# Request for Incidental Harassment Authorization for the Incidental Harassment of Marine Mammals Resulting from 2024 Ice Exercise Activities

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# Acronyms and Abbreviations

| | |
|---|---|
| °N | degrees north latitude |
| AFTT | Atlantic Fleet Training and Testing |
| cm | centimeter(s) |
| dB | Decibels |
| DPS | Distinct Population Segments |
| EA | Environmental Assessment |
| ESA | Endangered Species Act |
| FR | Federal Register |
| ft | Feet |
| HSTT | Hawaii-Southern California Training and Testing |
| Hz | Hertz |
| ICEX | Ice Exercise |
| ICEX24 | Ice Exercise 2024 |
| ICMP | Integrated Comprehensive Monitoring Program |
| IHA | Incidental Harassment Authorization |
| in | inch(es) |
| km | Kilometers |
| $km^2$ | square kilometer(s) |
| kHz | Kilohertz |
| m | meter(s) |
| mi | mile(s) |
| $mi^2$ | square mile(s) |
| MMPA | Marine Mammal Protection Act |
| NAEMO | Navy Acoustic Effects Model |
| Navy | United States Department of the Navy |
| nm | nautical mile(s) |
| NMFS | National Marine Fisheries Service |
| OEA | Overseas Environmental Assessment |
| PL | Public Law |
| PTS | permanent threshold shift |
| re 1 µPa | referenced to 1 micropascal |
| SEL | sound exposure level |
| SPL | sound pressure level |
| TTS | temporary threshold shift |
| U.S. | United States |
| U.S.C. | United States Code |
| UUV | unmanned underwater vehicle |

# SECTION 1 Description of Specified Activities

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

## 1.1 Introduction

The United States (U.S.) Department of the Navy (Navy) has prepared this request for an Incidental Harassment Authorization (IHA) for the incidental taking (as defined in Section 5) of marine mammals during Ice Exercise (ICEX) 2024 (hereinafter ICEX24) activities proposed within the Beaufort Sea and Arctic Ocean north of Prudhoe Bay, Alaska.

The Navy prepared an Environmental Assessment/Overseas Environmental Assessment (EA/OEA) for the ICEX program in 2022 to evaluate all components of the Proposed Action (i.e., conducting an ICEX) (U.S. Department of the Navy 2021a). For the 2022 ICEX (U.S. Department of the Navy 2021b), an IHA for activities involving active acoustic sources was issued to the Navy (87 Federal Register [FR] 7803). To accommodate changes to acoustic sources and research being performed during ICEX24, a supplement to that EA/OEA is being prepared, which supports this IHA application. A description of the Proposed Action for which the Navy is requesting an IHA is provided in Section 1.2. A description of the Study Area and various components is provided in Section 2.

This document has been prepared in accordance with the applicable regulations of the Marine Mammal Protection Act (MMPA), as amended by the National Defense Authorization Act for Fiscal Year 2004 (Public Law [PL] 108-136) and further amended by the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (PL 115–232). The request for an IHA is based on: (1) the analysis of spatial and temporal distributions of protected marine mammals in the Study Area, (2) the review of aspects of the training activities that have the potential to incidentally harass marine mammals, and (3) a risk assessment to determine the likelihood of effects. Section 1.2 describes the aspects of the training activities that are likely to result in Level B harassment, Level A harassment, or mortality under the MMPA. Of the Navy activities analyzed, the Navy has determined that only the use of acoustic transmissions has the potential to affect marine mammals that may be present within the Study Area at a level sufficient to qualify as harassment under the MMPA.

## 1.2 Proposed Action

The Proposed Action is to conduct submarine training and testing activities, which includes the establishment of a tracking range and temporary ice camp, and conduct research in an Arctic environment. The purpose of the Proposed Action is to evaluate the employment and tactics of submarine operability in Arctic conditions. The Proposed Action also would evaluate emerging technologies and assess capabilities in the Arctic environment, and it would provide opportunities to gather data on Arctic environmental conditions.

### 1.2.1 Ice Camp

The ice camp would consist of a command hut, dining tent, sleeping quarters, an outhouse, a powerhouse, two runways (a primary and a back-up runway only for use in case of emergency), and a helipad (Figure 1-1). The number of structures/tents would range from 15 to 20, and structures typically would be 7 to 20 feet (ft) by 20 to 33 ft (2 to 6 meters [m] by 6 to 10 m) in size. Some tents may be octagon shaped and approximately 20 ft (6 m) in diameter. Berthing tents would contain bunk beds, a heating unit, and a circulation fan. The completed ice camp, including runway, would be approximately

1 mile (mi; 1.6 kilometers [km]) in diameter. Support equipment for the ice camp includes snowmobiles, snow blowers, gas powered augers and saws (for boring holes through the ice), two reverse osmosis units, and diesel generators.

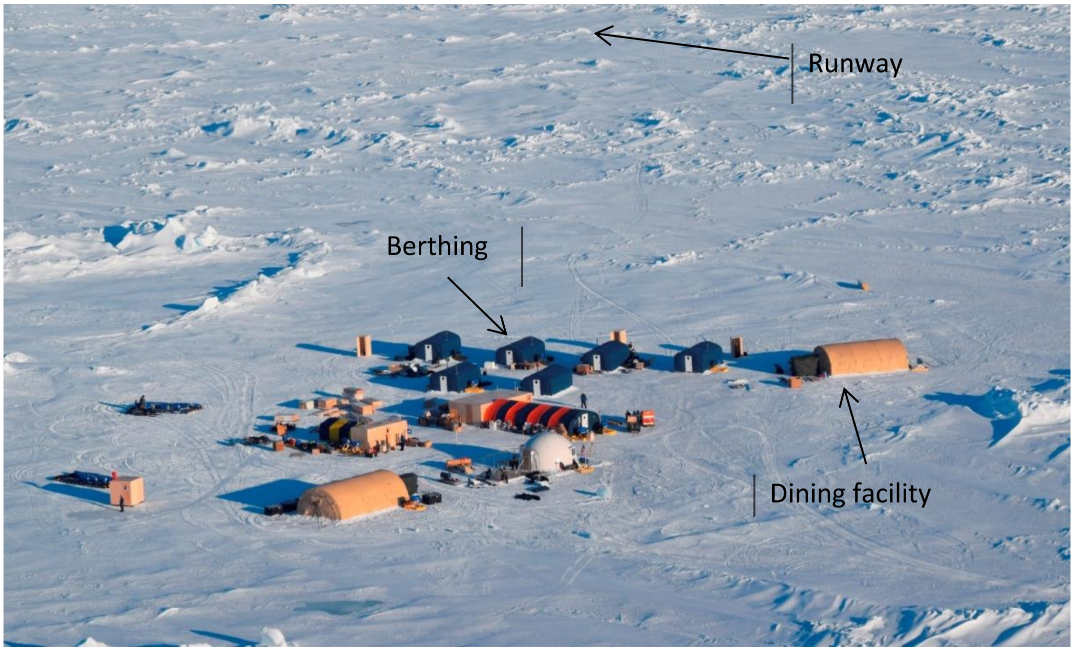


**Figure 1-1. Example Ice Camp**

All ice camp materials, fuel, and food would be transported from Prudhoe Bay, Alaska, and would either be air-dropped from military transport aircraft (e.g., C-17 and C-130) or arrive via small twin-engine aircraft and military and commercial helicopters at the ice camp runway. Aircraft would be used to transport personnel and equipment from the ice camp to Prudhoe Bay; up to nine round trips would occur daily during ice camp build-up and demobilization. At the completion of ICEX, the ice camp would be demobilized, and all personnel and materials would be removed from the ice floe. All shelters, solid waste, hazardous waste, and sanitary waste would be removed from the ice upon completion of the mission and disposed of in accordance with applicable laws and regulations.

A portable tracking range for submarine training and testing would be installed in the vicinity of the ice camp during ICEX24; hydrophones would be deployed on the ice and extend to approximately 98 ft (30 m) below the ice. Hydrophones would be approximately 4.65 inches (in; 11.8 centimeters [cm]) in length and have 2,000 ft (610 m) in associated cables. The associated cable would be Kevlar reinforced with a long-life polyurethane jacket for durability. The hydrophones would be deployed by drilling/melting holes in the ice and lowering the cable down into the water column. Hydrophones would be linked remotely to the command hut via cables (Figure 1-2). 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. Recovery of the hydrophones is planned; however, if emergency demobilization is required or the hydrophones are frozen in place and are unrecoverable, they would be left in place.

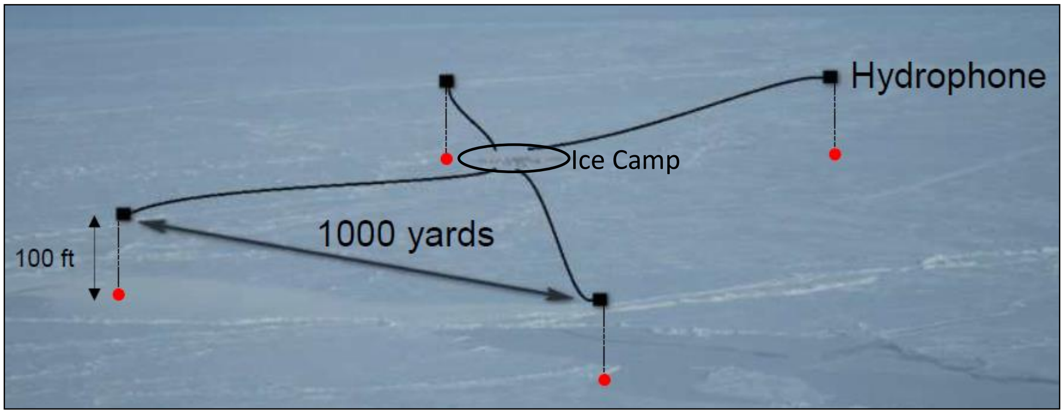


**Figure 1-2. Schematic of the Underwater Tracking Range**

### 1.2.2 Submarine Training and Testing

Submarine activities associated with ICEX24 are classified, but they generally entail safety maneuvers and active sonar use similar to submarine activities conducted in other undersea environments. These maneuvers and sonar use would be conducted in the Arctic to test their performance in a cold environment. Classified descriptions of submarine training and testing activities planned for ICEX24 can be provided to authorized individuals upon request. Submarine training and testing involves active acoustic transmissions. No exercise torpedo use is planned for ICEX24. All other non-acoustic components of submarine training and testing activities were fully analyzed within the ICEX EA/OEA and remain unchanged; these non-acoustic components will not be discussed further in this document as their impacts do not rise to the level of harassment as defined under the MMPA.

### 1.2.3 Research Activities

Personnel and equipment proficiency testing and multiple research and development activities would be conducted. Each type of activity scheduled for ICEX24 has been reviewed and placed into a general category of actions (Table 1-1). Unmanned underwater vehicle (UUV) testing and various acoustic/communication sources (i.e., echosounders, and transducers) involve active acoustic transmissions, which have the potential to harass marine mammals. Most acoustic transmissions that would be used in ICEX24 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). Additionally, any sources 200 kilohertz (kHz) or above in frequency or 160 decibels (dB) or below in source level are automatically considered *de minimis* (U.S. Department of Navy 2018). Sources 200 kHz or above are considered outside of marine mammal hearing ranges. Assuming spherical spreading for a 160 dB referenced to 1 micropascal (re 1 µPa) source, the sound will attenuate to less than 140 dB within 33 ft (10 m) and less than 120 dB within 328 ft (100 m) of the source. Ranges would be even shorter for a source less than 160 dB re 1 µPa source level.

**Table 1-1. Summary of Training and Testing and Research Activities**

| ***Activity Type*** | ***Category of Action*** | ***Project*** | ***Description*** |
|---|---|---|---|
| Submarine Training and Testing | Logistics | Ice Camp Operations | A camp is constructed and an associated underwater tracking range is deployed to support submarine training and testing. |
| | Submarine Training and Testing | Submarine Training and Testing | Submarines conduct various training and testing events. |
| Research Activities | On-Ice Data Collection | Ice Cores/Snow Samples | Collection of ice cores and/or snow to obtain abiotic (e.g., snow depth, thermal properties) and/or biotic (e.g., eDNA, microbial communities) information. |
| | | Sensors | Use of sensors to measure ice thickness. |
| | In-water Device Data Collection Personnel/ Equipment Proficiency | Buoys | Deployment of buoys to collect abiotic measurements (e.g., climate data, light transmission) and biotic measurements (e.g., phytoplankton blooms). |
| | | Sensors | Deployment of various remote sensor nodes to collect measurements on photosynthetic light levels, speed of different sounds, conductivity, temperature, and depth. |
| | | Unmanned Underwater Vehicle | Deployment of an autonomous and tethered unmanned underwater vehicle to measure sea-ice ocean interactions, such as exchanges of heat, salt, and momentum with sea-ice. |
| | | Water Samples | Collection of water samples under the ice for eDNA analysis. |
| | | Training and Support | Personnel conduct various activities in extreme cold, including, but not limited to, combat casualty care protocols, expeditionary ice diving operations, expeditionary camp construction operations support/maintenance, infiltration, special operations, and exfiltration. |
| | Underwater Equipment Testing | Acoustics/ Communication | Various communication systems and/or acoustic sources deployed under the ice, or in the water column, to determine system signal recognition capabilities. |
| | | Unmanned Underwater Vehicle | Autonomous unmanned underwater vehicle deployed to test communication and range of vehicle along with the vehicles ability to sample under-ice and in the open Arctic Ocean. |
| | Aerial System Testing | Unmanned Fixed-Wing | Fixed-wing unmanned aerial systems launched by hand or by pneumatic catapult. Fixed-wing systems may have up to 15-ft (4.6-m) wingspan and up to a 6.5 hour endurance. |
| | Unmanned On-Ice System Testing | Unmanned On-Ice Vehicle | Autonomous unmanned electric snowmobile deployed to test real-time ice detection, navigation, and provide various real-time monitoring data (e.g., meteorological data, ice thickness). |

Notes: eDNA= environmental deoxyribonucleic acid

### 1.2.4 Scientific Active Acoustic Devices

One unmanned underwater vehicle would be deployed under the ice to test the communication and range of the vehicle and to conduct under-ice and in-water column sampling. Several other acoustic sources (i.e., echosounder, transducers) would be deployed under the ice, or in the water column, to determine systems signal recognition capabilities. Acoustic parameters for these active sources are in Table 1-2.

**Table 1-2. Parameters for Scientific Devices with Active Acoustics**

| *Research Institution* | *Source Name* | *Frequency Range (kHz)* | *Source Level (dB)* | *Pulse Length* | *Source Type* |
|---|---|---|---|---|---|
| Woods Hole Oceanic Institute | LRAUV+ | 10 and 25 | 185 or less | 14 and 3000 ms | Unmanned Underwater Vehicle |
| Naval Postgraduate School | Echosounder[1] | 38 to 200 | 221 | 0.5 ms | Sonar |
| Massachusetts Institute of Technology Lincoln Lab | Echosounder[1] | 115 and 200 | 227 or less | 1 ms | Sonar |
| Naval Postgraduate School | Geospectrum M72, Geospectrum M71, ITC 1007 | 0.13, 0.8, and 5 | 190 or less | maximum length sequence of 20 min on and 40 min off | Transducer |

Note: dB = decibels; kHz = kilohertz; LRAUV = Long Range Autonomous Underwater Vehicle; min = minutes; ms = millisecond(s)

[1] Echosounders are a type of sonar. Echosounders have transducers that send sound pulses (sonar signals) into the water. The signal is reflected, and the transducer receives the returning echo.

# SECTION 2 Dates, Duration, and Geographic Region

The date(s) and duration of such activity and the specific geographical region where it will occur.

To support submarine training and testing, the Navy would establish an ice camp. The ice camp would be established approximately 100 to 200 nautical miles (nm) north of Prudhoe Bay, Alaska in the same study area defined in the ICEX Supplemental EA/OEA; the exact location cannot be identified in advance, as many of the required conditions (e.g., ice cover) cannot be forecasted until around the time when the exercises are expected to commence. 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, all within the Study Area (Figure 2-1). Though the Study Area is large, the area where the proposed ice camp would be located is a much smaller area (Figure 2-1). Prior to the set-up of the ice camp, reconnaissance flights will be conducted to locate suitable ice conditions required for the location of the ice camp. The reconnaissance flights will occur over an area of approximately 27,172 square miles ($mi^2$; 70,374 square kilometers [$km^2$]); the actual ice camp would be no more than 1 mi (1.6 km) in diameter, approximately 0.8 $mi^2$ (2 $km^2$) in area.

The Proposed Action would occur over approximately a six-week period within February through April 2024, including construction and demobilization of the ice camp. The submarine training and testing and the research activities would occur over approximately four weeks during the six-week period. This IHA is requested only the for active acoustic transmissions during the Proposed Action.

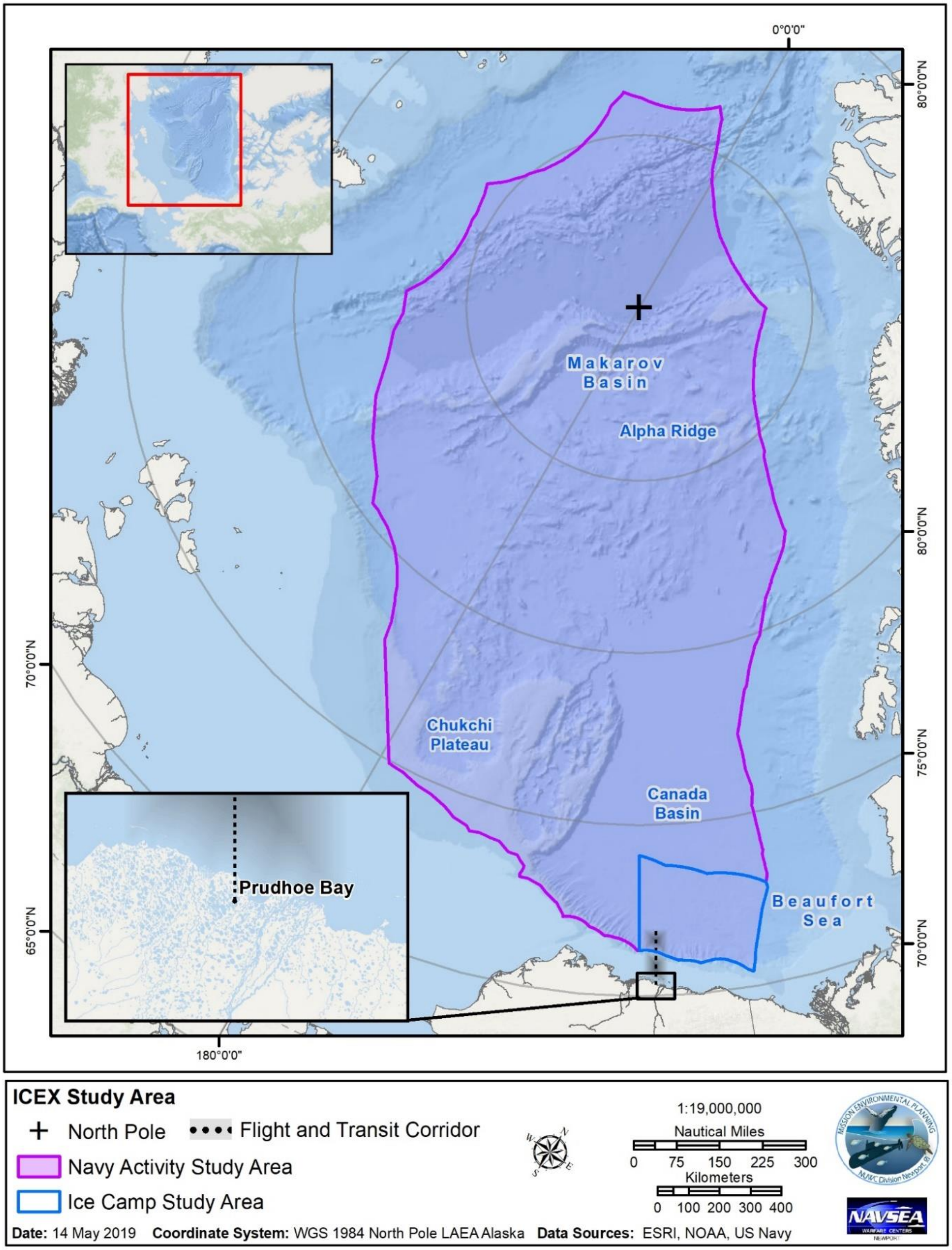


**Figure 2-1. ICEX Study Area**

# SECTION 3 Species and Numbers of Marine Mammals

The species and numbers of marine mammals likely to be found within the activity area.

Activities conducted during the Proposed Action are only expected to cause harassment, as defined by the MMPA as it applies to military readiness, to the ringed seal (*Phoca hispida hispida*). Therefore, no other species are discussed herein. Information on the estimated abundance for the species present in the Study Area can be found in Table 3-1. Additional relevant information on the ringed seal status, life history, and distribution is presented in Section 4.

**Table 3-1. Species and Populations Expected to be Present in the Study Area**

| ***Species*** | ***Status*** | ***Stock*** | ***Population Size (Potential Biological Removal[1])*** | ***Source[2]*** |
|---|---|---|---|---|
| Ringed seal | Threatened | Arctic | 171,418 (4,755) | (Moreland et al. 2013), (Conn et al. 2014) |

[1] Potential biological removal only for the Bering Sea. Potential biological removal for Chukchi and Beaufort Seas are unavailable.

[2]Abundance data and sources are from the 2021 Alaska Marine Mammal Stock Assessment Report (Muto et al. 2021), which is the most recent stock assessment.

# SECTION 4 Affected Species Status and Distribution

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

The marine mammal species discussed in this section are those for which general regulations governing potential incidental harassment of marine mammals are sought. Ringed seals are listed under the Endangered Species Act (ESA). All subspecies are listed as depleted under the MMPA. Relevant information on their status, life history, and distribution is presented below.

## 4.1 Ringed Seal (Arctic Stock)

### 4.1.1 Regional and Seasonal Distribution

Ringed seals are the most common pinniped in the Study Area. They have a wide distribution in seasonally and permanently ice-covered waters of the Northern Hemisphere (North Atlantic Marine Mammal Commission 2004). During the fall, ringed seal movements become increasingly restricted with the onset of the fall freeze. Seals in the Beaufort Sea will either remain in the area, or they will move west and south with the advancing ice pack (i.e., dispersing throughout the Chukchi and Bering Seas) (Crawford et al. 2012; Frost and Lowry 1984; Harwood et al. 2012). 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 1988c), and therefore, they would occur in the Study Area (Figure 2-1). Passive acoustic monitoring of ringed seals from a high-frequency recording package deployed at a depth of 787 ft (240 m) in the Chukchi Sea, 75 mi (120 km) north-northwest of Barrow, Alaska, detected ringed seals in the area between mid-December and late May over a four-year study (Jones et al. 2014). Telemetry data from Von Duyke et al. (2020) indicated that ringed seals occupy the Chukchi Sea and Bering Strait during the winter months.

Ringed seals have an affinity for ice-covered waters and are well adapted to occupying both shore-fast and pack ice (Gryba et al. 2021; Kelly 1988c). Ringed seals can be found farther offshore than other pinnipeds, since they can maintain breathing holes in ice thickness greater than 7 ft (2 m) (Smith and Stirling 1975). Breathing holes are maintained by ringed seals' claws on their fore flippers (Kelly 2022). 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 all times of the year (Muto et al. 2020).

Ringed seals have at least two distinct types of subnivean lairs: haul out lairs and birthing lairs (Smith and Stirling 1975). Haul out lairs are typically single-chambered (Hauser et al. 2021) 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 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). Pupping begins in March, but the majority of births occur in early April. About a month after parturition, mating resumes in late April and early May.

Snow depths of at least 20 to 26 inches (in; 50 to 65 centimeters [cm]) are required for functional birth lairs (Kelly 1988b; Lydersen 1998; Lydersen and Gjertz 1986; Smith and Stirling 1975), and such depths typically are found only where 8 to 12 in (20 to 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). Lentfer (1972) found that ringed seals north of Barrow, Alaska (west of the Ice Camp Study Area), build their subnivean lairs on the pack ice near pressure ridges. Since subnivean lairs were found north of Barrow in pack ice, they are assumed to be found within the sea ice in the Ice Camp Study Area.

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 0.39 to 10.8 $mi^2$ (1 to 27.9 $km^2$; median 0.24 $mi^2$ [0.62 $km^2$] for adult males and 0.25 $mi^2$ [0.65 $km^2$] for adult females). Most (94 percent) of the home ranges were less than 1.2 $mi^2$ (3 $km^2$) during the subnivean period (Kelly et al. 2010). Near large polynyas, ringed seals maintain ranges up to 2,700 $mi^2$ (7,000 $km^2$) during winter and 810 $mi^2$ (2,100 $km^2$) during spring (Born et al. 2004). 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 (Harwood et al. 2015). Ringed seals may occur within the Study Area throughout the year, including during the Proposed Action.

### 4.1.2 Population and Abundance

#### 4.1.2.1 Status of Stock

The ringed seal, specifically the Arctic subspecies, occurs within the U.S. Exclusive Economic Zone of the Beaufort, Chukchi, and Bering Seas and would be expected to occur within the Study Area (Hamilton et al. 2022; Kelly et al. 2009; Muto et al. 2021; Palo 2003; Palo et al. 2001). The Arctic subspecies is listed as depleted and strategic under the MMPA (Muto et al. 2021). The ringed seal is listed as threatened under the ESA (77 FR 76706; December 28, 2012). The taxonomic status of the Arctic subspecies remains unresolved, and the Arctic stock may encompass the entire Arctic subspecies range due to widespread mixing and lack of population structure (Muto et al. 2021). However, for the purposes of this analysis, the Arctic stock of ringed seals is considered the portion of the Arctic subspecies that occurs within the U.S. Exclusive Economic Zone of the Beaufort, Chukchi, and Bering seas.

A reliable population estimate for the entire stock is not available. In spring of 2012 and 2013, American and Russian researchers conducted aerial abundance and distribution surveys over the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). Conn et al. (2014), using a sub-sample of the data collected from the U.S. portion of the Bering Sea in 2012, calculated an abundance estimate of 171,418 ringed seals. Researchers expect to provide a population estimate for the entire Arctic stock of ringed seals once the final Bering Sea results are combined with the results from the spring surveys of the Chukchi Sea (conducted in 2016) and Beaufort Sea (previously planned to occur in 2020).

#### 4.1.2.2 Abundance

The abundance of ringed seals in the ICEX Study Area utilized for quantitative analysis are from sighting data from the Ocean Biodiversity Information System-Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP) (Halpin et al. 2015). The ICEX Study Area (Figure 2-1) was overlaid on the OBIS-SEAMAP ringed seal sightings map that included sightings from years 2000 to 2007 and 2013. Sighting data were only available for the mid to late summer and fall months. Due to the paucity of winter and spring data, the average number of individual ringed seals per year was assumed to be present in the ICEX Study Area during the Proposed Action; therefore, it is assumed that three ringed seals would be present in the Study Area.

### 4.1.3 Hearing and Vocalization

Ringed seals fall into the phocid seal hearing group. Functional hearing limits for this hearing group are estimated to be 75 Hz to 30 kHz in air and 75 Hz to 75 kHz in water (Kastak and Schusterman 1999; Kastelein et al. 2009a; Kastelein et al. 2009b; Møhl 1968a, 1968b; Reichmuth 2008; Terhune and Ronald 1971, 1972). Phocids can make calls between 90 Hz and 16 kHz (Richardson et al. 1995). The generalized hearing for phocids (underwater) ranges from 50 Hz to 86 kHz (NMFS Office of Protected Resources 2018), which includes the suggested auditory bandwidth for pinnipeds in water proposed by Southall et al. (2007), ranging between 75 Hz and 75 kHz. Based on a study by Sills et al. (2015), the best frequencies for ringed seal hearing were 12.8 and 25.6 kHz at 49 and 50 (dB re 1µPa at 1 m, respectively). The best hearing range for ringed seals combined was 0.4 to 52 kHz (Sills et al. 2015). Data on ringed seal hearing indicates an upper frequency limit to be 60 kHz (Terhune and Ronald 1976), which falls within the phocid hearing group's range.

# SECTION 5 Type of Incidental Taking Authorization Requested

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury and/or death), and the method of incidental taking.

## 5.1 Take Authorization Request

The Navy is requesting an IHA for the incidental taking of a specified number of ringed seals, incidental to proposed ICEX24 activities in the Beaufort Sea between February and April 2024. This taking would occur as a result of acoustic transmissions during the ICEX24 event. The term "take," as defined in Section 3 (16 United States Code [U.S.C.] § 1362 (13)) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment: Level A (potential injury) and Level B (potential disturbance).

The National Defense Authorization Act of Fiscal Year 2004 (PL 108-136) amended the definition of "harassment" as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government, consistent with Section 3(18)(B) of the MMPA [16 U.S.C. § 1362(18)(B)]. The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National Defense Authorization Act (PL 107-314). Military training activities within the Study Area are composed of military readiness activities as that term is defined in PL 107-314 because training activities constitute "training and operations of the Armed Forces that relate to combat" and "adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." For military readiness activities, the relevant definition of harassment is 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
- 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 such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. § 1362(18)(B)(i) and (ii)].

The ICEX EA/OEA considered the following stressors for potential impacts to marine mammals:

- Acoustic (active acoustics [sonar, torpedo, transducer, UUV], aircraft noise, and on-ice vehicle noise)
- Physical disturbance and strikes (aircraft, on-ice and in-water vessel/vehicle strike, and human presence)
- Expended material (combustive materials, bottom disturbance, entanglement, and ingestion)

From the analyses, the Navy determined the only stressor that could potentially result in the incidental taking of marine mammals is from active acoustic transmissions (torpedo exercises will not be conducted during ICEX24). The ICEX Supplemental EA/OEA analyzed only acoustic transmissions, the only stressor whose analysis changed from the 2022 document in light of changes to the Proposed Action and updated science. The ICEX Supplemental EA/OEA likewise concluded that acoustic transmissions could potentially result in the incidental taking of marine mammals.

## 5.2 Incidental Take Request

The methods of incidental take associated with the acoustic transmissions from the Proposed Action are described within Section 1. Acoustic transmissions from submarine and research activities have the potential to disturb or displace marine mammals. Specifically, only underwater active transmissions may result in the "take" in the form of Level B harassment. Mitigation and monitoring measures discussed in Section 11 and Section 13 will be implemented to further minimize the potential for takes of marine mammals. Table 5-1. summarizes the Navy's final take request based on a model that was used to quantitatively estimate the potential number of exposures that could occur for the ICEX24 training and research activities from February through April 2024. Only Level B takes are anticipated to occur from the Proposed Action. Derivation of these values is described in more detail in Section 6.

**Table 5-1. Total Number of Exposures Requested per Species During ICEX24 Training Activities**

| ***Common Name*** | ***Level B Takes Requested*** |
|---|---|
| Ringed seal | 126 |

# SECTION 6 Take Estimates for Marine Mammals

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in Section 5, and the number of times such takings by each type of taking are likely to occur.

The methods for estimating the number and types of exposures identified in Section 5 are provided below. The Navy Acoustic Effects Model (NAEMO) was previously used to produce a quantitative estimate of PTS, TTS, and behavioral exposures for seals. For ICEX24, a new approach that utilizes sighting data from previous surveys conducted within the Study Area was used that estimates Level B harassment and is further described in Section 6.3. The stressor that is estimated to result in Level B harassment for ringed seals is active acoustic transmissions.

The information presented in this section includes a summary of the vocalization and hearing capabilities of marine mammal groups, the types of acoustic impacts potentially resulting from the Proposed Action, criteria and thresholds against which the types of impacts are analyzed, and a description of the quantitative analysis used to estimate impacts to marine mammals.

## 6.1 Vocalization and Hearing of Marine Mammals

All marine mammals that have been studied can produce sounds and use sounds to forage, orient, detect and respond to predators, and socially interact with others. Measurements of marine mammal sound production and hearing capabilities provide some basis for assessment of whether exposure to a particular sound source may affect a marine mammal behaviorally or physiologically. Marine mammal hearing abilities are quantified using live animals either via behavioral audiometry or electrophysiology (Au 1993; McFadden et al. 2022; Nachtigall et al. 2007; Schusterman 1981; Wartzok and Ketten 1999). Behavioral audiograms, which are plots of animals' exhibited hearing threshold versus frequency, are obtained from captive, trained live animals using standard testing procedures with appropriate controls, and these tests are considered to be a more accurate representation of a subject's hearing abilities. Behavioral audiograms of marine mammals are difficult to obtain because many species are too large, too rare, and too difficult to acquire and maintain for experiments in captivity.

Electrophysiological audiometry measures small electrical voltages produced by neural activity when the auditory system is stimulated by sound. The technique is relatively fast, does not require a conscious response, and is routinely used to assess the hearing of newborn humans. Hearing response in relation to frequency for both methods of evaluating hearing ability is a generalized U-shaped curve or audiogram showing the frequency range of best sensitivity (lowest hearing threshold) and frequencies above and below with higher threshold values (McFadden et al. 2022).

Consequently, our understanding of a species' hearing ability may be based on the behavioral audiogram of a single individual or small group of animals (McFadden et al. 2022). In addition, captive animals may be exposed to local ambient sounds and other environmental factors that may impact their hearing abilities and may not accurately reflect the hearing abilities of free-swimming animals (Houser et al. 2010). For animals not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are made based on physiological structures, vocal characteristics, and extrapolations from related species.

NMFS reviewed studies of hearing sensitivity of marine mammals and developed thresholds for use as guidance when assessing the effects of anthropogenic sound on marine mammals, based on measured or estimated hearing ranges (NMFS Office of Protected Resources 2018). The guidance places marine mammals into the generalized hearing groups based on their hearing sensitivities. Ringed seals fall into the hearing group for phocid pinnipeds (true seals). This group has generalized in water hearing ranges between 50 Hz and 86 kHz[1] (NMFS Office of Protected Resources 2018).

Table 6-1 provides a summary of sound production and general hearing capabilities for the ringed seal. Note that values in this table are not meant to reflect absolute possible maximum ranges; rather, they represent the best known ranges of each functional hearing group. A detailed discussion of the functional hearing groups can be found in NMFS (2018).

**Table 6-1. Marine Mammal Functional Hearing Groups**

| *Functional Hearing Group* | *Species Which May Be Present in the Area* | *Sound Production[1]* | *General Hearing Ability Frequency Range (in water)[2]* |
|---|---|---|---|
| | | *Frequency Range* | |
| Phocidae | Ringed Seals | 20 Hz to 30 kHz | 50 Hz to 86 kHz |

Note: Hz = Hertz; kHz = kilohertz

[1] Sound production includes groans, moans, woofs, and clicks.

[2] Note that values in this table are not meant to reflect absolute possible maximum ranges; rather, they represent the best known ranges of phocidae.

Sources: Southall et al. (2007), Southall et al. (2019), and NMFS Office of Protected Resources (2018)

## 6.2 Analysis Framework

The potential impacts were analyzed in terms of potential hearing loss and behavioral reactions as a result of the Proposed Action.

### 6.2.1 Hearing Threshold Shifts

The most familiar effect of exposure to high intensity sound is hearing loss, meaning a shift in the hearing threshold. This phenomenon is called a noise-induced threshold shift, or simply a threshold shift (Miller 1974). The distinction between permanent threshold shift (PTS) and temporary threshold shift (TTS) is based on whether there is complete recovery of a threshold shift following a sound exposure. If the threshold shift eventually returns to zero (the threshold returns to the pre-exposure value), the threshold shift is considered a TTS. The recovery to pre-exposure threshold from studies of marine mammals is usually on the order of minutes to hours for the small amounts of TTS induced (Finneran et al. 2005; Nachtigall et al. 2004). The recovery time is related to the exposure duration, the sound exposure level (SEL), and the magnitude of the threshold shift, with larger threshold shifts and longer exposure durations requiring longer recovery times (Finneran et al. 2005; Mooney et al. 2009). If the threshold shift does not return to zero but leaves some finite amount of threshold shift, then that remaining threshold shift is a PTS.

Studies of marine mammals have been designed to determine relationships between TTS and exposure parameters, such as level, duration, and frequency. In these studies, hearing thresholds were measured in trained marine mammals before and after exposure to intense sounds. The difference between the pre-exposure and post-exposure thresholds indicates the amount of TTS. Kastelein et al. (2016) studied

[1] Southall et al. (2007) suggested an auditory bandwidth for pinnipeds in water to range between 75 Hz and 75 kHz.

the effects of intermittent anthropogenic sounds, such as sonar, and the onset of TTS in the harbor porpoise (*Phocoena phocoena*). The study found that relatively short intermittent sounds, such as sonar, had a much smaller impact on TTS than a constant anthropogenic sound, such as pile driving (Kastelein et al. 2016). Other species studied include the bottlenose dolphin (*Tursiops truncatus*), beluga (*Delphinapterus leucas*), finless porpoise (*Neophocaena asiaeorientalis*), California sea lion (*Zalophus californianus*), harbor seal (*Phoca vitulina*), and northern elephant seal (*Mirounga angustirostris*). Some of the more important data obtained from these studies are onset-TTS levels–exposure levels sufficient to cause a just-measurable amount of TTS, often defined as 6 dB of TTS (Finneran et al. 2000; Finneran et al. 2002; Schlundt et al. 2000).

Although there have been no marine mammal studies designed to measure PTS, the potential for PTS in marine mammals can be estimated based on known similarities between the inner ears of marine and terrestrial mammals. Experiments with marine mammals have revealed similarities to terrestrial mammals for features such as TTS, age-related hearing loss, ototoxic drug-induced hearing loss, masking, and frequency selectivity. Therefore, in the absence of marine mammal PTS data, onset-PTS exposure levels may be estimated by assuming some upper limit of TTS that equates to the onset of PTS, then using TTS growth relationships from marine and terrestrial mammals to determine the exposure levels capable of producing this amount of TTS.

### 6.2.2 Behavioral Reactions or Responses

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 also can 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.

Southall et al*.* (2007) and Southall et al. (2021) 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. After examining all of the available data, Southall et al. (2007) and Southall et al. (2021) 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. Phocids showed avoidance reactions at or below 190 dB re 1 µPa at 1 m; thus, seals may actually receive levels adequate to produce TTS before avoiding the source.

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 (*Mesoplodon densirostris*) 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 has necessitated the update of the Navy’s behavioral response criteria.

The Navy's pinniped behavioral criteria is based on controlled exposure experiments on the following captive animals: hooded seal (*Cystophora cristata*), gray seal (*Halichoerus grypus*), and California sea lion (Götz et al. 2010; Houser et al. 2013a; Kvadsheim et al. 2010). Overall exposure levels were 110 to 170 dB re 1 µPa for hooded seals, 140 to 180 dB re 1 µPa for gray seals, and 125 to 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 gray 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 (Figure 6-1) 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 6 mi (10 km) is used beyond which exposures would not constitute a take under the military readiness definition.

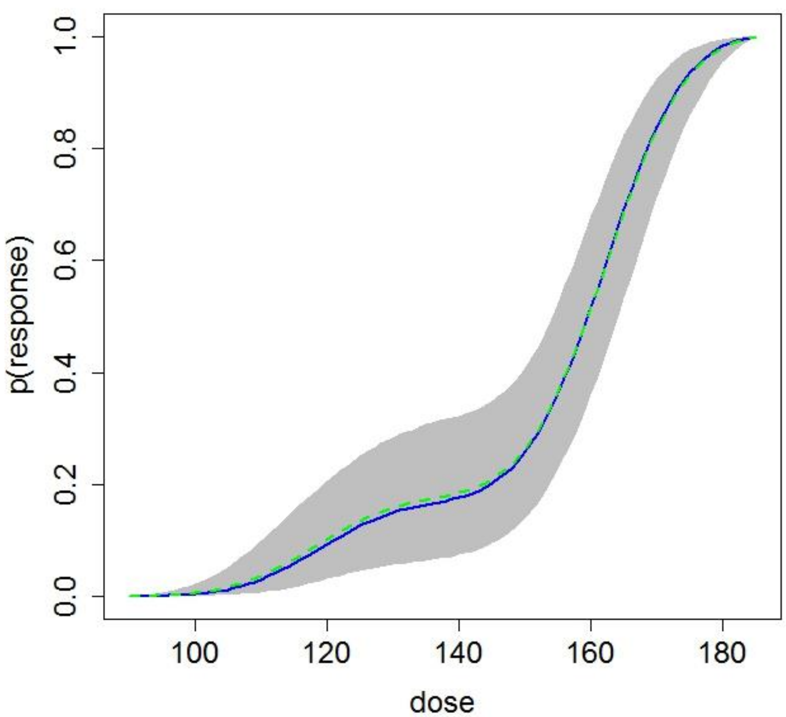


**Figure 6-1. The Bayesian biphasic dose-response Behavioral Response Function for Pinnipeds**

*The blue solid line represents the Bayesian Posterior median values, the green dashed line represents the biphasic fit, and the gray represents the variance. [X-Axis: Received Level dB re 1 µPa), Y-Axis: Probability of Response]*

## 6.3 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. The only marine mammal susceptible to impacts from acoustic transmissions associated with the Proposed Action would be ringed seals.

No numerical data exist regarding presence of ringed seals in the ICEX Study Area during the months of February, March, and April. Previously, density derived from a habitat suitability model (Kaschner et al. 2006) was used to estimate acoustic exposures of marine mammals using NAEMO; however, this density data drastically overestimated the abundance of ringed seals in the Study Area and led to an inaccurate number of modeled ringed seal takes. Instead, using data from sighting surveys that previously occurred in the ICEX Study Area was determined to be the better approach for estimating ringed seal presence and exposure. Ringed seal presence in the ICEX Study Area was obtained using sighting data from the OBIS-SEAMAP (Halpin et al. 2009). The ICEX Study Area was overlaid on the OBIS-SEAMAP ringed seal sightings map that included sightings from the years 2000 to 2007 and the year 2013. Sighting data were only available for the mid to late summer and fall months. Due to the paucity of winter and spring data, the average number of individual ringed seals per year was assumed to be present in the ICEX Study Area during the Proposed Action; therefore, it is assumed that three ringed seals would be present in the Study Area. It is assumed that the OBIS-SEAMAP reported sightings would correspond to a more accurate number of animals that could be present at the time of the Proposed Action than the previously used densities.

## 6.4 Estimated Take of Marine Mammals

When sound sources are active, exposure to increased sound pressure levels (SPLs) would likely involve individuals that are moving through the area during foraging trips. Ringed seals also may be exposed en route to haul out sites or subnivean lairs. As discussed further in Section 7, if exposure were to occur, the pinnipeds could exhibit behavioral responses, such as avoidance, increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, individuals affected by acoustic transmissions resulting from the Proposed Action would move away from the sound source. Ringed seals may be temporarily displaced from their subnivean lairs within the Ice Camp Study Area. Any pinniped would have to be within 6 mi (10 km) of the source for any behavioral reaction (e.g., flushing from a lair). Any effects experienced by individual pinnipeds are anticipated to be limited to short-term disturbance of normal behavior, temporary displacement or disruption of animals that may occur near the Proposed Action. Therefore, the exposures requested are expected to have no more than a minor effect on individual animals and no adverse effect on the populations of ringed seals.

Table 6-2 shows the exposures expected for ringed seals based on the quantitative results. The quantitative analysis indicated that three ringed seals would occur within the Study Area. To be conservative, the Navy has assumed that all three ringed seals would be exposed to acoustic transmissions above the threshold for Level B take, and that each would be exposed each day of the Proposed Action (42 days total). Therefore, assuming an animal can only be taken once per day, the Navy requests 126 Level B takes of ringed seals (Table 6-2). Unlike the NAEMO modeling approach used to estimate ringed seal takes in the ICEX22 IHA, the occurrence method used in this ICEX IHA does not support the differentiation between behavioral or TTS exposures. Therefore, all takes are classified as Level B and not further distinguished. Modeling for the previous three ICEXs (2018, 2020, and 2022) did not result in any Level A takes, even in years where torpedoes were used. Torpedoes are not used in ICEX24, but all other sound sources are similar to those previously modeled, and are used in a similar manner. Therefore, no Level A takes are anticipated due to ICEX24. The numbers generated from the quantitative analysis provide conservative estimates of marine mammal exposures, the short duration, limited geographic extent of ICEX24 activities, and mitigation measures would further limit actual exposures.

**Table 6-2. Quantative Modeling Results of Potential Exposures for ICEX24 Activities**

| ***Common Name*** | ***Level B Harassment*** | ***Level A Harassment*** | ***Percentage of Stock Taken (%)[1]*** |
|---|---|---|---|
| Ringed seal | 126 | 0 | 0.07 |

[1] Percentage of stock taken calculated based on proportion of number of Level B takes per the stock population estimate provided in Table 3-1.

# SECTION 7 Anticipated Impact of the Activity

The anticipated impact of the activity upon the species or stock of marine mammal.

Consideration of negligible impact is required for NMFS to authorize incidental take of marine mammals. By definition, an activity has a "negligible impact" on a species or stock when it is determined that the total taking is not likely to reduce annual rates of adult survival or recruitment (i.e., offspring survival, birth rates).

The conclusions and predicted exposures in this analysis find that overall impacts on marine mammal species and stocks would be negligible, despite the potential Level B harassment to ringed seals, for the following reasons:

- All estimated acoustic harassments for the Proposed Action are within the non-injurious TTS or behavioral effects zones (Level B harassment).
- Mitigation measures described in Section 11 are designed to reduce sound exposure to marine mammals.

Based on the current state of science, including behavioral response studies, it is not currently possible to distinguish between significant and insignificant behavioral reactions derived from the quantitative analysis data. However, it is assumed for the purposes of this analysis that more intense and longer duration activities would lead to a higher probability of animals having significant behavioral reactions. Behavioral reactions of marine mammals to sound are known to occur but can be difficult to predict due to the variability in the severity of responses of specific individuals. Recent behavioral studies indicate that reactions to sounds, if any, are highly contextual and vary between species and individuals within a species (Moretti et al. 2010; Southall et al. 2011; Thompson et al. 2010; Tyack 2009; Tyack et al. 2011). Marine mammals may change their activity when exposed to disruptive levels of sound (Southall et al. 2021).

When sound becomes potentially disruptive, animals at rest become active (Blundell and Pendleton 2015; Mikkelsen et al. 2019), and feeding or socializing pinnipeds often cease these activities by diving or swimming away. If the sound disturbance occurs around a haul out site, pinnipeds may move back and forth between water and land or temporarily abandon the haul out (Andersen et al. 2014; Hastie et al. 2014). When attempting to understand behavioral disruption by anthropogenic sound, a key question to ask is whether the exposures have biologically significant consequences for the individual or population (National Research Council of the National Academies 2005). Anthropogenic disturbances that cause seals to repeatedly flush from haul outs can have numerous deleterious effects, including reduced pupping success (Ruiz-Mar et al. 2022).

If a marine mammal does react to an underwater sound by changing its behavior or moving a small distance, the impacts of the change may not be detrimental to the individual. For example, researchers have found during a study focusing on bottlenose dolphins' response to whale watching vessels in New Zealand, that when animals can adapt with constraint and easily feed or move elsewhere, there is little biological effect on survival (Lusseau and Bejder 2007). On the other hand, if a sound source displaces marine mammals from an important feeding or breeding area for a period long enough to cause an impact, and they do not have an alternate equally desirable area, impacts on the marine mammal could be negative because the disruption has biological consequences. Biological parameters or key elements having greatest importance to a marine mammal relate to its ability to grow, reproduce, and survive. These key elements could be defined as follows:

- Growth: adverse effects on ability to feed;
- Reproduction: the range at which reproductive displays can be heard and the quality of mating/calving grounds; and
- Survival: sound exposure may directly affect a species' ability to live.

The importance of the disruption and degree of biological consequence for individual marine mammals often has much to do with the frequency, intensity, and duration of the disturbance. Isolated acoustic disturbances, such as acoustic transmissions, usually have minimal consequences or no lasting effects for marine mammals. Marine mammals regularly cope with occasional disruption of their activities by predators, adverse weather, and other natural phenomena. Accordingly, it is reasonable to assume that marine mammals can tolerate occasional or brief disturbances by anthropogenic sound reasonably without significant biological consequences.

## 7.1 The Context of Behavioral Disruption and TTS - Biological Significance to Populations

Consequences to populations are much more difficult to predict, and empirical measurement of population effects from anthropogenic stressors is limited (National Research Council of the National Academies 2005). To predict indirect, long-term, and cumulative effects, the processes must be well understood, and the underlying data must be available for models.

No research has been conducted on the potential behavioral responses of ringed seals to the type of acoustic sources used during the Proposed Action. Data are available on (1) effects of non-impulsive sources (e.g., sonar transmissions) on other phocids in water, and (2) reactions of ringed seals while in subnivean lairs. This information was assessed and incorporated into the findings of this analysis.

### 7.1.1 Effects of Non-Impulsive Sources on Phocids in Water

For non-impulsive sounds ( similar to the sources used during the Proposed Action), Southall et al. (2007) 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 (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 (minor or moderate avoidance of the sound source). Southall et al. (2021) conducted a severity scale analysis on a study by Hastie et al. (2014). The authors noted the response of two captive gray seals to two different sonar signals (200 and 375 kHz systems). The behavioral reactions were ranked on a severity scale as a 6 (sustained avoidance where seals spent more time hauled out) for one sonar system (200 kHz) and ranked as a 5 (onset of avoidance such as heading away and/or increasing range from the source but remaining in the water) for the other sonar system (375 kHz). Gray seals showed a change in behavior at 165.7 (1/3-octave level; 200 kHz system) and 160.3 (1/3 octave level; 375 kHz system) dB re 1 µPa at 1 m root mean square (Hastie et al. 2014; Southall et al. 2021).

Additional data on hooded seals indicate avoidance responses to signals above 160 to 170 dB re 1 µPa (Kvadsheim et al. 2010), and data on gray seals and harbor seals indicate avoidance responses at received levels of 135 to 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. 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.

Behavioral studies have been conducted specifically on ringed seals and bearded seals. In one study aimed to investigate the under-ice movements and sensory cues associated with under-ice navigation of ice seals, acoustic transmitters (60 to 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 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 were at the upper limit of ringed seal hearing, the ringed seals appeared unaffected by the acoustic transmissions, as they maintained normal behaviors (e.g., finding breathing holes). In a similar study, bearded seals exposed to undersea ambient noise levels between 100 and 900 Hz indicated a behavioral threshold at 100 to 105 dB for males, in which males stopped increasing call amplitude (Fournet et al. 2021). The limited vocal compensation of bearded seals as ambient noise increases could potentially lead to masking (Fournet et al. 2021).

Seals exposed to non-impulsive sources with a received SPL within the range of calculated exposures (142 to 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 behavior may occur as a result of exposure to the acoustic transmissions associated with the Proposed Action, these behavioral changes largely would be within the normal range of behaviors for the animal (e.g., the use of a breathing hole farther from the source, rather than one closer to the source) (Kelly et al. 1988).

### 7.1.2 Effects on Ringed Seals within Subnivean Lairs

Adult ringed seals spend up to 20 percent of their time in subnivean lairs during the timeframe of the Proposed Action (Kelly et al. 2010). Ringed seal pups spend about 50 percent of their time in the lair during the nursing period (Lydersen and Hammill 1993). Subnivean lairs are typically used by individual seals (haul out 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). The acoustic modeling does not account for seals within subnivean lairs, and all animals are assumed to be in the water and susceptible to hearing acoustic transmissions 100 percent of the time. Therefore, the acoustic modeling output likely represents an overestimate, given the percentage of time that ringed seals are expected to be in subnivean lairs rather than in the water. Although the exact amount of transmission loss of sound traveling through ice and snow is unknown, it is clear that some sound attenuation would occur due to the environment itself. The best hearing sensitivity for ringed seals in air (i.e., in a subnivean lair) has been documented between 3 and 5 kHz; at higher frequencies, the hearing threshold rapidly increases (Sills et al. 2015).

If the acoustic transmissions are heard and 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 their primary predators (polar bears [*Ursus maritimus*] and Arctic foxes [*Vulpes lagopus*]), although the type of sound would be novel to them. Responses of ringed seals to a variety of human-induced noises (e.g., helicopter noise, snowmobiles, dogs [*Canis lupus familiaris*], people, and seismic activity) have been variable. Some seals entered the water, and some seals remained in the lair (Kelly et al. 1988). 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). Additionally, it is not unusual to find up to three birth lairs within 328 ft (100 m) of each other, probably made by the same female seal, as well as one or more haul out lairs in the immediate area (Smith et al. 1991). If a ringed seal mother perceives the acoustic transmissions as a threat, the network of multiple birth and haul out lairs allows the mother and pup to move to a new lair (Smith and Hammill 1981; Smith and Stirling 1975). However, the acoustic transmissions associated with the Proposed Action are unlike the low-frequency sounds and vibrations felt from approaching predators. The acoustic transmissions 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 transmissions (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 or subnivean lair relatively easily without impacting their normal behavior patterns.

## 7.2 Conclusion

The Navy concludes that training and testing activities within the Study Area would result in Level B takes, as summarized in Table 5-1. . Based on best available science, the Navy concludes that exposures to the Arctic stock of ringed seals due to the Proposed Action would result in only short-term effects to most individuals exposed and likely would not affect annual rates of recruitment or survival. The Proposed Action is anticipated to have a negligible impact on the Arctic stock of ringed seals within the Study Area based on the following: (1) the life history information of ringed seals, (2) seal expected behavioral patterns in the Study Area, (3) the majority of modeled exposures resulting in temporary behavioral disturbance (Table 6-2), and (4) the application of mitigation procedures proposed in Section 11.

# SECTION 8 Anticipated Impacts on Subsistence Uses

The anticipated impact of the activity on the availability of the species or stock of marine mammals for subsistence uses.

Potential marine mammal impacts resulting from the Proposed Action will be minimal. The Proposed Action would occur outside of the primary subsistence use season (i.e., summer months), and the Study Area is seaward of known subsistence use areas.

Subsistence hunting is important for many of the Alaska Native communities. Studies of the North Slope villages of Nuiqsut, Kaktovik, and Barrow identified the primary resources used for subsistence to include terrestrial mammals (caribou [*Rangifer tarandus granti*], dall sheep [*Ovis dalli dalli*], moose [*Alces alces*], wolf [*Canis lupus*], and wolverine [*Gulo gulo*]), birds (geese [*Branta canadensis*], and willow ptarmigan [*Lagopus lagopus*]), fish (Arctic cisco [*Coregonus autumnalis*], Arctic char/Dolly Varden trout [*Salvelinus malma*], and broad whitefish [*Coregonus nasus*]), and marine mammals (bowhead whale [*Balaena mysticetus*], ringed seal, bearded seal, and walrus [*Odobenus rosmarus divergens*]) (Harcharek et al. 2018; Stephen R. Braund & Associates 2010, 2017). Of these species, only ringed seals would be located within the Study Area during the Proposed Action.

Ringed seals have historically been used as a primary source of food for dog teams (Gryba et al. 2021); this need has lessened with the introduction of snowmachines. Ringed seal meat is used to supplement bearded seal and other meat. Ringed seal hunting typically occurs during the summer months, though some hunting occurs year-round (Gryba et al. 2021). Harvest locations for ringed seals during winter typically occur within several miles of shore (Stephen R. Braund & Associates 2010). From 1985 through 2003, for years in which data were available, an average of 419 ringed seals were harvested per year for the villages of Barrow, Nuiqsut, and Kaktovik (Stephen R. Braund & Associates 2010). With the addition of the North Slope villages of Wainright, Point Lay, and Point Hope, an average of 1,099 ringed seals were harvested per year (Ice Seal Committee 2014). Based on estimates by Nelson et al. (2019), average regional subsistence harvest for the North Slope Borough is 1,146 ringed seals. The number of seals harvested in a given year can vary considerably, depending upon environmental conditions (e.g., ice cover).

The Study Area is at least 100 to 150 nm from land, well seaward of known subsistence use areas, and the Proposed Action would conclude prior to the start of the summer months, during which the majority of subsistence hunting would occur. In addition, the Proposed Action would not remove individuals from the population; there would be no impacts caused by this action to the availability of ringed seals for subsistence hunting. Therefore, subsistence uses of marine mammals would not be impacted by this action.

# SECTION 9 Anticipated Impacts on Habitat

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

Marine mammal habitat and prey species may be temporarily impacted by acoustic sources associated with the Proposed Action. The potential for acoustic sources to impact marine mammal habitat or prey species is discussed below.

## 9.1 Expected Effects on Habitat

The effects of the introduction of sound into the environment are generally considered to have a lesser impact on marine mammal habitat than the impacts from physical alteration of said habitat. Active acoustics from the Proposed Action would occur intermittently over four of the six week ICEX24 period. Acoustic transmissions are not expected to result in long-term physical alteration of the water column, as the occurrences are of limited duration and would occur sporadically. Acoustic transmissions also would have no impact to subnivean lairs in the ice because ice dampens acoustic transmissions (Richardson et al. 1995). The determination of temporary impacts to the physical environment includes minimal possible impacts to ringed seal habitat.

## 9.2 Effects on Marine Mammal Prey

### 9.2.1 Invertebrates

Marine invertebrates occur in the world's oceans, from warm shallow waters to cold deep waters, and they 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 (benthic, pelagic, and sympagic [within the sea ice]) of the Beaufort Sea (Josefson et al. 2013; Sutton et al. 2020). The diverse range of species include oysters, crabs, worms, shrimp, snails, sponges, sea fans, isopods, and stony corals (Chess and Hobson 1997; Dugan et al. 2000; Proctor et al. 1980; Sutton et al. 2020).

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 (Charifi et al. 2017; 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). Studies on mollusks have also indicated that they may hear only low-frequency sources (Charifi et al. 2017; Ellers 1995). 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 to 60 Hz) to high-frequency signals (20 to 55 kHz) (Henninger and Watson 2005; Jézéquel et al. 2022; Patek and Caldwell 2006; Staaterman et al. 2016).

Aquatic invertebrates sense motion with ciliated cells and/or statocysts, as some invertebrates can have both (Charifi et al. 2017; Solé et al. 2018). Aquatic invertebrates that can sense local water movements with ciliated cells include cnidarians, flatworms, segmented worms, urochordates (tunicates), cephlapods, mollusks, and arthropods (Budelmann 1992a, 1992b; Popper et al. 2001; Solé et al. 2018). 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, crustaceans, and mollusks, to be sensitive to water particle movements associated with sound (Charifi et al. 2017; Dinh and Radford 2021; Goodall et al. 1990; Hu et al. 2009; Kaifu et al. 2008; Popper et al. 2001; Radford et al. 2022). 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 generally identify behavioral responses. Non-auditory injury, PTS, TTS, and masking studies have been rare 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 (Dinh and Radford 2021; Goodall et al. 1990; Lovell et al. 2005; Lovell et al. 2006; Radford et al. 2022). Most cephalopods and mollusks likely sense low-frequency sound below 1 kHz, with best sensitivities at lower frequencies (Budelmann 2010; Charifi et al. 2017; Ellers 1995; Mooney et al. 2010; Offutt 1970; Putland et al. 2023). A few cephalopods may sense higher frequencies up to 1.5 kHz (Hu et al. 2009). Furthermore, recent auditory evoked potential recordings for hummingbird bobtail squid (*Euprymna berryi*) indicate TTS to be induced by vessel sound exposure in juveniles (at 400 to 800 Hz), mid-adults (at 200 to 500 Hz), and late-adults (at 200 to 600 Hz) (Putland et al. 2023).

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. Mobile marine invertebrates capable of sensing sound may alter their 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.

### 9.2.2 Fish

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, not all species are known to occur in the Arctic waters of the Beaufort Sea. A near-shore study of the central Beaufort Sea near Prudhoe Bay, Alaska recorded 24 different fish species (Priest et al. 2018), while a study located on the Canadian Beaufort shelf identified 70 to 86 different fish species (Majewski et al. 2016). 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. 2013; 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 similarly to 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; Popper et al. 2019). 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; Popper et al. 2019). 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 a little over 100 of the 32,000 fish species (Ladich and Fay 2013), 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; Popper et al. 2019). 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 (Popper and Hawkins 2019). 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; Putland et al. 2019; 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, "freezing" and staying in place, or scattering (Popper 2003; Putland et al. 2019). Auditory masking also could 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; Putland et al. 2019). If an individual fish comes into contact with low-frequency acoustic transmissions and is able to perceive the transmissions, it would be 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.

## 9.3 Conclusion

Based on the discussion above, the proposed activities would not result in any permanent impact on habitats or prey sources (e.g., fish and invertebrates) used or consumed by ringed seals.

# SECTION 10 Anticipated Effects of Habitat Impacts on Marine Mammals

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

While ringed seals may be encountered feeding in the Study Area, the Proposed Action would not be expected to have any habitat-related effects that could cause significant or long-term consequences for individual ringed seals, or their populations, because operations would be limited in duration. There would not be any expected habitat-related effects from acoustic transmissions associated with the Proposed Action that could impact subnivean lairs, the primary habitat of ringed seals. Based on the discussions in Section 9, there will be no loss or modification of ringed seals' prey or prey habitat, and as a result, no impacts to marine mammal populations would be expected.

# SECTION 11 Mitigation Measures to Protect Marine Mammals and Their Habitat

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Both standard operating procedures and mitigation measures would be implemented during the Proposed Action. Standard operating procedures serve the primary purpose of providing for safety and mission success, and they are implemented regardless of their secondary benefits (e.g., to a resource), while mitigation measures are used to avoid or reduce potential impacts. Even though not all of the standard operating procedures and mitigation measures listed below are applicable to reduce impacts to ringed seals, they were included for completeness.

While the Proposed Action would utilize both standard operating procedures and mitigation measures in a variety of manners, the activities using active acoustics would utilize passive acoustic listening. Submarines conducting training activities would utilize passive acoustic sensors to listen for vocalizing marine mammals, and active transmissions would be halted in the event that vocalizing marine mammals are detected.

Additional mitigations were considered for testing activities; however, because those activities that result in exposures to marine mammals occur under the ice, there are no methods to visually or acoustically monitor the area. Therefore, no additional mitigation is feasible.

## 11.1 Standard Operating Procedures

The following procedures would be implemented:

- The location for any air-dropped equipment and material would be visually surveyed prior to release of the equipment/material to ensure the landing zone is clear. Equipment and materials would not be released if any animal is observed within the landing zone.
- Air drop bundles would be packed within a plywood structure with honeycomb insulation to protect the material from damage.
- Spill response kits/material would be on-site prior to the air-drop of any hazardous material (e.g., fuel).

## 11.2 Mitigation Measures

In addition to the standard operating procedures above, the following mitigation measures would be implemented to reduce or avoid potential harm to marine resources:

- Submarines would utilize passive acoustic sensors to listen for vocalizing marine mammals for 15 minutes prior to starting active acoustic transmissions. Submarine active transmissions would be halted in the event vocalizing marine mammals are detected and would not restart acoustic transmissions until 15 minutes have passed with no marine mammal detections.
- Passengers 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 snow drifts near pressure ridges, which are preferred areas for subnivean lair development.
- Camp development is scheduled to begin mid-February and would be completed well before ringed seal pupping season begins. This allows ringed seals to avoid the camp area prior to pupping, further reducing potential impacts.
- The camp and runway would be established on first-year and multi-year ice in areas without pressure ridges.
- Camp deployment would begin mid-February and be gradual, with activity increasing over the first five days and would be completed by March 15, 2024.
- All material (construction material, unused food, excess fuel) and wastes (solid waste, hazardous waste) would be removed from the ice floe upon completion of ICEX24.
- Dish soap would be selected from the U.S. Environmental Protection Agency's "Safer Choice" list.
- All cooking and food consumption would occur within designated facilities to minimize attraction of nearby animals.
- Fixed wing aircraft would operate at highest altitudes practicable taking into account safety of personnel, meteorological conditions and need to support safe operations of a drifting ice camp. Aircraft would not reduce altitude if a seal is observed on the ice. In general, cruising elevation will be 457 m (1,500 ft) or higher.
- Unmanned Aircraft Systems (UASs) would maintain a minimum altitude of at least 15.2 m (50 ft) above the ice and would not be used to track or follow marine mammals.
- Helicopter flights would use prescribed transit corridors when traveling to/from Prudhoe Bay and the ice camp. Helicopters would not hover or circle above or within 457 m (1,500 ft) of groups of marine mammals.
- Aircraft would maintain a minimum separation distance of 1.6 km (1 mi) from groups of 5 or more seals.
- Aircraft will not land on ice within 800 m (0.5 mi) of hauled-out pinnipeds.

# SECTION 12 Mitigation Measures to Protect Subsistence Uses

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation (POC) or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses.

The Proposed Action takes place a significant distance seaward of any known subsistence hunting activities. Furthermore, the Proposed Action would occur for a brief period of time outside of the subsistence hunting season. Based on the results from the acoustic analysis (see Section 6.4), no mortality of ringed seals are expected, eliminating the possibility of removal of individual ringed seals from the population that could impact Alaska Native harvests. The Navy plans to provide advance public notice to local residents and other users of the Prudhoe Bay region of Navy activities and measures used to reduce impacts on resources. This will include notification to local Alaska Native tribes that may have members who hunt marine mammals for subsistence. Though ringed seals are used for subsistence off the North Slope of Alaska, the Study Area is seaward of all subsistence hunting areas. If any tribe expresses concerns regarding project impacts to subsistence hunting of marine mammals, further communication between the Navy and the tribe will take place, including provision of any project information and clarification of any mitigation and minimization measures that may reduce impacts to marine mammals.

# SECTION 13 Monitoring and Reporting

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

## 13.1 Monitoring Plan

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 has been developed in direct response to Navy permitting requirements established in various MMPA Final Rules, ESA consultations, Biological Opinions, 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. ICEXs, in comparison, are short duration exercises that occur approximately every other year. Additionally, due to the location and expeditionary nature of the ice camp, the number of personnel 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. However, the Navy is still committed to increasing knowledge of the Arctic environment, and though the United States Fleet Forces has not funded any individual projects since 2018, other Navy commands, such as the Office of Naval Research, continues to fund projects in the Arctic region.

## 13.2 Reporting

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 ICEX24 activity, the Navy will immediately halt the activity and report the incident consistent with the stranding and reporting protocol in the AFTT stranding plan. This is consistent with other Navy documents, such as the HSTT Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement.

# SECTION 14 Suggested Means of Coordination

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

The Navy strives to be a world leader in marine species research and has provided more than $100 million over the past five years to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to increase the understanding of marine species physiology and behavior.

The Navy sponsors 70 percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported research include the following:

- Gaining a better understanding of marine species distribution and important habitat areas
- Understanding the consequences of disturbance to marine populations
- Understanding the effects of sound on marine mammals
- Developing tools to model and estimate potential effects of sound

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and outside research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods into Navy activities. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential monitoring tool. Overall, the Navy will continue to research and contribute to academic research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include monitoring programs, data sharing with NMFS from research and development efforts, and future research as previously described.

The Navy does not anticipate any marine mammal specific research conducted in conjunction with the Proposed Action. However, the Navy is currently developing marine mammal species density models for the Arctic region to assist with Navy environmental planning, and those density models will be available to other entities once finalized. Additionally, numerous environmental and climatological studies are conducted during ICEX that increase the scientific community's understanding of the Arctic region, and that information is freely available as well.

# SECTION 15 List of Preparers

| *Name* | *Role* | *Education and Experience* |
|---|---|---|
| **Naval Undersea Warfare Center, Division Newport** | | |
| Code 1023, Environmental Branch, Mission Environmental Planning Program | | |
| Emily Robinson | Project Lead; Project Coordination; Document Development | Masters of Environmental Science and Management; B.S. Integrated Science and Technology; Experience: 9 years Environmental Planning |
| **McLaughlin Research Corporation** | | |
| Kayla Anatone-Ruiz | Document Development | Ph.D. in Biology; Masters of Environmental Science and Management Wetlands Biology; B.S. in Environmental Science; Experience: 1 year Environmental Planning, 10 years Biological Research |

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