NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL AND CONFERENCE OPINION

Title:	Biological and Conference Opinion on the Issuance of Marine Mammal Protection Act Permit No. 20466 to Alaska Department of Fish and Game for Scientific Research on Ice Seals
Consultation Conducted By:	Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
Action Agency:	Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service
Publisher:	9ffice of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
Approved:	Donna S. Wieting Director, Office of Protected Resources
Date:	SEP 20 2017

Consultation Tracking number: FPR-2017-9197

Digital Object Identifier (DOI): https://doi.org/10.7289/V59C6VNT

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1 INTRODUCTION

The Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat they depend on. Section 7(a)(2) of the ESA requires Federal agencies to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with National Marine Fisheries Service (NMFS) for threatened or endangered species (ESA-listed), or designated critical habitat that may be affected by the action that are under NMFS jurisdiction (50 C.F.R. §402.14(a)). If a Federal action agency determines that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS concur with that determination for species under NMFS jurisdiction, consultation concludes informally (50 C.F.R. §402.14(b)).

The Federal action agency shall confer with the NMFS for species under NMFS jurisdiction on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 C.F.R. §402.10). If requested by the Federal agency and deemed appropriate, the conference may be conducted in accordance with the procedures for formal consultation in §402.14.

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS provides an opinion stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. If NMFS determines that the action is likely to jeopardize listed species or destroy or adversely modify critical habitat, NMFS provides a reasonable and prudent alternative that allows the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is the NMFS Office of Protected Resources Permits and Conservation Division (Permits Division). The Permits Division proposes to issue a Marine Mammal Protection Act (MMPA) permit (Permit No. 20466) to the Alaska Department of Fish and Game (i.e., the researchers; ADFG) authorizing scientific research on ice seals in the Bering, Chukchi, and Beaufort Seas of Alaska, including bearded seals (Beringia Distinct Population Segment [DPS]) and ringed seals (Arctic DPS, proposed as threatened, listing vacated and currently under appeal).

This consultation, biological opinion, and incidental take statement, were completed in accordance with section 7(a)(2) of the statute (16 U.S.C. 1536 (a)(2)), associated implementing regulations (50 C.F.R. §§401-16), and agency policy and guidance was conducted by NMFS

Office of Protected Resources Endangered Species Act Interagency Cooperation Division (hereafter referred to as "we"). This biological opinion (opinion) and incidental take statement were prepared by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division in accordance with section 7(b) of the ESA and implementing regulations at 50 C.F.R. §402.

This document represents the NMFS opinion on the effects of these actions on the bearded seal Beringia DPS, ringed seal Arctic DPS and proposed critical habitat, Steller sea lion and designated critical habitat, seven ESA-listed whale species (bowhead, North Pacific right, fin, humpback Western North Pacific and Mexico DPS, Western North Pacific gray, blue, and sei whales), and North Pacific right whales designated critical habitat. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

The ice seal research activities that are the subject of this consultation are part of an on-going research program by ADFG. The ADFG has conducted research and monitoring of ice seals for decades using aerial and vessel surveys, tissue and other biologic sampling, and remote tracking with authorization from NMFS. The purpose of the research is to monitor the status and health of four species of seals: ringed, bearded, spotted, and ribbon seals in the Bering, Chukchi, and Beaufort Seas. Research activities monitor the population status of ice seals during changing sea ice conditions. The previous permit for the same research activities was amended in 2014. An ESA section 7 consultation was completed in October 2014, for the permit modification (which will expire in December 2017) due to the listing of the ringed seal Arctic DPS and bearded seal Beringia DPS as threatened under the ESA in 2012. A formal ESA section 7 consultation was completed for the permit modification because the issuance of an MMPA permit authorizing research on the ringed seal Arctic DPS and bearded seal Beringia DPS is a Federal action that may affect listed species. The consultation resulted in a biological opinion that concluded that the proposed action is not likely to jeopardize the continued existence of ringed seals (Arctic DPS) and bearded seals (Beringia DPS); may affect but is not likely to adversely affect blue, fin, humpack, North Pacific right, sei, and bowhead whales, and Steller sea lion; and may affect but is not likely to adversely affect designated critical habitat for North Pacific right whales and Steller sea lions. The consultation did not make an effects determination for the proposed ringed seal Arctic DPS critical habitat because it was not proposed in October 2014, when the previous consultation was concluded.

On July 25, 2014, the United States (U.S.) 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 appealed the decision and the U.S. Court of Appeals for the Ninth Circuit issued an opinion reversing the judgment of the District Court (*Alaska Oil and Gas Association v Pritzker*, Case

No. 14-35806) on October 24, 2016. On February 22, 2017, the Ninth Circuit denied a petition for rehearing *en banc* and on May 12, 2017, the District Court entered final judgement. Therefore, the Beringia DPS of bearded seals is a threatened species and is considered in this opinion.

On March 11, 2016, the U.S. District Court for the District of Alaska issued a memorandum decision in a lawsuit challenging the listing of the Arctic DPS of ringed seals under the ESA (*Alaska Oil and Gas Association v. Pritzker*, Case No. 4:14-cv-029-RPB). The decision vacated NMFS's listing of the Arctic DPS of ringed seals as a threatened species. NMFS filed a notice of appeal of the District Court decision on May 3, 2016. NMFS published a rule proposing the designation of critical habitat for ringed seal (Arctic DPS) in the Bering, Chukchi, and Beaufort Seas in Alaska on December 9, 2014 (79 FR 73010). Because the District Court's decision vacated the listing of the Arctic DPS of ringed seal as threatened, the designation of critical habitat for the DPS cannot be completed. In the interim, our consultations and resultant biological opinions under section 7(a)(2) of the ESA will continue to address effects to ringed seals (Arctic DPS) and their proposed critical habitat so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on this DPS and its proposed critical habitat, even though the listing of the species is not in effect.

1.2 Consultation History

This opinion is based on information provided in the January 5, 2017, permit application, the February 9, 2017, draft permit, correspondence with the Permits Division, the opinion for Permit No. 15324, and annual reports from previously permitted work on ice seals by the ADFG. Our communication with the Permits Division regarding this consultation is summarized as follows:

- **October 2016**: Applicant submitted permit application to Permits Division
- **January 5, 2017**: Applicant submitted revised permit application to Permits Division after a series of exchanges beginning when application was first submitted
- **February 9, 2017**: Received the Permits Division's request for initiation of ESA section 7 consultation under the ESA as well as the permit application, draft permit, and annual reports from previous work
- **March 8, 2017**: Sent a request for additional information to the Permits Division
- **March 9, 2017**: Received a partial response to our request for additional information from the Permits Division
- **March 29, 2017**: Received the final response to our request for additional information from the Permits Division and initiated the ESA section 7 consultation for the action. The same day, the Permits Division deemed the application complete and opened the application for public comment.
- **April 28, 2017**: Received clarification of the number of animal carcasses from subsistence fishing or other legal research or collection activities that will be allowed for collection of samples under the permit from the Permits Division.

- **May 8, 2017**: Public comment period closed, received copy of comments from Marine Mammal Laboratory (MML) from Permits Division May 17, 2017
- **July 17, 2017**: Marine Mammal Commission (MMC) letter received
- **July 26, 2017**: Received copy of revised draft of permit incorporating MML and MMC recommendations
- **July 27, 2017**: Sent a request for clarification on some aspects of the draft permit to the Permits Division. Received a response July 31, 2017.

2 THE ASSESSMENT FRAMEWORK

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species; or adversely modify or destroy their designated critical habitat.

"Jeopardize the continued existence of" 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 an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 C.F.R. §402.02.

"Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of an ESA-listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 C.F.R. §402.02).

An ESA section 7 assessment involves the following steps:

Description of the Proposed Action (Section 3), *Interrelated and Interdependent Actions* (Section 4), and *Action Area* (Section 5): We describe the proposed action, identify any interrelated and interdependent actions, and describe the action area within the spatial extent of those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on the physical, chemical, and biotic environment within the action area, including the spatial and temporal extent of those stressors.

Status of Endangered Species Act Protected Resources (Section 6): We identify the ESA-listed species and designated critical habitat that are likely to co-occur with those stressors in space and time and evaluate the status of those species and habitat. In this Section, we also identify those *Species and Designated Critical Habitat Not Likely to be Adversely Affected* (Section 6.1) and those *Species and Designated Critical Habitat Likely to be Adversely Affected* (Section 6.2).

Environmental Baseline (Section 7): We describe the environmental baseline in the action area including past and present impacts of Federal, state, or private actions and other human activities in the action area; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation; and impacts of state or private actions that are contemporaneous with the consultation in process.

Effects of the Action (Section 8): We identify the number, age (or life stage), and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. We also consider whether the action "may affect" designated critical habitat. This is our exposure analysis. We evaluate the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure. We also consider how the action may affect designated critical habitat. This is our response analysis. We assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. This is our risk analysis. The adverse modification analysis considers the impacts of the proposed action on the essential habitat features and conservation value of designated critical habitat.

Cumulative Effects (Section 9): Cumulative effects are the 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. Effects from future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 compliance.

Integration and Synthesis (Section 10): In this section, we integrate the analyses in the opinion to summarize the consequences to ESA-listed species and designated critical habitat under NMFS' jurisdiction.

Conclusion (Section 11): With full consideration of the status of the species and the designated critical habitat, we consider the effects of the action within the action area on populations or subpopulations and on essential habitat features when added to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

- Reduce appreciably the likelihood of survival and recovery of the ESA-listed species in the wild by reducing its numbers, reproduction or distribution, and state our conclusion as to whether the action is likely to jeopardize the continued existence of such species; or

- Appreciably diminish the value of designated critical habitat for the conservation of an ESA-listed species, and state our conclusion as to whether the action is likely to destroy or adversely modify designated critical habitat.

If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, then we must identify reasonable and prudent alternative(s) to the action, if any, or indicate that to the best of our knowledge there are no reasonable and prudent alternatives. See 50 C.F.R. §402.14.

In addition, we include an *Incidental Take Statement* (Section 12) that specifies the impact of the take, reasonable and prudent measures to minimize the impact of the take, and terms and conditions to implement the reasonable and prudent measures (ESA section 7 (b)(4); 50 C.F.R. §402.14(i)). We also provide discretionary *Conservation Recommendations* (Section 13) that

may be implemented by action agency (50 C.F.R. §402.14(j)). Finally, we identify the circumstances in which *Reinitiation of Consultation* (Section 14) is required (50 C.F.R. §402.16).

To comply with our obligation to use the best scientific and commercial data available, we collected information identified through searches of Google Scholar, Research Gate, literature cited sections of peer-reviewed articles, species listing documentation, and reports published by government and private entities. This opinion is based on our review and analysis of various information sources, including:

- Information submitted by the Permits Division and the applicant
- Government reports (including NMFS' biological opinions and stock assessment reports)
- NOAA technical memoranda
- Peer-reviewed scientific literature

These resources were used to identify information relevant to the potential stressors and responses of ESA-listed species and designated critical habitat under NMFS' jurisdiction that may be affected by the proposed action to draw conclusions on risks the action may pose to the continued existence of these species and the value of designated critical habitat for the conservation of ESA-listed species.

3 DESCRIPTION OF THE PROPOSED ACTION

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies.

The Permits Division proposes the issuance of a scientific research permit to ADFG, pursuant to the provisions of the MMPA, as amended (16 U.S.C. 1361 et seq.), and the regulations governing the taking and importing of marine mammals (50 CFR Part 216). Permit No. 15324 expires in December 2017 and Permit No. 20466 (the subject of this consultation) would replace it and expire May 31, 2022 with the possibility for a one-year extension.

The objective of the research is to monitor the status and health of the populations of 4 species of ice seals (bearded, ringed, ribbon, and spotted) relative to changes in the environment and industrial disturbances in order to identify and evaluate potential conservation problems. Samples from the subsistence harvest will be collected. Subsistence harvest is the legal hunting of seals by the indigenous peoples of Alaska for subsistence food, materials, and due to cultural significance. Upon issuance of the Permit, the researchers will receive samples from subsistence harvested seals opportunistically throughout the year. ADFG will conduct field work annually over the permit lifetime from March until November to capture, track and sample live seals as part of biosampling and tagging activities.

The Permits Division proposes to authorize the directed take of ringed seals (Arctic DPS; Table 1) and bearded seals (Beringia DPS; Table 2) to fulfill the ADFG's scientific research objective. The proposed activities are explained in detail below.

Table 1. Proposed permitted annual takes of ringed seals (Arctic Distinct Population Segment), male and female.

Life stage	Number of seals	Takes per seal	Activities	Details
All	5,000	3	Incidental disturbance	Aerial and vessel surveys
All	1,000	3	Incidental disturbance	Incidental disturbance of non-target animals during capture activities; seals may be incidentally disturbed up to 3 times per capture event
All except neonates, unweaned pups, and females with dependent pups	200	1	Capture, restrain, administer drugs, tag, instrument, measure, weigh, collect samples, ultrasound, release	ID tags; samples of whiskers, blood, urine, feces, hair; swabs (oral, nasal, urogenital, rectal); biopsies of blubber, muscle, skin; ultrasound; up to 4 transmitting instruments including one flipper-attached instrument; no remote sedation
All except neonates, unweaned pups, and females with dependent pups	5	1	Unintentional mortality associated with capture/handling	Not to exceed 25 seals in 5 years
All	5,000	1	Import/export/receive parts	From subsistence-harvested seals: all tissues, stomach contents, claws, whiskers, hair,

Life stage	Number of seals	Takes per seal	Activities	Details
				urine, fecal material, organs, blubber, and female reproductive tracts

Table 2. Proposed annual takes of bearded seals (Beringia Distinct Population Segment), male and female.

Life stage	Number of seals	Takes per seal	Activities	Details
All	5,000	3	Incidental disturbance	Aerial and vessel surveys
All	1,000	3	Incidental disturbance	Incidental disturbance of non-target animals during capture activities; seals may be incidentally disturbed up to 3 times per capture event
All except neonates, unweaned pups, and females with dependent pups	200	1	Capture, restrain, administer drugs, tag, instrument, measure, weigh, collect samples, ultrasound, release	ID tags; samples of whiskers, blood, urine, feces, hair; swabs (oral, nasal, urogenital, rectal); biopsies of blubber, muscle, skin; ultrasound; up to 4 transmitting instruments including one flipper-attached instrument; remote dart delivery of sedatives and/or

Life stage	Number of seals	Takes per seal	Activities	Details
				non-lethal deterrents may be used
All except neonates, unweaned pups, and females with dependent pups	5	1	Unintentional mortality associated with capture/handling	Not to exceed 25 seals in 5 years
All	5,000	1	Import/export/receive parts	From subsistence-harvested seals: all tissues, stomach contents, claws, whiskers, hair, urine, fecal material, organs, blubber, and female reproductive tracts

3.1 Import, Export, Receive Parts

The Permits Division proposes the authorization of the import/export and receipt of biological samples (or parts) to assess the health, condition, contaminant load, and diet of ice seals. The researchers will receive samples from the subsistence harvest by the indigenous people of Alaska with whom ADFG regularly interact, specifically from six villages (Point Hope, Shishmaref, Diomede, Gambell, Savoonga, and Hooper Bay). Samples may also be received through the North Slope Borough from Barrow, Wainwright and Kaktovik for coverage of the Bering, Chukchi, and Beaufort Seas. Samples may also be imported from Russia, Canada, and Norway from legally taken seals (from subsistence harvest or research). Samples may be exported to laboratories outside the U.S. for analysis. Samples provided to researchers will include:

- Tissues (skin and other organs)
- Stomach/stomach contents
- Blubber
- Muscle
- Female reproductive tracts
- Hair
- Urine and fecal material
- Teeth

3.2 Surveys

Aerial and vessel surveys may be conducted year-round but generally will occur from April through October. Seals may be photographed during normal survey procedures (vessel and aerial) in order to better identify individual seals or to confirm count estimates. The potential disturbance would be no greater than the survey as no deviation or change of survey protocol is required for photography.

Aerial Surveys: These will be conducted from a fixed wing aircraft flying at an altitude of more than 200 m. Surveys will be flown at the highest possible altitude while still allowing for accurate data collection. During surveys, the plane will circle within visual contact, but not directly over a group of seals, for up to 15 minutes in order to count and photograph all seals present.

Vessel Surveys: These will be designed to monitor changes in local seal distribution or abundance with changing ice conditions. Surveys will be conducted from vessels ranging from small local boats to large commercial vessels. Transects will be designed to systematically cover the study area. When seals are present, the survey boat will follow the transect slowly to minimize the wake. Vessels will follow predetermined transects counting and observing seals within 200-500 m depending on visibility. Seals hauled out will only be approached at a distance close enough to observe and record them, usually 100 m is sufficient.

3.3 Capture

Seals may be captured in the water, on ice, or on land using various methods. ADFG proposes the capture of up to 200 seals per species per year, or 1,000 seals of each species over the 5-year permit. Scheduled capture events occur after pups are weaned but seals are sometimes available for capture year-round such as when seals are temporarily trapped on the ice when access holes freeze providing additional opportunities for capture and tagging. No females with dependent pups will be captured under this permit nor will dependent young be captured (pers. comm., Sara Young, Permits and Conservation Division, to Lisamarie Carrubba, ESA Interagency Cooperation Division, March 29, 2017).

In the water: Seals in the water will be captured using nets and traps. Nets are set using small boats and seals may be brought to shore, to ice, or processed in a boat. Seals are caught using specially designed “seal” nets (Figure 1). Nets may be equipped with zippers in order to join sections together. Nets may be set during the day or night and are sometimes left overnight. Nets may be set in ringed seal breathing holes and near lagoon entrances (Figure 2). Nets set near lagoon entrances will be monitored continuously and pulled immediately if belugas are seen or reported in the area to minimize the chance of capturing beluga whales. Long-handled dip nets can be used to catch smaller ringed and spotted seals upon approach by boat. Most nets are monitored constantly but nets left overnight are checked in the morning as soon as there is enough daylight to see. Seals will be removed from nets immediately upon capture for nets that

are tended constantly or as soon as the net is checked for those nets left overnight. Seals are removed from nets by bringing the seal and/or net to shore or ice. A sling off the side of the boat used to transport the seal and net is used to cradle the seal while moving it in the net. Small seals may be brought into the boat for processing or transporting. Nets are designed with light lead lines and anchored to the float line so that once a seal is captured it can take the net to the surface in order to breathe as needed.

Figure 1. Net being used to capture a seal near Kotzebue (photo from ADFG, Alaska Department of Fish and Game Marine Mammal Program Ice Seals)

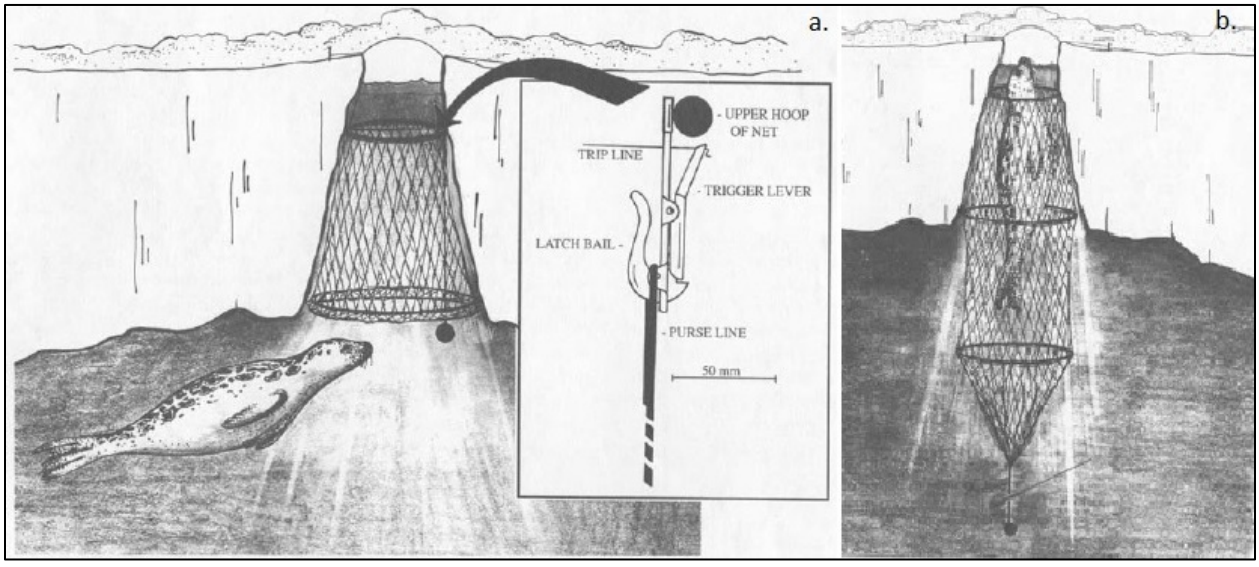

Figure 2. Net for live capturing ringed seals in their breathing holes shown with lower chambers attached to upper prior to seal's entrance with insert showing trigger mechanism (a) and shown fully extended and pursed (b) (from Kelly 1996).

A floating trap has been used in Russia to capture ice seals and may be used as part of the activities proposed under this permit (Figure 3). The trap is made with hinged doors and netting.

The seal drops through the doors into the net when it tries to haul out on the platform. The net is held out by a metal frame at the bottom and contains the seal until the trap is removed from the water without entangling the animal. The doors have stops so that they will not open outward once the seal is in the trap. A metal frame at the bottom keeps the net square and taut. The animal can surface and breathe while in the trap. If floating traps are deployed, researchers will be required to monitor the traps continuously from a distance using binoculars or a spotting scope and to extract seals from the trap as soon as possible.

When a seal is caught in any trap, it is removed and placed in a hoop net (a soft mesh net with a rubber outer ring) in the boat for transfer to a beach or to ice. Seals are taken out of the boat and may be moved from the boat to a processing area out of the weather using an ATV with a trailer to hold the seal.

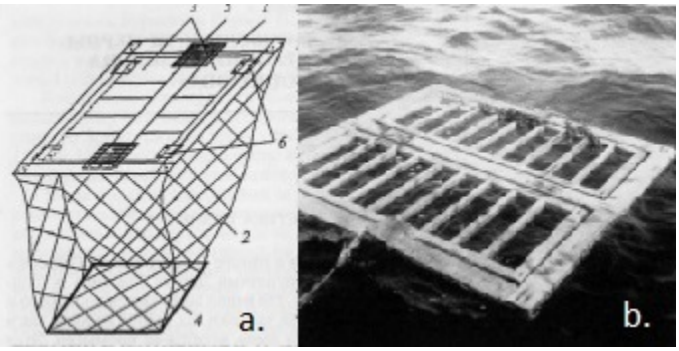

Figure 3. Floating trap for live capture of ice seals used in Russia that may be used in this study. The components of the trap are shown in (a) and an image of the trap in the water in (b) (from ADFG 2017).

Non-lethal deterrents (e.g., rubber bullets, bean bags, or paintballs) may be used to startle seals during capture activities. Non-lethal deterrents are shot in the direction of a seal without hitting it to minimize a seal's surface time cause it to tire more quickly. Firing of non-lethal deterrents at a seal may be repeated several times so the boat can approach the seal more closely in order to deploy a net. Non-lethal deterrents may also be used to startle a seal toward a net. The use of non-lethal deterrents is an adaptation of the method used by Native Alaskan seal hunters to get close to seals to harpoon them and prevent them from sinking once shot. Upon capture, seals will be held at the surface and allowed to breathe normally during the tagging and sampling process. No seal will be pursued for more than 30 minutes (approximately 3 – 5 approaches). If a seal is not captured within this 30-minute window, it will be left alone.

On ice or on land: Seals on the sea ice may be captured by blocking the hole with plywood, which can be moved across the hole from a bling, preventing the seal from entering the water. Once the access hole is blocked, a handler can take hold of the seal by the hind flippers and pull it away from the hole. In some cases, seas on ice may be captured by placing a hoop net or long-handled dip net over it.

A seal on land will be approached by running up to it and placing a small hoop net or long-handled dip net over it.

3.4 Use and Administration of Drugs

Dart-delivered chemical immobilization may be used to try to capture bearded seals. To date, efforts to dart large bearded seals have been unsuccessful because they are wary of boats and people and leave ice flows before researchers are close enough to fire. A combination of three drugs (midazolam, butorphanol, and medetomidine) was used successfully to immobilize Steller and California sea lions and a two-drug combination (midazolam and medetomidine) has shown promise for capturing grey seals. A drug combination will be developed for this research based on the combinations used for other species. All drug combinations and dosages will be coordinated with the ADFG veterinarian in consultation with other veterinarians based on experiments involving drug combinations for phocids in captivity. The seals will be approached following immobilization and a net will be deployed to hold tranquilized seals near the boat. After approach or physical restraint, an intramuscular (IM) dose of midazolam via pole syringe or hand injection or an intravenous (IV) dose of diazepam may be administered if necessary and an additional dose may be administered if the original dose starts to wear off.

Once the seal is physically restrained and blindfolded, either of the components of the chemical restraint may be reversed or reversed at the end of the handling procedure using chemical reversal agents. During sampling and tagging (described below), some seals may need to be sedated with diazepam (IV) or midazolam (IM). If the original dose starts to wear off, seals may be administered an additional dose. If the seal becomes too deeply sedated and is hypoventilating or is otherwise in need of emergency intervention, in addition to the chemical reversal agents, doxapram will be administered by IV or sublingually. If intubated or if the animal can be intubated rapidly, doxapram in saline will be administered intratracheally followed by ventilation with oxygen. Epinephrine in saline can be administered intratracheally as an adjunct to the above emergency-only procedures. The expected duration of sedation will be approximately 40 minutes. After antagonist drugs are administered, the seal will be monitored visually until it is fully alert and reacts normally.

Seals that have been sedated and given a reversal agent will be held until they show full signs of recovery from the effects of the drugs (e.g., are alert at the approach of researchers and respond when gently touched).

A single dose of Banamine (IM) may be administered immediately following surgery performed to collect blubber and muscle biopsies to provide post-operative anti-inflammatory effects.

3.5 Sampling and Tagging

All captured seals will have measurements taken, samples collected, and be given a numbered identification tag placed on a hind flipper (up to 200 animals per species per year). Seals may be physical restrained on a stretcher are secured to the stretcher with nylon straps (Figure 4) or straddled with front flippers pinned to their sides (Figure 5). Some seals (large bearded or aggressive spotted and ringed seals) may need to be sedated. Seals will be restrained only for the duration of the tag attachments, biopsy and blood draw. Sedated seals may be given a reversal

agent that will shorten the recovery period and holding time if the anesthetic has not already worn off.

Scheduled capture events will take place after pups are weaned and no females with dependent young or dependent young themselves will be captured. All other seals will be sampled and tagged if the seal is deemed healthy. If adult females are temporarily trapped on the ice during pupping season and captured opportunistically, they will not be drugged and will be held only the length of time needed to tag them.

Tagging: The webbing of one of the hind flippers is cleaned with Betadine or a similar solution and a hole is made in the flipper with special pliers in order to attach one or two numbered plastic tags (e.g., Jumbo Rototag). The skin plug that comes from the hole in the flipper created to place the tag will be frozen, placed in ethanol, or placed in dimethyl sulfoxide until sent for genetic analysis or archived.

Figure 4. Ringed seal secured to a stretcher with straps for sampling, measurement, and placement of instruments (from ADFG 2017).

Figure 5. Ringed seal being straddled by the handler to restrain it. Handler is not sitting on the seal and his weight is on his knees (from ADFG 2017).

Measurements: Seals are weighed on stretchers or by bundling them in a tarp or hoop net and hanging them briefly from a spring scale on a bi- or tripod, or from a pole with two people holding the ends of it. With the seal on its belly, measurement taken include curvilinear length from the tip of the nose to the tip of the tail, straight length from the tip of the nose to the tip of the tail, girth behind the front flippers, and maximum girth around the belly. The sex of the animal is also recorded.

Whisker Samples: Two whiskers will be plucked, one from each side, from each animal by grasping the whisker near its base using a pair of pliers. Whiskers are placed in a labeled whirlpak bag and will be used for isotope and hormonal analyses.

Blood Sampling: Regardless of capture method, seals will be physically restrained by people or a hoop net when drawing blood. The needle site will be cleaned with Betadine or similar solution before blood is drawn. Blood is drawn from the extradural intravertebral vein using a disposable sterile needle. No more than three attempts to draw blood will be made per individual. A maximum of 10 milliliters per kilogram (ml/kg) body weight of blood per seal will be collected (e.g., maximum volume of blood collected from a 20 kg seal would be 200 ml) based on the total blood volume of marine mammals and the amount that can be collected on a single occasion from healthy animals (ADFG 2017). Blood samples will be used to determine disease exposure, hormonal status, blood chemistry, and archived for other used. Blood may also be collected on filter paper from the flipper punch site when tagging animals.

Biopsies: A full-thickness blubber biopsy may be taken above the hip using a sterile (disposable) 6-millimeter (mm) diameter biopsy punch. Single use, disposable biopsy equipment will be used. The length of the equipment will vary with the size of the seal and blubber depth. All reusable biopsy equipment that penetrates deeper than the dermis will be sterilized (using steam) prior to use on another seal. Blubber samples will be used for body condition and diet (fatty acid) studies and possibly to test for contaminants.

A muscle biopsy may be taken from the hip (longissimus dorsi or gluteus maximus) or foreflipper (pectoral) regions using standard medical biopsy needles or a 6 mm diameter, regular length (7 mm) biopsy punch and the punch size will not vary with seal age. Muscle samples will be used to determine nutritional status and body condition of the animals.

Lidocaine or an analgesic combination of lidocaine and Bupivacaine in a 50:50 ratio will be injected into the sampling area prior to taking a blubber or muscle biopsy and a sterile scalpel blade will be used to make an incision of approximately 1 centimeter (cm) through the skin.

Skin biopsies will be collected from seals that receive a hind flipper transmitter. Skin scrapings will be taken of skin lesions. Healthy skin samples will be used for genetic analysis and health studies.

Hair Samples: A sample of hair from an area measuring approximately 5 cm by 5 cm may be shaved from the dorsal side of the body and collected in a whirlpak bag. Hair will be used for contaminant (e.g., mercury) and isotope (e.g., diet) analyses.

Urine, Fecal, and Swab Sample Collection: Urine and fecal material (free catch) may also be collected opportunistically and frozen for monitoring for the presence of toxic algae. Swabs (oral, nasal, urogenital, and rectal) may be taken to test for bacterial and other health screening factors. Skin lesions may also be swabbed.

Ultrasound: Blubber content may be measured non-invasively by measuring blubber depth at up to twenty sites along the body using a portable ultrasound unit. Readings are taken by placing the transducer upon the skin. This procedure can be performed in approximately 20 minutes.

3.6 Onboard Instruments

Up to 200 animals per species per year will be equipped with satellite location/depth transmitters. Some animals will receive both a satellite location/depth transmitter and a flipper-mounted location only transmitter. Some may receive a flipper-mounted location only transmitter and be temporarily fitted with a Crittercam® or acoustic tag, but not both. Some may receive a satellite location/depth transmitter, a flipper transmitter, and be fitted temporarily with a Crittercam® or acoustic recorder. Some may receive a satellite location/depth transmitter, a location/CTD transmitter (also called a Sonde, this is an oceanography instrument used to measure the conductivity, temperature, and pressure of seawater), and a flipper-mounted location-only transmitter. Some may receive a flipper-mounted location-only transmitter and a temporary acoustic recorder. The maximum number of instruments any one seal will carry is two glue-on transmitters, one temporary recording instrument, and one flipper transmitter. Most seals will receive one glue-on transmitter and one flipper-mounted transmitter. Recapture of individual ice seals is not intended or anticipated during the duration of the project.

Glue-On Instruments: These include location/depth transmitters, location/CTD transmitters, video camera recorders, and acoustic recorders with accelerometers. Transmitters send data to satellites while recorders store data and need to be retrieved. A glue-on satellite location/depth transmitter may be placed on top of the head or on the back (see Figures 4 and 5). Adhesive (e.g., 5-minute epoxy or superglue) is mixed in two small batches. The first batch goes onto the bottom of the transmitter and on mesh or neoprene and on the hair of the seal. The glue is spread in a thin layer so that it does not generate too much heat during the curing process and irritate the seal's skin. When that layer dries, the second batch of glue is used to cover any places that were missed where the transmitter needs to be bonded to the seal's skin. A piece of mesh or neoprene may be used between the transmitter and the seal's hair. The neoprene is glued to the hair and transmitter in the same way in terms of applying glue to each surface and waiting until tacky before pressing together to ensure maximum adhesion.

An onboard video camera "Crittercam®" may be used to collect diet and habitat data. Crittercams® record video and the instrument can be remotely released from the animal when

desired. Crittercams® are 30 by 8 by 8 cm and weigh approximately 1,000 grams (g) in air but are close to neutrally buoyant in water. A base plate is attached to the pelage on the back of the animal with quick setting epoxy and the camera is then attached to the base plate (Figure 6). The base plate will remain attached until the annual molt but the camera is released within 24 hours or remotely released sooner.

Acoustic data loggers record and store sound levels and can be attached to the animal in the same way as Crittercams®. Bioacoustic Probes (Greenridge Sciences) measure 19.3 by 3.2 cm and weigh approximately 230 g. Acoustic tags that transmit data to satellites are in development and may be used in areas where retrieving a logger is problematic. Acoustic satellite tags would be similar in size and mass to CTD tags.

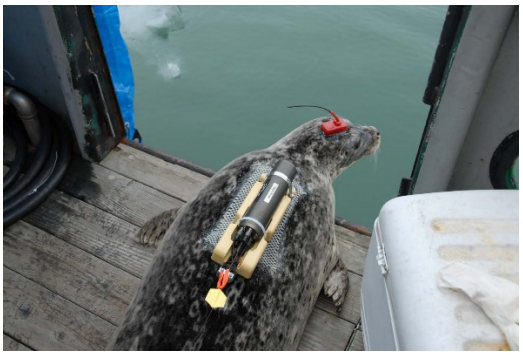

Figure 6. A seal with Crittercam® mounted on its back (from ADFG 2017).

Flipper-attached instruments: The hind flipper is cleaned with providone iodine or chlorhexidine and then wiped with 70 percent isopropyl alcohol and left to dry. Two disposable sterile 6 mm diameter biopsy punches will be used to make two holes in the webbing for the transmitter attachment. Seals are physically restrained by people or hoop nets as necessary while installing the transmitter. These transmitters are smaller than those that are glued on and only collect location data (e.g., Wildlife Computers SPOT tag measuring approximately 80 by 20 by 10 mm and weighing approximately 30 g). These tags are retained longer because they do not shed with the hair during the molt. Up to 200 seals of each species per year may receive both a glue-on and a flipper tag. In no case will the seal be intentionally recaptured to retrieve a tag. Hind flipper tags rarely transmit unless the seal is hauled out but are valuable in determining seasonal fidelity to areas where haulout behavior is common, such as for breeding and molting.

After instruments are securely attached and turned on, data sheets are checked to make sure the tag number is written down and all of the data are complete and the seal is then released into the water. The glue-on tags remain attached until the spring molt when they are shed with the old pelagae.

3.7 Release

Unsedated captured seals will be allowed to go directly into the water immediately after sampling and tagging. The total time from the capture to the onset of sampling and tagging seals

will vary from 60 to 120 minutes; however, seals caught when daylight is ending or for due to weather-related safety issues may be held approximately 10 hours before release.

3.8 Unintentional Mortality

The Permits Division proposed to authorize the unintentional mortality of seals (see Tables 1 and 2) as a result of the research procedures that will be used in Permit No. 20466. Unintentional mortality associated with the proposed research activities is rare but can occur with the most likely source being drowning in nets. ADFG reported in the permit application for this consultation that over the last five years, they have captured 87 seals using nets and have had four mortalities in nets over this time.

3.9 Proposed Permit Terms and Conditions

In conjunction with the issuance of the permit, the Permits Division would require Terms and Conditions in the permit specifying the duration of the permit; the number and kind of protected species, location, and manner by which these species will be taken, and counting and reporting requirements for takes; and restrictions on research methods to be used including aerial and vessel surveys, darting, handling, and sampling of animals (see Appendix A).

4 INTERRELATED AND INTERDEPENDENT ACTIONS

Interrelated actions are those that are part of a larger action and depend on that action for their justification. *Interdependent* actions are those that do not have independent utility apart from the action under consultation. For this consultation, we consider all vessel transit associated with research activities as interdependent. Thus, we evaluate the effects this vessel transit may have on ESA-listed species and designated critical habitat and so include all waters traversed to and from activities considered in this consultation as part of the action area.

5 ACTION AREA

Action area means all areas affected directly, or indirectly, by the Federal action, and not just the immediate area involved in the action (50 C.F.R. §402.02). The proposed action would occur year-round in waters of the Bering, Chukchi, and Beaufort Seas of Alaska. The researchers will receive biological samples from seals harvested by residents of six villages (Point Hope, Shishmaref, Diomede, Gambell, Savoonga, and Hooper Bay) and from the North Slope Borough from Barrow, Wainwright, and Kaktovik (Figure 7). Researchers may also capture/restrain, tag, instrument, sample, and release seals in any village along the west and north coast of Alaska from Bristol Bay to Kaktovik. The action area includes the transit routes used by research vessels in order to reach locations where vessel surveys and live capture of animals will take place.

Figure 7. Map of the action area for this consultation (from Alaska Department of Fish and Game Marine Mammal Program Ice Seals).

6 STATUS OF ENDANGERED SPECIES ACT PROTECTED RESOURCES

This section identifies the ESA-listed species that potentially occur within the action area that may be affected by the issuance of Permit No. 20466. It then summarizes the biology and ecology of those species and what is known about their life histories in the action areas. The status is determined by the level of risk that the ESA-listed species and designated critical habitat face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This section also breaks down the species and designated critical habitats that may be affected by the proposed action, describing whether or not those species and designated critical habitats are likely to be adversely affected by the proposed action. The species and designated critical habitats deemed likely to be adversely affected by the proposed action are carried forward through the remainder of this opinion.

This section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

The species potentially occurring within the action area that may be affected by the proposed actions are listed in Table 3, along with their regulatory status.

NMFS uses two criteria to identify the ESA-listed or critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are interrelated to or interdependent with the Federal agency's proposed action. The first criterion is exposure, or some reasonable expectation of a co-occurrence, between one or more potential stressors associated with the proposed activities and ESA-listed species or designated critical habitat. If we conclude that an ESA-listed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude that the species or critical habitat is not likely to be adversely affected by those activities.

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitat that is exposed to a potential stressor but is likely to be unaffected by the exposure is also not likely to be adversely affected by the proposed action. We applied these criteria to the species ESA-listed in Table 3 and we summarize our results below.

An action warrants a "may affect, not likely to be adversely affected" finding when its effects are wholly *beneficial, insignificant* or *discountable*. *Beneficial* effects have an immediate positive effect without any adverse effects to the species or habitat. Beneficial effects are usually discussed when the project has a clear link to the ESA-listed species or its specific habitat needs and consultation is required because the species may be affected.

Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. That means the ESA-listed species may be expected to be affected, but not harmed or harassed.

Discountable effects are those that are extremely unlikely to occur. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did impact a listed species),but it is very unlikely to occur.

Table 3. Threatened and endangered species that may be affected by the Permit Division's proposed permitting of ice seal research activities and Alaska Department of Fish and Game's carrying out these activities.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538
Bowhead Whale (*Balaena mysticetes*)	E – 35 FR 18319	-- --	-- --
North Pacific Right Whale (*Eubalaena japonica*)	E – 73 FR 12024	73 FR 19000	78 FR 34347
Humpback Whale (*Megaptera novaeangliae*) - Western North Pacific and Mexico DPS	E – Western North Pacific DPS T – Mexico DPS 81 FR 62259	-- --	55 FR 29646
Western North Pacific Gray Whale (*Eschrichtius robustus*)	E – 35 FR 18319	-- --	-- --
Blue Whale (*Balaenoptera musculus*)	E – 35 FR 18319	-- --	07/1998
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Pinnipeds			
Ringed Seal (*Phoca hispida hispida*) – Arctic DPS	T – 77 FR 76706 Vacated, Appeal Pending	79 FR 73010 Proposed, Depends on Result of Appeal	-- --
Bearded Seal (*Erignathus barbatus*) – Beringia DPS	T – 77 FR 76740	-- --	-- --
Steller Sea Lion (*Eumetopias jubatus*) – Western DPS	E – 55 FR 49204	58 FR 45269	03/2008

6.1 Species and Designated Critical Habitat Not Likely to be Adversely Affected

6.1.1 Cetaceans

The Permits Division proposes the authorization of ice seal research activities through Permit No. 20466. Research activities include vessel and aerial surveys of ice seals (spotted, ringed, bearded, and ribbon) and active capture of ice seals that also requires the use of vessels, as well as deployment of nets and traps. These activities have the potential to affect the following species of cetaceans whose ranges include the action area: bowhead, North Pacific right, North Pacific gray, fin, and humpback Western North Pacific and Mexico DPS whales. Blue and sei whales could also be affected, although these species are not typically observed north of the Aluetian Islands in the Bering Sea and are not reported from the Chukchi or Beaufort Seas and are therefore less likely to be present during research activities than other whale species.

Aerial Surveys: Aerial surveys using a fixed-wing aircraft are proposed to monitor ice seal distribution and population trends. Aerial surveys will take place year-round but are expected to be more common from April to October over the 5-year permit lifetime. Thus, aerial surveys will take place during periods when whales may be concentrated in their feeding grounds within the action area. Planes will fly at altitudes of 200 m or greater and will avoid flying over non-target species, such as whales. If researcher sight an ESA-listed cetacean, they will increase their altitude or alter course to avoid harassing the whale. Therefore, any noise or visual disturbance associated with the surveys would be of short duration (the time needed to spot the whale and alter course or increase the altitude of the airplane) and so small as to be immeasurable. Therefore, the effects associated with aerial surveys conducted as part of the proposed research activities on cetaceans will be insignificant and will not result in take.

Vessel Operations: Vessel transit will occur as part of all in-water research activities, including vessel surveys and capture/handling/release of ice seals. Vessel surveys will be conducted from vessels ranging in size from small boats to large commercial vessels and may occur year-round. During vessel surveys, the researchers will operate vessels at slow speeds (under 10 knots) to minimize wake with 100 percent observer coverage to look for ice seals. These observers will also be responsible for reporting sightings of non-target species in order to avoid potential vessel

collisions. The slow speeds at which vessels with operate coupled with the number of observers who will be onboard make it unlikely that vessels will collide with ESA-listed whale species during surveys. Any noise or visual disturbance from vessel operations to cetaceans associated with surveys is expected to be momentary and so small in scale as to be immeasurable. Therefore, the effects associated with vessel surveys on cetaceans will be insignificant and will not result in take.

Vessel transit to survey areas and areas targeted for capturing ice seals may take place at greater speeds. Vessels used for capture activities do not include larger commercial vessels that may be employed during vessel surveys, which reduces the potential for impacts to ESA-listed whale species associated with vessel collisions. The presence of observers during all activities will ensure non-target species that are sighted along the vessel's path are avoided to minimize the potential for collision. ADFG has been conducting similar research activities over a number of years with previous authorization from the Permits Division with no reports of vessel strikes. Therefore, the effects associated with vessel transit as part of all proposed in-water research activities will be discountable.

Nets and Traps: Nets and traps will be used to capture ice seals. Most nets and traps are too small to capture cetaceans but all have the potential for entanglement. Nets used across lagoon entrances are larger and do have the potential to capture smaller cetaceans. In July 2012, nets set to catch seals in Elson Lagoon near Barrow resulted in the capture of six beluga whales, two of which died. Because of this, ADFG has modified its methodology such that nets set near lagoon entrances will be monitored continuously and pulled immediately if belugas are seen or reported in the area to minimize the chance of capturing beluga whales. This will protect ESA-listed whale species as well (because the belugas captured were not part of the ESA-listed Cook Inlet DPS, which is not located in the action area). Most traps and nets are monitored continuously but some are left overnight and checked as soon as it is daylight with the exception of those set near lagoon entrances that are no longer left unattended. No nets or traps are deployed if ESA-listed whales are observed in a deployment area and gear is retrieved from the water if ESA-listed whales enter the area while nets and traps are in the water. ADFG retrieves all gear at the end of each capture attempt, removing the potential for entanglement and the conversion of abandoned gear in marine debris that would present a hazard to cetaceans. The 2012 incident with beluga whales was the only entanglement event during the five years of research conducted under the previous permit issued to ADFG based on the information provided by the Permits Division. Therefore, the effects to ESA-listed whales associated with entanglement in nets and traps used to capture ice seals is discountable.

North Pacific Right Whale Critical Habitat: Research will not be conducted within the area designated as North Pacific right whale critical habitat, which lies outside Alaska State waters. Vessels associated with the proposed action could transit through the area as there are no predefined vessel transit routes associated with the proposed action, although this is unlikely because research activities, including vessel surveys and capture/handling/release activities, will

take place only in Alaska State waters. The designated critical habitat is delineated by coordinates forming a polygon in the Bering Sea (North Pacific right whale critical habitat) in an area characterized by high densities of zooplankton such as copepods and euphausiids that serve as prey species for North Pacific right whales and comprise the primary constituent elements of its designated critical habitat. The proposed research activities will not affect the abundance or distribution of the prey species in the designated critical habitat. Therefore, the proposed action will have no effect on North Pacific right whale critical habitat.

In summary, we conclude that the Permits Division's issuance of Permit No. 20466 may affect, but is not likely to adversely affect ESA-listed bowhead, North Pacific right, North Pacific gray, fin, humpback Western North Pacific and Mexico DPS, blue, and sei whales, and will have no effect on North Pacific right whale designated critical habitat.

6.1.2 Pinnipeds

As for ESA-listed whale species, the proposed research activities that include aerial surveys, vessel operations, and the use of nets and traps to capture four species of ice seals have the potential to affect Steller sea lions and their designated critical habitat. The northern portion of the Steller sea lion's (Western DPS) range overlaps with the southern portion of the ranges of bearded and ringed seals. However, ice seals occupy a different habitat than the Steller sea lion Western DPS. Steller sea lions have been observed to haul out on sea ice but this is considered atypical behavior. Ice seals use sea ice to rest, molt, and pup. Steller sea lions use land habitat on gravel, rocky or sandy beaches, ledges, or rocky reefs to rest, molt, and pup (rookeries).

Aerial Surveys: Aerial surveys using a fixed-wing aircraft are proposed to monitor ice seal distribution and population trends. Aerial surveys will take place year-round but are expected to be more common from April to October over the five-year permit lifetime. Thus, aerial surveys will take place during periods when Steller sea lion females have pups. Planes will fly at altitudes of 200 m or greater and will avoid flying over non-target species. Planes will also avoid Steller sea lion rookeries, maintaining distances of 3,000 ft (914 m) from rookeries. If researcher sight a Steller sea lion, they will increase their altitude or alter course to avoid harassing the animal. Therefore, any noise or visual disturbance associated with the surveys would be of short duration (the time needed to spot the animal and alter course or increase the altitude of the airplane) and so small as to be immeasurable. Therefore, the effects associated with aerial surveys conducted as part of the proposed research activities on Steller sea lions will be insignificant and will not result in take.

Vessel Operations: Vessel transit will occur as part of all in-water research activities, including vessel surveys and capture/handling/release of ice seals. Vessel surveys will be conducted from vessels ranging in size from small boats to large commercial vessels and may occur year-round. During vessel surveys, the researchers will operate vessels at slow speeds (under 10 knots) to minimize wake with 100 percent observer coverage to look for ice seals. These observers will also be responsible for reporting sightings of non-target species in order to avoid potential vessel collisions. The slow speeds at which vessels with operate coupled with the number of observers

who will be onboard make it unlikely that vessels will collide with Steller sea lions during surveys. As for aerial surveys, researchers conducting vessel surveys will maintain a distance of 3,000 ft (914 m) from rookeries to minimize the potential for interactions with Steller sea lions, including pups. Any noise or visual disturbance from vessel operations to Steller sea lions associated with surveys is expected to be momentary and so small in scale as to be immeasurable. Therefore, the effects associated with vessel surveys on Steller sea lions will be insignificant and will not result in take.

Vessel transit to survey areas and areas targeted for capturing ice seals may take place at greater speeds. Vessels used for capture activities do not include larger commercial vessels that may be employed during vessel surveys, which reduces the potential for impacts to Steller sea lions associated with vessel collisions. The presence of observers during all activities will ensure non-target species that are sighted along the vessel's path are avoided to minimize the potential for collision. ADFG has been conducting similar research activities over a number of years with previous authorization from the Permits Division with no reports of vessel strikes. As for survey activities, Steller sea lion rookeries will be avoided during vessel transit to/from research sites. Therefore, the effects associated with vessel transit as part of all proposed in-water research activities to Steller sea lions will be discountable.

Nets and Traps: Nets and traps will be used to capture ice seals. Steller sea lions are roughly the same size and could also be captured in these gear. However, because nets and traps will be set on or near ice where ice seals are known to haul out or maintain breathing holes and haul out of Steller sea lions on ice is extremely rare, it is unlikely that nets and traps will be located in areas where Steller sea lions would be captured instead of ice seals. Nets and traps will not be set near rookeries or in areas frequented by Steller sea lions. Most traps and nets are monitored continuously but some are left overnight and checked as soon as it is daylight with the exception of those set near lagoon entrances that are never left unattended. ADFG retrieves all gear at the end of each capture attempt, removing the potential for entanglement and the conversion of abandoned gear in marine debris that would present a hazard to Steller sea lions. During the 5 years of research conducted under the previous permit issued to ADFG, there was no capture of Steller sea lions in nets and traps based on the information provided by the Permits Division. Therefore, the effects to Steller sea lions associated with entanglement in nets and traps used to capture ice seals is discountable.

Steller Sea Lion Critical Habitat: Research will not be conducted within the area designated as Steller sea lion (Western DPS) critical habitat. In Alaska, Steller sea lion critical habitat includes all major haulouts and rookeries and an aquatic zone extending 20 nautical miles from those that are east of 144°W longitude and those that are west of 144°W longitude, a terrestrial zone that extends 3,000 ft (914 m) landward from the baseline or base point of each major rookery and haulout, and an air zone that extends 3,000 ft (914 m) above the terrestrial zone of each major rookery and haulout in Alaska measured vertically from sea level. Three special aquatic foraging areas in Alaska, including the Shelikof of Strait, Bogoslof, and Seguam Pass areas are also

designated critical habitat (Steller Sea Lion Critical Habitat in Alaska). The physical and biological habitat features that support reproduction, foraging, rest, and refuge are essential to the conservation of the Steller sea lion, which include terrestrial, air, and aquatic areas. In addition to rookeries and haulouts, Steller sea lions use traditional rafting sites where the animals rest on the ocean surface in a tightly-packed groups and these sites are an essential part of Steller sea lion habitat. Adequate food resources are also an essential component of Steller sea lion's aquatic habitat. Steller sea lions are opportunistic carnivores with waters in the vicinity of rookeries and haulouts serving as important foraging habitats, particularly for females with young and young animals. Prey species varies with location and seasons, as well as with changes in prey abundance and availability but appear to always include different fish species and cephalopods. There is a report of a Steller sea lion eating a ringed seal pup but this behavior is considered atypical. Therefore, the loss of ringed seals as a result of unintentional mortality associated with research activities, is not expected to result in impacts to Steller sea lion prey species and critical habitat. Similarly, because research activities have been designed to avoid areas of critical habitat and are not expected to result in reductions in fish and cephalopod populations in the action area, we believe there will be no effect to Steller sea lion critical habitat in Alaska as a result of the proposed action.

In summary, we conclude that the Permits Division's issuance of Permit No. 20466 may affect, but is not likely to adversely affect Steller sea lions and will have no effect on their designated critical habitat in Alaska.

Proposed Critical Habitat for Arctic Ringed Seals: was proposed for designation in the Bering, Chukchi, and Beaufort seas in Alaska (79 FR 73010). Physical or biological features essential to the conservation of the species included sea ice habitat suitable for the formation of and maintenance of subnivean birth lairs, sea ice habitat suitable as a platform for basking and molting, and primary prey resources to support Arctic ringed seals. None of the actions proposed under the MMPA permit being considered for issuance to ADFG by the Permits Division will affect these features. There will be no alteration of ice habitat during capture operations and there will be no capture of any prey species as the gear to be used to capture ice seals is designed to target these species and will be monitored during deployment.

In summary, we conclude that the Permits Division's issuance of Permit No. 20466 will have no effect on the proposed critical habitat for Arctic ringed seals.

6.2 Species Likely to be Adversely Affected

This section identifies the ESA-listed species that occur within the action area (Figure 7) that may be affected by the proposed research activities. The status is determined by the level of risk that the ESA-listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers or distribution" as described in 50 C.F.R. 402.2. More detailed information on the status and trends of these ESA-listed species, and

their biology and ecology can be found in the listing regulations and critical habitat designations published in the Federal Register, status reviews, recovery plans, and on the NMFS' website:

NMFS Office of Protected Resources Species Information

This section also examines the condition of critical habitat throughout the action area (such as coastal and marine environments that make up the action area), and discusses the condition and current function of designated critical habitat, including the essential physical and biological features that contribute to that conservation value of the critical habitat.

Specifically, the proposed action is the authorization of research on ice seals, including bearded seals (Beringia DPS) and ringed seals (Arctic DPS). The research activities that would be authorized by Permit No. 20466 are likely to adversely affect bearded seals (Beringia DPS) and ringed seals (Arctic DPS) and proposed critical habitat for ringed seals (Arctic DPS).

6.2.1 General Threats Faced by Ice Seals

Ice seals face several natural and man-made threats that shape their status and affect their ability to recover. Many of these threats are either the same or similar in nature for ESA-listed ice seal species. In this section, we discuss the general threats faced by ice seals. Predators are a natural threat to ice seals with polar and brown bears, killer whales, Greenland sharks, and walruses being some of the natural predators of ringed and bearded seals (Cleator 1996; Fay 1960; Heptner et al. 1976b; Kelly 1988b; Lowry and Fay 1984; Lowry et al. 1987; Zenkovich 1938; Burns and Eley 1976; Fay et al. 1990; Heptner et al. 1976a; Melnikov and Zagrebin 2005; Sipila 2003). Ringed seals are also preyed upon by other species and make up a large portion of the diet of polar bears (Derocher et al. 2004; Stirling and Parkinson 2006).

Ice seals have been hunted for subsistence for thousands of years, a practice that continues presently (Nomokonova et al. 2015; Krupnik 1984; Riewe 1991; Hovelsrud et al. 2008; Kovacs 2007; Krupnik 1988). Commercial harvesting of bearded seals in the Bering and Chukchi Seas led to a depletion of populations until regulations were put in place. Issuance of bounties for ringed seals led to dramatic population declines associated with excessive hunting until hunting was banned in different areas.

Organochlorine compounds have been found in ringed and bearded seals, including DDT and PCBs. These compounds appear to be ubiquitous in the Arctic marine food chain (Bang et al. 2001; Burrell 1981; Clausen 1978; Galster and Burns 1972; Addison et al. 2005; Addison and Smith 1974; Helle et al. 1983). A number of other contaminants have also been identified in ringed seals and heavy metals have been found to accumulate in ringed seal liver and kidney (Atwell et al. 1998; Gaden et al. 2009; Helle 1981).

Fisheries bycatch is a significant issue for ringed seals in the Baltic Sea, Lake Saimaa, and Lake Ladoga, though changes in the fishing industry to reduce bycatch mortality have resulted in lower numbers of seal mortalities (Sipila and Hyvarinen 1998; Sipilä et al. 2002). Low bycatch and mortality have been reported for bearded seals associated with the Bering Sea/Aleutian

Islands groundfish trawl fishery (Allen and Angliss 2010; Angliss and Allen 2009; Angliss and Lodge 2002). However, bottom trawling causes significant changes to the benthic environment bearded seals rely on to find prey.

Both bearded and ringed seals were proposed for listing under the ESA due to the potential impact of climate change on the biology of the species, specifically the availability of ice and prey abundance and distribution, as well as possible impacts of ocean acidification on the marine food chain (Cameron et al. 2010; Kelly et al. 2010; Ameghino 1899). Ringed seals rely on lairs for resting, nursing, thermoregulation, predator avoidance, and parturition. Early spring ice break-ups can adversely impact growth, condition, and survival of pups (Harwood et al. 2000; Lukin et al. 2006; Stirling and Smith 2004). For bearded seals, the presence of ice appears to be the most critical factor because this species uses the ice differently than ringed seals (Cameron et al. 2010). The recent reductions of the area of multi-year sea ice and the reduction of sea-ice thickness are of importance because it would take many years to restore thickness through annual growth and the loss of multi-year ice makes it unlikely the Arctic will return to previous climatological conditions (Kelly et al. 2010; Cameron et al. 2010).

Other climate change effects may lead to changes in the distribution and abundance of prey species of both ringed and bearded seals. Ocean acidification threatens changes in prey communities on which ringed and bearded seals depend. Ice loss in summer and fall months will also affect prey populations such as Arctic cod on which ringed seals depend during these months. Changes in bearded seal prey in response to ocean warming and loss of sea ice will affect the species, although the apparent dietary flexibility of bearded seals may mean these effects will be less than for other species (Cameron et al. 2010).

6.2.2 Bearded Seal (Beringia Distinct Population Segment)

Species Description

Two subspecies of bearded seals are recognized by NMFS: *Erignathus barbatus nauticus* in the Pacific and *Erignathus barbatus* in the Atlantic (Figure 8). Bearded seals in the Pacific are distributed from 85º N south to Sakhalin Island (45º N), including the Chukchi, Bering and Okhotsk Seas.

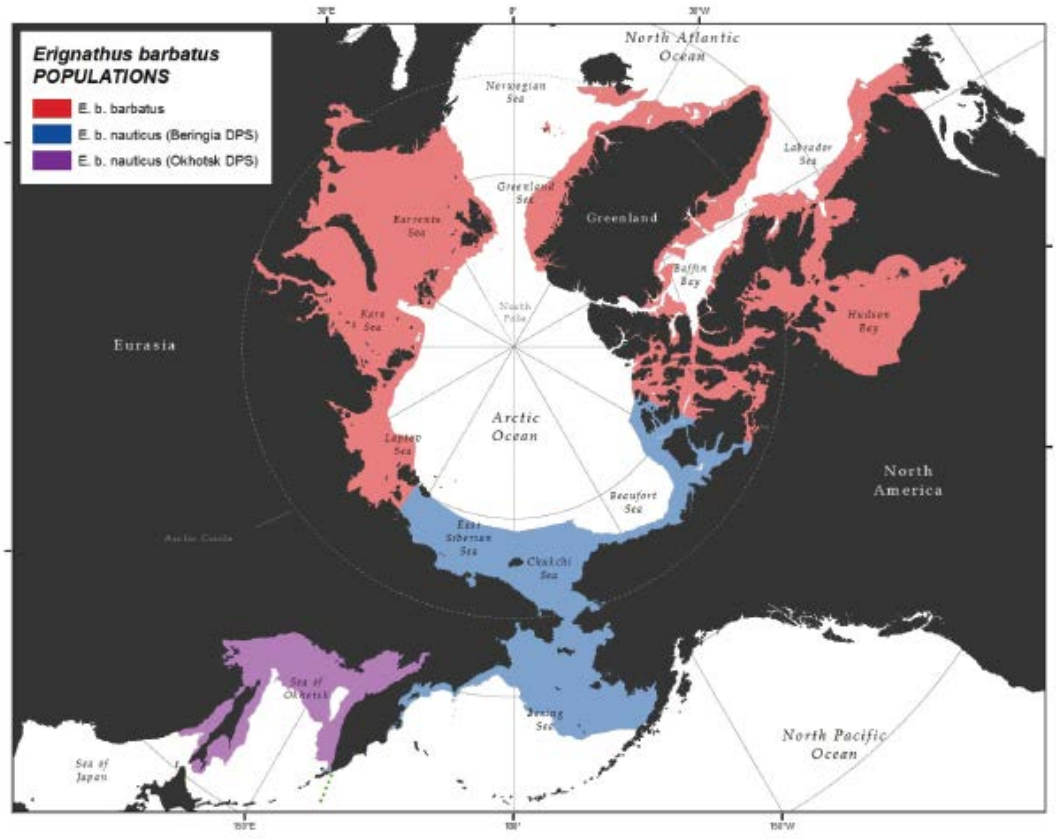

Figure 8. Map identifying the range of the two sub-species of bearded seal, *Erignathus barbatus barbatus* and *E. b. nauticus*, and the Beringia and Okhotsk distinct population segments. (from Cameron et al. 2010).

Figure 9. Bearded seal. Photo: NOAA

Bearded seals are distinguished by their small head, small square foreflippers, and thick, long, white whiskers that have resulted in the name "bearded." Pups have lighter markings on the face, resembling a "T" (Figure 99). The bearded seal is divided into two subspecies, with the Pacific subspecies (*E. b. nauticus*) further divided into two geographically and ecologically discrete DPSs: the Beringia DPS and the Okhotsk DPS. On December 20, 2012, the NMFS issued a final determination to list the Beringia DPS and Okhotsk DPS as threatened under the ESA (77 FR 76740) (Table 44). The U.S. District Court for the District of Alaska issued a decision that vacated the ESA listing of the Beringia DPS of bearded seals on July 25, 2014 (Alaska Oil and

Gas Association v. Pritzker, Case No. 4:13-cv-00018-RPB). The NMFS appealed that decision. On October 24, 2016, the Ninth Circuit Court ruled that the listing decision is reasonable and the threatened status of the Beringia DPS bearded seal was upheld.

Table 4. Bearded seal distinct population segment information summary.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Erignathus barbatus nauticus	**Bearded seal**	**Okhotsk**	**Threatened**	2010	77 FR 76740	N/A	None Designated
Erignathus barbatus nauticus	**Bearded seal**	**Beringia**	**Threatened**	2010	77 FR 76740	N/A	None Designated

We used information available in the final listing (77 FR 76740), the status review (Cameron et al. 2010), the 2015 stock assessment report (Muto 2016) and available literature to summarize the status of the bearded seal, as follows.

Life History

Generally, bearded seals move north in late spring and summer, staying along the edge of the pack ice in summer, and then move south in the fall. Bearded seals can live up to twenty to twenty-five years old. Female bearded seals become sexually mature at five or six years of age, males at six or seven. Breeding occurs from March to July. Male bearded seals vocalize during the breeding season, with a peak in calling during and after pup rearing. These calls are likely used to attract females and defend their territories to other males (Cameron et al. 2010). Pups are born between mid-March and May, and are usually weaned in fifteen days. Dependent pups spend about fifty percent of their time in the water. Nursing females spend more than ninety percent of their time in water, more than other large phocid seals. Bearded seals forage on a wide variety of benthic invertebrates, demersal fishes and sometimes, schooling fishes.

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Beringia DPS of the bearded seal. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Okhotsk DPS of the bearded seal.

The estimated population size of the Beringia bearded seal DPS is 155,000 individuals (75 FR 77496). There is substantial uncertainty around this estimate, however, and population trends for the DPS are unknown. An estimate of bearded seals in the western Bering Sea (63,200; 95 percent CI 38,400 to 138,600) from 2003 to 2008 appears to be similar in magnitude to an estimate from 1974 through 1987 (57,000 to 87,000) (Cameron et al. 2010).

The population size of the Okhotsk DPS is uncertain, but was thought to be approximately 95,000 at the time of the status review (Cameron et al. 2010).

Population trends are not available at this time for the Beringia DPS (Muto 2016).

The population trend of the Okhotsk DPS is unknown. Incomplete abundance estimates make it impossible to assess trend information. There is some evidence to suggest a decreasing trend over time, but that assessment is not reliable due to inconsistent surveys (Cameron et al. 2010).

There has been some study of the population structure of bearded seals, but it has not been possible to determine if Okhotsk DPS bearded seals are genetically distinct from other Pacific bearded seals (*E.b. nauticus*) (Cameron et al. 2010; Davis et al. 2008). The DPS determination was made on the basis that the Kamchatka Peninsula behaviorally isolates the breeding population in the Sea of Okhotsk.

Bearded seals are boreoarctic with a circumpolar distribution and are closely associated with sea ice. Most seals move seasonally, following the extent of the sea ice; however some remain near the coasts during the summer and early fall. Bearded seals in the Beringia DPS are found in the continental shelf waters throughout the Eastern Siberian, Chukchi and Beaufort Seas. The Okhotsk DPS includes bearded seals found in the Sea Okhotsk, Russia (Figure 8).

Status

In summary, the Beringia bearded seal DPS has a large, apparently stable population size, which makes it resilient to immediate perturbations. It is, however, threatened by future climate change, specifically the loss of essential sea ice and change in prey availability, and as a result, is likely to become endangered in the future. Bearded seals are an important species for Alaska subsistence hunters; the most recent estimate of annual statewide harvest is from 2000 and was 6,788 bearded seals. The current level of subsistence harvest is not known and there are no efforts to quantify statewide harvest numbers. Additional threats to the species include disturbance from vessels, sound from seismic exploration, and oil spills.

In summary, the Okhotsk bearded seal DPS has a large, apparently stable population size, which makes it resilient to immediate perturbations. It is, however, threatened by future climate change, specifically the loss of essential sea ice and change in prey availability, and as a result, is likely to become endangered in the future. Commercial harvest has depleted the bearded seal

population in parts of the Sea of Okhotsk. Additional threats to the species include disturbance from vessels, sound from seismic exploration, and oil spills.

Status of Species within the Action Area

The Beringia bearded seal DPS is present in the action area and will be affected by the proposed research activities.

In the Bering Sea where the Beringia bearded seal DPS is present, early springtime sea ice habitat is used for whelping. Springtime ice is also used during this period for nursing, mating, and some molting. The region that includes the Bering and Chukchi Seas is the largest area of continuous habitat for bearded seals (Cameron et al. 2010). The Bering-Chukchi platform is a shallow, intercontinental shelf where bearded seals can reach the bottom throughout the platform encompassing about half the Bering Sea, spanning the Bering Strait, and covering nearly all of the Chukchi Sea, meaning the area contains favorable foraging habitat (Cameron et al. 2010). During the breeding season, in May-June, bearded seals in the Bering Sea are near the ice front usually northward in heavier ice pack. As the ice retreats in the spring, most adults in the Bering Sea are thought to move north through the Bering Strait to spend summer and early fall at the southern edge of the Chukchi and Beaufort Sea pack is and the margin of mult-year ice (Cameron et al. 2010). Juveniles often remain near the coasts of the Bering and Chukchi Seas for the summer and early fall instead of moving with the ice edge and are found in bays, brackish water estuaries, river mouths, and even traveling up rivers (Cameron et al. 2010).

In the Bering Sea, the highest densities of seals in early spring have been observed between St. Lawrence and St. Matthew Islands (Cameron et al. 2010). Wintering and whelping bearded seals are also occupy coastal leads of the Bering and Chukchi Sea, such as in Bristol and Kuskokwim Bays, Norton and Kotzebue Sounds, the Gulfs of Karaginskiy and Anadyr, and near Point Hope (Cameron et al. 2010). The bearded seal population within the Beringia DPS is thought to be greater than that of the Okhotsk DPS. The Biological Review Team that conducted the status review for bearded seals recommends considering the current total Bering Sea bearded seal population to be approximately 125,000 individuals and the population in the U.S. portion of the Chukchi Sea as approximately 13,600 individuals based on aerial survey data (Cameron et al. 2010). There were no reliable numbers from aerial surveys to enable an estimate of the population in the Beaufort Sea.

Critical Habitat

Critical habitat has not been designated for the Beringia DPS bearded seal.

There is no designated critical habitat for the Okhotsk DPS bearded seal; NMFS cannot designate critical habitat in foreign waters.

Recovery Goals

A Recovery Plan has not been prepared for the Beringia DPS bearded seal.

NMFS has not prepared a Recovery Plan for the Okhotsk DPS bearded seal. In general, listed species which occur entirely outside U.S. jurisdiction are not likely to benefit from recovery plans (55 FR 24296; June 15, 1990).

6.2.3 Ringed Seal (Arctic Distinct Population Segment)

Species Description

Ringed seals have widespread, circumpolar distribution, and are found throughout the Arctic Ocean, as well as in the Sea of Okhotsk, Baltic Sea, Lake Ladoga and Lake Saimaa (Figure 10). There are five subspecies of ringed seals recognized: Ladoga (*P. h. ladogensis*), Saimaa (*P. h. saimensis*), Okhotsk (*P. h. ochotensis*), Baltic (*P. h. botnica*) and Arctic (*P. h. hispida*).

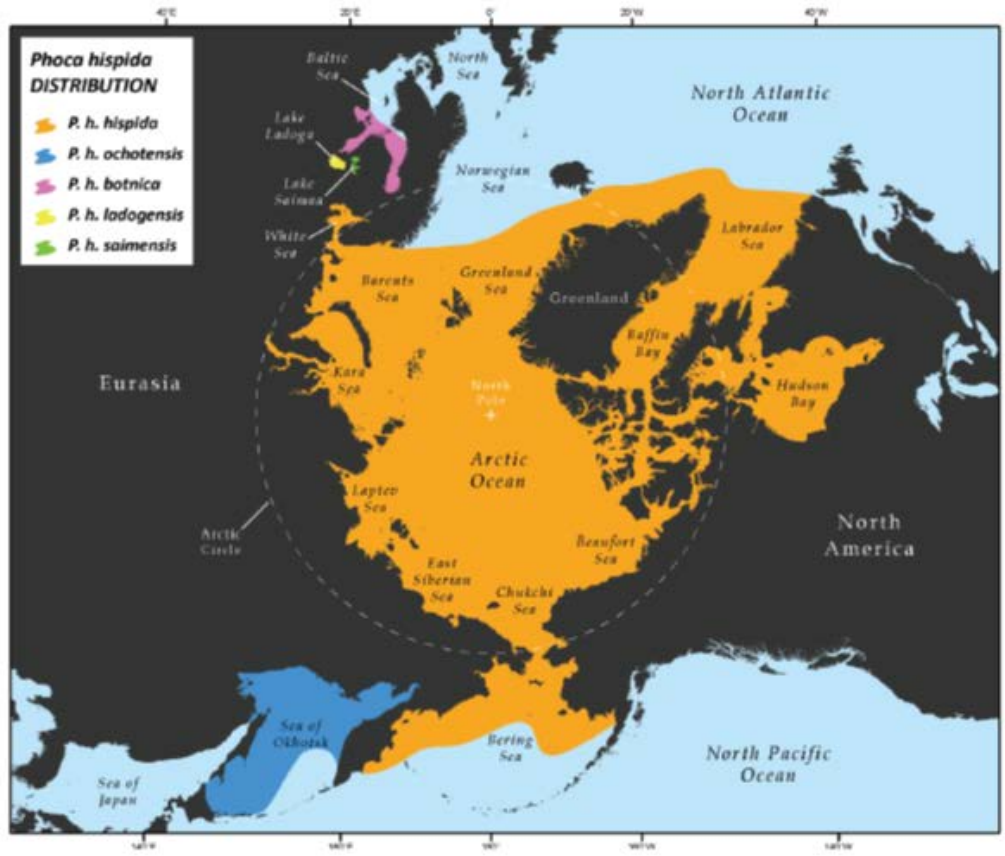

Figure 10. Map identifying the range of the five sub-species of ringed seal. (from Kelly et al. 2010)

Figure 11. Ringed seal. Photo:NOAA

Ringed seals have a dark coat with silver rings (Figure 11). Adults can be up to five feet (1.5 meters) and weigh between 110 and 150 pounds (50 and 70 kilograms). Saimaa ringed seals can weigh up to 240 pounds (110 kilograms). On December 28, 2012, NMFS issued a final determination to list the Arctic subspecies as threatened under the ESA (Table 5). On July 28, 1993, NMFS issued a final determination to list the Saimaa subspecies as endangered (Table 5). On December 28, 2012, NMFS issued a final determination to list the Okhotsk subspecies as threatened under the ESA (Table 5). On December 28, 2012, NMFS issued a final determination to list the Baltic subspecies as threatened under the ESA (Table 5). On December 28, 2012, NMFS issued a final determination to list the Ladoga subspecies as endangered under the ESA (Table 5).

The U.S. District Court for the District of Alaska issued a decision that vacated the ESA listing of the Arctic subspecies of ringed seal on March 11, 2016 (Alaska Oil and Gas Association v. National Marine Fisheries Service et al., Case 4:14-cv-00029-RRB). NMFS has appealed that decision. While that appeal is pending, our biological opinions will continue to address effects to arctic ringed seals so that action agencies have the benefit of NMFS' analysis of the consequences of the proposed action on this subspecies, even though the ESA listing of the subspecies was not in effect at the time this opinion was written.

Table 5. Ringed seal information summary.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Phoca hispida ochotensis	**Okhotsk Ringed seal**	N/A	**Threatened**	2010	77 FR 76706	N/A	None Designated
Phoca hispida ladogensis	**Ladoga Ringed seal**	N/A	**Endangered**	2010	77 FR 76706	N/A	None Designated

Phoca hispida saimensis	**Saimaa Ringed seal**	N/A	**Endangered**	2010	58 FR 40538	N/A	None Designated
Phoca hispida botnica	**Baltic Ringed seal**	N/A	**Threatened**	2010	77 FR 76706	N/A	None Designated
Phoca hispida	**Arctic Ringed seal**	N/A	**Threatened**	2010	77 FR 76706 Listing Vacated, Pending Appeal	N/A	79 FR73010 (Proposed)

We used information available in the final listing (77 FR 76706), recent stock assessment reports, the status review (Kelly et al. 2010), and available literature to summarize the status of the ringed seal, as follows.

Life History

Ringed seals are uniquely adapted to living on the ice. They use stout claws to maintain breathing holes in heavy ice, and excavate lairs in the snow cover above these holes to provide warmth and protection from predators while they rest, pup, and molt. The timing of breeding, whelping and molting varies spatially and is dependent on the availability of sea ice, with populations at lower latitudes performing these activities earlier in the year. Females give birth in late winter to early spring to a single pup annually; they nurse for five to nine weeks. During this time, pups spend an equal amount of time in the water and in the lair. Females attain sexual maturity at four to eight years of age, males at five to seven years. The average lifespan of a ringed seal is fifteen to twenty-eight years. They are trophic generalists, but prefer small schooling prey that form dense aggregations (Kelly et al. 2010).

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the ringed seal.

Abundance

No reliable population estimates for the entire Arctic ringed seal population due to the species' widespread distribution across political boundaries. In the status review, the population was estimated at approximately two million individuals; however, NMFS considers this a crude estimate, as it relies on outdated data collected in a variety of ways and does not include all areas of its range. In the status review, the population of ringed seals in Alaskan waters of the Chukchi and Beaufort Seas was estimated to be at least 300,000 individuals. This is most likely an

underestimate of the true abundance because surveys in the Beaufort Sea were limited to within forty kilometers of the shore (Kelly et al. 2010).

Currently, the population for Saimaa ringed seals is estimated at 320 individuals, calculated by the Metsähallitus Parks and Wildlife in Finland by conducting a snow lair census (Koivuniemi et al. 2016).

There are an estimated 5,068 Ladoga ringed seals (CI 4,026 to 7,086) (Trukhanova 2013).

In total, there are approximately between 7,240 and 7,340 individuals in the Baltic ringed seal population, combined across three known sub-populations. There are between 200 and 300 Baltic ringed seals in the Gulf of Finland (Loseva and Sagitov 2013). There are about 1,000 ringed seals in the Gulf of Riga (in western Estonia) (Jussi et al. 2013). In 2000, there were 6,040 Baltic ringed seals in Bothnian Bay, Sweden (Sundqvist et al. 2012).

Conservative estimates for the Okhotsk ringed seal place the population abundance at 676,000 (Kelly et al. 2010).

Population trend
Due to insufficient data, population trends for the Arctic subspecies cannot be calculated. It is unknown if the population is stable or fluctuating.

The Saimaa ringed seal population has increased since the late twentieth century, with annual variation in population growth of ± 20 seals (Sipila et al. 2013). This apparent population growth is regarded as unstable, however, as changing ice conditions from year to year can influence breeding success.

There is limited population trend information for the Ladoga ringed seal. There is evidence that the Ladoga ringed seal population is showing a positive trend; the 2012 estimate of 5,068 individuals is more than 2.4 times the 2001 estimate (Trukhanova et al. 2013).

There is no population trend available for the Baltic ringed seal as a whole. The sub-population in the Gulf of Finland has experienced a steep decline, from about 4,000 individuals in the 1980s and then increased from less than 100 to 237 in 2013 (Trukhanova et al. 2013). The number of Baltic ringed seals hauled out in Bothnian Bay increased from 1988 to 2000, from 2,000 to 6,040, a population increase of 4.6 percent (Sundqvist et al. 2012). Since ringed seals are so dependent on changing ice conditions for reproductive success, there is uncertainty as to how these trends will continue in the future.

There is no reliable population trend information for the Okhotsk ringed seal.

Genetics

The genetic population structure of the Arctic ringed seal is poorly understood. It is likely that population structuring exists in the species, but the extent to which it occurs is unknown.

The Saimaa ringed seal population is characterized as having extremely low genetic diversity (Valtonen et al. 2015). The population exhibits fewer distinct haplotypes than other ringed seal subspecies populations in the region. The Saimaa population has eight distinct haplotypes, while the Ladoga has 13, and the Baltic subspecies has 16 distinct haplotypes (Valtonen et al. 2012). There is clear spatial structuring in the Saimaa population, likely owing to low population density and high fidelity for breeding sites (Valtonen et al. 2012).

There is little genetic information available for the Ladoga ringed seal population. Mitochondrial DNA variability in Ladoga ringed seals is substantially higher than in the nearby Saimaa ringed seal population. The Ladoga population displays 13 distinct haplotypes, compared to eight in Saimaa ringed seals. The nucleotide diversity for the Ladoga population (0.015 ± 0.017) is reduced compared to the nucleotide diversity in the Baltic ringed seal population (0.047 ± 0.038) (Valtonen et al. 2012).

The genetic structure of Baltic ringed seals is not well understood. It is possible that population structuring is taking place between the three sub-populations of Baltic ringed seals, due to the species' high fidelity to breeding sites. The Baltic ringed seal population exhibits 16 distinct haplotypes (Valtonen et al. 2012).

There is no available information on the genetic diversity of Okhotsk ringed seals.

Spatial distribution

Arctic ringed seals are widely distributed throughout the Arctic Ocean, in waters of Russia, Canada, Greenland, Finland and the United States (Figure 10). In U.S. waters, Arctic ringed seals are found around Alaska in the Bering, Chukchi and Beaufort Seas. Most seals move seasonally, following the extent of the sea ice.

Saimaa ringed seals are one of two freshwater, landlocked ringed seal populations, and are found in Lake Saimaa, Finland (Figure 10). Most seals move seasonally, following the extent of the ice. Saimaa ringed seal pups are born from February to March in subnivean snow lairs in snow drifts along shorelines of islands, and molt in April during the nursing period (Kunnasranta et al. 2001).

Ladoga ringed seals are one of two freshwater, landlocked ringed seal populations, and are found in Lake Ladoga, Russia (Figure 10). Most seals move seasonally, following the extent of the ice.

In spring, seal density is highest in relatively shallow areas less than 50 meters deep (Trukhanova 2013).

Baltic ringed seals are found in the Baltic Sea, bordering Sweden, Finland, Russia, Estonia and Latvia (

Figure 10 Figure 10). There are three major sub-populations of Baltic ringed seals, in Bothnian Bay, Sweden, the Gulf of Finland, and the Gulf of Riga, Estonia. Most seals move seasonally, following the extent of the sea ice.

Okhotsk ringed seals occupy the Sea of Okhotsk bordering Russia and Japan (Figure 10). Most seals move seasonally, following the extent of the sea ice.

Status

The Arctic ringed seal is threatened due to climate change, especially from the expected loss of sea ice and snow cover in the foreseeable future. Ringed seals are an important species for Alaska subsistence hunters. The most recent estimate of annual statewide harvest is from 2000 and was 9,567 ringed seals. There are many subsistence communities in Alaska that are not surveyed, and the current statewide level of subsistence harvest is not known. The minimum estimate of the average annual harvest of ringed seals from 11 communities from 2009 to 2013 is 1,040 ringed seals (Muto 2016). Additional threats to the species include fisheries interactions (including entanglement), disturbance from vessels, noise from seismic exploration, and oil spills. In summary, the Arctic ringed seal has an apparently large population, making it resilient to immediate perturbations. However, since it is threatened by climate change in the long-term, the species is likely to become endangered in the future.

The Saimaa ringed seal underwent a dramatic decline in the twentieth century, falling from historic levels of between 4,000 and 6,000 to below two hundred individuals in the mid-1980s, mostly due to overexploitation (Kelly et al. 2010; Kokko et al. 1999). Additional anthropogenic threats include contamination from persistent organic pollutants, incidental by-catch in fisheries, and human disturbance during nursing (Kokko et al. 1999). Because of the low genetic diversity, small population size, unstable population growth, the Saimaa ringed seal is considered to have an elevated risk of extinction (Nyman et al. 2014). The species faces further threats from climate change and the predicted loss of pack ice. Finland has banned harvest of Saimaa seals. The Saimaa ringed seal is not resilient to future perturbations.

Although there is some evidence the population is exhibiting a positive trend, the Ladgoa ringed seal population is still regarded as unstable. Poor ice conditions, fishing activity and risk of interactions, and the expected loss of sea ice and snow cover in the foreseeable future, indicate uncertainty about the resiliency of the Ladoga ringed seal population.

Historically, there were approximately between 50,000 to 450,000 Baltic ringed seals (Kokko et al. 1999), and severely reduced by hunting to about 7,000 individuals present in the population today. The Baltic ringed seal population in the Gulf of Finland appears to be increasing (Trukhanova et al. 2013), and the population in Bothnian Bay has increased from 1988 to 2000 at a rate of 4.6 percent (Sundqvist et al. 2012). The species faces threats from fisheries by-catch, climate change, and the predicted loss of sea ice. Harvest of Baltic ringed seals was banned by Baltic Sea countries.

There are about 676,000 Okhotsk ringed seals. Russia permits subsistence hunting and for commercial purposes, but the overall take is thought to be minimal (Kelly et al. 2010). The Okhotsk ringed seal has an apparently large population, making it resilient to immediate perturbations. However, threatened by climate change in the long-term, the species is likely to become endangered in the future.

Status of Species within the Action Area

The Arctic ringed seal DPS is present in the action area and will be affected by the proposed research activities.

Throughout most of its range, the Arctic subspecies does not come ashore and uses sea ice as a substrate for resting, pupping, and molting. August to October is an open water or feeding period, early winter to March or May is a period when seals rest in subsurface caves, and the breeding/molting period begins once ice begins to melt and break up (Born et al. 2004; Kelly et al. 2010). Arctic ringed seals in the Beaufort and Chukchi Seas spend most of their time in the water or in snowy lairs (90 percent August-November, 20 percent December-March) except during the spring molt when they spend an average of 55 percent of their time basking on ice (Kelly et al. 2010; Smith and Stirling 1975). Artic ringed seals rest in their lairs from April to mid-May, particularly at night (Kelly et al. 2010). Ringed seals spend more time on ice once spring temperatures warm and lairs start becoming exposed, which occurs from approximately March to early June in the Bering and Chukchi Seas (Kelly et al. 2010). Basking while molting reaches a peak in the Arctic during June (Born et al. 2002; Carlens et al. 2006; Harwood et al. 2007; Kelly et al. 2010). Time out of water increases in June (Kelly et al. 2010).

The Arctic ringed seal is the most abundant of the ringed seal subspecies and has a circumpolar distribution. Arctic seals occur as far south as Newfoundland and Baffin Bay and the Bering Sea in the Pacific (King 1983; Mansfield 1967). While accurate population estimates are not available, it is estimated that the total population of ringed seals in the Chukchi and Beaufort Seas is 1 million seals (Kelly et al. 2010). Based on this and information from areas through the range of this DPS, the population of the Arctic ringed seal is estimated in the millions.

Critical Habitat

Critical habitat for Arctic ringed seals was proposed for designation in the Bering, Chukchi, and Beaufort seas in Alaska (79 FR 73010). Physical or biological features essential to the conservation of the species included sea ice habitat suitable for the formation of and maintenance of subnivean birth lairs, sea ice habitat suitable as a platform for basking and molting, and primary prey resources to support Arctic ringed seals.

There is no designated critical habitat for the Saimaa, Ladoga, Baltic or Okhotsk ringed seal; NMFS cannot designate critical habitat in foreign waters.

Recovery Goals

NMFS has not prepared a Recovery Plan for the Saimaa, Ladoga, Baltic, or Okhotsk ringed seal. In general, listed species which occur entirely outside U.S. jurisdiction are not likely to benefit from recovery plans (55 FR 24296; June 15, 1990).

NMFS has not prepared a Recovery Plan for the Arctic ringed seal.

7 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 C.F.R. §402.02).

7.1 Natural Phenomenon

In the following subsections, we consider the past and present impacts of natural phenomenon on the Arctic ringed seal DPS and Beringia bearded seal DPS in the action area.

7.1.1 Predation

Ringed Seals: Different life stages of Arctic ringed seals serve as prey species for polar bears, Arctic foxes, walruses, killer whales, Greenland sharks, common ravens, and glaucous gulls (Kelly et al. 2010). Ringed and bearded seals are the primary prey of polar bears ((Heptner et al. 1976b; Derocher et al. 2004). In the Beaufort Sea, ringed seals make up 98 percent of polar bear diets (Kelly et al. 2010).

Kelly et al. (2010) concluded that predation poses a medium to high threat to ringed seals given their importance to the diet of polar bears and because climate change could lead to greater exposure to predators if snow continues to melt early.

Bearded Seals: Polar bears are the primary predators of bearded seals but the remains of bearded seals have also been found in the stomach contents of walruses and killer whales (Cameron et al.

2010). The predicted reduction in seasonal sea ice is likely to reduce predation by polar bears but could lead to increased predation by walruses and killer whales, as well as possible predation on pups by wolves, foxes, and bears (Cameron et al. 2010). Overall, predation currently does not pose a significant threat to bearded seals at present.

7.1.2 Disease and Parasites

Beginning in mid-July 2011, elevated numbers of sick or dead seals, primarily ringed seals, with skin legions began appearing in the Arctic and Bering Strait regions. By December 2011, there were more than 100 cases of affected pinnipeds, including ringed and bearded seals in northern and western Alaska. NMFS and the U.S. Fish and Wildlife Service (USFWS) declared a Northern Pinniped Unusual Mortality Event on December 20, 2011. Disease surveillance in 2012-2013 detected few new cases similar to those observed in 2011 but the investigation remains open for bearded seals based on reports in 2013-2014 of ice seals in the Bering Strait region with patchy hair loss. No specific cause for the disease has been identified to date (Muto et al. 2017).

Ringed Seals: Jensen et al. (2010) suggested that seals are exposed to protozoan oocysts primarily through their prey, particularly filter-feeding species such as those ringed seals are known to ingest from Svalbard (Labansen et al. 2007) where testing showed antibodies to a protozoan in some ringed seals. Ringed seals in Alaska have showed evidence of exposure to protozoans (Dubey et al. 2003) versus ringed seals in the North Atlantic (Oksanen et al. 1998). Exposure may come from areas of high freshwater outflow with waters contaminated by excrement or the increase in ship traffic and possible transport of oocysts in ballast water or dumping of biodegradable waste from ships (Kelly et al. 2010). The distribution of Arctic foxes overlaps with that of Arctic ringed seals and some foxes spend large portions of the year on the ice and prey on young ringed seals, particularly in nearshore areas of the western Canadian Arctic (Smith 1976).

Ringed seals in the Canadian Arctic tested positive for exposure to phocine distemper virus (PDC) and canine distemper virus (CDV) between 1992 and 1994 (Duignan et al. 1997), despite having tested negative for PDC neutralizing antibodies between 1972 and 1988, suggesting an increase in exposure possibly due to range overlap with harp seals (Kelly et al. 2010). Examination of serum antibodies for herpesviruses, including in ringed seals, led researchers to suggest that marine mammals off the coasts of Alaska and Russia are regularly exposed to herpesviruses (Zarnke et al. 1997).

Evidence of *Brucella* exposure, a bacterium suspected of causing abortions in marine mammals (Rhyan et al. 2001), was reported for ringed seals from the Canadian Arctic in 1996 (Nielsen et al. 1996). Evidence of *Brucella* exposure was also reported for ringed seals from Svalbard and Franz Joseph Land between 1992 and 1995 (Tryland et al. 1999) and in ringed seals near Baffin Island (Forbes et al. 2000). However, more recent studies of ringed seals from Svalbard has not shown evidence of exposure (Tryland et al. 2005). No evidence of reproductive failure due to exposure to exposure to Brucella has been reported for ringed seals (Kelly et al. 2010).

Helminth parasites have been found in ringed seals from all parts of their range (Kelly et al. 2010). Parasites were found in low percentages of ringed seals infecting hearts and pulmonary arteries, lungs, intestines, liver, gall bladder, pancreas, and muscle tissue (Kelly et al. 2010). Infestation by lice and nasal mites are also reported to be rare in bearded and ringed seals (Kelly et al. 2010).

Kelly et al. (2010) concluded that disease and parasites pose a low threat to ringed seals because parasite infestations have only resulted in individual deaths rather than having population-level effects.

Bearded Seals: Little is known about diseases in bearded seals but limited testing of live and harvested animals by several investigators working in various bearded seal populations found the animals were negative for antibodies to caliciviruses (Calle et al. 2008); phocine distember virus (PDV) and influenza A virus (Zarnke et al. 1997; Calle et al. 2008); and phocid herpesvirus-2 (PhHV-2), PDV, and CDV (Quakenbush et al. 2010). Bearded seals from off the coastal of Alaska and Russia were found to possess antibodies for phocid herpesvirus-1 (PhHV-1) and PhHV-2 (Zarnke et al. 1997). Bearded seals harvested along the coast near Point Hope, Kotzebue, Shishmaref, and Little Diomede Island had antibodies for PhHV-1 (Quakenbush et al. 2010).

Brucella antibodies were found in only 2.2 percent of bearded seals tested from the native Alaskan harvest by Quakenbush et al. (2010) and no antibodies were found for any *Leptospira* species. Seals collected from around St. Lawrence Island were negative for *Brucella* antibodies but one seal appeared to have been exposed to *Leptospira* (Calle et al. 2008).

Protozoans were found in some bearded seals with females of the adult bearded seals tested being twice as likely to have antibodies, though pups were found to be free of antibodies (Jensen et al. 2010). Prevalence of these in other marine mammals appears to be increasing, meaning bearded seals may be more affected by these parasites in the future. Helminth parasites have also been found in bearded seals throughout their circumpolar range with many having severe infections (Cameron et al. 2010). Helminth parasites infect the stomach, duodenum, heart, gall bladder, lungs, and intestinal tract of bearded seals (Cameron et al. 2010).

Cameron et al. (2010) concluded that disease and parasites pose a low threat to bearded seals because diseases and parasites have not had population-level effects.

7.2 Human Activities

In the following subsections, we consider the past and present impacts of human activities on the Arctic ringed seal DPS and Beringia bearded seal DPS in the action area.

7.2.1 Climate Change

In all regions except the Bering Sea, the duration of summer when ice cover is reduced increased by 5-10 weeks and by more than 20 weeks in the Barents Sea between 1979-2013 (Laidre et al. 2015). Warming in the Arctic over the past few decades has been about twice the global mean

(IPCC 2013). Even if greenhouse gases are limited immediately, sea ice loss, which has been faster than originally predicted by climate models, will still continue for several decades potentially leading to ice-free summers by 2040 (Laidre et al. 2015; Overland and Wang 2013; Wang et al. 2016). Changes in sea ice will also affect the food web through changes in the timing and quantity of primary production (spring phytoplankton blooms) that in turn would affect lower trophic levels and benthic invertebrates and subsequently higher trophic levels (Wang et al. 2016).

Carbon dioxide concentrations have increased by 40 percent sine pre-industrial times primarily from fossil fuel emissions (IPCC 2013). The ocean absorbs emitted anthropogenic carbon dioxide, leading to ocean acidification, which is a process whereby chemical reactions occur that reduce both seawater pH and the concentration of carbonate ions. The waters of the Arctic and adjacent seas are among the most vulnerable to ocean acidification.

Ringed Seals: Climate affects the distribution of ringed seals due to its influence on sea ice. Warm temperatures and reduced snow cover result in pre-weaning lair melting, collapse, and/or abandonment; hypothermia; and high rates of predation as predators have freer movement through ice-free water and over areas that are not snow covered. Harwood et al. (2000) reported reduced growth and survival rates because of an early spring break up of ice. Because the depth and duration of snow cover is projected to decrease through the range of the ringed seal Arctic DPS this century, increased juvenile mortality is likely (Kelly et al. 2010). Crawford et al. (2012) documented large differences in movement and habitat use between adult and subadult ringed seals during the winter-spring season when seasonal sea ice covers the Bering and Chukchi Seas. Adult seals made localized movements in shorefast or heavy pack ice in the southern Chukchi and northern Bering Seas. Subadults followed the advancing ice southward into the Bering Sea and made larger daily movements. Subadults were also found farther from shore, nearer the southern ice edge, and in deeper waters than adults (Crawford et al. 2012). These differences may not apply to other areas in the Arctic but are important given the potential changes in sea ice due to climate change.

Ringed seals appeared to be least affected by changes in sea ice algae possibly because seals that were sampled had been feeding in the southern Chukchi and Bering Seas where diets of Arctic cod (on which the seals were feeding) were likely dominated by taxa that were not as directly associated with ice algae (Wang et al. 2016). The most likely impact of ocean acidification on ringed seals will be through affects to lower trophic levels that serve as prey to the species ringed seals consume. Warming water temperatures and decreasing sea ice will also alter the range of prey species consumed by ringed seals. Overall, climate change poses a moderate to high threat to ringed seals (Kelly et al. 2010).

Bearded Seals: About 70 percent of the Beringia DPS currently whelps in the Bering Sea where a longer ice-free period is forecasted in May and June. Bearded seals would likely have to shift their nursing, rearing, and molting areas to the ice covered seas north of the Bering Strait where food resources are poorer or to coastal haul-out sites on shore with increased risks of disturbance,

predation, and competition for resources including space. The spring and summer ice edge may retreat to deep waters of the Arctic Ocean basin, which could separate sea ice suitable for maturation of pups and molting from benthic foraging habitat (Cameron et al. 2010).

Wang et al. (2016) found that bearded seals were strongly linked with sea ice algae likely due to their dependence on benthic fauna that efficiently consume and assimilate ice algae. Ocean acidification may impact bearded seals through changes in prey populations, particularly calcifiers or those that feed on calcifiers. Ocean acidification may also impact bearded seals by altering the propagation of sound. Low frequency sounds may propagate more readily in more acidic oceans but this will also increase the potential for masking when man-made sounds are present (Cameron et al. 2010). As vessel traffic increases with the increased melting of sea ice, masking of sounds such as vocalizations by male bearded seals has the potential to affect reproduction of this species in areas where ship traffic and other human uses overlap with bearded seal breeding locations (Cameron et al. 2010). Overall, climate change poses a moderate to high threat to bearded seals (Cameron et al. 2010).

7.2.2 Oil and Gas Exploration

In the U.S., oil and gas activities have been conducted off the coast of Alaska since the 1970s with highest activity levels in the Beaufort Sea. There are active oil field in the Beaufort Sea. In the Chukchi Sea, exploratory wells have been drilled but there are no oil fields to date, although existing exploration plans may change this in the future. These activities are expected to continue and may even increase in the future if melting ice makes oil reserves more accessible. There are no offshore oil or gas fields in development or production in the Bering Sea. Oil and gas exploration, development, and production activities include seismic surveys, drilling operations, fill placement, pipeline and shoreline facility construction, and vessel and aircraft operations.

Ringed Seals: Oil and gas exploration, development, and production activities have the potential to impact ringed seals through noise, physical disturbance, and pollution caused by these activities, particularly when an accident occurs (Kelly et al. 2010).

In a study by Harwood et al. (2007) evaluating the potential impacts of exploratory drilling on ringed seals in the nearshore Canadian Beaufort Sea, seal breathing holes and lairs were not significantly different in distance from industrial activities during pre and post-drilling years. Similarly, the movements, behavior and home range size of tagged seals did not vary statistically during and post-drilling activity (Harwood et al. 2007). Moulton et al. (2005) reported that there was no evidence of local ringed seal distribution and numbers during the construction, drilling and production activities associated with BP's Northstar oil development in the Beaufort Sea based on spring aerial surveys of seals. Richardson and Williams (2004) also concluded there was little effect on ringed seals during their open-water period from the low to moderate level, low frequency industrial sounds emanating from the Northstar facility due to construction, drilling and construction at the Northstar facility. Northstar is a man-made island so some of the results may not be applicable to other facilities (Kelly et al. 2010).

Bearded Seals: Disturbance, injury, or mortality from oil spills and/or other discharges associated with oil and gas activities are considered to be moderately significant threats to the Beringia and Okhotsk DPS of bearded seals (Cameron et al. 2010). Oil spills would be difficult to clean up in the Arctic due to issues such as access and effectiveness of cleanup technologies. Bearded seal pups are not fully molted at birth and would be particularly prone to physical impacts from oiling. Seals could also be affected by oil exposure leading to skin irritation, disorientation, lethargy, conjunctivitis, corneal ulcers, and liver legions, as well as due to inhalation of vapors. Bearded seals are benthic foragers and could be affected by ingestion of contaminated prey. Spilled oil can cause disruptions in benthic communities and transfer of contaminants through the food web (Stowasser et al. 2004) with colder climates making these effects last longer. Threats to bearded seals from oil and gas activities are greatest where activities converge with breeding aggregations or migratory corridors such as the Bering Strait (Cameron et al. 2010) where these activities are considered a moderate threat.

7.2.3 Shipping and Transportation

Shipping activity in the Arctic is increasing as sea ice melts earlier and also due to oil and gas development in Russia and Norway and associated transport of these energy sources through the Arctic. This activity includes an increase in cruise ship traffic in addition to vessel traffic associated with the transport of goods such as oil and gas.

Ringed Seals: Shipping activities pose a threat to ringed seal mainly due to the potential for oil spills. Acoustic impacts from sounds produced by vessels can also disturb the normal behavior of seals and the animals may also be disturbed by the presence of the ships themselves. Vessel strikes are likely not a threat to the animals with the exception of icebreakers, which could crush individuals while they occupy their subnivean lairs in spring (Kelly et al. 2010). Because icebreaking activities are expected to increase in the Arctic and are not constrained by the presence of ice, the likelihood of impacts to ringed seals is expected to increase (Kelly et al. 2010). Kelly et al. (2010) concluded that shipping and transportation pose varying levels of threats to ringed seals depending on the overlap between seals and shipping activities.

Bearded Seals: Currently the use of icebreakers on the North Sea Route keeps shipping lanes in the Barents and Kara Seas open through pack ice at a time when bearded seals are hauling out in peak numbers to whelp and molt (O'Rourke 2010). Segments of the Northwest Passage are used as ice conditions permit in the Canadian Arctic, confining most traffic to the late summer when seals are thought to be largely aquatic (Cameron et al. 2010). Tourism is also a factor because the number of tour ships in Greenland for example has grown significantly and wildlife viewing occurs mainly in areas favored by bearded seals during late whelping and molting (Cameron et al. 2010). Potential impacts to bearded seals related to oil shipments are expected to increase in the southern Barents Sea, Pechora Sea, Kara Straits, and the southern Kara Sea (Brigham and Ellis 2004). One of the most significant threats to bearded seals posed by shipping and transportation activities is the potential for oil spills (Cameron et al. 2010). Discharges from vessels can also affect seals as can noise. Male bearded seals rely on underwater vocalizations to

find mates and, although the impacts of vessel noise on bearded seals have not been studied, the frequencies of the predominant vocalizations overlap the range over which ship noise dominates ambient noise (Cameron et al. 2010). Bearded seals vocalize over broad distances so their calls are susceptible to interference from shipping noise (Cameron et al. 2010). Cameron et al. (2010) concluded that shipping and transportation pose varying threat levels to bearded seals depending on the potential spatial and temporal overlap between vessels and seals, the intensity of shipping and the material be shipped.

7.2.4 Hunting

Ringed Seals: Ringed seals have been an important subsistence resource for many Alaska Native communities along the coasts of the northern Bering, Chukchi, and Beaufort Seas but their harvest levels have decreased significantly since the 1970s (Kelly et al. 2010). Ringed seals are also hunted by Native communities in the Canadian Arctic for subsistence uses. Ringed seals are hunted commercially in Canada, Greenland, Svalbard, and Russia and hunted for sport in Norway (Kelly et al. 2010). Catches in the tens of thousands occur annually in Canada and Greenland. Catches in Svalbard and Norway are in the hundreds annually. Russia manages the harvest of ringed seals through a total annual catch system and issues permits to commercial and subsistence fishers. Catch limits very with location with the largest harvests of thousands of seals allowed in the Bering and Chukchi Seas (Kelly et al. 2010).

Bearded Seals: Bearded seals have historically been an important subsistence resource for Native communities along the coasts of the northern Bering, Chukchi, eastern Siberian, and Beaufort Seas (Park 1999). Due to variations in reported harvest that may be due to changes in survey methodology, coverage, or reporting, it is not possible to accurately state the total number of bearded seals captured annually. However, based on the mean annual harvest reported from 1990-1998 and assuming 25-50 percent of seals struck are lost, Cameron et al. (2010) estimated the total annual hunt by Alaska Natives would range from 8,485 – 10,182 bearded seals. Total harvest of bearded seals by Siberian hunters in the Bering and Chukchi Seas is thought to have declined in the 1970s likely due to depletions from a growing commercial harvest in the 1960s and a shift to walrus hunting (Cameron et al. 2010). The last estimates for commercial or subsistence hunting in the Russian Bering and Chukchi Seas are from the early 1980s so it is unknown whether levels have increased (Cameron et al. 2010). Beginning in 1975, the Russian Federal Fisheries Agency has set total annual catch limits for the take of bearded seals in the western Bering and Chukchi Seas, Chukotka Peninsula, and eastern Siberia. Bearded seal hunting is also important in the western Canadian Arctic where the Inuvialuit use bearded seals though the ringed seal harvest is more important (Cameron et al. 2010). It was estimated that an average of approximately 25 bearded seals were taken annually by Native subsistence hunters from 1988-1997 (IHSWG 2003).

7.2.5 Fisheries

Ringed Seals: Ring seals may be captured incidentally or as bycatch in commercial fisheries. Commercial fisheries may also affect ringed seals through competition for prey species that

serve as prey for seals. Based on observer data from the Bering Sea-Aleutian Islands fisheries since the 1990s, trawl fisheries for pollock and flatfish resulted in the occasional incidental capture of one animal in some years but annual average mortality of ringed seals due to commercial fisheries were less than one animal (Kelly et al. 2010). Estimates of bycatch of ringed seals from other parts of the Arctic are not available but the distribution of ringed seals versus targeted fisheries have little overlap so bycatch levels are expected to be low (Kelly et al. 2010).

The U.S. fisheries in the North Pacific are managed to prevent overfishing of individual fish stocks, which is likely to reduce the potential indirect effects to ringed seals associated with targeted fishing of prey species. Commercial fishing can affect prey characteristics because larger fish are targeted, often leading to population shifts toward reproduction at earlier ages and smaller sizes. There are existing variations in size and recruitment success ringed seals seem adapted to so changes in prey sizes are not expected to have a significant impact on the seals unless fishing pressure increases (Kelly et al. 2010).

Bearded Seals: Monitoring of commercial groundfish trawl, longline, and pot fisheries in the Bering Sea-Aleutian Islands by shipboard observers in the 1990s and 2000s. During the 1990s, three years (1991, 1994, 1999) had more than one mortality per year observed in the groundfish trawl fishery but the mean annual mortality over this monitoring period was still less than one animal (Angliss and Lodge 2002). From 2000 – 2004, there was one mortality in two of the years (2000 and 2001) in the pollock trawl fishery for a mean annual mortality of less than one over the entire monitoring period (Angliss and Allen 2009). From 2002-2006, observer coverage was greater and incidental mortalities of bearded seals were again observed in the pollock trawl fishery; two in 2006 for a mean annual mortality of one animal during the monitoring period (Allen and Angliss 2010).

Commercial fisheries target species that are known prey items of bearded seals. U.S. fisheries are managed to prevent overfishing of individual stocks and the overall biomass levels of groundfish species have remained relatively stable since the 1970s (Mueter and Megrey 2006). Bycatch of other bearded seal prey items in fisheries could also affect seals due to potential reductions in biomass of prey. Non-target bycatch species were found to be largely animals that are not prey items for bearded seals in the Bering Sea for which there are data on bycatch (Cameron et al. 2010).

Due to natural variations in size and recruitment of prey species, changes in size and age at reproduction induced by targeted fishing are not expected to have a significant impact on bearded seals that already respond to natural variation in prey species (Cameron et al. 2010). Groundfish trawling affects benthic habitat bearded seals use when foraging. In U.S. waters, modifications to trawl gear and restrictions in areas where groundfishing can be done are likely to minimize the potential impacts to bearded seals associated with habitat impacts from trawling (Cameron et al. 2010). In other areas, such as the southern North Sea, the trawling intensity is

too high for biomass to recover with several areas being trawled seven times a year on average (Hiddink et al. 2006; Goñi 1998).

7.2.6 Pollution

Ringed Seals: Heavy metals such as mercury, selenium, cadmium, and zinc have been reported in the tissues of ringed seals, particularly liver, kidney and muscle tissue, from different locations in the Arctic (Kelly et al. 2010). Toxic effects of heavy metal concentrations were not detected, however.

Organochlorine pollutants, including compounds such as DDT and PCBs, have been reported in ringed seals. Concentrations increased with age in males but were reduced in nursing females due to transfer of contaminants to nursing pups (Kelly et al. 2010). Concentrations of some of these pollutants in Arctic ringed seals did not change between 1981 and 2000 according to Addison et al. (2005).

Perfluorinated contaminants (PFCs), used in many industrial products such as fire retardants, insecticides and herbicides, lubricants, adhesives, and paints, have been detected in ringed seals in the Alaskan Bering and Chukchi Seas (Quakenbush and Citta 2008). The contaminants did not appear to bioaccumulate with age in male or female seals (Quakenbush and Citta 2008).

Kelly et al. (2010) concluded that pollution poses a low to moderate threat to ringed seals, particularly given that levels of organochlorines are expected to continue increasing and climate change has the potential to increase the transport of pollutants from lower latitudes to the Arctic.

Bearded Seals: Bearded seals bioaccummulate mercury in tissues and rates of accumulation appear to be somewhat higher than in ringed seals (Smith and Armstrong 1978). Toxic effects of this bioaccumulation were not reported.

Organochlorine compounds and heavy metals have been found in most bearded seal populations that have been studied though research on contaminants and bearded seals is limited compared to ringed seals (Cameron et al. 2010). Of six marine mammals tested in Alaska, bearded seals had the highest concentrations of DDT (Kelly 1988a). Dieldrin and lindane were found in bearded seals though at less than half the concentration of DDT (Galster and Burns 1972). PFCs and related synthetic compounds have also been detected in bearded seals in the western Arctic (Powley et al. 2008). High concentrations of organochlorine compounds in the blubber of male bearded seals, particularly form Alaska and the White Sea in comparison to other areas where samples were collected are reported (Muir et al. 2003; Bang et al. 2001; Quakenbush et al. 2010).

Cameron et al. (2010) concluded that pollution poses a low to moderate threat to bearded seals particularly given the potential for increased input of pollutants to the marine environment through freshwater runoff.

7.2.7 Scientific Research

There are currently other permits that have been issued by the Permits Division for work in the Arctic that could affect ringed and bearded seals. Specifically, the Long Marine Laboratory has

an MMPA permit (No. 15142) for the acquisition of wild bearded seals in the Kotzebue Sound area for sensory assessment experiments. This permit includes the directed capture of a total of up to 4 bearded seals and their transfer to the Long Marine Laboratory, as well as the potential for harassment of ice seals and other marine mammals in the study area associated with the use of boats as part of capture activities. Captured seals could die in captivity as well, which could mean the loss of 4 bearded seals from the population in the Kotzebue Sound area. Woods Hole Oceanographic Institution also holds an MMPA permit (No. 16388) to conduct studies on baleen whales that require vessel surveys, which could lead to harassment of ringed and bearded seals during surveys.

Ringed Seals: Ringed seals have been collected occasionally for zoos and aquaria or killed for scientific research. Total numbers of seals collected are not known but are believed to be small and likely not to affect populations of any of the subspecies of ringed seals (Kelly et al. 2010).

Bearded Seals: Bearded seals have been collected for aquaria on rare occasions or killed for scientific research in some parts of their range. Total numbers of seals collected for scientific or educational purposes are not known but are believed to be very small with no effect on any of the populations of this animal (Cameron et al. 2010).

7.3 Synthesis of Baseline Impacts

Numerous factors have contributed to the current status of ringed (Arctic DPS) and bearded (Beringia DPS) seals including climate change, oil and gas production, shipping and transportation, hunting, fisheries, pollution, and collection for scientific research. Of these, climate change is the primary threat to the species due to their dependence on sea ice and the predicted continuing changes in the spatial extent of ice and timing of melting as well as the related impacts to prey species on which ringed and bearded seals depend. Fisheries, pollution, shipping and transportation, and oil and gas exploration are secondary threats but could be relatively important in specific areas where ranges of ringed and bearded seals overlap significantly with these activities, including into the future as these activities potentially expand in areas where thick ice has formerly limited their extent.

8 EFFECTS OF THE ACTION

Section 7 regulations define “effects of the action” as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 C.F.R. §402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur. This effects analyses section is organized following the stressor, exposure, response, risk assessment framework.

The jeopardy analysis relies upon the regulatory definition of “to jeopardize the continued existence of a listed species,” which is “to engage in an action that 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 C.F.R. §402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

8.1 Stressors Associated with the Proposed Action

The potential stressors we expect to result from the proposed action are associated with the receipt of parts from seals captured in permitted fisheries, vessel and aerial surveys of ice seals, capture of animals for sampling, tagging, and in some cases installation of recording/tracking instruments, the release of captured animals, and the use of drugs in capture attempts or to sedate captured animals and then counter the effects of sedation.

8.1.1 Import/Export/Receive Parts

The Permits Division proposes the authorization of the import and export of ringed and bearded seal parts and the transfer of parts from legal subsistence harvest and legal fisheries in non-U.S. jurisdictions to the ADFG researchers. Parts are imported, exported, or received opportunistically without financial incentives being provided. Therefore, research activities associated with the import, export, and receipt of parts from ringed and bearded seals do not create additional demand for seal capture. The results of analyses of the parts benefits seal management efforts as the resulting data provides information on the health and genetics of ringed and bearded seals. The import, export, and receipt of parts utilizes carcasses and parts from seals that are already dead; therefore, no harassment or take of live seals is involved in this activity.

8.1.2 Surveys

Aerial and vessel surveys would be authorized under the proposed permit in order to assess the abundance and distribution of ringed and bearded seals. The use of fixed-wing aircraft and vessels could lead to disturbance of ice seals due to their reaction to the noise generated by aircraft and vessel motors.

Aerial Surveys: The use of fixed-wing aircraft will result in less disturbance than if helicopters were to be used. Fleeing into the water is the most dramatic response to disturbance on the part of hauled-out seals. Less disturbed seals may also display behaviors such as head up or foreflippers extended or movement (alternating flippers, body shape) indicating a response to the aircraft. In a comparison seal reactions to the use of fixed-wing aircraft and helicopters, Born et al. (1999) found that 6 percent of seals escaped in response to the presence of fixed-wing aircraft as opposed to 49 percent when helicopters were used and aircraft flew at an altitude of approximately 150 m. Born et al. (1999) concluded that small fixed-wing aircraft needed to be at least 500 m from seals in order to reduce the risk of scaring the animals into the water and should not be directly overhead.

The Permits Division will require that aircraft maintain an altitude of at least 200 m above seals and circle within visual contact of groups of seals for no more than 15 minutes. To further reduce disturbance of animals associated with the use of fixed-wing aircraft, no direct passes of aircraft

over animals will be permitted and if seals are seen escaping in response to the presence of the aircraft, the plane will leave the area.

Juveniles and non-nursing adults species at least 80 percent of their time in the water (Kelly et al. 1986) and so would be less likely to be affected by the use of aircraft during aerial surveys. An animal may be harassed up to 3 times each year during survey activities based on the unpredictability of where ringed and bearded seals haul out and the large survey area.

Similarly, bearded seal pups enter the water within hours after birth (Kovacs et al. 1996) and pups aged 4 to7 days spend over half their time in the water (Lydersen et al. 1994). Pups rest close to ice holes so they can escape into the water when disturbed. Thus, disturbance as a result of aerial surveys is likely to result in the same 15 minutes of impact and a total of 45 minutes of loss resting and haul-out time for pups annually, again assuming the same individuals could be affected by aerial surveys up to three times each year.

Nursing females and ringed seal pups spend more time in lairs than non-nursing adult seals. Like bearded seal pups, ringed seal pups spend 50 percent of their time in the water (Lydersen and Hammill 1993). In contrast to bearded seals, ringed seal pups have a prolonged nursing period and accumulate blubber at a slow rate (Smith and Stirling 1975). For insulation against the cold, ringed seal pups rely on their wooly coat, which provides excellent insulation in air but offers almost no protection when wet (Ray and Smith 1968), meaning prolonged or frequent water entry could result in unsustainable energy costs for pups (Born et al. 1999). On the other hand, given that pups spend up to 50 percent of their time in the water, disturbance for a total of 45 minutes annually (assuming the same individual is disturbed up to three times in 15 minute intervals) is unlikely to affect the pups.

Nursing female ringed and bearded seals are more likely to be disturbed by aircraft than other adults because nursing females spend more time out of the water with their pups. As noted for other age groups, the permit will require that aerial surveys be limited to no more than 15 minutes in the area of a group of seals, be flown at a minimum altitude of 200 m, and not be conducted directly over seals.

Vessel Surveys: The Permits Division proposes the authorization of vessel surveys by the ADFG to assess the abundance and distribution of bearded and ringed seals. According to information from the ADFG, vessels used in the surveys will range from small boats to large commercial vessels. The use of vessels could lead to visual and auditory disturbance, ship strikes, and impacts to seals from pollution associated with vessel discharges.

Vessel surveys will be conducted at speeds of 10 knots or less and there will be 100 percent observer coverage to look for seals during surveys. If seals enter the water or change their swimming patterns in response to the presence of a survey vessel, the permit requires that the survey vessel leave the area in order to minimize effects to ringed and bearded seals.

In terms of vessel discharges that could include oily water, sewage, grey water, and aquatic nuisance species. Some of the survey vessels are too small to have ballast water. The action area

includes shipping lanes and oil and gas exploration that are more likely to result in impacts to ice seals if there are accidental groundings and spills than permitted discharges from the survey vessel. The operation of survey vessels will be in compliance with the applicable United States Coast Guard and U.S. Environmental Protection Agency regulations related to discharges from vessels.

Vessel noise is generated primarily by the machinery used to propel the vessel with the amount of noise related to the size of the vessel. Given that the many of the areas where surveys will take place have commercial vessel traffic such as cruise ships and tankers, it is unlikely that vessel noise from the surveys to be performed by the ADFG will be distinguishable from the operation of other vessels in much of the action area.

Seals that do react to vessel disturbance may swim away if they are in the water. Ringed and bearded seals are commonly observed close to vessels (Harris et al. 2001; Blees et al. 2010). Survey vessels will not alter their course to approach seals with researchers counting and photographing seals as the vessel passes. If researchers do notice seals swimming away in response to survey vessels, the permit will require that vessels leave the area.

On-ice ringed seals exhibited short-term escape reactions (temporarily entering the water) when a ship came within 0.25 to 0.5 km (Brueggeman et al. 1992). Less drastic responses to disturbances would be head lifting, extension of flippers, and movement of body. As for in-water seals, if researchers notice seals escaping into the water, the permit requires that survey vessels leave the area.

8.1.3 Capture

ADFG proposes the capture of up to 200 seals per species per year, or 1,000 seals of each species over the 5-year permit. No females with dependent pups will be captured under this permit nor will dependent young be captured. Scheduled capture events occur after pups are weaned but seals are sometimes available for capture year-round such as when seals are temporarily trapped on the ice when access holes freeze providing additional opportunities for capture and tagging.

Up to 1,000 ringed (Arctic DPS) and bearded (Beringia DPS) seals per year are expected to be incidentally harassed during capture events. These seals could be affected up to three times per capture event. Incidental harassment is likely to result in responses like those for aerial and vessel surveys. Head raising and body movement are insignificant responses that are not likely to adversely affect seals. Entry into the water will affect seals adversely but is not likely to reduce the fitness of any seal because the behavior falls within normal seal behavior.

Seals will be captured in water, on ice, or on land either by hand or using nets and traps. In the past, researchers performed fieldwork at a single location versus the five different locations where work was conducted under the previous permit (No. 15324) and is proposed under this permit.

Capture may lead to unintentional mortality, injury, and a stress response ranging from mild to severe. The most likely source of mortality is drowning in a net. Seals will suffer stress as a result of capture activities. Stress response results in the release of stress hormones, including epinephrine and cortisol. Chronic stress can impair the functionality of the immune and reproductive systems in pinnipeds (Fair and Becker 2000). Acute stress may result in hyperthermia where body temperatures rise to a level that can lead to muscle rigidity, brain damage and even death. No studies of the capture stress response of ringed and bearded seals were found but the response to capture of other seal species has been reported. Harcourt et al. (2010) reported a prolonged elevation in cortisol in response to capture in Weddell seals that could be ameliorated by a small dose of diazepam. Handling does not affect the blood chemistry of southern elephant seal mothers and pups (Engelhard et al. 2002) or the survival of pups to one year (McMahon et al. 2005). In grey seal pups, handling did not affect cortisol levels, thyroid hormone levels, or body mass (Bennett et al. 2012). Baker and Johanos (2002) did not find indicators that handling affected the survival, migration or condition of 549 Hawaiian monk seals.

8.1.4 Use and Administration of Drugs

The researchers propose the use of drugged darts to capture bearded seals on the ice. This was proposed under the previous permit but no attempts to use this capture technique were successful. A qualified veterinarian would perform any dart-injections of sedatives used to capture large bearded seals. The drug combination proposed for this (midazolam and butorphanol) does not override the dive reflex that prevents marine mammals from inhaling while submerged. Thus, if a seal were to enter the water after being darted, it would not inhale underwater, which would minimize chances of a darted animal drowning. If a darted seal enters the water, researchers would deploy a net to capture the seal or administer a reversal agent again using a dart if they could not reach the animal. Potential complications from the proposed drugs include apnea, bradycardia, hyperthermia, and hypothermia (Baylis et al. 2015). If complications arise, a veterinarian would administer naltrexone, doxapram, and/or epinephrine. While this procedure has not been used on bearded seals and the sedatives proposed for darting are different than those used on captured animals, the drug combination has been used successfully on other seal species. Similarly, the drugs proposed to counter any adverse reaction to the sedatives have been used successfully on other pinnipeds.

The use of drugs is also proposed to sedate ringed and bearded seals during capture and restraint activities though ADFG indicated that drugs are typically not used during capture and handling. Because the capture of up to 200 individuals of each species is proposed, the use of drugs could affect this number of animals. Seals that are sedated are given reversal agents and their reactions are tested prior to any release of the animal to minimize the potential for drowning or other effects of sedation.

8.1.5 Sampling and Tagging

The Permits Division proposes the authorization of biological sampling including the collection of tissue, blood, whiskers, blubber, muscle, hair, and oral, nasal, and urogenital samples from each seal captured by researchers. As noted previously, no females with dependent pups, pups, or neonates will be captured and sampled as part of the proposed research activities. Potential stressors from this sampling include discomfort, pain, infection, and injury. Researchers will also measure, weigh, and ultrasound captured seals in order to track health parameters, which may cause discomfort and stress response in seals. Finally, captured seals will receive tags to enable researchers to assess the abundance and distribution of ringed and bearded seals based on future capture in research surveys or during legal harvest. Potential stressors from the placement of plastic tags on the rear flippers of captured seals include pain and infection. In order to reduce stressors, the researchers will minimize restraint during weighing, measuring, and sample collection and retain captured seals for no more than 120 minutes.

Potential responses to sampling and tagging include no response, behavioral reactions to pain (in the case of invasive sampling and tagging), an immune response at the sample collection or tagging site, and tissue damage if tagging tears the flipper. No reports of infection as a result of sampling and tagging were found and ADFG researchers reported that hunters who captured sampled and tagged seals informed them that the seals were healthy.

In terms of whisker collection, the loss of a single whisker for sampling purposes will be not be distinguishable from normal whisker loss. Measurement, weighing, and ultrasound are commonly used to assess the condition of captured seals. These activities are not expected to result in adverse effects beyond discomfort from being restrained by a researcher or in a net.

8.1.6 On-Board Instruments

The Permits Division proposes the authorization of the use of on-board instruments on bearded and ringed seals. No animal will be fitted with more than two glue-on transmitters, one temporary recording instrument, and one flipper transmitter for a total of four instruments. Most seals will receive one glue-on transmitter and one flipper-mounted transmitter.

Seals may experience skin irritation due to the use of epoxy to secure some of the instruments. McCafferty et al. (2007) found localized heat increases around instruments placed on grey seals as the animals dried out apparently due to heat leakage around the sides of the instruments and mounting straps. McCafferty et al. (2007) concluded that these localized heat increases did not significantly change the total heat exchange of grey seals on land and no temperature effects were observed when seals were wet.

Flipper instruments are placed on a flipper using two biopsy plugs to create holes through while fasteners are placed. Thus, the placement of flipper instruments is similar to tagging with similar potential effects to seals. Potential responses to the placement of flipper instruments include no response, behavioral reactions to pain, an immune response at the installation site, and tissue damage if the flipper is torn (for instance if the instrument becomes entangled in something and

the animals struggles to free itself). As discussed in Section 8.1.5, regions of elevated temperature at sites of needle injection and biopsies were observed by McCafferty et al. (2007) associated with an immune response but these hot spots around the sample site were temporary. Paterson et al. (2011) used infrared thermography to monitor the healing process after attachment of flipper tags to grey seals and reported small increases in surface temperatures and swelling that lasted less than 24 days.

Instrumentation could lead to entanglement of animals potentially resulting in drowning and complications due to drag caused by instruments that could affect foraging time and success and ability to escape predators. Even the larger Crittercams® (to be left on for up to 24 hours in the case of the proposed research) do not appear to significantly affect seal behavior based on the use of this instrument on Hawaiian monk seals and male harbor seals (Parrish et al. 2000; Littnan et al. 2004; Bowen et al. 2002).

8.1.7 Release

As discussed previously, ADFG researchers propose the capture of up to 200 ringed and bearded seals annually over the five-year permit period. Attempts to escape during release could result in injuries to seals including contusions, lacerations, abrasions, hematomas, concussions, and fractures.

8.2 Mitigation to Minimize or Avoid Exposure

In order to minimize or avoid exposure of ringed (Arctic DPS) and bearded (Beringia DPS) seals to the potential stressors, the Permits Division will include the following conditions as permit requirements (see Appendix 1 for the complete permit text):

1. Manned aerial surveys must be flown at an altitude of 200 m. During surveys, the plane will circle within visual contact, but not directly over a group of seals for up to 15 minutes in order to accurately count and photograph all seals present.

2. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, Permits Division, for written permission to resume if three pinnipeds of any species are darted and suffer unanticipated adverse effects, including entering the water and either drowning or disappearing so that the fate of the animals cannot be determined.

3. Researchers must consult an experienced marine mammal veterinarian for proper dosages and protocols for use of anesthesia and sedatives, including administration via remote darting.

4. Researchers must capture and handle pinnipeds in groups small enough that handling and restraint time for each animal is minimized and all animals can be adequately monitored for signs of adverse reactions that could lead to serious injury or mortality.

5. When capturing or detaining animals in traps, Researchers must adequately monitor the animals to prevent injury, mortality, and dehydration.

6. When deploying floating traps, Researchers must monitor the traps from a distance using binoculars or spotting scope and extract seals from the trap as soon as possible.

7. The Researcher will not set unmonitored nets across lagoons.

8. Researchers must minimize the time lactating females are removed or otherwise separated from their dependent pups as a result of research activities. (Note that lactating females, unweaned pups, and neonates will not be targeted for capture under this permit, however.)

9. Researchers must immediately cease attempts to approach, capture, sedate (including remote darting), restrain, sample, mark, or otherwise handle pinnipeds if the procedure does not appear to be working or there are indications such acts may be life threatening or otherwise endanger the health and welfare of the animal. To the extent that it would not further endanger the health or welfare of the animal, Researchers may monitor or treat (e.g., administer reversal agents or attempt resuscitation) the animal as deemed appropriate in consultation with a veterinarian.

10. Researchers must use aseptic techniques for collection of external tissue samples (e.g., swabs), puncture procedures (e.g., venipuncture, flipper tagging), surgical procedures, and collection of internal tissue samples (e.g., blubber biopsy).

11. Researchers must use sterile disposable instruments (e.g., needles, biopsy punches) to the maximum extent practicable.

12. Researchers must limit the amount of blood collected to actual needs for sample analysis and not exceed three attempts (needle insertions) per site per animal, and not more than 1.0 ml of blood per kilogram body mass per capture event.

13. Sedated and anesthetized animals must be monitored closely and not be released until they recover normal locomotor capabilities. When sedated/anesthetized animals are too large or dangerous to be held until fully recovered from sedation/anesthesia they should be placed in secure sites where they will not be subjected to physical harm or extremes of temperature, and can be monitored from a safe distance.

14. Researchers must take appropriate actions (e.g., disinfection procedures) for minimizing the introduction of new disease agents, vectors capable of efficiently transmitting indigenous dormant diseases or those not currently being effectively transmitted and species that can serve as amplification hosts for transmitting indigenous diseases to other species.

15. To the maximum extent practicable without causing further disturbance of marine mammals, Researchers shall monitor study sites following any disturbance (e.g., surveys or sampling activities) to determine if any marine mammals have been killed or injured or pups abandoned.

16. To the maximum extent practicable, Researchers must continue to improve and refine their protocols including: minimizing capture risk by reducing net length and deployment duration; minimizing size of instruments or including release mechanisms; and minimizing duration of restraint.

17. In the event that a mortality occurs due to the use of floating traps, ADFG will contact NMFS to discuss mitigation measures for trap use. If two seals die due to the use of floating traps, use of the traps will be halted until ADFG confers with NMFS.

8.3 Exposure and Response Analysis

In the sections above, we described the stressors each activity proposed under the permit is likely to generate that the likely responses of ringed and bearded seals to these stressors. In the following section we consider the exposures that could cause an effect, where and when these exposures may occur, how long exposure may occur, the frequency and intensity, and the life stages, ages, and sexes of ringed and bearded seals that may be affected. We also consider the responses of ringed and bearded seals to exposures and the potential reduction in fitness associated with these responses.

8.3.1 Exposure Analysis

In the case of capture, administration of drugs, sampling and tagging, on-board instruments, and release, activities would occur together as part of capture events targeting specific animals. Recapture of animals is not planned as part of the proposed activities so capture activities are expected to affect up to 200 bearded and ringed seals, respectively, per year over the 5-year permit period. The only animals that will not be targeted for these activities are females with dependent pups, the pups themselves, and neonates. All other ringed and bearded seal life stages will be targeted for capture, sampling, tagging, instrumentation, and release. Both sexes will be targeted but, as noted previously, females with dependent pups will not be captured. Other adult females will be captured as part of the proposed action. In addition, during capture activities, up to 1,000 additional animals of each species could be affected by incidental disturbance associated with these activities including noise from researchers and vessels. Each of the 1,000 animals of

each species could be affected by incidental disturbance during capture and release activities up to three times each year over the 5-year permit period. Incidental disturbance during capture and release activities would affect all life stages and both sexes of ringed and bearded seals.

For aerial and vessel surveys, up to 5,000 individual seals of each species could be exposed to disturbance from vessels and fixed-wing aircraft up to three times each year over the 5-year permit period. All life stages and sexes of ringed and bearded seals could be affected by disturbance associated with the use of fixed-wing aircraft and vessels to perform surveys.

8.3.2 Response Analysis

8.3.2.1 Aerial and Vessel Surveys

Aerial Surveys: There is the potential for harassment of 5,000 bearded (Beringia DPS) and ringed (Arctic DPS) seals, respectively, each of the five years aerial surveys are proposed for a total of 50,000 seals of each species that could be disturbed by the use of fixed-wing aircraft to perform aerial surveys (Tables 1 and 2). Of these, based on the percentage from the study by Born et al. (1999), 300 animals of each species (6 percent) would be expected to respond by escaping into the water each year aerial surveys with fixed-wing aircraft are carried out under this consultation. This means up to 1,500 seals of each species could be expected to respond to aircraft noise by fleeing into the water. The rest of the seals that may be disturbed would respond by lifting their heads, extending their foreflippers, or moving their bodies. Entering the water is a significant effect that interrupts the normal behavior of an animal and would be expected to have the greatest effect on nursing mothers and their pups.

Juveniles and non-nursing adult ringed seals spend at least 80 percent of their time in the water (Kelly et al. 1986) and so would be less likely to be affected by the use of aircraft during aerial surveys. An animal may be harassed up to 3 times each year during survey activities based on the unpredictability of where ringed and bearded seals haul out and the large survey area. Due to the requirement that visual contact be maintained with a group of seals for no more than 15 minutes, a total of 45 minutes of resting and haul-out time would be lost for juveniles and non-nursing adult seals as it is expected that the same individuals could be disturbed up to three times per year. We do not anticipate that this temporary loss of resting and haul-out time would reduce the fitness of juvenile and non-nursing adult seals.

Similarly, bearded seal pups enter the water within hours after birth (Kovacs et al. 1996) and pups aged 4 to 7 days spend over half their time in the water (Lydersen et al. 1994). Pups rest close to ice holes so they can escape into the water when disturbed. Thus, disturbance as a result of aerial surveys is likely to result in the same 15 minutes of impact and a total of 45 minutes of loss resting and haul-out time for pups annually, again assuming the same individuals could be affected by aerial surveys up to three times each year. As for juvenile and non-nursing adult seals, escape into the water falls within the normal range of behavior for bearded seal pups and is not likely to reduce their fitness.

Nursing females and ringed seal pups spend more time in lairs than non-nursing adult seals. Like bearded seal pups, ringed seal pups spend 50 percent of their time in the water (Lydersen and Hammill 1993). In contrast to bearded seals, ringed seal pups have a prolonged nursing period and accumulate blubber at a slow rate (Smith and Stirling 1975). For insulation against the cold, ringed seal pups rely on their wooly coat, which provides excellent insulation in air but offers almost no protection when wet (Ray and Smith 1968), meaning prolonged or frequent water entry could result in unsustainable energy costs for pups (Born et al. 1999). On the other hand, given that pups spend up to 50 percent of their time in the water, disturbance for a total of 45 minutes annually (assuming the same individual is disturbed up to three times in 15 minute intervals) is unlikely to affect the pups. While Born et al. (1999) assessed the level of disturbance to ringed seals from the use of helicopters and fixed-wing aircraft in aerial surveys, they did not report the behavior of ringed seal pups to disturbance. Given that pups spend approximately 50 percent of their time in the water and the rest in lairs that may buffer some of the aircraft noise, we do not anticipate that disturbance from aircraft will reduce the fitness of ringed seal pups.

Nursing female ringed and bearded seals are more likely to be disturbed by aircraft than other adults because nursing females spend more time out of the water with their pups. As noted for other age groups, based on the requirement that aerial surveys be limited to no more than 15 minutes in the area of a group of seals, be flown at a minimum altitude of 200 m, and not be conducted directly over seals, we believe the potential for 45 minutes of disturbance per year that could lead to nursing females escaping into the water will not reduce the fitness of nursing female ringed and bearded seals.

Based on information from the previous permit (No. 15324), during the permit period from 2012-2015, 98 ringed (Arctic DPS) and zero bearded (Beringia DPS) seals were harassed and this harassment of ringed seals was only reported due to the use of aerial and vessel surveys in 2015. No harassment of either species associated with aerial and vessel surveys was reported in other years.

In summary, aerial surveys are likely to adversely affect up to 5,000 bearded and ringed seals up to 3 times annually with the potential for impacts to up to 50,000 seals of each species over the 5 year lifetime of the proposed permit. Data from surveys indicates that harassment from survey activities is far less than this estimate. Aerial surveys are not expected to reduce the fitness of any seal. Therefore, we believe the impacts of aerial surveys on ringed and bearded seals will be insignificant.

Vessel Surveys: There is the potential for 5,000 ringed (Arctic DPS) and bearded (Beringia DPS) seals to be disturbed by vessel surveys each year for a total of 50,000 seals of each species over the 5 year lifetime of the proposed permit.

No vessel strikes have been reported as part of the current ice seal research or under other research permits for marine mammals that use similar vessels. Ringed and bearded seals are highly agile in water and the vessels will not be approaching ice seal habitat. Vessel surveys will be conducted at speeds of 10 knots or less and there will be 100 percent observer coverage to

look for seals during surveys. If seals enter the water or change their swimming patterns in response to the presence of a survey vessel, the permit requires that the survey vessel leave the area in order to minimize effects to ringed and bearded seals. Therefore, we believe that the potential for a vessel strike affecting bearded and ringed seals is discountable.

In terms of vessel discharges that could include oily water, sewage, grey water, and aquatic nuisance species. Some of the survey vessels are too small to have ballast water. The action area includes shipping lanes and oil and gas exploration that are more likely to result in impacts to ice seals if there are accidental groundings and spills than permitted discharges from the survey vessel. The operation of survey vessels will be in compliance with the applicable United States Coast Guard and U.S. Environmental Protection Agency regulations related to discharges from vessels. We expect discharges from survey vessels to be undetectable and the associated effects on ringed (Arctic DPS) and bearded (Beringia DPS) seals to be insignificant.

Vessel noise is generated primarily by the machinery used to propel the vessel with the amount of noise related to the size of the vessel. Given that the many of the areas where surveys will take place have commercial vessel traffic such as cruise ships and tankers, it is unlikely that vessel noise from the surveys to be performed by the ADFG will be distinguishable from the operation of other vessels in much of the action area. The estimated potential for impact to ringed and bearded seals from vessel use is 10 percent of the ringed seal Arctic DPS and less than 33 percent of the bearded seal Beringia DPS. It is anticipated that 5,000 animals of each species could be affected by disturbance up to three times per year during vessel surveys (Tables 1 and 2). Based on information from the current permit for the same work as proposed under Permit No. 20466, ADFG does not have data indicating that the vessel surveys conducted as part of the research lead to significant behavioral changes on the part of ice seals. Vessel noise may mask the mating calls of bearded seals but this effect will be infrequent and short in duration.

Seals that do react to vessel disturbance may swim away if they are in the water. Ringed and bearded seals are commonly observed close to vessels ((Harris et al. 2001; Blees et al. 2010);). Survey vessels will not alter their course to approach seals with researchers counting and photographing seals as the vessel passes. If researchers do notice seals swimming away in response to survey vessels, the permit will require that vessels leave the area.

On-ice ringed seals exhibited short-term escape reactions (temporarily entering the water) when a ship came within 0.25 to 0.5 km (Brueggeman et al. 1992). Less drastic responses to disturbances would be head lifting, extension of flippers, and movement of body. As for in-water seals, if researchers notice seals escaping into the water, the permit requires that survey vessels leave the area. As described for aerial surveys, entering the water is part of the normal behavior of various life stages of ice seals and is not expected to affect their fitness. Up to 5,000 individuals could be affected up to 3 times per year during vessel surveys as for aerial surveys.

Based on information from the previous permit (No. 15324), during the permit period from 2012-2015, 98 ringed (Arctic DPS) and zero bearded (Beringia DPS) seals were harassed and this harassment of ringed seals was only reported due to the use of aerial and vessel surveys in

2015. No harassment of either species associated with aerial and vessel surveys was reported in other years.

In summary, vessel surveys are likely to adversely affect up to 5,000 bearded and ringed seals up to 3 times annually with the potential for impacts to up to 50,000 seals of each species over the 5 year lifetime of the proposed permit. Data from the actual surveys show that harassment is far less than this estimate. Vessel surveys are not expected to reduce the fitness of any seal. Therefore, we believe the effects of vessel surveys on ringed and bearded seals will be insignificant.

8.3.2.2 Capture

Up to 200 seals of each species will be targeted for capture (Tables 1 and 2). There could be five mortalities per year due to drowning or prolonged submergence in nets and traps or entanglement in nets or gear. Seals may also suffer injury as a result of capture and restraint. Directed capture will not target any nursing females, neonates or unweaned pups.

Up to 1,000 ringed (Arctic DPS) and bearded (Beringia DPS) seals per year are expected to be incidentally harassed during capture events. These seals could be affected up to three times per capture event. Incidental harassment could affect all life stages of ringed and bearded seals. Incidental harassment is likely to result in responses like those for aerial and vessel surveys. Based on data from actual capture activities associated with Permit No. 15324 of which the proposed permit is a continuation (Table 6), we anticipate that the actual incidental harassment of seals during capture activities will affect a maximum of 50 animals of each species per year rather than the estimated 1,000 animals per year requested in the permit. Therefore, the effect of incidental harassment of bearded and ringed seals due to capture events where the animals are not the target will be insignificant.

Seals will be captured in water, on ice, or on land either by hand or using nets and traps. In the past, researchers performed fieldwork at a single location versus the five different locations where work was conducted under the previous permit (No. 15324) and is proposed under this permit. Based on the data from Permit No. 15324 (Table 6), we expect that the estimated capture of 200 seals of each species and unintentional mortality of five seals of each species in each year (Tables 1 and 2) of the proposed work will be considerably less. Specifically, we estimate that up to 10 seals of each species will be captured each year and there will be less than one mortality of ringed and bearded seals in each year of the proposed permit.

Table 6. Actual take of ringed (Arctic Distinct Population Segment) and bearded (Beringia Distinct Population Sement) seals associated with capture activities reported for Permits

No. 15324 for 2012, 2013, 2014, and 2015 where take includes incidental harassment of animal, actual captures, and unintentional mortalities due to capture activities.

	Incidental Harassment during Capture Activities (No. of Seals)				**Captures (No. of Seals)**				**Unintentional Mortality (No. of Seals)**			
Year	**2012**	**2013**	**2014**	**2015**	**2012**	**2013**	**2014**	**2015**	**2012**	**2013**	**2014**	**2015**
Ringed Seal (Arctic DPS)	0	8	25	45	2	3	7	2	0	1	0	0
Bearded Seal (Beringia DPS)	0	2	5	33	1	0	4	10	0	0	0	0

Capture may lead to unintentional mortality, injury, and a stress response ranging from mild to severe. The most likely source of mortality is drowning in a net, which occurred in 2013 when a ringed seal drown in a net when the capture net was entangled in an ice flow. Due to the time needed to disentangle the net from the ice, the animal drowned. To minimize the potential for this to occur, researchers now use shorter nets and avoid areas with swift currents, broken chunks of ice, and other hazards that could interfere with the rapid extraction of seals from nets. If weather conditions deteriorate, researchers remove nets from the water or redeploy them in safer locations. Under the last permit for the same work, the ringed seal death was the only unintentional mortality of a ringed (Arctic DPS) or bearded (Beringia DPS) seal associated with research activities. In terms of the use of floating traps, no seals were captured in these traps during the previously permitted work. The proposed work under the new permit has additional requirements related to the use of these traps that include continuous monitoring and checking of the traps because they are thought to be more likely to lead to accidental drowning of seals. The permit conditions will include a requirement that, if any animals dies in one of these traps, the researchers will discuss additional mitigation measures with NMFS for the use of the traps. If two animals die as a result of trap use, use will be suspended until ADFG confers with NMFS to determine whether trap use can continue. Therefore, we expect there will be no unintentional mortality of ringed and bearded seals in most years.

Seals will suffer stress as a result of capture activities. Chronic stress can impair the functionality of the immune and reproductive systems. Acute stress may result in hyperthermia. No studies of the capture stress response of ringed and bearded seals are available. However, based on studies of the response to capture of other seal species, it does not appear that capture of seals results in long-term health risks. In order to reduce stressors, in addition to monitoring traps and nets, the

researchers will use nets with floating lead lines so seals captured in the net can surface to breathe, place seals on a soft mesh hoop net for transport, and avoid contact during transport to shore.

The researchers from ADFG report that bearded seals sometimes hang around tagging site after being captured, handled, and released indicating that seals of this species at least are not particularly affected by capture and some seals in the Barrow Sea were curious about research activities, actually approaching vessels during capture activities ((ADFG 2015)). In addition, no seal is pursued for more than 30 minutes (or three to five approaches) to minimize stress response. If the seal is not captured within 30 minutes, the researchers leave the animal alone and target another individual. Recapture of individuals is not intended or anticipated. Therefore, we believe that stress responses to capture on the part of ringed (Arctic DPS) and bearded (Beringia DPS) seals are not likely to reduce the fitness of any individuals.

Escape attempts during capture could lead to injuries to seals including contusions, lacerations, abrasions, hematomas, concussions, and fractures. Such injuries would reduce seal fitness if not noticed and treated. Injuries of this type would be noticed by researchers and would lead to injured seals being held for treatment rather than released. The researchers did not report any of these injuries as a result of capture activities from 2012 through 2015 under a permit to do the same work as proposed under Permit No. 20466. Therefore, we conclude that injury as a result of capture is not likely to occur.

In summary, the capture of up to 200 individuals of ringed and bearded seals, respectively, is likely to result in adverse effect to these species as a result of unintentional mortality during capture activities. Up to five individuals per year, or 25 individuals of each species over the five year permit lifetime could die as a result of capture activities, particularly due to drowning in net or traps. The implications of unintentional mortalities from capture are discussed below in our risk assessment.

8.3.2.3 Use and Administration of Drugs

Under the previous permit, no attempts to use drugged darts to capture bearded seals on the ice were successful. Therefore, there were no effects to bearded seals as a result of this activity. If researchers were to successfully dart a bearded seal on the ice, attempts would be made to capture the animal immediately to avoid it fleeing into the water. If a darted seal enters the water, researchers would deploy a net to capture the seal or administer a reversal agent again using a dart if they could not reach the animal.

Drugs are also used to sedate ringed and bearded if they are aggressive during capture and sampling activities. ADFG indicated that drugs are typically not used during capture and handling. Sedatives are only administered if animals are aggressive in order to avoid injury to the animal and the handlers. In order to minimize the potential for an overdose, doses are carefully controlled and calculated based on the size of the animal. ADFG also has a veterinarian working with them to ensure mixtures of drugs are safe and doses are appropriate. Because the capture of

up to 200 individuals of each species is proposed, the use of drugs could affect this number of animals. However, because researchers indicated that drugs are rarely used and only in cases of aggressive animals, we anticipate that the number of animals that will be sedated will be much less. Seals that are sedated are given reversal agents and their reactions are tested prior to any release of the animal to minimize the potential for drowning or other effects of sedation.

Seals that receive an administration of sedatives may show no reaction or react by reducing their activity, exhibiting a stress response, or suffering a severe reaction such as hyperventilation and escape. Although death is rare as a result of anesthesia in pinnipeds, complications of short-term anesthesia may include apnea, poor muscle relaxation, and prolonged recovery time (Spelman 2004). Most seals respond to the use of diazepam as a sedative by reducing activity and having a lower stress response (Harcourt et al. 2010) and the effects of this drug are then reversed using flumazenil. This combination has long been used for sedation and reversal on marine mammals. ADFG did not report any adverse effects of the use of these drugs on captured seals, although as noted previously they also noted that drug administration is rarely needed.

Seals that are too deeply sedated exhibit slower or shallower breathing. If this happens or a seal is otherwise in need of emergency intervention due to sedation, the researchers will administer doxapram, a central nervous system and respiratory stimulant used to treat respiratory arrest. We expect the administration of this drug, which is commonly administered to reduce recovery time associated with anesthesia and for emergency resuscitation, to result in recovery, revival, or stimulation of breathing (Lynch et al. 1999). In case of an emergency, the researchers may also administer epinephrine. Both epinephrine and dotoxapram have been used to revive captive and wild pinnipeds (NMFS 2014). We expect similar responses from ringed and bearded seals if such measures are necessary due to sedation.

Seals that have been sedated and have not suffered any adverse responses will be given antagonist drugs to counter the sedative and monitored until fully alert and normally reactive prior to being released.

In summary, we do not expect the direct administration of drugs to result in overall fitness reductions for ringed (Arctic DPS) or bearded (Beringia DPS) seals. Because individuals could suffer adverse effects from drug administration, we conclude that the use of sedatives could lead to unintentional mortality of up to one seal of each species per year. This includes the use of dart-delivered sedatives to capture bearded seals, which includes the potential for a seal to drown if researchers are not able to capture darted animals in a net or administer a counter-agent in a timely manner. We discuss the implication of the possible unintentional mortality of up to one ringed and one bearded seal annually in our risk assessment below.

8.3.2.4 Sampling and Tagging

The ADFG proposes the sampling and tagging of up to 200 ringed (Arctic DPS) and bearded (Beringia DPS) seals, respectively, each year of the 5-year permit. Based on the information from the current permit for the same work as proposed under Permit No. 20466, the number of

seals successfully captured has been much lower than this (Table 6). This may be due to the change from capturing and sampling seals at one location only under Permit No. 358-1787 (2006-2011) to attempting to capture seals from five different locations under Permit No. 13524, leading to a division of effort that may reduce the capacity of researchers to capture greater numbers of seals.

Potential responses to sampling and tagging include no response, behavioral reactions to pain (in the case of invasive sampling and tagging), an immune response at the sample collection or tagging site, and tissue damage if tagging tears the flipper. Seals may vocalize or flinch in response to pain when blood is drawn or tissue is cut for sampling and tagging. This discomfort is expected to be temporary and tag sites are treated with an antiseptic in order to reduce the risk of infection. In terms of blood collection, the insertion of the needle is not expected to cause injury or infection due to the extremely small size of the needle tip. No reports of infection as a result of sampling and tagging were found as part of previously permitted work. Tissue plugs are collected associated with tagging as a hole needs to be made in the rear flipper in order to install a tag. The collection of swabs (oral, nasal, urogenital) are not likely to result in adverse effects to any individual other than behavioral responses to being restrained by hand or in a net. Thus, we do not anticipate that sampling and tagging activities will lead to reductions in fitness of ringed and bearded seals.

In terms of whisker collection, because seals periodically shed their whiskers and lose or damage whiskers during normal foraging activities, we do not expect the collection of one whisker from each captured animal to interfere with the animal's ability to forage. Whiskers are used as sensors to navigate in water and detect prey but the loss of a single whisker for sampling purposes will be not be distinguishable from normal whisker loss. Therefore, we conclude that the loss of one whisker per animal may result in temporary pain to the animal but would not reduce the fitness of the individual.

Potential responses to measuring, weighing, and performing ultrasounds include no reaction, vocalization, and struggling to escape. Measurement, weighing, and ultrasound are commonly used to assess the condition of captured seals. These activities are not expected to result in adverse effects beyond discomfort from being restrained by a researcher or in a net. Behaviors such as remaining passive, vocalizing, or struggling to escape are not expected to result in any reductions of fitness of ringed and bearded seals.

In summary, sampling and tagging activities are likely to result in adverse effects to ringed and bearded seals but these effects are expected to be temporary in nature and will not reduce the fitness of any of the animals.

8.3.2.5 On-Board Instruments

ADFG proposes the capture of up to 200 animals per species per year, all of which would be equipped with on-board instruments (see Figures 4, 5, and 6 for examples of what these instruments look like on seals). Animals may receive different instruments but no animal will be

fitted with more than two glue-on transmitters, one temporary recording instrument, and one flipper transmitter for a total of four instruments, although seals will commonly receive only two instruments in total.

Seals may experience skin irritation due to the use of epoxy to secure some of the instruments. To date, no effects of epoxy use to secure instruments have been observed by ADFG who used the same method to place instruments on ice seals under their previous permit.

Flipper instruments are placed on a flipper using two biopsy plugs similar to tagging. Potential responses to the placement of flipper instruments include no response, behavioral reactions to pain, an immune response at the installation site, and tissue damage if the flipper is torn (for instance if the instrument becomes entangled in something and the animals struggles to free itself). Seals may vocalize or flinch in response to pain when tissue is cut. This discomfort is expected to be temporary. In addition, instrument placement sites are treated with an antiseptic in order to reduce the risk of infection. ADFG researchers reported that hunters who captured seals with flipper-mounted instruments informed them that the seals were healthy and there was no sign of infection on the flipper areas around the instruments. Thus, we do not anticipate that installation of instruments on a rear flipper will lead to reductions in fitness of ringed and bearded seals.

Instrumentation could lead to entanglement of animals potentially resulting in drowning and complications due to drag caused by instruments that could affect foraging time and success and ability to escape predators. Based on results of the previously permitted research, it does not appear that the instruments lead to entanglement of seals or impacts to foraging or predator evasion behavior. This is likely due to the small size of the instruments versus the large body size of the seals. Crittercams®, which are the largest instruments that may be placed on seals, are designed to fall off within 24 hours of installation and researchers can also remotely detach these instruments if necessary. Under the previous permit, researchers tracked adult seals fitted with transmitters for up to 278 days and subadults for up to 297 days and did not find evidence that the on-board instruments affected the seals' behavior. Based on the results from work done under the previous permit and studies of Hawaiian monk seals and male harbor seals (Parrish et al. 2000; Littnan et al. 2004; Bowen et al. 2002), even the larger Crittercams® do not appear to significantly affect seal behavior. Seals that have been legally harvested and reported to researchers appeared to be healthy (ADFG 2017).

In summary, the placement of on-board instruments on bearded and ringed seals whether glue-on or flipper mounted is likely to result in adverse effects to ringed and bearded seals but these effects are expected to be temporary in nature and will not reduce the fitness of any of the animals.

8.3.2.6 Release

ADFG researchers propose the capture of up to 200 ringed and bearded seals annually over the five-year permit period. Restraint time will be restricted to no more than 120 minutes for each

animal captured. The only exceptions to this will be if animals are injured, if daylight is ending or if weather conditions change such that researchers would not be able to monitor released animals to ensure they are behaving normally upon release. Captured animals will be held until they are alert, active, and in good condition.

Attempts to escape during release could result in injuries to seals including contusions, lacerations, abrasions, hematomas, concussions, and fractures. These injuries could reduce the fitness of seals. We expect the researchers to notice any swelling, blood, changes in behavior, or irregular movements that would indicate seals have been injured. Based on information from past research on ice seals conducted by ADFG, injuries have not occurred as a result of capture and release of animals. If injury did occur during release, researchers would recapture the animal for treatment. ADFG (2015) reported that at release, all tagged animals appeared to be energetic and in good condition and most swam away vigorously.

In summary, release activities are likely to result in adverse effects to ringed and bearded seals but these effects are expected to be temporary in nature and will not reduce the fitness of any of the animals.

8.4 Risk Analysis

With the exceptions of capture, including the use of darts to deliver a sedative to try and capture bearded seals on the ice, and the use of drugs, the proposed activities are not likely to reduce the fitness of any seals. Capture and the use of drugs could result in the annual mortality of up to five seals of each species as a result of drowning in a net or trap, drowning due to escape to the water following dart-delivered sedation, or complications from the use of drugs. Despite these potential mortalities, the activities proposed under this permit are not expected to have population of species-level effects. Only capture and the use of drugs are considered further in this risk analysis.

Unintentional mortality is not common. Under the previous permit (No. 15324), there was only one mortality from 2012-2015 as a result of a ringed seal drowning in a net that was set to capture animals. Prior to 2012, a permit (No. 358-1787) to capture ice seals using the same methods as proposed under Permit No. 20466 but at a single location rather than five separate locations did not result in any mortalities of ringed or bearded seals in 2006 or 2008 (data were not available for 2007 or 2009-2011). Over these same years (2006, 2008, and 2012-2015), a total of 81 bearded and ringed seals have been captured. Thus, the mortality of one seal represents approximately 1.2 percent of the seals captured. However, because the Permits Division proposes the authorization of five unintentional mortalities annually for each species as a result of the proposed activities, we consider the effects of these deaths on the species. We use the 2016 Stock Assessment Report (Muto et al. 2017) for each species to evaluate the effects of five mortalities annually over the five-year permit period on ringed (Arctic DPS) and bearded (Beringia DPS) seals.

In the status review for ringed seals, Kelly et al. (2010) estimated that the population of the Arctic DPS of ringed seals is 1 million animals in the Chukchi and Beaufort Seas. Thus, five mortalities per year over a 5-year period represents an annual loss of approximately 0.0005 percent of the ringed seal (Arctic DPS) population. The population estimate is considered to be an underestimate (Allen and Angliss 2013), which means the annual loss would be an even smaller percentage of the total population and overall population viability. Normally, the abundance estimate along with other parameters would be used to calculate potential biological removal levels. However, a minimum population estimate (N_{MIN}) for the entire stock of ringed seals cannot be determined because current reliable estimates of abundance are not available for the Chukchi and Beaufort Seas (Muto et al. 2017). For 2012, Conn et al. (2014) provided an abundance estimate of 170,000 that can be considered an N_{MIN} for only the U.S. sector of the Bering Sea ringed seal population. Muto et al. (2017) used the N_{MIN} for ringed seals in the U.S. sector of the Bering Sea to calculate a potential biological removal rate of 5,100 animals, although a similar calculation cannot be made for the entire stock because an estimate of N_{MIN} is not available.

In terms of the potential impact of five unintentional mortalities of ringed seals as a result of the proposed research activities on population viability, we consider the population effects in the context of total annual anthropogenic mortality. Total annual mortality is estimated as 9,571 of which 3.5 deaths are the result of fisheries bycatch and the rest due to subsistence harvest (Allen and Angliss 2013). For Alaska only, total annual mortality is estimated as 1,054 with 3.7 deaths due to fishing and the rest due to subsistence harvest (Muto et al. 2017). Adding up to five unintentional mortalities per year over the 5-year permit will not result in a significant increase in total annual mortality. Therefore, we conclude that the loss of up to five individuals annually would not have a measurable effect on the population and is not likely to reduce the population viability of the ringed seal (Arctic DPS).

In the status review for bearded seals, Cameron et al. (2010) estimated that the population of the Beringia DPS is 155,000 animals. Thus, five mortalities per year over a 5-year period represents an annual loss of approximately 0.003 percent of the bearded seal (Beringia DPS) population. As for ringed seals, the population estimate for bearded seals is considered to be an underestimate (Allen and Angliss 2013), which means the annual loss would be an even smaller percentage of the total population and overall population viability. A minimum population estimate (N_{MIN}) for the entire stock of bearded seals cannot be determined but research programs have recently developed new survey methods and partial abundance estimates (Muto et al. 2017). For 2012, Conn et al. (2014) provided an abundance estimate of 299,174 for only the U.S. sector of the Bering Sea bearded seal population. Muto et al. (2017) used the 2012 Bering Sea abundance estimate to calculate an N_{MIN} of 273,676 bearded seals in the U.S. sector of the Bering Sea. Using this N_{MIN}, a potential biological removal rate of 8,210 animals was calculated by Muto et al. (2017), although a similar calculation cannot be made for the entire stock because an estimate of N_{MIN} is not available.

In terms of the potential impact of five unintentional mortalities of bearded seals as a result of the proposed research activities on population viability, we consider the population effects in the context of total annual anthropogenic mortality. Total annual mortality is estimated as 6,790 of which 1.8 deaths are the result of fisheries bycatch and the rest due to subsistence harvest (Allen and Angliss 2013). For Alaska only, total annual mortality is estimated as 391 with 1.4 deaths due to fishing and the rest due to subsistence harvest (Muto et al. 2017). Adding up to five unintential mortalities per year over the 5-year permit will not result in a significant increase in total annual mortality. Therefore, we conclude that the loss of up to five individuals annually would not have a measurable effect on the population and is not likely to reduce the population viability of the bearded seal (Beringia DPS).

Because the proposed action is not likely to have a measurable effect on population size of either species and likewise is not likely to reduce the population viability of ringed (Arctic DPS) or bearded (Beringia DPS) seals, we conclude that the proposed action is not likely to reduce the viability of ringed (Arctic DPS) or bearded (Beringia DPS) seals.

9 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 of the Federal action subject to consultation (50 C.F.R. §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 ESA.

For this consultation, cumulative effects include oil and gas exploration, shipping and transportation, hunting, fishing, and transport of land-based pollutants from human development to marine waters. There are active oil field in the Beaufort Sea and oil exploration has taken place in the Chukchi Sea. Shell abandoned leases in the Beaufort Sea according to information from the Bureau of Ocean Energy Management (https://www.boem.gov/shell-chukchi/) and many other companies appear to be allowing leases in the Beaufort and Chukchi Seas to expire (https://www.boem.gov/Alaska-Detailed-Listing-of-Active-Leases/). Therefore, the exact locations and amount of leasing for oil and gas exploration in the foreseeable future in the action area cannot be determined. With the increase in sea ice loss, vessel traffic is likely to increase in the foreseeable future to support oil and gas, shipping and transportation, recreational cruises, scientific research, and military activities. Hunting activities are expected to continue into the foreseeable future as are fishing activities. We are not aware of any proposed or anticipated changes in hunting and fisheries that would substantially change the impacts of these activities on ringed (Arctic DPS) and bearded (Beringia DPS) seals. Melting of sea ice and continued terrestrial development appear to be contributing to increases in transport of land-based pollutants to marine waters and this trend is expected to increase as climate change continues.

10 INTEGRATION AND SYNTHESIS

The *Integration and Synthesis* section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the *Effects of the Action* (Section 8) to the *Environmental Baseline* (Section 7) and the *Cumulative Effects* (Section 9) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. In this case we consider only the impacts of the action on the survival and recovery of ringed (Arctic DPS) and bearded (Beringia DPS) seals. This assessment is made in full consideration of the *Status of the Species* (Section 6).

The Permits Division proposes the issuance of MMPA Permit No. 20466 to ADFG for scientific research on ringed (Arctic DPS) and bearded (Beringia DPS) seals. The action area includes coastal waters of the State of Alaska. The researchers would survey and capture seals and would also collect samples from dead carcasses obtained from subsistence hunters. Research activities on live seals include capture, restraint, sedation, tagging, instrumentation, measuring, sample collection, release, and aerial and vessel surveys. The Permits Division proposes the authorization of up to five unintentional mortalities per year for each species of seal over the 5-year permit.

The ringed seal Arctic DPS and bearded seal Beringia DPS were listed as threatened under the ESA because the species are at risk of becoming endangered in the future due to change in sea ice resulting from climate change. The ringed seal (Arctic DPS) has been vacated (*Alaska Oil and Gas Association v. Pritzker*, Case No. 4:14-cv-029-RPB); however, we include the species in our analyses because NMFS filed a notice of appeal of the District Court decision on May 3, 2016. Both species have large population sizes although reliable abundance estimates and population trends are not available. The species both appear to be resilient to perturbations including oil and gas exploration, shipping and transportation, subsistence hunting, fisheries interactions, pollution, and scientific research, as well as to unexplained events such as the mortality that occurred in 2011.

The collection of samples from subsistence-harvested seals is not likely to adversely affect any seal because the animals sampled will have been killed by hunters. Other activities that will be conducted under the proposed permit, including sampling and tagging, on-board instrumentation, and release, are likely to have adverse effects on individual animals but are not likely to result in loss of fitness of these animals. Aerial and vessel surveys are likely to affect ringed and bearded seals, particularly due to the potential to provoke a behavioral response to the noise generated by fixed-wing aircraft or vessels, but the overall effects of survey work are expected to be insignificant to ringed (Arctic DPS) and bearded (Beringia DPS) seals.

The capture of seals and use of drugs is likely to adversely affect seals and may result in the death of up to five individuals of each species per year over the 5-year permit as a result of drowning during capture activities (in nets, traps, or due to remote administration of a sedative using darts) or due to an adverse reaction to the administration of drugs. The mortality of up to 5 individuals of each species will result in a reduction in numbers of each species. As discussed previously, females with dependent pups, pups, and neonates will not be targeted for capture. Animals that will be targeted for capture include males and females of each species that may be sexually mature. The loss of up to five individuals of each species that may be sexually mature would represent a loss of reproduction at an individual level.

The proposed action will not affect the species' current geographic range or the geographic range of their DPSs. Despite the lack of adequate population estimates for each species, the loss of up to five individuals annually is not expected to exceed 0.0005 and 0.003 percent of the total abundance of ringed and bearded seals, respectively.

Future state or private actions are likely to continue and some potentially to increase in the action area. These cumulative effects include oil and gas exploration, shipping and transportation, hunting, fishing, and terrestrial development activities that lead to the transport of pollutants to marine waters.

Considering the status of ringed (Arctic DPS) and bearded (Beringia DPS) seals, the environmental baseline, the effects of the action, and cumulative effects, we do not expect the proposed research activities to result in a significant reduction in numbers or reproduction of ringed and bearded seals or a change in the distribution of either species. Therefore, we expect that the proposed action will not appreciably reduce the likelihood of both survival and recovery of ringed (Arctic DPS) and bearded (Beringia DPS) seals in the wild. We have determined that the anticipated level of unanticipated mortality (up to five individuals of each species annually over the 5-year permit) of ringed and bearded seals is not likely to jeopardize the continued existence of the ringed seal Arctic DPS or the bearded seal Beringia DPS.

11 CONCLUSION

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of ringed seals (Arctic DPS) or bearded seals (Beringia DPS). NMFS determine that the proposed action will have no effect on the proposed critical habitat for ringed seals (Arctic DPS) as discussed in Section 6.1.

12 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt

to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such as extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The MMPA defines harassment as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (16 U.S.C. §1362(18)(A)(ii)." For this consultation, we interpret "harass" using the USFWS and MMPA definitions. As discussed in Section 8 of this opinion, we do not believe harassment of ringed and bearded seals during aerial and vessel survey and capture activities (in the case of non-target animals) will rise to the level of take.

Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of the incidental take statement. For this consultation, we do not anticipate the incidental take of any ESA-listed species as directed take of ice seals will be part of the permitted action included in the MMPA permit to be issued by the Permits Division for research activities.

13 CONSERVATION RECOMMENDATIONS

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

We provide the following conservation recommendations to further protect ringed and bearded seals from stressors associated with the proposed research activities and obtain data specific to ringed and bearded seals targeted under this permit:

- Researchers should thoroughly document the time spent surveying ice seals using fixed-wing aircraft and vessels and the responses of all animals during these survey activities in order to assess stress responses and develop measures to further minimize them in coordination with the Permits Division.
- Researchers should thoroughly document the time spent in all attempted capture and release activities and the responses of target and non-target animals to these activities in

order to assess stress responses on the part of these animals and develop measures to further minimize the stress responses of captured animals and animals that are incidentally harassed as a result of capture and release activities.

- Researchers should thoroughly document the behavioral reactions to all sampling and tagging activities in order to determine whether additional measures to further minimize stress and potential physical and biological impacts such as injury and immune responses to sampling and tagging.
- Researchers submit this information to the Permits Division as part of their required annual reporting.
- The Permits Division should post this information on their Authorizations and Permits for Protected Species online database (https://apps.nmfs.noaa.gov/) including all attachments detailing the results.

In order for NMFS' Office of Protected Resources Endangered Species Act Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their critical habitat, the Permits Division should notify the Endangered Species Act Interagency Cooperation Division of any conservation recommendations they implement in their final action.

14 REINITIATION NOTICE

This concludes formal consultation for the proposed issuance of Permit No. 20466. As 50 C.F.R. §402.16 states, reinitiation of formal consultation 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 taking specified in the incidental take statement is exceeded.
(2) New information reveals effects of the agency action that may affect ESA-listed species or critical habitat in a manner or to an extent not previously considered.
(3) The identified action is subsequently modified in a manner that causes an effect to ESA-listed species or designated critical habitat that was not considered in this opinion.
(4) A new species is listed or critical habitat designated under the ESA that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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APPENDIX A

Permit No. 20466
Expiration Date: August 15, 2022
Reports Due: December 31st, annually

PERMIT TO TAKE PROTECTED SPECIES[1] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to Alaska Department of Fish and Game, Division of Wildlife Conservation, Juneau, AK, (hereinafter "Permit Holder"), [Responsible Party: Lori Quakenbush], pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*) and the regulations governing the taking and importing of marine mammals (50 CFR Part 216).

II. Abstract

The objectives of the permitted activity, as described in the application, are to monitor the status and health of four species of ice seals by analyzing samples from the subsistence harvest and documenting movements and habitat use by tracking animals with satellite transmitters and conducting aerial and vessel surveys.

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including attachments and appendices. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through August 15, 2022. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources, pursuant to applicable regulations and the requirements of the MMPA.

2. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, NMFS Permits and Conservation Division (hereinafter "Permits Division") for written permission to resume

    a. If serious injury or mortality[2] of protected species reaches that specified in

[1] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.
[2] This permit allows for unintentional serious injury and mortality caused by the presence or actions of researchers up to the limit in Table 2 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling

Table 2 of Appendix 1.

b. If authorized take[3] is exceeded in any of the following ways:

i. More animals are taken than allowed in Table 2 of Appendix 1.
ii. Animals are taken in a manner not authorized by this permit.
iii. Protected species other than those authorized by this permit are taken.

c. Following incident reporting requirements at Condition E.

3. The Permit Holder may continue to possess biological samples[4] acquired[5] under this permit after permit expiration without additional written authorization, provided the samples are maintained as specified in this permit.

B. Number and Kind(s) of Protected Species, Location(s) and Manner of Taking

1. The tables in Appendix 1 outline the number of protected species, by species and stock, authorized to be taken, and the locations, manner, and time period in which they may be taken.

2. Researchers working under this permit may collect visual images (e.g., photographs, video) as needed to document the permitted activities, provided the collection of such images does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 2 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS MMPA Permit No. 20466. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:

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procedures or invasive tagging; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[3] By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

[4] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

[5] Authorized methods of sample acquisition are specified in Appendix 1.

a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

Counting and Reporting Takes

a. On land or ice - Count and report 1 take per pinniped per day for those that show movement[6] or flushing[7] (excluding alert[8]) to an approach or other permitted activity, regardless of the number of approaches and behavioral responses of the same individual in a day.

b. In water – Count and report 1 take per pinniped or cetacean per day including all approaches[9] in water.

c. Aerial - During Unmanned Aircraft System (UAS) surveys, count 1 take per cetacean or pinniped approached per day, regardless of the number of passes.

Aerial Surveys

d. Manned aerial surveys must be flown at an altitude of 200 meters. During surveys, the plane will circle within visual contact, but not directly over a group of seals for up to 15 minutes in order to accurately count and photograph all seals present.

Darting

e. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, Permits Division for written permission to resume if 3 pinnipeds of any species are darted and suffer unanticipated adverse

[6] Movements in response to the source of disturbance, ranging from short withdrawals at least twice the animal's body length to longer retreats over the beach, or if already moving a change of direction of greater than 90 degrees.
[7]All retreats (flushes) to the water.
[8]Seal head orientation or brief movement in response to disturbance, which may include turning head towards the disturbance, craning head and neck while holding the body rigid in a u-shaped position, changing from a lying to a sitting position, or brief movement of less than twice the animal's body length.
[9] An "approach" is defined as a continuous sequence of maneuvers involving a vessel or equipment, including drifting, directed toward a pinniped or group of pinnipeds closer than 50 yards.

effects, including entering the water and either drowning or disappearing so that their fate cannot be determined.

f. Researchers must consult an experienced marine mammal veterinarian for proper dosages and protocols for use of anesthesia and sedatives, including administration via remote darting.

Capture

g. Researchers must capture and handle pinnipeds in groups small enough that handling and restraint time for each animal is minimized and all animals can be adequately monitored for signs of adverse reactions that could lead to serious injury or mortality.

h. When capturing or detaining animals in traps, Researchers must adequately monitor the animals to prevent injury, mortality, and dehydration.

i. When deploying floating traps, Researchers must monitor the traps from a distance using binoculars or spotting scope and extract seals from the trap as soon as possible.

j. Researchers must not leave nets across lagoons unmonitored.

k. To the maximum extent feasible, researchers must be aware of the presence and location of non-target protected species at all times as they conduct netting activities. Researchers must make every effort to prevent interactions with these species.

l. Researchers must stop netting activities and immediately free any non-target protected species captured per Condition A.2.

Handling

m. Researchers must minimize the time lactating females are removed or otherwise separated from their dependent pups as a result of research activities.

n. Researchers must immediately cease attempts to approach, capture, sedate (including remote darting), restrain, sample, mark, or otherwise handle pinnipeds if the procedure does not appear to be working or there are indications such acts may be life-threatening or otherwise endanger the health or welfare of the animal. To the extent that it would not further endanger the health or welfare of the animal, Researchers may monitor or treat (e.g., administer reversal agents or attempt resuscitation) the animal as deemed appropriate in consultation with a veterinarian.

o. Researchers must use aseptic techniques for collection of external tissue samples (e.g., swabs), puncture procedures (e.g., venipuncture, flipper tagging), surgical procedures, and collection of internal tissue samples (e.g., blubber biopsy).

p. Researchers must use sterile disposable instruments (e.g., needles, biopsy punches) to the maximum extent practicable.

q. Researchers must limit the amount of blood collected to actual needs for sample analysis and not exceed three attempts (needle insertions) per site per animal, and not more than 10 ml blood per kg body mass per capture event.

r. Sedated and anesthetized animals must be monitored closely and not be released until they recover normal locomotor capabilities. When sedated/anesthetized animals are too large or dangerous to be held until fully recovered from sedation/anesthesia, they should be placed in secure sites where they will not be subject to physical harm or extremes of temperature, and can be monitored from a safe distance.

s. Researchers must take appropriate actions (e.g., disinfection procedures) for minimizing the introduction of new disease agents, vectors capable of efficiently transmitting indigenous dormant diseases or those not currently being effectively transmitted, and species that can serve as amplification hosts for transmitting indigenous diseases to other species.

t. To the maximum extent practical without causing further disturbance of marine mammals, Researchers shall monitor study sites following any disturbance (e.g., surveys or sampling activities) to determine if any marine mammals have been killed or injured or pups abandoned. Any observed serious injury to or death of a marine mammal is to be reported as indicated in Condition A.2. Any observed abandonment of a dependent marine mammal pup is to be reported to the NMFS Alaska Regional Stranding Network Coordinator (phone: 907-586-7248).

u. To the maximum extent practical, Researchers must continue to improve and refine their protocols including:
    i. Minimizing unintended capture risk by reducing net length and deployment duration;
    ii. Minimizing size of instruments or include release mechanisms; and
    iii. Minimizing duration of restraint.

v. In the event an animal dies as a result of research activities, the Permit Holder must, within two weeks, submit an incident report as described in Condition E.2. A necropsy should be performed, except where not feasible such as in remote areas with limited personnel or when there is an obvious drowning. Gross necropsy findings should be included as part of an incident report. Final necropsy findings (e.g., histology and other analyses) must be submitted when complete.

w. In the event that a mortality occurs due to the use of floating traps, ADF&G will contact NMFS to discuss mitigation measures for trap use. If two

seals die due to use of the floating traps, use of the traps will be halted until ADF&G confers with NMFS and receives approval to continue.

x. In the event that an animal is remotely darted and disappears into the water without resighting, it must be considered a mortality under the permit.

6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37).

b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the
   i. species and, where known, age and sex;
   ii. date of collection, acquisition, or import;
   iii. type of sample (e.g., blood, skin, bone);
   iv. origin (i.e., where collected or imported from); and
   v. legal authorization for original sample collection or import.

c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the
   i. name and affiliation of the recipient;
   ii. address of the recipient;
   iii. types of samples to be sent (species, tissue type); and
   iv. type of analysis or whether samples will be curated.

e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional

written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E. 3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

   a. Principal Investigator – Lori Quakenbush.

   b. Co-Investigator(s) –See Appendix 2 for list of names and corresponding activities.

   c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

   a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

   b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

   c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

   d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:

a. individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

b. individuals included as backup for those personnel essential to the conduct of the permitted activity, and

c. individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians, pilots) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

7. The Permit Holder or PI may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

8. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit.

9. Submit requests to add CIs or change the PI by one of the following:

a. the online system at NOAA Fisheries APPS;
b. an email attachment to the permit analyst for this permit; or
c. a hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when

a. Engaged in a permitted activity.

b. A protected species is in transit incidental to a permitted activity.

c. A protected species taken or imported under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

1. The Permit Holder must submit incident, annual, and final reports containing the information and in the format specified by the Permits Division.

a. Reports must be submitted to the Permits Division by one of the following:

i. the online system at NOAA Fisheries APPS;
ii. an email attachment to the permit analyst for this permit; or
iii. a hard copy mailed or faxed to the Chief, Permits Division.

b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

2. Incident Reporting

a. If the total number of mortalities is reached, or authorized takes have been exceeded as specified in Conditions A.2 and B.5, the Permit Holder must

i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;

ii. Submit a written report within 2 weeks of the incident as specified below; and

iii. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

b. Any time a serious injury or mortality of a protected species occurs, a written report must be submitted within two weeks.

c. The incident report must include 1) a complete description of the events and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

3. Annual reports describing activities conducted during the previous permit year (from January 1 to December 31) must

a. be submitted by April 1 each year for which the permit is valid;

b. include details on the behavioral responses of all pinnipeds subject to remote darting, and

c. include a tabular accounting of takes and a narrative description of activities and effects.

4. A final report summarizing activities over the life of the permit must be submitted by (December 31, 2022), or, if the research concludes prior to permit expiration, within 180 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division.

F. Notification and Coordination

1. NMFS Regional Offices are responsible for ensuring coordination of the timing and location of all research activities in their areas to minimize unnecessary duplication, harassment, or other adverse impacts from multiple researchers.

2. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Office listed below at least two weeks prior to initiation of each field trip/season.

a. Notification must include the:

i. locations of the intended field study and/or survey routes;

ii. estimated dates of activities; and

iii. number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant "in training").

b. Notification must be sent to the following Assistant Regional Administrator for Protected Resources:

Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012;

3. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:

a. allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe permitted activities; and

b. providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:

a. in order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under section 103 of the MMPA;

b. in a case in which a violation of the terms and conditions of the permit is found;

c. in response to a written request[10] from the Permit Holder; and

d. if NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA or the regulations at 50 CFR 216 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA and 15 CFR part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

a. The Permit Holder must contact the Permits Division for verification

[10] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

before conducting the activity if they are unsure whether an activity is within the scope of the permit.

b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder:

a. agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216 and all restrictions and requirements under the MMPA;

b. acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

c. acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

Donna S. Wieting Director, Office of Protected Resources National Marine Fisheries Service	Lori Quakenbush Alaska Department of Fish and Game Responsible Party
Date Issued	Date Effective

Appendix 1: Tables Specifying the Kind(s) of Protected Species, Location(s), and Manner of Taking

Table 1: Annual take and import of parts of pinnipeds in Alaska. Collection and import of parts may occur year-round annually. Samples may be exported or imported from Russia, Canada, and Norway.						
Line	Species	Stock/Listing Unit	Number of Animals	Number of Samples	Take Action	Details
1	Seal, bearded		5,000	Unlimited	Collect/import/export	
2	Seal, ribbon		5,000	Unlimited	Collect/import/export	
3	Seal, ringed		5,000	Unlimited	Collect/import/export	
4	Seal, spotted		5,000	Unlimited	Collect/import/export	

Table 2: Annual takes of marine mammals in Alaska. Field work may occur year-round annually from August 15, 2017 through August 14, 2022. Seals may be captured in water, on ice, or on land by hand, in floating traps, or in nets.								
Line	Species	Stock/ Listing Unit	Life Stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
1	Seal, bearded	Beringia	All	100	1	Capture/ Handle/ Release	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Administer drug, topical; Anesthesia, injectable sedative; Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, muscle biopsy; Sample, skin; biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Remote dart-delivery of sedatives and/or non-lethal deterrents may be used Up to 25 would receive blubber and muscle biopsies. Lactating females and unweaned pups would not be captured, sampled, or tagged.
2	Seal, bearded	Beringia	All	100	1	Capture/ Handle/ Release	Collect, scat; Collect, urine; Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Unweaned pups and lactating females would not be captured, sampled, or tagged.
3	Seal, ribbon	Alaska Stock	All	100	1	Capture/ Handle/ Release	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Administer drug, topical; Collect, scat; Collect, urine;	Non-lethal deterrents may be used. Up to 25 would receive

							Instrument, external (e.g., VHF, SLTDR); Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, muscle biopsy; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	blubber and muscle biopsies. Lactating females and unweaned pups would not be captured, sampled, or tagged.
4	Seal, ribbon	Alaska Stock	All	100	1	Capture/ Handle/ Release	Collect, scat; Collect, urine; Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Non-lethal deterrents may be used. Lactating females and unweaned pups would not be captured, sampled, or tagged.
5	Seal, ringed	Alaska Stock	All	100	1	Capture/ Handle/ Release	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Administer drug, topical; Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, muscle biopsy; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Non-lethal deterrents may be used. Up to 25 would receive blubber and muscle biopsies. Lactating females and unweaned pups would not be captured, sampled, or tagged.
6	Seal, ringed	Alaska Stock	All	100	1	Capture/ Handle/ Release	Collect, scat; Collect, urine; Mark, flipper tag; Measure (standard morphometrics); Restrain, board;	Non-lethal deterrents may be used. Lactating

							Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	females and unweaned pups would not be captured, sampled, or tagged.
7	Seal, spotted	Alaska Stock	All	100	1	Capture/ Handle/ Release	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Administer drug, topical; Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, muscle biopsy; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Non-lethal deterrents may be used. Up to 25 would receive blubber and muscle biopsies. Lactating females and unweaned pups would not be captured, sampled, or tagged.
8	Seal, spotted	Alaska Stock	All	100	1	Capture/ Handle/ Release	Collect, scat; Collect, urine; Mark, flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Non-lethal deterrents may be used. Lactating females and unweaned pups would not be captured, sampled, or tagged.
9	Seal, bearded	Beringia	All	1,000	3	Harass	Incidental disturbance	Incidental disturbance of non-

								target animals during capture activities; seals may be incidentally disturbed up to 3 times per capture event.
10	Seal, ribbon	Alaska Stock	All	1,000	3	Harass	Incidental disturbance	Incidental disturbance of non-target animals during capture activities; seals may be incidentally disturbed up to 3 times per capture event.
11	Seal, ringed	Alaska Stock	All	1,000	3	Harass	Incidental disturbance	Incidental disturbance of non-target animals during capture activities; seals may be incidentally disturbed up to 3 times per capture event.
12	Seal, spotted	Alaska Stock	All	2,000	3	Harass	Incidental disturbance	Incidental disturbance of non-target animals

								during capture activities; seals may be incidentally disturbed up to 3 times per capture event.
13	Seal, spotted	Alaska Stock	All	50,000	12	Harass	Aerial/Vessel Surveys	Harassment during aerial and vessel surveys. Spotted seals haul out in large groups at predictable locations. Therefore, repeated surveys of the same haulout could result in multiple harassments of the same individual seals.
14	Seal, bearded	Beringia	All	5,000	3	Harass	Aerial/Vessel Surveys	Harassment during aerial and vessel surveys. Bearded seals do not haul out in predictable locations. Therefore, repeated surveys are less likely to harass the same individual seals.
15	Seal, ribbon	Alaska Stock	All	2,000	3	Harass	Aerial/Vessel Surveys	Harassment during aerial and vessel surveys. Ribbon seals do not haul out

								in predictable locations. Therefore, repeated surveys are less likely to harass the same individual seals.
16	Seal, ringed	Alaska Stock	All	5,000	3	Harass	Aerial/Vessel Surveys	Harassment during aerial and vessel surveys. Ringed seals do not haul out in predictable locations. Therefore, repeated surveys are less likely to harass the same individual seals.
17	Whale, beluga	Range-wide excluding Cook Inlet stock	All	25	1	Incidental take	Incidental harassment	Incidental harassment during pinniped capture and tagging activities.
18	Seal, bearded	Beringia	All	5	1	Unintentional mortality	Intentional (directed) mortality; Salvage (carcass, tissue, parts); Unintentional mortality	Unintentional mortalities during darting and capture activities, NTE 25 seals in 5 years. Includes euthanasia if warranted.
19	Seal, ribbon	Alaska Stock	All	5	1	Unintentional mortality	Intentional (directed) mortality; Salvage (carcass, tissue, parts); Unintentional mortality	Unintentional mortalities during capture activities, NTE 25 seals in 5

								years. Includes euthanasia if warranted.
20	Seal, ringed	Alaska Stock	All	5	1	Unintentional mortality	Intentional (directed) mortality; Salvage (carcass, tissue, parts); Unintentional mortality	Unintentional mortalities during capture activities, NTE 25 seals in 5 years. Includes euthanasia if warranted.
21	Seal, spotted	Alaska Stock	All	5	1	Unintentional mortality	Intentional (directed) mortality; Salvage (carcass, tissue, parts); Unintentional mortality	Unintentional mortalities during capture activities, NTE 25 seals in 5 years. Includes euthanasia if warranted.
22	Whale, beluga	Range-wide excluding Cook Inlet stock	All	2	1	Capture/ Handle/ Release	Incidental capture	Unintentional capture and release of animals during seal capture activities.
23	Whale, beluga	Range-wide excluding Cook Inlet belugas	All	1	1	Unintentional mortality	Intentional (directed) mortality; Salvage (carcass, tissue, parts); Unintentional mortality	Unintentional mortalities during seal capture activities, NTE 5 belugas in 5 years. Includes euthanasia, if warranted.

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 20466.

The following individuals are approved to act as Principal Investigator and Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name of Personnel	Activities
Principal Investigator	
Lori Quakenbush (Principal Investigator)	All research activities, excluding muscle biopsies.
Co-Investigators	
Ryan Adam	Sample collection from subsistence harvest
Billy Adams	Seal capture, tagging, and non-invasive sampling activities. Does not include drug delivery and remote darting.
Joseph Andrew	Vessel surveys
Kimberlee B. Beckmen	All research activities (Veterinarian)
Anna Bryan	All research activities except remote sedation
John Citta	Seal capture tagging and non-invasive sampling activities. Does not include drug delivery and remote darting.
Justin Crawford	All research activities, excluding blubber and muscle biopsies and remote sedation
Louise Foster	Sample collection from subsistence harvest
Kathryn Frost	All research activities, excluding remote darting
Isaac Leavitt	Seal capture, tagging, and non-invasive sampling activities. Does not include drug delivery and remote darting.
Peter Lockuk	Vessel surveys
Frank Logusak	Vessel surveys
Mark Nelson	All research activities except remote sedation
Joseph Skin	Seal capture, tagging, and non-invasive sampling activities. Does not include drug delivery and remote darting.
Andrew Von Duyke	Seal capture, tagging, and non-invasive sampling activities. Does not include drug delivery and remote darting

Biological samples authorized for collection or acquisition in Tables 1 and 2 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

Authorized Recipient	Sample Type	Disposition
Athens Veterinary Diagnostic Laboratory College of Veterinary Medicine University of Georgia Athens, GA 30602 e-mail: www.vet.uga.edu/dlab	Serum	Serology (samples consumed in analysis or returned post analysis)
Dr. James Berner Alaska Native Tribal Health Consortium 4000 Ambassador Dr. Anchorage, AK 99508 e-mail: jberner@anthc.org	Any tissue	Toxic algae monitoring, disease monitoring, contaminants monitoring, and human health perspectives (samples consumed in analysis)
Dr. Suzanne Budge Department of Process Engineering and Applied Science Dalhousie University P.O. Box 15000 Halifax, Nova Scotia, Canada B3H 4R2 e-mail: Suzanne.budge@dal.ca	Blubber	Seal diet via fatty acids (samples consumed in analysis)
Dr. Kathy Burek Alaska Veterinary Pathology Services (AVPS) 23834 The Clearing Drive Eagle River, AK 99577 e-mail: avps.kbh@gmail.com	Any tissue	Histological analyses (samples consumed in analysis)
Dr. Ken Coyle University of Alaska Institute of Marine Science Fairbanks, AK 99775 e-mail: coyle@ims.uaf.edu	Invertebrate prey	Invertebrate prey identification (samples returned to ADF&G post identification)
Dr. Stephen Ferguson Freshwater Institute Fisheries and Oceans Canada 501 University Crescent Winnipeg, MB, R3T 2N6 e-mail: Steve.ferguson@dfo-mpo.gc.ca	Liver, kidney, and muscle	Seal diet via stable isotopes and genetic studies (samples consumed in analysis)

Authorized Recipient	Sample Type	Disposition
Dr. Todd O'Hara University of Alaska Wildlife Toxicology Lab Fairbanks, AK 99775 e-mail: tmohara@alaska.edu	Liver, kidney, muscle, blubber, and blood filter strips	Contaminants and disease analyses (samples consumed in analysis or returned post analysis)
Dr. Lara Horstmann School of Fisheries and Ocean Sciences University of Alaska Fairbanks Fairbanks, AK99775 e-mail: Lara.horstmann@alaska.edu	Any tissue	Seal diet, disease, and graduate student studies (samples consumed in analysis or returned post analysis)
Shawna Karpovich Wildlife Physiologist II Alaska Department of Fish and Game 1300 College Rd. Fairbanks, AK 99701 e-mail: Shawna.karpovich@alaska.gov	Any tissue	Seal diet, hormone, and health studies (samples consumed in analysis or returned post analysis)
Dr. Mandy Keogh Wildlife Physiologist III, Steller Sea Lion Research Program Alaska Department of Fish and Game 1300 College Rd. Fairbanks, AK 99701 e-mail: mandy.keogh@alaska.gov	Any tissue	Seal diet, hormone, and health studies (samples consumed in analysis or returned post analysis)
Dr. Kathi Lefebvre Northwest Fisheries Science Center 2725 Montlake Blvd E Seattle, WA 98112 e-mail: kathi.lefebvre@noaa.gov	Stomach content, intestinal content, feces, urine, and amniotic fluid	Toxic algae analysis (samples consumed in analysis)
Matson's Laboratory 135 Wooden Shoe Ln. Manhattan, MT 59741 http://matsonslab.com/	Teeth	Tooth age analysis (samples returned post analysis)
Dr. Tom McDonald TDI Brooks International B&B Laboratories, Inc. 1902 Pinon Drive College Station, TX 77845	Liver, kidney, muscle, and blubber	Contaminants analyses (samples consumed in analysis)

Authorized Recipient	Sample Type	Disposition
e-mail: tommcdonald@tdi-bi.com		
Amanda Moors NIST Marine Environmental Specimen Bank Hollings Marine Laboratory 331 Fort Johnson Rd. Charleston, SC 29412 e-mail: Amanda.moors@noaa.gov	Liver, kidney, and muscle	AMMTAP Archival and curation for contaminant studies (samples are transferred)
Dr. Brenda Norcross School of Fisheries and Ocean Sciences University of Alaska Fairbanks Fairbanks, AK 99775 e-mail: bnorcross@ims.uaf.edu	Fish prey	Forage fish/seal diet studies (samples consumed in analysis or returned post analysis)
Dr. Ingebjørg Helena Nymo Department of Arctic and Marine Biology Faculty of Biosciences, Fisheries and Economics University of Tromsø – The Arctic University of Norway e-mail: ingebjorg.h.nymo@uit.no	Serum	Disease monitoring (samples consumed in analysis or returned post analysis)
Dr. Link Olson UAF Museum of the North Fairbanks, AK e-mail: ffleo@uaf.edu	Liver, kidney, muscle, spleen, heart, and jaw	Tissue archival and curation (samples are transferred)
Dr. Colleen Reichmuth Long Marine Laboratory University of California, Santa Cruz 100 Shaffer Rd. Santa Cruz CA 95060 e-mail: coll@ucsc.edu	Muscle	Analysis and curation of remaining samples (samples are transferred)
Dr. Kelly Robertson National Marine Fisheries Service Southwest Fisheries Science Center 8901 La Jolla Shores Dr. La Jolla, CA 92037 e-mail: Kelly.Robertson@noaa.gov	Liver, muscle, and skin	Archival and curation for genetic studies (samples are transferred)

Authorized Recipient	Sample Type	Disposition
Dr. Raphaela Stimmelmayr Wildlife Veterinarian and Research Biologist NSB Department of Wildlife Management P.O. Box 69, Barrow, AK 99723 e-mail: Raphaela.Stimmelmayr@north-slope.org	Any tissue	Seal health studies (samples consumed in analysis or returned post analysis)
Dr. Heather Walden University of Florida College of Veterinary Medicine 1945 SW 16th Ave, V2-155 Gainesville, FL 32608 e-mail: hdstockdale@ufl.edu	Heart, lungs, liver, gall bladder, intestine, feces, stomach parasites, and other parasites.	Parasite identification (samples consumed in analysis or returned post analysis)
William Walker 9055 Bayview Dr. SW Vashon Island, WA 98070 e-mail: mindwalk@msn.com	Fish and cephalopod prey	Fish and cephalopod prey identification (samples returned to ADF&G post identification)
Dr. Matthew Wooller Water and Environmental Research Center Alaska Stable Isotope Facility University of Alaska Fairbanks, Fairbanks, AK 99775 e-mail: mjwooller@alaska.edu	Any tissue	Stable isotope analysis (samples consumed in analysis or returned post analysis)