

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Alaska Groundfish Fisheries as Authorized by the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and State of Alaska Parallel Groundfish Fisheries and Issuance of an Exempted Fishing Permit to test a Salmon Excluder Device in the Bering Sea Pollock Fishery

NMFS Consultation Number: AKR-2014-9400


Action Agency: National Marine Fisheries Service Alaska Region Sustainable Fisheries Division (SFD)

Affected Species and Determinations:

| ESA-Listed Species | Status | Is Action Likely to Adversely Affect Species? | Is Action Likely To Jeopardize the Species? | Is Action Likely To Destroy or Adversely Modify Critical Habitat? |
|---|------------|---|---|---|
| Ringed Seal, Arctic subspecies (<i>Phoca hispida hispida</i>) | Threatened | Yes | No | N/A |
| Bearded Seal, Beringia DPS (<i>Erignathus barbatus nauticus</i>) | Threatened | Yes | No | N/A |

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:


James W. Balsiger, Ph.D.
Administrator, Alaska Region

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1 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1536(a)(2)) requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action "may affect" a protected species or its critical habitat, that agency is required to consult formally with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR §402.14(a)). Federal agencies comply with this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the USFWS concurs with that conclusion (50 CFR §402.14(b)).

For the actions described in this document, the action agency is NMFS's Alaska Regional Office – Sustainable Fisheries Division (SFD), which proposes to continue authorizing the federal groundfish fisheries in the Bering Sea and Aleutian Islands management area. The proposed action also includes the State of Alaska (State) parallel groundfish fisheries because these fisheries are intricately connected with the Federal groundfish fisheries off Alaska. SFD also proposes to issue exempted fishing permits (EFPs) from time to time for the purpose of testing salmon excluder devices in the eastern Bering Sea (EBS) pollock fishery. The consulting agency for this proposal is NMFS's Alaska Regional Office – Protected Resources Division. This document represents NMFS's final biological opinion (opinion) on the effects of this proposal on the threatened Arctic subspecies of the ringed seal and the Beringia DPS of the bearded seal in accordance with section 7(b) of the ESA and implementing regulations at 50 CFR 402.

The opinion is in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-5444) ("Data Quality Act") and underwent pre-dissemination review.

1.1 Background

NMFS listed the Beringia and Okhotsk DPSs of the *Erignathus barbatus nauticus* subspecies of the bearded seal (*Erignathus barbatus*) (77 FR 76740) and the Arctic (*Phoca hispida hispida*), Okhotsk (*Phoca hispida ochotensis*), and Baltic (*Phoca hispida botnica*) subspecies of the ringed seal (*Phoca hispida*) as threatened and the Ladoga subspecies (*Phoca hispida ladogensis*) of the ringed seal as endangered (FR 77 76706) under the ESA in February 2013. Of these taxa, only the Beringia DPS of the bearded seal and the Arctic ringed seal occur in U.S. waters.

As a result of this listing, SFD requested reinitiation of ESA section 7 consultation on fisheries that occur in the geographic range of the Beringia DPS of the bearded seal and the Arctic ringed seal. SFD determined that the Alaska groundfish fisheries as authorized by the fishery management plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI Groundfish FMP) and the State parallel groundfish fisheries are likely to adversely affect the Beringia DPS of the bearded seal and the Arctic ringed seal. SFD also determined that issuance of EFPs to test salmon excluder devices in the Bering Sea Pollock fishery is likely to adversely affect the Beringia DPS of the bearded seal (NMFS 2014a).

SFD previously consulted with PRD on the effects of the federal and State parallel groundfish fisheries on ESA-listed species. The 2010 North Pacific Groundfish Fishery Biological Opinion (FMP BiOp) (NMFS 2010) is the most recent comprehensive section 7 consultation on the effects of the groundfish fisheries as authorized under the BSAI Groundfish FMP on ESA-listed species. The FMP BiOp concluded that the fisheries were not likely to jeopardize the continued existence of the eastern distinct population segment (DPS) of Steller sea lions; the Central North Pacific population or the Western North Pacific population of humpback whales; the North Pacific sperm whale population; or the Northeast Pacific fin whale population. The FMP BiOp determined that NMFS could not insure that the Alaska groundfish fisheries in the western and central sub-regions of the Aleutian Islands were not likely to jeopardize the continued existence of the western DPS (WDPS) of Steller sea lions or to adversely modify their designated critical habitat. In 2014, NMFS issued a biological opinion focusing only on the WDPS of Steller sea lions in the Aleutian Islands and found that a new set of proposed Steller sea lion protection measures for the BSAI groundfish fisheries was not likely to jeopardize the continued existence of the WDPS or result in the destruction or adverse modification of critical habitat (NMFS 2014b).

This biological opinion is based on information provided in the Biological Assessment prepared by SFD (NMFS 2014a), the FMP BiOp (NMFS 2010), the 2014 BiOp (NMFS 2014b), the Status Review of the Ringed Seal (*Phoca hispida*) (Kelly et al. 2010a), the Status Review of the Bearded Seal (*Erignathus barbatus*) (Cameron et al. 2010), the proposed and final listing determinations for the ringed and bearded seals (75 FR 77476 and 75 FR 77496, and 77 FR 76706 and 77 FR 76740, respectively), the draft Environmental Assessment for issuing an exempted fishing permit for the purpose of testing a salmon excluder device in the eastern Bering Sea pollock fishery (NMFS 2014c), and relevant scientific literature.

A complete record of this consultation, AKR-2014-9400, is on file at the NMFS Alaska Regional Office.

1.2 Consultation History

On September 17, 2014, SFD requested reinitiation of formal consultation under section 7 of the ESA on the effects of the Alaska groundfish fisheries on the Arctic ringed seal and the Beringia DPS of bearded seals. SFD prepared a biological assessment (NMFS 2014a) and concluded that the groundfish fisheries, including fishing under an EFP to test a salmon excluder device in the Bering Sea pollock fishery, were likely to adversely affect the Arctic ringed seal and the Beringia DPS of bearded seals by direct take incidental to the fisheries.

On September 25, 2014, PRD determined that the information contained in the biological assessment (NMFS 2014a) was sufficient and reinitiated formal consultation.

1.3 Proposed Action

BSAI Groundfish Fisheries

Alaska fisheries in federal waters are managed under fishery management plans (FMPs) authorized by the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The

North Pacific Fishery Management Council (Council) recommends the FMPs and amendments to these FMPs, the Secretary of Commerce approves, disapproves or partially approves these recommendations, and NMFS implements the provisions of the FMPs by federal regulations at 50 CFR parts 679 and 680. All FMPs must comply with the MSA National Standards as well as requirements of other applicable regulations and federal laws, including the ESA. The BSAI Groundfish FMP contains conservation and management measures necessary and appropriate to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of fisheries. The federal fisheries are managed in the waters of the Exclusive Economic Zone (EEZ; 3 to 200 nautical miles offshore). State parallel groundfish fisheries are groundfish fisheries that occur inside State waters from 0 to 3 nm.

Fisheries managed under the BSAI FMP include: walleye pollock (pollock), Pacific cod, sablefish, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, flathead sole, Alaska plaice, other flatfish, Pacific ocean perch, northern rockfish, shortraker rockfish, rougheye rockfish, other rockfish, Atka mackerel, squid, sharks, skates, sculpins, and octopus (Page 11 in (NPFMC 2014). The acceptable biological catch (ABC), overfishing level (OFL), and total allowable catch (TAC) amounts for each target species or species group for 2014 and 2015 were recommended by the Council, and these were approved by the Secretary of Commerce on March 4, 2014 (79 FR 12890, correction 79 FR; Table 1). A detailed description of fisheries management policy, fisheries assessment, and implementation of the federal groundfish fisheries in the BSAI and State parallel groundfish fisheries is provided in Chapter 2 of the FMP BiOp (NMFS 2010) and incorporated here by reference.

Table 1. Overfishing level (OFL), acceptable biological catch (ABC), and total allowable catch (TAC), of selected groundfish in the BSAI for 2014 and 2015.

| Species | Area | 2014 | | | 2015 | | |
|--------------------------------|---------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | OFL | ABC | TAC | OFL | ABC | TAC |
| Pollock | EBS | 2,795,000 | 1,369,000 | 1,267,000 | 2,693,000 | 1,258,000 | 1,258,000 |
| Pacific cod | BS | 299,000 | 255,000 | 246,897 | 319,000 | 272,000 | 251,712 |
| | AI | 20,100 | 15,100 | 6,997 | 20,100 | 15,100 | 6,487 |
| Sablefish | BS | 1,584 | 1,339 | 1,339 | 1,432 | 1,210 | 1,210 |
| Yellowfin sole | BSAI | 259,7000 | 239,800 | 184,000 | 268,900 | 248,300 | 187,000 |
| Greenland Turbot | BS | n/a | 1,659 | 1,659 | n/a | 2,478 | 2,478 |
| Arrowtooth flounder | BSAI | 125,642 | 106,599 | 25,000 | 125,025 | 106,089 | 25,000 |
| Northern Rock Sole | BSAI | 228,700 | 203,800 | 85,000 | 216,310 | 190,100 | 85,000 |
| Flathead sole | BSAI | 79,633 | 66,293 | 24,500 | 77,023 | 64,127 | 25,129 |
| Alaska plaice | BSAI | 66,800 | 55,100 | 24,500 | 66,300 | 54,700 | 25,000 |
| Pacific Ocean Perch | BS | n/a | 7,684 | 7,684 | n/a | 7,340 | 7,340 |
| Northern Rockfish | BSAI | 12,077 | 9,761 | 2,594 | 11,943 | 9,652 | 3,000 |
| Blackspotted/Rougheye Rockfish | EBS/EAI | n/a | 177 | 177 | n/a | 201 | 201 |
| Shortraker Rockfish | BSAI | 493 | 370 | 370 | 493 | 370 | 370 |
| Atka Mackerel | EAI/BS | n/a | 21,652 | 21,652 | n/a | 21,769 | 21,769 |
| Squid | BSAI | 2,624 | 1,970 | 310 | 2,624 | 1,970 | 325 |
| Skate | BSAI | 41,849 | 35,383 | 26,000 | 39,746 | 33,545 | 26,000 |
| Shark | BSAI | 1,363 | 1,022 | 125 | 1,363 | 1,022 | 125 |
| Octopus | BSAI | 3,450 | 2,590 | 225 | 3,450 | 2,590 | 225 |
| Sculpin | BSAI | 56,424 | 42,318 | 5,750 | 56,424 | 42,318 | 5,750 |

Exempted Fishing Permits

Under 50 CFR 679.6, an EFP may be issued to allow exemptions from certain fishery regulations under 50 CFR Part 679. SFD proposes to issue of an EFP to Gauvin and Associates, LLC, to facilitate the continued development and testing of a salmon excluder device for pollock trawl gear in the Bering Sea in 2015 and 2016. This action is needed to develop an additional method for reducing salmon bycatch in the Bering Sea pollock fishery. Salmon bycatch in the Bering Sea pollock fishery is a great concern to those who depend on salmon resources in Alaska and Canada, and further reduction in salmon bycatch is desired by those who use salmon resources and by the pollock fishing industry. The goal of the experiment is to develop an excluder which permits the escapement of salmon while preventing the loss of pollock from the net.

The experiment is limited to the eastern Bering Sea Management Area in the locations commonly used by catcher vessels and catcher/processors to harvest pollock and would be conducted with up to three trawl fishing vessels. A more detailed description of the proposed EFP is provided in NMFS (2014c) and incorporated here by reference. Maps of where fishing is likely to concentrate under the EFP and a table of species harvested under the most recent previous EFP (EFP 11-01) are provided in Table 5 and Figures 7 to 9 of the appendix in NMFS (2014c). NMFS has authorized similar EFPs in the past for salmon excluder devices in the pollock fishery, and SFD anticipates receiving applications for additional similar EFPs in the future to test different gear configurations.

The EFP exempts participating vessel operators from the following provisions of the BSAI groundfish FMP:

- the requirement to adhere to pollock total allowable catch (TAC) limits;
- the accrual of salmon bycatch to the salmon prohibited species catch (PSC) limit;
- fishery closures in the Chum Salmon Savings Area, the Bering Sea Pollock Restriction Area, and the Catcher Vessel Operating Area;
- the fishery closure in the Steller Sea Lion Conservation Area (SCA) provided that the total amount of pollock harvest by all fishing sectors remains below 28% of the annual pollock TAC before April 1;
- observer coverage requirements (though all fishing activities under the EFP would be monitored by NMFS-trained observers to account for groundfish and salmon catch to ensure compliance with the limits specified in the EFP).

Fishing for pollock with trawl gear fitted with a salmon excluder device is mechanically similar to fishing for pollock without the excluder device. The EFP participants would use pelagic trawl gear in the Bering Sea subarea. The areas trawled would be areas previously trawled for pollock. The majority of pollock fishermen in the Bering Sea currently use salmon excluder devices on a regular basis to reduce salmon bycatch and benefit from incentive programs in place for the pollock fishery (NMFS 2014c).¹

The potential harvest of pollock under the proposed EFP is 0.19% of the BSAI pollock TAC in 2014 and 0.39% of the projected BSAI pollock TAC in 2015 (NMFS 2014c). The EFP would permit the harvest of 7,500 mt of pollock and an estimated 1,450 Chinook salmon by one to three vessels. The amounts of other species (e.g., squid, jellyfish) expected to be taken under the EFP are so small that any effects on non-target species would not be discernable from the effects of fishing under the BSAI groundfish FMP (NMFS 2014c).

¹ Fishers have had good success in reducing Chinook salmon bycatch with the current design though further work is needed to design an excluder that is simultaneously effective at reducing Chinook and chum salmon bycatch.

In this biological opinion, we consider the effects of issuing the EFP for 2015 and 2016 and for EFPs that may be issued in the future to test salmon excluder devices in the BSAI pelagic trawl fisheries that are of a similar nature and scale as the 2015 and 2016 EFP. EFPs proposed for future authorization that are not similar in nature and scale to the 2015-16 EFP may require separate consultation.

1.4 Description of the Action Area

The “action area” includes all of the areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this biological opinion includes the areas where the federal and State parallel groundfish fisheries operate in the BSAI. The BSAI is defined as the eastern Bering Sea and that portion of the North Pacific Ocean adjacent to the Aleutian Islands that is west of 170° W, up to the United States – Russian Convention Line of 1867 (Figure 1).

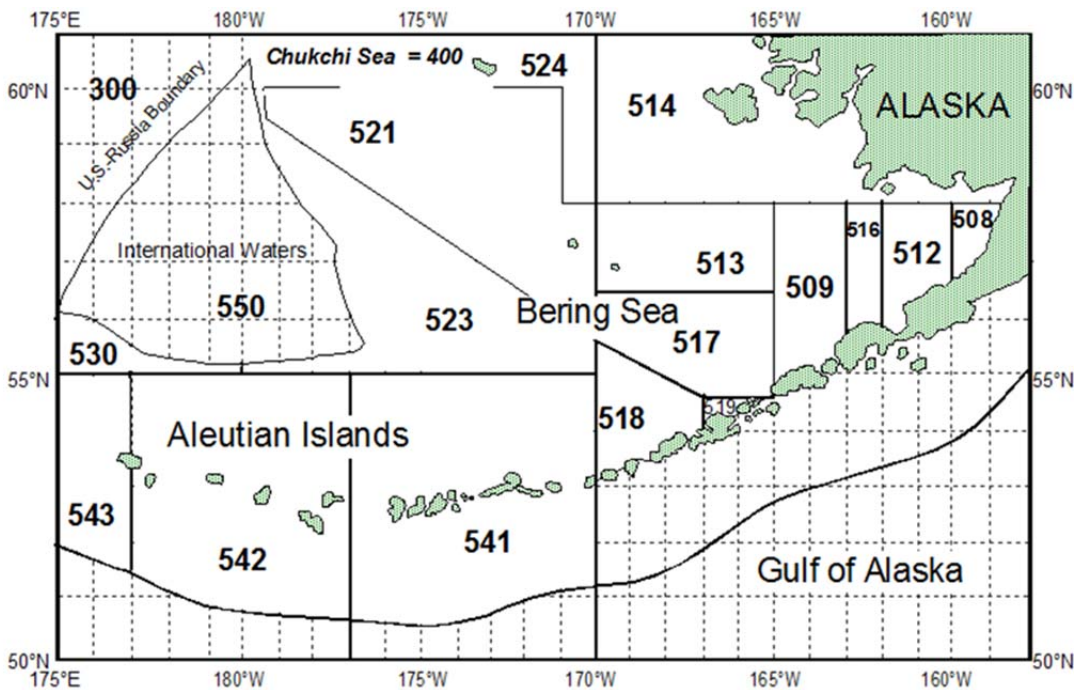


Figure 1. Bering Sea and Aleutian Islands groundfish fishery statistical areas.

2 STATUS OF THE SPECIES

NMFS has determined that the threatened bearded and ringed seals may occur in the action area, and are likely to be adversely affected by the proposed action. This opinion considers the effects of the proposed action on the species listed in Table 2.

Table 2. Species listed under the ESA likely to be adversely affected by the proposed action.

| Species | Stock | Status | Listing | Critical Habitat |
|-------------------------------------|--|---------------|-------------------------------|-------------------------|
| <i>Phoca hispida hispida</i> | Arctic Subspecies of Ringed Seal | Threatened | December 28, 2012 77 FR 76706 | Not yet proposed |
| <i>Erignathus barbatus nauticus</i> | Beringia DPS of the Pacific Bearded Seal | Threatened* | December 28, 2012 77 FR 76740 | Not yet proposed |

* On July 25, 2014, the US District Court for the District of Alaska issued a memorandum decision in a lawsuit challenging the listing of bearded seals under the ESA (Alaska Oil and Gas Association v. Pritzker, Case NO. 4:13-cv-00018-RPB). The decision vacated NMFS’s listing of the Beringia DPS of bearded seals as a threatened species. NMFS is currently appealing that decision. In the interim, our biological opinions under section 7 of the ESA will continue to address effects to bearded seals so that action agencies have the benefit of NMFS’s analysis of the consequences of the proposed action on this DPS, even though the listing of the species is not in effect.

2.1 Arctic Ringed Seal

2.1.1 Population Structure

A single Alaskan stock of ringed seal is recognized in U.S. waters. This stock is part of the Arctic ringed seal subspecies. The genetic structuring of the Arctic subspecies has yet to be thoroughly investigated, and Kelly et al. (2010b) cautioned that it may prove to be composed of multiple distinct populations.

2.1.2 Distribution

Arctic ringed seals have a circumpolar distribution (Figure 2). They occur in all seas of the Arctic Ocean, and range seasonally into adjacent seas including the Bering Sea. In the Chukchi and Beaufort Seas, where they are year-round residents, they are the most widespread seal species. For the purposes of this biological opinion, the Alaska stock of ringed seals is considered the portion of *Phoca hispida hispida* that occurs within the U.S. Exclusive Economic Zone of the Beaufort, Chukchi, and Bering Seas.

Arctic ringed seals have an affinity for ice-covered waters and are able to occupy areas of even continuous ice cover by abrading breathing holes in that ice (Hall 1865, Bailey and Hendee 1926, McLaren 1958). Throughout most of their range, Arctic ringed seals use sea ice as a substrate for resting, pupping, and molting (Kelly et al. 1988, Kelly et al. 2010b). Outside the breeding and molting seasons, they are distributed in waters of nearly any depth; their distribution is strongly correlated with seasonally and permanently ice-covered waters and food availability (e.g. Simpkins et al. 2003, Freitas et al. 2008).

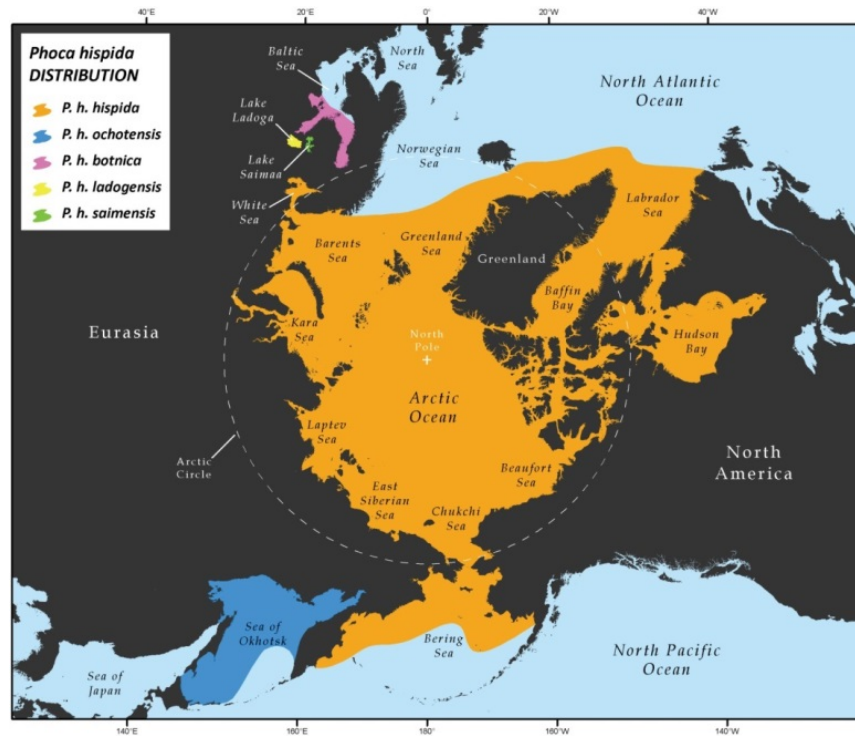


Figure 2. Distributions of five subspecies of ringed seals, including the Arctic ringed seal’s distribution which is shown in orange. Source: Kelly et al. 2010).

The seasonality of ice cover strongly influences ringed seal movements, foraging, reproductive behavior, and vulnerability to predation. Three ecological seasons have been described as important to ringed seals: the “open-water” or “foraging” period when ringed seals forage most intensively, the subnivean period in early winter through spring when seals rest primarily in subnivean lairs (snow caves) on the ice, and the basking period between lair abandonment and ice break-up (Born et al. 2004, Kelly et al. 2010a).

Overall, the record from satellite tracking indicates that during the foraging period, ringed seals breeding in shorefast ice either forage within 100 km of their shorefast breeding habitat or they make extensive movements of hundreds or thousands of kilometers to forage in highly productive areas and along the pack ice edge (Freitas et al. 2008, Kelly et al. 2010b). Movements during the foraging period by ringed seals that breed in the pack ice are unknown. During the winter subnivean period, ringed seals excavate lairs in the snow above breathing holes where the snow depth is sufficient. These lairs are occupied for resting, pupping, and nursing young in annual shorefast and pack ice. Movements during the subnivean period are typically limited, especially when ice cover is extensive. During the late spring basking period, ringed seals haul out on the surface of the ice for their annual molt.

2.1.3 Status

Ringed seal population surveys have not been completed in Alaska for over a decade and no complete population survey has been conducted (Allen and Angliss 2014). Therefore, there are

no specific estimates of population size available for the Arctic subspecies of the ringed seal, but most experts would postulate that population numbers are in the millions. Based on the available abundance estimates for study areas within the Chukchi-Beaufort Sea region and extrapolations for pack ice areas without survey data, Kelly et al. (2010b) indicated that a reasonable estimate for the Chukchi and Beaufort Seas is one million seals, and for the Alaskan portions of these seas is at least 300,000 seals. This estimate is based on estimates from surveys in Bengtson et al. (2005) and Frost et al. (2004) in the late 1990s and 2000. This is not considered a reliable minimum population estimate. It is likely an underestimate of the population size in Alaska (Allen and Angliss 2014).

Bengtson et al. (2005) estimated the abundance of ringed seals from spring aerial surveys conducted along the eastern Chukchi coast from Shishmaref to Barrow at 252,000 seals in 1999 and 208,000 in 2000 (corrected for seals not hauled out). However, the estimates from 1999 and 2000 in the Chukchi Sea only covered a portion of this stock's range (Allen and Angliss 2014).

Current and reliable data on trends in abundance for the Alaska stock of ringed seals are unavailable. PBR for this stock is also unknown at this time (Allen and Angliss 2014).

2.1.4 Threats to the Species

Threats to Arctic ringed seals are described in detail in the species' Status Review (Kelly et al. 2010b) and the proposed listing rule (75 FR 77476), and are briefly summarized below. Details about individual threats in the action area will also be discussed in the *Environmental Baseline* section.

Predation. Polar bears are the main predator of ringed seals, but other predators include Arctic and red foxes, walruses, wolves, wolverines, killer whales, and ravens (Burns and Eley 1976, Heptner et al. 1976b, Fay et al. 1990, Derocher et al. 2004, Melnikov and Zagrebin 2005). The threat currently posed to ringed seals by predation is moderate, but predation risk is expected to increase as snow and sea ice conditions change with a warming climate (75 FR 77476).

Parasites and Diseases. Ringed seals have co-evolved with numerous parasites and diseases, and these relationships are presumed to be stable. Since July 2011, more than 60 dead and 75 diseased seals, mostly ringed seals, have been reported in Alaska. The underlying cause of the disease remains unknown, and is under investigation. Kelly et al. (2010b) noted that abiotic and biotic changes to ringed seal habitat could lead to exposure to new pathogens or new levels of virulence, but the threat of parasites and disease to ringed seals is considered to be low.

Climate Change: Loss of Sea Ice and Snow Cover. Diminishing sea ice and snow cover is identified as the greatest threat to the persistence of Arctic ringed seals. Within this century, snow cover is projected to be inadequate for the formation and occupation of birth lairs over a substantial portion of the subspecies' range. Without the protection of the lairs, ringed seals—especially newborn—are vulnerable to freezing and predation (75 FR 77476). Additionally, high

fidelity to birthing sites exhibited by ringed seals makes them more susceptible to localized degradation of snow cover (Kelly et al. 2010b).

Climate Change: Ocean Acidification. Although no scientific studies have directly addressed the impacts of ocean acidification on ringed seals, the effects would likely be through their ability to find food. The decreased availability or loss of prey species from the ecosystem may have a cascading effect on ringed seals (Kelly et al. 2010b).

Harvest. Ringed seals were harvested commercially in large numbers during the 20th century, which led to the depletion of their stocks in many parts of their range. Arctic ringed seals have been hunted by humans for millennia and while commercial harvests have been banned since 1972, ringed seals remain a fundamental subsistence resource for many northern coastal communities today. The number of seals taken annually varies considerably between years due to ice and wind conditions, which impact hunter access to seals. Currently there is no comprehensive effort to quantify harvest levels of seals in Alaska. As of August 2000 the subsistence harvest database indicated that the statewide annual ringed seal subsistence harvest is 9,567 (Allen and Angliss 2014). Data on community subsistence harvests are no longer being collected and no new annual harvest estimates exist. Kelly et al. (2010b) concluded that although subsistence harvest of Arctic ringed seals is currently substantial in some parts of their range, harvest levels appear to be sustainable.

Commercial Fisheries Interactions. Commercial fisheries may impact ringed seals through direct interactions (i.e., incidental take or bycatch) and indirectly through competition for prey resources and other impacts on prey populations. Based on data from 2007 and 2011, there have been an average of 3.52 (CV=0.06) mortalities of ringed seals incidental to commercial fishing operations per year (Allen and Angliss 2014).

For indirect interactions, Kelly et al. (2010b) noted that commercial fisheries target a number of known ringed seal prey species such as walleye pollock (*Theragra chalcogramma*), Pacific cod, herring (*Clupea* sp.), and capelin. These fisheries may affect ringed seals indirectly through reductions in prey biomass and through other fishing mediated changes in ringed seal prey species. The extent that reduced numbers in individual fish stocks affect the viability of Arctic ringed seals is unknown. However, Arctic ringed seals were not believed to be significantly competing with or affected by commercial fisheries in the waters of Alaska (Frost 1985, Kelly et al. 1988).

Shipping. Current shipping activities in the Arctic pose varying levels of threats to Arctic ringed seals depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with ringed seal habitats. These factors are inherently difficult to know or predict, making threat assessment highly uncertain. Most ships in the Arctic avoid areas of ice. This necessarily mitigates many of the risks of shipping to ringed seals. Icebreakers pose special risks to ringed seals because they are capable of operating year-round in all but the heaviest ice

conditions and are often used to escort other types of vessels (e.g., tankers and bulk carriers) through ice-covered areas.

Contamination. Contaminants research on Arctic ringed seals has been conducted in most parts of the subspecies' range. Pollutants such as organochlorine (OC) compounds and heavy metals have been found in Arctic ringed seals. The variety, sources, and transport mechanisms of the contaminants vary across the ringed seal's range, but these compounds appear to be ubiquitous in the Arctic marine food chain. Statistical analysis of OCs in marine mammals has shown that for most OCs, the European Arctic is more contaminated than the Canadian and U.S. Arctic. Tynan and DeMaster (1997) note that climate change may increase the transport of pollutants from lower latitudes to the Arctic, highlighting the importance of continued monitoring of contaminant levels.

Oil and Gas Activities

Oil and gas activities may impact ringed seals primarily through noise, physical disturbance, and pollution, particularly in the event of a large oil spill. Within the range of the Arctic ringed seal, offshore oil and gas exploration and production activities are currently underway in the United States, Canada, Greenland, Norway, and Russia. Oil and gas activities have been conducted off the coast of Alaska since the 1970s, with most of the activity occurring in the Beaufort Sea. Although five exploratory wells have been drilled in the past, no oil fields have been developed or brought into production in the Chukchi Sea to date.

2.1.5 Feeding and Prey Selection

Many studies of the diet of Arctic ringed seal have been conducted and although there is considerable variation in the diet regionally, several patterns emerge. Most ringed seal prey is small, and preferred prey tends to be schooling species that form dense aggregations. Ringed seals rarely prey upon more than 10-15 prey species in any one area, and not more than 2-4 of those species are considered important prey. Fishes are generally more commonly eaten than invertebrate prey, but diet is determined to some extent by availability of various types of prey during particular seasons as well as preference, which in part is guided by energy content of various available prey (Reeves 1998, Wathne et al. 2000). Invertebrate prey seem to become more important in the diet of Arctic ringed seals in the open water season and often dominate the diet of young animals (e.g., Lowry et al. 1980, Holst et al. 2001).

Despite regional and seasonal variations in the diet of Arctic ringed seals, fishes of the cod family tend to dominate the diet from late autumn through early spring in many areas (Kovacs 2007). Arctic cod (*Boreogadus saida*) is often reported to be the most important prey species for ringed seals, especially during the ice-covered periods of the year (Lowry et al. 1980, Smith 1987, Holst et al. 2001, Labansen et al. 2007). Quakenbush et al. (2011b) reported evidence that in general, the diet of Alaska ringed seals sampled consisted of cod, amphipods, and shrimp. They found that fish were consumed more frequently in the 2000s than during the 1960s and

1970s, and identified the five dominant species or taxa of fishes in the diet during the 2000s as: Arctic cod, saffron cod, sculpin, rainbow smelt, and walleye pollock. Invertebrate prey were predominantly mysids, amphipods, and shrimp, with shrimp most dominant.

2.1.6 Diving, Hauling out, and Social Behavior

Behavior of ringed seals is poorly understood because both males and females spend much of their time in lairs built in pressure ridges or under snowdrifts for protection from predators and severe weather.

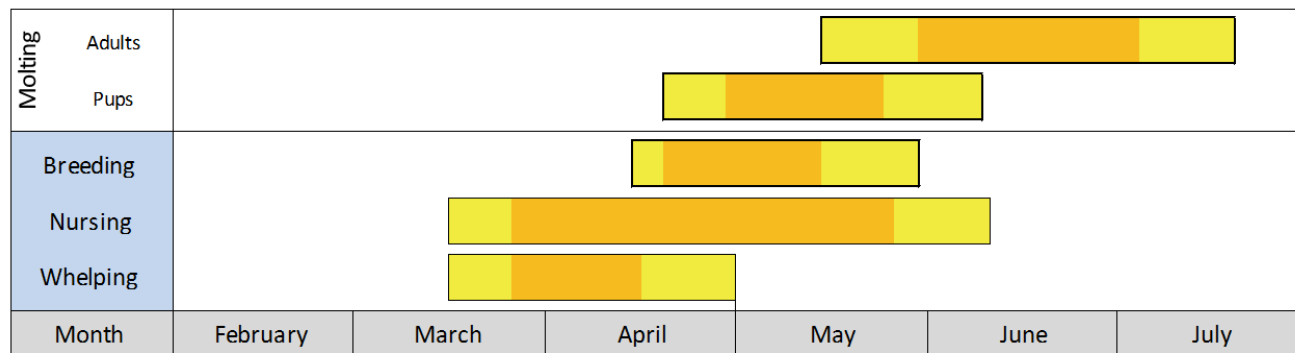


Figure 3. Approximate annual timing of reproduction and molting for Arctic ringed seals. Yellow bars indicate the “normal” range over which each event is reported to occur and orange bars indicated the “peak” timing of each event (source: Kelly et al. 2010b).

Arctic ringed seals use sea ice as a platform for resting throughout the year, and they make and maintain breathing holes in the ice from freeze-up until breakup (Frost et al. 2002). They normally give birth in late winter-early spring in subnivean lairs constructed in the snow on the sea ice above breathing holes, and mating takes place typically in May shortly after parturition. In the spring, as day length and temperature increase, ringed seals haul out in large numbers on the surface of the ice near breathing holes or lairs. This behavior is associated with the annual May-July molt (see Figure 3).

Ringed seal pups spend about 50% of their time in the water during the nursing period, diving for up to 12 minutes and as deep as 89 m (Lydersen and Hammill 1993). The pups’ large proportion of time spent in the water, early development of diving skills, use of multiple breathing holes and nursing/resting lairs, and prolonged lanugo stage were interpreted as adaptive responses to strong predation pressure, mainly by polar bears (*Ursus maritimus*) and Arctic foxes (*Alopex lagopus*) (Smith and Lydersen 1991, Lydersen and Hammill 1993).

Tagging studies revealed that Arctic ringed seals are capable of diving for at least 39 minutes (Teilmann et al. 1999) and to depths of over 500 m (Born et al. 2004); however, most dives reportedly lasted less than 10 minutes and dive depths were highly variable and were often limited by the relative shallowness of the areas in which the studies took place (Lydersen 1991,

Kelly and Wartzok 1996, Teilmann et al. 1999, Gjertz et al. 2000a). Based on three-dimensional tracking, Simpkins et al. (2001) categorized ringed seal dives as either travel, exploratory, or foraging/social dives. Ringed seals tend to come out of the water during the daytime and dive at night during the spring to early summer breeding and molting periods, while the inverse tended to be true during the late summer, fall, and winter (Kelly and Quakenbush 1990, Lydersen 1991, Teilmann et al. 1999, Carlens et al. 2006, Kelly et al. 2010b). Captive diving experiments conducted by Elsner et al. (1989) indicated that ringed seals primarily use vision to locate breathing holes from under the ice, followed by their auditory and vibrissal senses for short-range pilotage.

2.2 Beringia DPS of Bearded Seals

2.2.1 Population Structure

There are two recognized subspecies of the bearded seal: *E. b. barbatus*, often described as inhabiting the Atlantic sector (Laptev, Kara, and Barents seas, North Atlantic Ocean, and Hudson Bay; (Rice 1998)); and *E. b. nauticus*, which inhabits the Pacific sector (remaining portions of the Arctic Ocean and the Bering and Okhotsk seas; (Ognev 1935, Scheffer 1958, Manning 1974, Heptner et al. 1976a). Geographic boundaries for the divisions between the two subspecies are subject to the caveat that distinct boundaries do not appear to exist (Cameron et al. 2010). Two distinct population segments were identified for the *E. b. nauticus* subspecies—the Okhotsk DPS in the Sea of Okhotsk, and the Beringia DPS, encompassing the remainder of the range of this subspecies. Only the Beringia DPS of bearded seals is found in U.S. waters (and the action area), and these are of a single recognized Alaska stock.

2.2.2 Distribution

Bearded seals have a circumpolar distribution (Burns 1967, 1981; Fedoseev 1965; Johnson et al. 1966; Kelly 1988; Smith 1981), and the range of the *E. b. nauticus* subspecies includes portions of the Arctic Ocean and the Bering and Okhotsk Seas (Heptner et al. 1976; Manning 1974; Ognev 1935; Scheffer 1958) (Figure 6). Bearded seals primarily feed on benthic organisms that are more numerous in shallow water where light can reach the seafloor (Fedoseev 1965). Thus, the bearded seals' effective range is generally restricted to areas where seasonal sea ice occurs over relatively shallow waters, typically less than 200 m, where they are able to reach the ocean floor to forage (Burns 1981; Burns and Frost 1979; Fedoseev 1984, 2000; Heptner et al. 1976; Kosygin 1971; Kovacs 2002; Nelson et al. 1984). Cameron et al. (2010) defined the core distribution of bearded seals as those areas over waters less than 500 m deep.

The region that includes the Bering and Chukchi seas is the largest area of continuous habitat for bearded seals (Burns 1981, Nelson et al. 1984). The Bering-Chukchi Platform is a shallow intercontinental shelf that encompasses half of the Bering Sea, spans the Bering Strait, and covers nearly all of the Chukchi Sea. Bearded seals can reach the bottom everywhere along the shallow shelf and so it provides them favorable foraging habitat (Burns 1967). The Bering and Chukchi seas are generally covered by sea ice in late winter and spring and are then mostly ice

free in late summer and fall, a process that helps drive a seasonal pattern in the movements and distribution of bearded seals in this area (Burns 1967, 1981, Nelson et al. 1984). During winter, most bearded seals in Alaskan waters are found in the Bering Sea, while smaller numbers of year-round residents remain in the Beaufort and Chukchi Seas. From mid-April to June, as the ice recedes, many bearded seals that overwinter in the Bering Sea migrate northward through the Bering Strait into the Chukchi and Beaufort Seas, where they spend the summer and early fall at the southern edge of the Chukchi and Beaufort Sea pack ice at the wide, fragmented margins of multiyear ice. A small number of bearded seals, mostly juveniles, remain near the coasts of the Bering and Chukchi seas for the summer and early fall instead of moving with the ice edge. These seals are found in bays, brackish water estuaries, river mouths, and have been observed up some rivers (Burns 1967, Heptner et al. 1976a, Burns 1981).

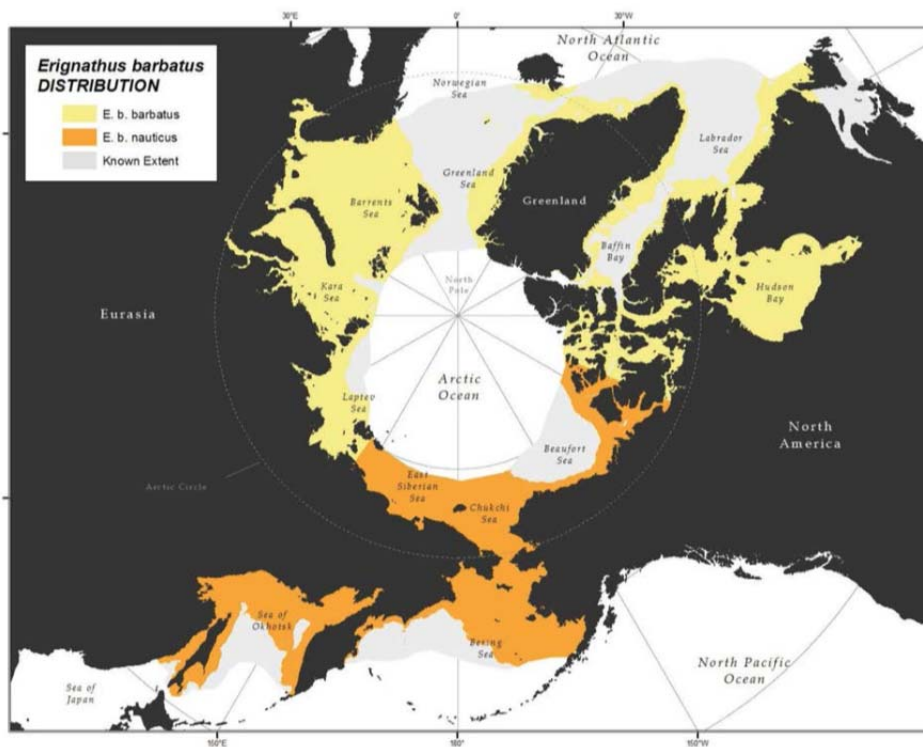


Figure 4. The global distribution of bearded seals as adapted from maps of known extent in Burns (1981) and Kovacs (2002). The colored areas of core distribution are those areas of known extent that are in waters less than 500 m deep. The subspecies range boundaries were approximated from the literature (Cameron et al., 2010).

2.2.3 Status

Current abundance estimates for the Beringia DPS are highly uncertain. Based on extrapolated aerial survey data, Cameron et al. (2010) estimated the current population of bearded seals in the Bering Sea to be about double the 63,200 estimate reported by Ver Hoef et al. (2010), or approximately 125,000 individuals. Cameron et al. (2010) derived crude estimates of: 3,150

bearded seals for the Beaufort Sea (uncorrected for seals in the water), which was noted as likely a substantial underestimate given the known subsistence harvest of bearded seals in this region; and about 27,000 seals for the Chukchi Sea based on extrapolation from limited aerial surveys (also uncorrected for seals in the water). Based on these numbers, the Alaskan stock of bearded seals is considered greater than approximately 155,000 (77 FR 76740) and may be as large as 250,000-300,000 (Popov 1976, Burns 1981).

At present, reliable data on the minimum population estimate, trends in population abundance or the maximum net productivity rate of the Alaska stock of bearded seals are unavailable (Allen and Angliss 2014). Because a reliable estimate of minimum abundance is currently not available, the PBR for this stock is unknown (Allen and Angliss 2014).

2.2.4 Threats to the Species

Threats to the Beringia DPS of bearded seal are described in detail in the species' Status Review (Cameron et al. 2010) and the proposed listing rule (75 FR 77496), and are briefly summarized below. Details about individual threats in the action area will also be discussed in the *Environmental Baseline* section.

Predation. Polar bears are the primary predator of bearded seals. Other predators include brown bears, killer whales, sharks, and walruses (seemingly infrequent). Predation under the future scenario of reduced sea ice is difficult to assess; polar bear predation may decrease, but predation by killer whales, sharks, and walrus may increase (Cameron et al. 2010).

Parasites and Diseases. A variety of diseases and parasites have been documented to occur in bearded seals. The seals have likely coevolved with many of these and the observed prevalence is typical and similar to other species of seals. However, since July 2011, over 100 sick or dead seals have been reported in Alaska. The cause of the Arctic seal disease remains unknown, and is under investigation. Abiotic and biotic changes to bearded seal habitat may lead to exposure to new pathogens or new levels of virulence, but the potential threats to ringed seals were considered low (Cameron et al. 2010).

Climate Change: Sea Ice Loss. For at least part of the year, bearded seals rely on the presence of sea ice over the productive and shallow waters of the continental shelves where they have access to food—primarily benthic and epibenthic organisms—and a platform for hauling out of the water. With loss of sea ice, the spring and summer ice edge may retreat to deep waters of the Arctic Ocean basin, which could separate sea ice suitable for pup maturation and molting from benthic feeding areas.

Climate Change: Ocean Acidification. The process of ocean acidification has long been recognized, but the ecological implications of such chemical changes have only recently begun to be appreciated. The waters of the Arctic and adjacent seas are among the most vulnerable to ocean acidification. The most likely impact of ocean acidification on bearded seals will be through the loss of benthic calcifiers and lower trophic levels on which the species' prey

depends. Cascading effects are likely both in the marine and freshwater environments. Our limited understanding of planktonic and benthic calcifiers in the Arctic (*e.g.*, even their baseline geographical distributions) means that future changes are difficult to detect and evaluate. However, due to the bearded seals' apparent dietary flexibility, these threats are of less concern than the direct effects of potential sea ice degradation.

Ocean acidification may also impact bearded seals by affecting the propagation of sound in the marine environment. Researchers have suggested that effects of ocean acidification will cause low-frequency sounds to propagate more than 1.5X as far (Hester et al. 2008, Brewer and Hester 2009), which, while potentially extending the range bearded seals can communicate under quiet conditions, will increase the potential for masking when man-made noise is present.

Harvest. Bearded seals were among those species hunted by early Arctic inhabitants (Krupnik 1984), and today they remain a central nutritional and cultural resource for many northern communities (Hart and Amos 2004, ACIA 2005, Hovelsrud et al. 2008). The solitary nature of bearded seals has made them less suitable for commercial exploitation than many other seal species. Still, within the Beringia DPS they may have been depleted by commercial harvests in the Bering Sea during the mid-20th century.

Alaska Native hunters mostly take bearded seals of the Beringia DPS during their northward migration in the late spring and early summer, using small boats in open leads among ice floes close to shore (Kelly et al. 1988). Allen and Angliss (2014) reported that based on subsistence harvest data maintained by ADFG primarily for the years 1990 to 1998, the mean estimated annual harvest level in Alaska averaged 6,788 bearded seals as of August 2000. Data on community subsistence harvests are no longer being collected and no new annual harvest estimates exist (Allen and Angliss 2014). Cameron et al. (2010) noted that ice cover in hunting locations can dramatically affect the availability of bearded seals and the success of hunters in retrieving seals that have been shot, which can range from 50-75% success in the ice (Burns and Frost 1979, Reeves et al. 1992) to as low as 30% in open water (Burns 1967, Smith and Taylor 1977, Riewe and Amsden 1979, Koski and Davis 1980). Using the mean annual harvest reported from 1990-1998, assuming 25 to 50% of seals struck are lost, they estimated the total annual hunt by Alaska Natives would range from 8,485 to 10,182 bearded seals. The best estimate of the total statewide annual harvest currently available is 6,788 bearded seals (Allen and Angliss 2014).

Assuming contemporary harvest levels in eastern Siberia are similar to Alaska, as was the pattern in the 1970s and 1980s, and a comparable struck-loss rate of 25-50%, the total annual take from the entire Bering and Chukchi Seas would range from 16,970 to 20,364 bearded seals (Cameron et al. 2010). In the western Canadian Beaufort Sea, bearded seal hunting has historically been secondary to ringed seal harvest, and its importance has declined further in recent times (Cleator 1996). Cameron et al. (2010) concluded that although the current subsistence harvest is

substantial in some areas, there is little or no evidence that subsistence harvests have or are likely to pose serious risks to the Beringia DPS (Cameron et al. 2010).

Commercial Fisheries Interactions. Commercial fisheries may impact bearded seals through direct interactions (i.e., incidental take or bycatch) and indirectly through competition for prey resources and other impacts on prey populations. Estimates of bearded seal bycatch could only be found for commercial fisheries that operate in Alaska waters. Between 2007 and 2011, there were incidental serious injuries and mortalities of bearded seals in the Bering Sea/Aleutian Islands Pollock trawl and the Bering Sea/Aleutian Islands flatfish trawl. The estimated minimum mortality rate incidental to commercial fisheries is 1.8 (CV= 0.05) bearded seals per year, based exclusively on observer data (Allen and Angliss 2014). For indirect impacts, Cameron et al. (2010) noted that commercial fisheries target a number of known bearded seal prey species, such as walleye pollock (*Theragra chalcogramma*) and cod. Bottom trawl fisheries also have the potential to indirectly affect bearded seals through destruction or modification of benthic prey and/or their habitat.

Shipping. Current shipping activities in the Arctic pose varying levels of threats to bearded seals depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with bearded seal habitats. These factors are inherently difficult to know or predict, making threat assessment highly uncertain. Most ships in the Arctic avoid areas of ice. This necessarily mitigates many of the risks of shipping to bearded seals. Icebreakers pose special risks to bearded seals because they are capable of operating year-round in all but the heaviest ice conditions and are often used to escort other types of vessels (e.g., tankers and bulk carriers) through ice-covered areas.

Research. Mortalities may occasionally occur incidental to marine mammal research activities authorized under the MMPA permits issued to a variety of government, academic, and other research organizations. Between 2003-2007, there was one mortality resulting from research on the Alaska stock of bearded seals, which results in an average of 0.2 mortalities per year from this stock (Tammy Adams, Permits, Conservation, and Education Division, Office of Protected Resources, pers comm. as cited in (Allen and Angliss 2014).

Contamination. Research on contaminants and bearded seals is limited compared to the extensive information available for ringed seals. Pollutants such as OC compounds and heavy metals have been found in most bearded seal populations. The variety, sources, and transport mechanisms of the contaminants vary across the bearded seal's range, but these compounds appear to be ubiquitous in the Arctic marine food chain. Statistical analysis of OCs in marine mammals has shown that, for most OCs, the European Arctic is more contaminated than the Canadian and U.S. Arctic. Tynan and DeMaster (1997) noted climate change has the potential to increase the transport of pollutants from lower latitudes to the Arctic, highlighting the importance of continued monitoring of bearded seal contaminant levels.

Oil and Gas. Within the range of the Beringia DPS, offshore oil and gas exploration and production activities are underway in the United States, Canada, and Russia. Oil and gas exploration, development, and production activities include: seismic surveys; exploratory, delineation, and production drilling operations; construction of artificial islands, causeways, ice roads, shore-based facilities, and pipelines; and vessel and aircraft operations. These activities have the potential to impact bearded seals, primarily through noise, physical disturbance, and pollution, particularly in the event of a large oil spill.

Oil and gas activities have been conducted off the coast of Arctic Alaska since the 1970s, with most of the activity occurring in the Beaufort Sea. Although five exploratory wells have been drilled in the past, no oil fields have been developed or brought into production in the Chukchi Sea to date. Lease sale plans for 2012 through 2017 include areas in the Beaufort Sea, Chukchi Sea and Cook Inlet (BOEM 2012).

2.2.5 Feeding and Prey Selection

Bearded seals feed primarily on a variety of invertebrates (crabs, shrimp, clams, worms, and snails) and some fishes found on or near the sea bottom (Burns 1981, Kelly et al. 1988, Reeves et al. 1992, Hjelset et al. 1999, Cameron et al. 2010). They primarily feed on or near the bottom, diving to depths of less than 100 m (though dives of adults have been recorded up to 300 m and young-of-the-year have been recorded diving down to almost 500 m; (Gjertz et al. 2000b). Unlike walrus that root in the soft sediment for benthic organisms, bearded seals are believed to scan the surface of the seafloor with their highly sensitive whiskers, burrowing only in the pursuit of prey (Marshall et al. 2006, Marshall et al. 2008). They are also able to switch their diet to include schooling pelagic fishes when advantageous. Satellite tagging indicates that adults, subadults, and to some extent pups, show some level of fidelity to feeding areas, often remaining in the same general area for weeks or months at a time (Cameron 2005, Cameron and Boveng 2009). Diets may vary with age, location, season, and possible changes in prey availability (Kelly et al. 1988).

Quakenbush et al. (2011a) reported that fish consumption appeared to increase between the 1970s and 2000s for Alaska bearded seals sampled in the Bering and Chukchi Seas, although the difference was not statistically significant. Bearded seals also commonly consumed invertebrates, which were found in 95% of the stomachs sampled. In the 2000s, sculpin, cod, and flatfish were the dominant fish taxa consumed (Quakenbush et al. 2011a). The majority of invertebrate prey items identified in the 2000s were mysids, isopods, amphipods, and decapods. Decapods were the most dominant class of invertebrates, and were strongly correlated with the occurrence of shrimp and somewhat correlated with the occurrence of crab. Mollusks were also common prey, occurring in more than half of the stomachs examined throughout the years of the study.

2.2.6 Diving, Hauling out, and Social Behavior

The diving behavior of adult bearded seals is closely related to their benthic foraging habits and in the few studies conducted so far, dive depths have largely reflected local bathymetry (Gjertz et al. 2000b, Krafft et al. 2000). Studies using depth recording devices have until recently focused on lactating mothers and their pups. These studies showed that mothers in the Svalbard Archipelago make relatively shallow dives, generally <100 m in depth, and for short periods, generally less than 10 min in duration. Nursing mothers dived deeper on average than their pups, but by 6 weeks of age most pups had exceeded the maximum dive depth of lactating females (448-480 m versus 168-472 m) (Gjertz et al. 2000b). Adult females spent most of their dive time (47-92%) performing U-shaped dives, believed to represent bottom feeding (Krafft et al. 2000); U-shaped dives are also common in nursing pups (Lydersen et al. 1994).

There are only a few quantitative studies concerning the activity patterns of bearded seals. Based on limited observations in the southern Kara Sea and Sea of Okhotsk it has been suggested that from late May to July bearded seals haul out more frequently on ice in the afternoon and early evening (Heptner et al. 1976a). From July to April, three males (two subadults and one young adult) tagged as part of a study in the Bering and Chukchi Seas rarely hauled out at all, even when occupying ice covered areas. This is similar to both male and female young-of-year bearded seals instrumented in Kotzebue Sound, Alaska (Frost et al. 2008); suggesting that, at least in the Bering and Chukchi Seas, bearded seals may not require the presence sea ice for a significant part of the year. The timing of haulout was different between the age classes in these two studies however, with more of the younger animals hauling out in the late evening (Frost et al. 2008) while adults favored afternoon.²

Other studies using data recorders and telemetry on lactating females and their dependent pups showed that, unlike other large phocid seals, they are highly aquatic during a nursing period of about three weeks (Lydersen and Kovacs 1999). At Svalbard Archipelago, nursing mothers spent more than 90% of their time in the water, split equally between near-surface activity and diving/foraging (Holsvik 1998, Krafft et al. 2000), while dependent pups spent about 50% of their time in the water, split between the surface (30%) and diving (20%) (Lydersen et al. 1994, Lydersen et al. 1996, Watanabe et al. 2009). In addition to acquiring resources for lactation, time spent in the water may function to minimize exposure to surface predators (Lydersen and Kovacs 1999, Krafft et al. 2000). Mothers traveled an average 48 km per day and alternated time in the water with one to four short bouts on the ice to nurse their pups usually between 0900 h and 2100 h (Krafft et al. 2000). This diurnal pattern also coincides with the timing of underwater mating calls by breeding males (Cleator et al. 1989, Van Parijs et al. 2001). In the spring, adult males are suspected to spend a majority of their time in the water vocalizing and defending territories, though a few observations suggest they are not entirely aquatic and may haul out near

² M. Cameron, Unpubl. data, National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115, as cited in (Cameron et al. 2010).

females with or without pups (Krylov et al. 1964, Burns 1967, Fedoseev 1971, Finley and Renaud 1980).

3 ENVIRONMENTAL BASELINE

The “environmental baseline” includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The action area for this biological opinion is defined in section 1.4.

3.1 Stressors for Species in the Action Area

The following discussion summarizes the principal stressors that affect threatened ringed and bearded seals.

3.1.1 Subsistence Harvest

While substantial commercial harvest of both ringed and bearded seals in the late 19th and 20th Centuries led to local depletions, commercial harvesting of ice seals has been prohibited in U.S. waters since 1972 by the MMPA. Since that time, the only harvest of ringed and bearded seals allowed in U.S. waters is for subsistence for Alaska Native communities.

As described in Chapter 2, bearded and ringed seals are an important species for Alaska subsistence hunters. Historical subsistence harvest data are presented in Chapter 2. Data on contemporary harvest levels of ringed and bearded seals by Alaska communities are no longer being collected (Allen and Angliss 2014). Therefore, for this biological opinion we assume that subsistence harvest levels in the action area are similar to historical harvests which are estimated to be approximately 9,567 ringed seals and 8,485 to 10,182 bearded seals per year.

3.1.2 Acoustic Noise

Levels of anthropogenic (human-caused) sound can vary dramatically depending on the season, type of activity, and local conditions. These noise sources include transportation, dredging, and construction; oil, gas, and mineral exploration in offshore areas; geophysical (seismic) surveys; sonars; explosions; and ocean research activities (Richardson et al. 1995).

Several investigators have argued that anthropogenic sources of noise have increased ambient noise levels in the ocean over the last 50 years (NRC 1994, 1996, 2000, 2003, 2005; Richardson et al. 1995). As discussed in the preceding section, much of this increase is due to increased shipping as ships become more numerous and of larger tonnage (NRC 2003).

3.1.3 Shipping

A comprehensive survey of all shipping activity in the Arctic was conducted using 2004 as the baseline year (Arctic Council 2009). Responses to the survey varied greatly between Arctic

states. Several states were unable to provide complete data for 2004; therefore, the survey likely underestimated shipping activity during the reporting year. It is estimated that approximately 6,000 individual vessels operated in the Arctic during 2004. About half of these vessels were traveled along the Great Circle Route through the Aleutian Islands in the North Pacific Ocean/southern Bering Sea. Excluding vessels using the Great Circle Route, the most vessels by category were fishing vessels at about 1,600 or slightly less than 50% of the remaining total, followed by bulk carriers at about 20%. Shipping activity is highly concentrated in the ice-free regions of the Bering Sea (Figure 5) – including fishing operations, scientific explorations, and transport of marine goods and resources.

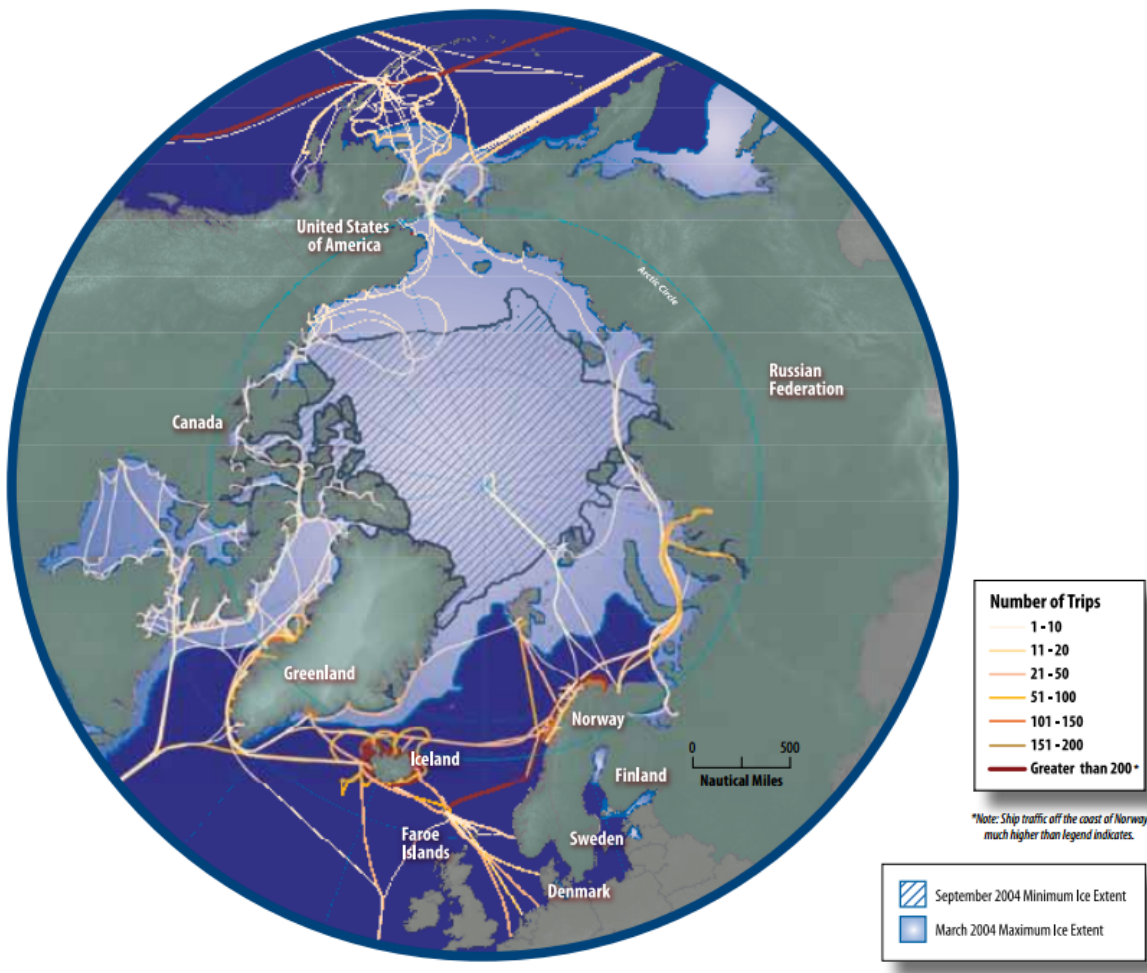


Figure 5. Shipping traffic in the Arctic for survey year 2004. *Ship traffic off the coast of Norway much higher than the legend indicates. Source: Arctic Council 2009.

Potential threats to ringed and bearded seals posed by shipping activities include accidental or illegal discharge of oil or other toxic substances, disturbance from vessel noise, vessel strikes and indirect contributions to global climate change and air pollution (Kelly et al. 2010a, Cameron et al. 2010).

Ship Strikes

Vessel traffic can pose a threat to marine mammals because of the risk of ship strikes. Although there is no official reporting system for ship strikes, numerous incidents of vessel collisions with marine mammals have been documented in Alaska (NMFS 2010c).

Current shipping activities in the Arctic pose varying levels of threats to ice seals depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with ice seal habitats. The presence and movements of ships in the vicinity of some seals can affect their normal behavior (Jansen et al. 2010) and may cause ringed seals to abandon their preferred breeding habitats in areas with high traffic (Smiley and Milne 1979, Mansfield 1983). To date, no bearded or ringed seal carcasses have been found with propeller marks. However, Sternfield (2004) documented a singled spotted seal stranding in Bristol Bay, Alaska that may have resulted from a propeller strike. Icebreakers pose special risks to ice seals because they are capable of operating year-round in all but the heaviest ice conditions and are often used to escort other types of vessels (*e.g.*, tankers and bulk carriers) through ice-covered areas. Reeves (1998) noted that some ringed seals have been killed by ice-breakers moving through fast-ice breeding areas.

In a preliminary assessment of future threats to Arctic marine mammals, Huntington (2009) considered shipping to be a low level threat with modest impacts that should be amenable to effective regulation. The ringed and bearded seal Biological Review Teams (BRT) (Kelly et al. 2010a and Cameron et al. 2010) used a scale from 1 to 4 to rank threats to the persistence of ringed seal subspecies; 1 represents low or zero threat, 2 represents moderate threat, 3 a high threat, and 4 represents a very high threat. The BRT ranked threats associated with shipping from a low of 1.4 (noise pollution associated with shipping) to a high of 1.6 (physical disturbance, injury or mortality from shipping) for the Arctic subspecies of the ringed seal (Kelly et al. 2010a). The BRT ranked both of these threats as 1.5 for the Beringia DPS of bearded seals (Cameron et al. 2010).

Oil and gas activity

Currently, there are no lease sales or exploration plans in the eastern Bering Sea (BOEM 2011).

Miscellaneous sound sources

Other acoustic systems that may be used in the Arctic by researchers, military personnel, or commercial vessel operators include high-resolution geophysical equipment, acoustic Doppler current profilers, mid-frequency sonar systems, and navigational acoustic pingers (LGL 2005, 2006). These active sonar systems emit transient sounds that vary widely in intensity and frequency (BOEM 2011).

3.1.4 Commercial Fisheries

The Bering Sea is one of the world's most productive ecosystems and supports numerous fisheries. The Bering Sea's abundant fish and game have supported the lives and livelihood of people on the Asian and North American continents since prehistoric times. Due to increased

demand for furs and whale oil, exploitation of the Bering Sea's resources began on a commercial scale in the 18th and 19th centuries. During the 20th century, international markets turned to the Bering Sea for seafood resources. The Marine Mammal Protection Act was passed in 1972, banning the commercial harvest of marine mammals and the taking of marine mammals declined significantly. Today, approximately 25 species of fish, crustaceans and mollusks of the Bering Sea are considered commercially important (NRC 1996).

Ringed Seal – Direct Interactions

Until 2003, there were three different federally-regulated commercial fisheries in the Bering Sea that could have interacted with ringed seals and were monitored for incidental mortality by fishery observers. As of 2003, changes in fishery definitions in the List of Fisheries have resulted in separating these three fisheries into 12 fisheries (69 FR 70094, December 2, 2004). This change does not represent a change in fishing effort, but provides managers with better information on the component of each fishery that is responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska.

Between 2007 and 2011, there were incidental serious injuries and mortalities of ringed seals in the Bering Sea/Aleutian Islands flatfish trawl fishery, the Bering Sea/Aleutian Islands pollock trawl, Bering Sea/Aleutian Islands Pacific cod trawl, and the Bering Sea/Aleutian Islands Pacific cod longline. Based on data from 2007 to 2011, there are an annual average of 3.52 (CV = 0.06) mortalities of ringed seals incidental to commercial fishing operations (see Table 3) (Allen and Angliss 2014).

Table 3. Summary of incidental mortality of ringed seals (Alaska stock) due to commercial fisheries from 2007 to 2011 and calculation of the mean annual mortality rate (Allen and Angliss 2014).

| Fishery name | Years | Data type | Observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|--|--------------|------------------|--------------------------|---|--|------------------------------|
| Bering Sea/Aleutian Is. flatfish trawl | 2007 | obs data | 72 | 0 | 0 | 2.00 (CV = 0.02) |
| | 2008 | | 100 | 2 | 2.0 | |
| | 2009 | | 100 | 1 | 1.0 | |
| | 2010 | | 100 | 0 | 0 | |
| | 2011 | | 100 | 6(+1) * | 6.0 (7) ** | |
| Bering Sea/Aleutian Is. pollock trawl | 2007 | obs data | 85 | 0 | 0 | 1.0 (CV = 0.04) |
| | 2008 | | 85 | 1 | 1.0 | |
| | 2009 | | 86 | 1 | 1.0 | |
| | 2010 | | 86 | 0 | 0 | |
| | 2011 | | 98 | 3 | 3.0 | |
| Bering Sea/Aleutian Is. Pacific cod trawl | 2007 | obs data | 53 | 0 | 0 | 0.2 (CV = 0.01) |
| | 2008 | | 59 | 0 | 0 | |
| | 2009 | | 63 | 0 | 0 | |
| | 2010 | | 66 | 0 | 0 | |
| | 2011 | | 60 | 1 | 1.0 | |
| Bering Sea/Aleutian Is. Pacific cod longline | 2007 | obs data | 63 | 0 | 0 | 0.32 (CV = 0.6) |
| | 2008 | | 63 | 0 | 0 | |
| | 2009 | | 60 | 0 | 0 | |
| | 2010 | | 64 | 0 | 0 | |
| | 2011 | | 57 | 1 | 1.6 | |
| Total estimated annual mortality | | | | | | 3.52 (CV = 0.06) |

* Total mortalities observed in unsampled hauls.

** Total mortalities observed in sampled and unsampled hauls. Since the total mortality (7) exceeds the estimated mortality (6.0) for 2011, the sum of actual mortalities observed (7) will be used as a minimum for that year.

Ringed seal – Indirect fishery effects

As explained in Section 2.1.5 sculpin and walleye pollock are important prey for Arctic ringed seals. While the fisheries and ringed seals may both target these species, ringed seals are not believed to be competing with the commercial fisheries in the waters of Alaska for prey (Kelly et al. 2010a).

Bearded Seal – Direct Interactions

Similar to ringed seals, the monitoring of incidental serious injury or mortality of bearded seals changed as of 2003, and provided managers a better insight into how each fishery in Alaska was potentially impacting the species (Allen and Angliss 2014).

Between 2007 and 2011, there were incidental serious injuries and mortalities of bearded seals in the Bering Sea/Aleutian Islands pollock trawl and the Bering Sea/Aleutian Islands flatfish trawl (Table 4). The estimated minimum mortality rate incidental to commercial fisheries is 1.8 (CV = 0.05) bearded seals per year, based exclusively on observer data (Allen and Angliss 2014).

Table 4. Summary of incidental mortality of bearded seals (Alaska stock) due to commercial fisheries from 2007-2011 and calculation of the mean annual mortality rate. Details of how percent observer coverage is measured is included in Allen and Angliss (Allen and Angliss 2014).

| Fishery Name | Year | Data Type | Percent Observer Coverage | Observed Mortality | Estimated Mortality | Mean Annual Takes (CV in parentheses) |
|----------------------------------|------|-----------|---------------------------|--------------------|---------------------|---------------------------------------|
| BSAI Pollock Trawl | 2007 | Obs. data | 85 | 1 | 1.0 | 1.4 (CV=0.06) |
| | 2008 | | 85 | 4 | 4.1 | |
| | 2009 | | 86 | 1 | 1.0 | |
| | 2010 | | 86 | 0(+1) [*] | 0(1) ^{**} | |
| | 2011 | | 98 | 0 | 0 | |
| BSAI Flatfish Trawl | 2007 | Obs. data | 72 | 0 | 0 | 0.4 (CV= 0.03) |
| | 2008 | | 100 | 1 | 1.0 | |
| | 2009 | | 100 | 0 | 0 | |
| | 2010 | | 100 | 0 | 0 | |
| | 2011 | | 100 | 1 | 1.0 | |
| Estimated Total Annual Mortality | | | | | | 1.8 (CV= 0.05) |

^{*} Total mortalities observed in unsampled hauls.

^{**} Total mortalities observed in sampled and unsampled hauls. Since the total mortality (1) exceeds the estimated mortality (0) for 2010, the sum of actual mortalities observed (1) will be used as a minimum estimate for that year.

Bearded seal – Indirect fishery effects

For indirect interactions, it is important to note that commercial fisheries in the action area target a number of known bearded seal prey species, such as walleye pollock and cod. These fisheries may affect bearded seals indirectly through reductions in prey biomass. The U.S. fisheries in the

North Pacific are managed to prevent overfishing of individual stocks. As such, strict limits on catch and bycatch are placed on all groundfish species or species groups. However, even well-managed fisheries result in reduced levels of biomass relative to theoretical mean unfished levels. The extent that the lower abundance levels of these individual stocks affect the viability of bearded seal populations is unknown. In the U.S. EEZ, overall biomass levels of all groundfish species have remained relatively stable between 15 and 20 million metric tons of biomass after showing substantial increases since the 1970s (Mueter and Megrey 2006). The Bering Sea pollock and Pacific cod fisheries may also impact bearded seals through bycatch of their benthic invertebrate prey. Data from Alaska groundfish fisheries observers is used to estimate bycatch of crab, and other “prohibited species” (e.g., halibut, salmon and herring). The bycatch of Bairdi crab was over ten million crab in 1994 but dropped to five million in 1995 and declined steadily to around one million in 2006. In addition to target and prohibited species, non-target species bycatch is also monitored. Non-targets are divided into four categories: 1) forage species, 2) Habitat Areas of Particular Concern (HAPC) (e.g., sponges, anemones, corals), 3) non-specified species (grenadiers, crabs, starfish, jellyfish, benthic invertebrates, shrimp and others), 4) other species (e.g., sculpins, sharks, octopus). In the BSAI non-specified species comprised the majority of non-target catch from 1997-2007 (Gaichas and Boldt 2010). However, jellyfish, grenadiers and sea stars comprised the majority of the non-specified catch so bycatch of non-targets is not relevant to concerns about impacts of bycatch on bearded seal prey, at least in the Bering Sea.

Commercial fishing can also have indirect effects on marine mammals through changes in genetics, reproductive capacity, and life history characteristics of their prey. Fisheries generally select particular individuals (usually larger and older fish) and focus on particular locations (such as spawning or feeding grounds) such that fishing is non-random with respect to fish characteristics (or phenotypes). If there is a genetic component to differences in phenotypes between fish, then fishing will cause evolutionary change. The argument that fishing could cause phenotypic evolution is widely known in general terms. There are numerous examples of changes in life history characteristics of commercially exploited stocks over time, such as weight-at-age, length-at-age, length-at-maturation and age-at-maturation (reviewed in Law 2000). Fisheries can generate selection on life history traits by catching more fish of some ages or sizes than others. In many cases, fisheries remove larger and older fish which means that early-maturing and smaller fish leave more offspring than late-maturing ones and are selected for. This has consequences for yield. For example, the current patterns of fishing are selecting a life history in Northeast Arctic cod in which fish allocate resources to reproduction rather than growth. The sustainable yield associated with this life history could be less than half the yield potentially available (Law and Grey 1989). It is important to note that although changes in life history characteristics of fished populations have been observed, there is uncertainty about what causes these changes. This is due in part to the fact that potential fishery effects on life history characteristics are superimposed on a backdrop of environmental change that can affect the same characteristics (such as the effect of temperature on growth). It is also unclear how fast fishery-

induced evolution occurs. It is uncertain whether evolution contributes to the phenotypic changes observed in many fish stocks, or whether it is operating at a much longer time scale (Law 2000).

Fishing can impact reproductive capacity through changes in fish size. Reductions in fish size can result from long-term size-selective fishing (e.g., Zwanenburg 2000). The decrease in the proportion of large fish might have negative impacts on reproductive capacity of the population if smaller, first-time spawners are less successful in producing viable eggs than are larger, more experienced spawners (Trippel et al. 1997). In addition, some temperate demersal fishes, such as cod and other gadids, are thought to rely on the longevity and size of mature individuals to bridge the gaps between years of strong recruitment (Longhurst 1999). A reduction in the average size of prey species also could reduce the per capita energy content and may increase the foraging effort exerted by bearded seals. Conversely, older fish may be more cryptic, harder to catch, and less numerous. Groundfish stocks are known to have a high degree of interannual variability in recruitment and it is likely that such fluctuations occurred prior to fishing. As such, bearded seals dependence on different size composition for groundfish species would seem to be fairly adaptable.

Bottom trawl fisheries also have the potential to indirectly affect bearded seals through destruction or modification of benthic prey and/or their habitat. The predominant direct effects of bottom trawls include “smoothing of sediments, moving and turning of rocks and boulders, resuspension and mixing of sediments, removal of sea grasses, damage to corals, and damage or removal of epibenthic organisms. In October, 2010 NMFS issued a final rule requiring the modification of nonpelagic trawl gear in the directed flatfish fishery in the Bering Sea subarea to raise portions of the gear off the ocean bottom (75 FR 61642). NMFS took this action to reduce potential adverse effects of nonpelagic trawl gear on bottom habitat.

3.1.5 Scientific Research Interactions

Bearded Seals

Bearded seals have occasionally been collected for aquariums or killed for scientific research. Mortalities may occasionally occur incidental to marine mammal research activities authorized under MMPA permits issued to a variety of government, academic, and other research organizations. Between 2007-2011, there was 1 bearded seal mortality resulting from research on the Alaska stock of bearded seals (2007), which results in an average of 0.2 mortalities per year from this stock (Allen and Angliss 2014).

Ringed Seals

Ringed seals have occasionally been killed or collected for zoos and aquariums or killed for scientific research. There are no documented lethal takes of ringed seals for scientific research in the action area. Total numbers of ringed seals used for scientific purposes range-wide are small and likely have no impact on the populations of any of the subspecies (Kelly et al. 2010a).

3.1.6 Climate Change

Section 4.1.6.1 of the 2010 BiOp (NMFS 2010) discusses the environmental baseline of the Bering Sea with respect to global climate change and is incorporated here by reference. In 2007, the Intergovernmental Panel on Climate Change concluded that the warming of the climate system is unequivocal as evidenced by increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level (IPCC 2007).

Ringed Seals

The main concern about the conservation status of ringed seals stems from the likelihood that their sea-ice and snow habitats have been modified by the warming climate and, more so, that the scientific consensus projections are for continued and perhaps accelerated warming in the foreseeable future (Kelly et al. 2010a). Climate models consistently project overall diminishing ice and snow cover through the 21st century with regional variation in the timing and severity of those losses. Increasing atmospheric concentrations of greenhouse gases are driving climate warming and increasing acidification of the ringed seal's habitat. Changes in ocean temperature, acidification, and ice cover threaten prey communities on which ringed seals depend. Laidre et al. (2008) concluded that on a worldwide basis ringed seals were likely to be highly sensitive to climate change based on an analysis of various life history features that could be affected by climate.

The greatest impacts to ringed seals from diminished ice cover will be mediated through diminished snow accumulation. While winter precipitation is forecasted to increase in a warming Arctic (Walsh et al. 2005), the duration of ice cover will be substantially reduced, and the net effect will be lower snow accumulation on the ice (Hezel et al. 2012). Ringed seals excavate subnivean lairs (snow caves) in drifts over their breathing holes in the ice, in which they rest, give birth, and nurse their pups for 5-9 weeks during late winter and spring (Chapksii 1940, McLaren 1958, Smith and Stirling 1975). Snow depths of at least 50-65 cm are required for functional birth lairs (Smith and Stirling 1975, Lydersen and Gjertz 1986, Kelly 1988b, Lydersen 1998, Lukin et al. 2006), and such depths typically are found only where 20-30 cm or more of snow has accumulated on flat ice and then drifted along pressure ridges or ice hummocks (Lydersen et al. 1990, Hammill and Smith 1991, Lydersen and Ryg 1991, Smith and Lydersen 1991). According to climate model projections, snow cover is forecasted to be inadequate for the formation and occupation of birth lairs within this century over the Alaska stock's entire range (Kelly et al. 2010a).

Without the protection of the lairs, ringed seals—especially newborns—are vulnerable to freezing and predation (Kumlien 1879, McLaren 1958, Lukin and Potelov 1978, Smith and Hammill 1980, Lydersen and Smith 1989, Stirling and Smith 2004). Changes in the ringed seal's habitat will be rapid relative to their generation time and, thereby, will limit adaptive responses.

Bearded Seal

The main concern about the conservation status of bearded seals also stems from the likelihood that their sea-ice habitat has been modified by the warming climate and, more so, that the scientific projections are for continued and perhaps accelerated warming in the foreseeable future (Cameron et al. 2010). For bearded seals, the presence of sea ice is considered a requirement for whelping and nursing young. Similarly, the molt is believed to be promoted by elevated skin temperatures that, in polar regions, can only be achieved when seals haul out of the water. Thus, if suitable ice cover is absent from shallow feeding areas during times of peak whelping and nursing (April/May), or molting (May/June and sometimes through August), bearded seals would be forced to seek either sea-ice habitat over deeper waters (perhaps with poor access to food) or coastal regions in the vicinity of haul-out sites on shore (perhaps with increased risks of disturbance, predation, and competition). Both scenarios would require bearded seals to adapt to novel (i.e., suboptimal) conditions, and to exploit habitats to which they may not be well adapted, likely compromising their reproduction and survival rates. A reliable assessment of the future conservation status of each bearded seal species segment requires a focus on projections of specific regional conditions, especially sea ice. End of century projections for the Bering Sea in April-May suggest that there will be sufficient ice only in small zones of the Gulf of Anadyr and in the area between St. Lawrence Island and Bering Strait. In June in the Bering Sea, suitable ice is predicted to disappear as early as mid-century. To adapt to this regime, bearded seals would likely have to shift their nursing, rearing and molting areas to the ice covered seas north of the Bering Strait. Laidre et al. (2008) also concluded that on a worldwide basis bearded seals were likely to be highly sensitive to climate change based on an analysis of various life history features that could be affected by climate.

3.1.7 Ocean Acidification

A second major concern for bearded and ringed seals, driven primarily by the production of carbon dioxide emissions, is the modification of habitat by ocean acidification, which may alter prey populations and other important aspects of the marine ecosystem. The environmental baseline of the Bering Sea with respect to ocean acidification is discussed in section 4.1.6.2 or the 2010 BiOp (NMFS 2010) and is incorporated here by reference. Ocean acidification, a result of increased carbon dioxide in the atmosphere, may impact bearded and ringed seal survival and recruitment through disruption of trophic regimes that are dependent on calcifying organisms. The nature and timing of such impacts are extremely uncertain. Changes in bearded and ringed seal prey, anticipated in response to ocean warming and loss of sea ice, have the potential for negative impacts, but the possibilities are complex. Ecosystem responses may have very long lags as they propagate through trophic webs. Because of bearded seals' apparent dietary flexibility, this threat may be of less immediate concern than the threats from sea-ice degradation (Allen and Angliss 2014).

4 EFFECTS OF THE ACTION

The effects of the action refer to the direct and indirect effects of the action on the species. Indirect effects of the action are those that are later in time (than direct effects), but are still

reasonably certain to occur. In this case, the actions are continuing implementation of the BSAI Groundfish FMP and the issuance of exempted fishing permits to test the efficacy of a salmon excluder device in the Bering Sea pollock fishery.

As discussed above, the Bering Sea groundfish fisheries are ongoing actions and ringed and bearded seals have been subject to the effects of these fisheries for several decades prior to being listed as threatened under the ESA. Sections 2.1.4, 2.2.4, and 3.1.4 described the impacts of the commercial fisheries in the eastern Bering Sea on the Arctic subspecies of ringed seals and the Beringia DPS of bearded seals.

4.1 Exposure of Ringed and Bearded Seals to the Effects of the Action

Species are exposed to the physical, chemical, and biotic stressors of a federal action when their spatial and temporal distributions overlap. As explained in sections 2.1.4, 2.2.4, and 3.1.4 ringed and bearded seals are exposed to the physical stressor of being captured in commercial fishery trawl nets and to the biotic stressors of habitat alteration through trawl gear contact with the sea floor and the removal of ringed and bearded seal prey species in the commercial fisheries.

Direct interactions between commercial trawl fisheries and ringed and bearded seals have been documented in the eastern Bering Sea (see sections 2.1.4 and 2.2.4). These sections also establish the spatial and temporal overlap with the removal of ringed and bearded seal prey and the commercial fisheries.

4.2 Response of Ringed and Bearded Seals to the Effects of the Action

In this section, we evaluate the available evidence to determine how individual ringed and bearded seals are likely to respond to exposure to the effects of the action and whether the probable exposure would be sufficient to evoke particular responses.

Response to Capture in Trawl Gear

As evidenced by the available data, ringed and bearded seals captured in trawl nets are likely to drown, resulting in the loss of the individuals from the population. Ringed and bearded seals that are incidentally hooked in the groundfish hook and line fisheries are likely to drown.

Response to Removal of Prey or Modification of Foraging Habitat

The groundfish fisheries remove pollock and Pacific cod which are known prey of ringed and bearded seals. Thus, the fisheries may impact ringed and bearded seals by reducing prey biomass through direct removal of prey and reduced prey size through altered age composition of the remaining stock. As explained in section 3.1.4, bottom trawl gear may also modify benthic habitat which may affect the abundance and distribution of bearded seal prey species. Ringed and bearded seals exposed to reduced prey resources would have to alter their spatial foraging distribution or switch their foraging to alternate prey items or age classes. Altered foraging behavior could result in successful foraging with no reductions in fitness to the affected ringed or

bearded seal; alternately, it may result in a net caloric deficit which could result in reduced body condition. Lowered body condition may lead to reduced survival through starvation at the most extreme or increased susceptibility to disease or predation. Lowered body condition of adult females may also result in reduced reproduction. The available data do not indicate that the probable exposure to the effects of reduced prey resources in the Bering Sea groundfish fisheries are sufficient to result in reduced survival or reproduction of Arctic ringed seals or the Beringia DPS of bearded seals.

4.3 Risk to Ringed and Bearded Seals from the Action

In this section of the assessment NMFS identifies the probable risks to individual ringed and bearded seals that are likely exposed to the effects of the BSAI groundfish fisheries and we identify the consequences of the risks to the individuals to the populations they comprise.

As explained above, the probable risk to ringed and bearded seals from the BSAI groundfish fisheries, including work conducted under salmon excluder EFPs, is capture and subsequent drowning in trawl nets. Though, in 2011 one ringed seal was observed to be taken in the BSAI Pacific cod hook-and-line fishery (Allen and Angliss 2014). The available data indicate that the mean annual mortality rate is approximately 4 ringed seals and 2 bearded seals likely to be captured in the BSAI groundfish fisheries (Allen and Angliss 2014). However, the number of ringed and bearded seals captured incidental to the fisheries is likely to vary from year to year. For example, four bearded seals were observed to be taken in the BSAI pollock trawl fishery in 2008 and none were observed to be taken in 2011 (Table 4). A total of 12 ringed seals were observed to be taken in the BSAI groundfish fisheries in 2011 (Table 3), though on average only 4 ringed seals are likely to be taken per year. One additional bearded seal per year is anticipated to be taken in fishing conducted under the anticipated salmon excluded EFPs (NMFS 2014c). In order to be conservative, we considered the maximum observed mortality in a given year.

In considering the consequence to the Arctic ringed seal and Beringia DPS populations as a result of the loss of these individuals each year we consider the effect of the subsistence harvest. A rough estimate of approximately 9,500 ringed seals and 8,485 to 10,182 bearded seals are taken for subsistence harvest each year (Kelly et al. 2010, Cameron et al. 2010). Based on a review of the current population size of ringed and bearded seals and the ongoing subsistence harvest, Kelly et al. (2010) and Cameron et al. (2010) noted that there was little to no evidence that the subsistence harvests have or are likely to pose serious risks to the Arctic ringed seal or the Beringia DPS of bearded seals.

Takes of ringed and bearded seals occurred in the commercial fisheries prior to their listing as threatened under the ESA in 2012. The current population sizes of ringed and bearded seals are large (see sections 2.1.3 and 2.2.3). The baseline level of direct human-caused mortality at the time both species were listed in 2012 was considered to be sustainable. Based on the data available today (Allen and Angliss 2014), NMFS assumes that the current level of human-caused mortality has not changed to a measurable extent relative to 2012. Therefore, given their large

population sizes, the expected loss of 12 ringed seals (as in 2011) and 6 bearded seals (as in 2008³) per year in the BSAI groundfish fisheries and salmon excluder EFPs is not likely to pose a risk to the survival or recovery of the populations these individuals comprise.

5 CUMULATIVE EFFECTS

“Cumulative effects” are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

5.1 State-Managed Fisheries in the BSAI

State-managed fisheries generally occur from 0 to three miles offshore; however, some State-managed fisheries (e.g., Tanner crab) may extend into federal waters. State-managed commercial fisheries in the vicinity of the bearded and ringed seal are salmon, herring, and shellfish. These fisheries may be subject to changes from one fishing season to the next. The Board of Fisheries, established under Alaska Statute 16.05.221, is authorized to adopt regulations for fisheries in State waters to establish open and closed seasons, quotas, bag limits, and fishing methods. The Board of Fisheries meets four to six times a year to consider proposed changes to fisheries regulations. The Board relies on science provided by Alaska Department of Fish and Game (ADF&G), public comment, and guidance from the Alaska Department of Public Safety and Alaska Department of Law in creating regulations. Regulation announcements, news releases, and updates are available on the ADF&G website (<http://www.adfg.alaska.gov/>).

The State of Alaska establishes harvest quotas independent of federal groundfish /State parallel fisheries for State-waters seasons. State-managed fisheries are controlled by guideline harvest levels (GHLs), which are monitored by the State, and are typically a percentage of the federal acceptable biological catch (ABC). The federal TACs for Gulf of Alaska and BSAI Pacific cod are reduced by the amount needed for the State’s GHL for Pacific cod to prevent exceeding the ABC. Currently, the State-managed Pacific cod fishery in the BSAI is allocated 3 percent of the federal ABC. Typically, the State sets the fishery quotas and opens State-managed fisheries after federal fisheries conclude in adjacent waters. State-managed fisheries are discussed below.

5.1.1 Norton Sound, Port Clarence, Kotzebue

The Norton Sound, Port Clarence and Kotzebue areas include all waters from Point Romanof in southern Norton Sound to Point Hope, and St. Lawrence Island (Menard et al. 2012). Five species of Pacific salmon are indigenous to the area although chum and pink salmon historically are the most abundant. Most herring spawning populations arrive near the eastern Bering Sea coast immediately after ice breakup between mid-May and mid-June. Spawning progresses

³ Five bearded seals were observed to be taken in the BSAI groundfish fisheries in 2008 (Table 4) and 1 bearded seal was taken incidental to the salmon excluder EFP.

northward and may continue along portions of the Seward Peninsula or within the Chukchi Sea into July or August (Bernard 2011). Commercial fisheries include herring and salmon. Subsistence fisheries include red king crab, capelin, rainbow smelt, northern pike, starry flounder, yellowfin sole, Arctic flounder, Alaska plaice, Arctic grayling, burbot, and halibut. Other species utilized for commercial and subsistence purposes include inconnu or “sheefish”, Dolly Varden, and whitefish. These fish are taken by set gill nets, beach seines, jigging through the ice, and rod and reel (Menard et al. 2012).

5.1.2 Bristol Bay

The Bristol Bay management area includes all coastal and inland waters east of a line from Cape Newenham to Cape Menshikof. Sockeye salmon are by far the most abundant salmon species that return to Bristol Bay each year, but Chinook, chum, coho, and in even years, pink salmon returns are important to the fishery as well. The five species of Pacific salmon found in Bristol Bay are the focus of major commercial, subsistence, and sport fisheries. Pacific herring have been documented throughout Bristol Bay, but a major concentration returns to the Togiak area each spring to spawn and is the focus of herring sac roe and spawn-on-kelp fisheries (Jones et al. 2013).

5.2 Vessel Activity

There are two main navigation routes crossing the Arctic: the Northern Sea Route (NSR) and the Northwest Passage (NWP). The NSR, which is actually the central portion of a longer trans-Arctic route called the Northeast Passage, passes through the Russian Arctic along the northern coast of Eurasia from the Barents Sea in the west to the Bering Sea in the east. The NWP goes through the Arctic along the northern coast of North America from the Labrador Sea in the east, through the Canadian Arctic Archipelago, to the Bering Sea in the west. Currently, most shipping in the Arctic is destination (e.g., moving goods into or out of the Arctic) (Arctic Council 2009).

The current operating season along the NWP is short – generally from late July to mid-October – and depends on the ice conditions in any given year (Arctic Council 2009). This perennially ice-choked passage was ice-free for the first time in recorded history during the summer of 2007 (National Snow and Ice Data Center (NSIDC) 2007).

Survey results from 2004 indicated that approximately 6,000 individual vessels operated in the Arctic, of which about half were vessels travelling along the Great Circle Route through the Aleutian Islands in the North Pacific Ocean/southern Bering Sea. Excluding vessels using the Great Circle Route, the most vessels by category were fishing vessels at about 1,600 or slightly less than 50 percent of the remaining total, followed by bulk carriers at about 20 percent.

Most operations occurred along the periphery of the Arctic Ocean in coastal waters that were either ice-free year-round or ice-covered only seasonally. In the seasonally ice-covered areas,

nearly all of the vessel activity in 2004 occurred during or after the ice melt, when icebreakers were not required for access (Arctic Council 2009). The areas showing the highest concentrations of incidents and accidents were also the areas with the largest volumes of shipping activity. In the few years since the Arctic Marine Shipping Assessment survey, shipping activity in the Arctic has increased significantly. At the current rate of increase, it will not take long to double or triple the 2004 shipping activity levels in the Arctic (Arctic Council 2009).

Climate change is expected to increase ship accessibility and the construction and operation of more economical offshore platforms due to reduced sea ice extent, thickness, and seasonal duration (AMAP 2007; Hassol 2004). Incentives for development of marine-based production and transportation might further increase as development of land becomes more complicated due to permafrost thaw and coastal erosion (AMAP 2007; Symon 2005).

Although the future of Arctic shipping remains largely uncertain and quantitative predictions of future shipping activity are unavailable, nearly all types of Arctic shipping (fishing operations, transport of goods into and resources out of the Arctic, commercial icebreaking, scientific explorations, and marine tourism) are either plausible or anticipated in the future (Arctic Council 2009). Through 2010, Arctic shipping is expected to remain overwhelmingly destinational (for regional trade), with trans-Arctic voyages only being plausible on an experimental basis during some summers (Arctic Council 2009). Recent offshore oil and gas leases in the Beaufort and Chukchi Seas may lead to increased marine traffic in the Bering Strait region, which may require formally established vessel routing measures (Arctic Council 2009).

The annual navigation season for light ice-class ships was projected to increase from 2 to 4 months for the NWP and from 3 to 6 months for the NSR by 2100 (Khon et al. 2010). A lack of major ports and other maritime infrastructure were seen as being significant limiting factors to future Arctic marine operations. By mid-century, a proposed new route, the Central Arctic Ocean Route (CAOR), could cross a significant portion of the Arctic Basin and be economically feasible and navigable at least intermittently (Ellis 2008, Holland et al. 2006). The CAOR would reduce the distance between Russian ports by 10 to 15 percent compared to the NSR (Cameron et al. 2010; Kelly et al. 2010a).

6 SYNTHESIS AND CONCLUSIONS

In this section, NMFS summarizes the effects identified in the preceding sections and details the consequences of the risks posed to Arctic ringed seals and the Beringia DPS of bearded seals. Finally, this section concludes whether NMFS has insured that the proposed action is not likely to jeopardize the continued existence of the Arctic subspecies of the ringed seal or the Beringia DPS of the bearded seal.

6.1 Jeopardy Standard

Jeopardize the continued existence of [a listed species] means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).⁴

6.2 Synthesis

Arctic Ringed Seal

Arctic ringed seals are not presently in danger of extinction but are likely to become so in the foreseeable future. The principal threat to the continued existence of Arctic ringed seals is the loss of habitat stemming from climate change. April and May ice cover is projected to decline throughout the century in the Bering Sea, with substantial interannual variability forecasted in the eastern Bering Sea. Ringed seals are vulnerable to habitat loss from changes in the extent or concentration of sea ice because they depend on this habitat for pupping, nursing, molting and resting. Arctic ringed seal populations have been exposed to the direct and indirect effects of commercial fisheries, including the BSAI groundfish fisheries, for several decades. The ongoing commercial groundfish fisheries and fishing conducted under salmon excluder EFPs may indirectly affect ringed seals via reduced prey resources and are likely to directly capture approximately 4 ringed seals (and up to approximately 12) per year (Section 4) consistent with the baseline effects. In 2012 NMFS determined that the threats of pollutants, oil and gas activities, fisheries and shipping do not individually or collectively place the Arctic subspecies at risk of becoming endangered in the foreseeable future (77 FR 76714).

There are no specific estimates of population size available for the Arctic subspecies of ringed seals, but most experts postulate that population numbers are in the millions. Experts in ringed seal ecology concluded that the mortality of approximately 9,500 ringed seals taken for subsistence each year was likely to be sustainable (Kelly et al. 2010a). Therefore, the mortality of 12 Arctic ringed seals incidental to the BSAI groundfish fisheries, including fishing conducted under salmon excluder EFPs, is not likely to affect the survival or recovery of the Arctic subspecies of the ringed seal.

Beringia DPS of Bearded Seals

The Beringia DPS of the bearded seal is not presently in danger of extinction but is likely to become so in the foreseeable future. The principal threat to the continued existence of the Beringia DPS is the loss of habitat stemming from climate change. The main concern about the conservation status of bearded seals stems from the likelihood that their sea ice habitat has been modified by the warming climate, and more so, that the scientific consensus projections are for

⁴ For purposes of this opinion, NMFS interprets this definition consistent with the court's opinion in *National Wildlife Federation v. NMFS*, 524 F.3d 917 (9th Cir. 2008). NMFS's jeopardy analysis considers how the proposed action may affect the likelihood of survival of the species and how it may affect the likelihood of recovery of the species.

continued warming in the foreseeable future. Loss of sea ice poses a risk to bearded seals because sea ice provides a dry and stable platform for whelping and nursing, a rearing habitat, habitat that allows pups to gain experience diving, swimming, and hunting, and a habitat for rutting males to hold territories and attract mates, and a platform for extended periods of hauling out during molting. A second concern is increased acidification of the ocean which may alter bearded seal prey populations.

The Beringia DPS of bearded seals has been exposed to the direct and indirect effects of commercial fisheries, including the BSAI groundfish fisheries, for several decades. The ongoing commercial groundfish fisheries and fishing conducted under salmon excluder EFPs may indirectly affect bearded seals via reduced prey resources and are likely to directly capture approximately 3 (and up to approximately 6) bearded seals per year (Section 4) consistent with the baseline effects. In 2012 NMFS determined that the threats of pollutants, oil and gas activities, fisheries and shipping do not individually or collectively place the Beringia DPS at risk of becoming endangered in the foreseeable future (77 FR 76747).

The Alaskan stock of bearded seals is considered to be greater than approximately 155,000 (77 FR 76740) and may be as large as 250,000-300,000 (Popov 1976, Burns 1981). Based on a review of the current population size of bearded seals and the ongoing subsistence harvest of an estimated 8,485 to 10,182 seals per year, Cameron et al. (2010) concluded that there was little to no evidence that the subsistence harvests have or are likely to pose serious risks to the Beringia DPS of bearded seals.

Takes of bearded seals occurred in the commercial fisheries prior to the listing of bearded seals as threatened under the ESA in 2012. The baseline level of direct human-caused mortality at the time both species were listed in 2012 was considered to be sustainable. Based on the data available today (Allen and Angliss 2014), NMFS assumes that the current level of human-caused mortality has not changed to a measurable extent relative to 2012. Therefore, the expected loss of 5-6 bearded seals per year in the BSAI groundfish fisheries, including fishing conducted under salmon excluder EFPs, is not likely to affect the survival or recovery of the Beringia DPS of the bearded seal.

6.3 Conclusions

After reviewing the available scientific and commercial data, current status of Arctic ringed seals and the Beringia DPS of bearded seals, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NMFS's biological opinion that the continued authorization of the BSAI groundfish fisheries per the BSAI Groundfish FMP and the issuance of EFPs to test salmon excluder devices in the Bering Sea pollock fishery, when added to the effects of the environmental baseline, are not likely to jeopardize the continued existence of the Arctic subspecies of ringed seals or the Beringia DPS of the bearded seal.

7 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species without a special exemption. Such prohibitions may be extended to threatened species pursuant to section 4(d). Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of carrying out an otherwise lawful activity.

At the time of listing, NMFS determined that ESA section 4(d) protective regulations were not necessary or advisable for the conservation of the threatened Arctic subspecies of ringed seals or the threatened Beringia DPS of bearded seals (77 FR 76740 and 77 FR 7606). Although taking of ringed or bearded seals is not prohibited by regulations, NMFS is issuing this incidental take statement for the purpose of notifying the action agency as to when it would be required to reinstate section 7 consultation.

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by Section 101(a)(5) of the MMPA. Accordingly, the terms of this incidental take statement become effective only upon the issuance of the MMPA section 101(a)(5)(e) authorization.

7.1 Amount or Extent of Take

The section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or the extent of land or marine area that may be affected by an action, if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14 (i); see also 51 FR 19926, 19953-54 (June 3, 1986)).

As described in Section 4.3, NMFS anticipates the annual taking of up to approximately 12 ringed seals and 6 bearded seals incidental to the proposed action. Because some variability in the level of takes is expected from year to year, NMFS is specifying the take over a period of 3 consecutive years, over which time the anticipated level of take is not expected to be exceeded.

Table 5. The number of ringed and bearded seals expected to be captured and killed in the BSAI groundfish fisheries, including fishing under salmon excluder EFPs, in the Bering Sea pollock fishery over a period of 3 consecutive years.

| Species | Incidental Take |
|--------------------------------------|-----------------|
| Arctic Subspecies of the Ringed Seal | 36 |
| Beringia DPS of Bearded Seals | 18 |

7.2 Effect of the Take

In the accompanying opinion, NMFS determined that these levels of anticipated incidental take are not likely to result in jeopardy to the Arctic subspecies of the ringed seal or the Beringia DPS of the bearded seal.

7.3 Monitoring the Impact of Take

In order to monitor the impacts of incidental take, SFD must report the progress of the action and its impacts on the species to NMFS Protected Resources as set forth below. See 50 C.F.R. 402.14(i)(3).

- Observer Program. NMFS shall continue to require participants in the federal BSAI groundfish fisheries to carry observers pursuant to the regulations at 50 CFR 679.
- Fishery observers shall continue to document interactions with ringed and bearded seals in the BSAI groundfish fisheries.
- Data Collection. Per the protocols in the 2014 North Pacific Groundfish Observer Manual⁵, observers shall continue to monitor either every haul or as many randomly selected hauls as possible for marine mammal interactions. Observers shall continue to instruct vessel crew to notify the observer if any marine mammals are found in the catches and shall request that the marine mammals be held for the examination by the observer. Observers shall continue to record takes of marine mammals and collect heads or snouts from incidentally captured pinnipeds.
- Information Dissemination. NMFS shall continue to provide the fishery observer-collected marine mammal interaction data to the National Marine Mammal Lab for inclusion in the annual marine mammal Stock Assessment Reports.

8 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species, to help implement recovery plans, or to develop information (50 CFR 402.02).

1. NMFS should develop and disseminate information on ways for fishers to avoid capturing seals in trawl gear.
2. NMFS should research development or modification of existing technologies to detect and alert fishers if seals become captured in their gear.

⁵ Available online at: <http://www.afsc.noaa.gov/FMA/document.htm>

9 REINITIATION NOTICE

As provided in 50 CFR 402.16, reinitiation of formal consultation under section 7 of the ESA is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of the incidental take is exceeded; (2) new information reveals the effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that or to an extent that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

10 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act (DQA)) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

Utility

This document records the results of an interagency consultation. The information presented in this document helps to fulfill NMFS's legal obligations under the ESA. The information is also useful and of interest to the general public. The information presented herein represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

This consultation will be posted on the NMFS Alaska Region website (<http://alaskafisheries.noaa.gov/protectedresources/>).

Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook and ESA Regulations, 50 CFR 402.01 et seq.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Alaska Region ESA quality control and assurance processes.

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