This document is scheduled to be published in the
Federal Register on 12/17/2019 and available online at
https://federalregister.gov/d/2019-27124, and on **govinfo.gov**

BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XR067]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to U.S. Navy 2020 Ice Exercise Activities in the Beaufort Sea and Arctic Ocean

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from the United States Department of the Navy (Navy) for authorization to take marine mammals incidental to Ice Exercise 2020 (ICEX20) north of Prudhoe Bay, Alaska. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in *Request for Public Comments* at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision. The Navy's activities are considered military readiness activities pursuant to the

MMPA, as amended by the National Defense Authorization Act for Fiscal Year 2004 (NDAA).

DATES: Comments and information must be received no later than **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Fowler@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Amy Fowler, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as "mitigation"); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth.

The NDAA (Pub. L. 108–136) removed the "small numbers" and "specified geographical region" limitations indicated above and amended the definition of "harassment" as it applies to a "military readiness activity." The activity for which incidental take of marine mammals is being requested addressed here qualifies as a military readiness activity. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, we must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment. NMFS plans to adopt the Navy's Supplemental Environmental Assessment/Overseas Environmental Assessment for Ice Exercise (Supplemental EA/OEA), as we have preliminarily determined that it includes adequate information analyzing the effects on the human environment of issuing the IHA. The Navy's Supplemental EA/OEA is posted online at *http://www.nepa.navy.mil/icex*. We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On July 3, 2019, NMFS received a request from the Navy for an IHA to take marine mammals incidental to submarine training and testing activities, including establishment of a tracking range on an ice floe in the Beaufort Sea and Arctic Ocean north of Prudhoe Bay, Alaska. The application was deemed adequate and complete on November 22, 2019. The Navy's request is for take of a small number of ringed seals (*Pusa hispida hispida*) and bearded seals (*Erignathus barbatus*) by Level B harassment. Neither the Navy nor NMFS expect serious injury or mortality to result from this activity. Therefore, an IHA is appropriate.

NMFS previously issued an IHA to the Navy for similar activities conducted in 2018 (83 FR 6522; February 14, 2018). The Navy complied with all the requirements (*e.g.*, mitigation, monitoring, and reporting) of the previous IHA and information regarding their monitoring results may be found in the *Estimated Take* section.

Description of Proposed Activity

Overview

The Navy proposes to conduct submarine training and testing activities from an ice camp established on an ice floe in the Beaufort Sea and Arctic Ocean for approximately six weeks beginning in February 2020. Submarine active acoustic transmissions may result in occurrence of temporary hearing impairment (temporary threshold shift (TTS)) and behavioral harassment (Level B harassment) of ringed and bearded seals.

Dates and Duration

The proposed action would occur over approximately a six-week period from February through April 2020, including deployment and demobilization of the ice camp. The submarine training and testing activities would occur over approximately four weeks during the six-week period. The proposed IHA would be effective for a period of one year from February 1, 2020 through January 31, 2021.

Specific Geographic Region

The ice camp would be established approximately 100-200 nautical miles (nmi) north of Prudhoe Bay, Alaska. The exact location of the camp cannot be identified ahead of time as required conditions (*e.g.*, ice cover) cannot be forecasted until exercises are expected to commence. Prior to the establishment of the ice camp, reconnaissance flights would be conducted to locate suitable ice conditions. The reconnaissance flights would cover an area of approximately 70,374 square kilometers (km^2). The actual ice camp would be no more than 1.6 kilometers (km) in diameter (approximately 2 km^2 in area). The vast majority of submarine training and testing would occur near the ice camp, however some submarine training and testing may occur throughout the deep Arctic Ocean basin near the North Pole within the total study area of 2,874,520 km^2. The locations of the overall activity study area and ice camp study area are shown in Figure 2-1 of the Navy's application.

Detailed Description of Specific Activity

Ice Camp

ICEX20 includes the deployment of a temporary camp situated on an ice floe. Reconnaissance flights to search for suitable ice conditions for the ice camp would depart from the public airport in Deadhorse, Alaska. The camp generally consists of a command hut, dining hut, sleeping quarters, a powerhouse, runway, and helipad. The number of structures and tents ranges from 15-20, and each tent is typically 2 meters (m) by 6 m in size. The completed ice camp, including runway, is approximately 1.6 km in diameter. Support equipment for the ice camp includes snowmobiles, gas-powered augers and saws (for boring holes through ice), and diesel generators. All ice camp materials, fuel, and food would be transported from Prudhoe Bay, Alaska, and delivered by air-drop from military transport aircraft (*e.g.*, C-17 and C-130), or by landing at the ice camp runway (*e.g.*, small twin-engine aircraft and military and commercial helicopters). During flights between Deadhorse and the ice camp, aircraft would maintain an altitude of 1,000 ft (305 m) or greater. Transit of aircraft between the mainland and the ice camp, use of snowmobiles and other equipment, and the footprint of the ice camp are not expected to result in take of marine mammals.

A portable tracking range for submarine training and testing would be installed in the vicinity of the ice camp. Ten hydrophones, located on the ice and extending to 100 m below the ice, would be deployed by drilling or melting holes in the ice and lowering the cable down into the water column. Four hydrophones would be physically connected to the command hut via cables while the others would transmit data via radio frequencies. Additionally, tracking pingers would be configured aboard each submarine to continuously monitor the location of the submarines. Acoustic communications with the submarines would be used to coordinate the training and research schedule with the submarines. An underwater telephone would be used as a backup to the acoustic communications. The hydrophone network and acoustic communications between submarines and the ice camp are not expected to result in take of marine mammals.

Submarine Activities

Submarine activities associated with ICEX20 generally entail safety maneuvers and active sonar use. These maneuvers and sonar use are similar to submarine activities conducted in other undersea environments and are being conducted in the Arctic to test their performance in a cold environment. Submarine training and testing involves active acoustic transmissions, which have the potential to harass marine mammals. Navy acoustic sources are categorized into "bins" based on frequency, source level, and mode of usage (Department of the Navy 2015). The specifics of ICEX20 submarine acoustic sources are classified, including the designated bin(s).

Research Activities

Personnel and equipment proficiency testing and multiple research and development activities would be conducted as part of ICEX20. In-water device data collection and unmanned underwater vehicle testing involve active acoustic transmissions, which have the potential to harass marine mammals; however, the acoustic transmissions that would be used in ICEX20 for research activities are considered *de minimis*. *De minimis* sources have the following parameters: low source levels, narrow beams, downward directed transmission, short pulse lengths, frequencies above (outside) known marine mammal hearing ranges, or some combination of these factors (Department of the Navy 2013). Additional information about ICEX20 research activities is located in Table 2-1 of the Navy's Supplemental EA/OEA. Research activities associated with ICEX20 are not expected to result in take of marine mammals and are not discussed further in this document.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see *Proposed Mitigation* and *Proposed Monitoring and Reporting*).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of ringed and bearded seals. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*).

Table 1 lists all species with expected potential for occurrence in the project area and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2018). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality or serious injury is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this notice represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. Alaska SARs (Muto *et al.*, 2019). All values presented in Table 1 are the most recent available at the time of publication and are available in the 2018 Alaska SARs (Muto *et al.*, 2019).

Table 1 -- Marine Mammal Species Potentially Present in the Project Area

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenidai						
Bowhead whale	*Balaena mysticetus*	Western Arctic	E/D;Y	16,982 (0.058, 16,091, 2011)	161	44
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Beluga whale	Delphinapterus leucas	Beaufort Sea	-/-;N	39,258 (0.229, 32,453, 1992)	649	166
Order Carnivora – Superfamily Pinnipedia						
Family Phocidae (earless seals)						
Ringed seal	*Pusa hispida hispida*	Alaska	T/D;Y	170,000 (-, 170,000, 2013) (Bering Sea and Sea of Okhotsk only)	5,100 (Bering Sea-U.S. portion only)	1,054
Bearded seal	Erignathus barbatus	Alaska	T/D;Y	299,174 (-, 273,676, 2012) (Bering Sea-U.S. portion only)	8,210 (Bering Sea-U.S. portion only)	557

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
2- NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable.
3 - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.
NOTE: *Italicized species are not expected to be taken or proposed for authorization*

All species that could potentially occur in the proposed survey areas are included in Table 1. However, the temporal and/or spatial occurrence of bowhead whales and beluga whales is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here. Bowhead whales migrate annually from wintering areas (December to March) in the northern Bering Sea, through the Chukchi Sea in the spring (April through May), to the eastern Beaufort Sea, where they spend much of the summer (June through early to mid-October) before returning again to the Bering Sea (Muto *et al.*, 2017). They are unlikely to be found in the ICEX20 study area during the February through April ICEX20 timeframe. Beluga whales follow a similar pattern, as they tend to spend winter months in the Bering Sea and migrate north to the eastern Beaufort Sea during the summer months.

In addition, the polar bear (*Ursus maritimus*) may be found in the project area. However, polar bears are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

Bearded Seal

Bearded seals are a boreoarctic species with circumpolar distribution (Burns 1967; Burns 1981; Burns and Frost 1979; Fedoseev 1965; Johnson et al. 1966; Kelly 1988a; Smith 1981). Their normal range extends from the Arctic Ocean (85° N) south to Sakhalin Island (45° N) in the Pacific and south to Hudson Bay (55° N) in the Atlantic (Allen 1880; King 1983; Smith 1981). Bearded seals are widely distributed throughout the northern Bering, Chukchi, and Beaufort Seas and are most abundance north of the ice edge zone (Macintyre *et al.*, 2013). Bearded seals inhabit the seasonally ice-covered seas of the Northern Hemisphere, where they whelp and rear their pups and molt their coats on the ice in the spring and early summer. The overall summer distribution is quite broad, with seals rarely hauled out on land, and some seals, mostly juveniles, may not follow the ice northward but remain near the coasts of the Bering and Chukchi seas (Burns 1967; Burns 1981; Heptner *et al*,. 1976; Nelson 1981). As the ice forms again in the fall and winter, most seals move south with the advancing ice edge through the Bering Strait into the Bering Sea where they spend the winter (Boveng and Cameron 2013; Burns and Frost 1979; Cameron and Boveng 2007; Cameron and Boveng 2009; Frost *et al*., 2005; Frost *et al*,. 2008). This southward migration is less noticeable and predictable than the northward movements in late spring and early summer (Burns 1981; Burns and Frost 1979; Kelly 1988a). During winter, the central and northern parts of the Bering Sea shelf have the highest densities of bearded seals (Braham *et al*., 1981; Burns 1981; Burns and Frost 1979; Fay 1974; Heptner *et al*., 1976; Nelson *et al*., 1984). In late winter and early spring, bearded seals are widely but not uniformly distributed in the broken, drifting pack ice ranging from the Chukchi Sea south to the ice front in the Bering Sea. In these areas, they tend to avoid the coasts and areas of fast ice (Burns 1967; Burns and Frost 1979).

Bearded seals along the Alaskan coast tend to prefer areas where sea ice covers 70 to 90 percent of the surface, and are most abundant 20 to 100 nm (37 to 185 km) offshore during the spring season (Bengston *et al*., 2000; Bengtson *et al*., 2005; Simpkins *et al*., 2003). In spring, bearded seals may also concentrate in nearshore pack ice habitats, where females give birth on the most stable areas of ice (Reeves *et al*., 2002). Bearded seals haul out on spring pack ice (Simpkins *et al*., 2003) and generally prefer to be near polynyas (areas of open water surrounded by sea ice) and other natural openings in the sea ice for breathing, hauling out, and prey access (Nelson *et al*., 1984; Stirling 1997).

While molting between April and August, bearded seals spend substantially more time hauled out then at other times of the year (Reeves *et al*., 2002).

In their explorations of the Canada Basin, Harwood *et al.* (2005) observed bearded seals in waters of less than 200 m during the months from August to September. These sightings were east of 140° W. The Bureau of Ocean Energy Management conducted an aerial survey from June through October that covered the shallow Beaufort and Chukchi Sea shelf waters, and observed bearded seals from Point Barrow to the border of Canada (Clarke *et al.*, 2014). The farthest from shore that bearded seals were observed was the waters of the continental slope.

On December 28, 2012, NMFS listed both the Okhotsk and the Beringia distinct population segments (DPSs) of bearded seals as threatened under the ESA (77 FR 76740). The Alaska stock of bearded seals consists of only Beringia DPS seals.

Ringed Seal

Ringed seals are the most common pinniped in the study area and have wide distribution in seasonally and permanently ice-covered waters of the Northern Hemisphere (North Atlantic Marine Mammal Commission 2004). Throughout their range, ringed seals have an affinity for ice-covered waters and are well adapted to occupying both shore-fast and pack ice (Kelly 1988c). Ringed seals can be found further offshore than other pinnipeds since they can maintain breathing holes in ice thickness greater than 2 m (Smith and Stirling 1975). Breathing holes are maintained by ringed seals' sharp teeth and claws on their fore flippers. They remain in contact with ice most of the year and use it as a platform for molting in late spring to early summer, for pupping and nursing in late winter to early spring, and for resting at other times of the year.

Ringed seals have at least two distinct types of subnivean lairs: haulout lairs and birthing lairs (Smith and Stirling 1975). Haulout lairs are typically single-chambered and offer protection from predators and cold weather. Birthing lairs are larger, multi-chambered areas that are used for pupping in addition to protection from predators. Ringed seal populations pup on both land-fast ice as well as stable pack ice. Lentfer (1972) found that ringed seals north of Barrow, Alaska (west of the ice camp), build their subnivean lairs on the pack ice near pressure ridges. Since subnivean lairs were found north of Barrow, Alaska, in pack ice, they are also assumed to be found within the sea ice in the ice camp proposed action area. Ringed seals excavate subnivean lairs in drifts over their breathing holes in the ice, in which they rest, give birth, and nurse their pups for five to nine weeks during late winter and spring (Chapskii 1940; McLaren 1958; Smith and Stirling 1975). Snow depths of at least 50–65 centimeters (cm) are required for functional birth lairs (Kelly 1988a; Lydersen 1998; Lydersen and Gjertz 1986; Smith and Stirling 1975), and such depths typically are found only where 20–30 cm or more of snow has accumulated on flat ice and then drifted along pressure ridges or ice hummocks (Hammill 2008; Lydersen *et al.*, 1990; Lydersen and Ryg 1991; Smith and Lydersen 1991). Ringed seals are born beginning in March, but the majority of births occur in early April. About a month after parturition, mating begins in late April and early May.

In Alaskan waters, during winter and early spring when sea ice is at its maximal extent, ringed seals are abundant in the northern Bering Sea, Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort Seas (Frost 1985; Kelly 1988b) and, therefore, are found in the study area (Figure 2-1 in Application). Passive acoustic monitoring of ringed seals from a high frequency recording package deployed at a depth of 240 m in the Chukchi Sea 120 km north-northwest of Barrow, Alaska, detected ringed seals in the area between mid-December and late May over the four year study (Jones *et al.*, 2014). With the onset of the fall freeze, ringed seal movements become increasingly restricted and seals will either move west and south with the advancing ice pack with many seals dispersing throughout the Chukchi and Bering Seas, or remain in the Beaufort Sea (Crawford *et al.*, 2012; Frost and Lowry 1984; Harwood *et al.*, 2012). Kelly *et al.* (2010) tracked home ranges for ringed seals in the subnivean period (using shorefast ice); the size of the home ranges varied from less than 1 up to 27.9 km^2; (median is 0.62 km^2 for adult males and 0.65 km^2 for adult females). Most (94 percent) of the home ranges were less than 3 km^2 during the subnivean period (Kelly *et al.*, 2010). Near large polynyas, ringed seals maintain ranges up to 7,000 km^2 during winter and 2,100 km^2 during spring (Born *et al.*, 2004). Some adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly *et al.*, 2010). The size of winter home ranges can, however, vary by up to a factor of 10 depending on the amount of fast ice; seal movements were more restricted during winters with extensive fast ice, and were much less restricted where fast ice did not form at high levels. Ringed seals may occur within the study area throughout the year and during the proposed action.

In general, ringed seals prey on fish and crustaceans. Ringed seals are known to consume up to 72 different species in their diet; their preferred prey species is the polar cod (Jefferson *et al.*, 2008). Ringed seals also prey upon a variety of other members of the cod family, including Arctic cod (Holst *et al.*, 2001) and saffron cod, with the latter particularly important during the summer months in Alaskan waters (Lowry *et al.,* 1980). Invertebrate prey seems to become prevalent in the ringed seals diet during the open-water season and often dominates the diet of young animals (Holst *et al.,* 2001; Lowry *et al.,* 1980). Large amphipods (*e.g.*, *Themisto libellula*), krill (*e.g.*, *Thysanoessa inermis*), mysids (*e.g.*, *Mysis oculata*), shrimps *(e.g.*, *Pandalus* spp., *Eualus* spp., *Lebbeus polaris*, and *Crangon septemspinosa*), and cephalopods (*e.g.*, *Gonatus* spp.) are also consumed by ringed seals.

Most taxonomists recognize five subspecies of ringed seals. The Arctic ringed seal subspecies occurs in the Arctic Ocean and Bering Sea and is the only stock that occurs in U.S. waters (referred to as the Alaska stock). NMFS listed the Arctic ringed seal subspecies as threatened under the ESA on December 28, 2012 (77 FR 76706), primarily due to anticipated loss of sea ice through the end of the 21st century.

A comprehensive and reliable abundance estimate for the Alaska stock of ringed seals is not available. However, using data from surveys in the late 1990s and 2000 (Bengtson *et al.*, 2005; Frost *et al.*, 2004), Kelly *et al.* (2010) estimated the total population in the Alaska Chukchi and Beaufort seas to be at least 300,000 ringed seals. This is likely an underestimate since surveys in the Beaufort Sea were limited to within 40 km from shore (Muto *et al.*, 2017). Conn *et al.* (2014) calculated an abundance estimate of about 170,000 ringed seals for the U.S. portion of the Bering Sea. This estimate did not account for availability bias and did not include ringed seals in the shorefast ice zone, which were surveyed using a different method. Thus, the actual number of ringed seals in the U.S. sector of the Bering Sea is likely much higher, perhaps by a factor of two or more (Muto *et al.*, 2017).

Ice Seals Unusual Mortality Event (UME)

Since June 1, 2018, elevated strandings of ringed seals, bearded seals, and spotted seals (*Phoca largha*) have occurred in the Bering and Chukchi Seas. This event has been declared a UME. A UME is defined under the MMPA as a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response. From June 1, 2018 to November 22, 2019, there have been at least 284 dead seals reported, with 119 stranding in 2018 and 165 to date in 2019, which is nearly 10 times the average number of strandings of about 29 seals annually. All age classes of seals have been reported stranded, and a subset of seals have been sampled for genetics and harmful algal bloom exposure, with a few having histopathology collected. Results are pending, and the cause of the UME remains unknown.

There was a previous UME involving ice seals from 2011 to 2016, which was most active in 2011-2012. A minimum of 657 seals were affected. The UME investigation determined that some of the clinical signs were due to an abnormal molt, but a definitive cause of death for the UME was never determined. The number of stranded ice seals involved in this UME, and their physical characteristics, is not at all similar to the 2011-2016 UME, as the seals in 2018-2019 have not been exhibiting hair loss or skin lesions, which were a primary finding in the 2011-2016 UME. The investigation into the cause of the most recent UME is ongoing. More detailed information is available at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2018-2019-ice-seal-unusual-mortality-event-alaska*.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans).

Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 2.

Table 2 -- Marine Mammal Hearing Groups (NMFS, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

***** Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Two species of phocid pinnipeds (ringed seal and bearded seal) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 1.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The *Estimated Take* section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The *Negligible Impact Analysis and Determination* section considers the content of this section, the *Estimated Take* section, and the *Proposed Mitigation* section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound Sources

Here, we first provide background information on marine mammal hearing before discussing the potential effects of the use of active acoustic sources on marine mammals.

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in Hz or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds and attenuate (decrease) more rapidly in shallower water. Amplitude is the height of the sound pressure wave or the 'loudness' of a sound and is typically measured using the dB scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to 1 microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. RMS is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). RMS accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al.*, 1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al.*, 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson, 1995). Under sea ice, noise generated by ice deformation and ice fracturing may be caused by thermal, wind, drift and current stresses (Roth *et al.,* 2012);
- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. In the ice-covered study area, precipitation is unlikely to impact ambient sound;
- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz; and
- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al.*, 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.*, a passing vessel) is sometimes termed background sound, as opposed to ambient sound. Anthropogenic sources are unlikely

to significantly contribute to ambient underwater noise during the late winter and early spring in the study area as most anthropogenic activities will not be active due to ice cover (*e.g*. seismic surveys, shipping) (Roth *et al.*, 2012).

The sum of the various natural and anthropogenic sound sources at any given location and time – which comprise "ambient" or "background" sound – depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al*., 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

Underwater sounds fall into one of two general sound types: impulsive and non-impulsive (defined in the following paragraphs). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g*., Ward, 1997 in Southall *et al*., 2007). Please see Southall *et al*., (2007) for an in-depth discussion of these concepts.

Impulsive sound sources (*e.g*., explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI 1986; Harris 1998; NIOSH 1998; ISO 2003; ANSI 2005) and occur either as isolated events or repeated in some succession. Impulsive sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features. There are no pulsed sound sources associated with any planned ICEX20 activities.

Non-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI 1995; NIOSH 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.*, rapid rise time). Examples of non-impulsive sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar sources (such as those planned for use by the U.S. Navy as part of the proposed action) that intentionally direct a sound signal at a target that is reflected back in order to discern physical details about the target.

Modern sonar technology includes a variety of sonar sensor and processing systems. In concept, the simplest active sonar emits sound waves, or "pings," sent out in multiple directions, and the sound waves then reflect off of the target object in multiple directions. The sonar source calculates the time it takes for the reflected sound waves to return; this calculation determines the distance to the target object. More sophisticated active sonar systems emit a ping and then rapidly scan or listen to the sound waves in a specific area. This provides both distance to the target and directional information. Even more advanced sonar systems use multiple receivers to listen to echoes from several directions simultaneously and provide efficient detection of both direction and distance. In general, when sonar is in use, the sonar 'pings' occur at intervals, referred to as a duty cycle, and the signals themselves are very short in duration. For example, sonar that emits a 1-second ping every 10 seconds has a 10 percent duty cycle. The Navy's most powerful hull-mounted mid-frequency sonar source typically emits a 1-second ping every 50 seconds representing a 2 percent duty cycle. The Navy utilizes sonar systems and other acoustic sensors in support of a variety of mission requirements.

Acoustic Impacts

Please refer to the information given previously regarding sound, characteristics of sound types, and metrics used in this document. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Gotz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. In this section, we first describe specific manifestations of acoustic effects before providing discussion specific to the proposed activities in the next section.

Permanent Threshold Shift - Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Finneran 2015). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al*., 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e.*, tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al*., 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g*., Ward, 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals – PTS data exists only for a single harbor seal (Kastak *et al*., 2008) – but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above (a 40-dB threshold shift approximates PTS onset; *e.g.*, Kryter *et al*., 1966; Miller, 1974) that inducing mild TTS (a 6-dB threshold shift approximates TTS onset; *e.g.,* Southall *et al.,* 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least six dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level (SEL) thresholds are 15 to 20 dB higher than TTS cumulative SEL thresholds (Southall *et al*., 2007).

Temporary Threshold Shift – TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin (*Tursiops truncatus)*, beluga whale, harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and three species of pinnipeds (northern elephant seal (*Mirounga angustirostris*), harbor seal, and California sea lion (*Zalophus californianus*)) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (Finneran 2015). TTS was not observed in trained spotted and ringed seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.*, 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al*. (2007), Finneran and Jenkins (2012), and Finneran (2015).

Behavioral effects – Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al*., 1995; Wartzok *et al*., 2003; Southall *et al*., 2007; Weilgart, 2007; Archer *et al*., 2010).

Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al*., 2012), and can vary depending on characteristics associated with the sound source (*e.g*., whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall *et al*. (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al*., 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al*., 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al*. 1995; NRC 2003; Wartzok *et al*. 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al*. 1997; Finneran *et al*. 2003). Observed responses of wild marine mammals to loud impulsive sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; see also Richardson *et al*., 1995; Nowacek *et al*., 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g*., Lusseau and Bejder 2007; Weilgart 2007; NRC 2003). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g*., Frankel and Clark 2000; Costa *et al*., 2003; Ng and Leung, 2003; Nowacek *et al*., 2004; Goldbogen *et al.*, 2013). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g*., foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g*., bubble nets or sediment plumes), or changes in dive behavior. As with other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in potential feeding disruption in any given circumstance (*e.g.,* Croll *et al*., 2001; Nowacek *et al*.; 2004; Madsen *et al*., 2006; Yazvenko *et al*., 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g*., Kastelein *et al*., 2001, 2005b, 2006; Gailey *et al*., 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al*., 2000; Fristrup *et al*., 2003; Foote *et al*., 2004), while right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al*., 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al*., 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al*., 1995). For example, gray whales are known to change direction – deflecting from customary migratory paths – in order to avoid noise from seismic surveys (Malme *et al*., 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g*., Bowles *et al*., 1994; Goold, 1996; Morton and Symonds, 2002; Gailey *et al*., 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g*., Blackwell *et al*., 2004; Bejder *et al*., 2006).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g*., directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e*., when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g*., Beauchamp and Livoreil,1997; Fritz *et al*., 2002; Purser and Radford 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g*., decline in body condition) and subsequent reduction in reproductive success, survival, or both *(e.g*., Harrington and Veitch 1992; Daan *et al*., 1996; Bradshaw *et al*., 1998). However, Ridgway *et al*. (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al*., 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al*., 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

For non-impulsive sounds (*i.e*., similar to the sources used during the proposed specified activity), data suggest that exposures of pinnipeds to sources between 90 and 140 dB re 1 μPa do not elicit strong behavioral responses; no data were available for exposures at higher received levels for Southall *et al.* (2007) to include in the severity scale analysis. Reactions of harbor seals were the only available data for which the responses could be ranked on the severity scale. For reactions that were recorded, the majority (17 of 18 individuals/groups) were ranked on the severity scale as a 4 (defined as moderate change in movement, brief shift in group distribution, or moderate change in vocal behavior) or lower; the remaining response was ranked as a 6 (defined as minor or moderate avoidance of the sound source). Additional data on hooded seals (*Cystophora cristata*) indicate avoidance responses to signals above 160–170 dB re 1 μPa (Kvadsheim *et al.*, 2010), and data on grey (*Halichoerus grypus*) and harbor seals indicate avoidance response at received levels of 135–144 dB re 1 μPa (Götz *et al.*, 2010). In each instance where food was available, which provided the seals motivation to remain near the source, habituation to the signals occurred rapidly. In the same study, it was noted that habituation was not apparent in wild seals where no food source was available (Götz *et* *al.* 2010). This implies that the motivation of the animal is necessary to consider in determining the potential for a reaction. In one study aimed to investigate the under-ice movements and sensory cues associated with under-ice navigation of ice seals, acoustic transmitters (60–69 kHz at 159 dB re 1 μPa at 1 m) were attached to ringed seals (Wartzok *et al.*, 1992a; Wartzok *et al.*, 1992b). An acoustic tracking system then was installed in the ice to receive the acoustic signals and provide real-time tracking of ice seal movements. Although the frequencies used in this study are at the upper limit of ringed seal hearing, the ringed seals appeared unaffected by the acoustic transmissions, as they were able to maintain normal behaviors (*e.g*., finding breathing holes).

Seals exposed to non-impulsive sources with a received sound pressure level within the range of calculated exposures (142–193 dB re 1 μPa), have been shown to change their behavior by modifying diving activity and avoidance of the sound source (Götz *et al.*, 2010; Kvadsheim *et al.*, 2010). Although a minor change to a behavior may occur as a result of exposure to the sources in the proposed action, these changes would be within the normal range of behaviors for the animal (*e.g.*, the use of a breathing hole further from the source, rather than one closer to the source, would be within the normal range of behavior) (Kelly *et al.* 1988).

Adult ringed seals spend up to 20 percent of the time in subnivean lairs during the winter season (Kelly *et al*., 2010a). Ringed seal pups spend about 50 percent of their time in the lair during the nursing period (Lydersen and Hammill 1993). During the warm season both bearded seals and ringed seals haul out on the ice. In a study of ringed seal haulout activity by Born *et al.* (2002), ringed seals spent 25-57 percent of their time hauled out in June, which is during their molting season. Bearded seals also spend a large amount of time hauled out during the molting season between April and August (Reeves *et al.*, 2002). Ringed seal lairs are typically used by individual seals (haulout lairs) or by a mother with a pup (birthing lairs); large lairs used by many seals for hauling out are rare (Smith and Stirling 1975). If the non-impulsive acoustic transmissions are heard and are perceived as a threat, ringed seals within subnivean lairs could react to the sound in a similar fashion to their reaction to other threats, such as polar bears (their primary predators), although the type of sound may be novel to them. Responses of ringed seals to a variety of human-induced sounds (*e.g.*, helicopter noise, snowmobiles, dogs, people, and seismic activity) have been variable; some seals entered the water and some seals remained in the lair. However, in all instances in which observed seals departed lairs in response to noise disturbance, they subsequently reoccupied the lair (Kelly *et al.*, 1988).

Ringed seal mothers have a strong bond with their pups and may physically move their pups from the birth lair to an alternate lair to avoid predation, sometimes risking their lives to defend their pups from potential predators (Smith 1987). If a ringed seal mother perceives the proposed acoustic sources as a threat, the network of multiple birth and haulout lairs allows the mother and pup to move to a new lair (Smith and Hammill 1981; Smith and Stirling 1975). The acoustic sources and icebreaking noise from this proposed action are not likely to impede a ringed seal from finding a breathing hole or lair, as captive seals have been found to primarily use vision to locate breathing holes and no effect to ringed seal vision would occur from the acoustic disturbance (Elsner *et al.*, 1989; Wartzok *et al.*, 1992a). It is anticipated that a ringed seal would be able to relocate to a different breathing hole relatively easily without impacting their normal behavior patterns.

Stress responses – An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al*., 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g*., Holberton *et al*., 1996; Hood *et al*., 1998; Jessop *et al*., 2003; Krausman *et al*., 2004; Lankford *et al*., 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al*., 2002b) and, more rarely, studied in wild populations (*e.g*., Romano *et al*., 2002a). These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Auditory masking – Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g*., those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al*., 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is anthropogenic, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al*., 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et al*., 2000; Foote *et al*., 2004; Parks *et al*., 2007b; Di Iorio and Clark, 2009; Holt *et al*., 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al*., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore, 2014). Masking can be tested directly in captive species (*e.g.*, Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al*., 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.*, from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Potential Effects of Sonar on Prey – Ringed and bearded seals feed on marine invertebrates and fish. Marine invertebrates occur in the world's oceans, from warm shallow waters to cold deep waters, and are the dominant animals in all habitats of the study area. Although most species are found within the benthic zone, marine invertebrates can be found in all zones (sympagic (within the sea ice), pelagic (open ocean), or benthic (bottom dwelling)) of the Beaufort Sea (Josefson *et al.,* 2013). The diverse range of species include oysters, crabs, worms, ghost shrimp, snails, sponges, sea fans, isopods, and stony corals (Chess and Hobson 1997; Dugan *et al.,* 2000; Proctor *et al.,* 1980).

Hearing capabilities of invertebrates are largely unknown (Lovell *et al.,* 2005; Popper and Schilt 2008). Outside of studies conducted to test the sensitivity of invertebrates to vibrations, very little is known on the effects of anthropogenic underwater noise on invertebrates (Edmonds *et al.,* 2016). While data are limited, research suggests that some of the major cephalopods and decapods may have limited hearing capabilities (Hanlon 1987; Offutt 1970), and may hear only low-frequency (less than 1 kHz) sources (Offutt 1970), which is most likely within the frequency band of biological signals (Hill 2009). In a review of crustacean sensitivity of high amplitude underwater noise by Edmonds *et al.* (2016), crustaceans may be able to hear the frequencies at which they produce sound, but it remains unclear which noises are incidentally produced and if there are any negative effects from masking them. Acoustic signals produced by crustaceans range from low frequency rumbles (20-60 Hz) to high frequency signals (20-55 kHz) (Henninger and Watson 2005; Patek and Caldwell 2006; Staaterman *et al.,* 2016). Aquatic invertebrates that can sense local water movements with ciliated cells include cnidarians, flatworms, segmented worms, urochordates (tunicates), mollusks, and arthropods (Budelmann 1992a, 1992b; Popper *et al.,* 2001). Some aquatic invertebrates have specialized organs called statocysts for determination of equilibrium and, in some cases, linear or angular acceleration. Statocysts allow an animal to sense movement and may enable some species, such as cephalopods and crustaceans, to be sensitive to water particle movements associated with sound (Goodall *et al.,* 1990; Hu *et al.,* 2009; Kaifu *et al.,* 2008; Montgomery *et al.,* 2006; Popper *et al.,* 2001; Roberts and Breithaupt 2016; Salmon 1971). Because any acoustic sensory capabilities, if present at all, are limited to detecting water motion, and water particle motion near a sound source falls off rapidly with distance, aquatic invertebrates are probably limited to detecting nearby sound sources rather than sound caused by pressure waves from distant sources.

Studies of sound energy effects on invertebrates are few, and identify only behavioral responses. Non-auditory injury, permanent threshold shift, temporary threshold shift, and masking studies have not been conducted for invertebrates. Both behavioral and auditory brainstem response studies suggest that crustaceans may sense frequencies up to 3 kHz, but best sensitivity is likely below 200 Hz (Goodall *et al.,* 1990; Lovell *et al.,* 2005; Lovell *et al.,* 2006). Most cephalopods likely sense low-frequency sound below 1 kHz, with best sensitivities at lower frequencies (Budelmann 2010; Mooney *et al.,* 2010; Offutt 1970). A few cephalopods may sense higher frequencies up to 1,500 Hz (Hu *et al.,* 2009).

It is expected that most marine invertebrates would not sense the frequencies of the sonar associated with the proposed action. Most marine invertebrates would not be close enough to active sonar systems to potentially experience impacts to sensory structures. Any marine invertebrate capable of sensing sound may alter its behavior if exposed to sonar. Although acoustic transmissions produced during the proposed action may briefly impact individuals, intermittent exposures to sonar are not expected to impact survival, growth, recruitment, or reproduction of widespread marine invertebrate populations.

The fish species located in the study area include those that are closely associated with the deep ocean habitat of the Beaufort Sea. Nearly 250 marine fish species have been described in the Arctic, excluding the larger parts of the sub-Arctic Bering, Barents, and Norwegian Seas (Mecklenburg *et al.,* 2011). However, only about 30 are known to occur in the Arctic waters of the Beaufort Sea (Christiansen and Reist 2013). Largely because of the difficulty of sampling in remote, ice-covered seas, many high-Arctic fish species are known only from rare or geographically patchy records (Mecklenburg *et al.,* 2011). Aquatic systems of the Arctic undergo extended seasonal periods of ice cover and other harsh environmental conditions. Fish inhabiting such systems must be biologically and ecologically adapted to surviving such conditions. Important environmental factors that Arctic fish must contend with include reduced light, seasonal darkness, ice cover, low biodiversity, and low seasonal productivity.

All fish have two sensory systems to detect sound in the water: the inner ear, which functions very much like the inner ear in other vertebrates, and the lateral line, which consists of a series of receptors along the fish's body (Popper and Fay 2010; Popper *et al.,* 2014). The inner ear generally detects relatively higher-frequency sounds, while the lateral line detects water motion at low frequencies (below a few hundred Hz) (Hastings and Popper 2005). Lateral line receptors respond to the relative motion between the body surface and surrounding water; this relative motion, however, only takes place very close to sound sources and most fish are unable to detect this motion at more than one to two body lengths distance away (Popper *et al.,* 2014). Although hearing capability data only exist for fewer than 100 of the 32,000 fish species, current data suggest that most species of fish detect sounds from 50 to 1,000 Hz, with few fish hearing sounds above 4 kHz (Popper 2008). It is believed that most fish have their best hearing sensitivity from 100 to 400 Hz (Popper 2003). Permanent hearing loss has not been documented in fish. A study by Halvorsen *et al.* (2012) found that for temporary hearing loss or similar negative impacts to occur, the noise needed to be within the fish's individual hearing frequency range; external factors, such as developmental history of the fish or environmental factors, may result in differing impacts to sound exposure in fish of the same species. The sensory hair cells of the inner ear in fish can regenerate after they are damaged, unlike in mammals where sensory hair cells loss is permanent (Lombarte *et al.*, 1993; Smith *et al.*, 2006). As a consequence, any hearing loss in fish may be as temporary as the timeframe required to repair or replace the sensory cells that were damaged or destroyed (Smith *et al.*, 2006), and no permanent loss of hearing in fish would result from exposure to sound.

Fish species in the study area are expected to hear the low-frequency sources associated with the proposed action, but most are not expected to detect sounds above this threshold. Only a few fish species are able to detect mid-frequency sonar above 1 kHz and could have behavioral reactions or experience auditory masking during these activities. These effects are expected to be transient and long-term consequences for the population are not expected. Fish with hearing specializations capable of detecting high-frequency sounds are not expected to be within the study area. If hearing specialists were present, they would have to be in close vicinity to the source to experience effects from the acoustic transmission. Human-generated sound could alter the behavior of a fish in a manner that would affect its way of living, such as where it tries to locate food or how well it can locate a potential mate; behavioral responses to loud noise could include a startle response, such as the fish swimming away from the source, the fish "freezing" and staying in place, or scattering (Popper 2003). Auditory masking could also interfere with a fish's ability to hear biologically relevant sounds, inhibiting the ability to detect both predators and prey, and impacting schooling, mating, and navigating (Popper 2003). If an individual fish comes into contact with low-frequency acoustic transmissions and is able to perceive the transmissions, they are expected to exhibit short-term behavioral reactions, when initially exposed to acoustic transmissions, which would not significantly alter breeding, foraging, or populations. Overall effects to fish from active sonar sources would be localized, temporary, and infrequent.

Effects to Physical and Foraging Habitat – Unless the sound source is stationary and/or continuous over a long duration in one area, neither of which applies to ICEX20 activities, the effects of the introduction of sound into the environment are generally considered to have a less severe impact on marine mammal habitat compared to any physical alteration of the habitat. Acoustic exposures are not expected to result in long-term physical alteration of the water column or bottom topography as the occurrences are of limited duration and would occur intermittently. Acoustic transmissions also would have no structural impact to subnivean lairs in the ice. Furthermore, since ice dampens acoustic transmissions (Richardson *et al.,* 1995), the level of sound energy that reaches the interior of a subnivean lair will be less than that ensonifying water under surrounding ice.

Non-acoustic Impacts – Deployment of the ice camp could potentially affect ringed seal habitat by physically damaging or crushing subnivean lairs. These non-acoustic impacts could result in ringed seal injury or mortality. However, seals usually choose to locate lairs near pressure ridges, and the ice camp will be deployed in an area without pressure ridges in order to allow operation of an aircraft runway. Further, portable tents will be erected for lodging and operations purposes. Tents do not require building materials or typical construction methods. The tents are relatively easy to mobilize and will not be situated near areas featuring pressure ridges. Finally, the camp buildup will be gradual, with activity increasing over the first five days. This approach allows seals to move to different lair locations outside the ice camp area. Based on this information, we do not anticipate any damage to subnivean lairs that could result in ringed seal injury or mortality.

ICEX20 personnel will be actively conducting testing and training operations on the sea ice and will travel around the camp area, including the runway, on snowmobiles. Although the Navy does not anticipate observing any seals on the ice, it is possible that the presence of active humans could behaviorally disturb ringed seals that are in lairs or on the ice. As discussed above, the camp will not be deployed in areas with pressure ridges and seals will have opportunity to move away from disturbances associated with human activity. Furthermore, camp personnel will maintain a 100-meter avoidance distance for all marine mammals on the ice. Based on this information, we do not believe the presence of humans on ice will result in take.

Our preliminary determination of effects to the physical environment includes minimal possible impacts to marine mammals and their habitat from camp operation or deployment activities. In summary, given the relatively short duration of submarine testing and training activities, relatively small area that would be affected, and lack of physical impacts to habitat, the proposed actions are not likely to have a permanent, adverse effect on populations of prey species or marine mammal habitat. Therefore, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual ringed or bearded seals or their respective populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. For this military readiness activity, the MMPA defines *harassment* as (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where the behavioral patterns are abandoned or significantly altered (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns and TTS, for individual marine mammals resulting from exposure to acoustic transmissions. Based on the nature of the activity, Level A harassment is neither anticipated nor proposed to be authorized, and described previously, no serious injury or mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take from exposure to sound by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) and the number of days of activities. For the proposed IHA, the Navy employed a sophisticated model known as the Navy Acoustic Effects Model (NAEMO) for assessing the impacts of underwater sound.

Acoustic Thresholds

Using the best available science, NMFS applies acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources—In coordination with NMFS, the Navy developed behavioral thresholds to support environmental analyses for the Navy's testing and training military readiness activities utilizing active sonar sources; these behavioral harassment thresholds are used here to evaluate the potential effects of the active sonar components of the proposed action. The response of a marine mammal to an anthropogenic sound will depend on the frequency, duration, temporal pattern and amplitude of the sound as well as the animal's prior experience with the sound and the context in which the sound is encountered (*i.e.*, what the animal is doing at the time of the exposure). The distance from the sound source and whether it is perceived as approaching or moving away can also affect the way an animal responds to a sound (Wartzok *et al.* 2003). For marine mammals, a review of responses to anthropogenic sound was first conducted by Richardson *et al.* (1995). Reviews by Nowacek *et al.* (2007) and Southall *et al.* (2007) address studies conducted since 1995 and focus on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated.

Multi-year research efforts have conducted sonar exposure studies for odontocetes and mysticetes (Miller *et al.* 2012; Sivle *et al.* 2012). Several studies with captive animals have provided data under controlled circumstances for odontocetes and pinnipeds (Houser *et al.* 2013a; Houser *et al.* 2013b). Moretti *et al.* (2014) published a beaked whale dose-response curve based on passive acoustic monitoring of beaked whales during U.S. Navy training activity at Atlantic Underwater Test and Evaluation Center during actual Anti-Submarine Warfare exercises. This new information necessitated the update of the behavioral response criteria for the U.S. Navy's environmental analyses.

Southall *et al.* (2007) synthesized data from many past behavioral studies and observations to determine the likelihood of behavioral reactions at specific sound levels. While in general, the louder the sound source the more intense the behavioral response, it was clear that the proximity of a sound source and the animal's experience, motivation, and conditioning were also critical factors influencing the response (Southall *et al.* 2007). After examining all of the available data, the authors felt that the derivation of thresholds for behavioral response based solely on exposure level was not supported because context of the animal at the time of sound exposure was an important factor in estimating response. Nonetheless, in some conditions, consistent avoidance reactions were noted at higher sound levels depending on the marine mammal species or group allowing conclusions to be drawn. Phocid seals showed avoidance reactions at or below 190 dB re 1 μPa @ 1 m; thus, seals may actually receive levels adequate to produce TTS before avoiding the source.

The Navy's Phase III proposed pinniped behavioral threshold has been updated based on controlled exposure experiments on the following captive animals: hooded seal, gray seal, and California sea lion (Götz *et al.* 2010; Houser *et al.* 2013a; Kvadsheim *et al.* 2010). Overall exposure levels were 110-170 dB re 1 μPa for hooded seals, 140-180 dB re 1 μPa for gray seals and 125-185 dB re 1 μPa for California sea lions; responses occurred at received levels ranging from 125 to 185 dB re 1 μPa. However, the means of the response data were between 159 and 170 dB re 1 μPa. Hooded seals were exposed to increasing levels of sonar until an avoidance response was observed, while the grey seals were exposed first to a single received level multiple times, then an increasing received level. Each individual California sea lion was exposed to the same received level ten times. These exposure sessions were combined into a single response value, with an overall response assumed if an animal responded in any single session. Because these data represent a dose-response type relationship between received level and a response, and because the means were all tightly clustered, the Bayesian biphasic Behavioral Response Function for pinnipeds most closely resembles a traditional sigmoidal dose-response function at the upper received levels and has a 50 percent probability of response at 166 dB re 1 μPa. Additionally, to account for proximity to the source discussed above and based on the best scientific information, a conservative distance of 10 km is used beyond which exposures would not constitute a take under the military readiness definition. NMFS is proposing the use of this dose response function to predict behavioral harassment of pinnipeds for this activity.

Level A harassment and TTS—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive).

These thresholds were developed by compiling the best available science and soliciting input multiple times from both the public and peer reviewers to inform the final product. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

The Navy's PTS/TTS analyses begins with mathematical modeling to predict the sound transmission patterns from Navy sources, including sonar. These data are then coupled with marine species distribution and abundance data to determine the sound levels likely to be received by various marine species. These criteria and thresholds are applied to estimate specific effects that animals exposed to Navy-generated sound may experience. For weighting function derivation, the most critical data required are TTS onset exposure levels as a function of exposure frequency. These values can be estimated from published literature by examining TTS as a function of sound exposure level (SEL) for various frequencies.

To estimate TTS onset values, only TTS data from behavioral hearing tests were used. To determine TTS onset for each subject, the amount of TTS observed after exposures with different SPLs and durations were combined to create a single TTS growth curve as a function of SEL. The use of (cumulative) SEL is a simplifying assumption to accommodate sounds of various SPLs, durations, and duty cycles. This is referred to as an "equal energy" approach, since SEL is related to the energy of the sound and this approach assumes exposures with equal SEL result in equal effects, regardless of the duration or duty cycle of the sound. It is well known that the equal energy rule will over-estimate the effects of intermittent noise, since the quiet periods between noise exposures will allow some recovery of hearing compared to noise that is continuously present with the same total SEL (Ward 1997). For continuous exposures with the same SEL but different durations, the exposure with the longer duration will also tend to produce more TTS (Finneran *et al.,* 2010; Kastak *et al.,* 2007; Mooney *et al.,* 2009a).

As in previous acoustic effects analysis (Finneran and Jenkins 2012; Southall *et al.,* 2007), the shape of the PTS exposure function for each species group is assumed to be identical to the TTS exposure function for each group. A difference of 20 dB between TTS onset and PTS onset is used for all marine mammals including pinnipeds. This is based on estimates of exposure levels actually required for PTS (*i.e*., 40 dB of TTS) from the marine mammal TTS growth curves, which show differences of 13 to 37 dB between TTS and PTS onset in marine mammals. Details regarding these criteria and thresholds can be found in NMFS' Technical Guidance (NMFS 2016).

Table 3 below provides the weighted criteria and thresholds used in this analysis for estimating quantitative acoustic exposures of marine mammals from the proposed action.

Table 3 -- Injury (PTS) and Disturbance (TTS, Behavioral) Thresholds for Underwater Sounds

Group	Species	Behavioral Criteria	Physiological Criteria	
			Onset TTS	Onset PTS
Phocid (in water)	Ringed/Bearded seal	Pinniped Dose Response Function	181 dB SEL cumulative	201 dB SEL cumulative

Quantitative Modeling

The Navy performed a quantitative analysis to estimate the number of mammals that could be harassed by the underwater acoustic transmissions during the proposed action. Inputs to the quantitative analysis included marine mammal density estimates, marine mammal depth occurrence distributions (U.S Department of the Navy, in prep), oceanographic and environmental data, marine mammal hearing data, and criteria and thresholds for levels of potential effects.

The density estimate used to estimate take is derived from habitat-based modeling by Kaschner *et al.*, (2006) and Kaschner (2004). The area of the Arctic where the proposed action will occur (100-200 nm north of Prudhoe Bay, Alaska) has not been surveyed in a manner that supports quantifiable density estimation of marine mammals. In the absence of empirical survey data, information on known or inferred associations between marine habitat features and (the likelihood of) the presence of specific species have been used to predict densities using model-based approaches. These habitat suitability models include relative environmental suitability (RES) models. Habitat suitability models can be used to understand the possible extent and relative expected concentration of a marine species distribution. These models are derived from an assessment of the species occurrence in association with evaluated environmental explanatory variables that results in defining the RES suitability of a given environment. A fitted model that quantitatively describes the relationship of occurrence with the environmental variables can be used to estimate unknown occurrence in conjunction with known habitat suitability. Abundance can thus be estimated for each RES value based on the values of the environmental variables, providing a means to estimate density for areas that have not been surveyed. Use of the Kaschner's RES model resulted in a value of

0.3957 ringed seals per km^2 in the cold season (defined as December through May) and a maximum value of 0.0332 bearded seals per km^2 in the cold and warm seasons. The density numbers are assumed static throughout the ice camp proposed action area for this species. The density data generated for this species was based on environmental variables known to exist within the proposed ice camp action area during the late winter/early springtime period.

The quantitative analysis consists of computer modeled estimates and a post-model analysis to determine the number of potential animal exposures. The model calculates sound energy propagation from the proposed sonars, the sound received by animat (virtual animal) dosimeters representing marine mammals distributed in the area around the modeled activity, and whether the sound received by a marine mammal exceeds the thresholds for effects.

The Navy developed a set of software tools and compiled data for estimating acoustic effects on marine mammals without consideration of behavioral avoidance or Navy's standard mitigations. These tools and data sets serve are integral components of NAEMO. In NAEMO, animats are distributed non-uniformly based on species-specific density, depth distribution, and group size information, and animats record energy received at their location in the water column. A fully three-dimensional environment is used for calculating sound propagation and animat exposure in NAEMO. Site-specific bathymetry, sound speed profiles, wind speed, and bottom properties are incorporated into the propagation modeling process. NAEMO calculates the likely propagation for various levels of energy (sound or pressure) resulting from each source used during the training event.

NAEMO then records the energy received by each animat within the energy footprint of the event and calculates the number of animats having received levels of energy exposures that fall within defined impact thresholds. Predicted effects on the animats within a scenario are then tallied and the highest order effect (based on severity of criteria; *e.g.*, PTS over TTS) predicted for a given animat is assumed. Each scenario or each 24-hour period for scenarios lasting greater than 24 hours is independent of all others, and therefore, the same individual marine animal could be impacted during each independent scenario or 24-hour period. In few instances, although the activities themselves all occur within the study area, sound may propagate beyond the boundary of the study area. Any exposures occurring outside the boundary of the study area are counted as if they occurred within the study area boundary. NAEMO provides the initial estimated impacts on marine species with a static horizontal distribution.

There are limitations to the data used in the acoustic effects model, and the results must be interpreted within these context. While the most accurate data and input assumptions have been used in the modeling, when there is a lack of definitive data to support an aspect of the modeling, modeling assumptions believed to overestimate the number of exposures have been chosen:

- Animats are modeled as being underwater, stationary, and facing the source and therefore always predicted to receive the maximum sound level (*i.e.,* no porpoising or pinnipeds' heads above water);
- Animats do not move horizontally (but change their position vertically within the water column), which may overestimate physiological effects such as

hearing loss, especially for slow moving or stationary sound sources in the model;

- Animats are stationary horizontally and therefore do not avoid the sound source, unlike in the wild where animals would most often avoid exposures at higher sound levels, especially those exposures that may result in PTS;
- Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating the temporary or permanent hearing loss, because there are not sufficient data to estimate a hearing recovery function for the time between exposures; and
- Mitigation measures that are implemented were not considered in the model. In reality, sound-producing activities would be reduced, stopped, or delayed if marine mammals are detected by submarines via passive acoustic monitoring.

Because of these inherent model limitations and simplifications, model-estimated results must be further analyzed, considering such factors as the range to specific effects, avoidance, and the likelihood of successfully implementing mitigation measures. This analysis uses a number of factors in addition to the acoustic model results to predict effects on marine mammals.

For non-impulsive sources, NAEMO calculates the sound pressure level (SPL) and sound exposure level (SEL) for each active emission during an event. This is done by taking the following factors into account over the propagation paths: bathymetric relief and bottom types, sound speed, and attenuation contributors such as absorption, bottom loss and surface loss. Platforms such as a ship using one or more sound sources are modeled in accordance with relevant vehicle dynamics and time durations by moving them across an area whose size is representative of the training event's operational area. Table 4 provides range to effects for active acoustic sources proposed for ICEX20 to phocid pinniped specific criteria. Phocids within these ranges would be predicted to receive the associated effect. Range to effects is important information in not only predicting acoustic impacts, but also in verifying the accuracy of model results against real-world situations and determining adequate mitigation ranges to avoid higher level effects, especially physiological effects to marine mammals.

Table 4 -- Range to Behavioral Effects, TTS, and PTS in the ICEX Study Area

Source/Exercise	Range to Effects (m)		
	Behavioral	TTS	PTS
Submarine Exercise	10,000[a]	4,025	15

[a] Empirical evidence has not shown responses to sonar that would constitute take beyond a few km from an acoustic source, which is why NMFS and Navy conservatively set a distance cutoff of 10 km. Regardless of the source level at that distance, take is not estimated to occur beyond 10 km from the source.

As discussed above, within NAEMO animats do not move horizontally or react in any way to avoid sound. Furthermore, mitigation measures that are implemented during training or testing activities that reduce the likelihood of physiological impacts are not considered in quantitative analysis. Therefore, the current model overestimates acoustic impacts, especially physiological impacts near the sound source. The behavioral criteria used as a part of this analysis acknowledges that a behavioral reaction is likely to occur at levels below those required to cause hearing loss (TTS or PTS). At close ranges and high sound levels approaching those that could cause PTS, avoidance of the area immediately around the sound source is the assumed behavioral response for most cases.

In previous environmental analyses, the Navy has implemented analytical factors to account for avoidance behavior and the implementation of mitigation measures. The application of avoidance and mitigation factors has only been applied to model-estimated PTS exposures given the short distance over which PTS is estimated. Given that no PTS exposures were estimated during the modeling process for this proposed action, the implementation of avoidance and mitigation factors were not included in this analysis.

Table 5 shows the exposures expected for bearded and ringed seals based on NAEMO modeled results.

Table 5 -- Quantitative Modeling Results of Potential Exposures for ICEX Activities

Species	Level B Harassment		Level A Harassment	Total
	Behavioral	TTS		
Bearded seal	3	1	0	4
Ringed seal	1,395	11	0	1,406

Effects of Specified Activities on Subsistence Uses of Marine Mammals

Subsistence hunting is important for many Alaska Native communities. A study of the North Slope villages of Nuiqsut, Kaktovik, and Barrow identified the primary resources used for subsistence and the locations for harvest (Stephen R. Braund & Associates 2010), including terrestrial mammals (caribou, moose, wolf, and wolverine), birds (geese and eider), fish (Arctic cisco, Arctic char/Dolly Varden trout, and broad whitefish), and marine mammals (bowhead whale, ringed seal, bearded seal, and walrus). Of these species, only bearded and ringed seals would be located within the study area during the proposed action.

The study area is at least 100-150 mi (161-241 km) from land, well seaward of known subsistence use areas and the planned activities would conclude prior to the start of the summer months, during which the majority of subsistence hunting would occur. In addition, the specified activity would not remove individuals from the population, therefore there would be no impacts caused by this action to the availability of bearded seals or ringed seals for subsistence hunting. Therefore, subsistence uses of marine mammals would not be impacted by this action.

Proposed Mitigation

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses. NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)). The NDAA for FY 2004 amended the MMPA as it relates to military readiness activities and the incidental take authorization process such that “least practicable impact” shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat, as well as subsistence uses. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Mitigation for Marine Mammals and their Habitat

The following general mitigation actions are proposed for ICEX20 to minimize impacts on ringed and bearded seals on the ice floe:

- Camp deployment would begin in mid-February and would be completed by March 15. Based on the best available science, Arctic ringed seal whelping is not expected to occur prior to mid-March. Construction of the ice camp would be completed prior to whelping in the area of ICEX20. As such, pups are not anticipated to be in the vicinity of the camp at commencement, and mothers would not need to move newborn pups due to construction of the camp. Additionally, if a seal had a lair in the area they would be able to relocate. Completing camp deployment before ringed seal pupping begins will allow ringed seals to avoid the camp area prior to pupping and mating seasons, reducing potential impacts;

- Camp location will not be in proximity to pressure ridges in order to allow camp deployment and operation of an aircraft runway. This will minimize physical impacts to subnivean lairs;

- Camp deployment will gradually increase over five days, allowing seals to relocate to lairs that are not in the immediate vicinity of the camp;

- Personnel on all on-ice vehicles would observe for marine and terrestrial animals; any marine or terrestrial animal observed on the ice would be avoided by 328 ft (100 m). On-ice vehicles would not be used to follow any animal, with the exception of actively deterring polar bears if the situation requires;

- Personnel operating on-ice vehicles would avoid areas of deep snowdrifts near pressure ridges, which are preferred areas for subnivean lair development; and

- All material (*e.g.*, tents, unused food, excess fuel) and wastes (*e.g.*, solid waste, hazardous waste) would be removed from the ice floe upon completion of ICEX20.

The following mitigation actions are proposed for ICEX20 activities involving acoustic transmissions:

- For activities involving active acoustic transmissions from submarines and torpedoes, passive acoustic sensors on the submarines will listen for vocalizing marine mammals for 15 minutes prior to the initiation of exercise activities. If a marine mammal is detected, the submarine will delay active transmissions, and not restart until after 15 minutes have passed with no marine mammal detections. If there are no animal detections, it may be assumed that the vocalizing animal is no longer in the immediate area and is unlikely to be subject to harassment. Ramp up procedures are not proposed as

Navy determined, and NMFS accepts, that they would result in an unacceptable impact on readiness and on the realism of training.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for subsistence uses.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density).

- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas).
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors.
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks.
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat).
- Mitigation and monitoring effectiveness.

The U.S. Navy has coordinated with NMFS to develop an overarching program plan in which specific monitoring would occur. This plan is called the Integrated Comprehensive Monitoring Program (ICMP) (U.S. Department of the Navy 2011). The ICMP was created in direct response to Navy permitting requirements established in various MMPA rules, ESA consultations, and applicable regulations. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas for which the Navy is seeking or has sought incidental take authorizations. The ICMP is intended to coordinate monitoring efforts across all regions and to allocate the most appropriate level and type of effort based on set of standardized research goals, and in acknowledgement of regional scientific value and resource availability.

The ICMP is focused on Navy training and testing ranges where the majority of Navy activities occur regularly as those areas have the greatest potential for being impacted. ICEX20 in comparison is a short duration exercise that occurs approximately every other year. Due to the location and expeditionary nature of the ice camp, the number of personnel onsite is extremely limited and is constrained by the requirement to be able to evacuate all personnel in a single day with small planes. As such, a dedicated monitoring project would not be feasible as it would require additional personnel and equipment to locate, tag and monitor the seals.

The Navy is committed to documenting and reporting relevant aspects of training and research activities to verify implementation of mitigation, comply with current permits, and improve future environmental assessments. All sonar usage will be collected via the Navy's Sonar Positional Reporting System database and reported. If any injury or death of a marine mammal is observed during the ICEX20activity, the Navy will immediately halt the activity and report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator, NMFS. The following information must be provided:

- Time, date, and location of the discovery;
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and

- General circumstances under which the animal(s) was discovered (*e.g.*, during submarine activities, observed on ice floe, or by transiting vessel).

The Navy will provide NMFS with a draft exercise monitoring report within 90 days of the conclusion of the planned activity. The draft exercise monitoring report will include data regarding sonar use and any mammal sightings or detection will be documented. The report will also include information on the number of sonar shutdowns recorded. If no comments are received from NMFS within 30 days of submission of the draft final report, the draft final report will constitute the final report. If comments are received, a final report must be submitted within 30 days after receipt of comments.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338;

September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

Underwater acoustic transmissions associated with ICEX20, as outlined previously, have the potential to result in Level B harassment of ringed and bearded seals in the form of TTS and behavioral disturbance. No serious injury, mortality or Level A takes are anticipated to result from this activity. At close ranges and high sound levels approaching those that could cause PTS, avoidance of the area immediately around the sound source would be seals' likely behavioral response.

NMFS estimates 11 takes of ringed seals and 1 take of bearded seals due to TTS from the submarine activities. TTS is a temporary impairment of hearing and TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, however, hearing sensitivity recovers rapidly after exposure to the sound ends. This activity has the potential to result in only minor levels of TTS, and hearing sensitivity of affected animals would be expected to recover quickly. Though TTS may occur in up to 11 ringed seals and 1 bearded seal, the overall fitness of these individuals is unlikely to be affected and negative impacts to the entire stocks are not anticipated.

Effects on individuals that are taken by Level B harassment could include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight. More severe behavioral responses are not anticipated due to the localized, intermittent use of active acoustic sources and mitigation by passive acoustic monitoring which will limit exposure to sound sources. Most likely, individuals will be temporarily displaced by moving away from the sound source. As described previously in the behavioral effects section, seals exposed to non-impulsive sources with a received sound pressure level within the range of calculated exposures, (142–193 dB re 1 μPa), have been shown to change their behavior by modifying diving activity and avoidance of the sound source (Götz *et al.*, 2010; Kvadsheim *et al.*, 2010). Although a minor change to a behavior may occur as a result of exposure to the sound sources associated with the planned action, these changes would be within the normal range of behaviors for the animal (*e.g.*, the use of a breathing hole further from the source, rather than one closer to the source, would be within the normal range of behavior).. Thus, even repeated Level B harassment of some small subset of the overall stock is unlikely to result in any significant realized decrease in fitness for the affected individuals, and would not result in any adverse impact to the stock as a whole.

The Navy's planned activities are localized and of relatively short duration. While the total project area is large, the Navy expects that most activities will occur within the ice camp action area in relatively close proximity to the ice camp. The larger study area depicts the range where submarines may maneuver during the exercise. The ice camp will be in existence for up to six weeks with acoustic transmission occurring intermittently over approximately four weeks.

The project is not expected to have significant adverse effects on marine mammal habitat. The project activities are limited in time and would not modify physical marine mammal habitat. While the activities may cause some fish to leave a specific area ensonified by acoustic transmissions, temporarily impacting marine mammals' foraging opportunities, these fish would likely return to the affected area. As such, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

For on-ice activity, serious injury and mortality are not anticipated. Level B harassment could occur but is unlikely due to mitigation measures followed during the exercise. Foot and snowmobile movement on the ice will be designed to avoid pressure ridges, where ringed seals build their lairs; runways will be built in areas without pressure ridges; snowmobiles will follow established routes; and camp buildup is gradual, with activity increasing over the first five days providing seals the opportunity to move to a different lair outside the ice camp area. The Navy will also employ its standard 100-m avoidance distance from any arctic animals. Implementation of these measures should ensure that ringed seal lairs are not crushed or damaged during ICEX20 activities and minimize the potential for seals and pups to abandon lairs and relocate.

The ringed seal pupping season on the ice lasts for five to nine weeks during late winter and spring. Ice camp deployment would begin in mid-February and be completed by March 15, before the pupping season. This will allow ringed seals to avoid the ice camp area once the pupping season begins, thereby reducing potential impacts to nursing mothers and pups. Furthermore, ringed seal mothers are known to physically move pups from the birth lair to an alternate lair to avoid predation. If a ringed seal mother perceives the acoustic transmissions as a threat, the local network of multiple birth and haulout lairs would allow the mother and pup to move to a new lair.

There is an ongoing UME for ice seals, including ringed and bearded seals. Elevated strandings have occurred in the Bering and Chukchi Seas since June 2018.

Though elevated numbers of seals have stranded during this UME, this event does not provide cause for concern regarding population-level impacts, as the population abundance estimates for each of the affected species number in the hundreds of thousands. The study area for ICEX20 activities is in the Beaufort Sea and Arctic Ocean, well north and east of the primary area where seals have stranded along the western coast of Alaska (see map of strandings at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2018-2019-ice-seal-unusual-mortality-event-alaska*). The location of the ICEX20 activities, combined with the short duration and low-level potential effects on marine mammals, suggest that the proposed activities are not expected to contribute to the ongoing UME.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No serious injury or mortality is anticipated or authorized;
- Impacts will be limited to Level B harassment, primarily in the form of behavioral disturbance;
- TTS is expected to affect only a limited number of animals;
- The number of takes proposed to be authorized are low relative to the estimated abundances of the affected stocks;
- There will be no loss or modification of ringed or bearded seal habitat and minimal, temporary impacts on prey;
- Physical impacts to ringed seal subnivean lairs will be avoided; and

- Mitigation requirements for ice camp activities would minimize impacts to animals during the pupping season.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Unmitigable Adverse Impact Analysis and Determination

Impacts to subsistence uses of marine mammals resulting from the proposed action are not anticipated. The proposed action would occur outside of the primary subsistence use season (*i.e.*, summer months), and the study area is 100-150 mi (161-241 km) seaward of known subsistence use areas. Harvest locations for ringed seals extend up to 80 nmi (148 km) from shore during the summer months while winter harvest of ringed seals typically occurs closer to shore. Additionally, no mortality or serious injury is expected or proposed to be authorized, and therefore no marine mammals would be removed from availability for subsistence. Based on this information, NMFS has preliminarily determined that there will not be an unmitigable adverse impact on subsistence uses from the Navy's proposed activities.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally, in this case with the NMFS Alaska Regional Office (AKR), whenever we propose to authorize take for endangered or threatened species.

NMFS is proposing to authorize take of ringed seals and bearded seals, which are listed under the ESA. The Permits and Conservation Division has requested initiation of section 7 consultation with the Protected Resources Division of AKR for the issuance of this IHA. NMFS will conclude the ESA consultation prior to reaching a determination regarding the proposed issuance of the authorization.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the Navy for conducting submarine training and testing activities in the Beaufort Sea and Arctic Ocean beginning in February 2020, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA. We also request comment on the potential renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for this IHA or a subsequent renewal.

On a case-by-case basis, NMFS may issue a one-year IHA renewal with an additional 15 days for public comments when (1) another year of identical or nearly identical activities as described in the Specified Activities section of this notice is planned or (2) the activities as described in the Specified Activities section of this notice would not be completed by the time the IHA expires and a renewal would allow for completion of the activities beyond that described in the Dates and Duration section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to expiration of the current IHA.

- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested renewal are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take because only a subset of the initially analyzed activities remain to be completed under the Renewal); and

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

- Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: December 12, 2019.

Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

[FR Doc. 2019-27124 Filed: 12/16/2019 8:45 am; Publication Date: 12/17/2019]