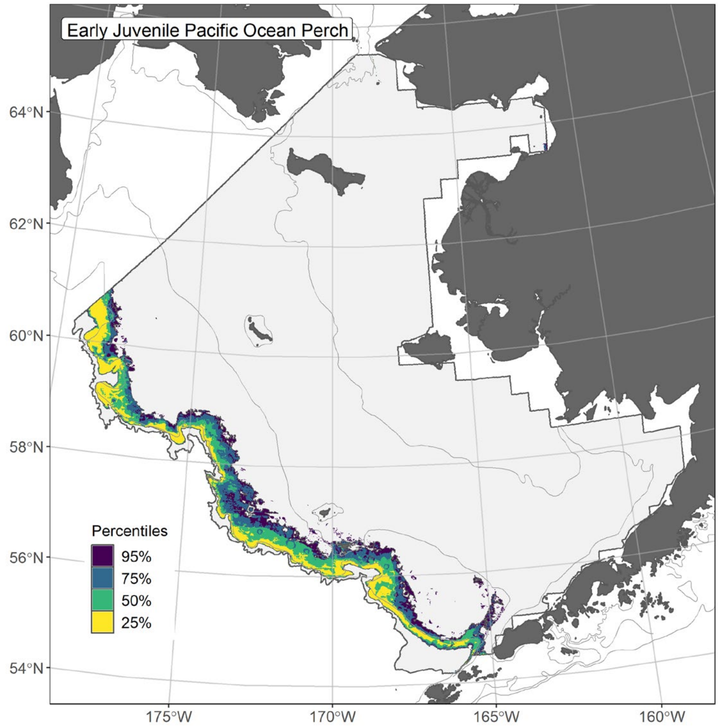

Figure E-169 EFH area of EBS settled early juvenile Pacific ocean perch, summer

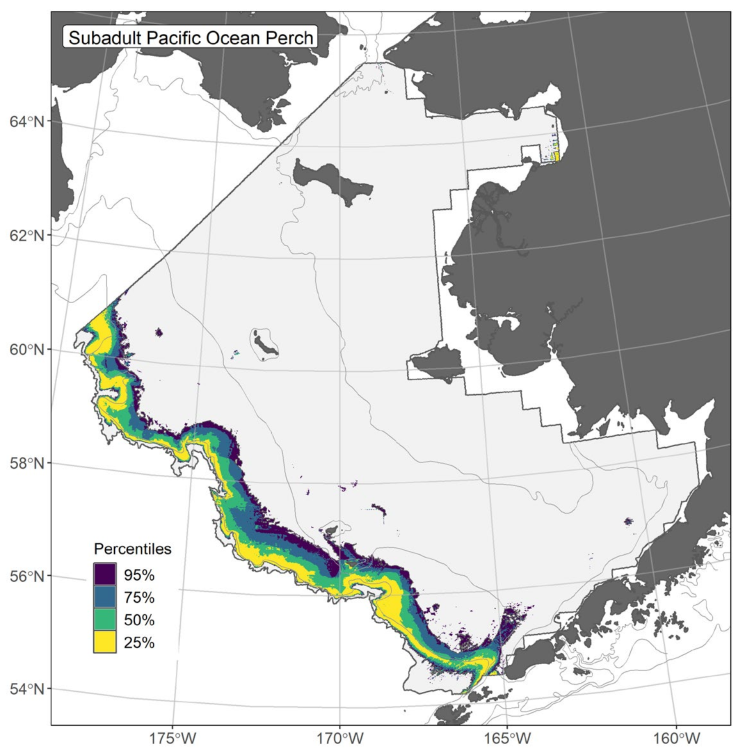

Figure E-170 EFH area of EBS subadult Pacific ocean perch, summer

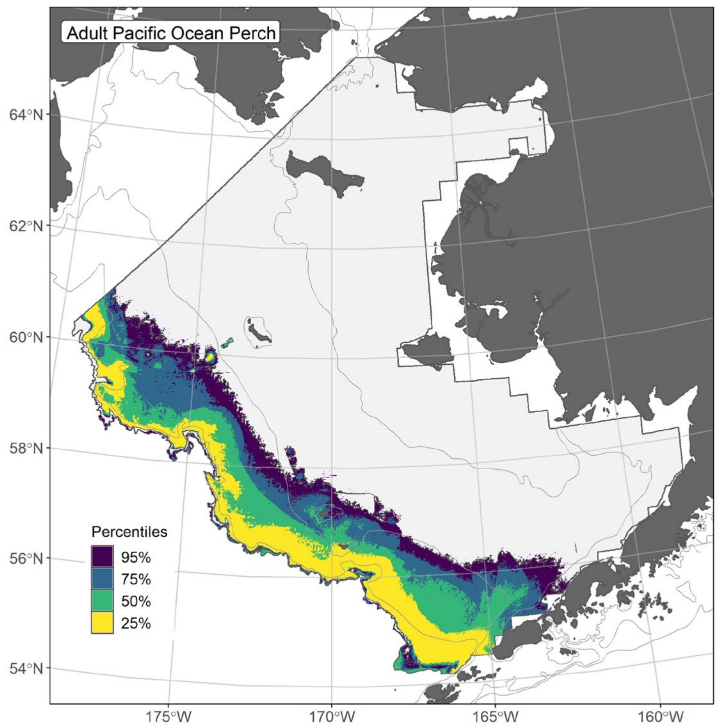

Figure E-171 EFH area of EBS adult Pacific ocean perch, summer

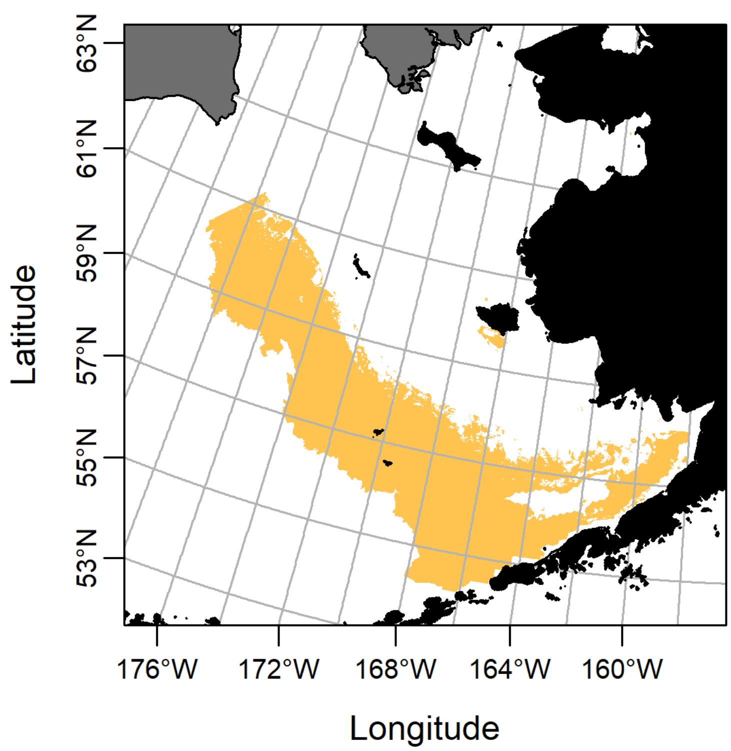

Figure E-172 EFH area of EBS Pacific ocean perch larvae, summer

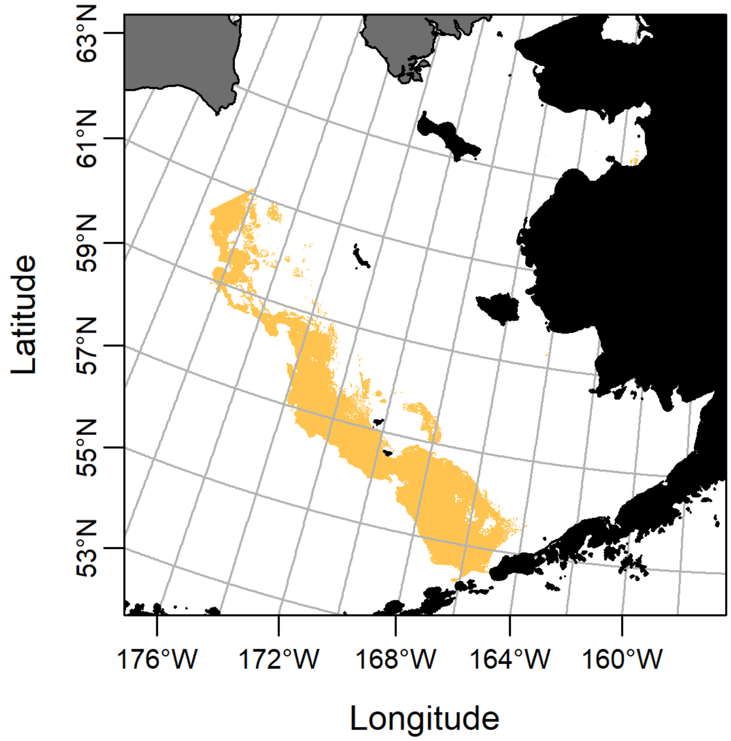

Figure E-173 EFH area of EBS adult Pacific ocean perch, fall

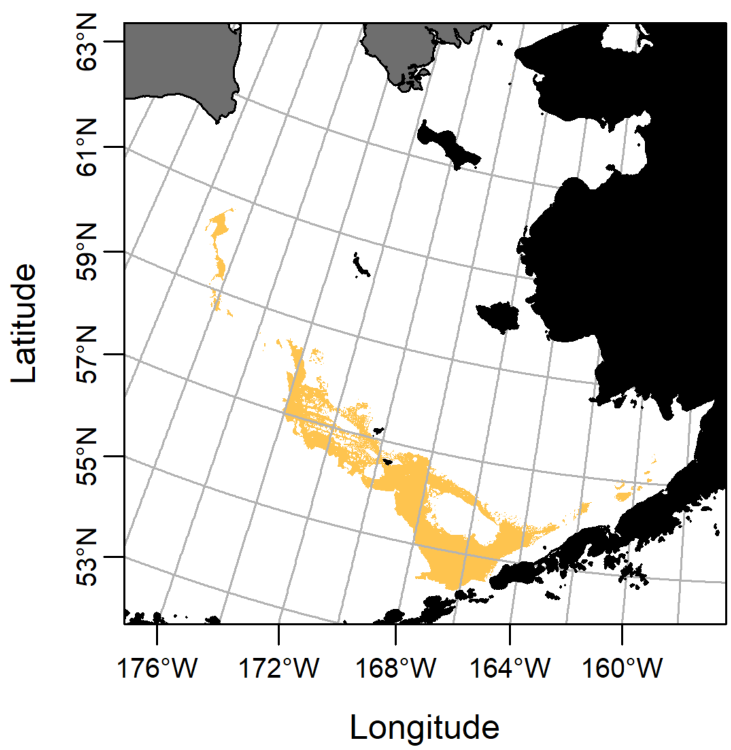

Figure E-174 EFH area of EBS adult Pacific ocean perch, winter

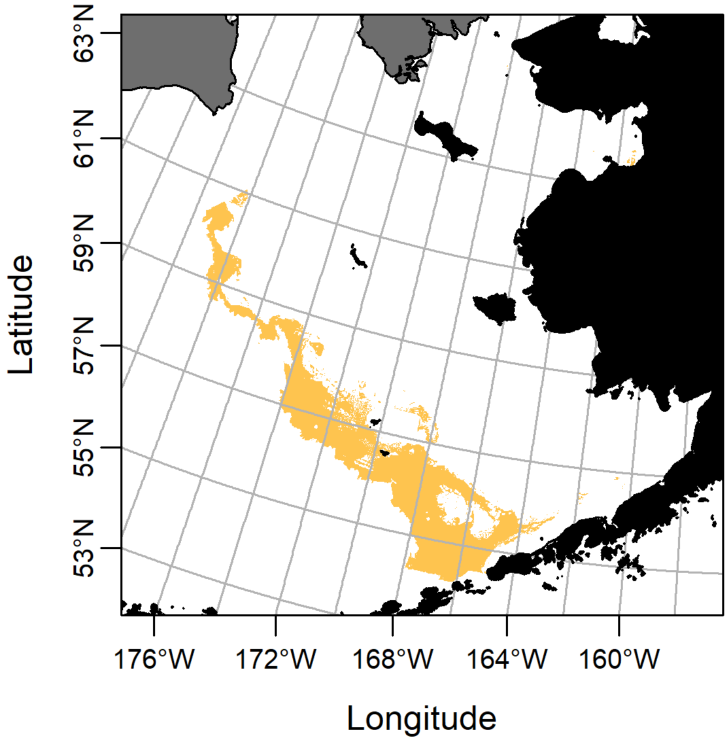

Figure E-175 EFH area of EBS adult Pacific ocean perch, spring

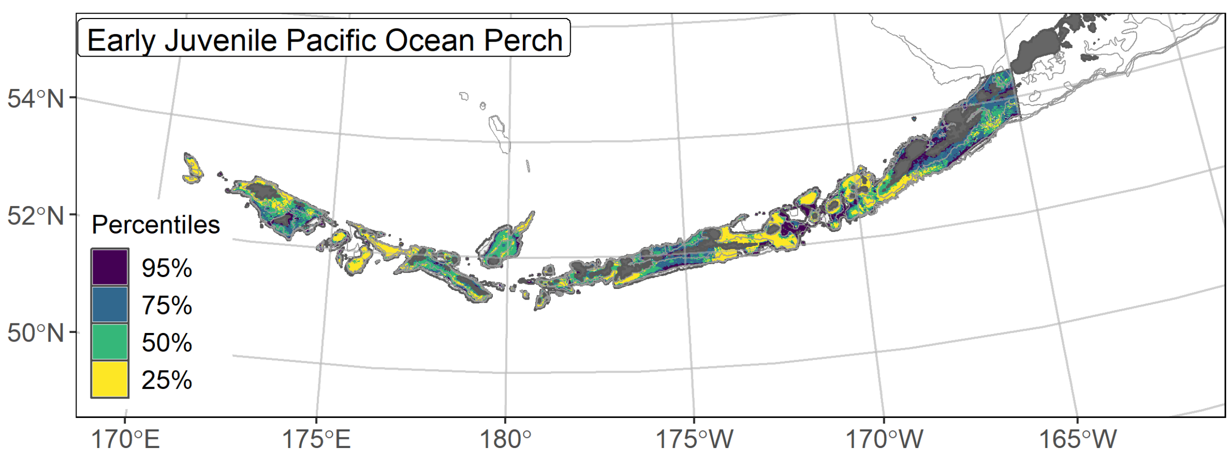

Figure E-176 EFH area of AI settled early juvenile Pacific ocean perch, summer

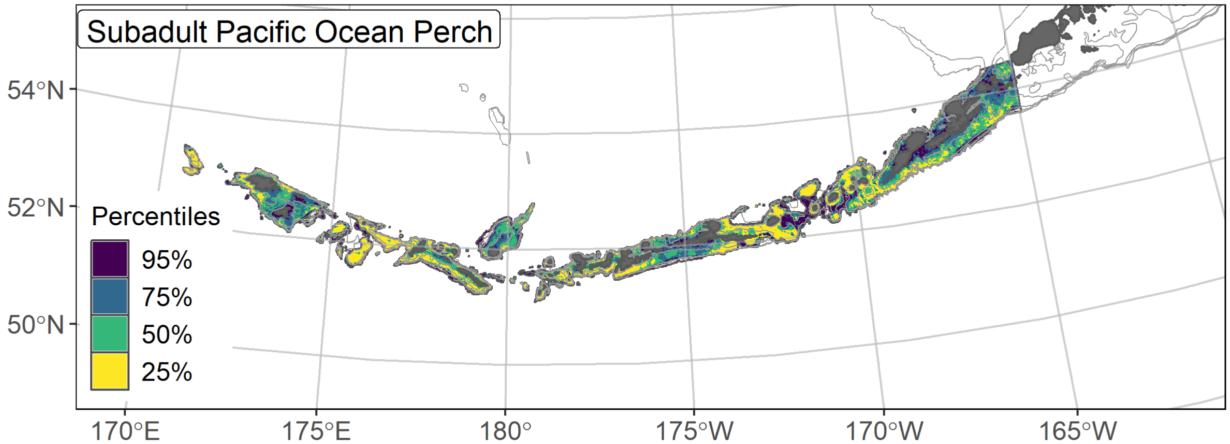

Figure E-177 EFH area of AI subadult Pacific ocean perch, summer

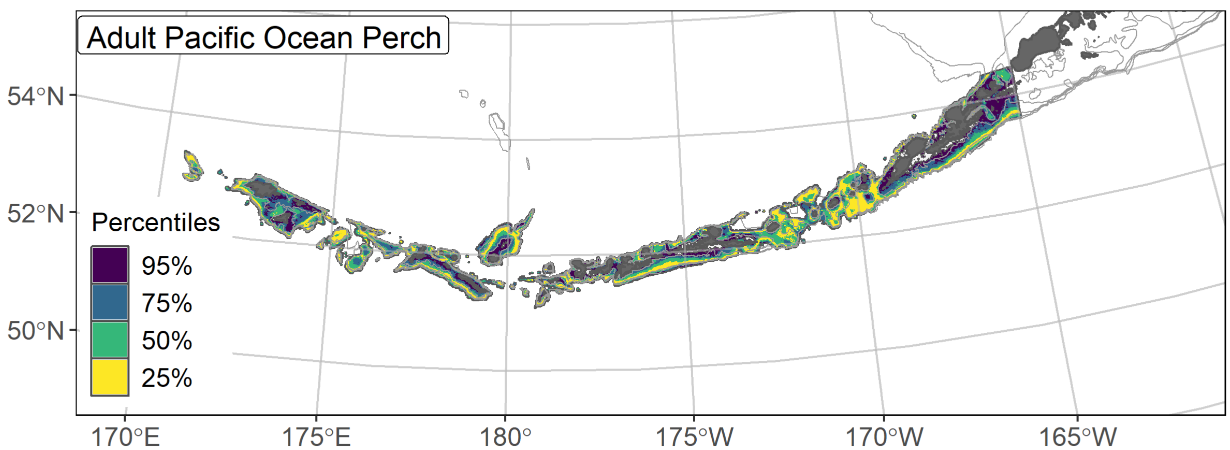

Figure E-178 EFH area of AI adult Pacific ocean perch, summer

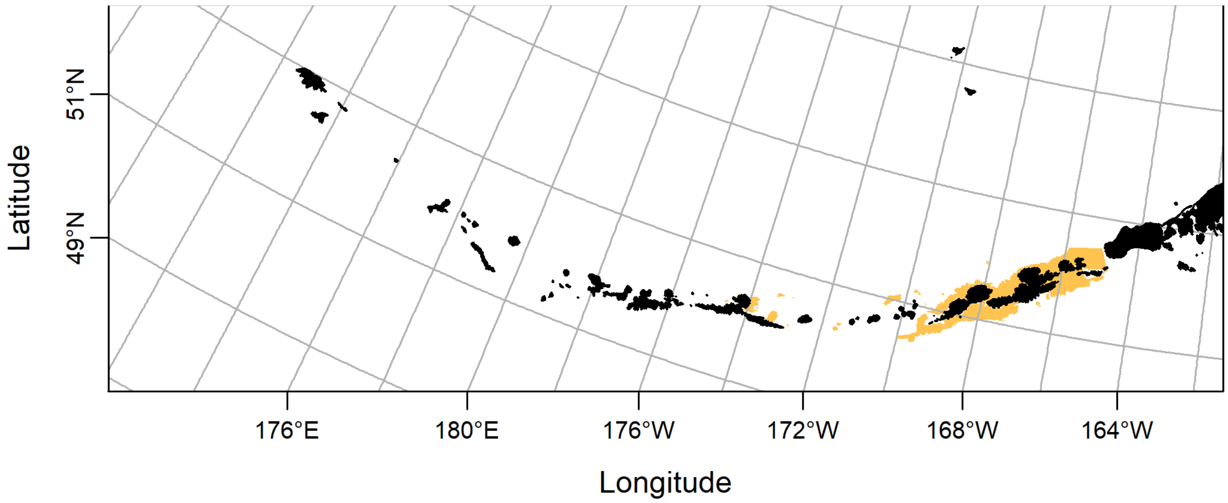

Figure E-179 EFH area of AI Pacific ocean perch larvae, summer

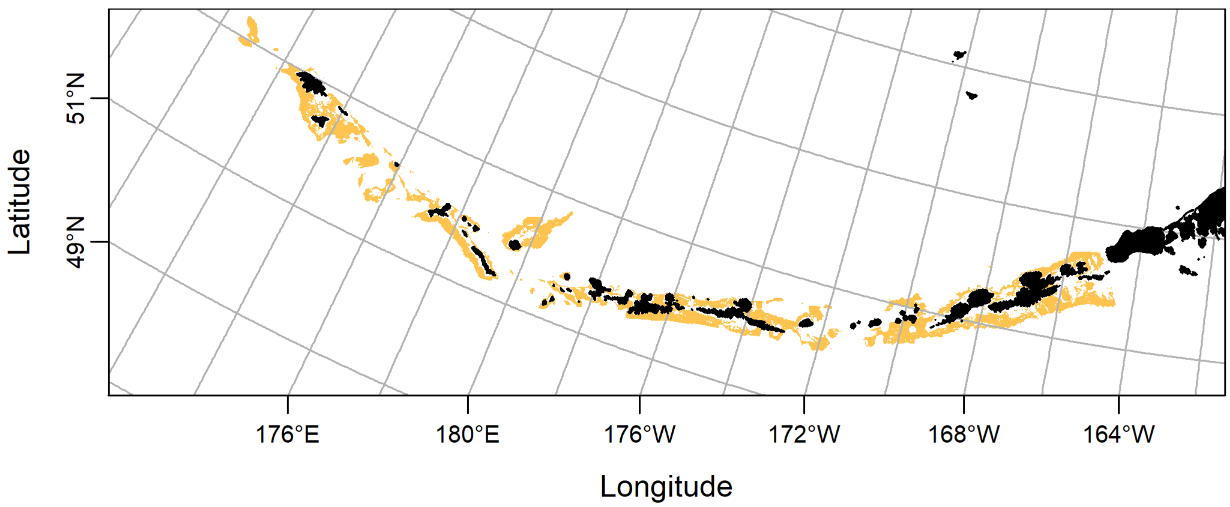

Figure E-180 EFH area of AI adult Pacific ocean perch, fall

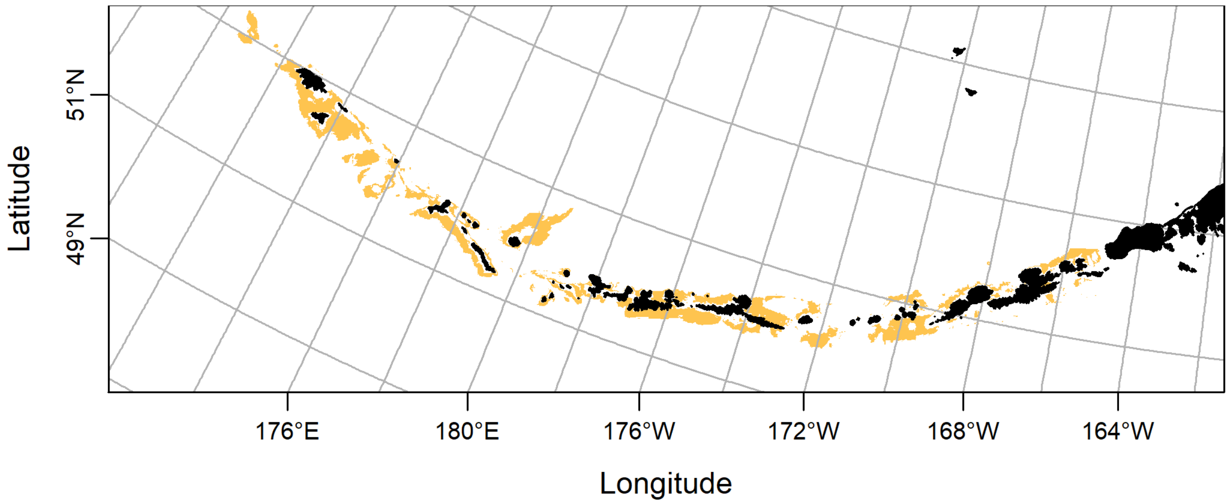

Figure E-181 EFH area of AI adult Pacific ocean perch, winter

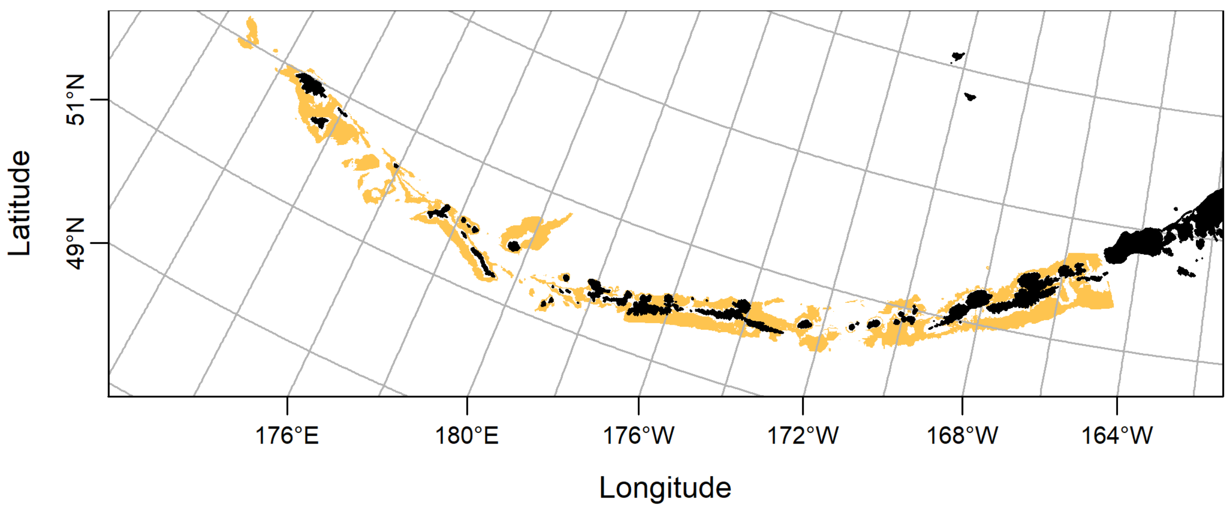

Figure E-182 EFH area of AI adult Pacific ocean perch, spring

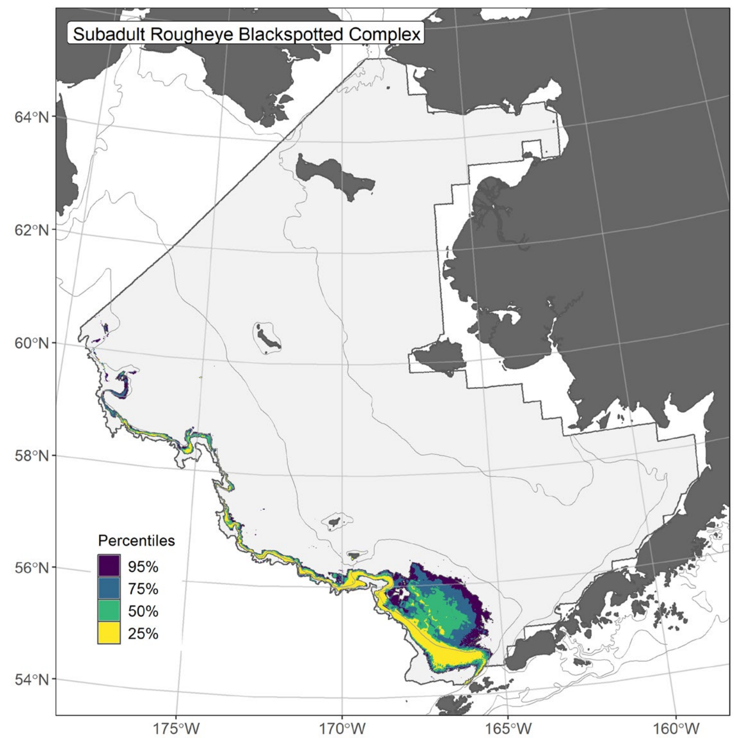

Figure E-183 EFH area of EBS subadult rougheye/blackspotted rockfish, summer

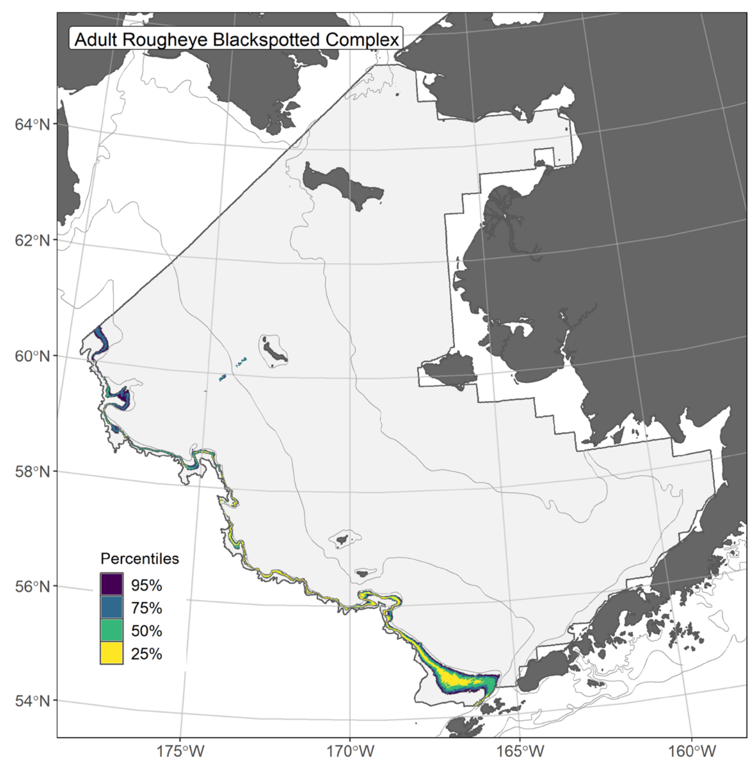

Figure E-184 EFH area of EBS adult rougheye/blackspotted rockfish, summer

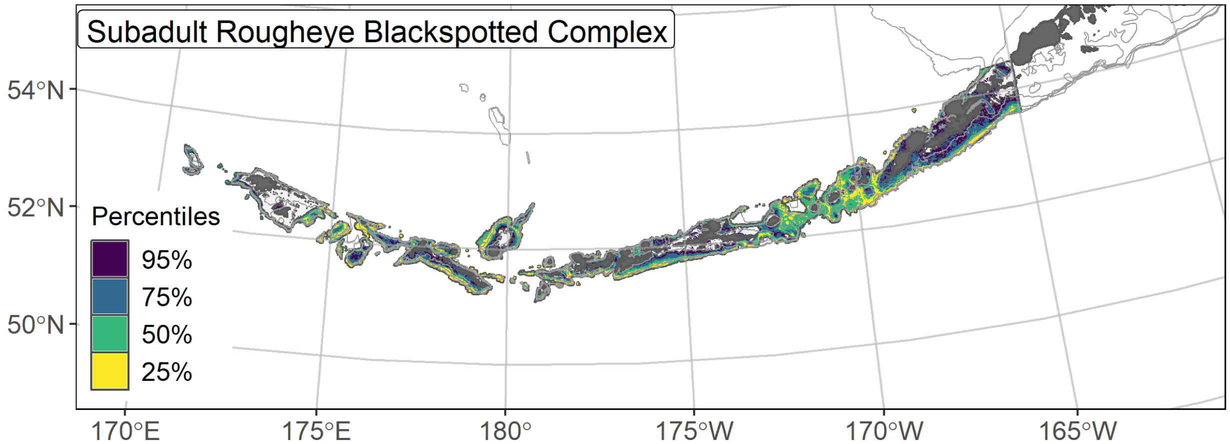

Figure E-185 EFH area of AI subadult rougheye/blackspotted rockfish, summer

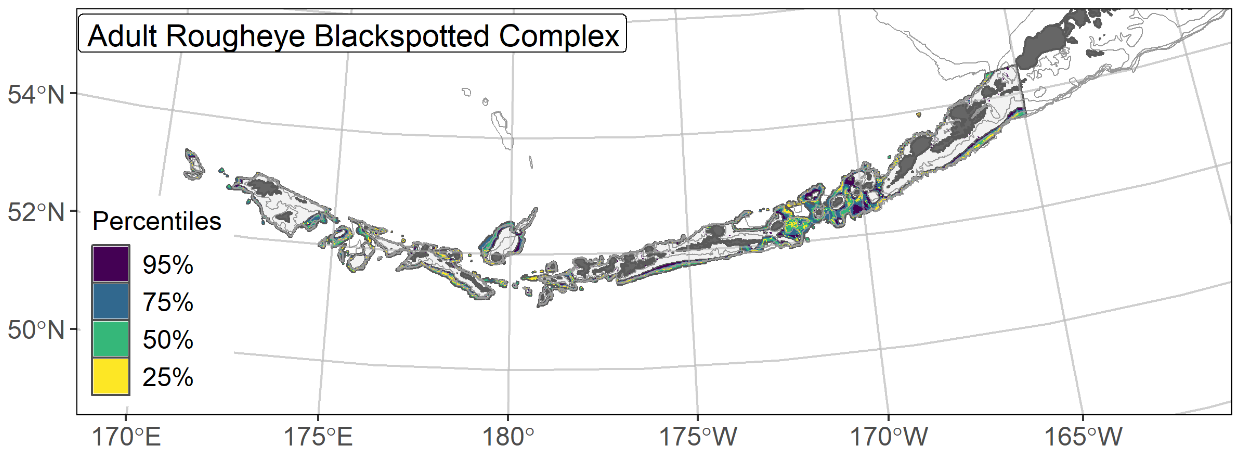

Figure E-186 EFH area of AI adult rougheye/blackspotted rockfish, summer

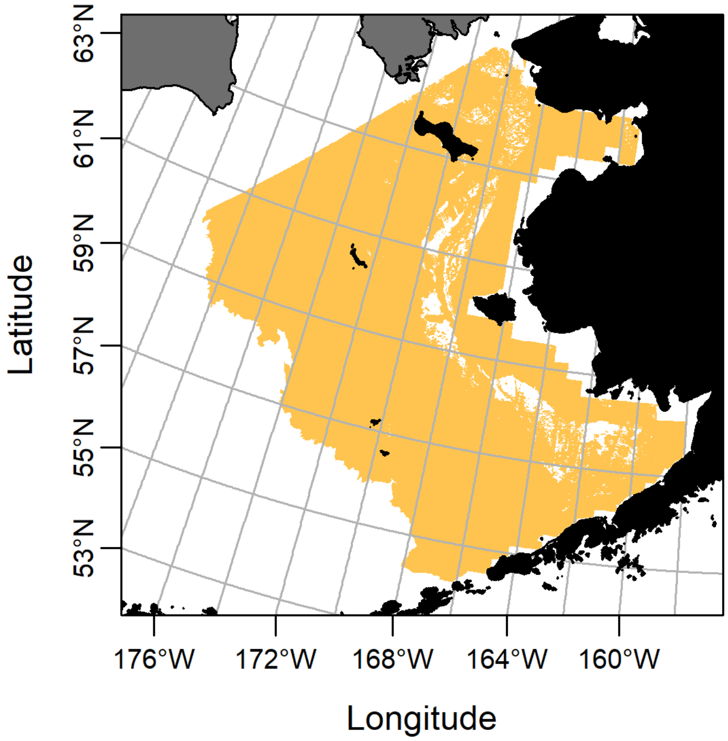

Figure E-187 EFH area of EBS adult rougheye rockfish, fall

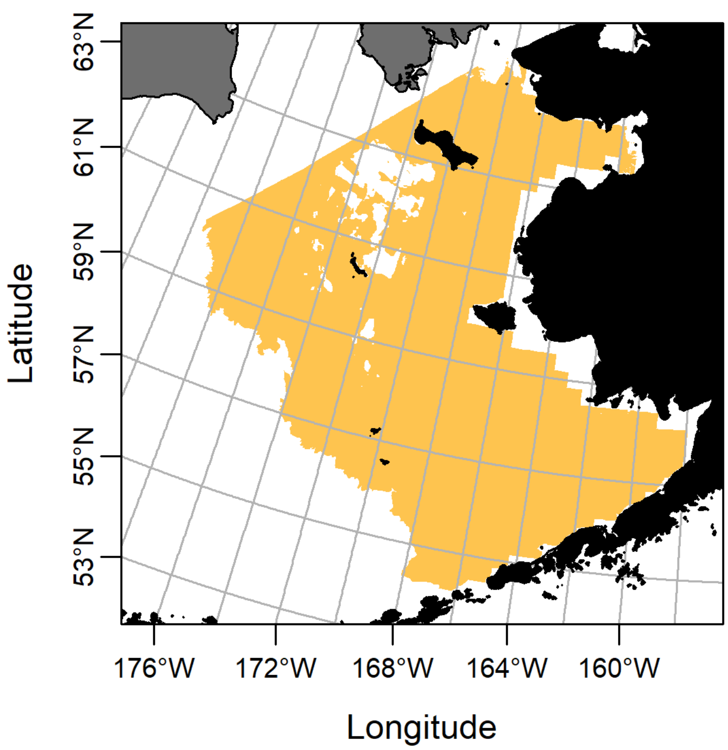

Figure E-188 EFH area of EBS adult rougheye rockfish, winter

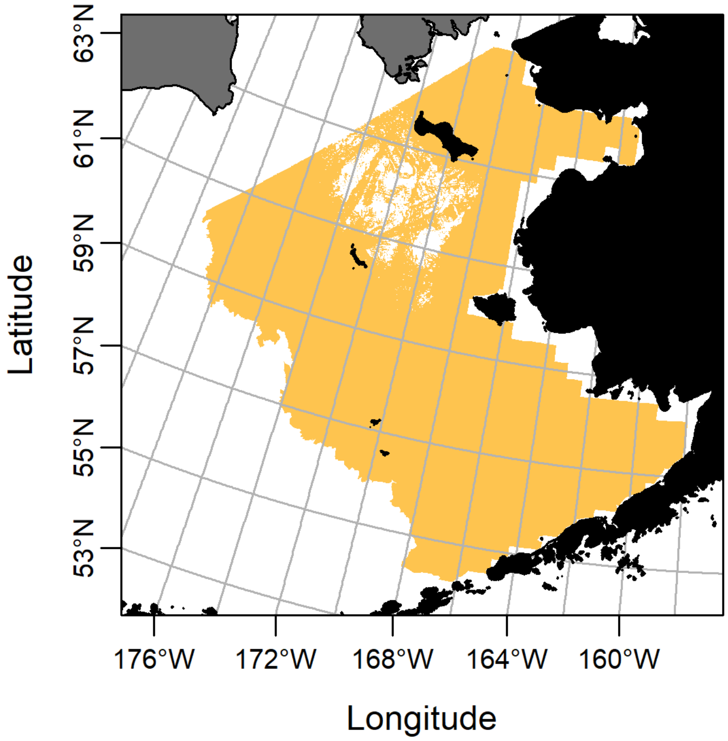

Figure E-189 EFH area of EBS adult rougheye rockfish, spring

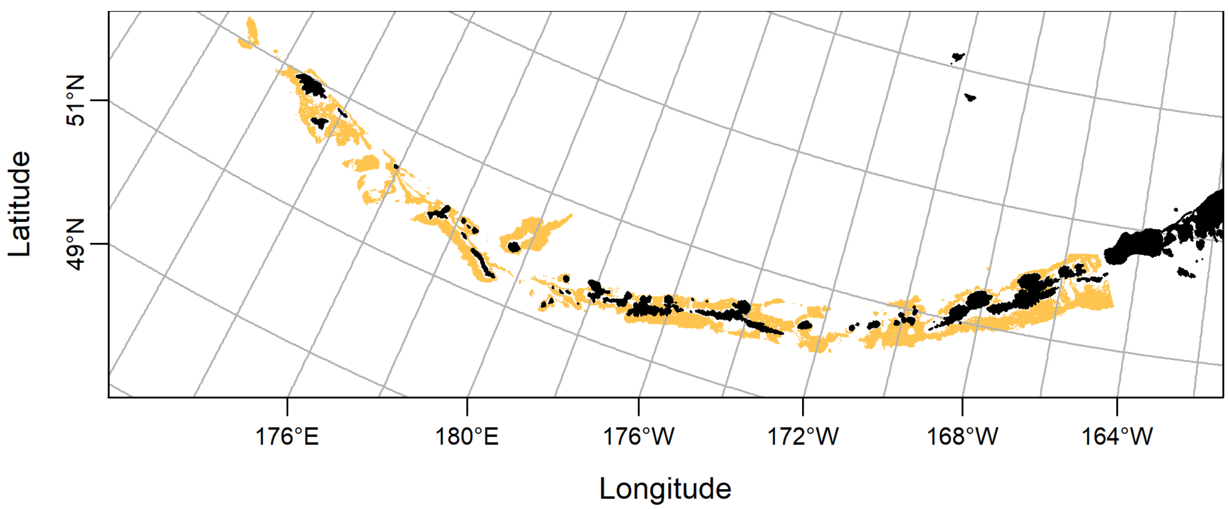

Figure E-190 EFH area of AI adult rougheye rockfish, fall

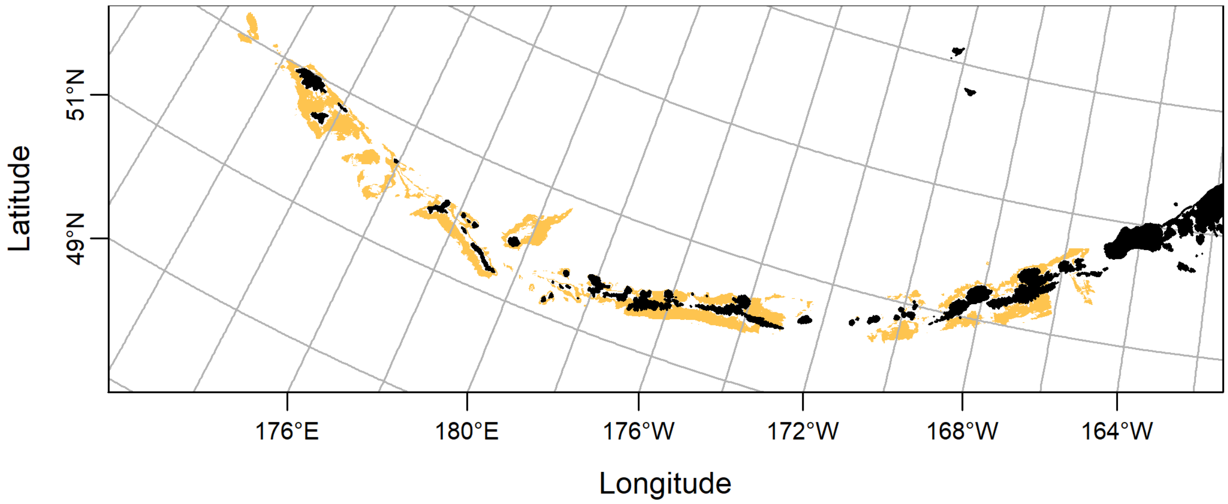

Figure E-191 EFH area of AI adult rougheye rockfish, winter

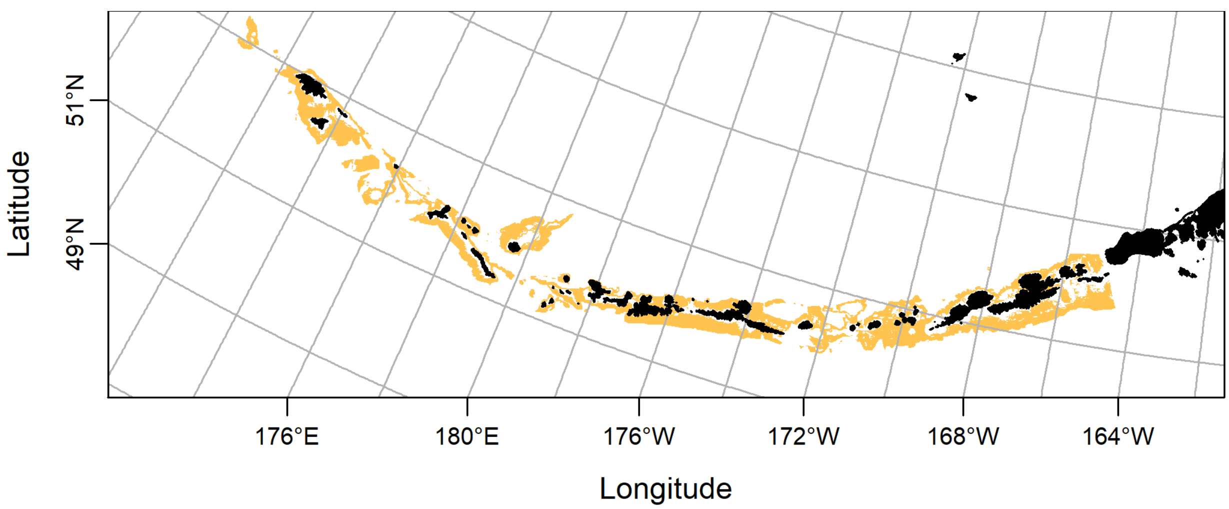

Figure E-192 EFH area of AI adult rougheye rockfish, spring

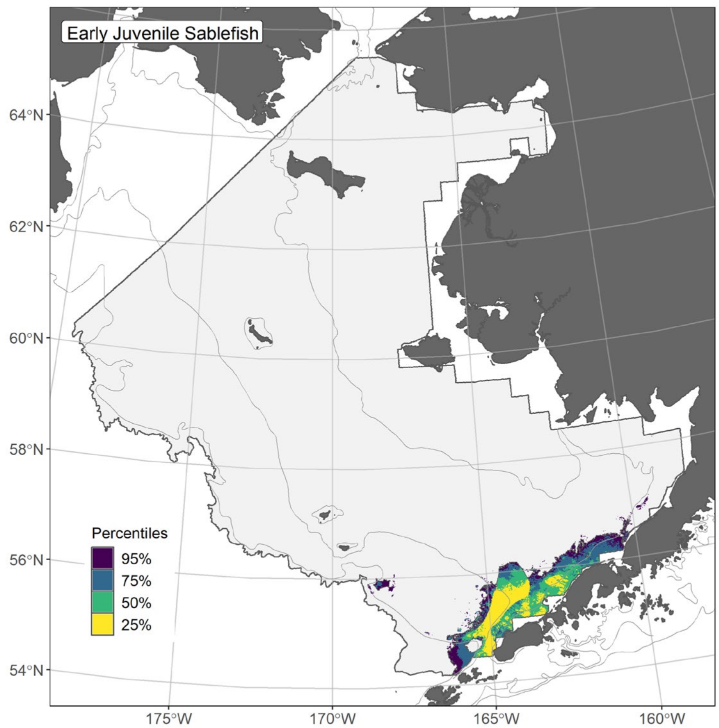

Figure E-193 EFH area of EBS settled early juvenile sablefish, summer

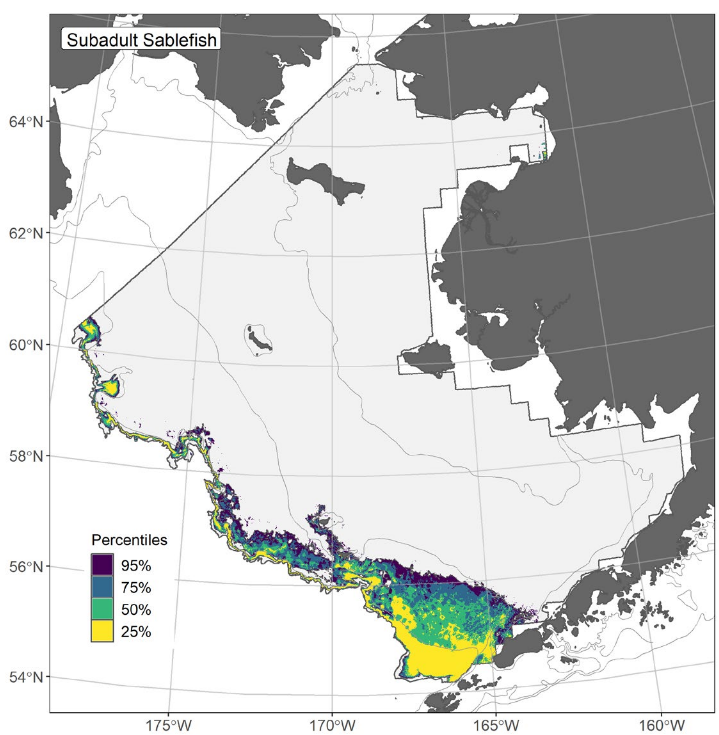

Figure E-194 EFH area of EBS subadult sablefish, summer

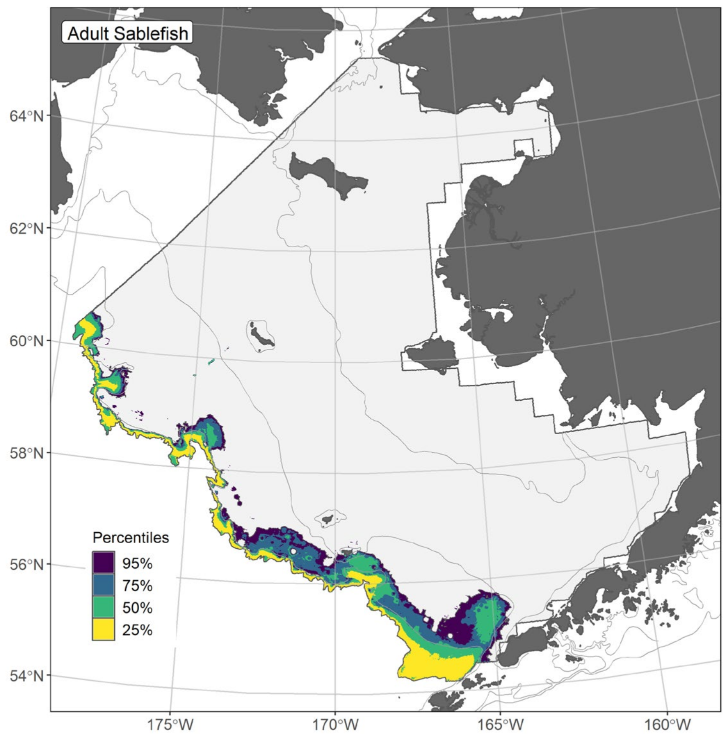

Figure E-195 EFH area of EBS adult sablefish, summer

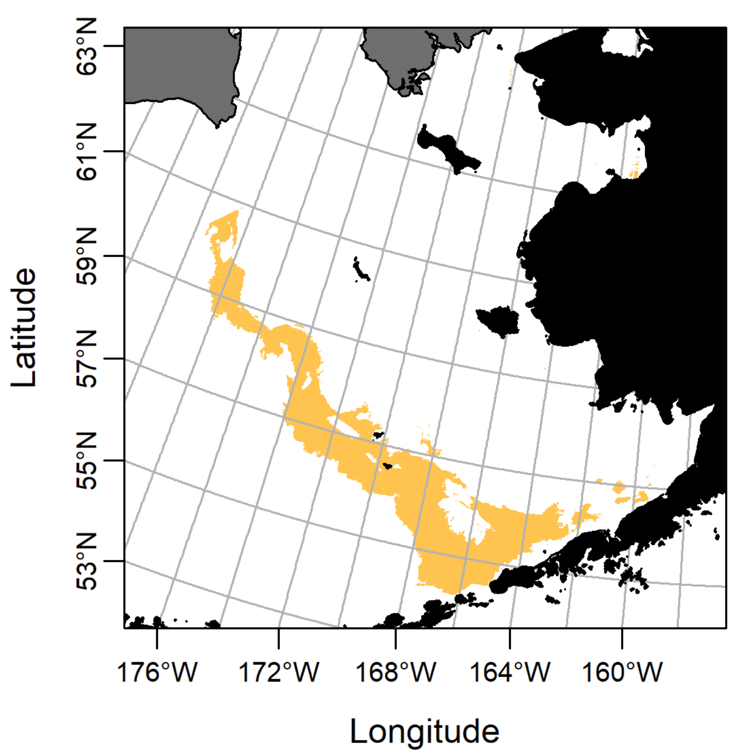

Figure E-196 EFH area of EBS adult sablefish, fall

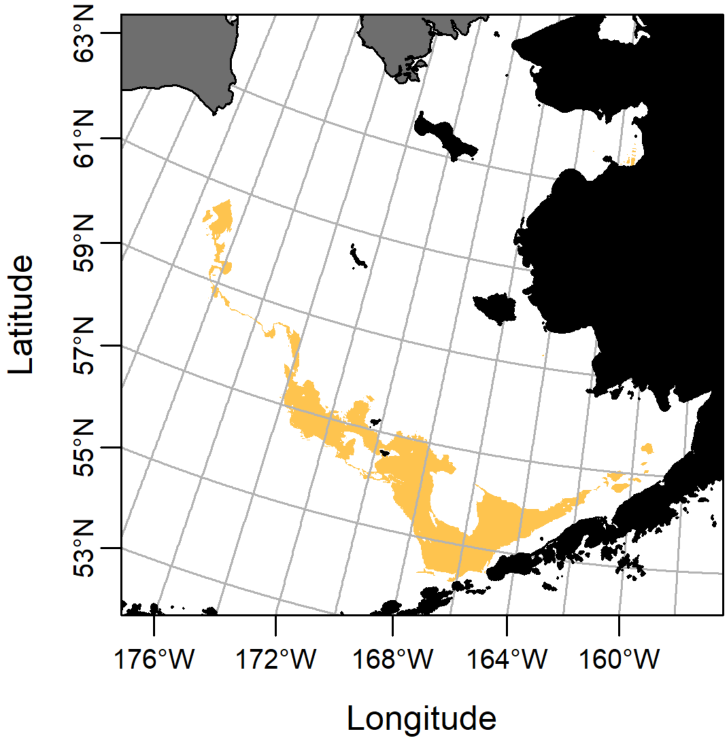

Figure E-197 EFH area of EBS adult sablefish, winter

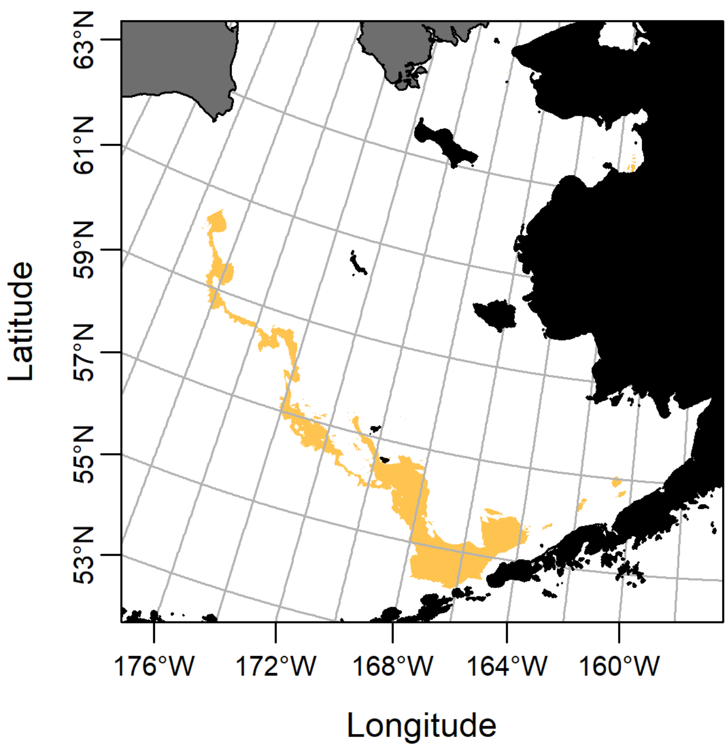

Figure E-198 EFH area of EBS adult sablefish, spring

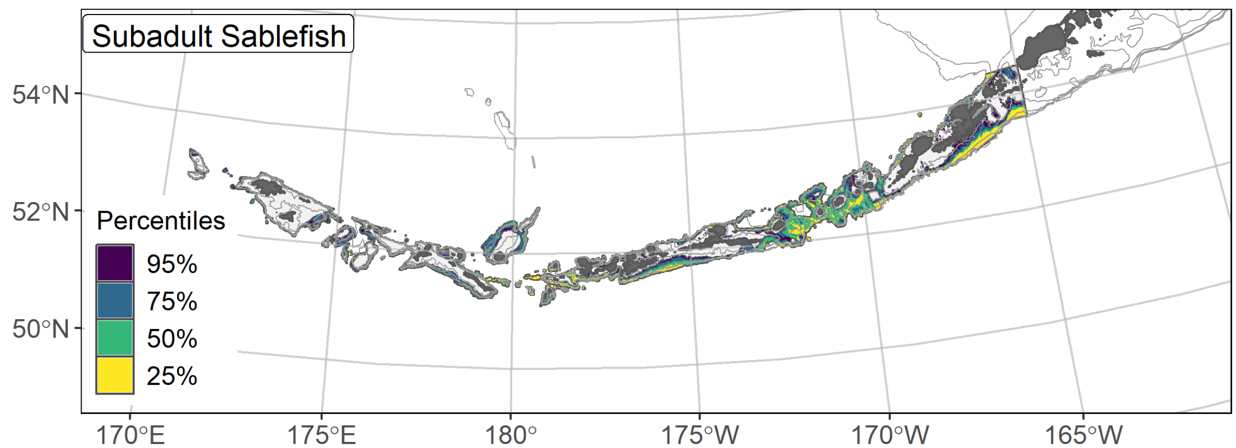

Figure E-199 EFH area of AI subadult sablefish, summer

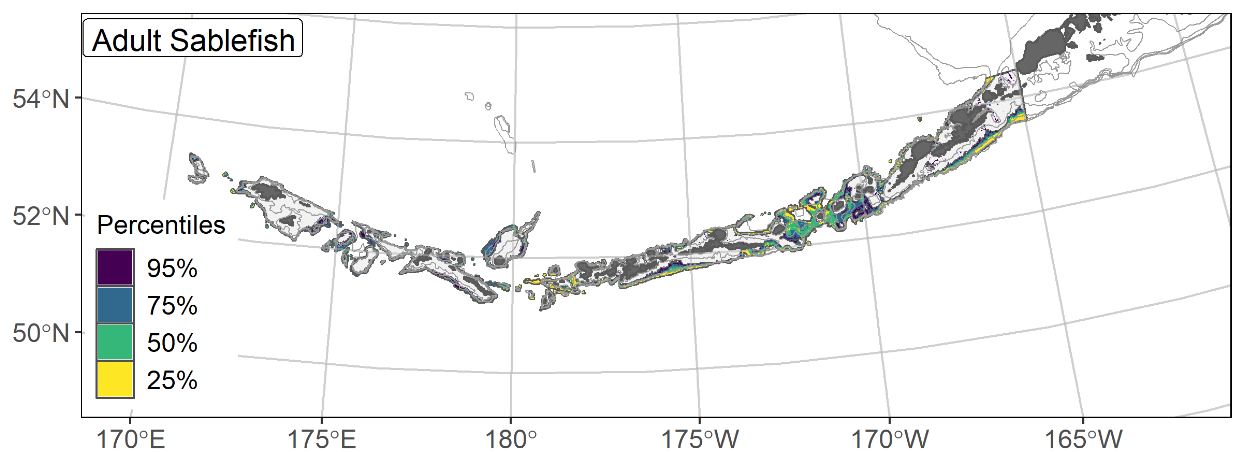

Figure E-200 EFH area of AI adult sablefish, summer

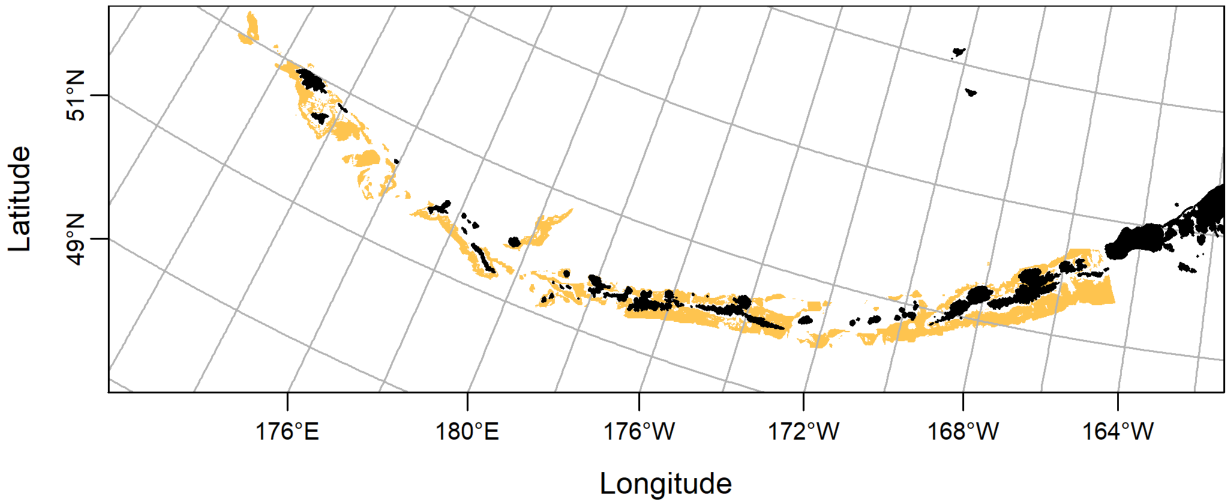

Figure E-201 EFH area of AI adult sablefish, fall

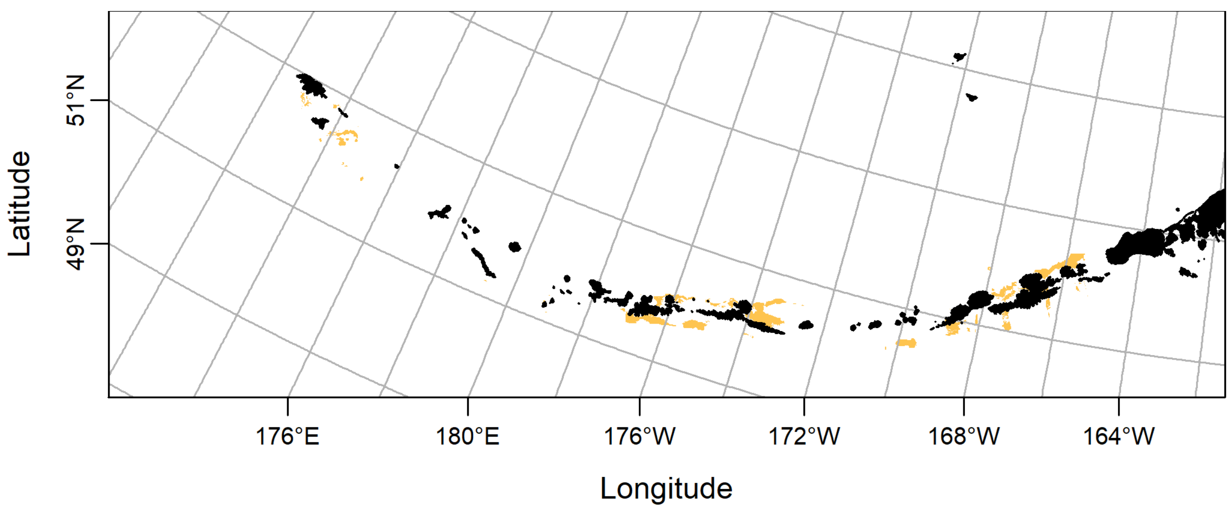

Figure E-202 EFH area of AI adult sablefish, winter

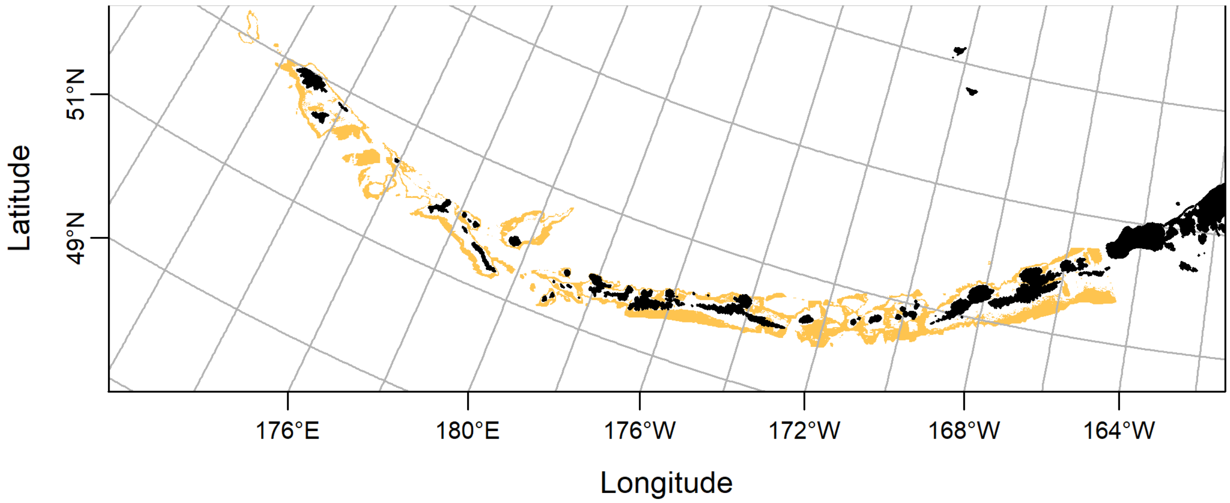

Figure E-203 EFH area of AI adult sablefish, spring

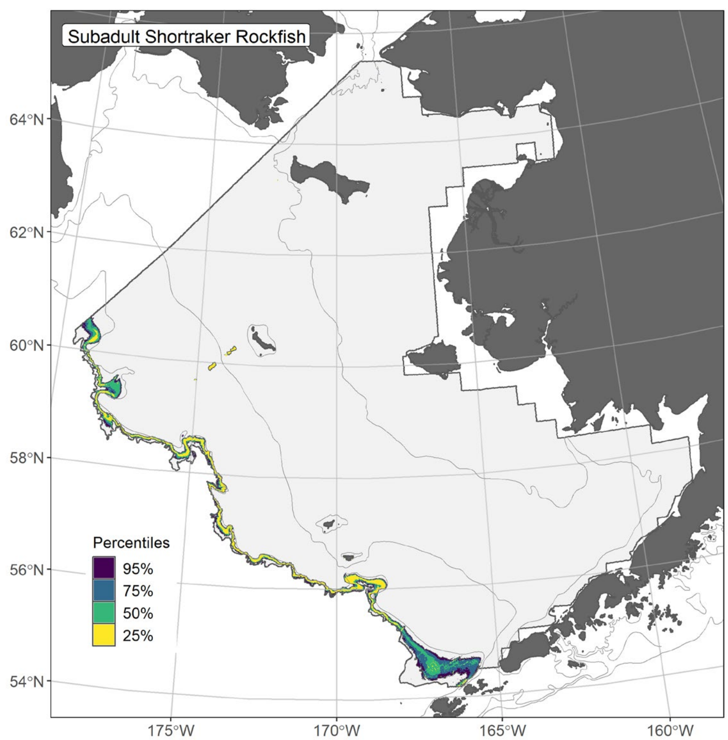

Figure E-204 EFH area of EBS subadult shortraker rockfish, summer

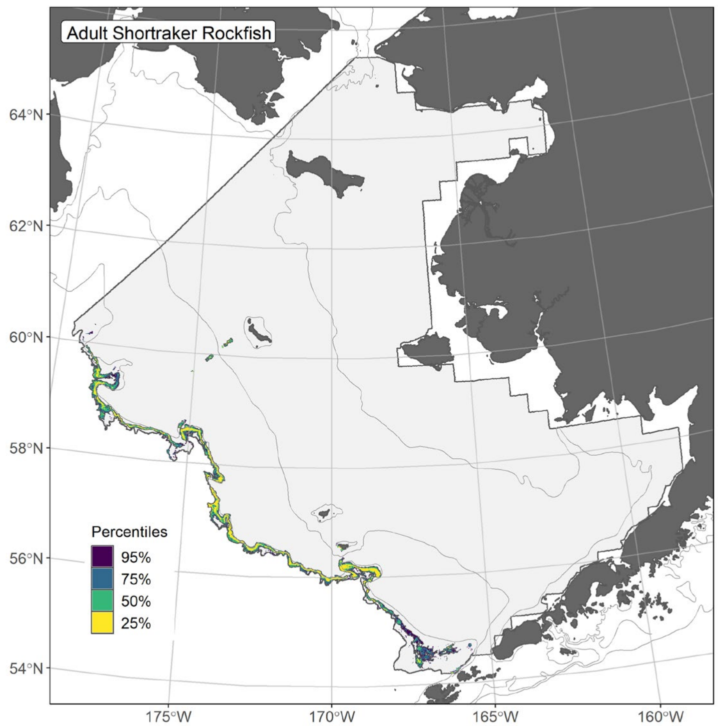

Figure E-205 EFH area of EBS adult shortraker rockfish, summer

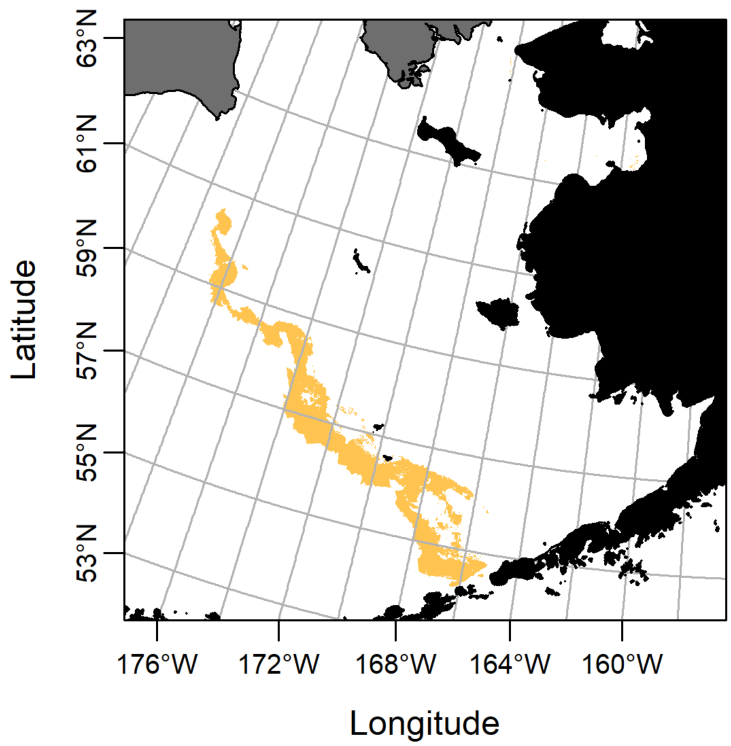

Figure E-206 EFH area of EBS adult shortraker rockfish, fall

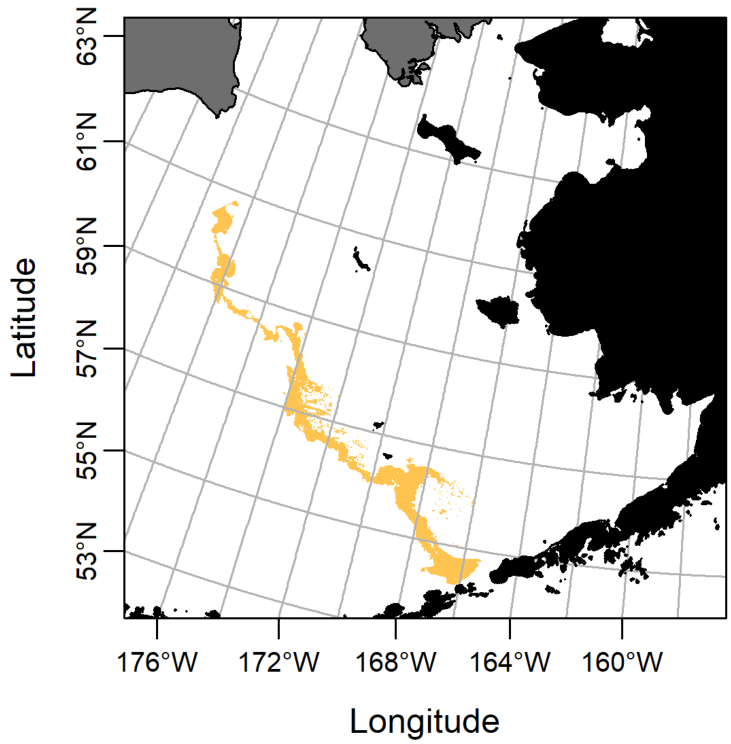

Figure E-207 EFH area of EBS adult shortraker rockfish, winter

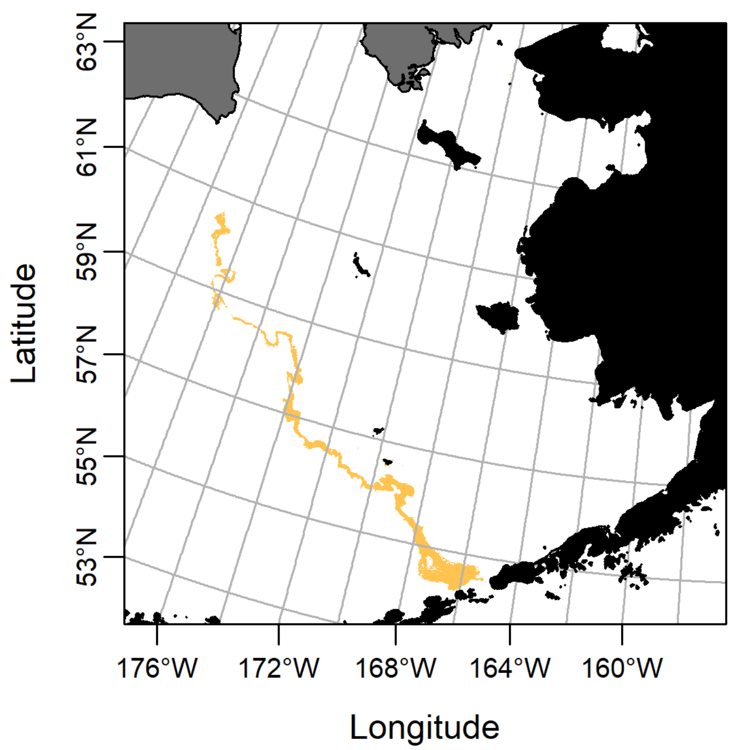

Figure E-208 EFH area of EBS adult shortraker rockfish, spring

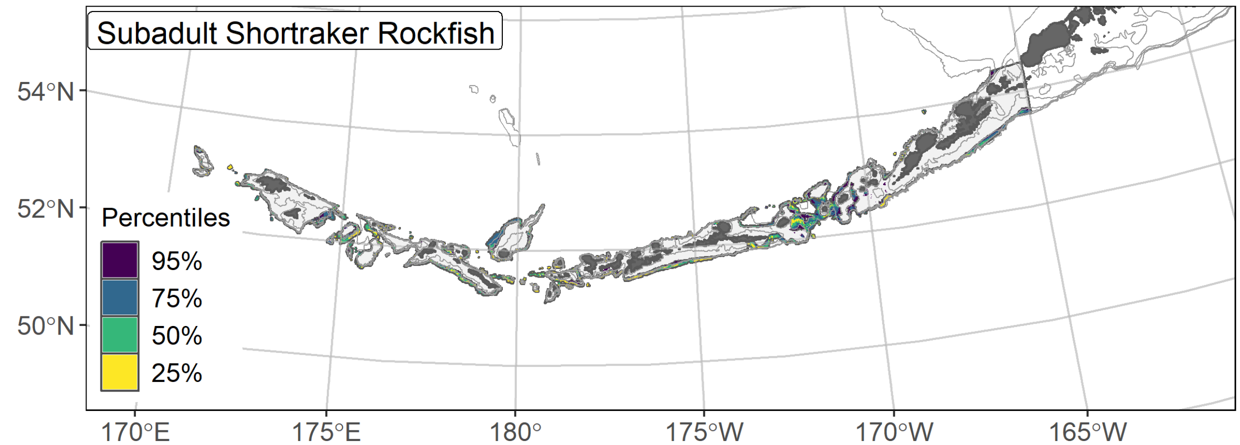

Figure E-209 EFH area of AI subadult shortraker rockfish, summer

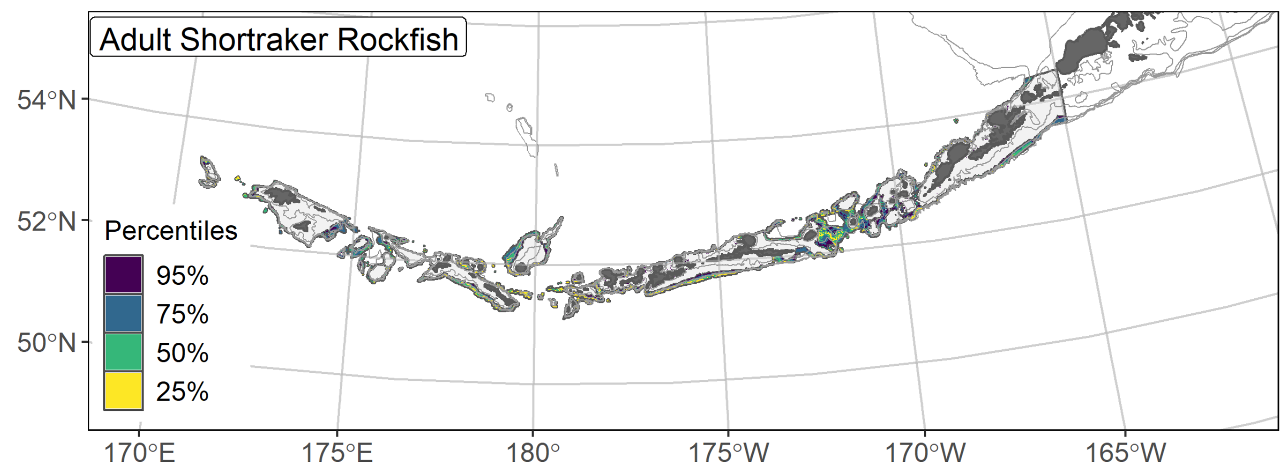

Figure E-210 EFH area of AI adult shortraker rockfish, summer

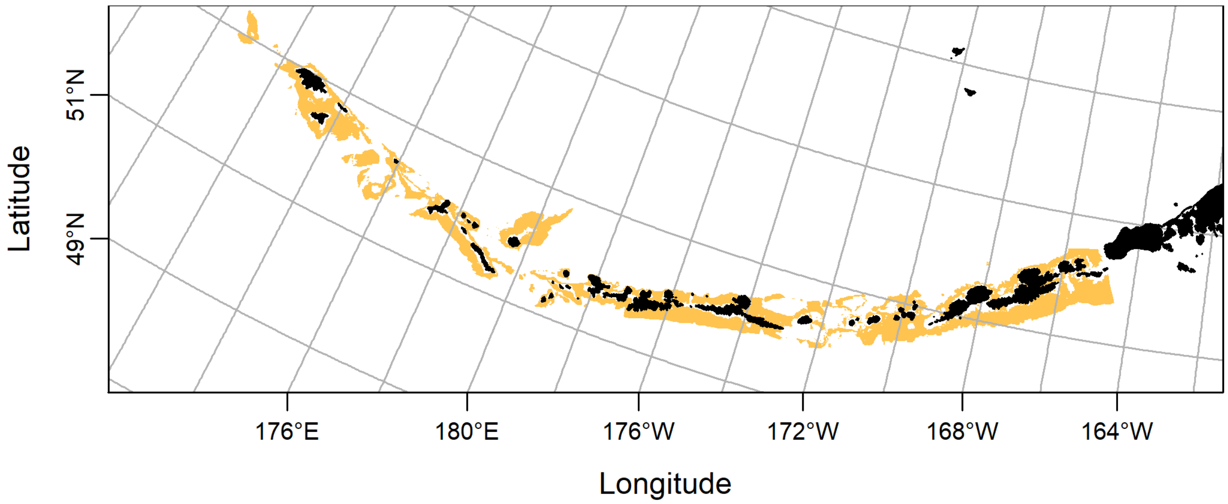

Figure E-211 EFH area of AI adult shortraker rockfish, fall

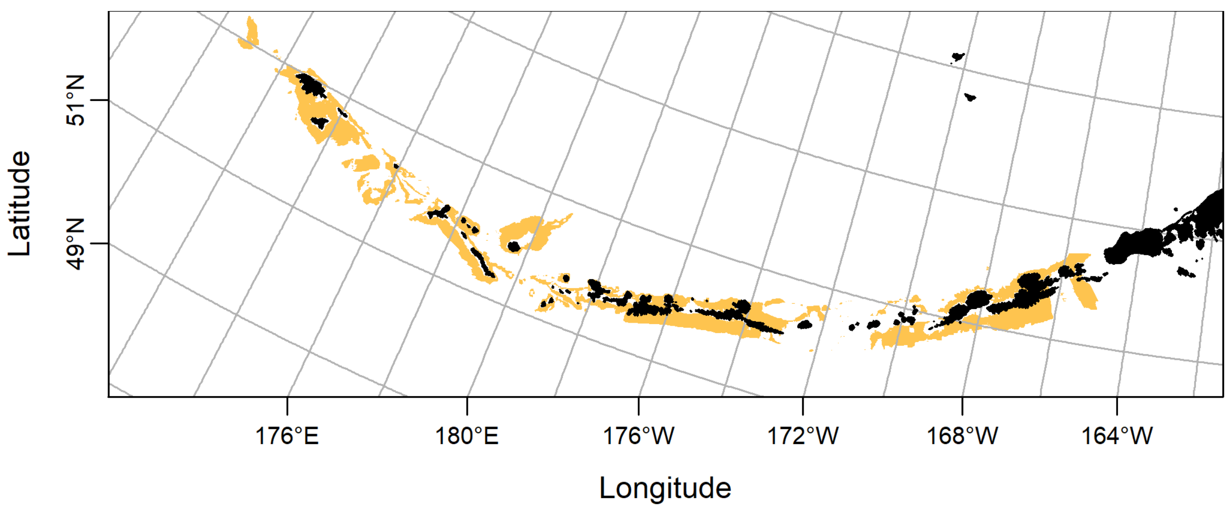

Figure E-212 EFH area of AI adult shortraker rockfish, winter

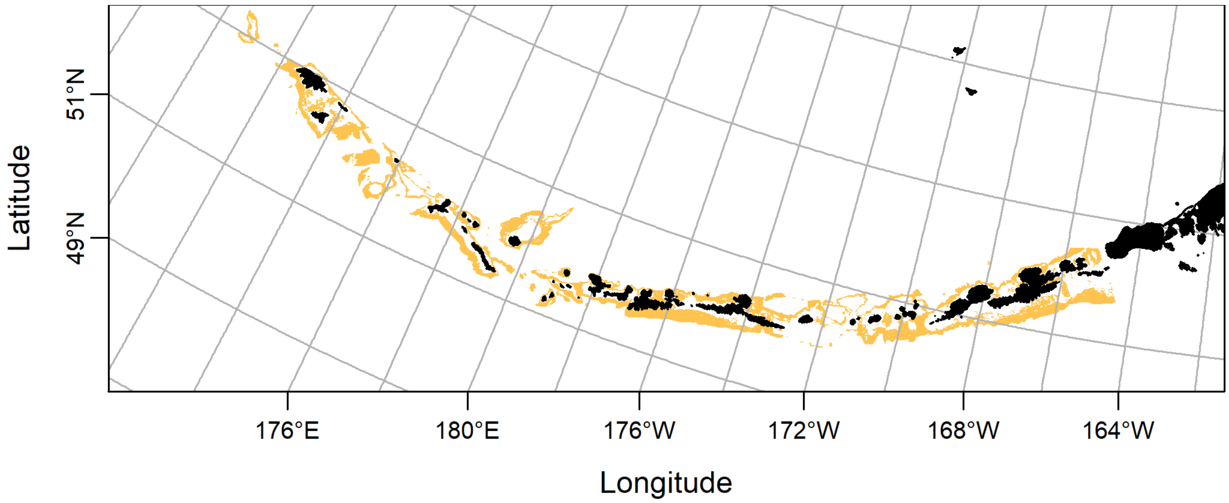

Figure E-213 EFH area of AI adult shortraker rockfish, spring

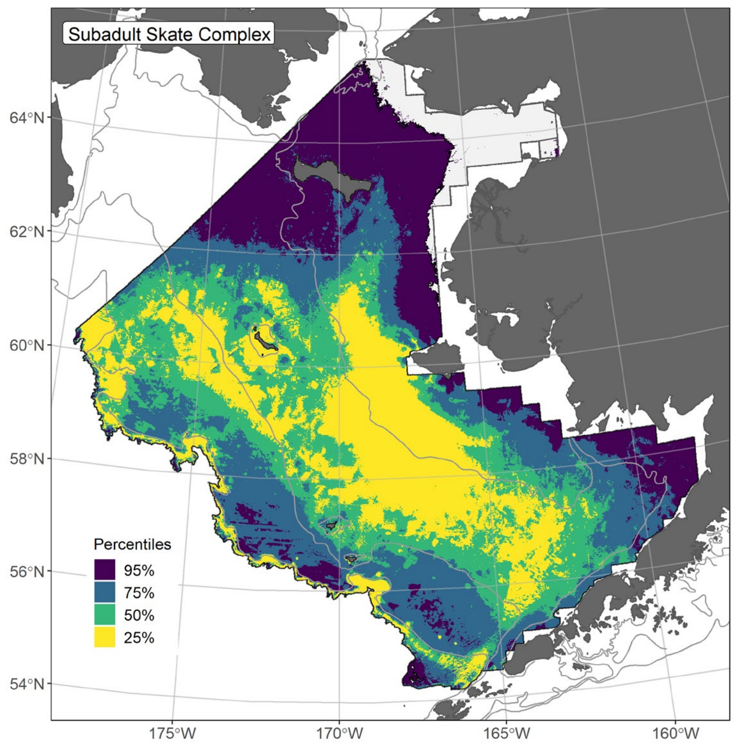

Figure E-214 EFH area of EBS subadult skate complex, summer

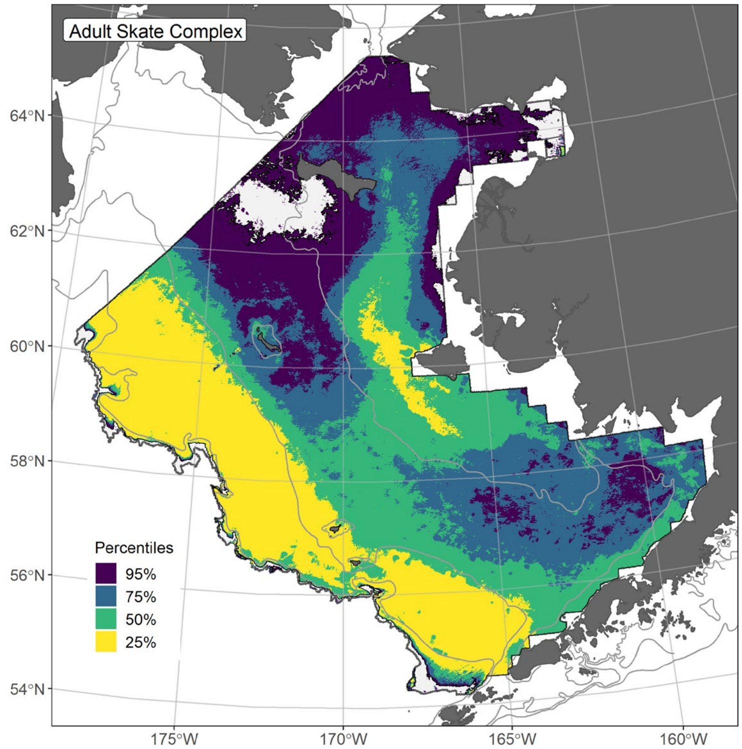

Figure E-215 EFH area of EBS adult skate complex, summer

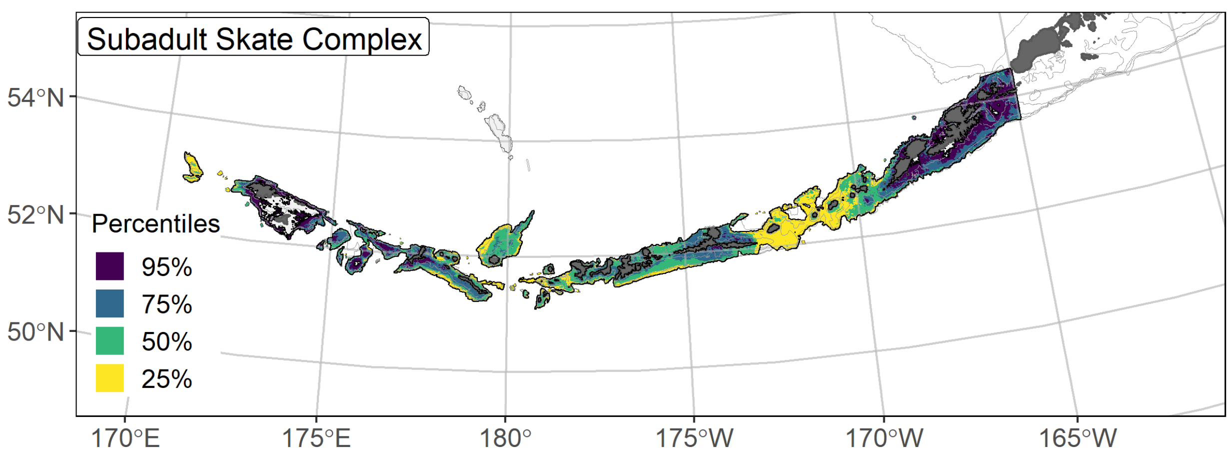

Figure E-216 EFH area of AI subadult skate complex, summer

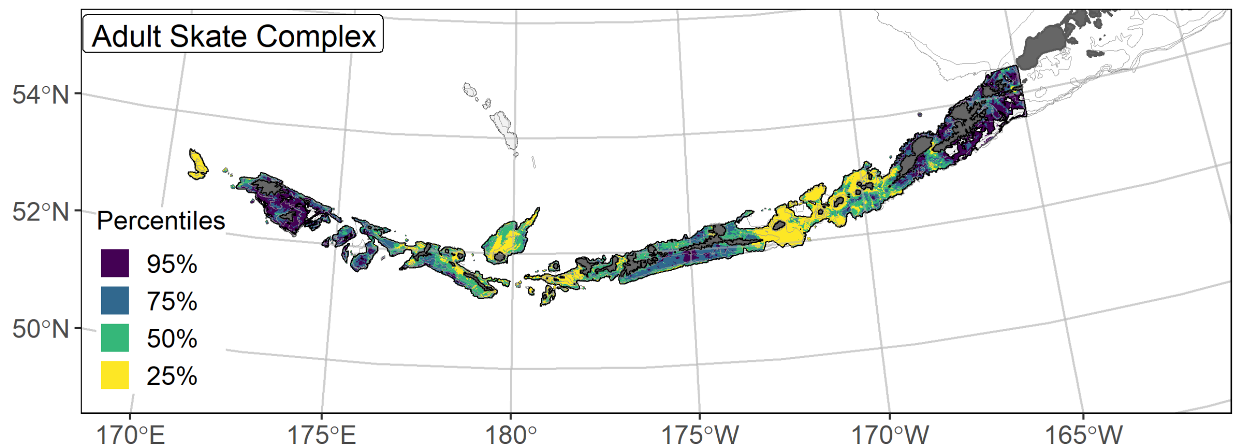

Figure E-217 EFH area of AI adult skate complex, summer

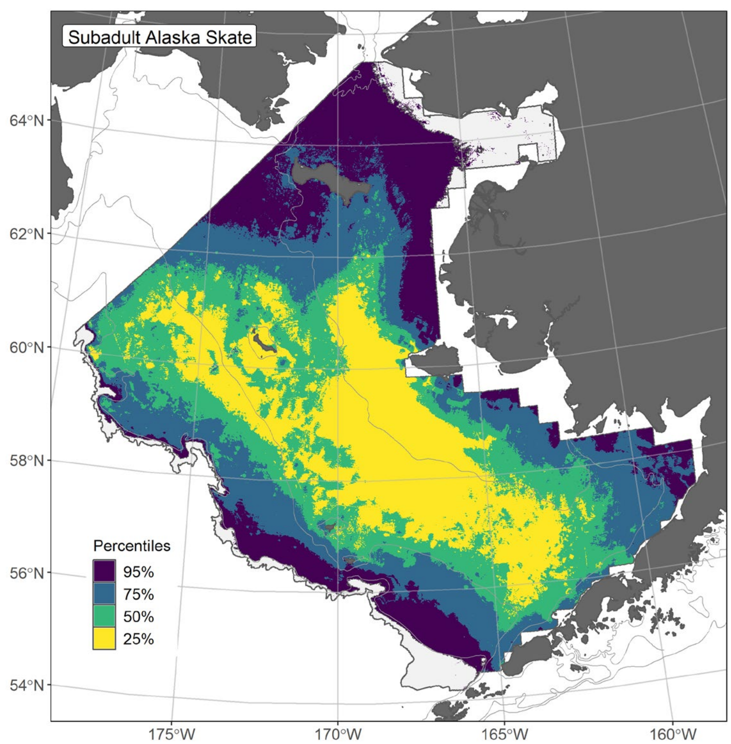

Figure E-218 EFH area of EBS subadult Alaska skate, summer

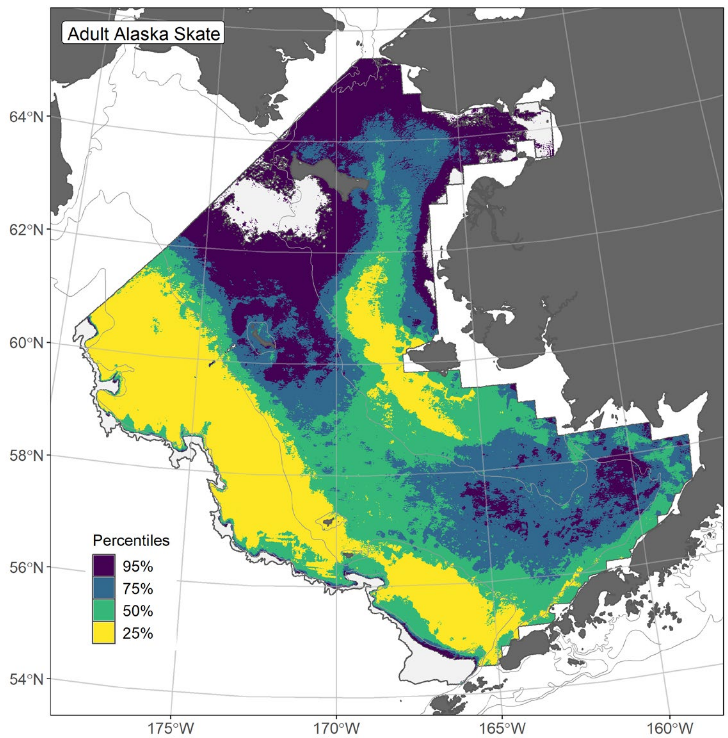

Figure E-219 EFH area of EBS adult Alaska skate, summer

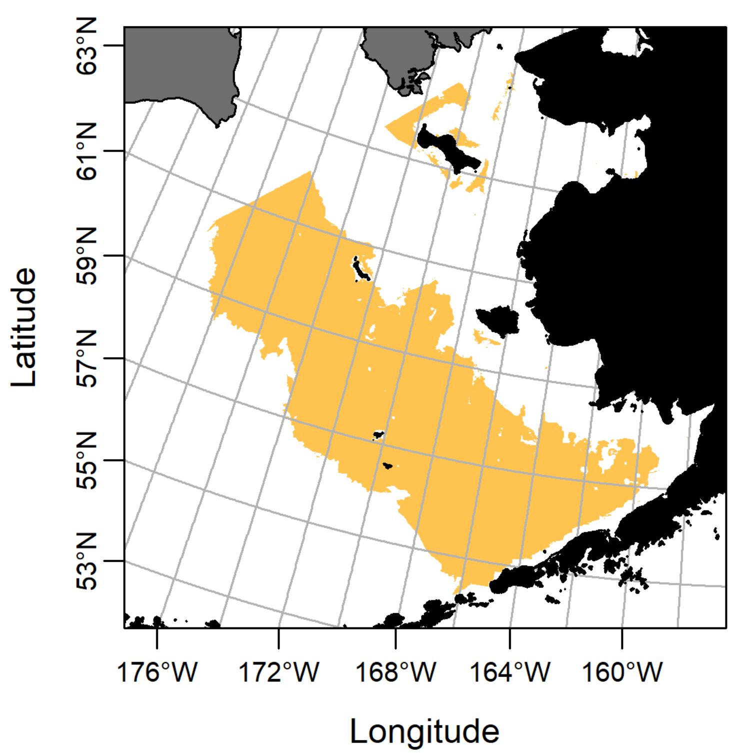

Figure E-220 EFH area of EBS adult Alaska skate, fall

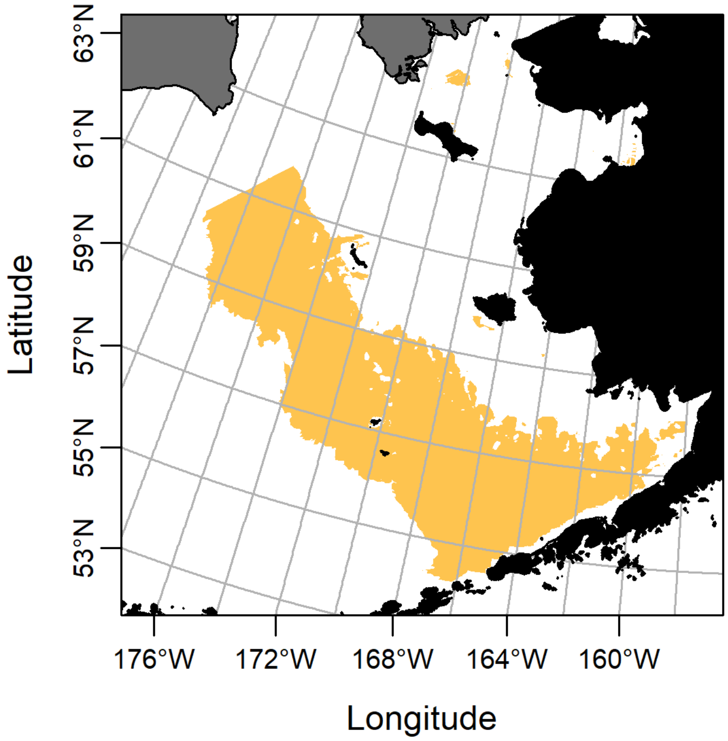

Figure E-221 EFH area of EBS adult Alaska skate, winter

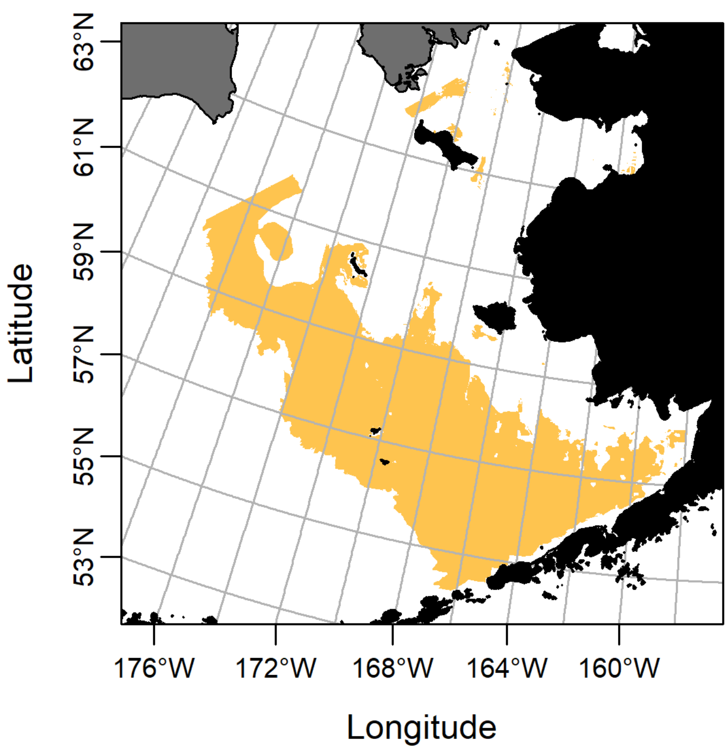

Figure E-222 EFH area of EBS adult Alaska skate, spring

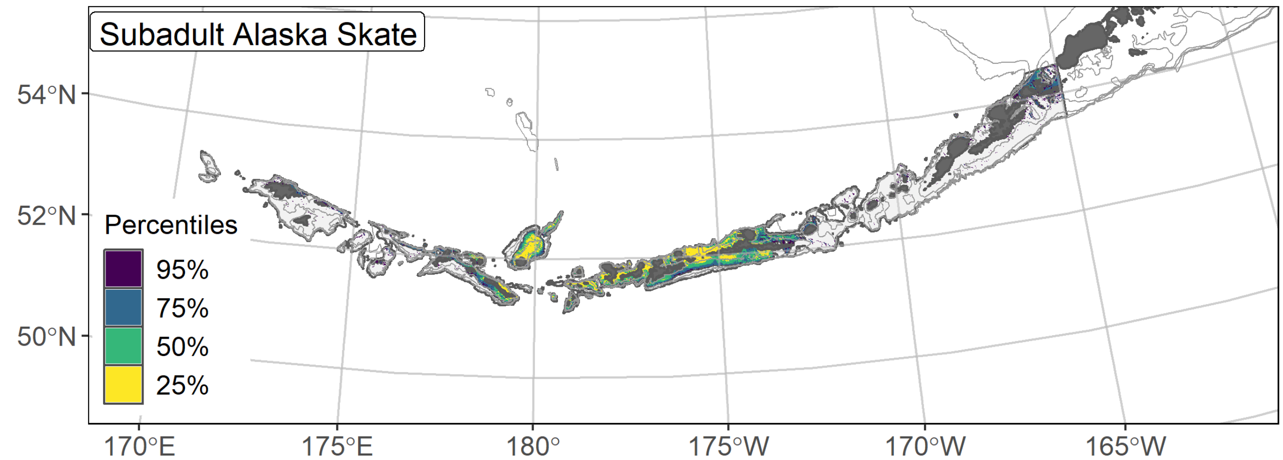

Figure E-223 EFH area of AI subadult Alaska skate, summer

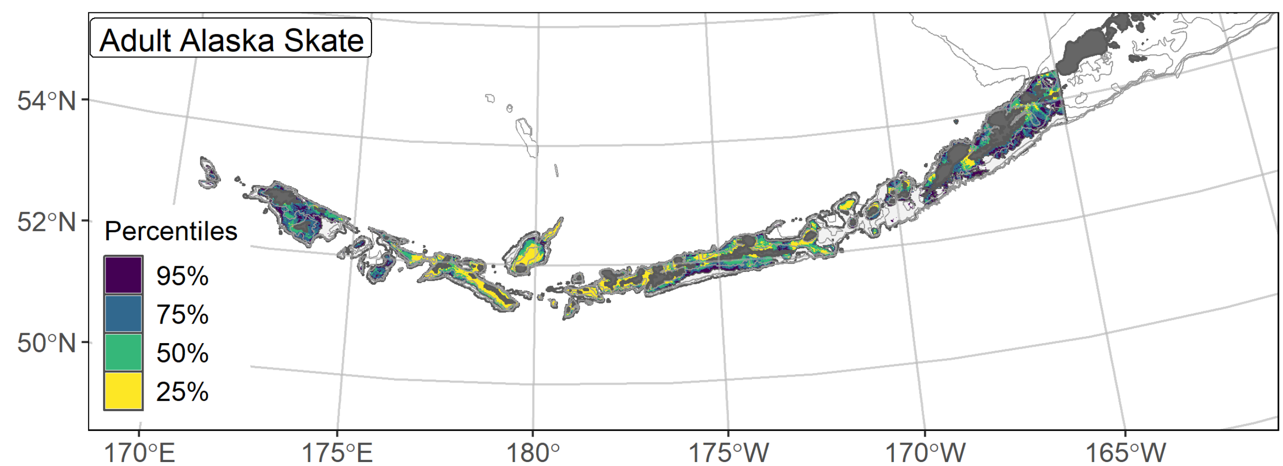

Figure E-224 EFH area of AI adult Alaska skate, summer

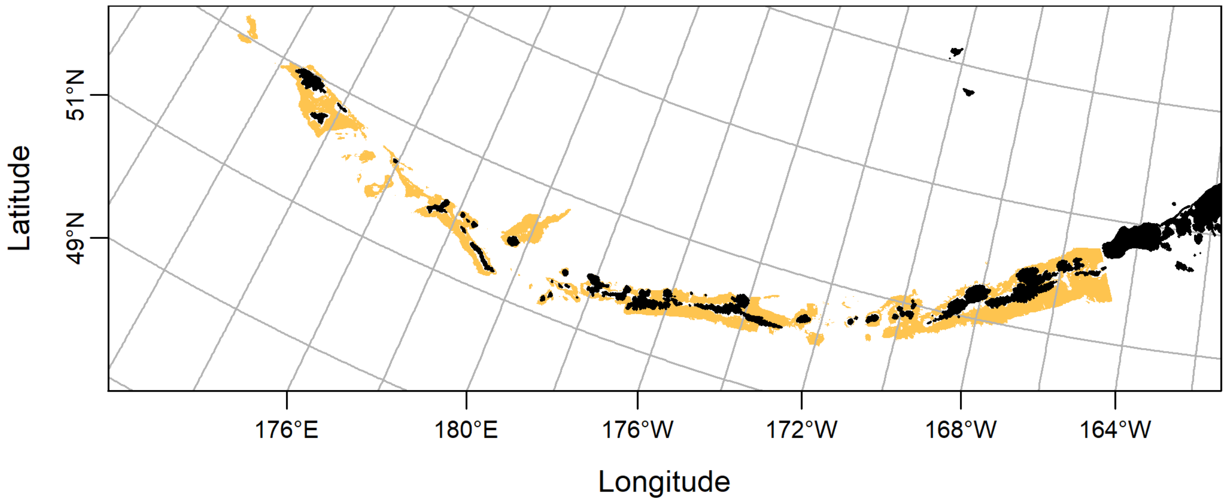

Figure E-225 EFH area of AI adult Alaska skate, fall

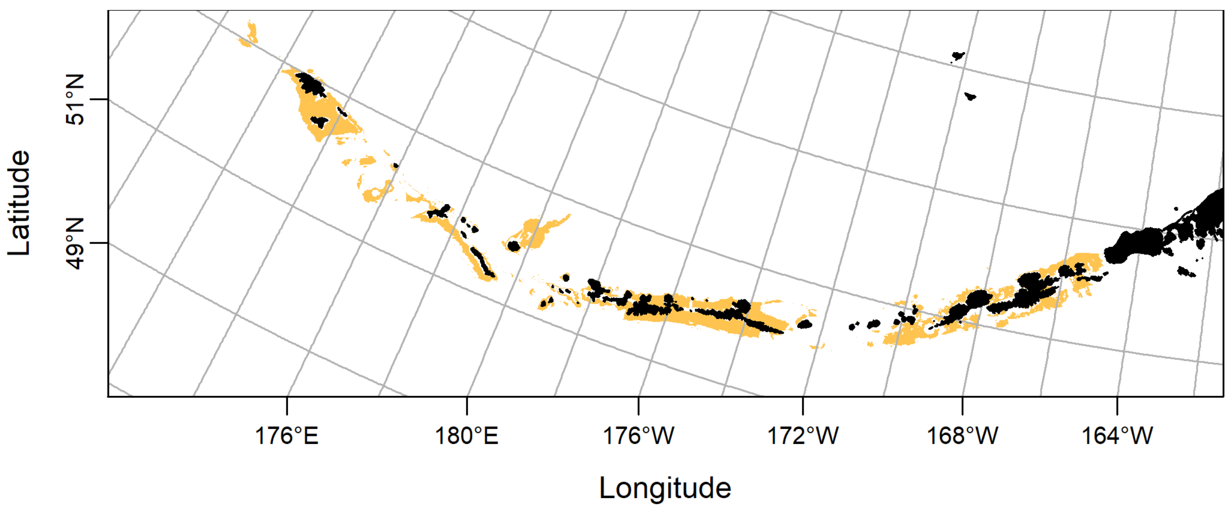

Figure E-226 EFH area of AI adult Alaska skate, winter

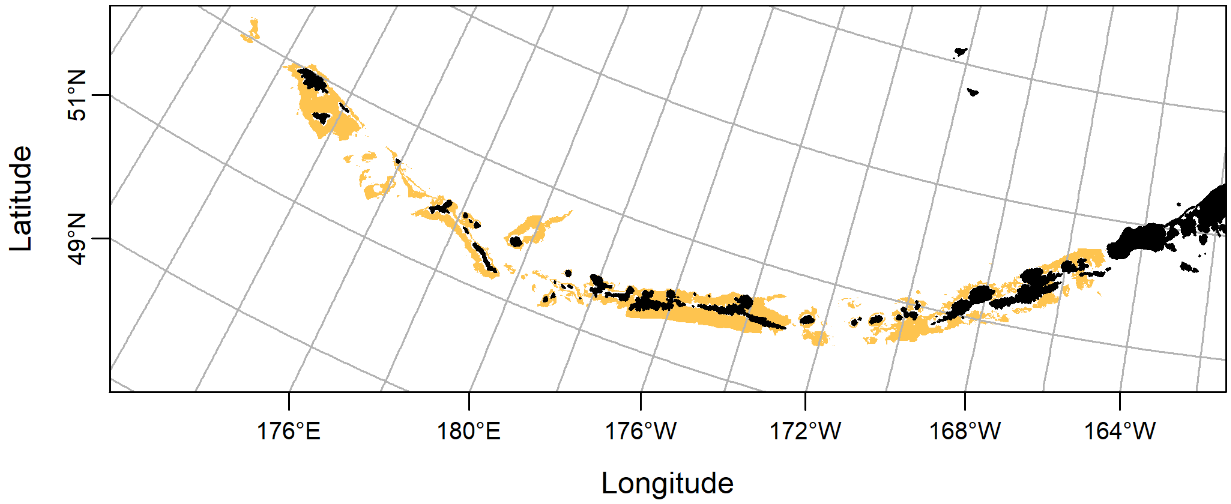

Figure E-227 EFH area of AI adult Alaska skate, spring

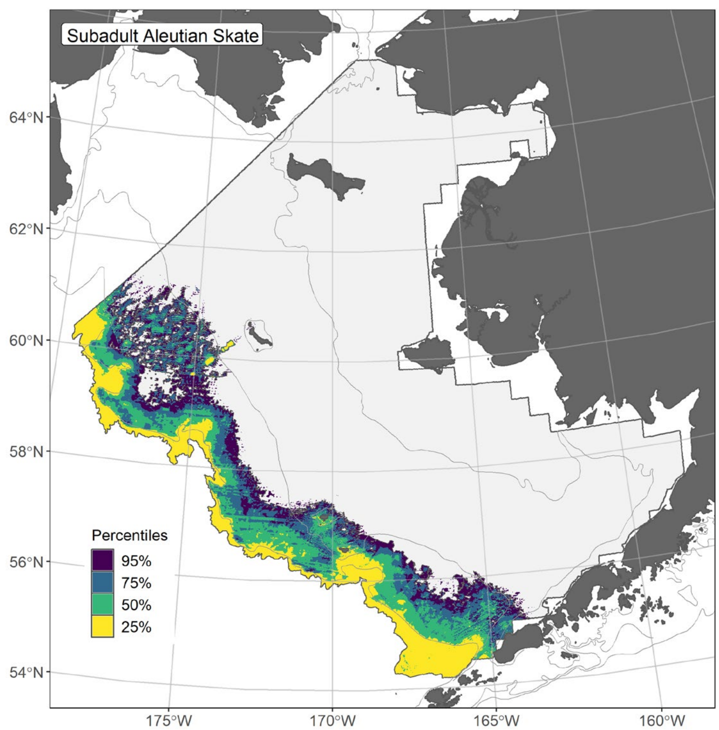

Figure E-228 EFH area of EBS subadult Aleutian skate, summer

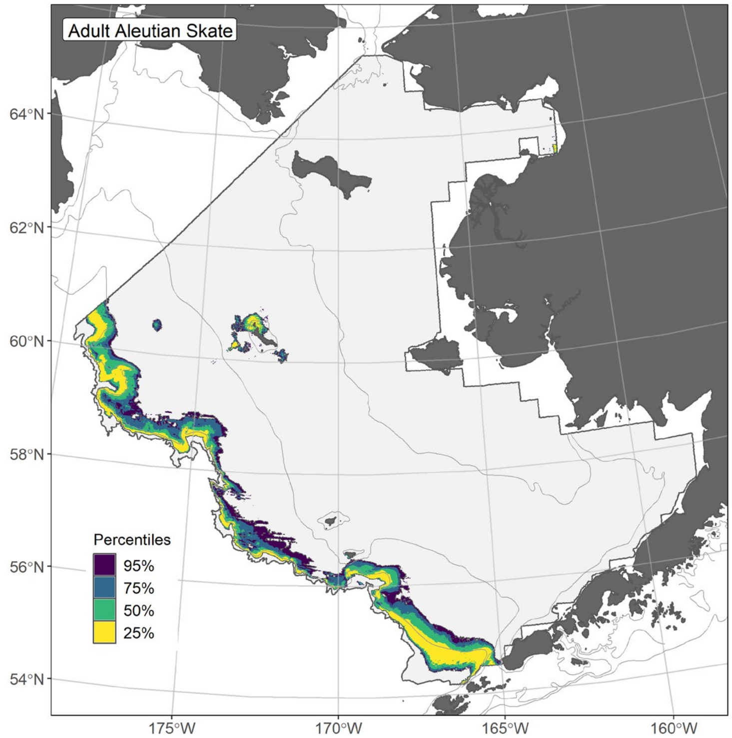

Figure E-229 EFH area of EBS adult Aleutian skate, summer

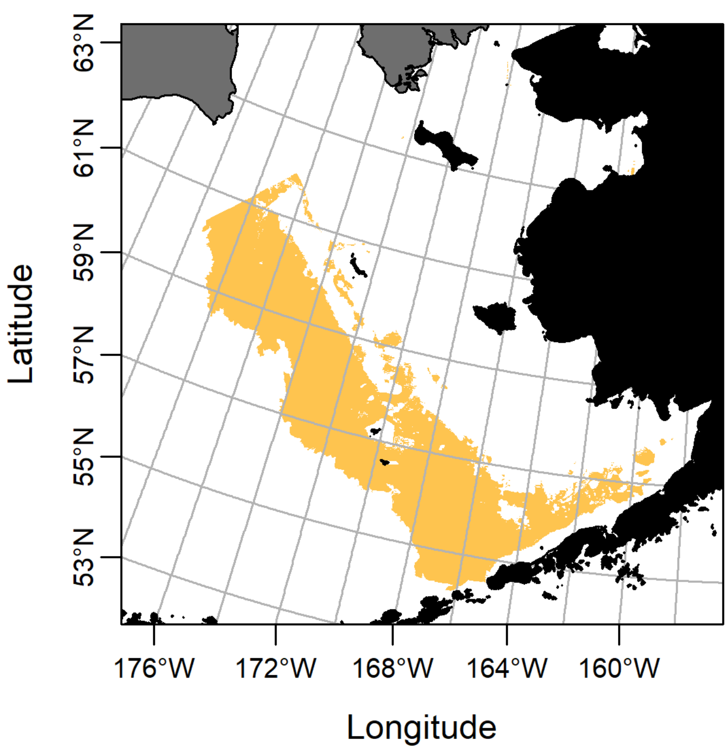

Figure E-230 EFH area of EBS adult Aleutian skate, fall

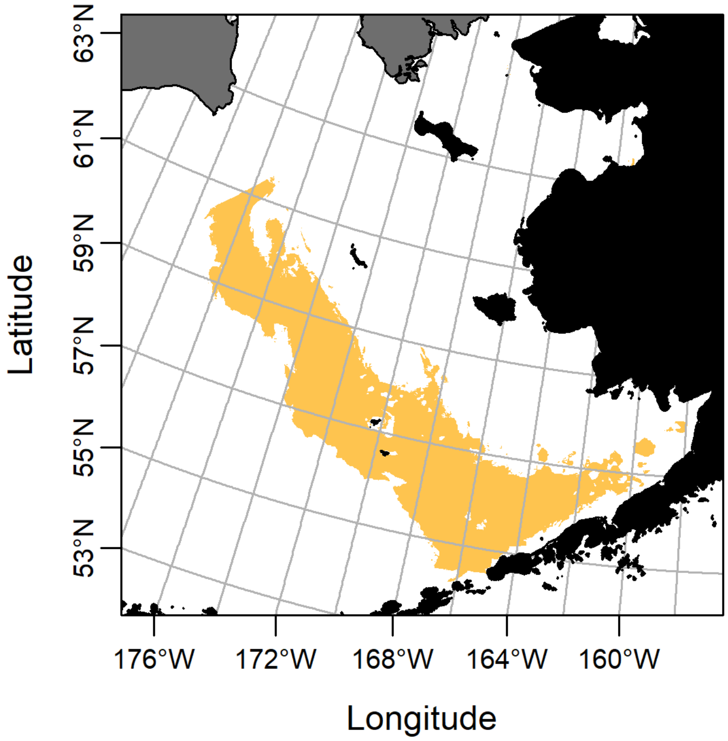

Figure E-231 EFH area of EBS adult Aleutian skate, winter

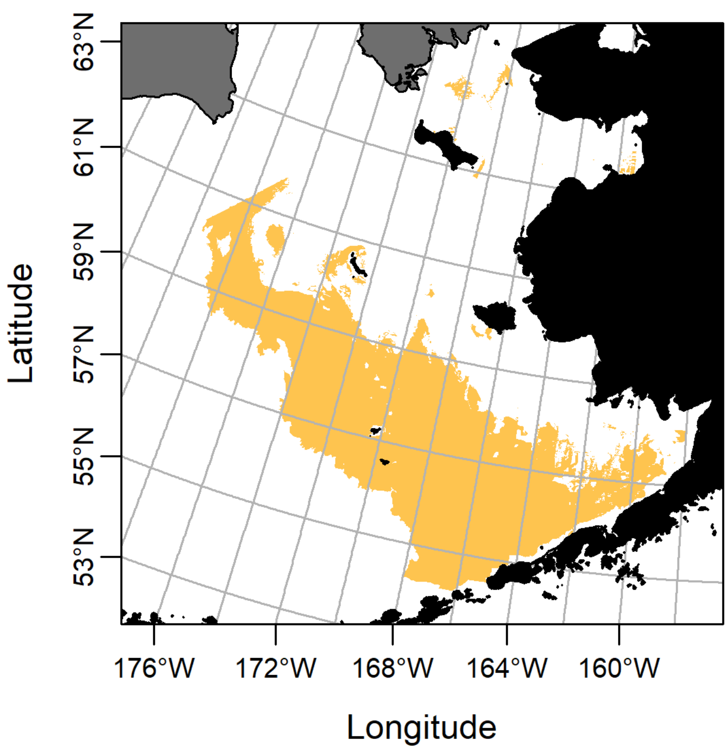

Figure E-232 EFH area of EBS adult Aleutian skate, spring

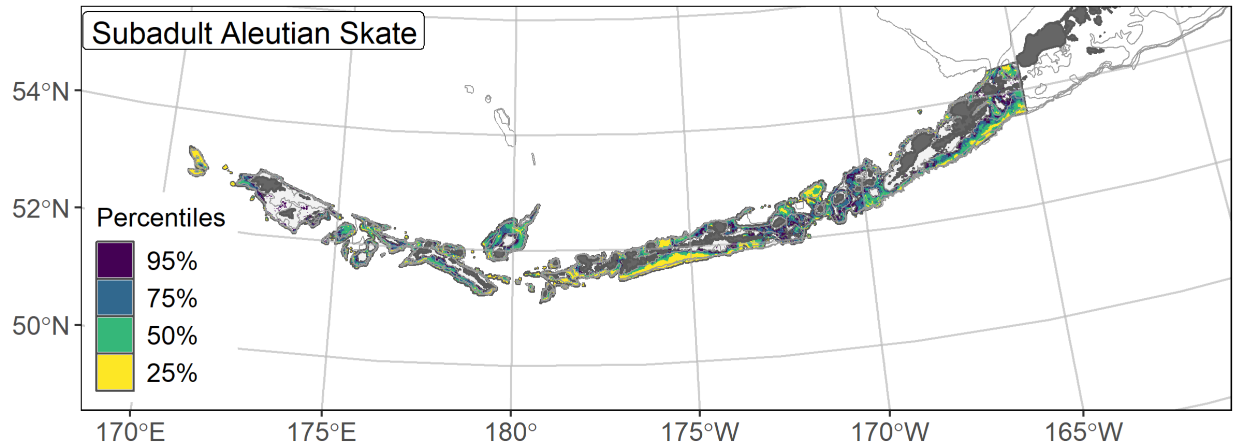

Figure E-233 EFH area of AI subadult Aleutian skate, summer

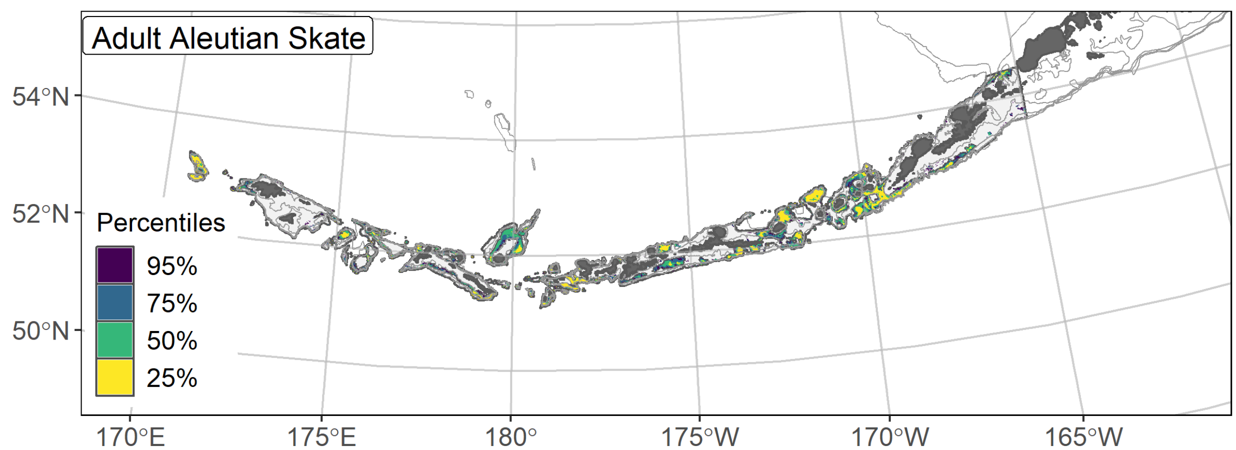

Figure E-234 EFH area of AI adult Aleutian skate, summer

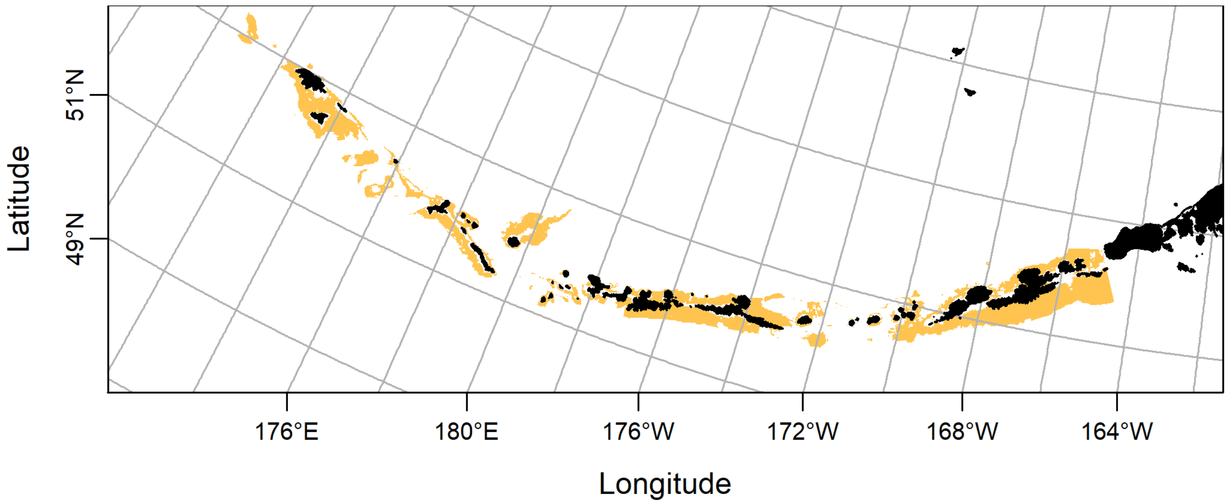

Figure E-235 EFH area of AI adult Aleutian skate, fall

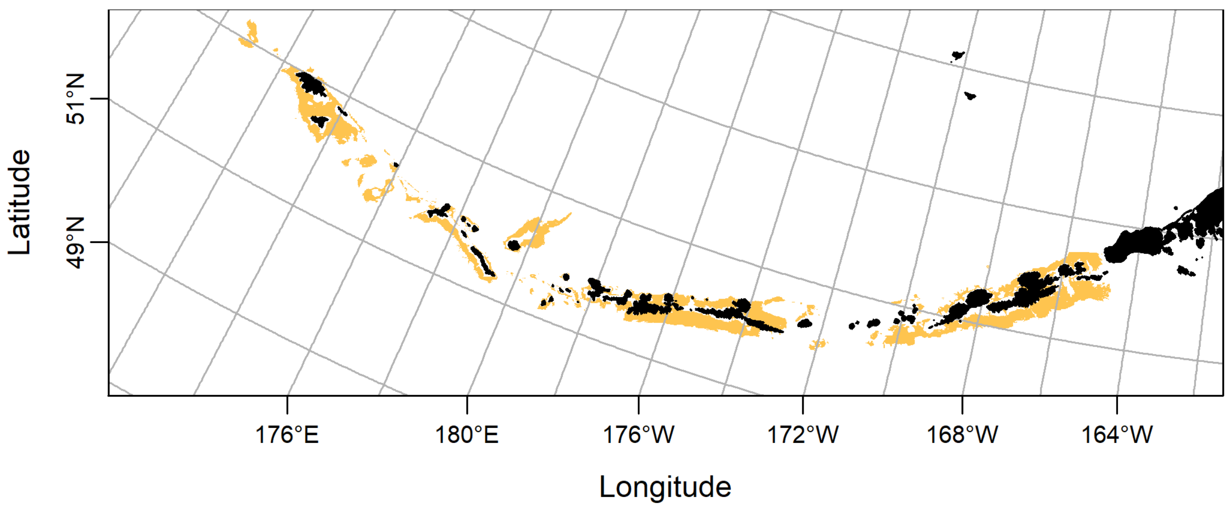

Figure E-236 EFH area of AI adult Aleutian skate, winter

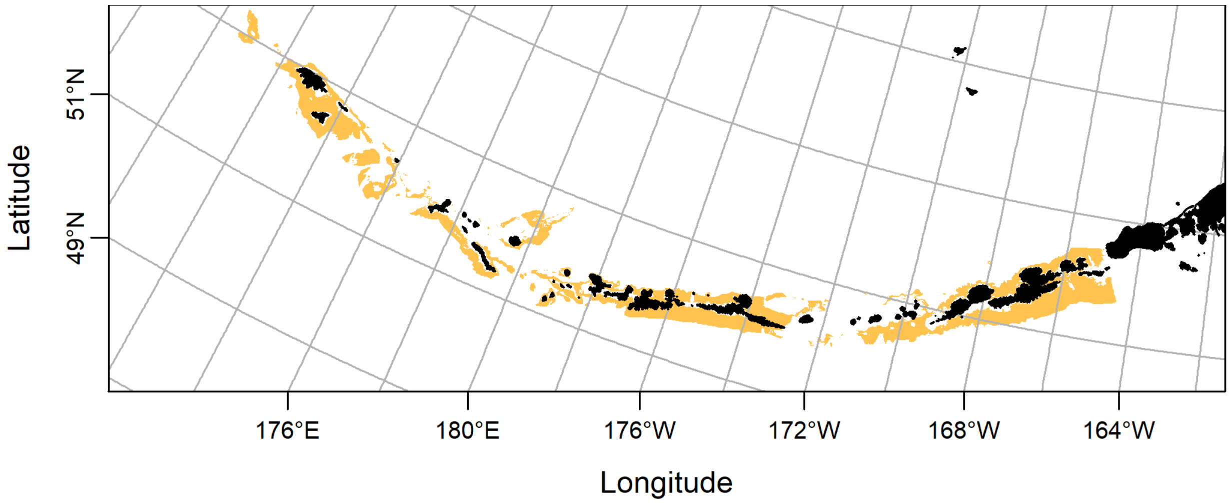

Figure E-237 EFH area of AI adult Aleutian skate, spring

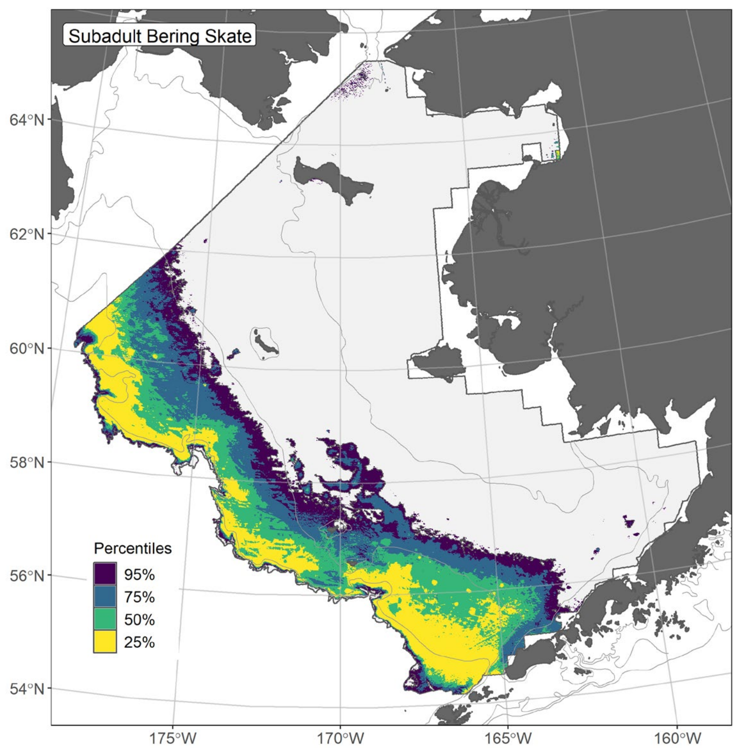

Figure E-238 EFH area of EBS subadult Bering skate, summer

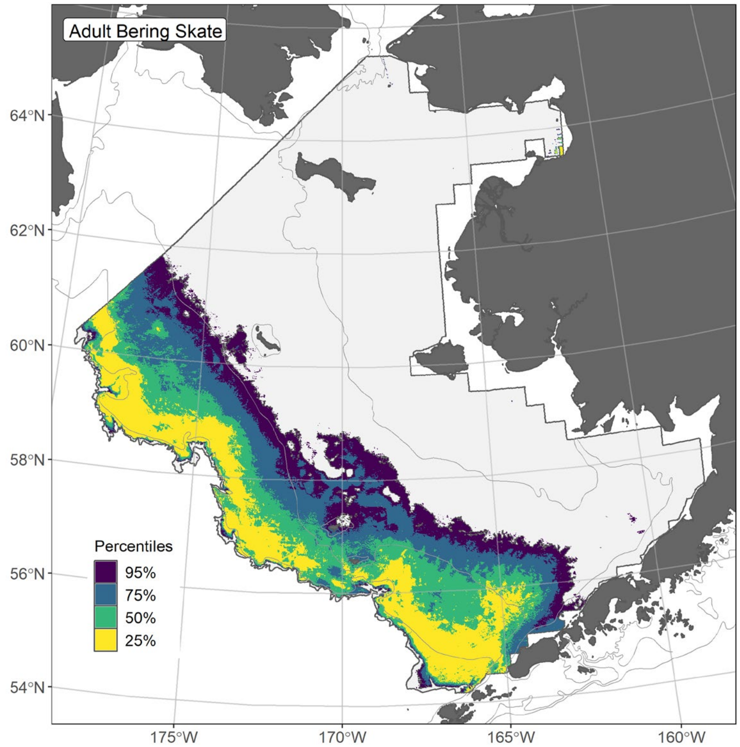

Figure E-239 EFH area of EBS adult Bering skate, summer

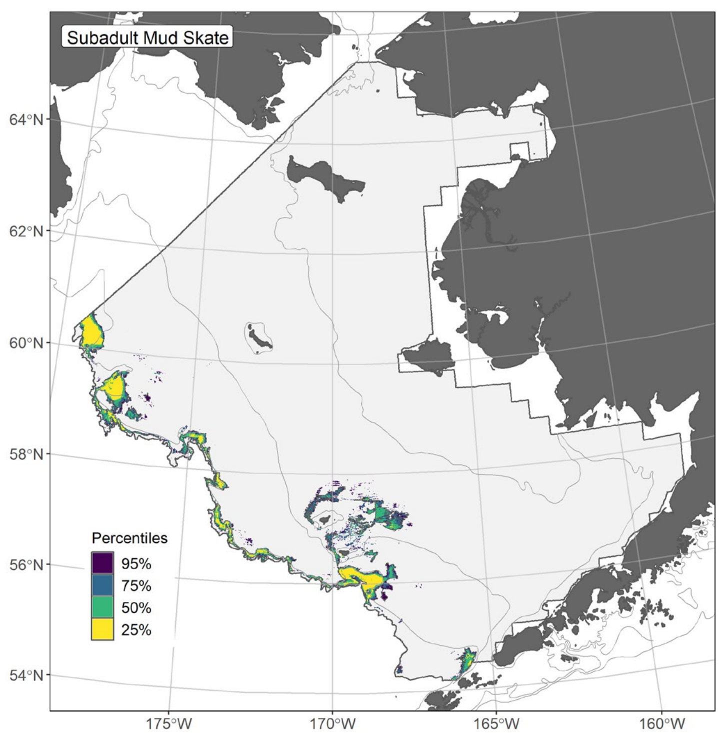

Figure E-240 EFH area of EBS subadult mud skate, summer

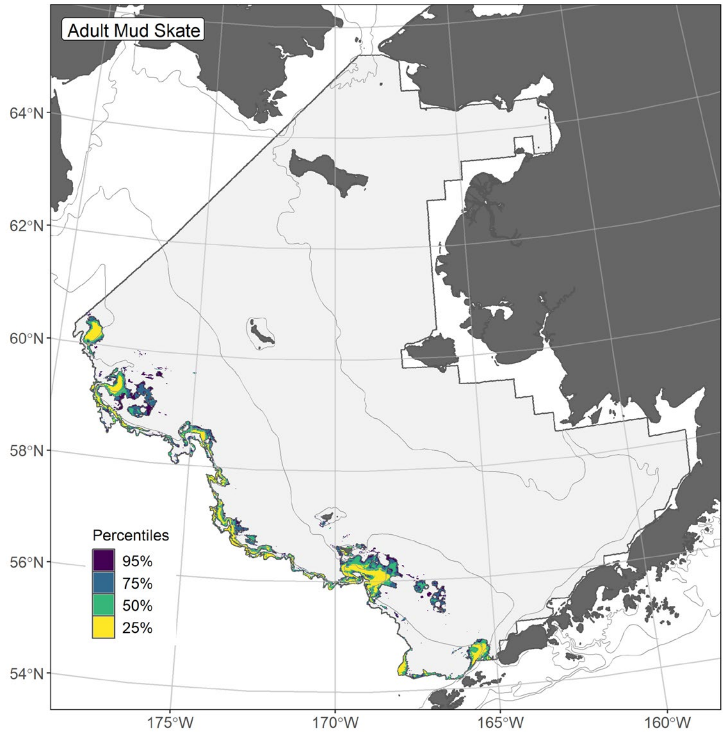

Figure E-241 EFH area of EBS adult mud skate, summer

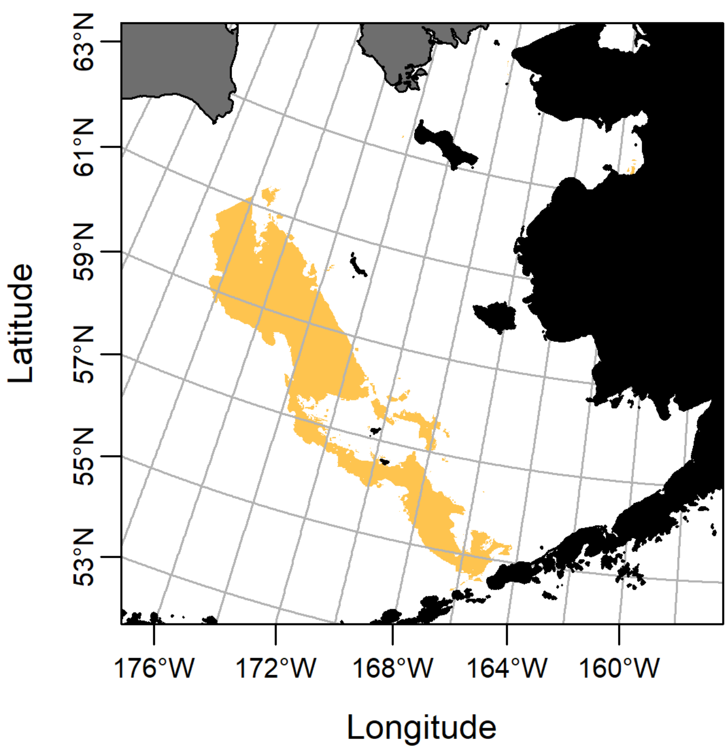

Figure E-242 EFH area of EBS adult mud skate, fall

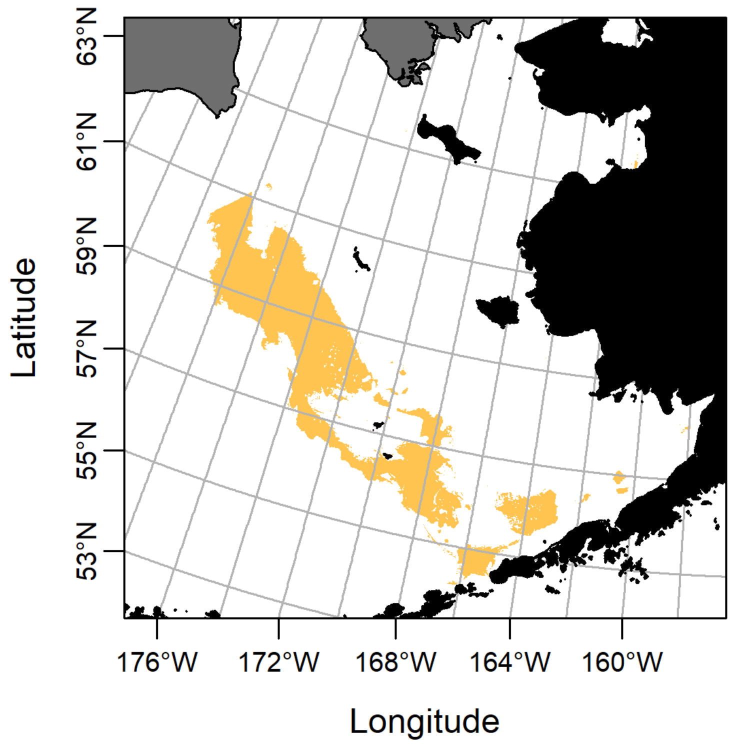

Figure E-243 EFH area of EBS adult mud skate, winter

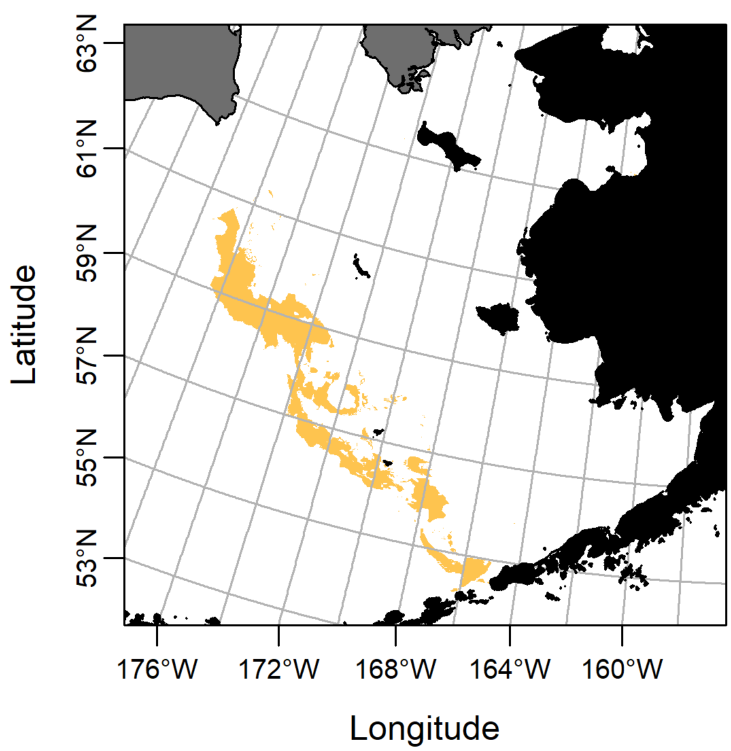

Figure E-244 EFH area of EBS adult mud skate, spring

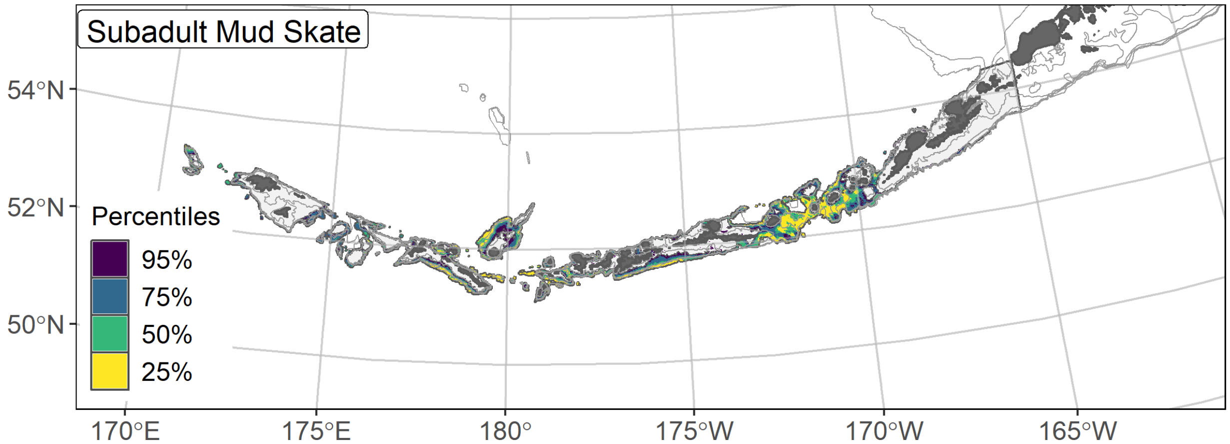

Figure E-245 EFH area of AI subadult mud skate, summer

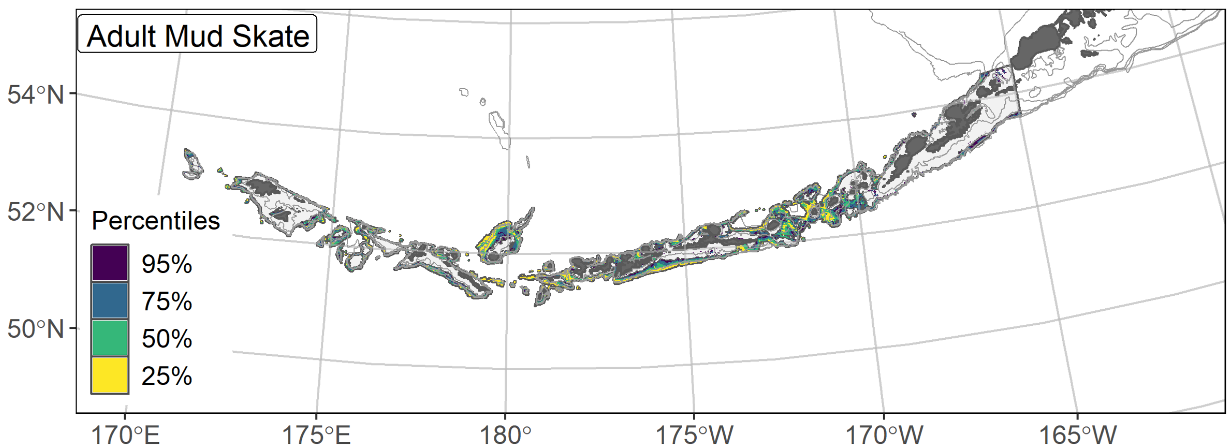

Figure E-246 EFH area of AI adult mud skate, summer

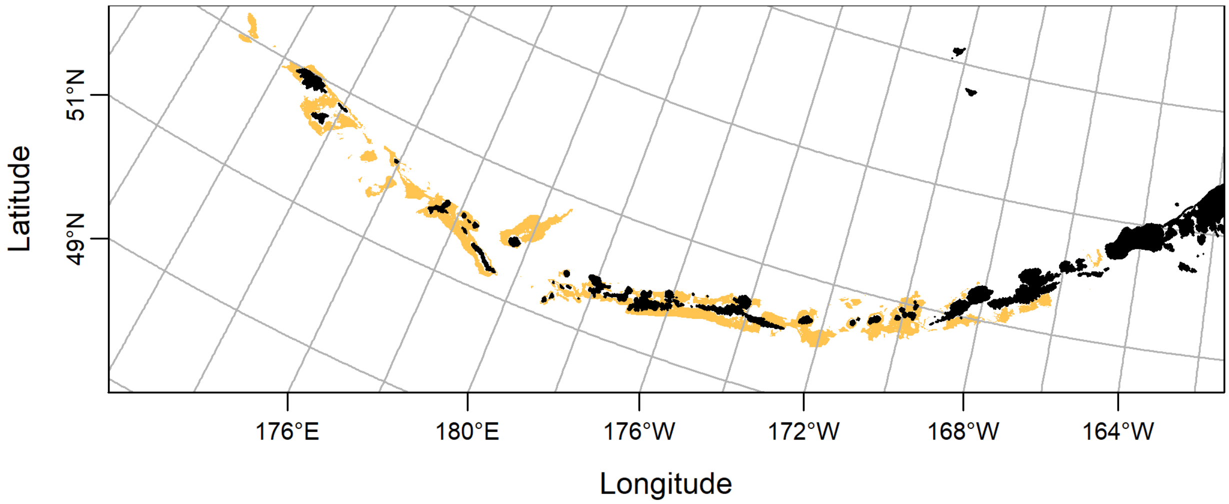

Figure E-247 EFH area of AI adult mud skate, fall

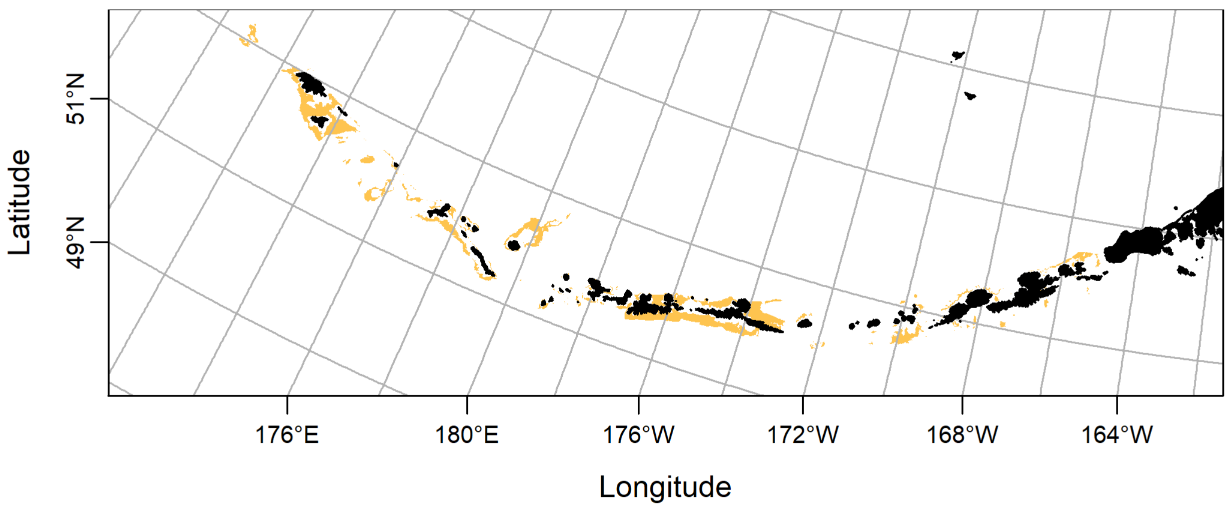

Figure E-248 EFH area of AI adult mud skate, winter

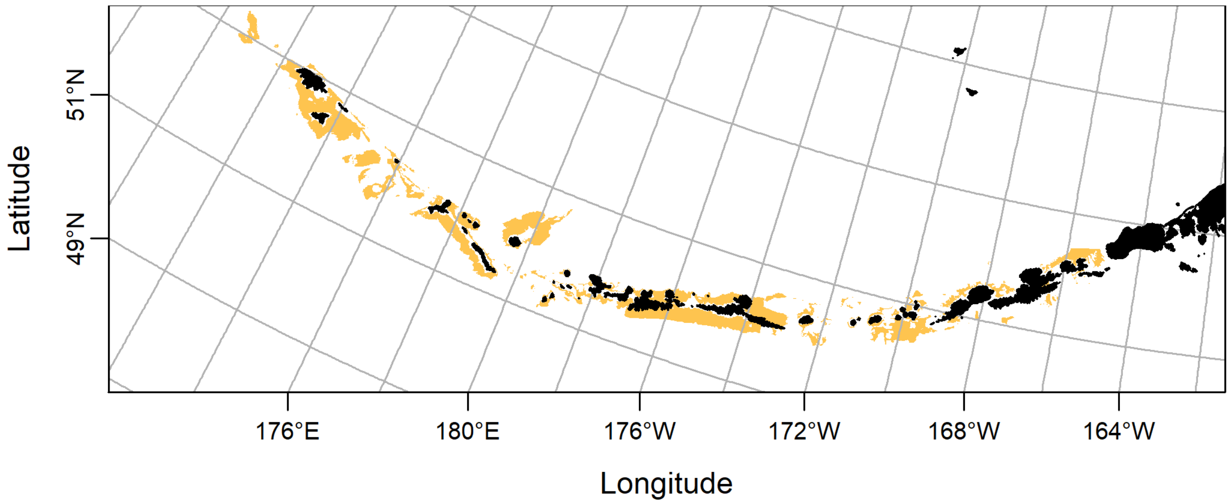

Figure E-249 EFH area of AI adult mud skate, spring

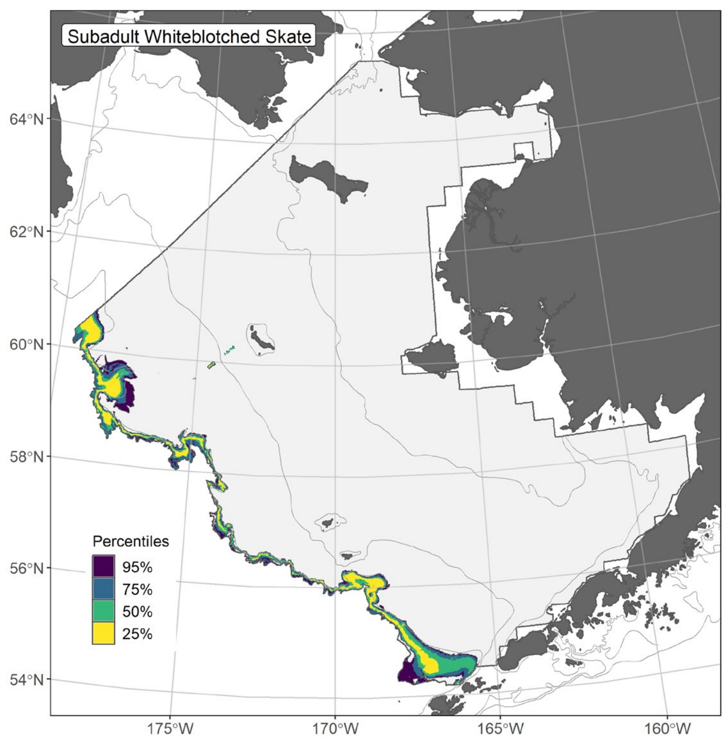

Figure E-250 EFH area of EBS subadult whiteblotched skate, summer

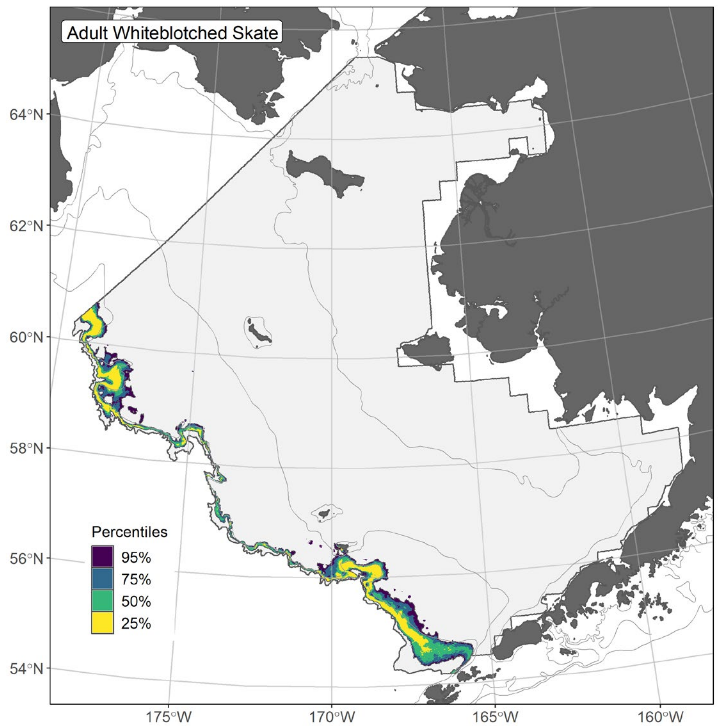

Figure E-251 EFH area of EBS adult whiteblotched skate, summer

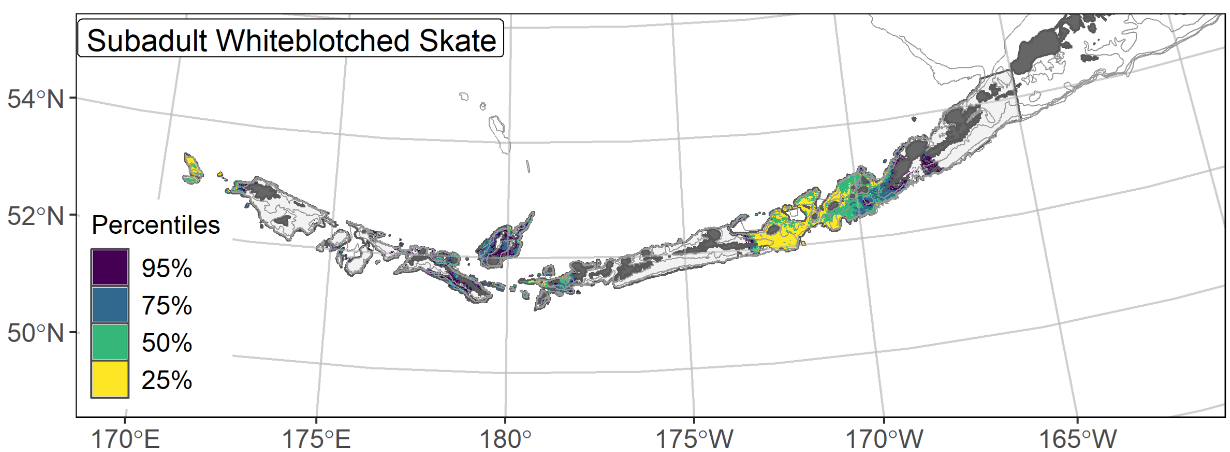

Figure E-252 EFH area of AI subadult whiteblotched skate, summer

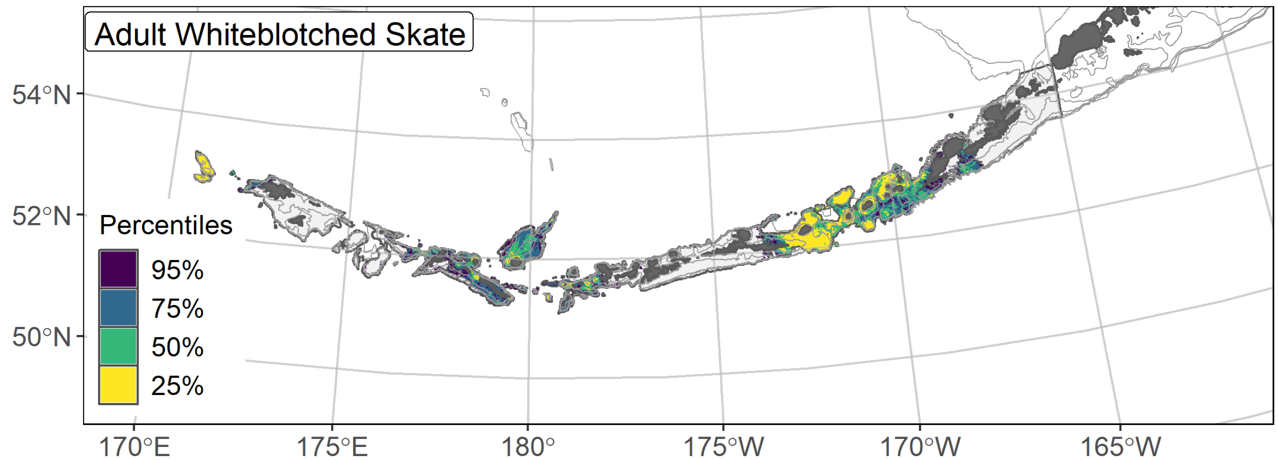

Figure E-253 EFH area of AI adult whiteblotched skate, summer

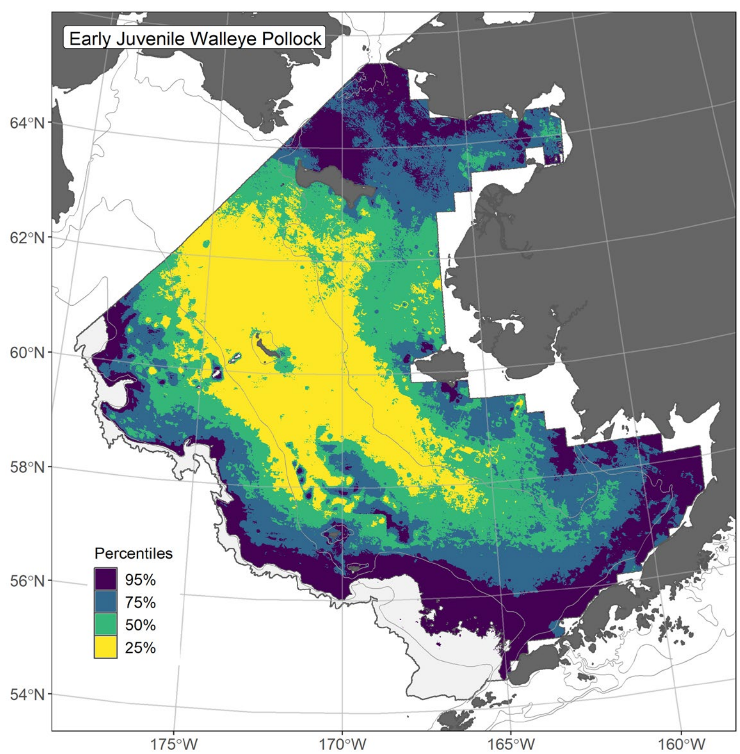

Figure E-254 EFH of EBS settled early juvenile walleye pollock, summer

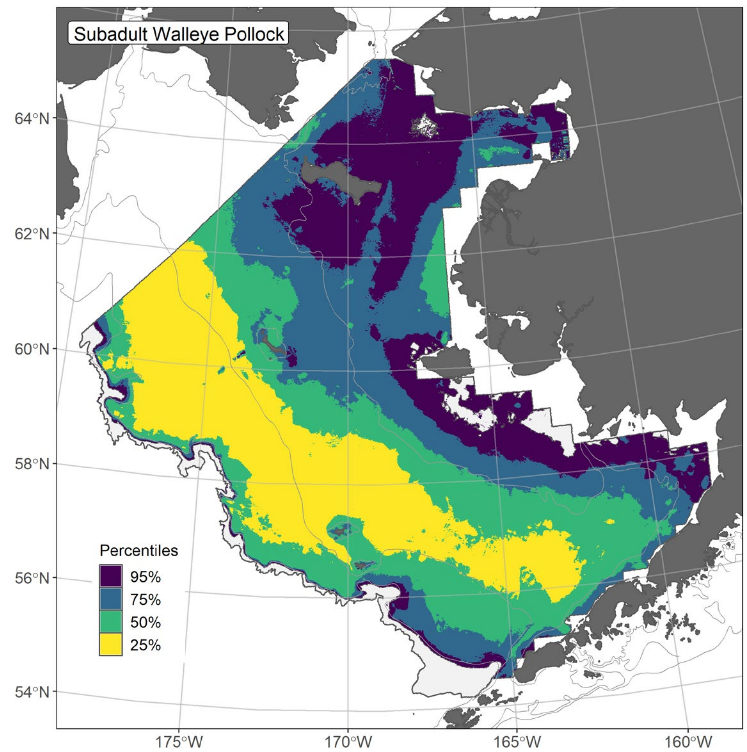

Figure E-255 EFH area of EBS subadult walleye pollock, summer

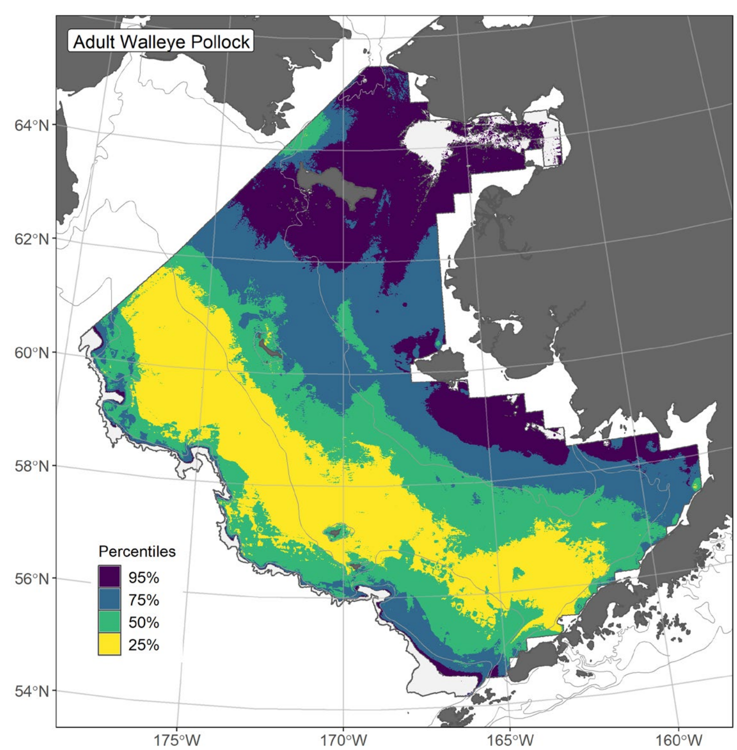

Figure E-256 EFH area of EBS adult walleye pollock, summer

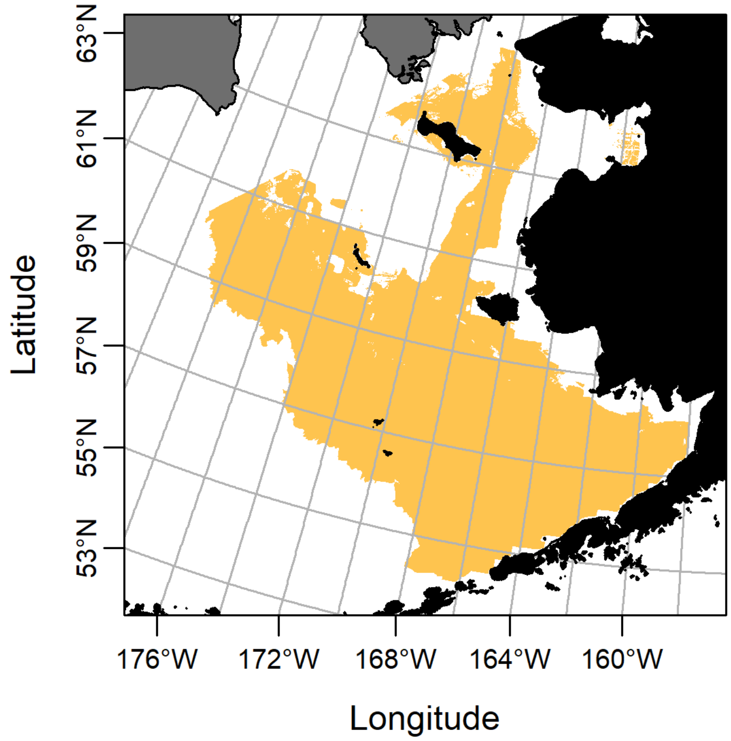

Figure E-257 EFH area of EBS walleye pollock eggs, summer

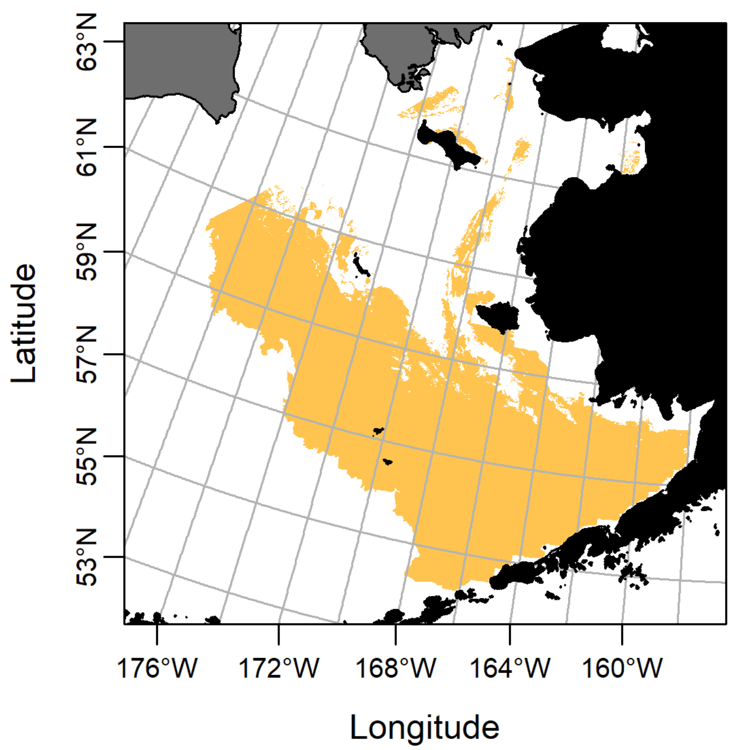

Figure E-258 EFH area of EBS larvae walleye pollock larvae, summer

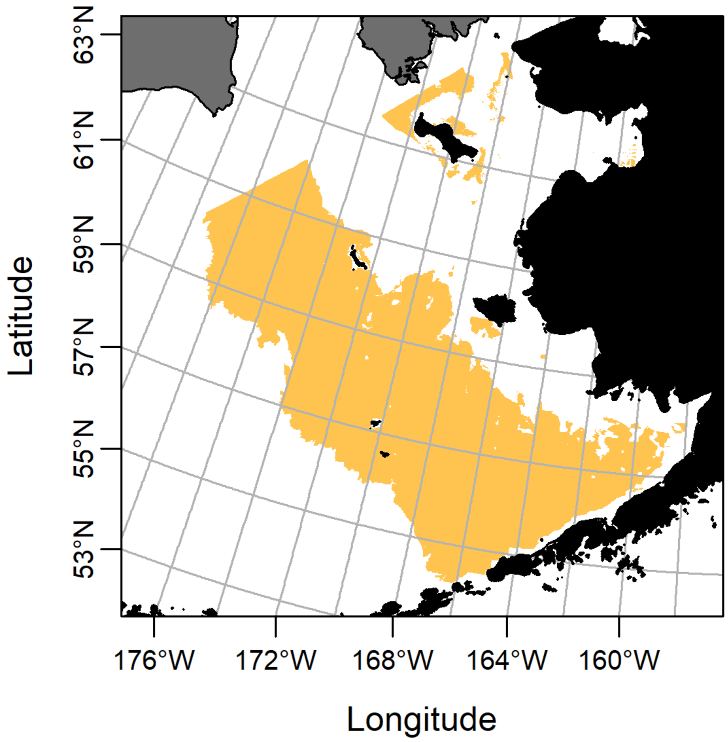

Figure E-259 EFH area of EBS adult walleye pollock, fall

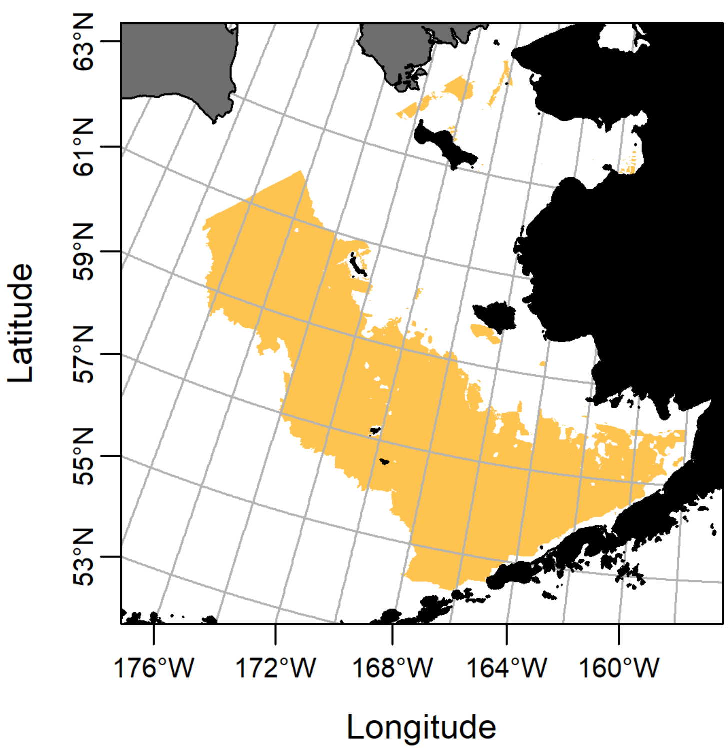

Figure E-260 EFH area of EBS adult walleye pollock, winter

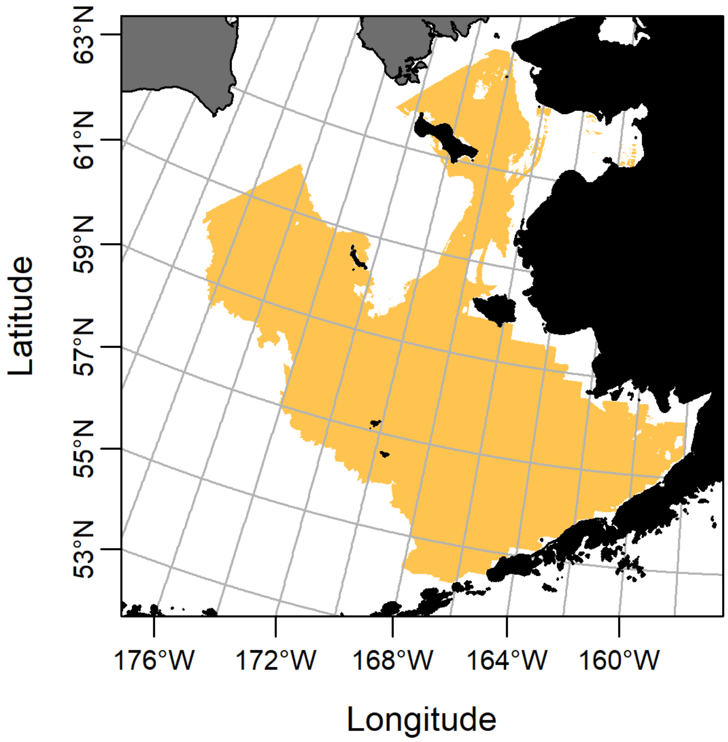

Figure E-261 EFH area of EBS adult walleye pollock, spring

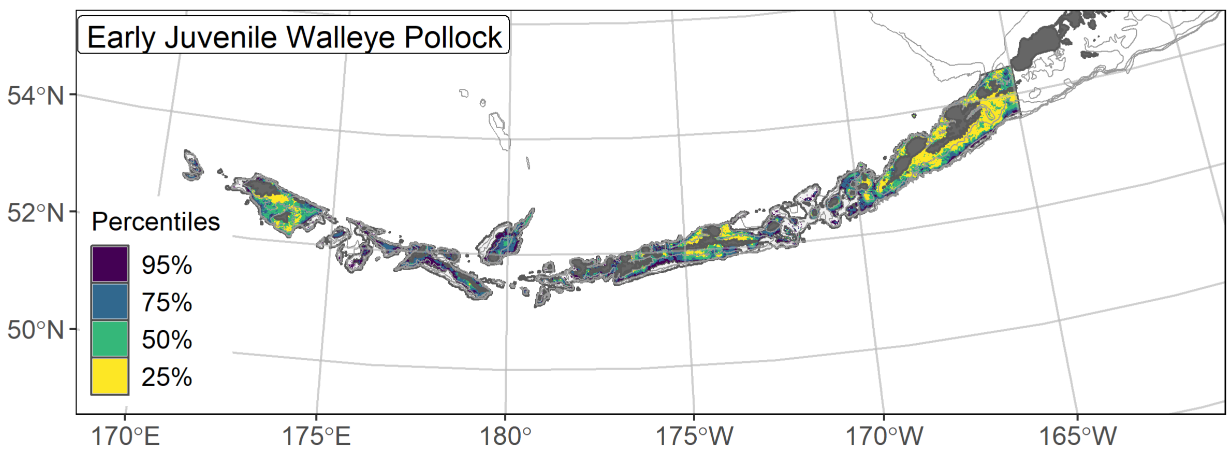

Figure E-262 EFH area of AI settled early juvenile walleye pollock, summer

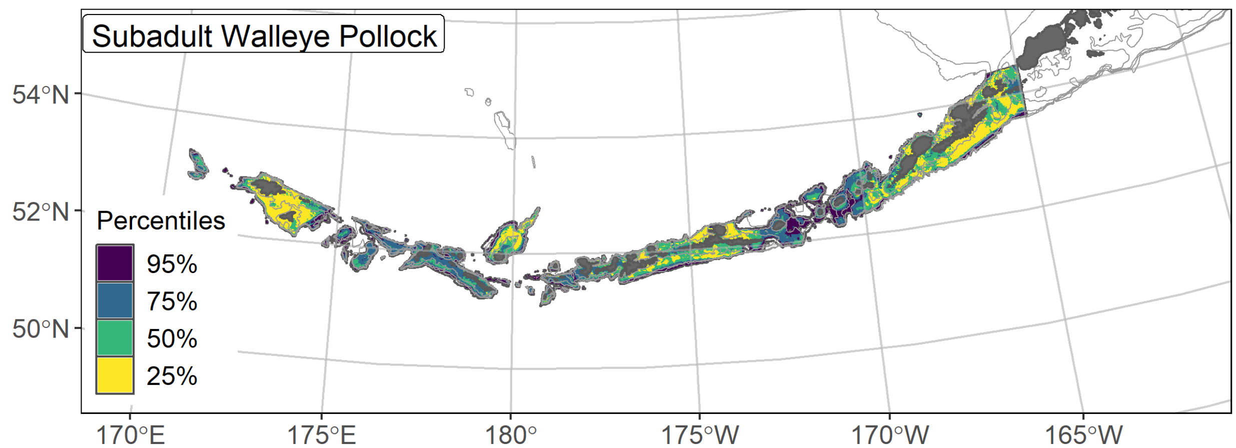

Figure E-263 EFH area of AI subadult walleye pollock, summer

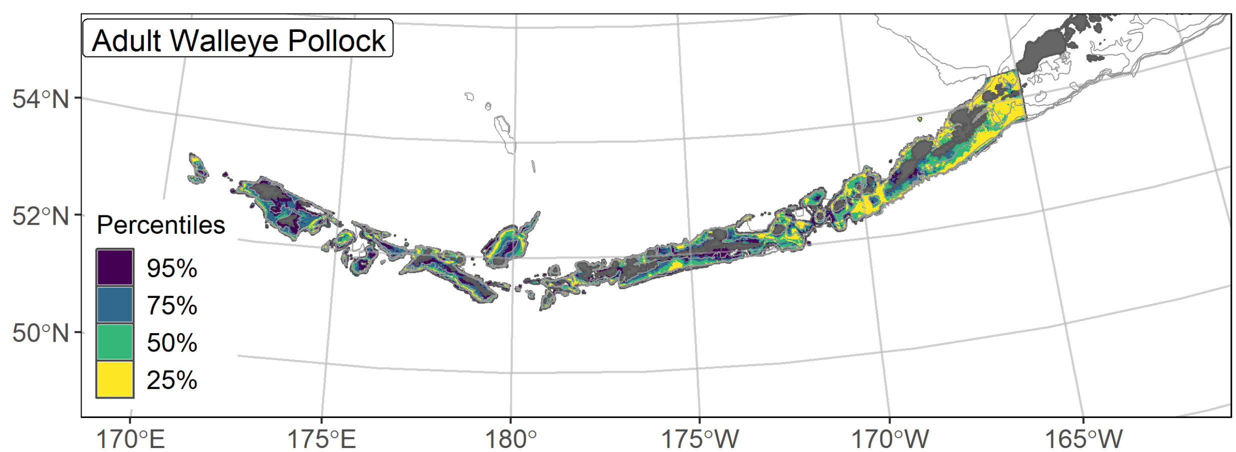

Figure E-264 EFH area of AI adult walleye pollock, summer

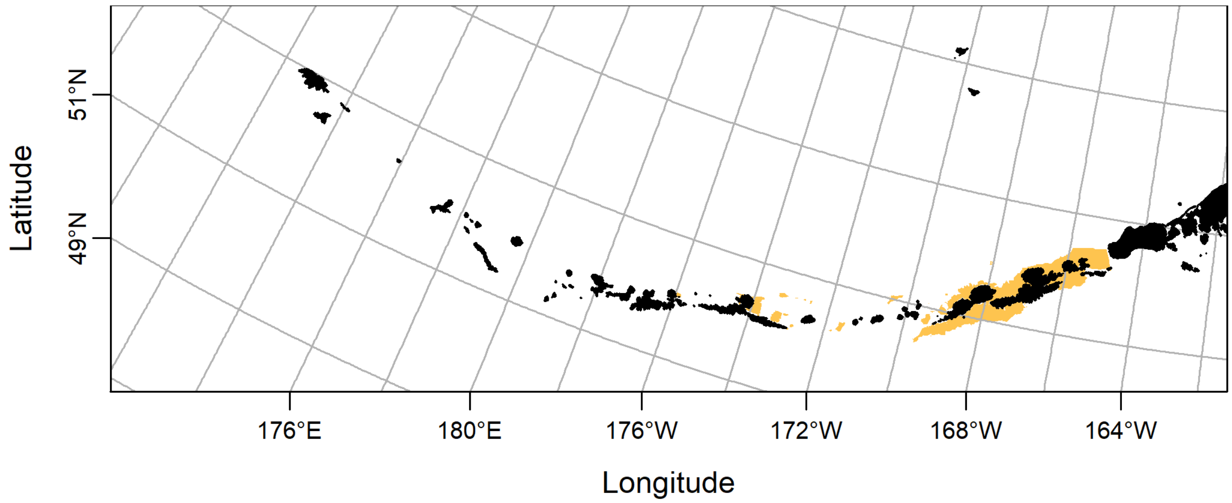

Figure E-265 EFH area of AI walleye pollock eggs, summer

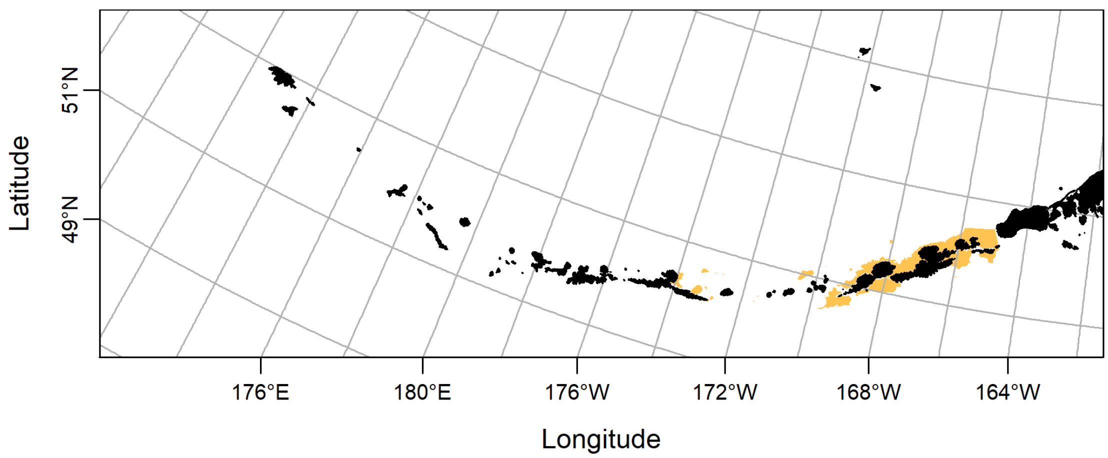

Figure E-266 EFH of AI walleye pollock larvae, summer

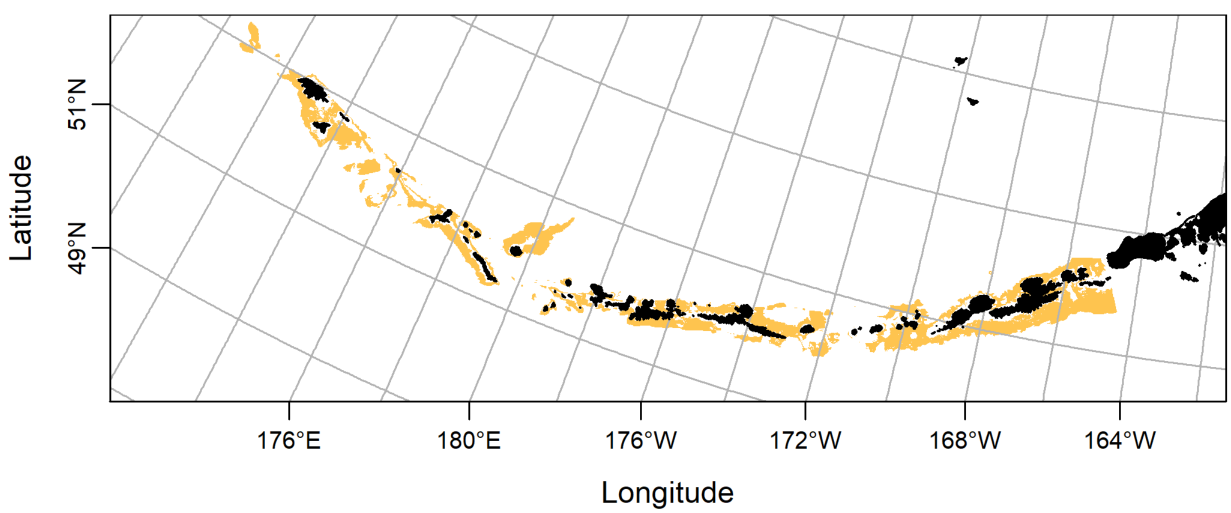

Figure E-267 EFH area of AI adult walleye pollock, fall

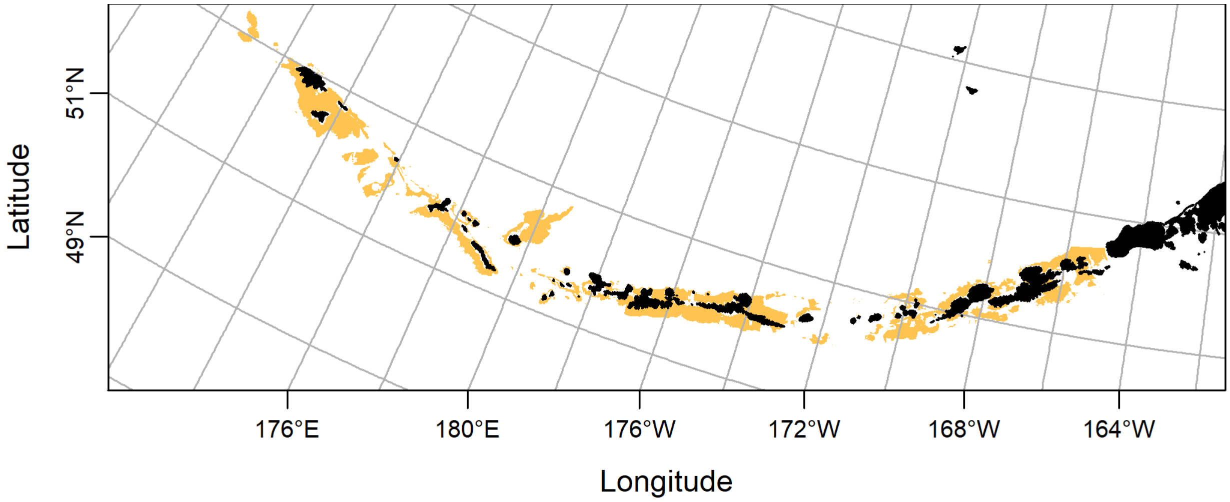

Figure E-268 EFH area of AI adult walleye pollock, winter

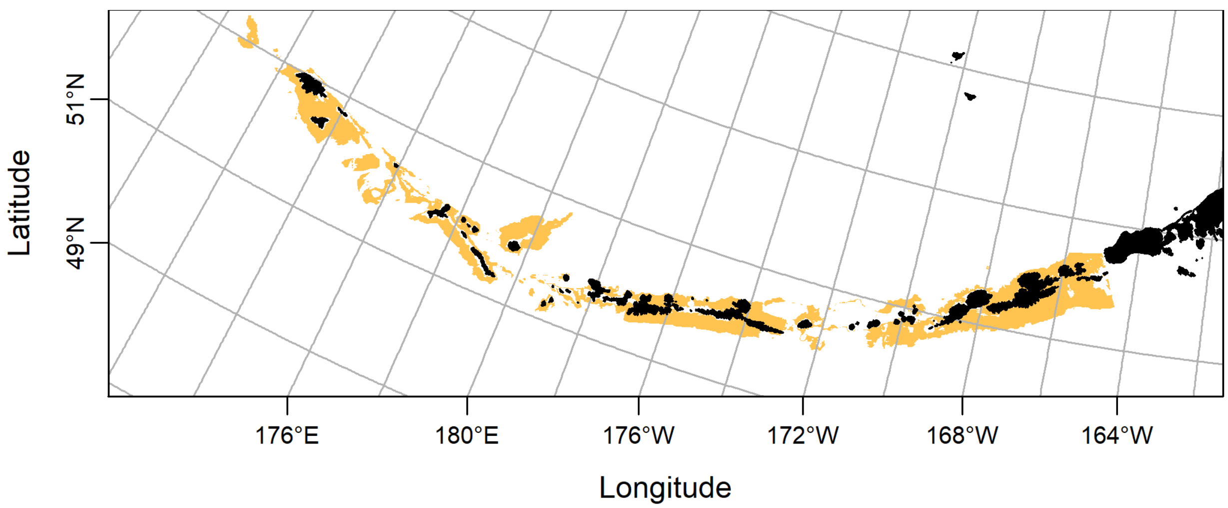

Figure E-269 EFH area of AI adult walleye pollock, spring

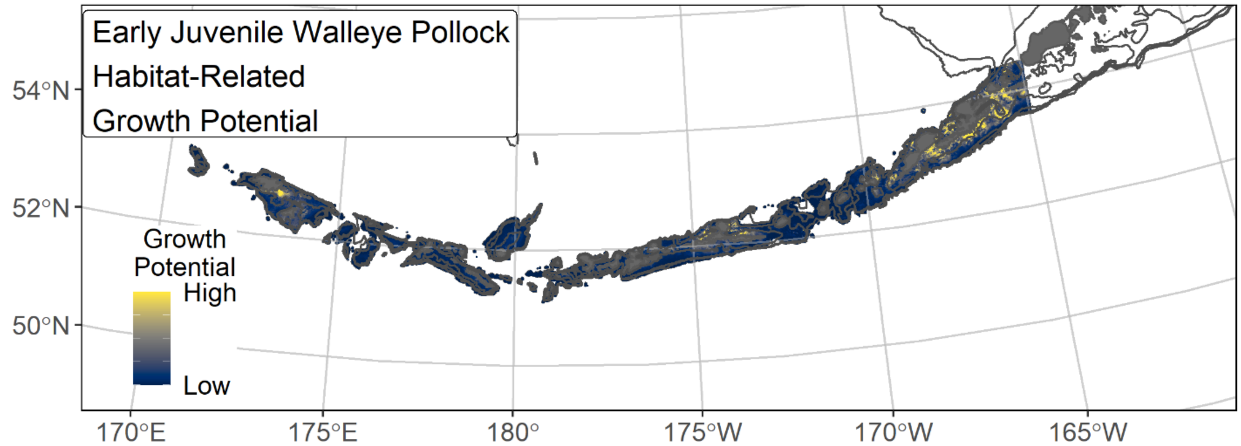

Figure E-270 EFH area of AI settled early juvenile walleye pollock, habitat-related growth potential, summer

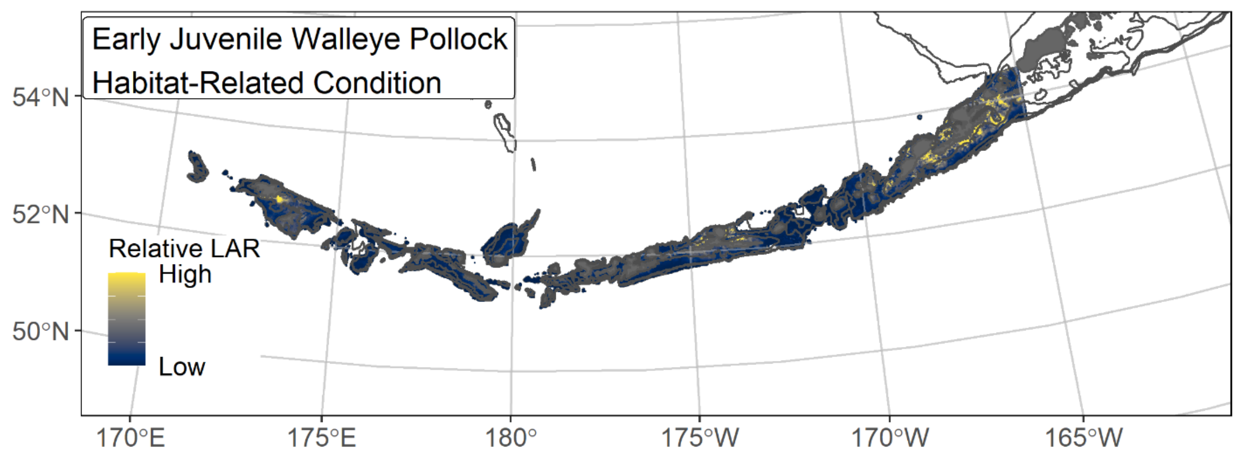

Figure E-271 EFH area of AI settled early juvenile walleye pollock, habitat-related condition, summer

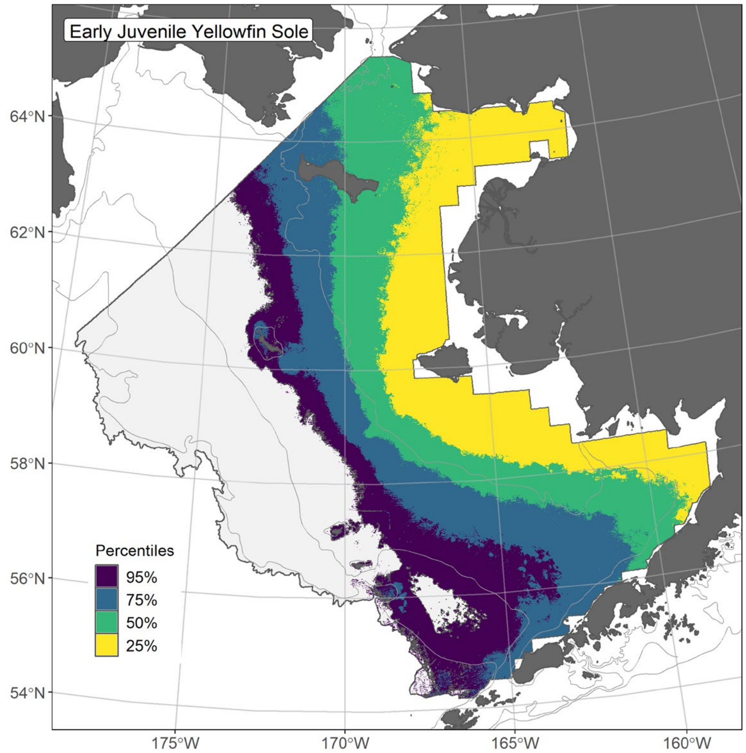

Figure E-272 EFH area of EBS settled early juvenile yellowfin sole, summer

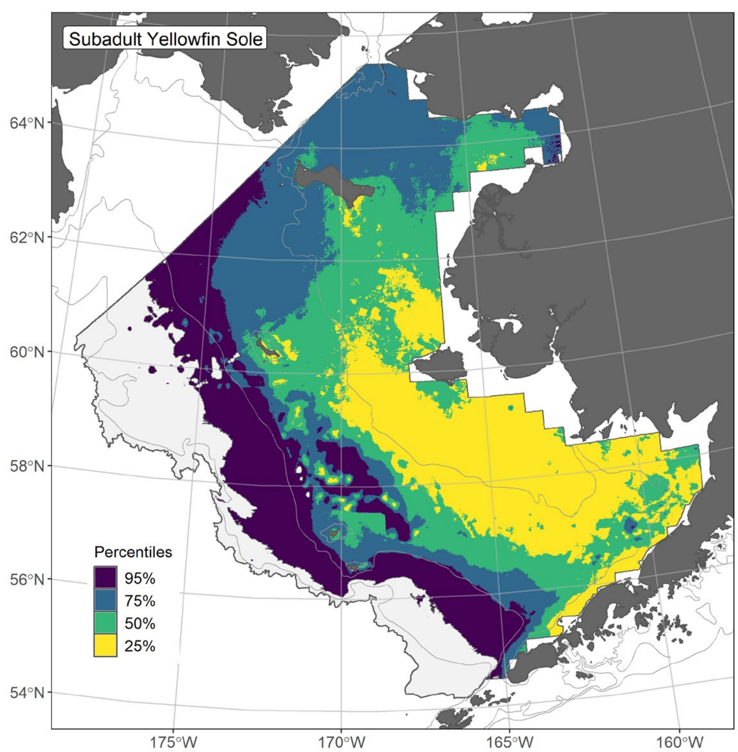

Figure E-273 EFH area of EBS subadult yellowfin sole, summer

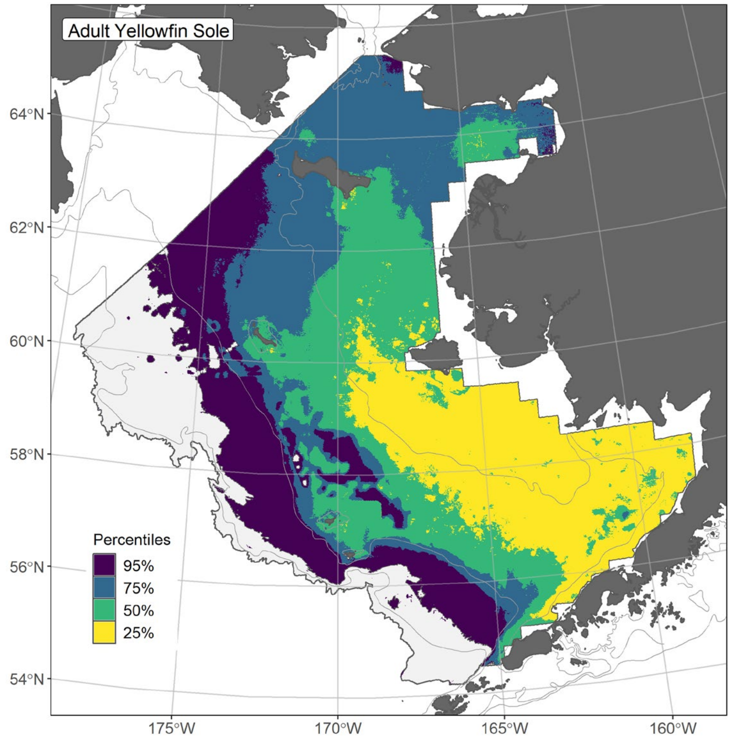

Figure E-274 EFH area of EBS adult yellowfin sole, summer

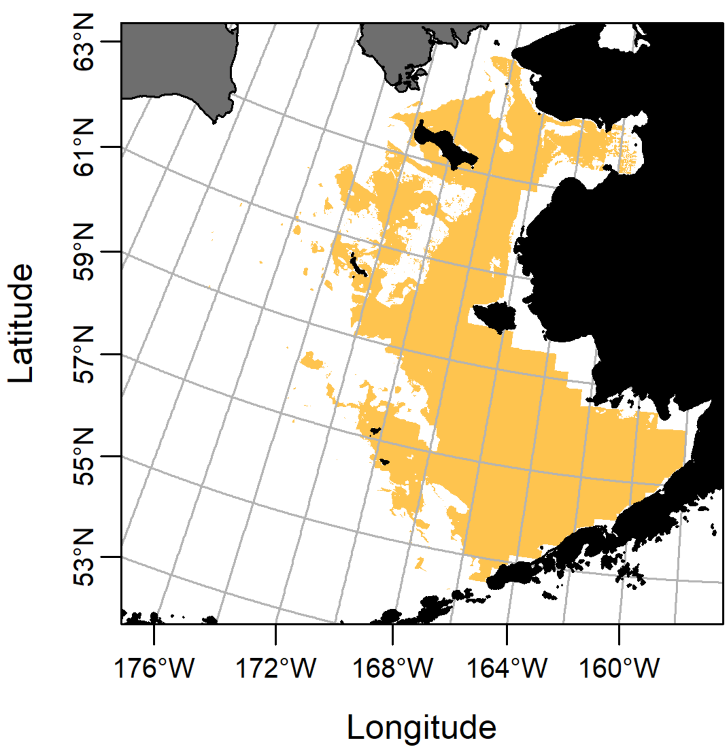

Figure E-275 EFH area of EBS yellowfin sole eggs, summer

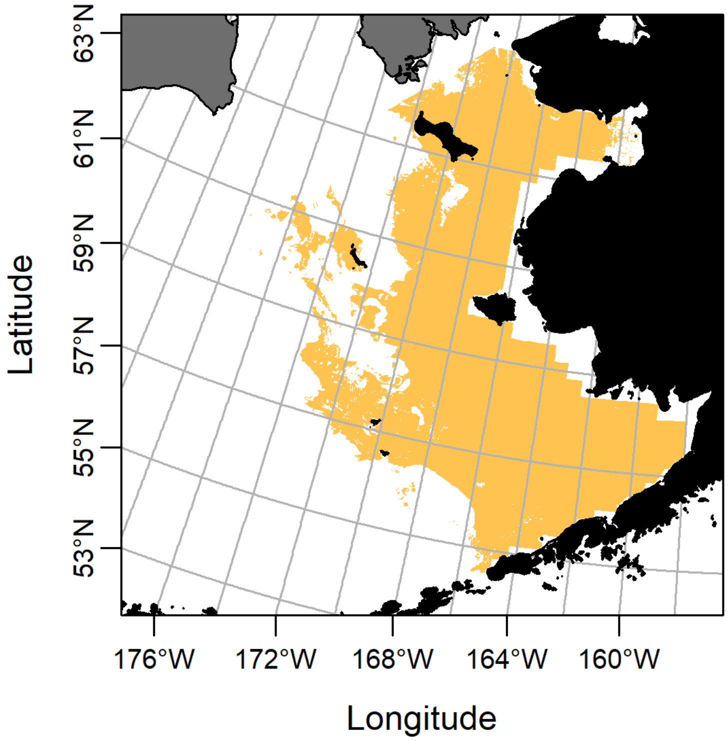

Figure E-276 EFH area of EBS yellowfin sole larvae, summer

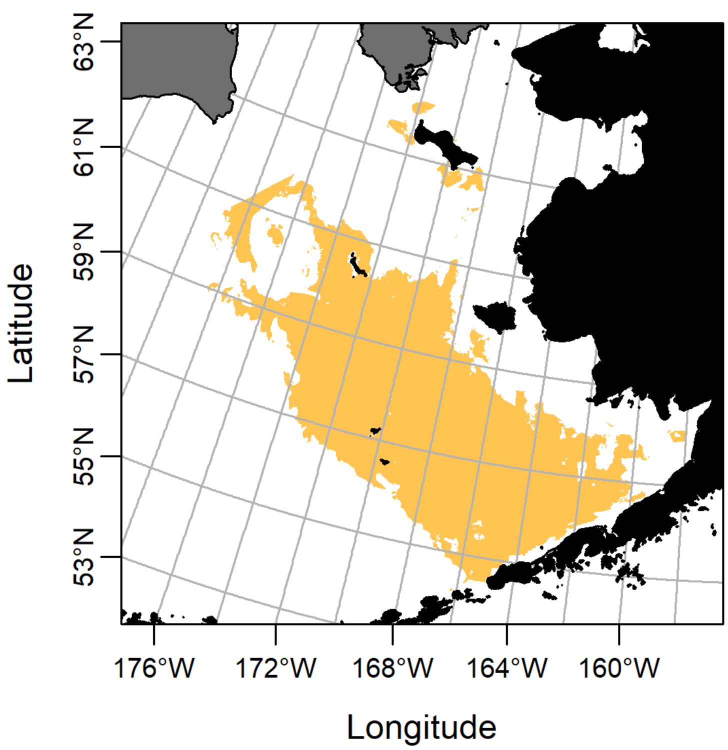

Figure E-277 EFH area of EBS adult yellowfin sole, fall

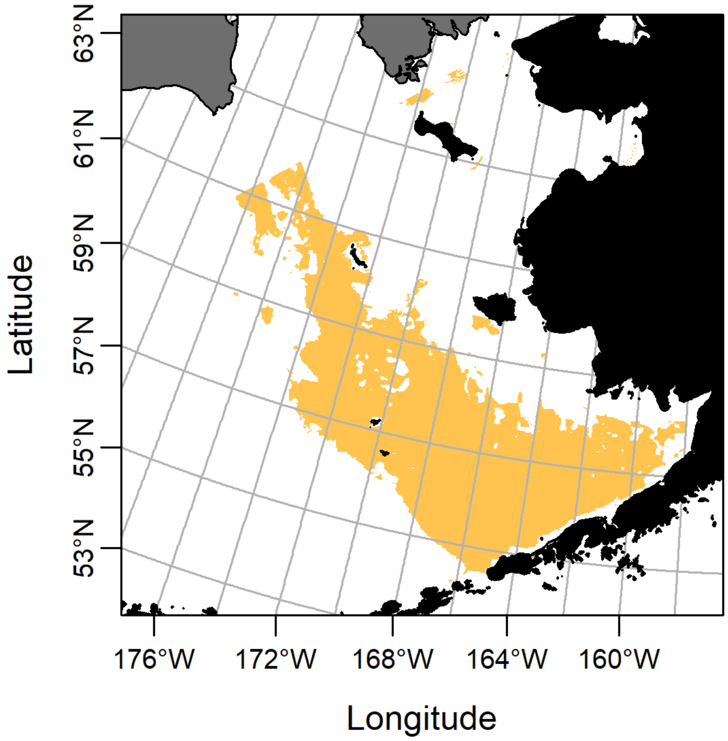

Figure E-278 EFH area of EBS adult yellowfin sole, winter

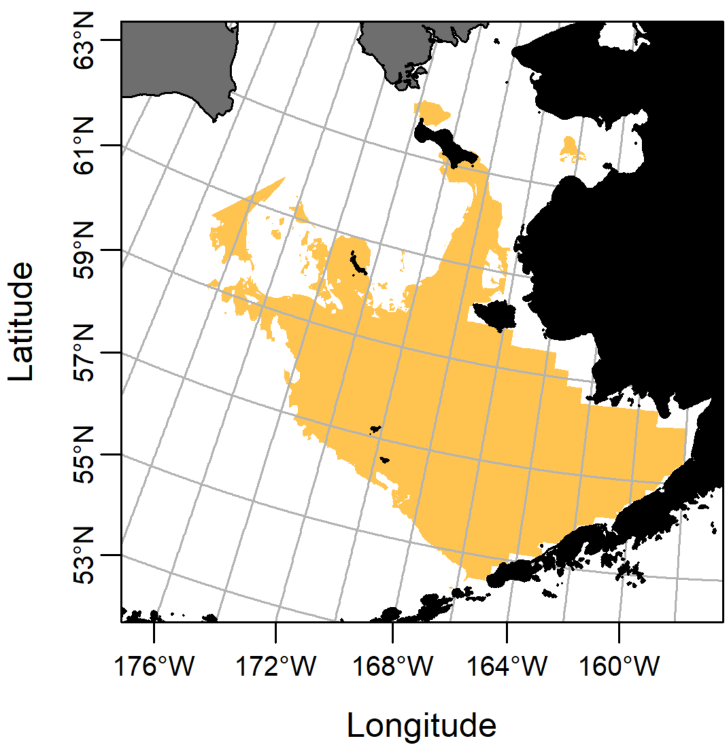

Figure E-279 EFH area of EBS adult yellowfin sole, spring

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Harris, J., E. A. Laman, J. L. Pirtle, M. C. Siple, C. N. Rooper, T. P. Hurst, and C. L. Conrath. 2022. Advancing model-based essential fish habitat descriptions for North Pacific species in the Aleutian Islands. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-458, 406 p. https://doi.org/10.25923/ffnc-cg42

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Appendix F Adverse Effects on Essential Fish Habitat

F.1 Fishing Effects on Essential Fish Habitat

F.1.1 Overview

This appendix addresses the requirement in Essential Fish Habitat (EFH) regulations (50 Code of Federal Regulations [CFR] 600.815(a)(2)(i)) that each FMP must contain an evaluation of the potential adverse effects of all regulated fishing activities on EFH. This evaluation should consider the effects of each fishing activity on each type of habitat found within EFH. FMPs must describe each fishing activity, review and discuss all available relevant information (such as information regarding the intensity, extent, and frequency of any adverse effect on EFH; the type of habitat within EFH that may be affected adversely; and the habitat functions that may be disturbed), and provide conclusions regarding whether and how each fishing activity adversely affects EFH.

The EFH regulations base the evaluation of the adverse effects of fishing on EFH on a 'more than minimal and not temporary' standard (50 CFR 600.815). Fishing operations may change the abundance or availability of certain habitat features (e.g., the presence of living or non-living habitat structures) used by managed fish species to accomplish spawning, breeding, feeding, and growth to maturity. The outcome of these changes depends on the characteristics of the fishing activities, the habitat, fish use of the habitat, and fish population dynamics. The duration and degree of fishing effects on habitat features depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of habitat features. The fishing effects model developed for this evaluation takes all of those variables into consideration (Smeltz et al. 2019).

F.1.2 Evaluation of fishing effects on EFH

The fishing effects (FE) model was developed by the NMFS Alaska Regional Office – HCD and scientists at Alaska Pacific University for the 2017 EFH 5-year Review. Updates and corrections to the model were made in 2022. The full FE model description can be found in the technical memorandum 2022 Evaluation of Fishing Effects on Essential Fish Habitat (Zaleski et al. 2024). The technical memorandum also includes the full process for estimating habitat disturbance within the core EFH areas (upper 50th percentile of EFH) modeled for each species or species complex within this FMP and the result of those estimates.

The full evaluation of the estimated fishing effects on species' core EFH areas are in the FE Report (Zaleski et al. 2024). It includes a description of the stock assessment author review process, whereby stock authors were provided with the FE model output and requested to quantitatively or qualitatively evaluate if the estimated habitat disturbance was adversely affecting EFH more than minimally and not temporarily. The FE Report includes each stock author's evaluations in Appendix 5. For the BSAI groundfish species or species complexes, 15 had estimates of habitat disturbance ≥ 10% of their core EFH area. No stock authors concluded that fishing effects were more than minimal and not temporary for their species or recommended to elevate their species to the Council for possible mitigation to reduce fishing effects to EFH.

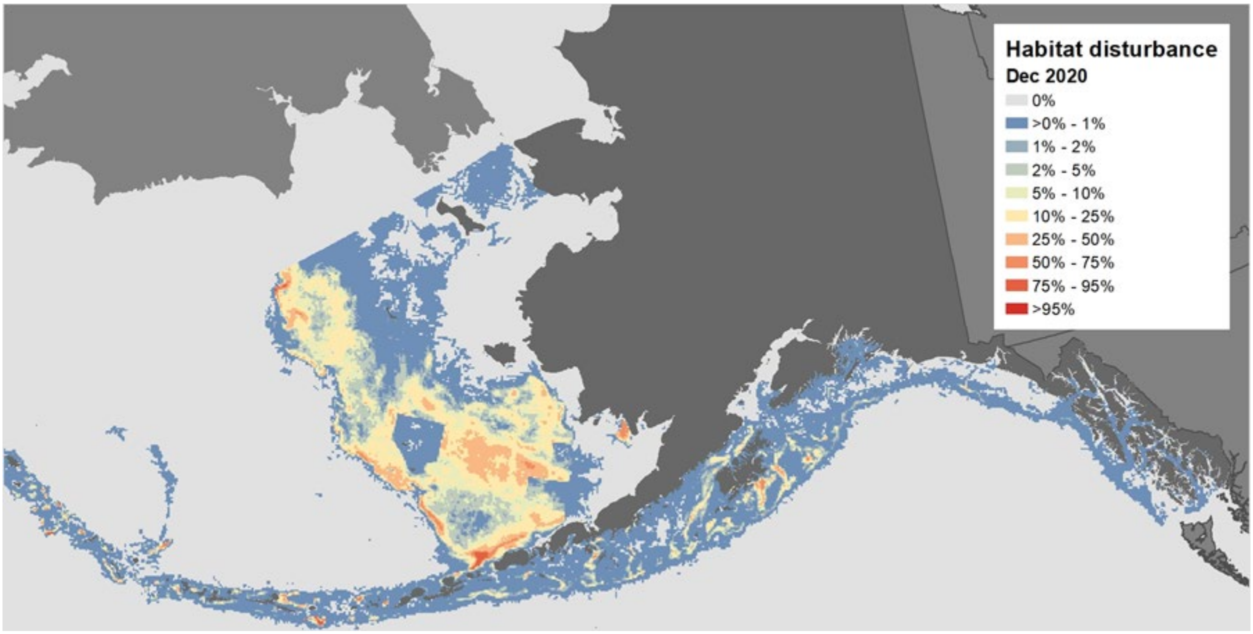

Figure F-1 Eastern Bering Sea cumulative percentage habitat disturbed. All gears combined.

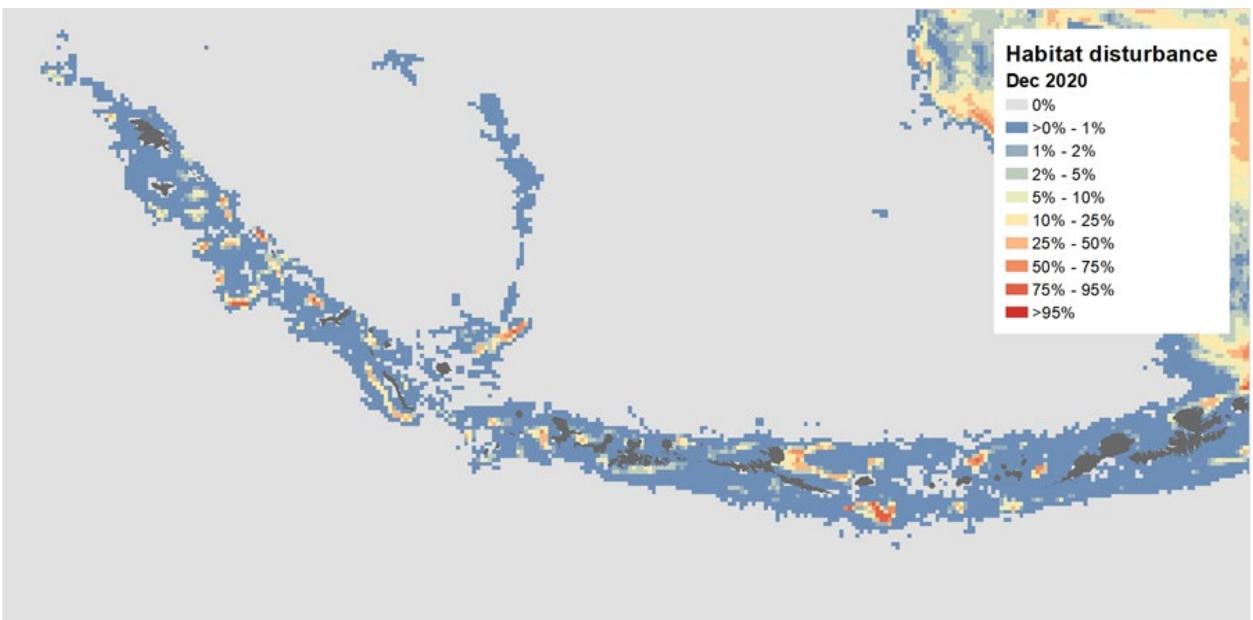

Figure F-2 Aleutian Islands cumulative percentage habitat disturbed. All gears combined.

F.2 Non-fishing Activities that may Adversely Affect Essential Fish Habitat

The waters, substrates, and ecosystem processes that support EFH and sustainable fisheries are susceptible to a wide array of human activities and climate-related influences unrelated to the act of fishing. These activities range from easily identified, point source discharges in watersheds or nearshore coastal zones to less visible influences of changing ocean conditions, and increased variability in regional temperature or weather patterns. Broad categories of such activities include mining, dredging, fill, impoundments, water diversions, thermal additions, point source and nonpoint source pollution, sedimentation, introduction of invasive species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. For Alaska, non-fishing impacts are reviewed in the Non-Fishing Impacts Report, which NMFS updates during an EFH 5-year Review.

F.2.1 Non-Fishing Impacts and EFH 5-year review from 2018-2023

The most recent report, *Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska* (Limpinsel et al. 2023), presents a brief history of the Magnuson-Stevens Act and the language, provisions, and purpose supporting conservation of EFH. The report emphasizes the growing importance and implementation of Ecosystem Based Fisheries Management. This iteration recognizes climate change as an anthropogenic threat influencing EFH. Chapter 2 provides a discussion on how greenhouse gas emissions are warming the Arctic and influencing the atmosphere, ocean, and fisheries across Alaska.

Chapters 3, 4 and 5 of this report address watersheds, estuaries and nearshore zones, and offshore zones, starting by highlighting the more commonly recognized physical, chemical, and biological processes that make each zone distinct. Each chapter discusses ecosystem processes, EFH attributes, sources of anthropogenic impacts that could compromise EFH, and proposes conservation recommendations to reduce the severity of those impacts. This report reflects the best available science.

F.2.2 Regulatory Alignment

The purpose of this report is to assist in the identification of activities that may adversely impact EFH and provide general EFH conservation recommendations to avoid or minimize adverse impacts. Section 305(b) of the Magnuson-Stevens Act requires Federal agencies to consult with NMFS on any action that they authorize, fund, or undertake, or propose to authorize, fund, or undertake, that may adversely affect EFH. Each Council shall comment on and make recommendations to the Secretary of Commerce, through NMFS, and any Federal or State agency concerning any such activity that, in the view of the Council, is likely to substantially affect the habitat, including essential fish habitat, of an anadromous fishery resource under its authority. If NMFS or the Council determines that an action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any State or Federal agency would adversely affect any EFH, NMFS shall recommend to the agency measures that can be taken to conserve EFH. Within 30 days after receiving EFH conservation recommendations from NMFS, a Federal agency shall provide a detailed response in writing regarding the matter. If the response is inconsistent with NMFS's recommendations, the Federal agency shall explain its reasons for not following the recommendations.

EFH conservation recommendations are non-binding to Federal and state agencies. EFH consultations do not supersede regulations or jurisdictions of Federal or state agencies. NMFS has no authority to issue permits for projects or mandate measures to minimize impacts of non-fishing activities. Most non-fishing activities identified in this report are subject to numerous Federal, state, and local environmental laws and regulations designed to minimize and mitigate impacts to fish, wildlife and habitat.

F.3 Cumulative Effects of Fishing and Non-fishing Activities on EFH

This section summarizes the cumulative effects of fishing and non-fishing activities on EFH. Cumulative impacts analysis is Component 5 of the ten EFH components. The cumulative effects of fishing and non-fishing activities on EFH were considered in the 2005 EFH EIS, but insufficient information existed to accurately assess how the cumulative effects of fishing and non-fishing activities influence ecosystem processes and EFH. The 2017 5-year Review reevaluated potential impacts of fishing and non-fishing activities on EFH using recent technologies and literature, and the current understanding of marine and freshwater fisheries science, ecosystem processes, and population dynamics (Simpson et al. 2017).

Cumulative impacts analysis was not a component of focus for the 2023 EFH 5-year Review. The 2017 evaluation is summarized below and includes updated references for the new reports.

Historical fishing practices may have had effects on EFH that have led to declining trends in some of the criteria examined in the EFH EIS (see Table 4.4-1 in NMFS 2005). For fishing impacts to EFH, the FE model calculates habitat disturbance at a monthly time step since 2003 and incorporates susceptibility and recovery dynamics, allowing for an assessment of cumulative effects from fishing activities. During the 2017 EFH 5-year Review, the effects of fishing activities on EFH were considered as minimal and temporary or unknown. This conclusion is similar to the 2022 evaluations (Zaleski et al. 2024).

The cumulative effects from multiple non-fishing anthropogenic sources are increasingly recognized as having synergistic effects that may degrade EFH and associated ecosystem processes that support sustainable fisheries. Non-fishing activities may have potential long term cumulative impacts due to the long term additive and chronic nature of the activities combined with climate change (Limpinsel et al. 2023). However, the magnitude of the effects of non-fishing activities cannot currently be quantified with available information. NMFS does not have regulatory authority over non-fishing activities, but frequently provides recommendations to other agencies to avoid, minimize, or otherwise mitigate the effects of these activities.

Fishing and each activity identified in the analysis of non-fishing activities may or may not significantly affect the function of EFH. The synergistic effect of the combination of all of these activities is also cause for concern. Unfortunately, available information is not sufficient to assess how the cumulative effects of fishing and non-fishing activities influence the function of EFH on an ecosystem or watershed scale. The magnitude of the combined effect of all of these activities cannot be quantified, so the 2017 EFH 5-year Review concluded that the cumulative level of concern is unknown.

F.4 Appendix F References

Limpinsel, D., S. McDermott, C. Felkley, E. Ammann, S. Coxe, G.A. Harrington, S. Kelly, J.L. Pirtle, L. Shaw, and M. Zaleski. 2023. Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska: EFH 5-year review from 2018-2023. National Marine Fisheries Service, Alaska Region, Juneau, Alaska. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/AKR-30, 26 p. https://doi: 10.25923/9z4h-n860

National Marine Fisheries Service (NMFS). 2005. Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska. March 2005. NMFS PO Box 21668, Juneau, AK 99801

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Zaleski, M., T. S. Smetlz, S. Rheinsmith, J. L. Pirtle, and G. Harrington. 2024. 2022 Evaluation of Fishing Effects on Essential Fish Habitat. NOAA Technical Memorandum NMFS-F/AKR-29, 208 p. https://doi.org/10.25923/c2gh-0w03

Appendix G Fishery Impact Statement

The Magnuson-Stevens Fishery and Conservation Management Act requires that a fishery management plan (FMP) include a fishery impact statement that assesses, specifies, and describes the likely effects of the FMP measures on participants in the fisheries and fishing communities affected by the FMP. A detailed analysis of the effects of the FMP on the human environment, including fishery participants and fishing communities, was conducted in the *Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement* (NMFS 2004). The following is a brief summary from this analysis.

The FMP has instituted privilege-based management programs in the some groundfish fisheries, and fishery managers, under the guidance of the FMP management policy, are moving towards extending privilege-based allocations to other groundfish fisheries.

1. The FMP promotes increased social and economic benefits through the promotion of privilege-based allocations to individuals, sectors and communities. For this reason, it is likely to increase the commercial value generated from the groundfish fisheries.
2. As the race-for-fish is eliminated, the FMP could result in positive effects in terms of producer net revenue, consumer benefits, and participant health and safety.
3. The elimination of the race-for-fish will likely result in a decrease in overall participation levels. In the long-run, communities are likely to see fewer persons employed in jobs related to the fishing industry (fishing, processing, or support sectors), but the jobs that remain could be more stable and provide higher pay.
4. The FMP's promotion of privilege-based allocations is also expected to increase consumer benefits and health and safety of participants.

The FMP has adopted a variety of management measures to promote the sustainability of the groundfish fisheries and dependent fishing communities.

- Management measures to account for uncertainty ensure the sustainability of the managed species by maintaining a spawning stock biomass for the target species with the potential to produce sustained yields.
- The transition to privilege-based management in the short-term could disrupt stability, however in the long-term, the stability of fisheries would be increased in comparison to a derby-style fishery.
- Communities would also tend to experience an increase in stability as a result of built-in community protections to the privilege-based management programs.

Appendix H Research Needs

Although research needs are identified in this appendix to the Fishery Management Plan (FMP), ongoing research and research needs are constantly being updated. It may therefore be useful to the reader to access other sources in order to obtain the North Pacific Fishery Management Council (Council)'s most current description of research and research needs on the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries. A complete discussion of up-to-date sources is included in Chapter 6 of the FMP. In particular, the Council's Science and Statistical Committee regularly updates the Council on its research needs, and these can be found on the Council's website. Additionally, ongoing research by National Marine Fisheries Service (NMFS)' Alaska Fisheries Science Center (AFSC) is also accessible through their website. Website addresses are in Chapter 6.

The FMP management policy identifies several research programs that the Council would like to encourage. These are listed in Section H.1. The Council relies on its Scientific and Statistical Committee (SSC) to assist the Council in interpreting biological, sociological, and economic information. The SSC also plays an important role in providing the Council with recommendations regarding research direction and priorities based on identified data gaps and research needs. The SSC and Council's research priorities are listed in Section H.2. Additionally, NMFS regularly develops a five-year strategy for fisheries research which is described in Section H.3. Research needs specific to essential fish habitat are described in Section H.4.

H.1 Management Policy Research Programs

The management objectives of the FMP (see Section 2.2.1) include several objectives that provide overarching guidance as to research programs that the Council would like to encourage.

- Encourage research programs to evaluate current population estimates for non-target species with a view to setting appropriate bycatch limits as information becomes available.
- Encourage programs to review status of endangered or threatened marine mammal stocks and fishing interactions and develop fishery management measures as appropriate.
- Encourage development of a research program to identify regional baseline habitat information and mapping, subject to funding and staff availability.
- Encourage a coordinated, long-term ecosystem monitoring program to collect baseline information and compile existing information from a variety of ongoing research initiatives, subject to funding and staff availability.

Other objectives in the management policy also contain research elements without which they cannot be achieved. Research initiatives that would support other FMP management objectives are discussed in Section H.1.2 below.

H.2 Council Research Priorities

At its March 2003 meeting, the SSC reviewed the list of research priorities as developed by the Council's BSAI and Gulf of Alaska (GOA) groundfish Plan Teams, and developed the following short list of research topics:

A. Critical Assessment Problems

For rockfish stocks there is a general need for better assessment data, particularly investigation of stock structure and biological variables.

- Supplement triennial trawl survey biomass estimates with estimates of biomass or indices of biomass obtained from alternative survey designs.
- Obtain age and length samples from the commercial fishery, especially for Pacific ocean perch, northern rockfish, and dusky rockfish.
- Increase capacity for production ageing of rockfish so that age information from surveys and the fishery can be included in stock assessments in a timely manner.
- Further research is needed on model performance in terms of bias and variability. In particular, computer simulations, sensitivity studies, and retrospective analyses are needed. As models become more complex in terms of parameters, error structure, and data sources, there is a greater need to understand how well they perform.

There is a need for life history information for groundfish stocks, e.g., growth and maturity data, especially for rockfish.

- There is a need for information about stock structure and movement of all FMP groundfish species, especially temporal and spatial distributions of spawning aggregations.

B. Stock Survey Concerns

- There is a need to explore ways for inaugurating or improving surveys to assess rockfish, including nearshore pelagics.
- There is a need to develop methods to measure fish density in habitats typically inaccessible to NMFS survey gear, i.e., untrawlable habitats.

C. Expanded Ecosystem Studies

- Research effort is required to develop methods for incorporating the influence of environmental and climate variability, and there influence on processes such as recruitment and growth into population models, especially for crab stocks.
- Forage fish are an important part of the ecosystem, yet little is known about these stocks. Effort is needed on stock status and distribution for forage fishes such as capelin, eulachon, and sand lance.
- Studies are needed to identify essential habitat for groundfish and forage fish. Mapping of nearshore and shelf habitat should be continued for FMP species.

D. Social and Economic Research

- Development of time series and cross-sectional databases on fixed and variable costs of fishing and fish processing.
- Pre- and post-implementation economic analyses of crab and GOA groundfish rationalization.
- Identification of data needed to support analyses of community level consequences of management actions.
- Development of integrated multispecies and multifishery models for use in analyses of large scale management actions, such as the Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement and the Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska.

E. Bycatch

- Identify sources of variability in actual and estimated bycatch rates.

F. Monitoring

- Promote advancement in video monitoring of otherwise unobserved catch for improved estimation of species composition of total catch and discrimination of retained and discarded catch

G. Research Priorities Identified by the National Research Council's Steller Sea Lion Committee

The SSC held a brief discussion on the research and monitoring recommendations of the NRC Steller sea lion Committee, as presented in the Executive Summary of their report. The SSC noted that their recommendations are consistent with recognized needs, but also that there is considerable ongoing Steller sea lion research. Among the National Research Council's recommendations, the SSC wishes to particularly identify their recommendation for a spatially-explicit, adaptive management experiment to definitively conclude whether fishing is playing a role in the current lack of Steller sea lion recovery. As noted in the SSC's February 2003 minutes, there are a number of scientific, economic, and Endangered Species Act regulatory considerations that must be addressed before such a plan can be seriously considered for implementation. However, the SSC supports further exploration of the merits of this adaptive management approach.

H.3 National Marine Fisheries Service

NMFS is responsible for ensuring that management decisions are based on the best available scientific information relevant to the biological, social, and economic status of the fisheries. As required by the Magnuson-Stevens Fishery Management and Conservation Act, NMFS published the *NMFS Strategic Plan for Fisheries Research* in December 2001, outlining proposed research efforts for fiscal years 2001-2006. The Strategic Plan outlines the following broad goals and objectives for NMFS: 1) to improve scientific capability; 2) to increase science quality assurance; 3) to improve fishery research capability; 4) to improve data collection; 5) to increase outreach/information dissemination; and 6) to support international fishery science. The document also outlines the AFSC's research priorities for this time period. Summarized below are the AFSC's research priorities grouped into four major research areas: research to support fishery conservation and management; conservation engineering research; research on the fisheries themselves; and information management research.

1. Research to Support Fishery Conservation and Management

   a. Biological research concerning the abundance and life history parameters of fish stocks

      - Conduct periodic (annual, biennial, triennial) bottom trawl, midwater trawl-acoustic, hydroacoustic bottom trawl, longline surveys on groundfish in the BSAI and GOA.
      - Conduct field operations to study marine mammal-fish interactions, with particular emphasis on sea lion and pollock, Pacific cod, and Atka mackerel interactions in the GOA and the BSAI management areas.
      - Observer programs for groundfish fisheries that occur off Alaska.
      - Assessments of the status of stocks, including their biological production potentials (maximum sustainable yield, acceptable biological catch, overfishing levels), bycatch requirements, and other parameters required for their management.
      - Assessments of the population dynamics, ecosystem interactions, and abundance of marine mammal stocks and their incidental take requirements.

   b. Social and economic factors affecting abundance levels

   c. Interdependence of fisheries or stocks of fish

d. Identifying, restoring, and mapping of essential fish habitat

e. Assessment of effects of fishing on essential fish habitat and development of ways to minimize adverse impacts.

2. Conservation Engineering Research

- Continue to conduct research to measure direct effects of bottom trawling on seafloor habitat according to a five-year research plan.
- Conduct fishing gear performance and fish behavioral studies to reduce bycatch and bycatch mortality of prohibited, undersized, or unmarketable species, and to understand performance of survey gear.
- Work with industry and the Council to develop bycatch reduction techniques.

3. Research on the Fisheries

a. Social and economic research

b. Seafood safety research

c. Marine

4. Information Management Research

- Continue to build data infrastructure and resources for easy access and data processing. The AFSC's key data bases are its survey data bases from the 1950s (or earlier) and the scientific observer data base that extends back to the foreign fishing days of the 1960s.
- Continue to provide information products based on experts and technical data that support NMFS, the Council, international scientific commissions, and the overall research and management community.

H.4 Essential Fish Habitat Research and Information Needs

One of the required components of the EFH provisions of each FMP is to include research and information needs. Each FMP should contain recommendations for research efforts that the Councils and NMFS view as necessary to improve upon the description and identification of EFH, the identification of threats to EFH from fishing and other activities, and the development of conservation and enhancement measures for EFH.

H.4.1 Alaska EFH Research Plan

A new Alaska EFH Research Plan that revises and supersedes earlier plans will guide research to support the next EFH 5-year Review and other fishery management information needs where advancements in habitat science are helpful (Pirtle et al. 2024). The Alaska EFH Research Plans have included five long term research goals that remain consistent with minor, meaningful updates since 2005. EFH research recommendations were informed during the 2023 EFH 5-year Review by contributing researchers, stock assessment scientists, and Council advisory bodies. These recommendations were summarized as three objectives for the new Alaska EFH Research Plan.

In addition, as part of the 2023 EFH 5-year Review, each stock assessment author provided a stock-specific evaluation of EFH research needs. Table 1 identifies these needs by species. These research needs also contributed to the research objectives in the revised Alaska EFH Research Plan.
These long term research goals, timely objectives, and species specific recommendations are informative

as updates to the EFH research recommendations in the BSAI Groundfish FMP.

H.4.2 EFH Research Recommendations

Five long-term research goals have been included in Alaska EFH Research Plans since 2005 (e.g., Sigler et al. 2017, Pirtle et al. 2024)—

1. Characterize habitat utilization and productivity at regional scales;
2. Assess sensitivity, impact, and recovery of disturbed benthic habitat;
3. Improve modeling and validation of human impacts on marine habitat;
4. Improve information regarding habitat and seafloor characteristics; and
5. Assess coastal and marine habitats facing human development.

These goals represent the need to understand habitat characteristics and their influence on observed habitat utilization and productivity for fishes and invertebrates. These goals also emphasize the importance of understanding human impacts on habitat (e.g., fishing, coastal development, and ongoing climate change), how these impacts in turn affect habitat utilization and productivity, and assessing the consequences of these impacts at regional scales.

To achieve these goals the complementary role and equal importance of targeted field and laboratory experiments, long-term monitoring, and analytical work should be emphasized to model and map the progressive levels of EFH information (EFH component 1) and impacts at a regional scale (EFH components 2, 4, and 5). In particular:

- Field and laboratory experiments are necessary to understand ecological mechanisms that underlie habitat association, vital rates and productivity, and how human activities (including fishing, development, and climate change) cause changes in habitat conditions and resulting utilization and productivity. In particular, understanding causality is not possible without experimental support. Understanding ecological mechanisms (i.e., causality) is also necessary to predict the likely impact of human impacts that have not previously been observed;
- Long-term monitoring is necessary to understand habitat utilization and productivity at regional scales;
- Analysis including statistical and mathematical modeling is needed to map the geographic distribution of the area of occupied habitat (EFH) for life stages of targeted FMP species and their prey and is also necessary to identify changes in habitat utilization likely resulting from human activities and climate change.

Without these three elements, applied habitat research cannot be successful.

In addition to the five long term research goals, three objectives are emphasized as important for research progress and preparation for future EFH 5-year Reviews and are described in the Alaska EFH Research Plan (Pirtle et al. 2024). These objectives were informed by recommendations from contributing researchers, stock assessment scientists, and Council advisory bodies during the 2023 EFH 5-year Review and are written with consideration of research needs across FMPs.

Objective 1: Improve EFH information for targeted species and life stages
The first objective seeks to improve EFH information for species and life stages that were identified as requiring further research during the 2023 EFH 5-year Review, as well as other targeted FMP species that were not updated in 2023 (i.e., salmon ocean life stages and scallops) under EFH component 1. Studies should focus on methods development with practical application to improve EFH information for a select set of species life stages, where the following pathways are recommended:

1. **Additional field data:** Collecting and incorporating additional field data in the models used to identify and describe EFH, beyond the large-mesh bottom trawl summer survey data that were used primarily during the 2017 and 2023 EFH 5-year Reviews. The importance of including alternative gear types to the extent practicable is emphasized, including longlines, pots, small-mesh and pelagic trawls, focusing on under-sampled life stages and habitats. The application of alternative data sources such as predator stomach contents and fishery-dependent catch and effort data is also encouraged. Sampling may also be used to improve understanding of seasonal variation in habitat use. This will presumably involve measuring (via paired experiments) or estimating a fishing-power correction between multiple sampling gears. When analyzed properly, these additional data sources can provide complementary information to characterize habitat profiles for life stages of targeted FMP species.
2. **Demographic processes driving variation over time:** Research focused on identifying processes that drive shifts in habitat use and productivity is recommended. This may involve hindcasting and forecasting methods, including (but not limited to) fitting models with covariates that vary over time, conditioning predictions upon spatio-temporal residuals, incorporating information about trophic interactions, and separately analyzing numerical density and size information. This might also involve process research, e.g., incorporating information about individual movement from tags, behavioral and eco-physiological experiments, or other process research. This likely requires methodological development and testing and could be focused on a few case-study species or species' life stages that are likely to be shifting substantially, for consideration during the future 5-year Reviews.
3. **Improved methods to integrate both monitoring and process research:** Continued development of new analytical methods to integrate process research is recommended when identifying species habitat utilization, vital rates, and productivity. Analytical methods might include individual- and agent-based models (IBMs) that "scale up" laboratory measurements, particularly when IBM output is used as a covariate or otherwise combined with survey and other species sampling information. This process research might include juvenile survival, growth, and movement experiments and habitat-specific observations. Ideally, these new methods would include process information and monitoring data simultaneously, rather than either a. seeking to validate an IBM via comparison with monitoring data without explicitly incorporating these data, or b. fitting to monitoring data without incorporating field or laboratory experimental data.

Objective 2: Improve fishing effects assessment
The second objective addresses the ongoing need to develop and improve methods to assess fishing impacts on habitat utilization and productivity (EFH component 2). Research pathways might include:

1. **Advance methods to assess fishing impacts:** It is often helpful to compare results from a variety of analytical methods and approaches. Advancing the existing Fishing Effects model (Smeltz et al. 2019) is recommended as well as developing new analytical approaches to address potential impacts of fishing to EFH.
2. **Cumulative effects:** Methods development is recommended to identify the cumulative effect of fishing and non-fishing human activities to EFH, including ongoing climate change (EFH component 5).

Objective 3: Improve understanding of nearshore habitat and forage species
The third objective acknowledges that additional research is needed regarding critical nearshore life stages and for the prey species that represent an important component of habitat suitability and EFH. Research may include the following pathways:

1. **Nearshore habitat:** Ongoing and expanded scientific efforts to understand habitat utilization and productivity into nearshore environments (EFH component 1). This nearshore habitat is critical

for juvenile life stages of many targeted FMP species (e.g., Pacific cod, flatfishes, salmonids) and prey species (EFH component 7) and is also subject to substantial impacts from human development. Improved understanding of nearshore habitat is intended to support the EFH consultations that are done near areas with human development (urban areas as well as shipping activities) (EFH components 4 and 5). Understanding nearshore habitat may also support improved understanding of recruitment processes and population connectivity. Data are available in the Nearshore Fish Atlas of Alaska and ShoreZone, and analytical methods have already been demonstrated (e.g., Grüss et al. 2021), but there remains substantial work to scale these methods to more species and within geographic areas of specific interest.

2. **Prey species:** Increased efforts are recommended to understand habitat utilization and productivity for those species that represent the primary prey for targeted FMP species (EFH component 7). This can include pelagic forage fishes (e.g., herring, eulachon, sand lance, etc.), juvenile stages of numerically abundant species (e.g., pollock, Pacific cod, salmonids), as well as invertebrates (e.g., Euphausiids, snow crab). Improved understanding of habitat-specific densities (i.e., Level-2 EFH information) can then be used as a covariate for understanding habitat suitability for their predators (i.e., targeted FMP species).

As part of the 2023 EFH Review, each stock assessment author provided a stock-specific evaluation of EFH research needs. Table 1 identifies these needs by species and FMP. These research needs also contributed to the research objectives in the revised Alaska EFH Research Plan (Pirtle et al. 2024).

Table 8. Stock assessment author research recommendations for Bering Sea/Aleutian Island groundfish species. These include focus areas of research and identify data sources for future EFH map iterations.

Bering Sea / Aleutian Island Species	Research Notes from Stock Assessment Authors
arrowtooth flounder	Incorporate other data sources like longline survey and IPHC survey data to supplement the slope bottom trawl survey. When evaluating FE, referencing habitat specificity variables in the climate vulnerability assessment and the habitat assessment prioritization for Alaska stocks could allow for a more targeted approach.
Atka mackerel	Further stratification of data in time and space may allow for patterns to become apparent at local scales.
flathead sole-Bering flounder complex	Investigate impacts to the habitat/environment on early life history and recruitment distribution.
Greenland turbot	Incorporate AFSC longline survey data in addition to the bottom trawl survey data. They also suggested forming a small team to reevaluate life stage breaks and look at spatially varying growth differences.
Kamchatka flounder	Incorporate AFSC longline survey data in addition to the bottom trawl survey data.
northern rock sole	Northern rock sole have exhibited changes in growth over time, so length-based categories may need to be addressed.

Bering Sea / Aleutian Island Species	Research Notes from Stock Assessment Authors
northern rockfish	Continue research on observing and modeling stock densities in untrawlable grounds, particularly in the Aleutian Islands and Bering Sea slope.
other flatfish complex	Group life history stages by age rather than length where possible.
other rockfish complex	Incorporate AFSC longline survey data.
Pacific ocean perch	Continue research on observing and modeling stock densities in untrawlable grounds, particularly in the Aleutian Islands and Bering Sea slope.
rougheye/ blackspotted rockfish complex	Continue research on observing and modeling stock densities in untrawlable grounds, particularly in the Aleutian Islands and Bering Sea slope.
sablefish	Incorporate longline survey data in future EFH analyses. Gather more data on life history patterns and habitat utilization: spawning locations, larval dispersal, juvenile nursery areas, and/or ontogenetic movement patterns. Utilize FE model outputs for areas aside from the regional requirements.
shortraker rockfish	Incorporate other data sources like longline survey and IPHC survey data to supplement the slope bottom trawl survey. When evaluating FE, referencing habitat specificity variables in the climate vulnerability assessment and the habitat assessment prioritization for Alaska stocks could allow for a more targeted approach.

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Appendix I Information on Marine Mammal and Seabird Populations

This appendix contains information on the marine mammal and seabird populations in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) management areas. Much of the information in this appendix is from the Programmatic Supplemental Environmental Impact Statement for Alaska Groundfish Fisheries, published by National Marine Fisheries Service (NMFS) in 2004.

I.1 Marine Mammal Populations

Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf (Lowry et al. 1982). In the areas fished by the federally managed groundfish fleets, twenty-six species of marine mammals are present from the orders Pinnipedia (seals, sea lion, and walrus), Carnivora (sea otter and polar bear), and Cetacea (whales, dolphins, and porpoises) (Lowry and Frost 1985). Most species are resident throughout the year, while others seasonally migrate into and out of Alaskan waters.

I.1.1 Potential impacts of fisheries on marine mammals

Direct Mortality from Intentional Take

Commercial harvests of marine mammals have occurred at various times and places, sometimes with devastating impacts on the populations of particular species. In some cases, such as the northern right whale, the species have not recovered to pre-exploitation population levels even though commercial whaling was halted decades ago.

Direct Mortality from Incidental Take in Fisheries

Some types of fisheries are much more likely to catch marine mammals incidentally than others. High seas driftnet fishing killed thousands of mammals before it was prohibited in 1991. Longline and pot fisheries very rarely catch marine mammals directly.

Indirect Effects through Entanglement

The following effects are classified as indirect because the impacts are removed in time and/or space from the initial action although in the analysis, these effects are considered together with the direct effect of incidental take. In some cases, individual marine mammals may be killed outright by the effect. In other cases, individuals are affected in ways that may decrease their chances of surviving natural phenomenon or reproducing successfully. These sub-lethal impacts may reduce their overall “fitness” as individuals and may have population-level implications if enough individuals are impacted.

Although some fisheries have no recorded incidental take of marine mammals, all of them probably contribute to the effects of entanglement in lost fishing gear. Evidence of entanglement comes from observations of animals trailing ropes, buoys, or nets or bearing scars from such gear. Sometimes stranded marine mammals also have evidence of entanglement but it may not be possible to ascertain whether the entanglement caused the injury or whether the corpse picked up gear as it floated around after death. Sometimes an animal is observed to become entangled in specific fishing gear, in which case an incidental take or minor injury may be recorded for that particular fishery, but many times the contributions of individual fisheries to the overall effects of entanglement are difficult to document and quantify.

The Marine Plastic Pollution Research and Control Act of 1987 (33 USC §§ 1901 et seq.), implements the provisions relating to garbage and plastics of the Act to Prevent Pollution from Ships (MARPOL Annex V). These regulations apply to all vessels, regardless of flag, on the navigable waters of the U.S. and in the exclusive economic zone of the U.S. It applies to U.S. flag vessels wherever they are located. The discharge of plastics into the water is prohibited, including synthetic ropes, fishing nets, plastic bags, and biodegradable plastics.

Indirect Effects through Changes in Prey Availability

The availability of prey to marine mammals depends on a large number of factors and differs among species and seasons. Among these factors are oceanographic processes such as upwellings, thermal stratification, ice edges, fronts, gyres, and tidal currents that concentrate prey at particular times and places. Prey availability also depends on the abundance of competing predators and the ecology of prey species, including their natural rates of reproduction, seasonal migration, and movements within the water column. The relative contributions of factors that influence prey availability for particular species and areas are rarely known. Most critical is the lack of information on how events outside an animal's foraging range or in a different season may influence the availability of prey to animals in a particular place and time.

Marine mammal species differ greatly from one another in their prey requirements and feeding behaviors, leading to substantial differences in their responses to changes in the environment. For some species, such as the baleen whales, diets consist largely of planktonic crustaceans or small squid and have no overlap of prey with species that are targeted or taken as bycatch in the groundfish fisheries. For other species, notably Steller sea lions, there is a high degree of overlap between their preferred size and species of prey and the groundfish catch. Many other species are in between, perhaps feeding on the same species but smaller sizes of fish than what is typically taken in the fisheries. Although they may take a wide variety of prey species during the year, many species may depend on only one or a few prey species in a given area and season. In addition, the prey requirements and foraging capabilities of nursing females and subadult animals may be much more restricted than for non-breeding adults, with implications for reproductive success and survival.

The question of whether different types of commercial fisheries have had an effect on the availability of prey to marine mammals has been addressed by examining the degree of direct competition (harvest) of prey and by looking for potential indirect or cascading effects of the fisheries on the food web of the mammals. For marine mammals whose diets overlap to some extent with the target or bycatch species of the fisheries, fishery removals could potentially decrease the density of prey fields or cause changes in the distribution of prey such that the foraging success of the marine mammals is affected. If alternate prey is not available or is of poorer nutritional quality than the preferred species, or if the animal must spend more time and energy searching for prey, reproductive success and/or survival can be compromised. In the case of marine mammals that do not feed on fish or feed on different species than are taken in the fisheries, the removal of a large number of target fish from the ecosystem may alter the predator and prey dynamics and thus the abundance of another species that is eaten by marine mammals. The mechanisms and causal pathways for many potential food web effects are poorly documented because they are very difficult to study scientifically at sea.

Although reductions in the availability of forage fish to marine mammals have been attributed to both climatic cycles and commercial fisheries, a National Research Council study on the Bering Sea ecosystem (NRC 1996) concluded that both factors probably are significant. Regime shifts are major changes in atmospheric conditions and ocean climate that take place on multi-decade time scales and trigger community-level reorganizations of the marine biota (Anderson and Piatt 1999). Two cycles of warm and cold regimes have been documented in the GOA in the past 100 years, with the latest shift being from a cold regime to a warm regime in 1977. The consequences of this shift on fish and crustacean populations have been documented, including major improvements in groundfish recruitment and the collapse of some high-value forage species such as shrimp, capelin, and Pacific sand lance (Anderson and Piatt 1999). Directed fisheries on forage fish can deepen and prolong their natural low population cycles (Duffy 1983, Steele 1991), with potential effects on marine mammal foraging success. There is some evidence that another regime shift may have begun in

1998 with colder water temperatures and increases in certain forage populations (NPFMC 2002), but the implications for marine mammals are still unclear. Climate change may also affect the dynamics of the ice pack, with serious consequences for the marine mammals associated with the ice pack, such as bowhead whales, the ice seals, and walrus.

Direct Effects through Disturbance by Fishing Vessels

The effects of disturbance caused by vessel traffic, fishing operations, engine noise, and sonar pulses on marine mammals are largely unknown. With regard to vessel traffic, many baleen and toothed whales appear tolerant, at least as suggested by their reactions at the surface. Observed behavior ranges from attraction to the vessel to course modification or maintenance of distance from the vessel. Dall's porpoise, Pacific white-sided dolphins, and even beaked whales have been observed adjacent to vessels for extended periods of time. Conversely, harbor porpoise tend to avoid vessels. However, a small number of fatal collisions with various vessels have been recorded in California and Alaska in the past decade and others likely go unreported or undetected (Angliss et al. 2001).

Reactions to some fishing gear, such as pelagic trawls, are poorly documented, although the rarity of incidental takes suggests either partitioning of foraging and fishing areas or avoidance. Given their distribution throughout the fishing grounds, at least some individuals may be expected to occasionally avoid contact with vessels or fishing gear, which would constitute a reaction to a disturbance. Assuming these instances occur, the effects are likely temporary. Sonar devices are used routinely during fishing activity as well as during vessel transit. The sounds produced by these devices may be audible to marine mammals and may thus constitute disturbance sources. Wintering humpback whales have been observed reacting to sonar pulses by moving away (Maybaum 1990, 1993), although few other cases of reaction have been documented.

Indirect Effects through Contamination by Oil Spills

For species such as the pinnipeds and sea otters that spend a substantial amount of time on the surface of the water or hauled out on shore, oil spills pose a significant environmental hazard, even in small amounts. The toxicological effects of ingested oil, ranging from potential organ damage to weakening of the immune system, are poorly known for most species, especially in regard to chronic low doses. Sea otters are particularly susceptible to oil spills because they depend on their thick fur to protect them from cold water, rather than layers of fat, and oil destroys the insulative properties of their fur. Thousands of sea otters died over a large expanse of the GOA as a result of the Exxon Valdez oil spill in 1989 (Garshelis 1997, Garrot et al. 1993, DeGange et al. 1994). There is very little data on the mortality of marine mammals from the much smaller volumes of oil that are more typical of marine vessel spills, resulting from fuel transfer accidents and bilge operations.

I.1.2 Statutory protection for marine mammals

There are two major laws that protect marine mammals and require the North Pacific Fishery Management Council (Council) to address their conservation in the FMPs. The first is the Marine Mammal Protection Act (MMPA) of 1972 (amended 1994). Management responsibility for cetaceans and pinnipeds other than walrus is vested with National Marine Fisheries Service (NMFS) Protected Resources Division (PRD). The United States Fish and Wildlife Service (USFWS) is responsible for management of walrus and sea otters. The goal of the MMPA is to provide protection for marine mammals so that their populations are maintained as a significant, functioning element of the ecosystem. The MMPA established a moratorium on the taking of all marine mammals in the United States with the exception of subsistence use by Alaska Natives. Under the authority of this Act, NMFS PRD monitors populations of marine mammals to determine if a species or population stock is below its optimum sustainable population. Species that fall below this level are designated as "depleted." Populations or stocks (e.g., the western stock of Steller sea lions) listed as threatened or endangered under the Endangered Species Act (ESA), are automatically designated as depleted under the MMPA.

The ESA was enacted in 1973 and reauthorized in 1988. This law provides broad protection for species that are listed as threatened or endangered under the Act. The species listed under the ESA that spend all or part of their time in the BSAI and GOA and that may be affected by the groundfish fisheries are included in the table below. There are eight whale species, and two distinct population segments of Steller sea lions.

Listed Species	Population or Distinct Population Segment (DPS)	Latin Name	Status
Blue whale	North Pacific	*Balaenoptera musculus*	Endangered
Bowhead whale	Western Arctic	*Balaena mysticetus*	Endangered
Fin whale	Northeast Pacific	*Balaenoptera physalus*	Endangered
Humpback whale	Western and Central North Pacific	*Megaptera novaeangliae*	Endangered
Right whale	North Pacific	*Eubalaena japonica*	Endangered
Sei whale	North Pacific	*Balaenoptera borealis*	Endangered
Sperm whale	North Pacific	*Physeter macrocephalus*	Endangered
Gray whale	Eastern Pacific	*Eschrichtius robustus*	Delisted
Steller sea lion	Western Alaska DPS	*Eumetopias jubatus*	Endangered
Steller sea lion	Eastern Alaska DPS	*Eumetopias jubatus*	Threatened

The mandatory protection provisions of the ESA have led to numerous administrative and judicial actions and have brought the issue of fisheries/sea lion interactions under intense scrutiny. Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of its designated critical habitat. For federal fishery management actions, the action agency, NMFS Sustainable Fisheries Division, is required under Section7(a)(2) to consult with the Steller sea lion expert agency, NMFS PRD, to determine if the proposed action may adversely affect Steller sea lions or their critical habitat. If the proposed action may adversely affect Steller sea lions or its designated critical habitat, formal consultation is required. Formal consultation is a process between the action and expert agency that determines whether a proposed action is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. The process begins with the action agency's assessment of the effects of their proposed action on listed species and concludes with the issuance of a "Biological Opinion" by the expert agency. A biological opinion is a document which includes: a) the opinion of NMFS PRD as to whether or not a federal action (such as federally authorized fisheries) is likely to jeopardize the continued existence of listed species or adversely modify designated critical habitat; b) a summary of the information on which the opinion is based; and c) a detailed discussion of the effects of the action on listed species or designated critical habitat. If the Biological Opinion concludes that the proposed action is likely to jeopardize the continued existence of threatened or endangered species or adversely modify critical habitat, then the expert agency recommends Reasonable and Prudent Alternatives to avoid the likelihood of "jeopardy" or "adverse modification" of critical habitat. The resulting legal requirements limit the Council from adopting FMP policies that result in a jeopardy finding for the Steller sea lions.

I.1.3 Consideration of marine mammals in groundfish fishery management

In order to fulfill their oversight responsibilities under the MMPA, NMFS PRD and the U.S. Fish and Wildlife Service (USFWS) have developed appropriate survey methodologies to census the various species of marine mammals. The results of these surveys, and other factors that affect the status of each species, are published in an annual "Marine Mammal Stock Assessment" report that is available on the NMFS national website (www.nmfs.noaa.gov).

Some species are much more difficult to census accurately than others, so there is a great deal of variation in the uncertainty of various population estimates. In addition, the huge expanses over which many species traverse and the remoteness of their habitats make surveys logistically difficult and expensive. For budgetary and logistical reasons, surveys of most species are not carried out every year and survey effort is prioritized for species of management concern. As a result, population estimates for some species may be outdated and trend information may not exist.

NMFS PRD requires all commercial fisheries in the U.S. Exclusive Economic Zone to report the incidental take and injury of marine mammals that occur during their operations (50 CFR 229.6). In addition to self-reported records, which NMFS PRD considers to be negatively biased and under representing actual take levels, certified observers are required in some fisheries to provide independent monitoring of incidental take as well as other fishery data.

Management measures are in place in the BSAI and GOA groundfish fisheries to protect Steller sea lions. These protection measures were deemed necessary based on the hypothesis that the continued decline of the western stock of the Steller sea lion is due to nutritional stress and that groundfish fisheries contribute to this stress by competing with sea lions for their key prey species. Management measures were specifically developed to reduce competitive interaction between Steller sea lions and the groundfish fisheries (NMFS 2001a). Mitigation efforts have focused on protecting the integrity of food supplies near rookeries and haulouts. Competitive interactions with the fishery may have the greatest effect on juvenile Steller sea lions between the time they are weaned and the time they reach adult size and foraging capability as the diving capacity of juveniles (and thus available foraging space) is less than that of adults. Adult females may also be susceptible to nutritional stress due to reduced prey availability in the vicinity of rookeries because of the limited foraging distribution and increased energetic demands when caring for pups. Specifically, the intent of the protection measures was to avoid competition around rookeries and important haulouts with extra precaution in the winter, and to disperse the fisheries outside of those time periods and areas.

Section 118 of the MMPA (50 CFR 229.2) requires all commercial fisheries to be placed into one of three categories, based on the frequency of incidental take (serious injuries and mortalities) relative to the value of potential biological removal (PBR) for each stock of marine mammal. PBR is defined as the maximum number of animals, not including natural mortalities, that may be removed from a stock while allowing that stock to reach or maintain its optimum sustainable population. In order to categorize each fishery, NMFS PRD first looks at the level of incidental take from all fisheries that interact with a given marine mammal stock. If the combined take of all fisheries is less than or equal to 10 percent of PBR, each fishery in that combined total is assigned to Category III, the minimal impact category. If the combined take is greater than 10 percent of PBR, NMFS PRD then looks at the individual fisheries to assign them to a category. Category I designates fisheries with frequent incidental take, defined as those with takes greater than or equal to 50 percent of PBR for a particular stock; Category II designates fisheries with occasional serious injuries and mortalities, defined as those with takes between one percent and 50 percent of PBR; Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities, defined as those with take less than or equal to one percent of PBR. Owners of vessels or gear engaging in Category I or II fisheries are required to register with NMFS PRD to obtain a marine mammal authorization in order to lawfully take a marine mammal incidentally in their fishing operation (50 CFR 229.4). In Alaska, this registration process has been integrated into other state and federal permitting programs to reduce fees and paperwork. Owners of vessels or gear engaging in Category III fisheries are not required to register with NMFS PRD for this purpose. Every year, NMFS PRD reviews and revises its list of Category I, II, and III fisheries based on new information and publishes the list in the Federal Register.

Under provisions of the MMPA, NMFS PRD is required to establish take reduction teams with the purpose of developing take reduction plans to assist in the recovery or to prevent the depletion of strategic stocks that interact with Category I and II fisheries. A “strategic” stock is one which: 1) is listed as endangered or threatened under the ESA, 2) is declining and likely to be listed as threatened under the ESA, 3) is listed as depleted under the MMPA, or 4) has direct human-caused mortality which exceeds the stock’s PBR.

The immediate goal of a take reduction plan is to reduce, within six months of its implementation, the incidental serious injury or mortality of marine mammals from commercial fishing to levels less than PBR. The long-term goal is to reduce, within five years of its implementation, the incidental serious injury and mortality of marine mammals from commercial fishing operations to insignificant levels approaching a zero serious injury and mortality rate, taking into account the economics of the fishery, the availability of existing technology, and existing state or regional Fishery Management Plans. Take reduction teams are to consist of a balance of representatives from the fishing industry, fishery management councils, state and federal resource management agencies, the scientific community, and conservation organizations. Fishers participating in Category I or II fisheries must comply with any applicable take reduction plan and may be required to carry an observer onboard during fishing operations.

In 2002, all of the Alaska groundfish fisheries (trawl, longline, and pot gear in the BSAI and GOA) were listed as Category III fisheries (67 FR 2410). However, NMFS PRD has recently proposed that the BSAI groundfish trawl fishery be elevated to Category II status based on a review of Observer Program records of marine mammal incidental take from 1990-2000 (68 FR 1414). According to the records, total incidental take of all fisheries is greater than 10 percent of PBR for the Alaska stocks of western and central North Pacific humpback whales, resident killer whales, transient killer whales, and the western stock of Steller sea lions. Based on the incidental take of these species relative to their respective PBRs, and some other considerations in the case of humpback whales, NMFS PRD determined in their "Tier 2" analysis that the BSAI groundfish trawl fishery posed a modest risk to these species. In addition, a number of state-managed salmon drift and set gillnet fisheries are listed in Category II, including those in Bristol Bay, Aleutian Islands, Alaska Peninsula, Kodiak, Cook Inlet, Prince William Sound, and Southeast Alaska. NMFS PRD has recently proposed reclassifying the Cook Inlet drift and set gillnet fisheries from Category II to Category III (68 FR 1414).

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I.2 Seabird Populations

Over 70 species of seabirds occur over waters off Alaska and could potentially be affected by direct and indirect interactions with the Bering Sea Aleutian Islands and Gulf of Alaska groundfish fisheries. Thirty-eight of these species regularly breed in Alaska and waters of the EEZ. More than 1,600 seabird colonies have been documented, ranging in size from a few pairs to 3.5 million birds (USFWS 2000). Breeding populations of seabirds are estimated at approximately 48 million birds and non-breeding migrant birds probably account for an additional 30 million birds (USFWS 1998). Most of the migrant birds are present only during the summer months (May through September) although some non-breeding albatross have been sighted at all months of the year (USFWS 1999). The distributions of species that breed in Alaska are well known in summer but for some species winter distributions are poorly documented or completely unknown.

I.2.1 Potential impacts of fisheries on seabird species

Potential fisheries impacts on a given seabird species could theoretically be measured by changes in survival or reproductive rates and ultimately by changes in the population. For all of these biological parameters, one would expect fluctuations in time and space as part of "normal" or natural conditions. The ability to distinguish these natural fluctuations from potential human-caused fluctuations requires reasonably accurate measurements of several parameters over a long time period and in many different areas. The USFWS surveys a number of large seabird colonies every year. Data is collected for selected species at geographically dispersed breeding sites along the entire coastline of Alaska. Some sites are scheduled for annual monitoring while others are monitored every three years. Although trends in sampling plots are reasonably well known at particular colonies, overall population estimates for most species are not precise enough to detect anything but the largest fluctuations in numbers. This is especially true for species that do not nest in dense concentrations. For some species, like the burrow and crevice-nesting alcids and storm-petrels, field methods for censusing populations are not available and require additional budgetary support for development. Population trends for those species that are regularly monitored are presented in an annual report entitled, "Breeding status, population trends, and diets of seabirds in Alaska", published by the USFWS (Dragoo et al. 2001).

Seabirds can interact with fisheries in a number of direct and indirect ways. Direct effects occur at the same time and place as the fishery action. Seabirds are attracted to fishing vessels to feed on prey churned up in the boat's wake, escaping fish from trawl nets, baited hooks of longline vessels, and offal discharged from trawl, pot, and longline vessels. In the process of feeding, seabirds sometimes come into contact with fishing gear and are caught incidentally. A direct interaction is usually recorded as the injury or killing of a seabird and is referred to as an "incidental take". Information on the numbers of birds caught incidentally in the various gear types comes from the North Pacific Groundfish Observer Program (Observer Program) and is reported in the annual *Stock Assessment and Fishery Evaluation* reports in the seabird section of "Ecosystem Considerations" appendix (NPFMC 2002, Tables 8, 9, 11, and 12).

Another direct fishery effect is the striking of vessels and fishing gear by birds in flight. Some birds fly away without injury but others are injured or killed and are thus considered incidental take. The Observer Program does not collect data on vessel strikes in a systematic way but there are some records of bird-strikes that have been collected on an opportunistic basis. These sporadic observations of vessel strikes from 1993-2000 have been entered into the Observer Notes Database, which is maintained by the USFWS, but have only received preliminary statistical analysis (seabird section of "Ecosystem Considerations for 2003", NPFMC 2002). Indirect effects refer to either positive or negative impacts on the reproductive success or survival of seabirds that may be caused by the fishery action but are separated in time or geographic location. The indirect effect which has received the most attention is the potential impact of fisheries competition or disturbance on the abundance and distribution of prey species that seabirds depend on, thus affecting seabird foraging success. Of particular note would be those effects on breeding piscivorous (fish-eating) seabirds that must meet the food demands of growing chicks at the nest colony. Reproductive success in Alaskan seabirds is strongly linked to the availability of appropriate fish (Piatt and Roseneau 1998, Suryan et al. 1998a, Suryan et al. 2000, Golet et al. 2000). Although seabird populations remain relatively stable during occasional years of poor food and reproduction, a long-term scarcity of forage fish leads to population declines. Other potential indirect effects on seabirds include physical disruption of benthic foraging habitat by bottom trawls, consumption of processing wastes and discarded offal, contamination by oil spills, introductions of nest predators (i.e., rats) to nesting islands, and ingestion of plastics released intentionally or accidentally from fishing vessels. Some of these potential impacts are related more to the presence of fishing vessels rather than the process of catching fish.

I.2.2 Statutory protection for seabirds

There are two major laws that protect seabirds and require the Council to address seabird conservation in their Fishery Management Plans. The first is the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712), as amended over the years. This law pertains to all of the seabird species found in the BSAI and GOA area (66 FR 52282) and governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts and nests. The definition of "take" in the Migratory Bird Treaty Act is "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10.12). In a fishery context, "take" refers to birds killed or injured during commercial fishing operations, whether in fishing gear or by striking some part of a vessel. Under the Migratory Bird Treaty Act, take of migratory birds is illegal, even if it is accidental or inadvertent, unless permitted through regulations (such as hunting regulations or permit exemptions). Thus far, only certain forms of intentional take have been legalized in these ways. There are currently no regulations to allow unintentional take. The USFWS and Department of Justice are vested with enforcement discretion, which has been used in lieu of a permitting program. Enforcement has focused on those who take birds with disregard for the law and the impact of their actions on the resource, particularly where effective conservation measures are available but have not been applied ("Fact sheet" on the Migratory Bird Treaty Act, K. Laing, USFWS). Executive Order 13186 (66 FR 3853-3856), "Responsibilities of Federal Agencies to Protect Migratory Birds," which was signed by the President on January 10, 2001, directs federal agencies to develop and implement a "Memorandum of Understanding" with the USFWS to promote the conservation of migratory birds affected by their actions, including mitigation of activities that cause unintentional take. NMFS and USFWS are currently developing this framework document which will incorporate seabird protection measures designed for specific fisheries (K. Rivera, NMFS National Seabird Coordinator, personal communication).

The second law is the ESA which provides broad protection for species that are listed as threatened or endangered. Presently there are three species listed under the ESA that spend all or part of their time in the BSAI and GOA and that may be affected by the groundfish fisheries: short-tailed albatross (endangered), Steller's eider (threatened), and spectacled eider (threatened). Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of habitat important to the continued existence of the species (Critical Habitat). For ESA listed seabirds, the USFWS is the agency responsible for conducting an assessment of the proposed action and preparing the appropriate Section 7 document, a "Biological Opinion". If the Biological Opinion concludes that the proposed action is likely to jeopardize the continued existence of threatened or endangered species or adversely modify its Critical Habitat, then the agency must develop Reasonable and Prudent Alternatives to minimize or mitigate the effect of the action. Even if a "no jeopardy" determination is made, as has been done for all three listed species in the BSAI and GOA, the agency may require and/or recommend that certain mitigation measures be adopted. In addition, the agency may establish a threshold number of incidental takes that would trigger a new Section 7 consultation to reexamine the required mitigation measures. In the case of the short-tailed albatross, the number of incidental takes that could be reasonably expected, given the designated mitigation measures, has been adopted as a threshold value and is described in the Incidental Take Statement attached to the Biological Opinion (USFWS 1999). These provisions of the ESA, as applied to the short-tailed albatross, have played a major role in the development of seabird protection measures for the longline sector of the BSAI and GOA groundfish fisheries.

USFWS may designate Critical Habitat areas for each species under the ESA if it can determine that those areas are important to the continued existence of the species. Critical Habitat may only be designated in U.S. territory, including waters of the Exclusive Economic Zone. Short-tailed albatross do not nest in U.S. waters but have been sighted throughout the BSAI and GOA area. No Critical Habitat has been designated for this species. Spectacled and Steller's eiders each have designated Critical Habitats in the BSAI where they concentrate in winter and during flightless molting periods (66 FR 9146 and 66 FR 8850 respectively; February 2001). Critical Habitat designations do not automatically restrict human activities like fishing. They do require the lead agency, in this case the USFWS, to monitor activities that may degrade the value of the habitat for the listed species.

I.2.3 Consideration of seabirds in groundfish fishery management

Seabird protection measures in the BSAI and GOA groundfish fisheries were initiated in the 1990s and have focused primarily on collecting seabird and fishery interaction data and on requiring longliners to use specific types of gear and fishing techniques to avoid seabird incidental take. This emphasis on longline gear restrictions has been driven by conservation concerns for the endangered short-tailed albatross as well as other species. As of 2004, longline vessels over 26 ft LOA are required to use either single or paired streamer lines (or in some cases for smaller vessels, a buoy bag line) to reduce incidental take of seabirds (see www.fakr.noaa.gov/protectedresources.seabirds.html for further information).

Observers collect incidental take data in the trawl and pot sectors of the fishery. USFWS and the trawl sector of the fishing industry are collaborating on research into minimizing the effects of the trawl "third wire" (a cable from the vessel to the trawl net monitoring device) on incidental take of seabirds. However, there have been no regulatory or Fishery Management Plan-level efforts to mitigate seabird incidental take in the trawl and pot sectors.

For species listed as threatened or endangered under the ESA, the USFWS may establish a threshold number of incidental takes that are allowed before mitigation measures are reviewed and perhaps changed. Although this is sometimes viewed as a "limit" on the number of birds (e.g., short-tailed albatross) that can be taken, the result of exceeding this threshold number is a formal consultation process between NMFS and USFWS, not an immediate shutdown of the fishery.

Another management tool that may affect incidental take of seabirds is the regulation of who is allowed to fish. Limited entry and rationalization programs such as Individual Fishing Quota and Community Development Quota programs may impact seabird incidental take if the number or size of fishing vessels changes because regulations on protective measures are based on the size of the vessel. Since different types of fishing gear are more prone to take different kinds and numbers of seabirds, allocation of total allowable catch among the different gear sectors can also have a substantial impact on incidental take.

Food web impacts can be addressed with several management tools. The Council has designated particular species and size classes of fish as being important prey for seabirds and marine mammals and has prohibited directed fisheries on these forage fish (BSAI Amendment 36 and GOA Amendment 39). The Council may also manage the allocation, biomass, and species of fish targeted by the industry through the total allowable catch-setting process. These factors impact the food web and could thus alter the availability of food to seabirds. While more information is available for the dynamics of fish populations than of invertebrate prey, food web interactions are very complicated and there is a great deal of scientific uncertainty regarding the specific effects of different management options.

Each of the management tools listed above requires reliable data to monitor the extent of fishery interactions and the effectiveness of mitigation efforts in accordance with management policy objectives. The Council established the Observer Program in order to collect fishery information. Beginning in 1993, the Observer

Program was modified to provide information on seabird/fishery interactions. Observers are presently required on vessels 125 ft LOA or more for 100 percent of their fishing days and aboard vessels 60-124 ft LOA for 30 percent of their fishing days. Vessels less than 60 ft LOA do not have to carry observers.

Observers receive training in seabird identification, at least to the level of being able to place birds into the categories requested by the USFWS. Some of these categories identify individual species and others lump species under generalized groups, e.g., "unidentified alcids." In many cases, birds that were caught as the gear was being deployed have soaked at depth for hours and have been eaten by invertebrates. By the time they are retrieved on board they may be identifiable only to a generalized group level. NMFS is currently working to improve the training of its observers in identifying birds from their feet and bills, which are often the only parts of the bird that are recognizable (S. Fitzgerald, Observer Program, personal communication). When the Observer Program data is analyzed and reported (as in the Ecosystem Considerations appendix in *Stock Assessment and Fishery Evaluation* reports), individual species with relatively few records are often lumped into larger categories. For example, the "gull" category contains many "unidentified gulls" but also various numbers of five different gull species that observers have identified to species. Similarly, the "alcid" group contains separate records of seven different alcid species.

For those vessels operating without observers, regulations require captains to report the taking of any ESA-listed species and to retain and deliver the body to USFWS for positive identification. Unfortunately, such self-reporting is unreliable due to the inability or unwillingness of some crews to identify and retain species of concern. Other existing fishery record-keeping and reporting requirements provide data on the distribution of fishing effort which could potentially be used in conjunction with directed research to analyze potential food web and seabird population impacts.

I.2.4 Bibliography

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Appendix J Consolidated Appropriations Act, 2005 (Public Law 108-447): Provisions related to catcher processor participation in the BSAI non-pollock groundfish fisheries

J.1 Summary of the Consolidated Appropriations Act, 2005

On December 8, 2004, the President signed into law the Consolidated Appropriations Act, 2005 (Public Law 108-447). With respect to fisheries off Alaska, the Consolidated Appropriations Act, 2005, establishes catcher processor sector definitions for participation in: 1) the catcher processor subsectors of the BSAI non-pollock groundfish fisheries, and 2) the BSAI Catcher Processor Capacity Reduction Program. The following subsectors are defined in Section 219(a) of the Act: AFA trawl catcher processor; non-AFA trawl catcher processor; longline catcher processor; and pot catcher processor. Section 219(a) also states that 'non-pollock groundfish fishery' means target species of Atka mackerel, flathead sole, Pacific cod, Pacific Ocean perch, rock sole, turbot, or yellowfin sole harvested in the BSAI. Thus, this legislation provides the qualification criteria that each participant in the catcher processor subsectors must meet in order to operate as a catcher processor in the BSAI non-pollock groundfish fisheries and/or participate in the BSAI Catcher Processor Capacity Reduction Program.

The Consolidated Appropriations Act, 2005, includes numerous provisions that are not related to the management of groundfish and crab fisheries off Alaska. Only the portions of the legislation related to eligibility of the catcher processor subsectors are provided for reference. The portions of the legislation authorizing and governing the development of the BSAI Catcher Processor Capacity Reduction Program are not provided here.

J.2 Consolidated Appropriations Act, 2005: Section 219(a) and (g)

SEC. 219. (a) DEFINITIONS.—In this section:

(1) AFA TRAWL CATCHER PROCESSOR SUBSECTOR.—The term ‘‘AFA trawl catcher processor subsector’’ means the owners of each catcher/processor listed in paragraphs (1) through (20) of section 208(e) of the American Fisheries Act (16 U.S.C. 1851 note).

(2) BSAI.—The term ‘‘BSAI’’ has the meaning given the term ‘‘Bering Sea and Aleutian Islands Management Area’’ in section 679.2 of title 50, Code of Federal Regulations (or successor regulation).

(3) CATCHER PROCESSOR SUBSECTOR.—The term ‘‘catcher processor subsector’’ means, as appropriate, one of the following:

(A) The longline catcher processor subsector.
(B) The AFA trawl catcher processor subsector.
(C) The non-AFA trawl catcher processor subsector.
(D) The pot catcher processor subsector.

(4) COUNCIL.—The term ‘‘Council’’ means the North Pacific Fishery Management Council established in section 302(a)(1)(G) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1852(a)(1)(G)).

(5) LLP LICENSE.—The term ''LLP license'' means a Federal License Limitation program groundfish license issued pursuant to section 679.4(k) of title 50, Code of Federal Regulations (or successor regulation).

(6) LONGLINE CATCHER PROCESSOR SUBSECTOR.—The term ''longline catcher processor subsector'' means the holders of an LLP license that is noninterim and transferable, or that is interim and subsequently becomes noninterim and transferable, and that is endorsed for Bering Sea or Aleutian Islands catcher processor fishing activity, C/P, Pcod, and hook and line gear.

(7) NON-AFA TRAWL CATCHER PROCESSOR SUBSECTOR.—The term ''non-AFA trawl catcher processor subsector'' means the owner of each trawl catcher processor—

(A) that is not an AFA trawl catcher processor;

(B) to whom a valid LLP license that is endorsed for Bering Sea or Aleutian Islands trawl catcher processor fishing activity has been issued; and

(C) that the Secretary determines has harvested with trawl gear and processed not less than a total of 150 metric tons of non-pollock groundfish during the period January 1, 1997 through December 31, 2002.

(8) NON-POLLOCK GROUNDFISH FISHERY.—The term ''nonpollock groundfish fishery'' means target species of Atka mackerel, flathead sole, Pacific cod, Pacific Ocean perch, rock sole, turbot, or yellowfin sole harvested in the BSAI.

(9) POT CATCHER PROCESSOR SUBSECTOR.—The term ''pot catcher processor subsector'' means the holders of an LLP license that is noninterim and transferable, or that is interim and subsequently becomes noninterim and transferable, and that is endorsed for Bering Sea or Aleutian Islands catcher processor fishing activity, C/P, Pcod, and pot gear.

(10) SECRETARY.—Except as otherwise provided in this Act, the term ''Secretary'' means the Secretary of Commerce.

(g) NON-POLLOCK GROUNDFISH FISHERY.—

(1) PARTICIPATION IN THE FISHERY.—Only a member of a catcher processor subsector may participate in—

(A) the catcher processor sector of the BSAI non-pollock groundfish fishery; or

(B) the fishing capacity reduction program authorized by subsection (b).

(2) PLANS FOR THE FISHERY.—It is the sense of Congress that—

(A) the Council should continue on its path toward rationalization of the BSAI non-pollock groundfish fisheries, complete its ongoing work with respect to developing management plans for the BSAI non-pollock groundfish fisheries in a timely manner, and take actions that promote stability of these fisheries consistent with the goals of this section and the purposes and policies of the Magnuson-Stevens Fishery Conservation and Management Act; and

(B) such plans should not penalize members of any catcher processor subsector for achieving capacity reduction under this Act or any other provision of law.