UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

OCT 30 2014

Memorandum For: Jolie Harrison
Chief, Permits and Conservation Division

From: Cathryn E. Tortorici Kellie L Taylor
for Chief, Endangered Species Act Interagency Cooperation Division

Subject: Biological opinion on the proposal to issue Marine Mammal Protection Act Permit Amendment No. 15324-01 to the Alaska Department of Fish and Game to conduct scientific research on ice seals

Enclosed is the NOAA National Marine Fisheries Service's (NMFS) biological opinion on the effects of issuance of the Marine Mammal Protection Act Permit Amendment No. 15324-01 to the Alaska Department of Fish and Game.

In this biological opinion, NMFS concludes that the issuance of the permit is not likely to jeopardize the continued existence of the ringed seal (Artic DPS) or the bearded seal (Beringia DPS). Critical habitat has not been designated for these species. We concur that the proposed action may affect but is not likely to adversely affect the following ESA-listed species: blue whale, fin whale, humpback whale, North Pacific right whale, sei whale, bowhead whale, western North Pacific gray whale, and Steller sea lion. We also concur that the proposed action is not likely to adversely affect the designated critical habitat for the following species: North Pacific right whale and Steller sea lion.

On July 25, 2014, the 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 is presently considering whether to appeal that decision. In the interim, our biological opinions under Section 7(a)(2) of the ESA will continue to address effects to bearded seals (Beringia DPS) so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on this DPS, even though the listing of the species is not in effect.

This concludes formal consultation on this action. Consultation on this issue must be reinitiated if: (1) the amount or extent of allowable take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

National Marine Fisheries Service
Endangered Species Act Section 7
Biological Opinion

Action Agency: National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division

Activity Considered: Issuance of Marine Mammal Protection Act Permit Amendment No. 15324-01 to Alaska Department of Fish and Game to conduct scientific research on ice seals (PCTS # FPR-2014-9092)

Consultation Conducted By: National Marine Fisheries Service, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division

Approved:

Donna S. Wieting
Director, Office of Protected Resources

Date: OCT 30 2014

This document is the National Marine Fisheries Service (NMFS), Office of Protected Resources' (OPR) biological opinion on the effects of the proposed action on endangered and threatened species and critical habitat that has been designated for those species. The consulting agency for the proposed action is NMFS OPR Endangered Species Act Interagency Cooperation Division. We prepared this Opinion in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.), and implementing regulations at 50 CFR §402.

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
cm	Centimeter
DPS	Distinct Population Segment
ESA	Endangered Species Act
FPR	Fisheries Protected Resources
FR	Federal Register
ft	Foot
g	Gram
Hz	Hertz
IPCC	Intergovernmental Panel on Climate Change
kg	Kilogram
kHz	Kilohertz
km	Kilometer

lb	Pound
m	Meter
mm	Millimeter
mg	Milligram
ml	Milliliter
MMPA	Marine Mammal Protection Act
N	North
NMFS	National Marine Fisheries Service
No.	Number
OPR	Office of Protected Resources
PCTS	Public Consultation Tracking System
SDR	Satellite depth recorder
SNC	Stranding Network Coordinator
SPOT	Smart position and temperature
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
v.	Versus
W	West

1 INTRODUCTION

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the U. S. Fish and Wildlife Service (USFWS), NMFS, or both, 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. Section 7(b)(3) requires that at the conclusion of consultation, NMFS or the USFWS provide an opinion stating how the agencies' actions will affect listed species and their critical habitat. If incidental take is expected, Section 7(b)(4) requires the consulting agency to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

When a Federal agency's action "may affect" a protected species, that agency is required to consult formally with NMFS or the USFWS, depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR §402.14(a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat, and if NMFS or the USFWS concurs with that conclusion (50 CFR §402.14(b)).

For the actions described in this Opinion, the action agency 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 amendment (Permit No. 15324-01) to the Alaska Department of Fish and Game (i.e., the researchers), authorizing scientific research on ice seals in Alaska, including ringed seals (Arctic Distinct Population Segment, DPS) and bearded seals (Beringia DPS).

1.1 Consultation History

On May 18, 2011, the Permits Division issued Permit No. 15324 to the Alaska Department of Fish and Game to authorize research on ice seals in Alaska. On December 28, 2012, NMFS listed the ringed seal (Arctic DPS) and bearded seal (Beringia DPS) as threatened under the ESA. For these species, NMFS did not issue ESA Section 4(d) regulations, which may include Section 9 prohibitions; therefore, an ESA Section 10 permit is not required to conduct research on these species. However, 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. For this reason, the Permits Division requested formal Section 7 consultation on May 9, 2014. On June 10, 2014, we requested additional information required for initiation, including the annual reports generated from the previous permit cycle. The Permits Division provided this information, and we initiated consultation on July 10, 2014.

On July 25, 2014, the 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 is presently considering whether to appeal that decision. In the interim, our biological opinions under Section 7(a)(2) of the ESA will continue to address effects to bearded seals (Beringia DPS) so that action agencies have the benefit of NMFS's analysis of the consequences of proposed actions on this DPS, even though the listing of the species is not in effect.

This Opinion is based on information provided in the May 9, 2014 draft permit, the January 14, 2014 permit application, and telephone discussions of July 22, 2014 with Courtney Smith (Permits Division), Amy Sloan (Permits Division) and Lori Quakenbush (Alaska Department of Fish and Game). A complete record of this consultation is on file at OPR.

2 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. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

The Permits Division proposes to issue a scientific research permit to the Alaska Department of Fish and Game, 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. 15324-01 amends and replaces Permit No. 15324 and expires on December 31, 2016.

The objectives of the permitted research are to monitor the status and health of ice seals in Alaska by analyzing samples from the subsistence harvest and documenting movements and habitat use by tracking animals with satellite transmitters. Subsistence harvest is the legal hunting of seals by the indigenous people of Alaska for subsistence food, materials, and cultural significance. Upon issuance of the Permit, the researchers will receive samples from subsistence harvested seals opportunistically throughout the year; they will conduct field work annually from March until November to capture, track, and sample live seals.

2.1 Proposed Activities

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

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

Lifestage	Seals	Takes per seal	Activities	Details
All	100,000	3	Incidental disturbance	Aerial and vessel surveys
All except neonates and unweaned pups	50	1	Incidental disturbance	Harassment incidental to capture
All except neonates and unweaned pups	200	1	Capture, restrain, administer drugs, tag, instrument, measure, weigh, collect samples, ultrasound, release.	Up to 120 will receive satellite depth recorders (SDRs). Up to 40 will receive both SDRs and flipper transmitters. Up to 40 receive flipper tags and Crittercams®. Up to 40 will receive flipper tags and acoustic tags. Urogenital swabs will be taken on all.
All except neonates and unweaned pups	5	1	Unintentional mortality	Not to exceed 25 seals in 5 years
All	5,000	1	Import/export/receive parts	From subsistence-harvested seals: all tissues, stomach contents, hair, urine, and fecal material.

Table 2. Proposed permitted annual takes of bearded seals (Beringia DPS), male and female.

Lifestage	Seals	Takes per seal	Activities	Details
All	50,000	3	Incidental disturbance	Aerial and vessel surveys
All except neonates and unweaned pups	50	1	Incidental disturbance	Harassment incidental to capture
All except neonates and unweaned pups	200	1	Capture, restrain, administer drugs, tag, instrument, measure, weigh, collect samples, ultrasound, release.	Up to 120 will receive SDRs. Up to 40 will receive both SDRs and flipper transmitters. Up to 40 receive flipper tags and Crittercams®. Up to 40 will receive flipper tags and acoustic tags. Urogenital swabs will be taken on all. Remote dart-delivery of sedatives.
All except neonates and unweaned pups	5	1	Unintentional mortality	Not to exceed 25 seals in 5 years
All	5,000	1	Import/export/receive parts	From subsistence-harvested seals: all tissues, stomach contents, hair, urine, and fecal material.

2.1.1 Import, Export, Receive Parts

The Permits Division proposes to authorize 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 the majority of samples from the subsistence harvest. The indigenous people of Alaska will provide seal measurements and the following samples to the researchers:

- Tissues (including skin and other organ tissues)
- Stomach/stomach contents
- Blubber
- Muscle
- Female reproductive tracts
- Hair
- Urine
- Fecal material
- Teeth

The researchers may also import samples from Russia, Canada, and Norway. Such samples must arise from legally taken seals, either for subsistence harvest or research purposes. Samples may be exported to Canada for laboratory analyses.

The following procedures will be performed on live animals, for research purposes.

2.1.2 Aerial Surveys

The Permits Division proposes to modify the researchers' current permit to include aerial and vessel surveys as a method to monitor seal distribution and population trends relative to changes in sea ice. Aerial surveys would generally occur April through October from a fixed wing aircraft. Surveys would be flown at the highest possible altitude that allows for accurate data collection, but always at an altitude greater than 200 m. During surveys, the plane would circle seals for up to 15 minutes in order to accurately count and photograph all seals present; however, the plane would not pass directly overhead of the seals. In the event that seals are disturbed and enter the water, the plane will leave the area.

2.1.3 Vessel Surveys

Vessel surveys would generally occur April through October on vessels ranging from small local boats to large commercial ships. Transects would be designed to systematically cover the study area following standard line-transect methods (Buckland et al. 1993, Thomas et al. 2002). The researchers would photograph seals in order to better identify individuals or to confirm count estimates; however, the vessels would not alter course or attempt close approach to photograph the seals.

2.1.4 Capture and Restrain

The Permits Division proposes to authorize seal capture and restraint for the purposes of tagging and biological sampling. The researchers would capture seals by hand, in floating traps, or in nets (i.e., seal nets, dip nets, and hoop nets).

On the ice, the researchers would block the ice hole with plywood to prevent the seal from entering the water (Sheffield and Menadelook Jr 2001). The researchers would capture the seal by grabbing its hind flippers or by throwing a hoop net or dip net over the seal.

On the water, the researchers would approach smaller seals by boat and use dip or hoop nets for capture. For larger seals, the researchers would use seal nets, which have light-weight floating lead lines so that a captured seal can still reach the surface to breathe. These nets are 12 ft high and 100 to 200 ft long. They are constructed of #30 netting (1 ft stretch mesh) with a one-inch diameter foam-core float line and 20 lb lead line. Seal nets are set using small boats (Figure 1). The researchers watch the nets continuously and check the nets at least every 45 minutes. The float lines and buoys fall beneath the surface when a seal is captured. Seal nets may also be set in ringed seal breathing holes (Kelly and Wartzok 1996).

Figure 1. Alaska Department of Fish and Game researchers use seal nets to capture a ringed seal (http://www.adfg.alaska.gov/static/research/programs/marinemammals/images/iceseal_tracking_capturing_ringed_seals_net.jpg)

In some instances, the researchers would use a floating trap to capture seals. The trap is made with hinged doors and netting (Figure 2). When the seal hauls out on the platform, the doors give way, and the seal drops into the net. The doors trap the seal inside until the researchers arrive; however, the seal can surface and breathe. The net does not entangle the seal, as a result of a metal frame at the bottom, keeping the net square and taut. A typical trap has a 1.5 m^2 frame with a 1.5 to 2.0 m net.

Рис. - 25. Устройство ловушки для нерпы.
1 - каркас; 2 — сетное полотно; 3 — дверцы (решетки); 4 - дно (проволочное); 5 - ограничитель; 6 - петли

самца), из них помечено и выпущено в воду 159. По возрастным группам их состав был следующим: 0+ - 43, 1+ - 32, 2 ... 5+ - 28,6... 8+-24; остальные животные были возрастом 9+ лет и старше. Возврат составил 5,2 % (Огнетов, Светочева,1998). Максимальное количество нерп (33) было помечено в 1995 г., чему способствовало наличие моторной лодки и привлечение к работам студентов. Заметное преобладание в уловах самок можно объяснить, видимо, большей активностью и агрессивностью со стороны самцов, которые стараются вытеснить их с камней в момент залегания. Данное положение подтверждают и результатами промысловых выборок, в которых самцы несколько превалируют над самками.

Мечение животных осуществляли наружными пластиковыми метками. Для отлова животных использовали сетные плавающие ловушки собственной конструкции (рис. 25). Ловушка представляет

Рис. 26. Ловушка, установленная на якорь. Фото Г.Н. Огнетова

Figure 2. Diagram and photo of a floating trap.
(Reference provided by the Alaska Department of Fish and Game).

Once captured, the researchers would use hoop nets to bring the seal to shore for processing. The researchers may restrain the seal by using a stretcher with nylon straps or by straddling the seal and pinning its flippers to its sides (Figure 3). The duration of restraint would not exceed 60 minutes, the time required for tagging and sample collection, or 120 minutes, the time required for instrumentation, tagging, and sample collection.

Figure 3. Manual restraint of seal for SDR instrumentation.
(Photo provided by the Alaska Department of Fish and Game).

2.1.5 Administer Drugs

The Permits Division proposes to authorize the use of chemical sedatives and reversal agents to restrain large, aggressive, or stressed seals. The researchers would administer diazepam (5 mg/ml) intramuscularly at a dosage of 0.25 to 0.80 mg/kg. Once the seal is restrained or at the end of the handling procedures, the researchers would administer a reversal agent to shorten the recovery period and holding time. Diazepam would be reversed using flumazenil at a dosage of 0.0002 to 0.002 mg/kg.

To sedate large bearded seals on the ice, a qualified veterinarian would use a remote dart projector to deliver a dart containing 0.15 to 0.2 mg/kg midazolam and 0.15 to 0.2 mg/kg butorphanol to the seal intramuscularly. The veterinarian would aim for the area over the tibia lumbar muscle, where the blubber layer is thinnest. Drug dosages would be based on visual estimates of body mass with assistance from subsistence hunters who have handled many bearded seals. After a minimum of 12 minutes of induction, the veterinarian would approach the seals for restraint and handling. Upon completion, the veterinarian would administer antagonist drugs and monitor the seal until it is fully alert and reactive. Butophanol would be reversed using naltrexone at a dosage of 0.5 mg/kg. Midazolam would be reversed using flumazenil at a dosage of 0.0002 to 0.002 mg/kg. The veterinarian would be involved in all aspects of the chemical immobilization procedure until the Alaska Department of Fish and Game veterinarian approves the researchers to continue independently.

If an animal is too deeply sedated, has shallow or slow breathing, or is otherwise in need of emergency intervention, the researchers would administer doxapram intravenously (20 ml to start, up to 5 ml/kg) or directly into the trachea (5 ml in 12 ml saline) followed by ventilation with oxygen). In case of emergency, the researchers may also administer epinephrine directly into the trachea (1000 units in saline).

2.1.6 Tag

The Permits Division proposes to authorize the external tagging of each seal for individual identification. The researchers would clean the tagging site with Betadine® or a similar antiseptic solution. They would punch a hole in the webbing of the hind flipper using modified pliers (the punch would be used as the tissue sample). The researchers would attach one or two numbered plastic tags through the hole in the webbing.

2.1.7 Instrument

The Permits Division proposes to authorize the instrumentation of select seals (Tables 1 and 2) to track their movements and habitat use. The researchers would attach a SDR, Smart Position and Temperature (SPOT) tag, acoustic tag, and/or Crittercam® to the seal.

The researchers would attach an SDR (manufactured by Wildlife Computers or Sea Mammal Research Unit) on the head or back of the seal (see Figure 3) using 5-minute epoxy glue, as follows:

- Apply epoxy to the fur of the seal in a thin layer to minimize heat on the seal's skin
- Place a piece of mesh over the epoxy
- Add a second layer of epoxy to the mesh
- Apply epoxy to the bottom of the SDR
- Adhere SDR to the mesh and fur

The SDR is approximately 100 g and 8 x 5 x 2 cm. The researchers would activate the SDR, and location and dive data would be transmitted via satellite. It would remain attached until the annual molt, when the seal sheds its pelage.

The researchers would attach a SPOT tag (manufactured by Wildlife Computers) via the plastic tag attachment site, through the webbing of the rear flipper (Figure 4). SPOT tags are approximately 30 g and 80 x 20 x 10 mm. Location data are transmitted via satellite when the seal hauls out.

Figure 4. SPOT tag application.
(Photo provided by the Alaska Department of Fish and Game.)

The researchers would attach an acoustic tag (Bioacustic Probe by Greeneridge Sciences, Inc.) to a base plate attached to the fur of a seal via epoxy, as described above for the SDR. It would remain attached until the annual molt, when the seal sheds its pelage. The acoustic tag is approximately 230 g and 19.3 x 3.2 cm. The researchers would install data loggers underwater to record and store sound levels. They would retrieve the data loggers to collect the data.

The researchers would attach a Crittercam® video camera (Figure 5) to the back of a seal to gather diet and habitat usage data. They would attach the instrument to a base plate attached to the fur via epoxy, as described above for the SDR. The base plate would remain attached to the pelage until the annual molt, but the camera will be remotely released from the seal within 24 hours of attachment. The Crittercam® is approximately 30 x 8 x 8 cm and weighs approximately 1,000 g in air, but it is close to neutrally buoyant in water.

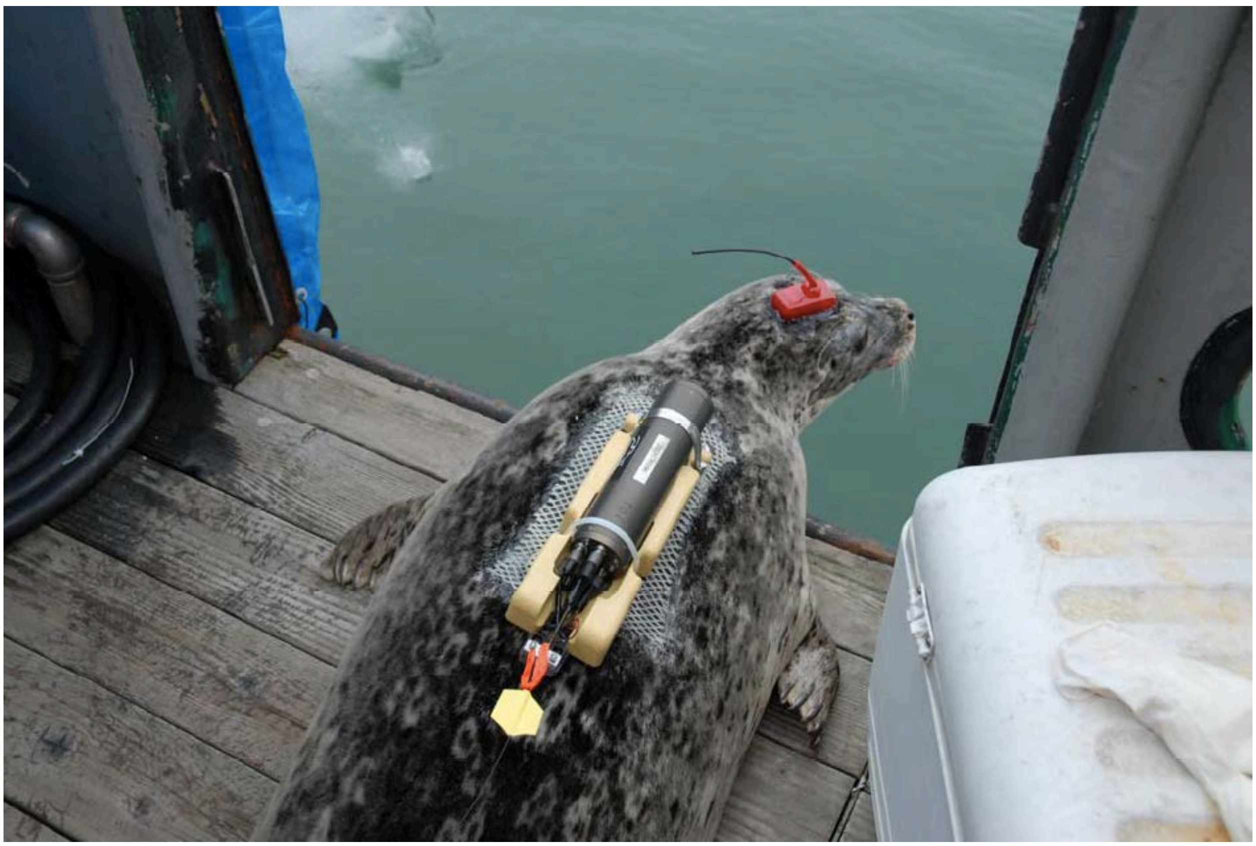

Figure 5. Crittercam® attachment.
(Photo provided by the Alaska Department of Fish and Game).

2.1.8 Measure

The Permits Division proposes to authorize the taking of standard morphometric measurements. The researchers would measure and record the following measurements:

- 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
- Maximum girth around the seal

2.1.9 Weigh

The researchers would weigh the seal on a stretcher or by bundling the seal in a hoop net and suspending it from a spring scale mounted to a tripod or to a pole with two people holding either end.

2.1.10 Collect Samples

The Permits Division proposes to authorize the collection of biological samples to assess the health, condition, contaminant load, and diet of the seal. The researchers would collect and preserve the skin plug created during the tagging procedure. They would pluck one whisker by grasping it near the base with pliers. The researchers would draw 90 to 125 ml of blood from the extradural intervertebral vein in the seal's back (Geraci and Smith 1975) using a disposable, sterile 18 or 20 gauge spinal needle, 1 to3.5 inches long. The researchers would collect blubber samples and a muscle biopsy using a 6 mm biopy punch. They would prepare the biopsy area by injecting lidocaine and making a 0.5 cm incision with a sterile scalpel blade. The researchers would collect hair by shaving a 5 cm^2 area on the dorsal side of the body. The researchers would collect oral, nasal, and urogenital samples by swabbing each orifice with a sterile swab. For all sample collection procedures, the researchers would use single-use, disposable biopsy sampling equipment, if available. If not available, the researchers would sterilize reusable biopsy equipment prior to use on each seal.

2.1.11 Ultrasound

The researchers would use a portable ultrasound unit (e.g., Scanoprobe II, Model 7310, Scanco, Inc.) to non-invasively measure blubber depth at 20 sites along the body. They would take readings by placing the transducer upon the skin of the seal.

2.1.12 Release

After all procedures have been completed, the researchers would release the seal. The researchers would release non-sedated seals directly into the water. The researchers would hold sedated seals until the seals exhibit recovery from the effects of the drugs (e.g., alert, responsive, and active).

The researchers would perform all procedures (from capture through release) within 60 to 120 minutes; however, they may hold seals for up to 10 hours due to the onset of darkness (i.e., the inability to safely monitor the seal's behavior) or weather-related safety issues.

2.1.13 Unintentional Mortality

The Permits Division proposes to authorize the unintentional mortality of seals (see Tables 1 and

2), as a result of the research procedures. Though unintentional mortality is rare, the most likely source of mortality is drowning in the seal net.

2.1.14 Proposed Permit Terms and Conditions

In conjunction with the issuance of the permit, the Permits Division would require Terms and Conditions, including:

- The researchers must suspend permitted activities in the event of serious injury or mortality that reaches limits specified in Tables 1 and 2. The researchers must contact the Chief of the Permits Division and submit a written incident report. 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 the permit.
- If authorized take is exceeded, the researchers must cease permitted activities and notify the Chief of the Permits Division as soon as possible, but no later than within two business days, and submit a written incident report. 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 the permit.
- The researchers must minimize the time lactating females are removed or otherwise separated from their dependent offspring as a result of research activities.
- The researchers must take reasonable steps to identify pups of lactating females before attempting to immobilize a lactating female.
- If a lactating female dies as a result of the permitted activities and her dependent pup can be identified, the researchers must immediately contact the NMFS Alaska Regional Stranding Network Coordinator (SNC) and proceed as directed. If the pup cannot be identified or the SNC determines the pup is not a candidate for rehabilitation, the pup is to be counted as a permit-related mortality.
- If a pregnant female dies as a result of the permitted activities, both the female and the unborn pup shall be counted as permit-related mortalities.
- The researchers shall 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.
- The researchers shall immediately cease attempts to approach, capture, 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, the researchers may monitor or treat (e.g., administer reversal agents or attempt resuscitation) the animal as deemed appropriate in consultation with a veterinarian.
- The 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).

- The researchers must use sterile disposable instruments (e.g., needles, biopsy punches) to the maximum extent practicable.
- The 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 or more than 1.0 ml blood per kg body mass per capture event.
- When capturing or detaining animals in traps, pens, carriers, or nets, the researchers must adequately monitor the animals to prevent injury, mortality, dehydration, and thermal stress.
- Sedated and anesthetized animals should be monitored closely and not be released until they recover normal movement. 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.
- The 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.
- To the maximum extent practical without causing further disturbance of marine mammals, the 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 must be reported. Any observed abandonment of a dependent marine mammal pup must be reported to the SNC.
- The researchers must submit annual, final, and incident reports, and papers or publications resulting from the permitted research to the Permits Division.
- Written incident reports related to serious injury and mortality events or to exceeding authorized takes, must be submitted to the Chief of the Permits Division within two weeks of the incident. The incident report must include a complete description of the events and identification of steps that will be taken to reduce the potential for additional research-related mortality or exceedance of authorized take.
- An annual report must be submitted to the Chief of the Permits Division at the conclusion of each year for which the permit is valid. Annual reports are due by April 1st of each year.
- A final report must be submitted to the Chief of the Permits Division by July 1, 2017, or, if the research concludes prior to permit expiration, within 180 days of completion of the research.
- Research results must be published or otherwise made available to the scientific community in a reasonable period of time.

- The researchers must provide written notification of planned field work to the Assistant Regional Administrator for Protected Resources at the Alaska Region. Such notification must be made at least two weeks prior to initiation of a field trip/season and must include the locations of the intended field study and/or survey routes, estimated dates of research, and number and roles of participants.
- To the maximum extent practical, the researchers must coordinate permitted activities with activities of other researchers conducting the same or similar activities on the same species, in the same locations, or at the same times of year to avoid unnecessary disturbance of animals. The Alaska Regional Office may be contacted for information about coordinating with other researchers.
- NMFS may review activities conducted pursuant to this permit. At the request of NMFS, the researchers must cooperate with any such review by:
  - Allowing an employee of NOAA or other person designated by the Director, OPR to observe permitted activities; and
  - Providing all documents or other information relating to the permitted activities.
- 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.
- The Director, OPR may modify, suspend, or revoke this permit in whole or in part:
  - In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulation prescribed under Section 103 of the MMPA and Section 4 of the ESA;
  - In a case in which a violation of the terms and conditions of the permit is found;
  - In response to a written request[1] from the researchers;
  - If NMFS determines that the application or other information pertaining to the permitted activities includes false information; and
  - If NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.
- 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 researchers, including those of a continuing nature.
- A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR part 904.
- NMFS shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit. The researchers must contact the Permits

[1] 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.

Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit. Failure to verify, where NMFS 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, the ESA, and applicable regulations in any enforcement actions.

- In signing the permit, the researchers:
    - Agree to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Part 216, and all restrictions and requirements under the MMPA;
    - Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the OPR Director; and
    - Acknowledges that the permit does not relieve the researchers of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

2.2 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The Permits Division proposes to authorize scientific research on ice seals in the Bering, Chukchi, and Beaufort Seas of Alaska.

The researchers would receive biological samples from seals harvested in villages (Point Hope, Kotzebue, Shishmaref, Diomede, Gambell, Savoonga, and Hooper Bay) and from Barrow, Wainwright, and Kaktovik. The 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.

Figure 6. The action area.
(http://www.adfg.alaska.gov/static/research/programs/marinemammals/images/map_villages.jpg)

2.3 Interrelated and Interdependent Activities

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. There are no interdependent or interrelated activities associated with the proposed action.

3 Approach to the Assessment

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, 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. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts on the conservation value of designated critical habitat.

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

We do not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[2]

3.1 Overview of NMFS' Assessment Framework

We will use the following approach to determine whether the proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area. The environmental baseline includes the past and present impacts of Federal, State, or private actions and other human activities *in the action area*. It includes the anticipated impacts of proposed Federal projects that have already undergone formal or early Section 7 consultation and the impacts of State or private actions that are contemporaneous with the consultation in process.
- Analyze the effects of the proposed action on both species and their designated critical habitat. In this step, we consider how the proposed action would affect the species' reproduction, numbers, and distribution or, in the case of salmon and steelhead, their viable salmonid population parameters. We also evaluate the proposed action's effects on critical habitat features.
- Describe any cumulative effects in the action area. Cumulative effects, as defined in our implementing regulations (50 CFR §402.02), are the effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate Section 7 consultation.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, we add the effects of the action to the environmental baseline and cumulative effects to assess whether the action could reasonably be expected to: (1) reduce appreciably the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the conservation value of designated or proposed critical habitat. These assessments are made in full consideration of the status of the species and critical habitat.
- Reach jeopardy and adverse modification conclusions. In this step, we state our conclusions regarding the jeopardy of species and the destruction or adverse modification of critical habitat.

[2] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, we must identify a reasonable and prudent alternative to the action, which must not be likely to jeopardize the continued existence of listed species nor adversely modify their designated critical habitat.

3.2 Risk Analysis for Endangered and Threatened Species

Our jeopardy determinations must be based on an action's effects on the continued existence of threatened or endangered species as those "species" have been listed, which can include true biological species, subspecies, or DPSs of vertebrate species. Because the continued existence of listed species depends on the fate of the populations that comprise them, the viability (that is, the probability of extinction or probability of persistence) of listed species depends on the viability of the populations that comprise the species. Similarly, the continued existence of populations are determined by the fate of the individuals that comprise them; populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our risk analyses reflect these relationships between listed species and the populations that comprise them, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individuals risks to identify consequences to the populations those individuals represent. Our analyses conclude by determining the consequences of those population-level risks to the species those populations comprise.

We measure risks to listed individuals using the individual's "fitness," which are changes in an individual's growth, survival, annual reproductive success, or lifetime reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual's probable response to an action's effects are likely to have consequences for the individual's survival and reproduction.

When individual, listed plants or animals are expected to experience reductions in fitness, we would expect those reductions to also reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent (Stearns 1992). Reductions in one or more of these variables (or one of the variables we derive from them) is a *necessary* condition for reductions in a population's viability, which is itself a *necessary* condition for reductions in a species' viability. Therefore, when listed plants or animals exposed to an action's effects are *not* expected to experience reductions in fitness, we would not expect that action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (Mills and Beatty 1979, Stearns 1992, Anderson 2000). As a result, if we conclude that listed plants or animals are *not* likely to experience reductions in their fitness, we would conclude our assessment because an action that is not likely to affect the fitness of individuals is not likely to jeopardize the continued existence of listed species.

If, however, we conclude that listed plants or animals are likely to experience reductions in their fitness, our assessment tries to determine if those fitness reductions are likely to be sufficient to reduce the viability of the populations those individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, or variance in these measures to make inferences about the population's extinction risks). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of Listed Resources* sections of this Opinion) as our point of reference. Finally, our assessment tries to determine if changes in population viability are likely to be sufficient to reduce the viability of the species those populations comprise. In this step of our analyses, we use the species' status (established in the *Status of the Species* section of this Opinion) as our point of reference, and we use our understanding of the general patterns and processes by which species become extinct to help inform our decision about whether changes in the performance of one or more populations are likely to affect the viability of the species those populations comprise.

3.3 Risk Analysis for Designated Critical Habitat

Our "destruction or adverse modification" determinations must be based on an action's effects on the conservation value of habitat that has been designated as critical to threatened or endangered species[3]. If an area encompassed in a critical habitat designation is likely to be exposed to the *direct or indirect consequences of the proposed action on the natural environment*, we ask if primary or secondary constituent elements included in the designation (if there are any) or physical or biotic phenomena that give the designated area value for the conservation are likely to respond to that exposure.

In this step of our assessment, we identify (a) the spatial distribution of stressors and subsidies produced by an action; (b) the temporal distribution of stressors and subsidies produced by an action; (c) changes in the spatial distribution of the stressors with time; (d) the intensity of stressors in space and time; (e) the spatial distribution of physical and biological features of designated critical habitat; and (f) the temporal distribution of constituent elements of designated critical habitat.

If primary constituent elements of designated critical habitat (or physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species) are likely to respond given exposure to the *direct or indirect consequences of the proposed action on the*

[3] We are aware that several courts have ruled that the definition of destruction or adverse modification that appears in the section 7 regulations at 50 CFR §402.02 is invalid and do not rely on that definition for the determinations we make in this Opinion. Instead, as we explain in the text, we use the "conservation value" of critical habitat for our determinations which focuses on the designated area's ability to contribute to the conservation or the species for which the area was designated.

natural environment, we ask if those responses are likely to be sufficient to reduce the quantity, quality, or availability of those constituent elements or physical, chemical, or biotic phenomena.

In this step of our assessment, we must identify or make assumptions about (a) the habitat's probable condition before any exposure as our point of reference (that is part of the impact of the environmental baseline on the conservation value of the designated critical habitat); (b) the ecology of the habitat at the time of exposure; (c) where the exposure is likely to occur; and (d) when the exposure is likely to occur; (e) the intensity of exposure; (f) the duration of exposure; and (g) the frequency of exposure.

In this step of our assessment, we recognize that the conservation value of critical habitat, like the base condition of individuals and populations, is a dynamic property that changes over time in response to changes in land use patterns, climate (at several spatial scales), ecological processes, changes in the dynamics of biotic components of the habitat, etc. For these reasons, some areas of critical habitat might respond to an exposure when others do not. We also consider how designated critical habitat is likely to respond to any interactions and synergisms between or cumulative effects of pre-existing stressors and proposed stressors.

If the quantity, quality, or availability of the primary constituent elements of the area of designated critical habitat (or physical, chemical, or biotic phenomena) are reduced, we ask if those reductions are likely to be sufficient to reduce the conservation value of the designated critical habitat for listed species in the action area. In this step of our assessment, we combine information about the contribution of constituent elements of critical habitat (or of the physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species, particularly for older critical habitat designations that have no constituent elements) to the conservation value of those areas of critical habitat that occur in the action area, given the physical, chemical, biotic, and ecological processes that produce and maintain those constituent elements in the action area. We use the conservation value of those areas of designated critical habitat that occur in the action area as our point of reference for this comparison. For example, if the critical habitat in the action area has limited current value or potential value for the conservation of listed species that limited value is our point of reference for our assessment.

If the conservation value of designated critical habitat in an action area is reduced, the final step of our analyses asks if those reductions are likely to be sufficient to reduce the conservation value of the entire critical habitat designation. In this step of our assessment, we combine information about the constituent elements of critical habitat (or of the physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species, particularly for older critical habitat designations that have no constituent elements) that are likely to experience changes in quantity, quality, and availability given exposure to an action with information on the physical, chemical, biotic, and ecological processes that produce and maintain those constituent elements in the action area. We use the conservation value of the entire designated critical habitat as our point of reference for this comparison. For example, if the designated critical habitat has limited current value or potential value for the conservation of listed species that limited value is our point of reference for our assessment.

3.4 Defining "Significance"

In biological opinions, we focus on potential physical, chemical, or biotic stressors that are "significant" in the sense of being distinct from ambient or background. We then ask if:

- Exposing individuals to those potential stressors is likely to represent a "significant" negative experience in the life history of individuals that have been exposed;
- Exposing individuals to those potential stressors is likely to cause the individuals to experience "significant" physical, chemical, or biotic responses;
- Any "significant" physical, chemical, or biotic response are likely to have "significant" consequence for the fitness of the individual animal;
- Exposing the physical, chemical, or biotic phenomena that we identified as constituent elements in a critical habitat designation or, in the case of critical habitat designations that do not identify constituent elements, those physical, chemical or biotic phenomena that give designated critical habitat value for the conservation of endangered or threatened species is likely to represent a "significant" change in the quantity, quality, or availability of the physical, chemical, or biotic resource;
- Any "significant" change in the quantity, quality, or availability of a physical, chemical, or biotic resource is likely to "significantly" reduce the conservation value of the designated critical habitat.

In all of these cases, the term "significant" means "clinically or biotically significant" rather than statistically significant because the presence or absence of statistical significance do not imply the presence or absence of clinical significance (Achinstein 2001, Royall 2004, Johnson 1999).

For populations (or sub-populations, demes, etc.), we are concerned about whether the number of individuals that are likely to experience "significant" reductions in fitness and the nature of any fitness reductions are likely to have a "significant" consequence for the viability (i.e., probability of demographic, ecological, or genetic extinction) of the population(s) those individuals represent. Here "significant" also means "clinically or biotically significant" rather than statistically significant.

For "species" (the entity that has been listed as endangered or threatened, not the biological species concept), we are concerned about whether the number of populations that are likely to experience "significant" reductions in viability (i.e., increases in their extinction probabilities) and the nature of any reductions in viability are likely to have "significant" consequence for the viability (= probability y of demographic, ecological, or genetic extinction) of the "species" those population comprise. Here, again, "significant" also means "clinically or biotically significant" rather than statistically significant.

For designated critical habitat, we are concerned about whether the area that has been designated is likely to experience "significant" reductions in the quantity, quality, or availability of physical, chemical, or biotic resources that are likely to result in "significant" reductions in the conservation value (usually measured using the concept of "carrying capacity") of the entire are contained in the designation.

3.5 Evidence Available for the Consultation

To conduct these analyses, we considered all lines of evidence available through published and unpublished sources that represent evidence of adverse consequences or the absence of such consequences. We reviewed the literature that was cited in the consultation initiation documents. We conducted electronic literature searches using *Google Scholar*. We also consulted recent biological opinions and NMFS status reviews for listed species, which provide information on the status of the species including their resiliency, population trends and specific threats. We did not conduct hand searches of published journals for this consultation. We organized the results of these searches using commercial bibliographic software.

4 STATUS OF LISTED RESOURCES

This section identifies the ESA-listed species and designated critical habitat that potentially occur within the action area that may be affected by the action (Table 3). Species that are not likely to be adversely affected by the action are not considered further in this Opinion. For species that are likely to be adversely affected by the action, we summarize the biology and ecology of those species and what is known about their life histories. The bearded seal (Beringia DPS) is not included in Table 3 because it is no longer listed under the ESA (*Alaska Oil and Gas Association v. Pritzker*, Case No. 4:13-cv-00018-RPB); however, we summarize the status of this species so that action agencies have the benefit of our analysis, in the event that NMFS appeals the court's decision.

4.1 ESA-listed Species and Designated Critical Habitat That May be Affected by the Proposed Action

Table 3 describes the species that occur within the action area and may be affected by the proposed action.

Table 3. ESA-listed species that may be affected by the action.

Species	ESA Status (E = endangered, T = threatened)	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Blue whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998
Fin whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538
Humpback whale (*Megaptera novaeangliae*)	E – 35 FR 18319	-- --	55 FR 29646
North Pacific right whale (*Eubalaena japonica)*	E – 73 FR 12024	73 FR 19000	78 FR 34347
Sei whale *(Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011
Bowhead whale (*Balaena mysticetes*)	E – 35 FR 18319	-- --	-- --
Western North Pacific gray whale (*Eschrichtius robustus*)	E – 35 FR 18319	-- --	-- --
Marine Mammals – Pinnipeds			
Ringed seal (*Phoca hispida hispida*) – Arctic DPS	T – 77 FR 76705	-- --	-- --
Steller sea lion (*Eumetopias jubatus*) – Western DPS	E – 55 FR 49204	55 FR 49204	03/2008

4.2 Species and Critical Habitat Not Considered Further

The Permits Division proposes to issue a permit amendment, which authorizes research on ice seals, including ringed seals (Arctic DPS) and bearded seals (Beringia DPS). The activities authorized under the permit are not likely to adversely affect other ESA-listed species or designated critical habitat because the effects would be insignificant or discountable. Insignificant effects relate to the size of impact and do not result in take; discountable effects are unlikely to occur. In the paragraphs below, we consider the effects of the action on cetaceans and pinnipeds and explain why we concur that the action is not likely to adversely affect ESA-listed cetaceans, Steller sea lions (Western DPS), or the designated critical habitat of these species; we do not anticipate incidental take for these species.

4.2.1 Cetaceans

The Permits Division proposes to authorize activities within the ranges of the following cetaceans: blue, fin, humpback, bowhead, sei, North Pacific right, and western North Pacific gray whales. Three activities may affect these species: aerial surveys, vessel surveys, and capture. The purpose of the aerial surveys is to monitor ice seal distribution and population trends. The researchers would fly at altitudes of greater than 200 m. They would avoid flying above non-target species, such as cetaceans. If the researchers sighted an ESA-listed cetacean, they would increase their altitude, or alter their course to avoid harassing the whale. Therefore, any noise or visual disturbance would be momentary (i.e., the time required to see the whale and alter the altitude or course) and so small in scale as to be immeasurable. The resulting effects on cetaceans would be insignificant and would not result in take.

The purpose of the vessel surveys is to monitor ice seal distribution and population trends. The researchers would conduct vessel surveys as slow speeds (under 10 knots) with 100 percent observer coverage (to observe ice seals). The researchers would not approach cetaceans; they would alter their course to avoid whales. At such slow speeds, with many researchers scanning the waters for marine mammals, the chance of a vessel strike is extremely small and unlikely to occur (i.e., discountable). Any noise or visual disturbance from the vessel would be momentary and so small in scale to be immeasurable. The resulting effects on cetaceans would be insignificant and would not result in take.

The researchers would use nets and traps to capture ice seals. Though these nets and traps are too small to capture ESA-listed cetaceans, there is potential for entanglement. To minimize this potential, the researchers would monitor the nets and traps continuously. They would not deploy the nets or traps if large whales were in the area, and they would retrieve the nets or traps if large whales entered the area. They would retrieve all gear at the end of each capture attempt, removing the potential for marine debris entanglement. Therefore, the chance of ESA-listed cetaceans becoming entangled in the nets or traps is extremely small and unlikely to occur (i.e., discountable).

The researchers would not conduct research in North Pacific right whale critical habitat, which is delineated by the following coordinates: 58° 00′ N/168° 00′ W; 58° 00′ N/163° 00′ W; 56° 30′ N/161° 45′ W; 55° 00′ N/166° 00′ W; 56° 00′ N/168° 00′ W; and 58 °00′ N/168° 00′ W (http://www.nmfs.noaa.gov/pr/pdfs/fr/fr73-19000.pdf). These coordinates define a polygon in the Bering Sea, characterized by high densities of zooplankton, such as copepods and euphausiids. These prey species comprise the primary constituent elements of North Pacific right whale critical habitat. Because the researchers would conduct their research within Alaska State waters and because the critical habitat lies outside of State waters, the activities would not overlap with the critical habitat. The proposed activities would not affect the abundance or distribution of the prey species. Therefore, we do not anticipate any effects on North Pacific right whale critical habitat.

In summary, we concur that the Permits Division’s issuance of the permit amendment is not likely to adversely affect the following cetacean species: blue, fin, humpback, bowhead, sei, North Pacific right, and western North Pacific gray whales.

4.2.2 Pinnipeds

The northern portion of the Steller sea lion’s range overlaps with the southern portion of the ranges of bearded seals and ringed seals; however, the ice seals occupy a different habitat than that of the Steller sea lion (Western DPS). Ice seals are uniquely adapted to living on the ice. They use sea ice to rest, molt, and pup. Though Steller sea lions have been observed to haul out on sea ice, this is considered atypical behavior. Steller sea lions use land habitat known as rookeries to rest, molt, and pup. Rookeries occur on beaches (gravel, rocky, or sand), ledges, or rocky reefs. Steller sea lions forage in near shore and pelagic waters. They are morphologically distinct from ice seals and are not likely to be confused with ringed or bearded seals.

The Permits Division proposes to authorize research activities within the northern range of the Steller sea lion (Western DPS). Three activities may affect this species: aerial surveys, vessel surveys, and capture. During aerial surveys, the researchers would avoid Steller sea lion rookeries, maintaining altitudes and distances of 3,000 ft (0.9 km). If the researchers sighted a Steller sea lion, they would increase their altitude, or alter their course to avoid harassing it. Therefore, any noise or visual disturbance would be momentary (i.e., the time required to see the sea lion and alter the altitude or course) and so small in scale as to be immeasurable. The resulting effects on Steller sea lions would be insignificant and would not result in take.

The purpose of the vessel surveys is to monitor ice seal distribution and population trends. The researchers would conduct vessel surveys as slow speeds (under 10 knots) with 100 percent observer coverage (to observe ice seals). The researchers would not approach Steller sea lion rookeries, maintaining a distance of 3,000 ft (0.9 km). The researchers would alter their course to avoid Steller sea lions at sea. At such slow speeds, with many researchers scanning the waters for ice seals, the chance of a vessel strike is extremely small and unlikely to occur (i.e., discountable). Any noise or visual disturbance from the vessel would be momentary and so small in scale to be immeasurable. The resulting effects of vessel surveys on Steller sea lions (Western DPS) would be insignificant and would not result in take.

The researchers would use nets and traps to capture ice seals. These nets and traps would be set on or near ice, where ice seals are known to haul out or maintain breathing holes. Nets and traps would not be set near Steller sea lion rookeries or in areas frequented by Steller sea lions. The researchers would monitor the nets and traps continuously. They would retrieve all gear at the end of each capture attempt, removing the potential for marine debris entanglement. Therefore, the chance of Steller sea lion capture or entanglement in the nets or traps is extremely small and unlikely to occur (i.e., discountable).

The researchers would not conduct research within designated critical habitat for the Steller sea lion (Western DPS), which is defined as a 20 nautical mile buffer around all major haul-outs and rookeries, as well as associated terrestrial, air and aquatic zones, and three large offshore foraging areas (http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/stellersealion_ak.pdf). Steller sea lion prey, an essential feature of the critical habitat, includes: walleye pollock, herring, capelin, mackerel, rockfish, salmon, and cephalopods. Though a Steller sea lion has been observed eating a ringed seal pup, such behavior is considered atypical. Therefore, the loss of ringed seals, as a result of unintentional mortality during research activities, is not likely to have a significant effect on Steller sea lion critical habitat. In summary, we concur that the Permits

Division's issuance of the permit amendment is not likely to adversely affect the Steller sea lion (Western DPS) or its designated critical habitat.

4.3 Species Considered Further in this Opinion

The Permits Division proposes to issue a permit amendment, which authorizes research on ice seals, including ringed seals (Arctic DPS) and bearded seals (Beringia DPS). The research activities are likely to adversely affect ringed seals (Arctic DPS) and bearded seals (Beringia DPS).

4.3.1 Ringed Seal (Arctic DPS)

The ringed seal (*Phoca hispida*) is a small, Northern Hemisphere ice seal. It is divided into five subspecies, including the Arctic subspecies (*Phoca hispida hispida*). On December 20, 2012, NMFS issued a final determination to list the Arctic DPS as threatened under the ESA. We used information available in the final listing (77 FR 76705), the proposed listing (75 FR 77476), and the status review report (Kelly et al. 2010) to summarize the status of the species, 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. They excavate lairs in the snow cover above these holes to provide warmth and protection from predators while they rest, pup, and molt. Females give birth in March and April to a single pup annually; they nurse for 5 to 9 weeks. During this time, pups spend an equal amount of time in the water and in the lair. Females attain sexual maturity at 4 to 8 years of age, males at 5 to 7 years. The average lifespan of a ringed seal is 15 to 28 years. They are trophic generalists, but prefer small, schooling prey that form dense aggregations (Kelly et al. 2010).

Population dynamics

The best estimated population size of the Arctic DPS is the low millions (Kelly et al. 2010). The DPS's broad distribution, seasonal movements, subsurface behavior, and remote, varying habitat prevent reliable estimates of population size or trends. The Arctic ringed seal DPS was listed as threatened, i.e., likely to become endangered in the foreseeable future. Warming climate trends are likely to result in the loss of essential sea ice and snow cover, and ocean acidification may alter prey populations (Kelly et al. 2010). The reduced snow cover throughout portions of its range would prevent the excavation of lairs, essential to resting, molting, and pupping. Earlier warming and break-up of ice in the spring would shorten the length of time pups have to grow and mature in a protected setting, which has been shown to reduce overall fitness. The large range and population size of the Arctic DPS, however, make it less vulnerable to other perturbations, such as hunting, fisheries interactions, and research takes. Therefore, ESA Section 4(d) protective regulations and Section 9 prohibitions were deemed unnecessary for the conservation of the species (http://www.nmfs.noaa.gov/pr/pdfs/species/ringedseal_frn_filed.pdf).

Acoustics

Ringed seals can hear frequencies of 1 to 40 kHz (Richardson et al. 1995, Blackwell et al. 2004). Though they may be able to hear frequencies above this limit (Terhune and Ronald 1976); their sensitivity to such sounds diminishes greatly above 45 kHz (Terhune and Ronald 1975).

Status summary

In summary, the Arctic ringed seal DPS has a large population size and is likely resilient to immediate perturbations. It is, however, threatened by climate change, specifically the loss of essential sea ice and snow cover, and as a result, is likely to become endangered in the future.

4.3.2 Bearded Seal (Beringia DPS)

The bearded seal (*Erignathus barbatus*) is a large, Northern Hemisphere ice seal. It is divided into two subspecies. The Pacific subspecies (*E. b. nauticus*) is further divided into two geographically and ecologically discrete DPSs. The Beringia DPS inhabits the continental shelf waters of the Bering, Chukchi, Beaufort, and East Siberian Seas. On December 20, 2012, NMFS issued a final determination to list the Beringia DPS as threatened under the ESA (77 FR 76739). On July 25, 2014, the U.S. District Court for the District of Alaska issued a decision, vacating this listing (*Alaska Oil and Gas Association v. Pritzker*, Case No. 4:13-cv-00018-RPB). We include the species in this Opinion in the event that NMFS appeals that decision. We used information available in the final listing (77 FR 76739), the proposed listing (75 FR 77496), and the status review report (Cameron et al. 2010) to summarize the status of the species, as follows.

Life history

In the spring and early summer, bearded seals rely on sea ice to rest, molt, and pup. Females mature at 5 to 6 years of age; they give birth to a single pup annually. The pups enter the water within hours of birth and begin to forage while still nursing, which lasts approximately 3 weeks. Males reach sexual maturity at 6 to 7 years of age. Bearded seals have a lifespan of 20 to 30 years. They feed primarily on benthic organisms, but they are also able to forage on schooling pelagic fishes (Cameron et al. 2010).

Population dynamics

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 (N = 63,200; 95% CI 38,400 – 138,600) from 2003 to 2008 appears to be similar in magnitude to an estimate from 1974 to 1987 (N = 57,000 to 87,000; Cameron 2010). The Beringia bearded seal DPS was listed as threatened, i.e., likely to become endangered in the foreseeable future. Warming climate trends are likely to result in the loss of essential sea ice habitat, and ocean acidification may alter prey populations (75 FR 77496). To adapt, bearded seals would likely shift their nursing, rearing, and molting areas to ice covered seas or land, potentially increasing the risks of disturbance, predation, and competition. The large range and population size of the Beringia DPS make it less vulnerable to other perturbations. Therefore, ESA section 4(d) protective regulations and section 9 prohibitions were deemed unnecessary for the conservation of the species (http://www.nmfs.noaa.gov/pr/pdfs/species/beardedseal_frn_filed.pdf).

Acoustics
Male bearded seals vocalize during the breeding season (March to July), with a peak in calling during and after pup rearing. Their complex vocalizations range from 0.02 to 11 kHz in frequency. These calls are likely used to attract females and defend their territories to other males (Cameron et al. 2010).

Status summary
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 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.

5 ENVIRONMENTAL BASELINE

By regulation, environmental baselines for biological opinions must include 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 that are contemporaneous with the consultation in process (50 CFR §402.02). The environmental baseline for this Opinion includes the effects of several activities affecting the survival and recovery of listed species in the action area.

5.1 Natural Phenomena

5.1.1 Predation
In Alaska, ringed and bearded seal predators include: polar bears, killer whales, and walrus. Arctic foxes and birds (gulls, ravens, and owls) also prey on ringed seal pups. For both species, polar bears are the primary predators, though ringed seals comprise the bulk of its diet. Hammill and Smith (1991) found that polar bears consumed 8 to 44 percent of the annual ringed seal pup production. Predation on ringed seals increased four-fold due to reduced snow depth as a result of unseasonably warm conditions (Hammill and Smith 1991). Therefore, Kelly et al. (2010) conclude that predation poses a medium to high threat to ringed seals; Cameron et al. (2010) conclude that predation poses a low to moderate threat to bearded seals.

5.1.2 Disease
Relatively little is known regarding diseases in ringed and bearded seals; however, ice seals are relatively solitary pinnipeds, reducing the transmission potential for infectious diseases caused

by viruses (e.g., herpesvirus, calicivirus, and distemper virus) and bacteria (e.g., *Brucella* and *Leptrospira*) (Fay 1974). Ringed and bearded seals have tested positive for serum antibodies to phocid herpesvirus-1 and phocid herpesvirus-2, but the disease has not been documented in ringed or bearded seals of Alaska (Zarnke et al. 1997). No ringed or bearded seals in Alaska have tested positive for phocine and canine distemper virus or Tillamook calcicivirus (Barlough et al. 1987). Quakenbush et al. (2010) identified *Brucella* antibodies in one of 46 tested bearded seals; there is no evidence of exposure in Alaskan ringed seals. There is one report of a bearded seal testing positive for exposure to *Leptrospira* in the Bering Sea (Calle et al. 2008); there is no evidence of exposure in ringed seals. Numerous parasites have been found in ringed and bearded seals, including: protozoa (e.g., *Giardia*), cestodes, trematodes, nematodes, lungworms, lice, and nasal mites. Though associated with isolated seal deaths, these parasite infections have not resulted in population level effects; therefore, disease poses a low threat to ringed and bearded seals in Alaska (Cameron et al. 2010, Kelly et al. 2010).

5.2 Human Activities

In the following sections we consider the effects of human activities on the species within the action area.

5.2.1 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) published "Climate Change 2013: The Physical Science Basis," which concludes, with 95 percent certainty, that human activity is the dominant cause of observed global warming since the mid-20th century. The report confirms that warming in the climate system is unequivocal, with many of the observed changes unprecedented over decades to millennia, including: warming of the atmosphere and the ocean, diminishing snow and ice, rising sea levels, and increasing concentrations of greenhouse gases (IPCC 2013).

Sea ice loss

From 1979 to 2012, the extent of annual mean Arctic sea ice decreased at a rate of 3.5 to 4.1 percent per decade (IPCC 2013). The summer sea ice minimum decreased at a rate of 9.4 to 13.6 percent per decade (0.73 to 1.07 million km^2 per decade). The IPCC (2013) reports with medium confidence that the Arctic summer sea ice retreat is unprecedented and that sea surface temperatures are anomalously high (i.e., highest temperatures in at least the last 1,450 years).

Ringed seals depend on sea ice for pupping, nursing, molting, and resting. Snow cover provides protection from cold and predators for ringed seals. The pups occupy subnivean lairs for the first 5 to 9 weeks of their lives to avoid predation and cold exposure. Warm temperatures and reduced snow cover result in pre-weaning lair melting/collapse/abandonment, hypothermia, and high rates of predation. Harwood et al. (2000) report reduced growth and survival rates as a result of an early spring break-up. The depth and duration of snow cover is projected to decrease throughout the range of ringed seals (Arctic DPS) within this century, resulting in increased juvenile mortality (Kelly et al. 2010).

Bearded seals utilize sea ice for the following purposes:

- A dry and stable platform for whelping and nursing of pups in April and May (Kovacs et al. 1996, Atkinson 1997);
- A rearing habitat that allows mothers to feed and replenish energy reserves lost while nursing;
- A habitat that allows a pup to gain experience diving, swimming, and hunting with its mother, and that provides a platform for resting, relatively isolated from most terrestrial and marine predators;
- A habitat for rutting males to hold territories and attract post-lactating females; and
- A platform suitable for extended periods of hauling out during molting.

If suitable ice cover is absent from shallow feeding areas during whelping and nursing, bearded seals would be forced to seek either sea ice habitat over deeper water or coastal regions in the vicinity of haul-out sites on shore, where predators abound. Rearing young in poorer foraging grounds would require mothers to forage for longer periods and/or compromise their own body condition, likely impacting the transfer of energy to offspring and affecting survival of pups, mothers, or both. A substantial portion (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. To adapt to this modified sea ice regime, bearded seals would likely have to shift their nursing, rearing, and molting areas to the ice covered seas north of the Bering Strait (with poor access to food) or to coastal haul-out sites on shore (with increased risks of disturbance, predation, and competition). Both of these scenarios would require bearded seals to adapt to novel (i.e., suboptimal) conditions, and to exploit habitats to which they may not be well suited, likely compromising their reproduction and survival rates. Further, the spring and summer ice edge may retreat to deep waters of the Arctic Ocean basin, which could separate sea ice suitable for pup maturation and molting from benthic feeding areas (Cameron et al. 2010).

Ocean acidification

Carbon dioxide concentrations have increased by 40 percent since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions (IPCC 2013). The ocean has absorbed about 30 percent of the emitted anthropogenic carbon dioxide, causing ocean acidification, an ongoing process whereby chemical reactions occur that reduce both seawater pH and the concentration of carbonate ions when carbon dioxide is absorbed by seawater. The IPCC reports with high confidence that the pH of ocean surface water has decreased by 0.1 since the beginning of the industrial era. The waters of the Arctic and adjacent seas are among the most vulnerable to ocean acidification. For ringed and bearded seals, ocean acidification is likely to alter ecosystem dynamics and availability of prey, which feed on the benthic calcifiers with dependence on calcium carbonate ions for development. While initial concerns focused on the negative effects of ocean acidification on animals with calcium carbonate shells and skeletons (e.g., pteropod mollusks, shellfish, and some benthic invertebrates) (Fabry et al. 2008), ocean acidification appears to affect the growth, survival, and behavior for a wide range of marine organisms (Pörtner 2008).

In summary, climate change poses a medium to high threat to ringed and bearded seals. Ringed seals (Arctic DPS) and bearded seals (Beringia DPS) were listed as threatened under the ESA to reflect their vulnerability to climate change and the likelihood of the species becoming endangered within the foreseeable future.

5.2.2 Shipping, Transportation, and Oil and Gas Exploration

In the Arctic, climate change has and will continue to result in the expansion of shipping activity, transportation, and oil and gas exploration (i.e., seismic surveys, drilling, and construction of support facilities). These activities have the potential to affect ringed and bearded seals primarily through noise, physical disturbance, and pollution.

Oil spills and blowouts present the greatest threats to ice seals. Fouling oil would compromise the insulative value of pups' lanugo coats, resulting in greater risk of low-temperature stress, (Kooyman et al. 1977, St. Aubin 1990), reduced mass at weaning (Davis and Anderson 1976), and reduced survival (Harding et al. 2005). Direct ingestion of oil, ingestion of contaminated prey, or inhalation of hydrocarbon vapors can reduce seals' health and survival.

A comprehensive survey of all shipping activity in the Arctic indicated at least 6,000 vessels operating in 2004 (Arctic Council 2009). The survey also indicates a positive relationship between the number of shipping incidents and the volume shipping activity. Therefore, additional shipping and transportation, as a result of less ice cover, is likely to lead to more accidents, including oil spills. In addition, vessels discharge oily sludge, sewage, and other contaminants that negatively impact the health of ringed and bearded seals. Vessel noise (20 to 300 Hz) may mask seals' underwater communications, including bearded seal mating vocalizations (130 to 10590 Hz). The mere presence and movement of ships may disrupt normal seal behaviors, causing them to abandon their breeding and resting habitats (Jansen et al. 2010).

Harwood et al. (2007) found no statistical differences in the movements, behavior, and home range of 10 ringed seals prior to and during offshore exploratory drilling. Seismic surveys (200 Hz to 1 kHz) overlap with the auditory bandwidth of seals (75 Hz to 75 kHz) (Southall 2007). Kelly et al. (1988) found that ringed seals were more likely to abandon breathing holes within 150 m of on-ice seismic exploration than at greater distances; strong fidelity to under-ice home ranges suggests that such displacement results in fitness costs (Kelly et al. 2010).

At present shipping, transportation, and oil and gas exploration are concentrated in ice-free areas, whereas ringed and bearded seals are closely associated with ice throughout the year. Therefore, Cameron et al. (2010) and Kelly et al. (2010) conclude that shipping, transportation, and oil and gas exploration pose a low to moderate threat to ringed and bearded seals.

5.2.3 Hunting

Indigenous people of the Arctic have hunted ringed and bearded seals for thousands of years (Riewe 1991). Commercial harvest in the late 19th and early 20th centuries, for seal oil and skins, led to stock depletions throughout the ranges of both species (Cameron et al. 2010, Kelly et al. 2010). Since 1972, commercial harvest has ceased, due to MMPA prohibitions. Subsistence harvest continues: an estimated 9,500 ringed seals were harvested by August in 2000; and a mean of 6,788 bearded seals were harvested annually from 1990 until 1998 (Allen and Angliss 2010). These estimates are likely to be underestimates of the total seals hunted each year due to 30 to 75 percent retrieval success (i.e., the likelihood of capturing a shot seal; Cameron et al. 2010). Huntington (2009) concludes that subsistence harvest poses a modest threat to Arctic marine mammals because it is well understood, of low impact, and can be actively managed. We conclude that hunting poses a low threat to ringed and bearded seals in Alaska (Cameron et al. 2010, Kelly et al. 2010).

5.2.4 Fisheries

Fisheries impact ringed and bearded seals through direct interactions (i.e., incidental take or bycatch) and indirectly through fishing gear interactions, competition for prey resources, and impacts on size structure, genetics, and/or life history of prey populations. Commercial trawl fishery observer data (9.7 to 82.2 percent observer coverage, collected from 1991 until 2006) indicate mean annual mortality rates of 0 to 1 individuals for ringed and bearded seals (Angliss and Lodge 2002, Angliss and Allen 2009). Indirect interactions may occur because commercial fisheries in Alaska target ringed and bearded seal prey species, including walleye pollock, cod, herring, and capelin. The overall all groundfish species in the U.S. exclusive economic zone have remained stable in recent decades (Mueter and Megrey 2006). While fishing pressure may result in changes in size, genetics, or life history, ringed and bearded seals are likely to adapt to such changes; therefore, Cameron et al. (2010) and Kelly et al. (2010) conclude that fisheries pose a low to moderate threat to ringed and bearded seals (Cameron et al. 2010, Kelly et al. 2010).

5.2.5 Pollution

Pollutants and contaminants cause adverse health effects in pinnipeds. Acute toxicity events may result in mass mortalities; repeated exposure to lower levels of contaminants may result in immune suppression, endocrine disruption, and reproductive failure (Atkinson et al. 2008). Organochlorine compounds and heavy metals have been found in ringed and bearded seals. Heavy metals such as mercury, cadmium, lead, selenium, arsenic, and nickel accumulate in vital organs, including the liver and kidneys, as well as in their central nervous system. Organochlorine compounds (such as dichloro-diphenyltrichlorethanes, polychlorinated biphenyls, and perfluorinated contaminants) have also been found in ringed and bearded seals. Lipophilic contaminants are transferred from a mother to her nursing pup. Therefore, Cameron et al. (2010) and Kelly et al. (2010) conclude that pollution poses a low to moderate threat to ringed and bearded seals (Cameron et al. 2010, Kelly et al. 2010).

5.2.6 Scientific Research

The Permits Division has issued other scientific research permits, which are likely to adversely affect ringed and bearded seals in the action area. Permit No. 15142 authorizes the capture of four bearded seals (Beringia DPS); up to two of the captured seals would be placed into permanent captivity for non-invasive sensory research (Permit No. 14535). Permit No. 18537 authorizes the incidental disturbance (i.e., harassment during aerial surveys) of ringed (N = 200) and bearded seals (N = 200), during scientific research targeting the Steller sea lion (Western DPS). Permit No. 14610 authorizes the incidental disturbance (i.e., harassment during vessel surveys) of ringed (N = 10) and bearded seals (N = 10), during scientific research targeting beluga and bowhead whales. These research projects pose a low threat to ringed and bearded seals.

5.3 The Impact of the Baseline on Listed Resources

Numerous factors have contributed to the current status of ringed (Arctic DPS) and bearded (Beringia DPS), including: predation, disease, climate change, hunting, fisheries interactions, pollution, and scientific research. Of these, climate change is the primary threat to the species. The loss of essential ice habitat and changes in prey availability represent medium to high threats to the species. Fisheries, pollution, shipping, transportation, and oil and gas exploration are secondary threats (low to medium threats). All threats are likely to become more severe in the future and must be considered as part of the baseline when evaluating the effects of the action on the viability of the species.

6 Effects of the Action on Species and Critical Habitat

In this section we present results of our assessment of the probable direct and indirect effects of the action. As we described in the *Approach to the Assessment* section of this Opinion, we organize our effects' analyses using a stressor identification - exposure - response framework for each activity. We also consider the aggregate effects of all activities taken together (i.e., aggregate effects) and perform a risk analysis to evaluate their effects on individual fitness, population viability, and the survival and recovery of the species. Cumulative effects are those effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur within the action area (50 CFR 402.02). We conclude this section with an *Integration and Synthesis of Effects* that integrates information we presented in the *Status of the Species* and *Environmental Baseline* sections of this Opinion with the results of our effects analyses.

6.1 Import/Export/Receive Parts

The Permits Division proposes to authorize the import and export of ringed and bearded seal animal parts and the transfer of parts from the subsistence harvest to the researchers. All samples must arise through legally taken seals, as authorized under other permits. Parts are imported, exported, or received opportunistically and without financial incentive. Therefore, these activities do not create a demand for samples, the take of seals, or result in any adverse effects to individuals. Analyses of the samples provide seal health and genetics information, which aids in the management of these species. We conclude that the import, export, and receipt of parts are likely to have wholly beneficial effects on ringed or bearded seals.

The import, export, and receipt of parts are passive activities under this permit that do not involve the harassment or handling of live seals. The activities listed below involve the harassment or handling of live seals, as targeted by the researchers.

6.2 Aerial Surveys

The Permits Division proposes to authorize the use of aerial surveys to assess seal abundance and distribution. Potential stressors include visual and auditory disturbances. We expect sound frequencies of 68 to 102 Hz and maximum source levels of 162 dB re 1 μPa at 1m. To minimize the disturbances:

- Flights would be conducted at altitudes greater than 200 m
- Circling would not exceed 15 minutes
- The plane would not pass directly overhead of seals
- If seals enter the water, the plane would leave the area

There is potential for 100,000 ringed seals (Arctic DPS) and 50,000 bearded seals (Beringia DPS) to be exposed to these stressors; each seal may be exposed to as many as three disturbances annually (Tables 1 and 2). Because the researchers have not conducted this activity in the past, we do not have any data on the likelihood of such exposure; however, the estimated levels of take represent less than 10 percent of the ringed seal Arctic DPS and less than one third of the bearded seal Beringia DPS. Seals of both sexes and all ages would be exposed to the disturbances.

Potential responses to the visual and noise disturbances include ; no response, head raise, and temporary entry into the water. Born et al. (1999) conducted a systematic study on the response of ringed seals to aircraft disturbance; 302 of 5,040 hauled-out ringed seals (6 percent) entered the water in response to a low-flying (150 m altitude) twin-engine plane (Born et al. 1999). In Baffin Bay, 44 bearded seals did not react to a twin-engine turboprop plane flying at 100 to 200 m altitude (Finley and Renaud 1980). Burns and Frost (1979) report that bearded seals raise their heads but usually remain on ice unless a plane passes directly overhead. Kelly et al. (1986) report that all ringed seals (N = 13) subsequently returned to their lairs and hauled out, after entering the water in response to anthropogenic disturbances.

The proposed aerial surveys would be flown at a higher altitude (200 m) than these studies, and the plan would not pass directly overhead. In addition, if the researchers observe seals entering the water, the plane would leave the area, minimizing the duration of disturbance for affected seals and removing the potential for disturbance for unaffected seals. Therefore, we expect less than 6 percent of ringed seals (N < 6,000) and bearded seals (N < 3,000) to respond to aerial surveys by temporarily entering the water. The majority of exposed seals (>94 percent) are likely to not respond or to respond by lifting their head.

We do not expect ringed or bearded seals to be adversely affected by head lifting or a lack of response (i.e., effects would be insignificant and take would not occur). Entering the water, however, is a significant effect that interrupts the normal behavior of the seal (i.e., hauling out to rest or nurse). Juveniles and non-nursing adults spend a large amount of time in the water. For example, 13 radio-tagged ringed seals spent at least 80 percent of their time in the water (Kelly et al. 1986). The proposed aerial survey would cause a temporary (no more than 15 minutes) and infrequent (no more than three instances annually) disturbance; the resultant loss of resting and haul-out time is not likely to exceed 45 minutes annually. Therefore, water entry and temporary displacement are not likely to reduce the fitness of juvenile and non-nursing adult seals.

Bearded seal pups enter the water within hours after birth (Kovacs et al. 1996). Pups aged 4 to 7 days spend over half of their time in the water (Lydersen et al. 1994). They rest close to ice holes so that they can escape to the water to avoid predators (Burns and Frost 1979). Disturbance as a result of aerial surveys is likely to result in water entry up to three times and 45 minutes annually. Like juvenile and non-nursing adult seals, this response falls within the normal range of behavior and is not likely to reduce the fitness of bearded seal pups.

Post-parturient female ringed seals and their pups spend more time in lairs, compared to males or nonlactating females and are vulnerable to disturbance during the nursing period (Kelly et al. 1986). Ringed seal pups depend on lairs for protection from predators and thermoregulation. Like bearded seal pups, ringed seal pups spend 50 percent of their time in water (Lydersen and Hammill 1993). Unlike 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 lanugo, or woolly coat, which is an excellent insulator in air but offers almost no protection when wet (Ray and Smith 1968). Therefore, prolonged or frequent water entry may result in unsustainable energy costs (Born et al. 1999). We were unable to find any studies documenting the behavior of ringed seal pups, as a result of aerial disturbance. The lairs may buffer some of the aircraft noise (Holliday et al. 1983). Water entry falls within the normal range of behavior of ringed seal pups, and the authorized flights would result in no more than three disturbances, for a total time of 45 minutes, annually. Therefore, we conclude that aerial surveys are not likely to reduce the fitness of ringed seal pups or their lactating mothers.

In summary, aerial surveys are likely to adversely affect up to 100,000 ringed seals and 50,000 bearded seals up to three times annually, but they not expected to reduce the fitness of any seal.

6.3 Vessel Surveys

The Permits Division proposes to authorize the use of vessel surveys to assess seal abundance and distribution. Potential stressors include visual and auditory disturbances, ship strikes, and vessel discharges. Vessel noise is primarily generated by propeller action, propulsion machinery, and hydraulic flow over the hull (Hildebrand 2004). Vessel noises occur at frequencies of 20 to 300 Hz and source levels of 150-190 dB re 1 μPa at 1 m (Greene 1995). Ship strikes are unlikely because ringed and bearded seals are highly agile in water (Cameron et al. 2010, Kelly et al. 2010) , and the vessel would not approach their ice habitat. Incidence of injury by vessel collisions with pinnipeds appears to be very low in the Arctic and sub-Arctic. To date, there have been no vessel collisions with ringed or bearded seals in Alaska (Bureau of Ocean Energy Management 2011). Vessel discharges include oily water, sewage, grey water, and aquatic nuisance species. Stressors would be minimized by:

- Vessels surveys would be conducted at slow speeds (10 knots or less)
- 100% observer coverage (looking for seals)
- Adherence with all U.S. Coast Guard and Environmental Protection Agency Vessel General Permit requirements
- If seals enter the water or change their swimming patterns the vessel would leave the area to minimize the effects

The vessel surveys would be operated at slow speeds with 100% observer coverage. Therefore, we conclude that a ship strike is extremely unlikely (i.e., discountable). The researchers would conduct the survey in a vessel that adheres to United States requirements, including the minimization of all discharges and transference of aquatic nuisance species. We expect any remaining discharges to have undetectable (i.e., insignificant) effects on ringed and bearded seals that would not amount to the level of take.

There is potential for 100,000 ringed seals (Arctic DPS) and 50,000 bearded seals (Beringia DPS) to be exposed to the auditory and visual disturbances associated with vessels; each seal may be exposed to as many as three disturbances annually (Tables 1 and 2). Because the researchers have not conducted this activity in the past, we do not have any data on the likelihood of such exposure; however, the estimated levels of take represent less than 10 percent of the ringed seal Arctic DPS and less than one third of the bearded seal Beringia DPS. Seals of both sexes and all ages would be exposed to the stressors.

The presence and movements of vessels may disturb normal seal behaviors or cause seals to abandon their preferred habitats (Cameron et al. 2010, Kelly et al. 2010). On-ice ringed seals exhibited short-term escape reactions (i.e., temporarily entered the water) when a ship came within 0.25 to 0.5 km (Brueggeman et al. 1992); however, ringed and bearded seals are commonly observed close to vessels (Harris et al. 2001, Blees et al. 2010). The vessel would not alter its course to approach seals; the researchers would count and photograph seals as the vessel passes; therefore, the duration of the exposure would not be more than a few minutes. A seal would be exposed to the vessel survey a maximum of three times annually. If the researchers observe seals entering the water or changing their swimming patterns, the vessel would leave the area to minimize such effects.

For on-ice seals, we expect the following responses to vessel surveys: no response, head lifting, or entering the water. The first two responses are not likely to have significant effects on the seals and do not constitute take. If seals entered the water, the vessel would leave the area, minimizing the disruption to seals. As described for the aerial surveys, entering the water is likely to adversely affect seals (by disrupting nursing or resting) but falls within the normal range of behaviors for ice seals. The disruption would be small in duration (i.e., a few minutes for the vessel to pass) and frequency (i.e., a maximum of three times annually). We conclude that vessel surveys are not likely to result in fitness losses for on-ice seals.

In-water seals are likely to respond to the visual and auditory disturbance of the vessel by swimming in the opposite direction. If the researchers noticed this response, the vessel would leave the area to minimize effects. Seals are highly agile in water, and even pups spend half of their time in water. Ringed seals often have multiple lairs, such that another lair may be accessed when one is blocked. The disruption would be small in duration (i.e., a few minutes for the vessel to pass) and frequency (i.e., a maximum of three times annually). In addition, vessel noise may mask the mating calls of male bearded seals; however, the vessel noise is likely to be a minor disturbance because it is small in duration and frequency. Burns and Frost (1979) report that singing males are easy to approach and inattentive to such minor disturbances. We conclude that vessel surveys are not likely to result in fitness losses for in-water seals.

In summary, vessel surveys are likely to adversely affect up to 100,000 ringed seals and 50,000 bearded seals up to three times annually, but we do not expect a reduction in fitness for any seal.

6.4 Capture/Restrain/Release

The Permits Division proposes to authorize the capture, restraint, and release of seals for research purposes. The researchers would capture seals by hand or in traps and nets. Potential stressors include:

- Drowning or prolonged submergence
- Entanglement in nets or gear
- Injury as a result of restraint
- Physiological stress response
- Incidental harassment of non-target seals

To minimize these stressors, the researchers would:

- Avoid areas with ice flows
- Continuously monitor nets
- Use nets $\leq$ 200 ft

- Use nets with floating lead lines so that a captured seal can surface to breathe
- Remove seals from nets as soon as possible
- Place seals on soft mesh hoop net and avoid contact during transport to shore
- Minimize restraint during weighing, measuring, and sample collection
- Minimize restraint time (≤ 120 minutes)
- Administer a sedative if necessary
- Release seals only when they are alert, active, and in good condition

Up to 200 ringed seals (Arctic DPS) and 200 bearded seals (Beringia DPS) would be exposed to the stressors associated with capture, restraint, and release (Tables 1 and 2). In addition, up to 50 non-target ringed seals (Arctic DPS) and 50 non-target bearded seals (Beringia DPS) would be incidentally harassed as the researchers capture other seals in the vicinity. Seals of both sexes and all ages (except neonates and unweaned pups) would be exposed to the stressors.

In the past, the researchers have performed fieldwork at a single location, as authorized under Permit Nos. 358-1787 and 15324. The researchers captured a total of 167 ice seals, including 58 ringed and bearded seals. In all captures (N = 167), only one seal died (0.5 percent). The researchers captured a total of eight ringed seals and 50 bearded seals (Table 4). Annually, they captured up to three ringed seals (annual average = 2) and up to 40 bearded seals (annual average = 12.5). Annually, up to 8 ringed seals (annual average = 3) and up to 38 bearded seals (annual average = 10) have been incidentally harassed during capture attempts of another seal. The Permits Division proposes to authorize increased take levels because the researchers have received funding to perform their fieldwork at five locations (a five-fold increase). Therefore, as many as 200 seals of each species (40 seals per year at five locations) are likely to be captured annually, with up to 5 unintentional mortalities (Tables 1 and 2). These numbers represent the maximum capture and unintentional mortality rates; however, based on their past performance averages, we expect:

- 10 ringed seal captures annually
- 63 bearded seal captures annually
- 1 ringed seal unintentional mortality annually
- 1 bearded seal unintentional mortality annually
- 50 ringed seal incidental disturbances (harassment) annually
- 50 bearded seal incidental disturbances (harassment) annually

Table 4. Actual take from previous years, Permit Nos. 358-1787 and 15324. (Data not available from 2007 and 2009-2011).

	2006	2008	2012	2013
Ringed seals captured	3	0	2	3

Ringed seals killed	0	0	0	1
Ringed seals harassed	2	2	0	8
Bearded seals captured	9	40	1	0
Bearded seals killed	0	0	0	0
Bearded seals harassed	38	0	0	2

Incidental harassment during capture of another seal is likely to result in the following responses: no response, head raise, or water entry. As described above, no response or a raised head are insignificant responses that not likely to adversely affect seals. Entry into water is likely to adversely affect seals but is not likely to reduce the fitness of any seal because it falls within the normal behavior of ice seals, which spend more than half of their time in the water.

Capture is the most stress-inducing activity proposed by the researchers. The following responses are likely: unintentional mortality, injury, and stress response (ranging from mild to severe). The most likely source of mortality is drowning in a net. In 2013, a ringed seal drowned in a net (Table 4) when the capture net was entangled in an ice flow. It took 20 to 30 minutes to disentangle the net from the ice. The researchers did not see any movement in the net during this time, but upon retrieval it became apparent that an adult male ringed seal died in the net because it had been unable to breathe. To avoid future complications, the researchers use shorter nets and avoid areas characterized by swift currents, broken chunks of ice, and/or any other hazard that could interfere with the prompt and safe extraction of an entangled seal. If weather, current, and/or ice conditions deteriorate, the researchers would pull the net and redeploy the nets in a safer location or halt operations until conditions improve. With such precautions and given the researchers' track record, we expect no seals to drown in the nets during most years; however, 1 to 5 individuals of each species may drown annually.

Seals are likely to mount a stress response during capture and restraint. Stress response, also known as the "fight or flight" response, results in the release of stress hormones, including epinephrine and cortisol. Chronic stress impairs the functionality of the immune and reproductive systems in pinnipeds (Fair and Becker 2000). Acute stress responses may result in hyperthermia (i.e., excessively high body temperature which could lead to muscle rigidity, brain damage, or death). It is uncertain whether seals are prone to capture myopathy, the degeneration and necrosis of striated and cardiac muscles (Fowler 1986), which may be fatal and may not develop until many days after capture and handling.

We could not find studies on the stress responses of ringed or bearded seals related to capture; however, studies exist for other seal species. Weddell seals (*Leptonychotes weddellii*) exhibit a clear, prolonged elevation in cortisol in response to capture; however, a small dose of diazepam ameliorated the effect (Harcourt et al. 2010), and the disturbance does not result in long-term changes in blood and fecal indicators of stress (Mellish et al. 2010). Handling does not affect the blood chemistry of southern elephant seal (*Mirounga leonina*) mothers and pups (Engelhard et al. 2002) or the survival of pups to one year (McMahon et al. 2005). Handling did not affect cortisol levels, thyroid hormone levels, or body mass in grey seal pups (*Halichoerus grypus*) (Bennett et al. 2012). Handling did not affect the survival, migration or condition of 549 Hawaiian monk seals (*Monachus schauinslandi)* (Baker and Johanos 2002). Thus, in seals, captures stress does not appear to result in long-term health risks. We conclude that stress responses to capture in ringed and bearded seals are not likely to reduce the fitness of any individuals.

Attempts to escape during restraint and release could lead to seal injuries, such as contusions, lacerations, abrasions, hematomas, concussions, and fractures. Such injuries could reduce the fitness of seals if not noticed and treated; however, the researchers are likely to notice injuries during restraint and handling. The researchers would notice swelling, blood, odd behavior, or irregular movement. They would not release an injured seal; instead, they would hold the animal for veterinary examination and treatment. We are not aware of any injuries as a result of past restraint by the researchers (N = 167). Similarly, we are not aware of any injuries as a result of release. We conclude that injury as a result of restraint or release is not likely to occur.

In summary, the capture of ringed and bearded seals (up to 200 individuals of each species) is likely to result in adverse effects to listed species. Most effects are not likely to reduce the fitness of individuals; however, it is possible that 1 to 5 individuals of each species will drown in the capture nets each year. We discuss the implications of such unintentional mortalities in our risk assessment below.

6.5 Administer Drugs

The Permits Division proposes to authorize the use of sedatives to ease the capture and restraint of ringed and bearded seals. The potential stressors of drug administration include: sedation and overdose. To minimize these risks, the researchers would administer reversal agents if necessary. A qualified veterinarian would perform the dart-injection of sedative to large bearded seals.

The researchers may administer sedatives to as many as 200 ringed seals and 200 bearded seals of both sexes and all ages (except neonates and unweaned pups); however the researchers do not normally administer drugs during capture and restraint. The researchers would only use sedatives to sedate aggressive seals if necessary to prevent injury to the seals or handlers. Therefore, we expect the researchers to administer drugs to less than 50 adults of each species.

Potential responses of seals to sedatives include: no reaction, reduced activity and stress response, severe drug reaction such as hyperventilation, and escape to water. Complications of short-term anesthesia in pinnipeds include apnea, poor muscle relaxation, and prolonged anesthetic recovery, but death is rare (Spelman 2004). Most seals are likely to respond to the injection of diazepam with reduced activity and lowered stress response (Harcourt et al. 2010). The effects of diazepam would be reversed using flumazenil. Diazepam and flumazenil have been long used as a sedative and reversal agent on mammals.

Known adverse effects of the drug include central nervous system excitement in dogs, irritability in cats, and muscle weakness in horses. It is routinely used for the chemical restraint and anesthesia of pinnipeds (Gales 1989, Lynch et al. 1999). We expect administration of diazepam to result in temporary muscle relaxation; we expect administration of flumazenil to result in revival of the seal. Though complications (including tachycardia and hypo- or hyperthermia) are possible, they are not likely to occur.

If a seal becomes too deeply sedated, its breathing slows or becomes shallow, or is otherwise in need of emergency intervention, the researchers would administer doxapram, which is a central nervous system and respiratory stimulant used to treat respiratory arrest. It is commonly administered during or after anesthesia (to reduce recovery time) and in emergency resuscitation procedures (Lynch et al. 1999). We expect administration of doxapram to result in recovery, revival, or stimulating animals to breathe (Lynch et al. 1999). Though complications (shaking and hyperresponsiveness) are possible, they are not likely to occur.

In case of emergency, the researchers would administer epinephrine, which is used to treat cardiac arrest and anaphylaxis. Both drugs have been used to revive captive and wild pinnipeds (NMFS 2014). We expect similar responses from ringed or bearded seals.

To sedate large bearded seals on the ice (i.e., not captured in a net or trap), a qualified veterinarian would use a remote dart projector to deliver a dart containing midazolam and butorphanol. Midazolam provides sedation, muscle relaxation, and is an anticonvulsant; butorphanol results in sedation and analgesia. This drug combination has not been field tested in bearded seals but has been used on California sea lions (*Zalophus californianus*) with no complications (Spelman 2004, Duncan 2009, Mulsow et al. 2011). The drug combination is notable in that it does not override the dive reflex that prevents marine mammals from inhaling while submerged. If a seal were to enter the water after being darted, it would not inhale underwater. In such a scenario, the researchers would deploy a net to capture the seal or administer the reversal agent (naltrexone). Therefore, administration of butorphanol/midazolam via dart is unlikely to result in drowning for any bearded seal. After sedation, we expect bearded seals to recover fully in less than an hour or within minutes of the administration of naltrexone. Potential complications include: apnea, bradycardia, hyperthermia, and hypothermia (Baylis et al. 2014). If such complications arise, the veterinarian would administer naltrexone, doxapram, and/or epinephrine. This procedure has not previously been used on bearded seals, and there are no data with which to evaluate the likelihood of fitness costs. Because there have been deaths associated with anesthetic maintenance in sea lions and fur seals, we conclude that unintentional mortality is possible. We do not expect more than a single death associated with dart delivery of sedatives to bearded seals.

When tagging and handling procedures are completed, the researchers or veterinarian would administer antagonist drugs to the seal. The seal would be monitored visually until it is fully alert and normally reactive.

In summary, we do not expect the direct administration of drugs to result in fitness reductions for ringed or bearded seals. Because it is a new procedure which has resulted in death in other pinnipeds, we conclude that the dart-delivery of sedative may result in the death of 0 to 1 bearded seal annually. We discuss the implication of this possible unintentional mortality in our risk assessment below.

6.6 Tag

The Permits Division proposes to authorize the tagging of ringed and bearded seals to assess abundance and distribution. The researchers would attach plastic tags to the rear flippers of seals. Potential stressors include pain and infection. To minimize the chance of infection, the researchers would clean the tagging site with Betadine® antiseptic solution.

The researchers would tag up to 200 ringed seals (Arctic DPS) and 200 bearded seals (Beringia DPS). They would tag seals of both sexes and all ages (except neonates and unweaned pups). In previous years, the researchers tagged up to three ringed seals (annual average = 2) and up to 40 bearded seals (annual average = 12.5), annually at a single location (Table 4). Because the researchers have received funding to perform their fieldwork at five locations, we expect an average of 10 ringed seals and 63 bearded seals to be tagged annually.

Potential responses to tagging include: no response, behavioral reactions to pain (e.g., vocalization, flinching, or sudden movement), an immune response at the tagging site, and tissue damage if the tag tears through the flipper. Seals may vocalize or flinch when the tissue is cut to insert the tag. The discomfort is likely temporary. Using infrared thermography to monitor the healing process after the attachment of flipper tags to grey seals, Paterson et al. (2011) report small, temporary (< 24 days) increases in surface temperature and swelling. We were not able to find any reports of infection as a result of tagging. However, Henderson and Johanos (1988) report two tags that had pulled through the webbing of a Hawaiian monk seal, leaving a healed tear in the tissue.

In a review of marine mammal tagging techniques, Walker et al. (2012) found that tagging caused pain and resulted in behavioral changes but did not affect survival, reproduction, or growth. Of the six studies that evaluated the effects of visual tags, only one reported measurable effects: tagged Hawaiian monk seals hauled out farther from the marking site 2 weeks after tagging and closer to the marking site 12, 14, 18, and 20 weeks after tagging (Henderson and Johanos 1988). However, a more recent study with a larger sample size (N = 437) indicates that migration rates of Hawaiian monk seals are not influenced by flipper tagging (Baker and Johanos 2002). Tagging does not appear to affect growth rates in northern fur seal pups (*Callorhinus ursinus*) (Trites 1991).

Few studies describe the effects of tagging on ringed or bearded seals. Smith et al. (1973) report that hot branding, a more invasive procedure than flipper tagging, caused little apparent distress to ringed seals. Tagging is likely to cause temporary pain to ringed and bearded seals; however, tagging is not likely to reduce the survival rate, migration patterns, or body condition of seals. Therefore, we conclude that tagging is not likely to result in fitness reductions for any individuals.

6.7 Instrument

The Permits Division proposes to authorize the instrumentation of ringed and bearded seals to assess their movements. The researchers would attach one or more of the following instruments to seals: SDR, SPOT tags, acoustic tags, or Crittercam®. Potential stressors include: attachment site complications, entanglement, and increased drag. To minimize these stressors, the researchers would:

- Apply thin layers of epoxy to minimize heat production
- Use the smallest instrument possible
- Use the shortest duration possible for Crittercam®

The researchers would attach SDRs (Figure 3) on up to 120 ringed seals (Arctic DPS) and 120 bearded seals (Beringia DPS). They would attach SDRs and flipper transmitters (Figure 4) on up to 40 ringed seals (Arctic DPS) and 40 bearded seals (Beringia DPS). They would attach Crittercams® (Figure 5) or acoustic tags on up to 40 ringed seals (Arctic DPS) and 40 bearded seals (Beringia DPS). Neonates and unweaned pups would not be instrumented.

Potential responses to instrumentation include: no reaction, physiological reactions to the epoxy, complications due to entanglement (e.g., drowning), and complications due to drag (e.g., increased foraging time, decreased foraging success, increased vulnerability to predators).

Though epoxy glue has the potential to cause thermal burns or react with the skin, such effects have not been documented (Walker et al. 2012). The attachment of instruments to juvenile grey seals did not alter the surface temperature of wet seals; however elevated temperatures were detected around the edges of the attachment sight when the seal was dry (McCafferty et al. 2007). Such heat increases are small and localized (approximately three percent of body surface area) and do not have a significant influence on the total heat exchange (approximate 0.5 percent of basal metabolic rate) of seals (McCafferty et al. 2007).

We could not find any examples of drowning or other complications associated with entanglement of the instrument. The drag caused by instruments does not appear to be sufficient to alter foraging or predator avoidance in seals, likely because of the large size of the seals relative to the tag.

In a review of marine mammal tagging techniques (excluding Crittercams®), Walker et al. (2012) found that instrumentation has no effects on survival. Epoxy-attached instruments did not affect the migratory behavior, body condition, or survival of Hawaiian monk seals (Baker and Johanos 2002). The attachment of instruments to southern elephant seals (N = 124) had no short term (i.e., mass) or long term (i.e., survival) effects, even across varying seal characteristics (i.e., gender, age, and size) and environmental conditions (McMahon et al. 2008). Despite its large size, the Crittercam® does not appear to affect behavior. Instrumentation with Crittercams® did not significantly alter the foraging and diving behavior of adult or juvenile Hawaiian monk seals (Parrish et al. 2000, Littnan et al. 2004). Bowen et al. (2002) report that while Crittercams® presumably affected the behavior of male harbor seals (*Phoca vitulina*), the effects were minor.

The researchers have attached instruments to seals in the past. They tracked adult seals with transmitters for as long as 278 days and subadults for 297 days. The average distance traveled by a seal was 4,000 km, and the longest distance was 11,000 km, suggesting that instrumentation does not prevent movement. Previous studies indicate normal movements of ringed and bearded seals after instrumentation (Gjertz et al. 2000, Teilmann et al. 2000).

While instrumentation is likely to have adverse effects on seals (localized heat increase and drag), we do not expect either to reduce the survival or reproduction of any seal. Therefore, we conclude that instrumentation is not likely to reduce the fitness of ringed or bearded seals.

6.8 Measure/Weigh/Ultrasound

The Permits Division proposes to authorize the researchers to measure, weigh, and ultrasound ringed and bearded seals to track health parameters. Potential stressors include discomfort.

The researchers would measure, weigh, and ultrasound up to 200 ringed seals (Arctic DPS) and 200 bearded seals (Beringia DPS). They would measure, weigh, and ultrasound seals of both sexes and all ages (except neonates and unweaned pups). In previous years, the researchers measured, weighed, and ultrasounded up to three ringed seals (annual average = 2) and up to 40 bearded seals (annual average = 12.5), annually at a single location (Table 4). Because the researchers have received funding to perform their fieldwork at five locations, we expect an average of 10 ringed seals and 63 bearded seals to be measured, weighed, and ultrasounded annually.

Potential responses include: no reaction, vocalization, and struggle to escape. Measuring, weighing, and ultrasounding seals is a common practice. It is not expected to result in adverse effects to any individual beyond the discomfort of being restrained by hand or in a net. In reaction to this discomfort, we expect the seals to remain passive, vocalize, or struggle to escape. Such behaviors are not likely to result in fitness costs to any ringed or bearded seal.

6.9 Collect Samples

The Permits Division proposes to authorize the collection of biological samples to assess the health and genetics of ringed and bearded seals. The researchers would collect tissue, blood, whisker, blubber, muscle, hair, oral, nasal, and urogenital samples from each seal. Potential stressors include discomfort, pain, infection, and injury. To minimize such stressors, the researchers would:

- Use lidocaine to minimize pain during muscle biopsy
- Use new or sterilized instruments
- Ensure that blood is drawn by experienced personnel

The researchers would collect samples from up to 200 ringed seals (Arctic DPS) and 200 bearded seals (Beringia DPS). They would collect samples from seals of both sexes and all ages (except neonates and unweaned pups). In previous years, the researchers collected samples from up to three live ringed seals (annual average = 2) and up to 40 live bearded seals (annual average = 12.5), annually at a single location (Table 4). Because the researchers have received funding to perform their fieldwork at five locations, we expect samples to be collected from an average of 10 live ringed seals and 63 live bearded seals.

Potential responses include: no reaction, vocalization, struggle to escape, and mounting of an immune response. Sample collection is a common practice. The collection of the tissue plug (a byproduct of tagging, discussed above), and the swabs (oral, nasal, and urogenital) are not likely to result in adverse effects to any individual beyond the discomfort of being restrained by hand or in a net. In reaction to this discomfort, we expect the seals to remain passive, vocalize, or struggle to escape. Such behaviors are not likely to result in fitness costs to any ringed or bearded seal.

Seals are likely to experience pain and may mount an immune response as a result of the following activities: blood draw, blubber and muscle biopsy, and whisker pull. The insertion of a needle to draw blood is likely to cause pain and discomfort to the seal; however, it is not expected to cause injury or infection, as the entry point is minuscule and new needles are used for each seal. The amount of blood collected (90 to 125 ml) is minor in relation to the size of the animal. For example, St. Aubin et al (1978) determined that three ringed seals had blood volumes of 139, 140, and 158 ml/kg whole body weight. Blood removal may cause increased blood cell production, resulting in a metabolic cost to the seal. In studies done on human hospital patients, phlebotomy is associated with a decrease in hemoglobin and hematocrit, and can contribute to anemia (Thavendiranathan et al. 2005). Such responses, however, are expected to be temporary and minor. The blubber and muscle biopsies, like the blood draw, are invasive procedures. McCafferty et al. (2007) observed regions of elevated temperature at the sites of needle injection and biopsy, as a result of disruption of the fur layer, penetration of the blubber layer, or changes in peripheral circulation associated with an immune response. The hot spots around the injection and biopsy sites were not permanent and could not be detected at the following measurement period (McCafferty et al. 2007). We are not aware of any injury or infection caused as a result of blood or biopsy collection, and we do not expect the reduction of fitness in any seals.

Whiskers (vibrissae) are keratinous, hair-like structures that are highly innervated, have large blood sinuses, and are controlled by voluntary muscles (Hirons et al. 2001). Whiskers are used as tactile sensors to navigate in water, detect prey, and follow the hydrodynamic trails of fish (Dehnhardt et al. 2001). Two experiments demonstrate the importance of whiskers to seals. In one study, a mask that was placed over the muzzle of a harbor seal prevented it from detecting a hydrodynamic trail (Dehnhardt et al. 2001). In another study, the removal of all whiskers temporarily impaired two juvenile harbor seals' ability to capture fish (Renouf 1979). The removal of all whiskers would likely interfere with a seal's foraging behavior; however, the researchers would only remove one whisker. Seals shed their whiskers periodically; they also damage or lose whiskers during normal foraging activities (Hirons et al. 2001). These losses do not appear to affect their ability to forage, survive, or reproduce. Therefore, it is unlikely that the pulling of one whisker would affect a seal's ability to forage, survive, or reproduce. We conclude whisker collection would result in temporary pain to a seal, but it would not reduce the fitness of any individual.

In summary, sample collection is likely to adversely affect seals, but we do not expect the collection of samples to reduce the fitness of any seal.

6.10 Aggregate Effects

In the sections above, we have described the stressors of each proposed activity and the likely responses of seals to those stressors. We then asked whether that activity would reduce the fitness of any seal. In reality, most activities would not occur in isolation, but rather, would occur during or in addition to other activities. In most cases, a seal would be exposed to all activities during a single capture event. For aerial and vessel surveys, a seal could be exposed to the resulting disturbances of planes or ships up to three times annually. Therefore, we must consider whether and how seals would respond to the aggregate effects of multiple activities, either conducted during a single capture event, or spread throughout the year.

Seals are likely to respond to aggregate effects through a general stress response, the severity of which is related to the duration of the activities. Therefore, the stress of a seal which is captured, restrained, tagged, measured, and sampled, is likely to be greater than a seal which is captured, restrained, tagged, measured, sampled, and instrumented. There is one exception: the direct sedation of a seal (an additional activity) is likely to reduce the stress response of the seal (Harcourt et al. 2010). For lengthy procedures and highly stressed individuals, the researchers are likely to employ sedation.

The most stressful activity is capture, which may result in loss of fitness for an individual through drowning. Bearded seals may also drown as a result of dart-delivered sedation. Capture resembles a predator attack, and natural responses include avoidance, escape, and defensive behavior. We do not expect such stress responses to result in the loss of fitness, just as the injury-free recovery from a predatory event is not likely to result in the loss of fitness. Though the severity of the stress response is likely to increase with duration of restraint, we do not expect this stress increase to result in the loss of fitness. Similarly, we do not expect additional activities (tagging, instrumentation, measuring, or sample collection) to elevate the stress response to a level that is likely to reduce fitness.

In our discussions of individual activities, we cited numerous studies, describing the response of seals to capture. These studies did not simply capture and then release the seals. They also involved tagging, measuring, instrumentation, and sample collection. Therefore, the lack of fitness costs reported in these studies applies to multiple activities, not just capture. We review these examples here, to describe the likely response of ringed and bearded seals to the aggregate effects of "handling," i.e., capture, tagging, instrumentation, measuring and sample collection:

- Weddell seals exhibit elevated cortisol levels, which are ameliorated by sedative (Harcourt et al. 2010) and do not result in long-term changes in stress indicators (Mellish et al. 2010).
- The blood chemistry of southern elephant seal mothers and pups (Engelhard et al. 2002) and the survival of pups to one year (McMahon et al. 2005) are not affected.
- Cortisol levels, thyroid hormone levels, or body mass in grey seal pups (Bennett et al. 2012) are not affected
- Survival, migration, and condition of Hawaiian monk seals (Baker and Johanos 2002) are not affected.

While repetitive activities (i.e., aerial and vessel surveys) result in a greater number of disruptions than a single event, a seal's response may weaken during subsequent exposures (i.e., repetition suppression). Regardless, the most costly response to three aerial surveys and three vessel surveys would be six water entries. Given the fact that even young ringed and bearded seals spend approximately 50 percent of the time in the water (Lydersen and Hammill 1993, Lydersen et al. 1994), such additive effects are not likely to result in fitness losses.

The aggregate effects of all proposed activities are likely to increase the duration and intensity of seal stress responses; however, elevated stress responses are likely to be temporary and infrequent. Therefore, we do not expect aggregate effects of the proposed activities to further reduce the fitness of any seal beyond the risks associated with capture.

6.11 Risk Analysis

With the exceptions of capture and dart-delivery of sedatives, the proposed activities are not likely to reduce the fitness of any seals. Therefore, such activities are not likely to have population or species level effects and will not be considered further.

Capture may result in the annual death of 1 to 5 seals of each species, as a result of drowning in the net. In addition, one bearded seal may die annually, due to complications during dart-delivered sedation. The total number of unintentional mortalities would not exceed five individuals of each species annually, per the permit requirements. Such deaths are not common: only one of 167 captured seals (0.5 percent) has died during 8 years of research. However, as the Permits Division proposes to authorize five unintentional mortalities annually for each species, we must consider the effects of these deaths. To evaluate the effect of five mortalities on the species, we consider the 2013 Stock Assessment Reports for each species (http://www.nmfs.noaa.gov/pr/sars/species.htm#phocids).

Five unintentional mortalities represents less than 0.0005 percent of the estimated ringed seal (Arctic DPS) population size (N_{min} = 1,000,000; Kelly et al. 2010). This estimate is considered to be an underestimate (Allen and Angliss 2013b), which further minimizes the impact of five unintentional mortalities on population viability. Normally, the abundance estimate and other parameters would be used to calculate potential biological removal levels. However, because the abundance estimate is more than 8 years old, Allen and Angliss (2013b) conclude that a reliable minimum population estimate is unavailable, and potential biological removal levels cannot be determined. Population trends and the status of this stock relative to the optimal sustainable population level are also unknown (Allen and Angliss 2013b).

To evaluate the impact of five unintentional mortalities of ringed seals (as a possible result of the proposed research) on population viability, we consider the population effects in context of the total annual anthropogenic mortality (N = 9,571) based on the best estimates of fisheries bycatch (N = 3.5) and subsistence harvest (N = 9,567) (Allen and Angliss 2013b). Adding up to five unintentional mortalities to the total annual anthropogenic mortality does not result in a statistically significant increase (P = 0.91; two-tailed t-test using a standard deviation of 100 for the estimated total anthropogenic mortality).

The proposed authorization of five unintentional is small in magnitude (<0.0005 percent) and not statistically significant (P = 0.91). We conclude that the loss of up to five individuals annually is not likely to reduce the population viability of the ringed seal (Arctic DPS). The total anthropogenic mortality does not threaten the viability of the population (which is why the species was designated threatened and not endangered, without take provisions). Likewise, the unintentional mortality of the proposed action would not have a measurable impact on the viability of the population.

Five unintentional mortalities represents less than 0.003 percent of the estimated bearded seal (Beringia DPS) population size (N = 155,000; Cameron et al. 2010). However, this is a crude estimate, and no reliable population estimate is available for the bearded seal (Beringia DPS) (Allen and Angliss 2013a). Allen and Angliss (2013a) conclude that a reliable minimum population estimate is unavailable, and potential biological removal levels cannot be determined. Reliable estimates of population trends, stock status, and the maximum net productivity rate are also unavailable (Allen and Angliss 2013a).

To evaluate the impact of five unintentional mortalities of Beringia bearded seals (as a possible result of the proposed research) on population viability, we consider the population effects in context of the total annual anthropogenic mortality (N = 6,790) based on the best estimates of fisheries bycatch (N = 1.8) and subsistence harvest (N = 6,788) (Allen and Angliss 2013a). Adding up to five unintentional mortalities to the total annual anthropogenic mortality does not result in a statistically significant increase ($P = 0.91$; two-tailed t-test using a standard deviation of 100 for the estimated total anthropogenic mortality).

The proposed authorization of five unintentional is small in magnitude (<0.003 percent) and not statistically significant ($P = 0.91$). We conclude that the loss of up to five individuals annually is not likely to reduce the population viability of the bearded seal (Beringia DPS). The total anthropogenic mortality does not threaten the viability of the population (which is why the species was designated threatened and not endangered, without take provisions). Likewise, the unintentional mortality of the proposed action would not have a measurable impact on the viability of the population.

Because the proposed action is not likely to reduce the population viability of either species, we conclude that the proposed action is not likely to reduce the viability of the ringed seal (Arctic DPS) or the bearded seal (Beringia DPS).

6.12 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 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

For this consultation, cumulative effects include: oil and gas exploration, development, and production activities; mining exploration, development, and production; air and marine transportation; major community development projects; and recreation and tourism. The State of Alaska has scheduled lease sales that would offer oil and gas exploration rights in certain regions including the Beaufort and Chukchi Seas nearshore areas. Activities in these areas are considered reasonably certain to occur in the foreseeable future; however, the exact locations and amount of acreage available for leasing are yet to be determined. Mineral mining takes place in onshore areas of the Chukchi Sea and is likely to continue in the foreseeable future. Transportation (i.e., aircraft and vehicle traffic) is reasonably certain to continue at current levels to facilitate the maintenance and development of coastal communities (i.e., freight, construction, tourism, hunting, research, and search and rescue missions). With the increase in sea ice loss, vessel traffic is likely to increase in the foreseeable future to support oil and gas industries, shipping, local transportation, military exercises, recreational cruises, scientific research cruises, and search and rescue missions. Major community development projects that are likely to occur in the foreseeable future include construction of a new airport in Kaktovik and a new emergency response facility at Wainwright. Recreation (including hunting and sport fishing) is likely to continue at current levels in the foreseeable future.

6.13 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 to the environmental baseline and the cumulative effects to formulate our biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species.

The Permits Division proposes to issue MMPA Permit Amendment No. 15324-01 to the Alaska Department of Fish and Game, who would conduct scientific research on ringed seals (Arctic DPS) and bearded seals (Beringia DPS). The action area includes coastal waters within the State of Alaska. The researchers would work with subsistence hunters to sample dead carcasses. Research activities on live seals include: capture, restraint, sedation, tagging, instrumentation, measuring, and sample collection. The Permits Division proposes to authorize up to five annual unintentional mortalities per species.

The ringed seal (Arctic DPS) and bearded seal (Beringia DPS) were listed as threatened under the ESA because they are at risk of becoming endangered in the future due to the loss of ice habitat resulting from climate change. The bearded seal (Beringia DPS) listing has been vacated (*Alaska Oil and Gas Association v. Pritzker*, Case No. 4:13-cv-00018-RPB); however, we include the species in our analyses, in the event that NMFS appeals the court's decision. Both species have large population sizes; though abundance estimates and trends are unreliable or unknown, the species appear to be resilient to the following perturbations: shipping, oil and gas exploration, subsistence hunting, fisheries interactions, pollution, and research.

The collection of samples from subsistence-harvested (i.e., previously killed) seals is not likely to adversely affect any seal. The following proposed research activities, alone and in aggregate, are likely to adversely affect seals but are not likely to result in the loss of fitness to any individual:

- Aerial and vessel surveys
- Direct drug administration
- Tagging
- Instrumentation
- Measuring/weighing/ultrasounding
- Sample collection

The capture of seals is likely to adversely affect seals and may result in the death of 1 to 5 seals of each species, as a result of drowning in nets. The likelihood of death is small (0.005); however, a drowning occurred in the past and may occur in the future. In addition, the researchers propose to dart-deliver sedative to large bearded seals. The researchers have not previously performed this procedure; therefore, effects data are not available. Though the researchers would take precautions, death is possible. Therefore, we expect 0 to 1 seals to drown as a result of this procedure annually. The total number of annual unintentional mortalities would not exceed five individuals for each species. Therefore, we consider the loss of fitness (i.e., death) of 1 to 5 individuals, of both sexes and any age, on the viability of each species.

Though reliable population estimates are not available, we do not expect the loss of up to five individuals annually, as a result of the proposed research activities, to exceed 0.0005 and 0.003 percent of total abundance for ringed and bearded seals, respectively. The loss of an additional five individuals annually is not a statistically significant increase over current levels of anthropogenic take ($P = 0.91$). Therefore, the loss of up to five individuals annually is not likely to reduce the viability of the ringed seal or bearded seal populations or DPSs.

Future state or private activities are likely to occur in the action area. These cumulative effects include: oil and gas exploration, development, and production activities; mining exploration, development, and production; air and marine transportation; major community development projects; and recreation and tourism.

Considering the status of the species, the environmental baseline, the effects of the action, and the cumulative effects, we do not expect the proposed action to significantly reduce the numbers, reproduction, or distribution of ringed seals (Arctic DPS) or bearded seals (Beringia DPS). Therefore, we do not expect the proposed action to reduce appreciably the likelihood of both the survival and recovery of ringed seals (Arctic DPS) or bearded seals (Beringia DPS) in the wild.

7 CONCLUSION

After reviewing the current status of the 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) and bearded seals (Beringia DPS). No critical habitat has been designated or proposed for these species.

We concur that the proposed action may affect but is not likely to adversely affect the following ESA-listed species: blue whale, fin whale, humpback whale, North Pacific right whale, sei whale, bowhead whale, western North Pacific gray whale, and Steller sea lion. We concur that the proposed action may affect but is not likely to adversely affect the designated critical habitat for the following species: North Pacific right whale and Steller sea lion.

8 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 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 to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior 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. Under the terms of ESA Sections 7(b)(4) and 7(o)(2), 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 this incidental take statement. However, we do not anticipate that the proposed action will incidentally take any ESA-listed species.

9 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat to help implement recovery plans or to develop information. We recommend that:

- Researchers continue to refine their protocols to minimize impact on seals, including:
    - Minimize capture risk by reducing net length and deployment duration
    - Minimize size of instruments or include release mechanisms
    - Minimize time of restraint
- Researchers collect response information (including instances of no response) for each activity performed on every seal.
- Researchers submit this information (along with actual take numbers for each activity as required by the permit) to the Permits Division annually.
- Permits Division posts this information on their Authorizations and Permits for Protected Species online database (https://apps.nmfs.noaa.gov/).

10 Reinitiation of Consultation

This concludes formal consultation on the proposed issuance of Permit No. 15324-01. As provided in 50 CFR §402.16, 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 incidental take is exceeded [i.e., if incidental take occurs]; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

11 References

11.1 Federal Register Notices Cited

35 FR 18319
75 FR 47538
55 FR 29646
73 FR 12024
73 FR 19000
78 FR 34347
77 FR 76705
55 FR 49204
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