PROTECTED SPECIES MITIGATION AND MONITORING FINAL REPORT

THwaites Offshore Research (THOR) Project onboard the *R/V Nathaniel B Palmer* in the Amundsen Sea, Antarctica

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Contents

Tables

Figures

Appendices

1 EXECUTIVE SUMMARY

The National Science Foundation (NSF), through the United States Antarctic Program (USAP), conducted a two-dimensional low-energy seismic survey in International Waters in the Amundsen Sea off the coast of Antarctica. The NSF's action was a collaborative multidisciplinary component of the joint initiative by the National Science Foundation and the United Kingdom Natural Environment Research Council to study the Thwaites Glacier system. The RVIB *Nathaniel B. Palmer*, which is owned by Offshore Vessel Services LLC and is operated by the Galliano Marine Service LLC, was chartered by the NSF to support the U.S. Antarctic Program. A seismic airgun array, single-beam echosounder, split-beam echosounder, multibeam echosounder, and an acoustic doppler current profiler were deployed as energy sources. The NSF also conducted icebreaking operations on the RVIB *Nathaniel B. Palmer*.

The low-energy seismic survey focused on the seafloor offshore from Thwaites Glacier and Pine Island Glacier. It also included records of past glacial and ocean change contained in sediments deposited by the glacier and surrounding ocean. The purpose of the survey was to collect data that will facilitate more accurate projections of ice loss and sea level rise originating from Thwaites Glacier in West Antarctica.

The National Science Foundation's THwaites Offshore Research (THOR) Project will complement Thwaites Glacier and other Amundsen Sea oceanographic and geological/geophysical studies and provide reference data that can be used to initiate and evaluate the reliability of ocean models. Data obtained by the survey will assist in establishing boundary conditions seaward of the Thwaites Glacier grounding line, elucidating external drivers of change, improving knowledge of processes leading to the collapse of Thwaites Glacier, and determining a history of past change in grounding line migration and conditions at the glacier base.

The *Nathaniel B. Palmer* departed Punta Arenas, Chile on 25 January 2020 and returned to port on 28 March 2020, covering a transit to the survey area and back of approximately 3,445 kilometers (1,860 nautical miles).

The seismic survey activities occurred 08 – 10 February 2020 and then resumed operations from 24 - 25 February 2020. Seismic operations involved 50 hours and 39 minutes of production operations. During the operations, five hours and 13 minutes of full power during line changes; fifteen minutes of ramp-ups and two minutes of source testing.

This report serves to comply with the reporting obligations for the survey required pursuant to the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). On 11 October 2019, the National Marine Fisheries Service (NMFS) received a revised biological assessment and incidental harassment authorization (IHA) application and take estimates from the NSF. On 23 January 2020, NMFS issued a Biological Opinion (BO) determining that the only potential stressor that is likely to affect ESA-listed species within the action area are sound fields produced by the seismic airgun array and icebreaking. NMFS also resolved that these stressors are not likely to adversely affect the Southern right whales, but it may adversely affect other species (blue whales, fin whales, sei whales and sperm whales) by introducing acoustic energy into the marine environment.

The NSF and NMFS Permits and Conservation Division estimated the exposure to sounds from the airgun array and icebreaking activities will result in a take (as defined under the MMPA) for all marine mammal species including those listed under the ESA. For Level B harassment under the MMPA and behavioral responses under the ESA, NMFS has historically relied on an acoustic threshold for 160 dB re: 1 µPa (rms) for impulsive sound sources like the seismic source and 120 dB re: 1 µPa (rms) for non-impulsive sound sources like icebreaking. These values are based on observations of behavioral responses of mysticetes, but is a standard used for all marine mammal species. For the proposed action, NMFS Permits and Conservation Division continued to rely on this historic acoustic threshold to estimate the number of takes by MMPA Level B harassment, and accordingly, takes of marine mammals proposed in the IHA for airgun array operations during low-energy seismic survey and icebreaking. On 24 October 2020, an IHA and an Incidental Take Statement (ITS) were issued for the project, authorizing the level B taking of the ESA-listed species (blue whales, fin whales, sei whales and sperm whales) and all other marine mammal species common to the Antarctic region. The number of takes authorized for this project are listed in Table 17.

RPS was contracted to provide continuous protected species observation coverage and to fulfil the environmental regulatory requirements and reporting mandated by NMFS in the IHA. Three PSOs were present on board the NBP throughout the survey.

Mitigation measures were implemented to reduce potential for injury or harassment to marine mammals protected under the ESA and MMPA. These measures included, but were not limited to, the use of NMFS approved Protected Species Observers (PSOs), the establishment of a 200 meter buffer zone from the seismic

source (where operators were alerted to the presence of the animal(s)), a 500 meter exclusion zone from the seismic source (where the source would be delayed or shut-down depending on the species present and some other special conditions), a 100 meter exclusion zone from the seismic source (where the source would be delayed and shut-down also depending on the species present) and the implementation of ramp-up procedures.

Over the course of the survey program, PSOs conducted visual monitoring for a total of 1062 hours 38 minutes. Of that total monitoring time, 507 hours and 55 minutes were during transit, 259 hours and 17 minutes were while the vessel was stationary, 207 hours and 56 minutes were during icebreaking maneuvers and 87 hours and 30 minutes were during seismic operations (including the time of deployment and retrieval of the acoustic source).

The acoustic source was active for a total of 56 hours and nine minutes during the survey program, which occurred during 5% of the total visual monitoring effort.

There was a total of 526 visual detections of marine mammals during the survey program. Visual detections consisted of 92 detections of whales, one detection of a beaked whale, eight detections of dolphins, and 430 detections of pinnipeds. There were four positive identified species of whales, one species of beaked whale, three species of dolphins and eight species of pinnipeds. Of the total detections, four sightings included more than one species. In these situations of multiple species observed simultaneously have the same detection number even though they were recorded separately.

There were two detections that resulted in the implementation of mitigation actions during the survey program, including a delay to initiation of the source and a shutdown of the source. Additionally, there were 21 strike avoidance maneuvers undertaken during the survey program; nine maneuvers were implemented for whale species and 12 for pinnipeds.

A total of 39 marine mammals were observed within the predicted 160 decibel radius of 976 meters (where there is a potential for a behavioral response), constituting Level B takes during seismic activities. This total included 36 crabeater seals and three Antarctic Minke whales. Additionally, there were a total of 508 marine mammals observed within the predicted 120 decibel radius of 6100 meters (where there is a potential for a behavioral response), constituting Level B takes during icebreaking operations. This total included 474 crabeater seals, 16 Antarctic Minke whales, 15 Weddell seals, two leopard seals and one southern elephant seal.

A summary sheet of observation, detection, and operational totals for the survey program can be found in Appendix B.

2 INTRODUCTION

The following report details the protected species monitoring and mitigation as well as seismic survey operations and icebreaking activities undertaken for a two-dimensional low-energy seismic survey on board the *RVIB Nathaniel B. Palmer* in the Amundsen Sea off Antarctica from 25 January to 28 March 2020.

This document serves to meet the reporting requirements in the IHA and ITS issued to NSF on 24 October 2020. The IHA and ITS authorized "takes" of Level B harassment of specific marine mammals, incidental to the marine seismic survey and Icebreaking activities. NMFS has stated that marine mammals receive sound levels equal to or greater than 160 dB re 1 µPa (root mean square (rms)) or 120 dB re: 1 µPa (rms) for the airgun array and icebreaking sound sources respectively. These sound levels could potentially disturb marine mammals, temporarily disrupting behavior, such that they could be considered non-lethal 'takes' (Level B harassment).

NMFS requires provisions such as exclusion zones (EZ), delayed operations, ramp-ups and shut-downs to be implemented to mitigate for potentially adverse effects of the seismic source on protected species. A 200-meter buffer zone, a 500-meter exclusion zone and a 100-meter exclusion zone were established from the acoustic source array as areas where the presence of a marine mammal would trigger the implementation of a mitigation action. These included delayed operations for all three zones, a shut-down of the acoustic source for the 500-meter EZ (depending on the species and special conditions– see Section 3.1) and a shut-down of the acoustic source for the 100-meter EZ.

The 100-meter exclusion zone is intended to be precautionary it will be expected to contain sound exceeding the injury criteria for all cetacean hearing groups (based on the dual criteria of SELcum and peak SPL), while also providing a consistent, reasonably observable zone within which protected species observers will typically be able to conduct effective observational effort. In this case, the 100-meter radial distance is expected to contain sound levels that will exceed the harm (MMPA Level A harassment) threshold based on cumulative sound exposure level criteria for all marine mammal hearing groups. In the 2011 *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (USGS and NSF 2011), Alternative B (the Preferred Alternative) conservatively applied a 100-meter exclusion zone for all low-energy sound sources in water depths greater than 100 meters (328.1 feet), with low-energy sound sources defined as any towed acoustic source with a single or a pair of clustered airguns with individual volumes of less than or equal to 250 cubic inches. Thus, the 100-meter exclusion zone proposed for this low-energy seismic survey is consistent.

2.1 Project Overview and Location

The survey program consisted of a two-dimensional low-energy seismic survey as well as icebreaking activities in International Waters in the Amundsen Sea off Antarctica between approximately 75.25 to 73.57 degrees South, and 101 to 108.5 degrees West. The low-energy seismic survey focused on the seafloor offshore Thwaites Glacier and Pine Island Glacier and utilized past records of glacial and ocean change contained in sediments deposited by the glacier and surrounding ocean. The purpose of the survey was to collect data that will facilitate more accurate projections of ice loss and sea level rise originating from Thwaites Glacier in West Antarctica.

The seismic survey occurred in international waters between approximately 75.07 to 74.04 degrees South, and 100.8 to 104.5 degrees West, just north (seaward) of the Thwaites Glacier and Pine Island Glacier, in waters depths ranging from approximately 497 meters to 6077 meters. The survey consisted of 17 lines totaling 460.3 kilometers of transect lines surveyed (Figure 1).

All seismic survey operations, including deployment and retrieval of the seismic equipment, were conducted solely by the RVIB *Nathaniel B. Palmer*. The vessel is 93.9 meters (308 feet) long, 18.3 meters (60 feet) at the beam, and a design draft of 6.8 meters (22.3 feet). Its propulsion system consists of four Caterpillar Model 3608 diesel engines, each producing 3,300 brake horsepower at 900 revolutions per minute, and a water jet bowthruster. Electrical power is provided by four Caterpillar 3512, 1050-kilowatt diesel generators. The *Palmer's* cruising speed was approximately 10 to 11 knots during transits and varied between four to six knots during the seismic surveys. Seismic acquisition was conducted in two stages, the first was between 08 to 10 February followed by the second from 24 to 25 February 2020.

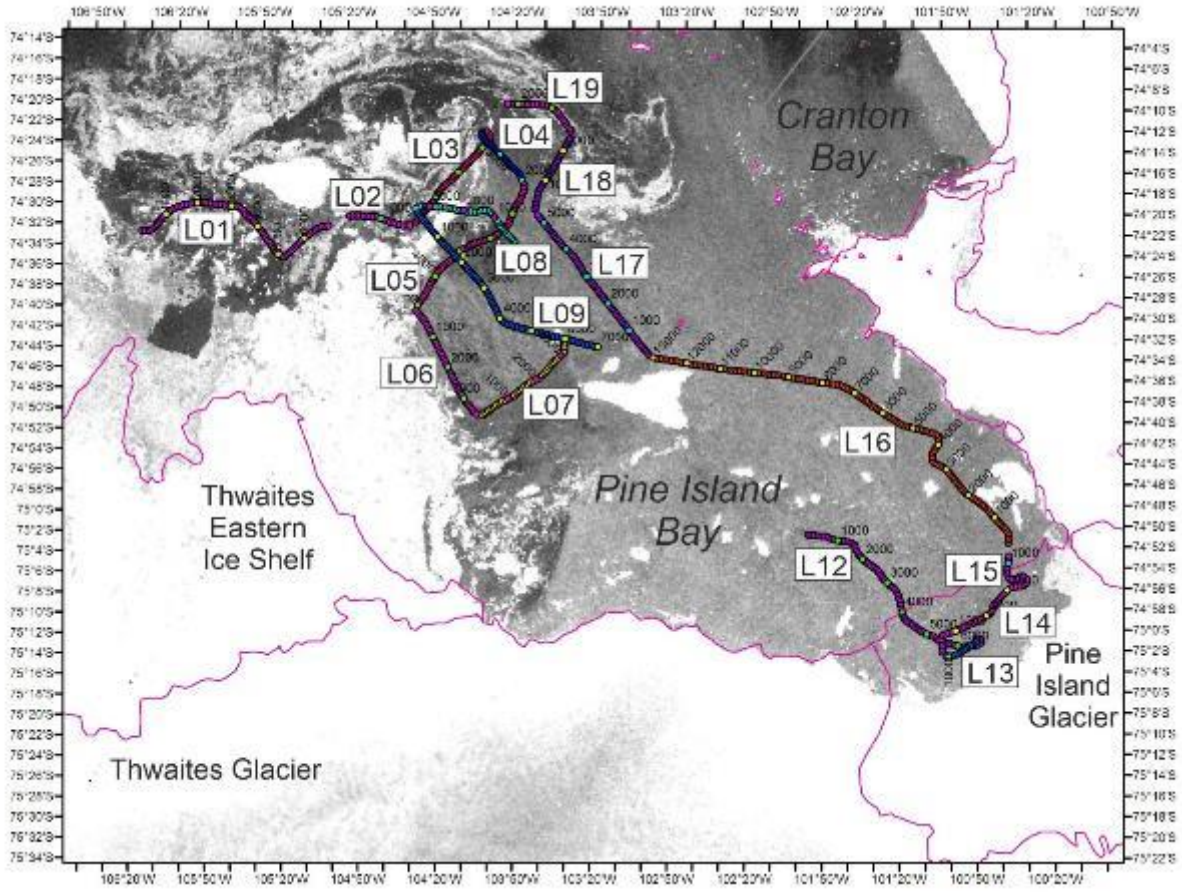


Figure 1. Location and survey lines of the Antarctic Seismic Survey.

2.2 Acoustic Sources

The energy source for the low-energy seismic survey was chosen by NSF to be the lowest practical to meet the scientific objectives and consisted of one towed array with two source elements deployed astern of the vessel.

The source array utilized two GI guns, true GI mode elements of 150 cubic inches (in^3) each, with an operating pressure of 2000 psi. The total volume of the seismic source array with the two source elements active was 300 in^3. Each discharge of the source consisted of a single brief pulse of sound (duration of approximately 0.1 second) with the greatest energy output occurring in the two to 200 hertz frequency range.

The source elements were towed at a depth of three meters. The center of the source was situated 135 meters from the Navigational Reference Point (NRP), which was located on the PSO observation Tower during the first phase of the survey (08 through 10 February) and 150 meters from the NRP during the second phase of the survey (24 through 25 February). This location positioned the first elements on the arrays approximately 70 and 85 meters from the stern of the vessel during the first and second phase respectively.

The shot point interval for this survey was 12.5 meters. During acquisition, the source elements would emit a brief pulse of sound every five seconds.

The receiving system for the survey program consisted of a single Geometrics GeoEel (solid) streamer of 250 meters in length. As the acoustic source array was towed along the track lines, the hydrophone streamer received the returning acoustic signals and transferred the data to the on-board processing system.

3 MITIGATION AND MONITORING METHODS

The PSO monitoring program on the NBP was established to meet the IHA requirements that were issued to the NSF by NMFS, which included both monitoring and mitigation objectives. The survey mitigation program is designed to minimize potential impacts of the NBP's seismic program and icebreaking on marine cetaceans and pinnipeds. The following monitoring protocols were followed to meet these objectives.

- Visual observations were established to provide real-time sighting data, allowing for the implementation of mitigation procedures as necessary.
- Ascertain the effects of marine cetaceans and pinnipeds exposed to sound levels constituting a "take".

In addition to the mitigation objectives outlined in the IHA, PSOs collected and analyzed necessary data mandated by the IHA.

3.1 Mitigation Methodology

Mitigation actions were implemented for visual detections of marine mammals. These actions included the establishment exclusion zones (EZ), and the implementation of delayed operations and shut-downs (during which the source was fully silenced) for protected species detected approaching, entering, or within the designated EZ.

There were two exclusion zones around the acoustic sound source for the implementation of the mitigation actions:

- ***500m*** for all beaked whales, Southern Right whale, all large whales with calf (sperm whales and baleen whales) and an aggregation of six or more large whales.
- ***100m*** for all other marine mammals.

Additionally, during the pre-search periods, a buffer zone of 100 meters for sightings of large whales (adults and less than six at a time), dolphins and pinnipeds.

Before the acoustic source could be activated from silence, two PSOs conducted a 30-minute clearance survey of the buffer and exclusion zones. In the event of a detection of protected species, a delay of source operations would be implemented if: (1) a marine mammal was detected approaching, entering, or within the corresponding EZ. Source operations would not be cleared to begin until the protected species were observed exiting their designated zones. If the animals were not observed leaving their designated zones (i.e. if they dove within the zone and were not re-sighted), operations would not be cleared to begin until a specific time had elapsed following the final detection of the animals. For detections of small odontocetes and pinnipeds, this time was 15 minutes following last sighting. For detections of any other marine mammal like mysticetes and large odontocetes, this time was 30 minutes following last sighting.

To initiate the acoustic source, a ramp-up was required. By requirement, a ramp-up consisted of each gun turned on at five minute intervals. As this project operated with only two elements, ramp-ups had a duration of five minutes.

Once the acoustic source was active, the 200-meter buffer zone from any element on the acoustic source arrays was established as an area in which the presence of marine mammals would initiate an alert to the seismic operators that the animal was detected and that the implementation of a mitigation action may soon be required. PSOs would keep in frequent contact with the seismic team, relaying information on the location and movement of the animal(s), and the implementation of any needed mitigation actions.

The 500-meter exclusion zone from any element on the acoustic source array was established as the area in which the presence of all beaked whales, Southern Right whale, all large whales with calf (sperm whales and baleen whales) and an aggregation of six or more large whales, observed approaching, entering, or within the zone would initiate a shut-down of the acoustic source. The 100-meter EZ from any element on the source array was established as the area in which the presence of any other marine mammal, entering, or within the zone would initiate a shut-down of the source.

Once the acoustic source had been shut-down for a detection of a protected species, the source had to remain silent until the marine mammal had been observed exiting its EZ or following a 30-minute clearance period with no further sightings, at which point a ramp-up was required.

Table 1 describes the various predicted safety radii applied to the protected species of cetaceans and pinnipeds for Level B harassment zones during the survey. Upon a detection within these radii while the acoustic source was active, PSOs would take count of the number of animals exposed to this level B threshold to ensure none of the species would exceed the number of allowed level B takes. Upon a sighting of a protected species were takes were not allowed, a shutdown of the acoustic source had to be implemented before the animal entered the level B harassment zones.

Table 1. Mitigation radii

Source and Volume	Tow Depth (m)	Water Depth (m)	Predicted 160 re 1uPArms (m) isopleth
2x45/105in3 (300in3) GI guns*	3	<100-1000	979
		>1000	653
1x45/105in3 (150in3) GI guns	3	<100-1000	503
		>1000	335
2x105/105in3 (420in3) GI guns	3	<100-1000	1044
		>1000	696
1x105/105in3 (210in3) GI guns	3	<100-1000	531
		>1000	354

*Source volume used during the most part of seismic operations.

Upon the visual detection of a protected species during icebreaking operations, the PSOs would identify the animal's range to the vessel while identifying the observed animal (cetacean or pinniped) to keep count of the level B takes, which would be added to the number of takes accounted for during seismic operations to make sure none of the species would exceed the number of allowed level B takes.

3.2 Visual Monitoring Survey Methodology

There were three trained and experienced PSOs on board to conduct the monitoring for marine mammals, record and report on observations, and request mitigation actions in accordance to the IHA. The PSOs on board were NMFS-approved and held certifications from a recognized Joint Nature Conservation Committee (JNCC) training program and/or a Bureau of Safety and Environmental Enforcement (BSEE) approved Gulf of Mexico Protected Species Observer program.

Visual monitoring was primarily carried out from the ice tower located 26.8 meters above the water surface, which allowed a 360° viewpoint around the acoustic source (Figure 2).

Figure 2. Protected Species Observer view from the ice tower.

Each PSO was equipped with 7x50 reticle binoculars. Inside the tower, there was a telephone and a radio for communications with the bridge or dry lab. There was also a monitor that displayed current information about the vessel's position, speed, and heading, along with water depth, wind speed and direction, and temperature. Environmental conditions along with vessel and acoustic source activity were recorded at least once an hour, or every time there was a change of one or more of the variables or any detections. Most observations were made from the tower; however, during severe weather or at other moments, observations would be conducted from the bridge or the catwalk (both approximately 15.8 meters above sea level).

Visual monitoring methods were implemented in accordance with the survey requirements outlined in the IHA and ITS. One PSO always watched for marine species during daylight periods during non-seismic operations and while the acoustic source operated.

When the acoustic source was activated from silent, PSOs maintained a two-person watch for 30 minutes prior to the activation of the source and until ramp-ups were completed. Monitoring was conducted each day during the periods of day light, which lasted up to 24 hours during part of the survey program.

A visual monitoring schedule was established by the PSOs where each person completed visual watches of varying lengths between one to four hours, two to three times a day, for a total of five to eight hours of visual monitoring per day. This schedule was arranged to ensure that there was at least one PSO on visual observation duty at all times except during meetings, drills or trainings that were held during non-seismic or non-icebreaking operations.

Since the ice tower allowed a 360-degree view, PSOs searched for blows or fins indicating the presence of a marine mammal, splashes or disturbances to the sea surface, the presence of large flocks of feeding seabirds and other sighting cues indicating the possible presence of a protected species.

Upon the visual detection of a protected species during seismic operations, PSOs would first determine the animal's range to the acoustic source while identifying the observed animal (cetacean or pinniped) to determine which exclusion zone applied to the animal. Range estimations were made using reticle binoculars, the naked eye, and by relating the animal to an object at a known distance, such as the acoustic array located 75 meters astern of the vessel. The PSOs would then notify the main science lab that there was an animal inside or outside of the exclusion zone. If the animal was observed inside the exclusion zone and a mitigation action was necessary, it was immediately implemented.

After every detection, PSOs recorded the following information for each protected species detection:

I. Species, group size, behavior, pace, heading (initial and final), direction of travel (towards or away from the vessel, parallel in same or opposite direction), bearing and distance from the vessel, sighting cue, visual description (features such as overall size; shape of head; color shape and position of dorsal fin; shape of blow, etc.).
II. Time, location, heading, speed, activity of the vessel (including number of source elements operating and whether in state of ramp-up or power-down), Beaufort Sea state and wind speed, visibility, and sun glare.
III. Time and distance of closest approach to the source, time when entering and exiting the predicted exclusion zone, type of mitigation action implemented, total time of production loss due to the mitigation action and avoidance maneuvers conducted.

During or immediately after each sighting event PSOs recorded the event per the requirements of the IHA and ITS. Each sighting event was linked to an entry on a datasheet such that environmental conditions and vessel activity are available for each one.

Specific species identifications were made whenever distance, length of sighting and visual observation conditions allowed. PSOs observed anatomical features of animals sighted with the naked eye and through the reticule binoculars and noted behavior of the animal or group. Photographs were taken whenever possible during detections, although in some cases photographs were not taken due to the brevity of a sighting. The cameras used were Sony Cybershot 50x optical zoom, Nikon DSLR D3400 with one 28-300-millimeter lens and one 200-500-millimeter telephoto lens, Canon EOS 200D with a 55-250-millimeter telephoto lens. Marine mammal identification books and manuals were consulted, and photos were examined during observation breaks to confirm identifications.

4 MONITORING EFFORT SUMMARY

4.1 Survey Operations Summary

4.1.1 General Survey Parameters

The THwaites Offshore Research (THOR) seismic survey program was conducted in two separate phases (Table 2). The dates and times of acquisition for each survey line can be found in Appendix C.

Table 2: Survey parameters of the program

Survey Parameter	Date	Time (UTC)	Location
Mobilization	25/01/2020	16:00	Punta Arenas
First Source Activity	08/02/2020	07:59	
Start of Acquisition	08/02/2020	10:50	
End of Acquisition	10/02/2020	03:23	
Second Source Activity	24/02/2020	12:49	
Start of Acquisition	24/02/2020	13:58	
End of Acquisition	25/02/2020	14:42	
Demobilization	28/02/2020	14:00	Punta Arenas

Acquisition continued according to the survey plan and survey operations were only suspended when operationally necessary, as outlined in Table 3. The source was silenced on three occasions, the first two were related to the seismic source and the third shutdown was for a protected species mitigation action.

Table 3: Suspension of survey operations

Date	Time Source silenced (UTC)	Time source initiated again (UTC)	Reason for Interruption in Acquisition
08-Feb-2020	**15:42**	**16:03**	**Source calibration**
09-Feb-2020	**06:38**	**18:27**	**Source malfunction**
24-Feb-2020	**22:48**	**22:49**	**Mitigation shutdown (VD#266)**

4.1.2 Acoustic Source Operations

The acoustic source was active for a total of 56 hours and nine minutes throughout the survey program. This total includes ramp-up of the acoustic source, full and reduced volume operations on a survey line, full and reduced volume operations not on a survey line and testing of the acoustic source elements.

By requirement, ramp-ups consisted of each gun turned on at five-minute intervals. As this project operated with only two elements, ramp-ups had a duration of five minutes each. The acoustic source was ramped-up three times over the course of the survey program to commence full volume operations from silent or resume full volume operations after a shut-down, totaling 15 minutes. All of the ramp- ups were cleared and monitored

by two PSOs per the survey requirements. Table 4 summarize the acoustic source operations over the course of the survey program.

There was one source testing during the survey program, totaling two minutes. This was a single gun test.

Of the remaining time of source operation, 22 hours and 13 minutes were on a reduce volume with only a single gun active (150db) and the other 33 hours and 39 minutes were at full volume with both guns active (300db), totaling 55 hours and 52 minutes. Of this time, 50 hours and 39 minutes were while on a survey line, and five hours and 13 minutes were while not on a survey line.

Seven of the survey lines were acquired with only one of the elements (150db), and the other 11 survey lines were acquired at a full volume of 300db. The change in the source volume was related to a malfunctioning on the element.

Table 4: Total acoustic source operations

Acoustic Source Operation	Duration
Source Tests	00:02
Ramp-up	00:15
Day-time ramp-ups from source silence	00:15
Night-time ramp-ups from source silence	00:00
Full 300 in^3/ Volume on a Survey Line	31:58
Full 300 in$^{3)}$/ Volume not on a Survey Line	01:41
Reduce 150 in^3/ Volume on a Survey Line	18:41
Reduce 150 in$^{3)}$/ Volume not on a Survey Line	03:32
Total Time Acoustic Source Was Active	**56:09**

The geospatial data for source operations conducted during seismic survey of the program can be found in Figure 1 and appendix C.

4.1.3 Interactions with Other Vessels

PSOs also observed and documented interactions with other marine vessel traffic. Eight other vessels were observed in the vicinity of the *RVIB Nathaniel B. Palmer*, including one cargo vessel, two passenger cruise ships, four fishing vessels and one research vessel. These vessels had an average closest distance of 2,075 meters to the *Nathaniel B. Palmer*, ranging between 500 and 8,000 meters. Table 5 lists the number of each vessel type observed as well as the closest, farthest, and average distances of each vessel type to the *Nathaniel B. Palmer*.

The majority of the vessel interactions occurred as the *Nathaniel B. Palmer* transited to and from port and at the beginning and end of the survey program, with the exception of one research vessel and one fishing vessel. The Korean research vessel, RV *Araon,* was observed on 13 and 14 February 2020 in the vicinity of the survey area. On 13 February 2020, the *Nathaniel B. Palmer* received a distress call from the fishing vessel, *Nordic Prince,* which was trapped in the ice. The *Nathaniel B. Palmer* started its transit in response the distress call and arrived on 14 February 2020 to the area. The fishing vessel was escorted through the pack ice to open water. On 15 February 2020, the fishing vessel *Nordic Prince* was left near the Northern edge of the ice to continue its transit safely and the *Nathaniel B. Palmer* returned to the survey area to resume normal survey operations.

There were no occasions during the survey program where other vessels, or another vessel's gear/equipment, were observed having some type of interaction with the *Nathaniel B. Palmer*'s seismic gear.

Table 5: Interactions with other vessels

Vessel Type	Total Number Observed	Recorded Distance to the *NBP* (meters)		
		Average	Closest	Farthest
Cargo	1	3,500	2,000	5,000
Cruise	2	900	800	1,000
Fishing	4	1,750	500	3,000
Research	1	6,500	5000	8000

4.2 Visual Monitoring Survey Summary

Visual monitoring was conducted mostly by one PSO during all daylight hours throughout the survey program, starting when the vessel left the dock and terminating upon return to port upon completion of the survey. During most part of the survey program, monitoring was conducted up to 24 hours a day, as the daylight time was continuous. This included times when the vessel was in transit and deploying and retrieving equipment as well as while the vessel was stationary doing other non-seismic work. Visual monitoring during times with no source operations was conducted to collect baseline data about protected species abundance in the survey areas.

Visual monitoring was conducted over a period of 64 days for a total of 1062 hours 38 minutes. Of the overall total visual monitoring effort, 5% (56 hours 09 minutes) was when the acoustic source was active, and 95% (1006 hours 29 minutes) when the acoustic source was silent. Visual monitoring while the acoustic source was silent was mainly conducted during the transits to and from the survey sites, and during equipment deployment, recovery and maintenance. Table 6 details the visual monitoring effort with acoustic source operations throughout the survey program.

Table 6: Total visual monitoring effort

Visual Monitoring Effort	Duration (hh:mm)	% of Overall Visual Monitoring Effort
Total monitoring while acoustic source active	56.09	5
Total monitoring while acoustic source silent	1006.29	95
Total monitoring effort	**1062:38**	**100**

Preferred visual observations were conducted from the ice tower, which provided a 360-degree view of the water around the vessel and the acoustic source. Visual watches were conducted from other locations, the catwalk and the bridge, if monitoring conditions could not be undertaken from the tower. Monitoring in the tower was unsafe during rough weather and strong sea conditions. PSOs conducted visual monitoring from the tower (86%) and from the bridge (14%) more often than any other location. The majority of the monitoring from the bridge was conducted due to rough weather.

Table 7: Total visual monitoring effort from observation locations

Observation Location During Visual Effort	Duration (hh:mm)	% of Overall Effort
Tower	908:59	85.6
Bridge	150:56	14.2
Catwalk	02:43	0.2

4.3 Environmental Conditions

Environmental conditions can have an impact on the probability of detecting protected species in a survey area. The environmental conditions present during visual observations were generally considered to be excellent to moderate.

Visibility was divided in three categories: between six to nine kilometers, between two and five kilometers, and less than two kilometers. The majority of visual monitoring during the Antarctic Seismic Survey Program was undertaken while visibility was between six and nine kilometers, comprising 45.8% of the overall monitoring effort; 27.3% of the overall visual monitoring effort was undertaken when visibility ranged between two and five kilometers and 26.9% when visibility was less than two kilometers (Table 8).

Table 8: Visibility during the survey

Total	<2 km	2-5 km	6-9 km
Duration (HH:MM)	**285:33**	**290:08**	**486:57**
% of effort	**26.9**	**27.3**	**45.8**

Reduced visibility was mainly attributed to periods of fog and snow. There were also periods of reduced lighting before sunrise and after sunset, which increased five weeks into the survey as the summer came to an end. Precipitation was recorded during 25.2% of the overall visual monitoring effort, for a total of 267 hours and 37 minutes. The majority of the precipitation was fog (14.3%, 152 hours and 22 minutes), followed by light snow (7.2%, 76 hours and 42 minutes) (Table 9).

Table 9: Precipitation during the survey

Total	None	Light Rain	Heavy Rain	Light Snow	Heavy Snow	Snowstorm	Fog
Duration (HH:MM)	**795:01**	**14:26**	**02:18**	**76:42**	**11:58**	**09:51**	**152:22**
% of effort	**74.8**	**1.4**	**0.2**	**7.2**	**1.1**	**0.9**	**14.3**

During visual monitoring, the entire predicted 160 decibel radius was not visible for 153 hours and 27 minutes, the entire 500-meter exclusion zone was not visible for 56 hours and 38 minutes, the entire 200-meter buffer zone was not visible for two hours and 37 minutes, and the entire 100-meter exclusion zone was not visible for 49 minutes (Table 10). The majority of the time where one of these predicted radii were not fully visible occurred during extended periods of dense fog and light snow, as well as periods of reduced lighting during the dawn and dusk hours.

Table 10: Duration radii were NOT fully visible during the survey

Total	160 dB	500 m	200 m	100 m
Duration (HH:MM)	153:27	56:38	02:37	00:49
% of effort	71.9	26.5	1.2	0.4

The Beaufort Sea state recorded during visual monitoring ranged from level one to level seven over the course of the survey program. The majority of visual observations (733 hours 37 minutes, 69%), were when conditions with the Beaufort state at level one or two. These were considered excellent conditions for the detection of protected species. (Table 11).

Table 11: Beaufort Sea State during the survey

Total	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Duration (HH:MM)	454:15	279:22	177:02	85:43	47:22	17:08	01:46	00:00	00:00	00:00
% of effort	42.7	26.3	16.7	8.1	4.5	1.6	0.2	0.0	0.0	0.0

The Beaufort wind force recorded during visual monitoring ranged from one (one to three knots) to ten (48 to 55 knots). The majority of visual monitoring was during wind force of four (11 to 16 knots) for a total of 275 hours and 30 minutes (25.9% of all visual monitoring effort). The highest wind speeds, between 48 and 55 knots (level ten), were recorded for a total of 34 minutes (0.1% of the overall project total) (Table 12).

Table 12: Beaufort Wind force during the survey

Total	B1 (1-3 knots)	B2 (4-6 knots)	B3 (7-10 knots)	B4 (11-16 knots)	B5 (17-21 knots)	B6 (22-27 knots)	B7 (28-33 knots)	B8 (34-40 knots)	B9 (41-47 knots)	B10 (48-55 knots)
Duration (HH:MM)	15:19	76:35	203:11	275:30	203:39	163:09	73:30	36:00	15:11	0:34
% of effort	1.4	7.2	19.1	25.9	19.2	15.4	6.9	3.4	1.4	0.1

Swell heights during visual observations were generally low, with swells of less than two meters recorded for the majority of visual observations (1013 hours and 25 minutes, 95.4% of the total visual effort). Swells between two and four meters occurred for 49 hours 13 minutes (Table 13).

Table 13: Swell Height during the survey

Total	<2m	2-4m	>4m
Duration (HH:MM)	1013:25	49:13	00:00
% of effort	95.4	4.6	0.0

The majority of visual monitoring effort was conducted with no glare present, for a total of 690 hours and 30 minutes (65%). Severe glare was the second most frequent condition recorded, with 164 hours and 59 minutes (15.5%) of the total effort (Table 14). During times of moderate to severe glare, it is possible that the detection of protected species was hindered.

Table 14: Glare during the survey

Total	None	Little	Moderate	Severe
Duration (HH:MM)	**690:30**	**135:07**	**72:02**	**164:59**
% of effort	**65.0**	**12.7**	**6.8**	**15.5**

5 MONITORING AND DETECTION RESULTS

5.1 Visual Detections

Visual monitoring by PSOs from the NBP resulted in the collection of 526 visual records of protected species; three of the recordings consisted of two mixed species and one consisted of three mixed species. Multiple species observed simultaneously have the same detection number assigned even though they are recorded separately so the total number of marine mammals per species was 531. 16 species of marine mammals were positively identified; observations were also made of unidentified baleen whales, unidentified whales, unidentified cetaceans, unidentified dolphins, unidentified seals, and unidentified otariids. The total number of detection events and total number of animals recorded by species are described in detail in Table 15 and in Appendix D.

Table 15: Number of visual detection records collected for each protected species

	Total Number of Detection Records	Total Number of Animals Recorded
Cetaceans		
Antarctic Minke whale	21	32
Fin whale	06	15
Humpback whale	47	103
Sei whale	05	24
Unidentifiable baleen whale	08	10
Unidentifiable cetacean	01	01
Unidentifiable whale	04	04
Southern bottlenose whale	01	03
Killer whale	03	13
Peale's dolphin	03	10
Commerson’s dolphin	01	07
Unidentifiable dolphin	01	03
Pinnipeds		
Crabeater seal	200	3,886
Leopard seal	12	14
Southern elephant seal	02	02
Weddell seal	75	180
Ross seal	01	01
Antarctic fur seal	35	72
South American fur seal	06	42
South American sea lion	01	01
Unidentifiable seal	97	351
Unidentified otariid	01	01
TOTAL	**531**	**4,775**

*Note: The numbers in this chart reflect the total number of species detections, however multiple species observed simultaneously have the same detection number even though they are recorded separately.

Of the 531 protected species detection events, 26 detections occurred while the acoustic source was active and 505 detections occurred while the acoustic source was silent. No detections occurred during ramp-up. All detections which occurred while the source was active occurred while the source was at full volume.

The average closest approach of protected species to the source at different source volumes was recorded during each detection event (Table 16). Some variables to consider are that most species were not observed in a sufficient number of sighting events in order to make comparisons or meaningful comparisons of their average closest approach to the source at varying activity levels. Also, seismic activities took place in a small

fraction of the total visual monitoring effort time. Occasionally, there was another source of sound coming from icebreaking operations while the acoustic source was silent.

Table 16: Average closest approach of protected species to the acoustic source at various volumes

Species Detected	Full volume (Acquisition 300in^3)		Ramp-up (150 in^3)		Seismic source silent			
					Not icebreaking		Icebreaking	
	Number of detections	Average closest approach to source (meters)	Number of detections	Average closest approach to source (meters)	Number of detections	Average closest approach to source (meters)	Number of detections	Average closest approach to source (meters)
Antarctic Minke whale	4	721.2			8	670	9	334.4
Fin whale					6	1321.5		
Humpback whale					47	1046		
Sei whale					5	654		
Unidentifiable baleen whale					8	2587		
Unidentifiable cetacean					1	370		
Unidentifiable whale	1	1460			3	1142		
Southern bottlenose whale					1	1310		
Killer whale					3	1946.3		
Peale's dolphin					3	267		
Commerson's dolphin					1	120		
Unidentifiable dolphin					1	150		
Crabeater seal	20	422.4			100	306	80	266.4
Leopard seal					4	286.5	8	398.1
Southern elephant seal					1	300	1	70
Weddell seal					27	359	48	294.1
Ross seal							1	300
Antarctic fur seal					35	280		
South American fur seal					6	175		
South American sea lion					1	10		
Unidentifiable seal	1	1700			66	645	30	576.6
Unidentifiable otariid					1	150		

There was a total of 531 visual detections of marine mammals throughout the survey program with pinnipeds being detected most frequently, making up for 81% (430 detection records) of all marine mammal sighting events. Crabeater seals were observed more frequently than any other marine mammal, with 200 separate detection events consisting of a total of 3,886 animals. Visual detections included: 92 detections of whales, one detection of beaked whale, eight detections of dolphins, and 430 detection of pinnipeds.

Visual detections of positively identified whales included: 47 detections of humpback whale (*Megaptera novaeangliae*) totaling 103 animals, 21 detections of Antarctic Minke whale (*Balaenoptera bonaerensis*) totaling 32 animals, six detections of fin whales (*Balaenoptera physalus*) totaling 15 animals and five detections of sei whale (*Balaenoptera borealis*) totaling 24 animals. Visual detections of positively identified beaked whales included: one detection of three Southern bottlenose dolphins (*Hyperoodon planifrons*). There were also eight detections of unidentified baleen whales totaling 10 animals, four detections of unidentified whales totaling four animals and one detection of an unidentified cetacean. Visual detections of positively identified dolphins included: three detections of killer whales (*Orcinus orca*) totaling 13 animals, three detections of Peale's dolphins (*Lagenorhynchus australis*) totaling 10 animals and one detection of Commerson's dolphins (*Cephalorhynchus commersonii*) totaling seven animals. There was also one detection of unidentified dolphins

totaling three animals. Visual detections of other positively identified pinnipeds included: 75 detections of Weddell seals (*Leptonychotes weddeii*) totaling 180 animals, 12 detections of Leopard seal (*Hydrurga leptonyx*) totaling 14 animals, two detections of Southern elephant seal (*Mironga leonina*) totaling two animals, one detection of Ross seal (*Ommatohoca rossii*) totaling one animal, 35 detections of Antarctic fur seal (*Arctocephalus gazella*) totaling 72 animals, six detections of South American fur seal (*Arctocephalus australis*) totaling 42 animals and one detection of an South American sea lion (*Otaria byronia*). There were also 97 detections of unidentified seals totaling 351 animals and one detection of unidentified otariid totaling one animal. Of the total detections, four sightings included more than one species; multiple species observed simultaneously have the same detection number even though they were recorded separately (Table 16).

The spatial distribution of marine mammal detections made on the NBP during transit between the survey site and port and while on the survey site are shown in Figure 3.

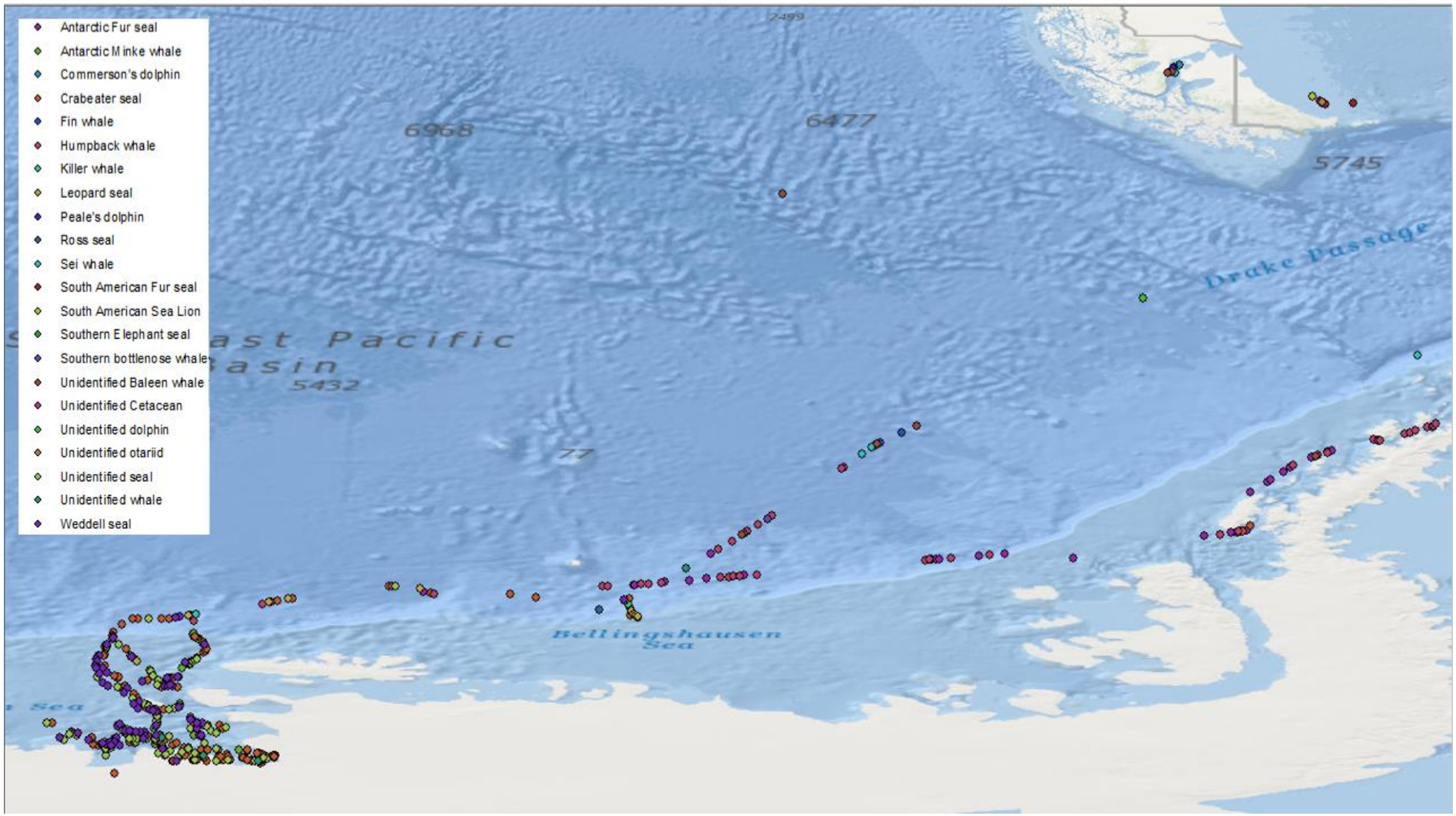


Figure 3: Spatial distribution of protected species during the survey.

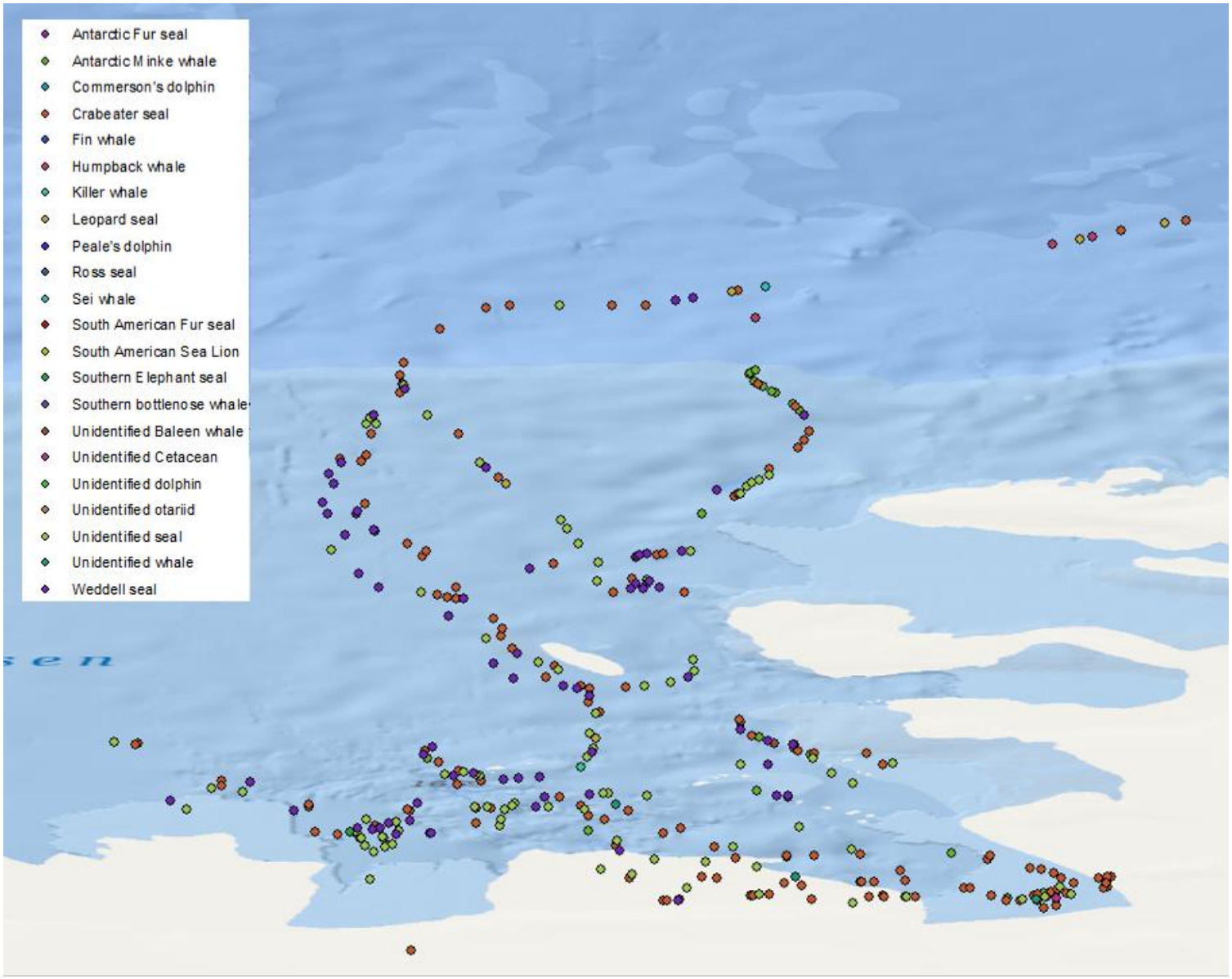


Figure 4: Zoomed in spatial distribution of protected species in the Amundsen Sea

5.1.1 Cetacean Detections

5.1.1.1 Antarctic Minke whale

There were 21 detections of Antarctic Minke whales (*Balaenoptera bonaerensis*) during the survey, totaling 32 individuals observed. Most detections were of one individual, with some sightings of two or three animals. There three individuals that entered the predicted 160 dB mitigation zone during seismic operations. The closest approach to the active acoustic seismic source was 210 meters on 24 February 2020. The closest approach to the acoustic seismic source deployment point recorded was 80 meters on 18 March; source was silent and onboard the vessel. There 16 individuals that entered the predicted 120 dB mitigation zone during icebreaking operations. Antarctic Minke whales were frequently observed blowing, surfacing and swimming below the water. Other behaviors include fast traveling while breaking the water surface with their rostrums causing big splashes. No mitigation actions were required for any of these detections; however, an avoidance maneuver was implemented on 24 February for the sighted Antarctic Minke whales.

5.1.1.2 Humpback whale

There were 47 detections of humpback whales (*Megaptera novaeangliae*), totaling 103 adult animals sighted. Most of the detections were of one or two individuals; other sightings included three to six animals. None of the whales were observed within the exclusion zones for seismic or icebreaking activities. On all of the detection the blow was visible, and most of the whales were surfacing, swimming and diving with flukes. Other behaviors observed included acrobatic performances like breaching and pectorals slapping, milling, diving without flukes and/or feeding. The whales were observed in all directions relative to the vessel. All of the detections occurred while in transit with no mitigation actions required. However, there were seven avoidance maneuvers implemented for humpback whales, all of them between 21 through 24 March 2020.

5.1.1.3 Fin whale

There were six detections of fin whales (*Balaenoptera physalus*) during the survey, totaling 15 individuals observed, three were juveniles. Three of the sightings consisted of two individuals, the other three consisted on one, three and five animals. All of the whales were observed blowing, other behaviors included surfacing, milling and/or swimming below the surface. For three of the detections, the whales were traveling parallel and in opposite direction as the vessel, the other three whales were stationary. All of the whales were observed during transit. The closest approach of these animals to the deployment point of the acoustic source was 485 meters on 30 January 2020. No mitigation action was required for any of these detections.

5.1.1.4 Sei whale

There were five detections of sei whales (*Balaenoptera borealis*) during the project, totaling 24 individuals observed, three of which were juveniles. The largest group observed consisted of 10 animals; the other detections consisted of two to five animals. All of the whales were observed blowing and surfacing; other behaviors included milling, swimming below the surface, lodging and/or diving. All of these detections occurred while in transit, with a closest approach of 175 meters to the deployment point of the acoustic source on 25 March 2020. No mitigation action was required for any of these detections; however, an avoidance maneuver was implemented on 25 February for the sighted sei whales.

5.1.1.5 Southern bottlenose whale

The only detection of Southern bottlenose whales (*Hyperoodon planifrons*) consisted of a group of three adult individuals. They were blowing and swimming at a moderate pace, crossing ahead of the vessel. Other behaviors observed included surfacing and diving. The closest approach of the whales to the vessel was 1132 meters. The detection occurred on 31 January 2020 while in transit. No mitigation action was required for this detection because the sound source was not deployed

5.1.1.6 Killer whale

There were three detections of killer whales (*Orcinus orca*) during the project, totaling 13 adult individuals. One detection was of two individuals, one was of three individuals and the other one consisted of eight individuals. Killer whales were mostly observed surfacing, swimming and blowing, with some other behaviors including spy hopping or diving with flukes. The animal's pace was moderate to vigorous. None of the killer whales were observed during icebreaking or seismic activity. If the acoustic source had been deployed, the

closest approach would have been 1334 meters on 01 February 2020. No mitigation action was required for any of these detections.

5.1.1.7 Commerson's Dolphin

The only detection of Commerson's dolphin (*Cephalorhynchus commersonii*) consisted of a pod of seven adult individuals. They were observed swimming at a vigorous pace towards the vessel. Other behaviors observed included swimming below the surface and porpoising. The detection occurred on 28 March 2020 while in transit and with the acoustic source not deployed. No mitigation action was required for this detection.

5.1.1.8 Peale's Dolphin

There were three detections of Peale's dolphins (*Lagenorhynchus australis*), totaling ten adult individuals. One detection consisted of a pod of four individuals. The other two detections were of four individuals and then two individuals. The dolphins were observed swimming vigorously towards and away from the vessel. Other behaviors displayed were breaching, jumping and swimming below the surface. All the detections occurred during transit while the acoustic source was not deployed; had it been in the water the closest approach would have been 180 meters on 28 March 2020. No mitigation actions were required for any of the detections.

5.1.1.9 Unidentified baleen whale

There were eight detections of unidentified baleen whales during the project, totaling 10 individuals. In all of the sightings the blow was visible, with other behaviors observed like swimming and/or milling. The closest sighting of these whales to the acoustic source deployment point was 500 meters on 25 January 2020. A positive identification of these species was not possible due to the distance of the sightings and/or the lack of features other than the blows of the animals. All of the detections occurred while in transit, and no mitigation action was required for any of these detections.

5.1.1.10 Unidentified whale

There were four detections of unidentified whales, each one consisting of one individual observed, totaling four individuals. Behaviors observed included blowing, surfacing and diving. The closest approach of the whales to the active acoustic source was 1460 meters on 08 February 2020. Overall, the closes approach of these whales to the acoustic source deployment point was 760 meters on 19 February 2020. Positive identification of the animals was not possible due to the distances at which they were observed. No mitigation action was required for any of these detections.

5.1.1.11 Unidentified cetacean

The only detection of an unidentified cetacean consisted of one individual observed on 22 February 2020. Positive identification of the animal was not possible since it was observed surfacing briefly, showing only its back and dorsal fin; the blow was not visible. The detection occurred during transit with the acoustic source not deployed. The closest approach to a deployed source would have been 370 meters. No mitigation action was required for this detection.

5.1.1.12 Unidentified Dolphin

There was one detection of unidentified dolphins, consisting of a pod of three individuals. The animals surfaced 150 meters off the bow, and they were bow riding, fast traveling and swimming under the surface. The detection occurred during transit with the acoustic source not deployed; had it been in the water, the closest approach would have been 150 meters. A positive identification of these animals was not possible due to the rough weather present at the moment. No mitigation action was required for this detection.

5.1.2 Pinniped Detections

5.1.2.1 Crabeater Seal

There were 200 detections of crabeater seal (*Lobodon carcinophagus*) totaling 3,886 individuals observed during the project. Number of individuals per detection ranged from one to 1670 individuals. There were 474

individuals observed within the predicted 120 dB radii during icebreaking operations, 406 of these animals were detected resting on the ice and moving vigorously towards the water as the vessel passed by, the other 68 individuals were detected in the water. Additionally, there were 36 individuals observed within the predicted 160 dB radii during seismic operations, two of these animals were detected resting on the ice and going into the water as the vessel passed by and the other 31 individuals were detected in the water. Other behaviors observed include surfacing, spy hoping, milling, swimming and porpoising. The closest approach to the active acoustic seismic source was zero meters on 24 February 2020. There were two mitigation actions required for crabeater seals, a delay of the start of the seismic source and a shutdown of the source. These mitigations resulted in a total mitigation time of 25 minutes and a total production loss of 11 minutes.

5.1.2.2 Weddell seal

There were 75 detections of Weddell seals (*Leptonychotes weddeii*) totaling 180 individuals observed, 12 of which were juveniles. Group size ranged from one individual to 19 individuals. None of the detections occurred while the acoustic source was active. There were 15 individuals within the predicted 120 dB mitigation zone during icebreaking operations. The majority of the detections the seals were observed resting on the ice, most of which did not move during the sighting. Only three of the detections were the seals observed in the water, mostly swimming, surfacing and diving. During two detections, the seals got out of the water and into the ice. There was one detection of a deceased Weddell seal. The closest distance of the seals to the deployment point of the acoustic source was 30 meters on 14 February and the animals were on the ice. No mitigation action was required for any of these detections; however, there were five detections that required an avoidance maneuver, one on 03 February, one on 14 February, one on 01 March, one on 13 March and the last one on 16 March.

5.1.2.3 Southern elephant seal

There were two detections of Southern elephant seals (*Mirounga leonina*), each sighting consisted of one individual. On both sightings, the seals were resting on the ice, with one of them diving into the water while the vessel was icebreaking, therefore it was accounted as a level B take. The closest approach of this species to the acoustic deployment point was 70 meters on 17 February 2020. No mitigation action was required for any of these detections since the sound source was not deployed.

5.1.2.4 Leopard seal

There were 12 detections of leopard seals (*Hydrurga leptonyx*), totaling 14 individuals observed during the project, one of which was a juvenile. During most of the sightings, the seals were resting on the ice, with some individuals moving around it while the vessel passed by. During three detections, the seals were first observed in the water, mostly surfacing and swimming. In one of the sightings, the seal got out of the water and onto the ice. There were two individuals that enter into the predicted 120 dB mitigation zone during icebreaking operations. All of the detections occurred while the acoustic source was onboard. The closest distance of the seals to the deployment point of the acoustic source was 40 meters on 14 February. No mitigation action was required for any of these detections.

5.1.2.5 Ross seal

There was one detection of a Ross seal (*Ommatophoca rossii*). The seal was resting on the ice during the entire detection, with a closest approach to the vessel of 300 meters. No mitigation action was required for this detection since the sound source was not deployed.

5.1.2.6 Antarctic fur seal

There were 35 detections of Antarctic fur seals (*Arctocephalus gazella*), totaling 72 adult individuals observed. The majority of the detections consisted of one animal; other detections were of groups of two to eight animals. During most of the sightings, the seals were surfacing, swimming and porpoising at a moderate to vigorous pace. During other detections, the animals were just logging at the surface. Other behaviors observed included spy hopping, milling, swimming below the surface and/or diving. The detections occurred while the acoustic source was not deployed. No mitigation action was required for any of these detections.

5.1.2.7 South American fur seal

There were six detections of South American fur seals (*Arctocephalus australis*), totaling 42 individuals during the project, three of which were juveniles. Group sizes ranged from one to five animals, with one detection consisting on 24 individuals. Most of the animals were porpoising, swimming and displaying acrobatic behaviors. Other behaviors included bow riding, logging, and/or diving. The closest distance of the seals to the deployment point of the acoustic source was 50 meters on 26 January 2020. All of the detections occurred while the vessel was in transit with the acoustic source onboard. No mitigation action was required for any of these detections.

5.1.2.8 South American sea lion

There was one detection of a South American sea lion (*Otaria byronia*). The seal surfaced its head 10 meters off the starboard bow and immediately dove. The vessel was in transit. No mitigation action was required for this detection.

5.1.2.9 Unidentified seal

There were 97 detections of unidentified seals during the project, totaling 351 individuals. Most detections consisted of one to eight individuals, nonetheless there were some sightings that consisted of groups of up to 37 individuals. Of the total detections, 67 were of seals that were resting on the ice, most of the animals did not move during the sighting. The rest of the detections were of seals observed in the water, mostly swimming, milling and/or surfacing. Other behaviors observed included porpoising, diving and spy hopping. A positive identification of these species was not possible due to the distance at which they occurred, the partial observation of the animal's bodies or the brief time the animas were sighted. Some of these animals were observed within the predicted 120 dB mitigation zone during icebreaking operations, however, as the animals were not identified to species level, they were not accounted for as takes. One of these detections was of a decease animal. No mitigation action was required for any of these detections.

5.1.2.10 Unidentified otariid

There was one detection of unidentified otariid, consisting of one individual observed 20 meters off the starboard bow. The animal was porpoising at a vigorous pace, while swimming parallel in the same direction as the vessel. At the end of the sighting it was swimming under the surface. A positive identification of the species was not possible due to the brief time the animal was sighted. The vessel was in transit. No mitigation action was required for this detection.

6 MITIGATION ACTION SUMMARY

There were two mitigation actions implemented during the Antarctic Seismic Survey Program due to detections of protected species. The actions consisted of one delay of the initiation of the source and one shut down. Both mitigation actions are described below.

On 09 February 2020, a delay to start a ramp-up was implemented for a crabeater seal that was observed within the exclusion zone for pre-searches (200-meter). The seal was initially sighted at 17:47 UTC at 270 meters from the acoustic source. The seal was swimming towards the exclusion zone, entering it at 17:49 UTC. The seal exited the exclusion zone and returned at 18:01 UTC, approaching as close as one meter from the source. The seal swam around the source and the stern until 18:01 UTC, when it dove out of sight within the exclusion zone. A delay to initiate the source was implemented, totaling 15 minutes of mitigation downtime. This detection was not considered a take, as the source was not active during the sighting.

On 24 February 2020, a shut down mitigation action was required for a detection of protected species. At 22:48 UTC, one crabeater seal surfaced from right under the acoustic source and another one surfaced 20 meters from it. Immediately, a shutdown of the source was requested and implemented. As the seal was sighted leaving the exclusion zone, the acoustic source resumed operations after, at 22:59 UTC, resulting in a production loss of 11 minutes. During this detection, three seals were observed within the predicted 160 dB threshold (979 meters), constituting three Level B takes.

In addition to the mitigation actions implemented during seismic operations, there were 21 detections that required strike avoidance maneuvers. Nine maneuvers were for whale species and 12 were for pinnipeds. On all of the strike avoidance maneuvers, the animals were observed continuing their activities after the vessel passed them by. Detailed descriptions of the maneuvers are outlined below.

On 30 January 2020, there was an avoidance maneuver required for two humpback whales. At 00:21 UTC, three whales approached the port bow swimming at a sedate pace. One of the whales swam parallel in the opposite direction as the vessel, getting as close as 10 meters from the port beam, while the other two surfaced at 20 meters off the bow crossing ahead of the vessel at a sedate pace. A strike avoidance maneuver was immediately implemented, causing the vessel to reduce speed and place the engines in neutral, allowing the whales to safely cross ahead getting as close as five meters from the vessel.

On 01 February 2020, there were two strike avoidance maneuvers during one detection of crabeater seals. At 17:42 UTC, a crabeater seal was observed resting on an ice-floe 55 meters off the bow. As a result, the vessel changed its course and passed the ice floe 45 meters off the starboard side. The other strike avoidance maneuver was implemented at 17:44 UTC, when a second crabeater seal was observed surfacing next to an ice floe at 65 meters from the bow. The vessel changed its course, passing the seal 30 meters off the starboard.

On 03 February 2020, at 21:17 UTC, the vessel changed its course to avoid a Weddell seal that was resting on an ice floe at 75 meters off the bow.

On 14 February 2020, there were three avoidances implemented. The first was at 01:13 UTC for a Weddell seal that was observed resting on an ice-floe in front of the vessel. As a result, the vessel turned slightly to port and passed the ice floe with the seal, 30 meters off the starboard side. The second maneuver was at 15:36, when the vessel stopped its transit while a crabeater seal moved away from the vessel's path. The third and last maneuver was at 16:31 UTC, the vessel changed its course. It turned slightly to starboard, for another crabeater seal that was resting on the ice at 250 meters from the bow.

On 24 February 2020, a reduction in the vessel's speed was requested as a strike avoidance maneuver for an Antarctic Minke whale. At 20:58 UTC, a whale was sighted for a couple of minutes 600 meters from the vessel. The whale suddenly surfaced 200 meters off the port bow, crossing slowly ahead of the vessel. The animal passed while under the surface at 30 meters off the bow. Two minutes later the whale was sighted at 400 meters off the starboard stern, and the vessel resumed its speed and continued its transit.

On 01 March 2020, two strike avoidance maneuvers were undertaken. At 19:41 UTC, the vessel turned slightly to starboard to avoid a pair of crabeater seals that were 300 meters off the port bow. The seals moved around the ice as the vessel passed by. At 20:48 UTC, the vessel altered its course slightly to avoid a

Weddell seal that was resting on a bergy bit ahead of the vessel, passing the seal 200 meters alongside the port.

On 13 March 2020, at 11:17 UTC, the vessel turned slightly to port to distance itself from a Weddell seal that was resting on the ice 250 meters ahead. The vessel passed alongside the animal, which was last observed at 450 meters from the stern.

On 16 March 2020, at 01:38 UTC, the vessel turned slightly to starboard to avoid a Weddell seal that was resting on the ice ahead of it; it passed the animal 350 meters alongside the port.

On 18 March 2020, there were three detections were at least one avoidance maneuver was implemented. At 02:40 UTC, the vessel changed course for a crabeater seal that was resting on the ice ahead of it. The vessel turned slightly to port to avoid the ice floe. The animal was also moving to port but stopped and started to move in the opposite direction. The vessel passed alongside the ice floe with the seal at a distance of 30 meters. Additionally, from 16:00 UTC to 19:20 UTC, the vessel changed course on several occasions during two long detections of crabeater seals, as they were scattered all around the thick ice while the vessel transited through it.

On 21 March 2020, there were two avoidance maneuvers implemented for humpback whales. At 12:41 UTC, the vessel changed course for two individuals that were logging ahead of the vessel, passing 80 meters from the starboard side. At 14:56 UTC, the vessel changed course again for two more individuals that were blowing stationary ahead of it; the vessel passed 200 meters from them.

On 22 March 2020, two avoidance maneuvers were implemented for humpback whales. At 13:35 UTC, the vessel reduced speed and changed course for two individuals that were milling ahead of the vessel. As the vessel approached them, they started to swim parallel and in opposite direction as the vessel. At 15:01 UTC, the vessel reduced speed again for two individuals that were crossing slowly ahead of the vessel, coming as close as 10 meters from the port bow.

On 23 March 2020, there was one avoidance maneuver implemented for a humpback whale. At 21:52 UTC, one individual surfaced 200 meters off the bow. As the whale was stationary, the vessel's engine was put in neutral. The animal proceeded to swim towards the starboard side, passing the vessel alongside at a distance of 50 meters.

On 24 March 2020, there was one avoidance maneuver implemented for a humpback whale. At 21:30 UTC, the vessel changed course when two individuals were observed crossing slowly ahead of the vessel, at a distance of 400 meters.

On 25 March 2020, one avoidance maneuver was implemented for sei whales. At 12:01 UTC, the vessel reduced speed and went to neutral for an aggregation of 10 individuals that were surrounding the vessel at the closest distance of five meters. The vessel continued its transit while the whales distanced themselves from the vessel at no less than 300 meters.

Additionally, there were two detections of seals (VD#154 and VD#155) where one or more individuals were observed within the allowed distance of 50 meters from the vessel while heavy icebreaking operations were taking place. As the ice was thick and maneuvers of the vessel were limited, a change of course or a complete stoppage of the engine was not possible. Nonetheless, all of the seals moved on their own and they were all observed after those close approaches.

6.1 Protected Species known to have been exposed to 160 decibels or greater of received sound levels

Numerous protected species are known to occur within the survey areas, including several species listed as endangered or threatened under the ESA. Endangered marine mammal species included: blue whales, fin whales, sei whales and sperm whales.

NMFS granted an IHA and ITS for the marine seismic survey allowing Level B harassment takes (exposure to sound pressure levels equal to or greater than 160 dB re: 1 µPa (rms) or 120 dB re: 1 µPa (rms) for the

airgun array and icebreaking sound sources, respectively, where there is a potential for behavioral changes) for 18 marine mammal species during the Antarctic survey program.

For the entire survey, a total of 4,775 individual marine mammals from 18 species (including four whale species listed as endangered species) were authorized for Level B takes only in the IHA and ITS (Table 17). Accountability of takes were registered during seismic operations (animals observed within the predicted distance to the level B threshold: 979 meters), and during light and heavy icebreaking activities (animals observed in the water within the 6.1 kilometers).

During the Antarctic survey, there was a total of five species that were observed within the predicted distance to the level B threshold: Antarctic Minke whale, crabeater seal, Weddell seal, leopard seal and Southern elephant seal. There were 90 detections that resulted in level B takes, 17% of which were attributed to seismic operations (160db exposure) and 83% were attributed to icebreaking operations (120db exposure). The total number of animals considered level B takes was 547 and of this number, 7% were takes during seismic operations and 97% were takes during icebreaking operations.

The species that resulted most exposed to the level B threshold was crabeater seals, which totaled 510 individuals considered level B takes, this was followed by the Antarctic Minke whale totaling 19 individuals considered as takes and the Weddell seal with 15 individuals considered as takes. The two species that were least exposed to the level B radius were the leopard seal, with only two individuals accounted as takes and the Southern elephant seal, with one take.

Table 17: Level B takes authorized by NMFS IHA and number of known individuals observed within the predicted zones

Species	Calculated Level B takes seismic	Calculated Level B takes icebreaking	Authorized number of takes	Potential Number of Level B takes seismic	Potential Number of Level B takes icebreaking	Total Potential Number of takes
Low frequency cetaceans						
Blue whale	1	1	2	0	0	0
Fin whale	27	54	81	0	0	0
Humpback whale	1	1	40	0	0	0
Antarctic Minke whale	2149	4319	6467	3	16	19
Common (dwarf) Minke whale	2149	4318	6467	0	0	0
Sei whale	1	2	6	0	0	0
Mid-frequency cetaceans						
Arnoux's beaked whale	23	47	70	0	0	0
Killer whale	1067	2144	3211	0	0	0
Layards beaked whale	2	5	7	0	0	0
Long-fined pilot whale	29	59	88	0	0	0
Southern bottlenose dolphin	25	51	76	0	0	0
Sperm whale	64	128	191	0	0	0
Gray's beaked whale	1	2	3	0	0	0
Phocids						
Crabeater seal	28	57	2000	36	474	510
Leopard seal	0	0	50	0	2	2
Ross seal	0	0	10	0	0	0
Southern elephant seal	8897	7748	16645	0	1	1
Weddell seal	0	1	100	0	2	2

The number of potential takes may be an underestimation and, therefore, may be a minimum estimate of the actual number of protected species potentially exposed to received sound levels within the predicted Level B harassment zones. It is possible that the estimated number of animals recorded were underestimates due to some animals not being seen or having moved away before they were observed. This is most likely to have occurred while icebreaking, as the radius was six kilometers and the seals may have moved from the ice and into the water before being spotted.

Additionally, beyond hours of dawn, dusk and darkness, there were several occasions where the entire predicted 160 dB radii, 500-meter exclusion zone, 200-meter buffer zone, and 100-meter exclusion zone were not fully visible, which would have prevented sightings of protected species within those areas around the vessel. Throughout the survey program, the entirety of the 160 decibel radii was not visible for 153 hours 27 minutes during visual monitoring efforts. The entire 500-meter exclusion zone was not visible for 56 hours 38 minutes, the entire 200-meter buffer zone was not visible for 02 hours 37 minutes, and the entire 100-meter exclusion zone was not visible for 49 minutes. The majority of the occasions where these radii were not fully visible occurred due to extended periods of dense fog and snow.

Table 18 describes the behavior of all animals, which were visually observed within the predicted Level B harassment zones while the acoustic source was active and Table 19 while icebreaking. There were no highly distinctive behavioral reactions observed in relation to the vessel or acoustic source during the seismic survey. the most recurrent behaviors of the animals at the end of the detections were moving away from the vessel and milling, occurring in five detections each. During icebreaking operations, there was a noticeable reaction from the seals that where closer to the vessel, they would either move vigorously away from the vessel and into the water or they moved further away on the ice. However, most of this reactions were due to the presence of the vessel, which was noticeable as the reaction came upon seeing the vessel approaching; most of the seals that didn't see the vessel or that saw it from a far distance continued resting on the ice without moving.

Movement Codes: **TV**: towards vessel; **AV**: away from vessel; **PV (SD/OD)**: parallel vessel (same direction or opposite direction); **PE (AH/BH):** perpendicular (crossing ahead or behind); **MI**: milling; **SA**: stationary; **V:** variable, **UN**: unknown**; OM**: other movement

Behavioural Codes: **ROI:** resting on ice **NS**: normal swimming; **FT**: fast travel; **ST**: slow travel; **MI**: milling; **BA**: resting/basking at surface; **FL:** floating; **SR**: surfacing/swimming at the surface; **SS**: swimming below surface; **BR**: bow/wake riding; **PO**: porpoising; **JP**: jumping; **SA**: surface active (lob tailing/pectoral slapping, full/partial breaching)**; R:** rolling; **DI**: dive; **DF**: dive with fluke; **FF**: feeding/foraging; **SB**: social behavior; **MT**: mating behavior; **BV**: blow visible (whale); **SV**: only splashes visible (dolphins); **DV**: dorsal fin visible; **OB**: other behavior

Table 18: Behavior of species observed within the predicted 160 db zone during seismic activities

Species	Detection No.	No. of Animals	Initial behavior	Initial direction in relation to vessel	Subsequent and Final behavior	Subsequent and Final direction in relation to vessel
Antarctic Minke whale	107	1	SS	PE(AV)	SR	PV(OD)
	256	1	SS/SR	PV(SD)	SS/SR	PV(SD)
	262	1	SR/BV	PV(OD)	DV/FT	AV
Crabeater seal	104	1	FT	TV	SA	AV
	252	14	SA	MI	SA	MI
	254	3	SR/PO	TV	SR/PO	PV(BH)
	258	1	SR	MI	SR	MI

Species	Detection No.	No. of Animals	Initial behavior	Initial direction in relation to vessel	Subsequent and Final behavior	Subsequent and Final direction in relation to vessel
	260	1	MI	MI	FT/PO/SR	AV
	264	1	SR	PV(OD)	SS	AV
	266	3	SR	TV	SR/PO	AV
	267	1	SR	MI	DI	UN
	269	3	SR	MI	SR	MI
	270	2	SR	MI	SR	MI
	271	3	MI/SR	MI	SR	PV(OD)
	273	3	SS/SA	MI	SS/SR	MI

Table 19: Behavior of species observed with the predicted 120 db zone during icebreaking

Species	Detection No.	No. of Animals	Initial behavior	Initial direction in relation to vessel	Subsequent and Final behavior	Subsequent and Final direction in relation to vessel
Antarctic minke whale	380	1	SR/BV	AV	SR/SS	PE(BH)
	425	2	BV	AV	SR/DI	AV
	439	1	BV	AV	SR	OM
	440	2	SR	UN	BV/DI	AV
	442	2	SR	AV	SS/DI	AV
	443	2	SR	AV	SS/DI	AV
	444	3	SR	AV	SS/DI	PV(OD)
	445	1	SR	AV	SS/DI	AV
	450	2	SR	PE(AH)	BD/SS/OB	PV(OD)
Leopard seal	63	1	ROI	ST	DI	UN
	85	1	SR	AV	ROI	ST
Weddell seal	133	1	ROI	ST	DI	UN
	147	2	OB/SR	AV	ROI/DI	ST/UN
	158	1	SR	MI	SR	UN
	166	1	ROI	ST	DI	UN

Species	Detection No.	No. of Animals	Initial behavior	Initial direction in relation to vessel	Subsequent and Final behavior	Subsequent and Final direction in relation to vessel
	177	1	ROI	ST	DI	UN
	181	1	ROI	ST	DI	UN
	182	1	ROI	ST	DI	UN
	185	1	ROI	ST	DI	UN
	323	1	ROI	ST	DI	UN
	388	1	SA/SR	MI	DI	AV
	400	1	ROI	ST	DI	UN
	409	1	SR	AV	ROI	ST
	417	2	SR	ST	DI	UN
Crabeater seal	39	2	ROI	ST	DI	UN
	43	16	ROI	ST	DI	UN
	47	2	ROI	ST	DI	UN
	50	1	SR	OM	ROI	UN
	51	21	ROI/SR	ST	SR	UN
	53	1	ROI	ST	DI	UN
	56	10	ROI	ST	SR/SS	UN
	62	4	ROI	ST	SS	AV
	64	2	SR	V	SR	MI
	68	20	ROI	ST	DI	UN
	73	1	ROI	ST	DI	UN
	75	1	ROI	ST	SS	UN
	76	5	SR	V	SR	MI
	77	1	ROI	ST	DI	UN
	78	1	ROI	ST	DI	UN
	79	1	ROI	ST	DI	AV
	81	3	SR	ST	SR	MI
	84	1	ROI	ST	DI	UN

Species	Detection No.	No. of Animals	Initial behavior	Initial direction in relation to vessel	Subsequent and Final behavior	Subsequent and Final direction in relation to vessel
	122	2	ROI	ST	DI	UN
	134	1	SR	OM	ROI	ST
	148	2	OB	OM	ROI	ST
	150	1	OB	OM	ROI	AV
	154	2	ROI	ST	DI	UN
	156	2	ROI	ST	DI	UN
	161	2	SR/MI/SA	VA	SR/MI/SA	VA
	162	1	ROI	ST	DI	UN
	210	1	ROI	ST	DI	UN
	216	2	ROI	ST	DI	UN
	278	2	ROI	ST	DI	UN
	281	4	ROI	ST	DI	UN
	286	1	ROI	ST	DI	UN
	299	2	ROI	ST	DI	UN
	311	1	SR	MI	DI	UN
	316	1	ROI	ST	DI	UN
	319	2	ROI	ST	DI	UN
	332	3	SR	MI	DI	UN
	334	1	ROI	ST	DI	UN
	381	5	SR/PO	UN	SR/PO	PE(BH)
	389	1	ROI	ST	DI	UN
	391	3	PO	AV	SR/SS	AV
	410	1	ROI	AV	DI	AV
	413	3	SS	VA	PO/DI	VA
	421	5	SR	UN	MI/DI	UN
	426	15	SR	UN	MI/SA/DI	UN
	434	1	ROI	UN	DI	UN

Species	Detection No.	No. of Animals	Initial behavior	Initial direction in relation to vessel	Subsequent and Final behavior	Subsequent and Final direction in relation to vessel
	435	4	ROI	ST	DI	UN
	436	6	SR	MI	SS/DI/OB	MI
	437	198	ROI	ST	SA/MI/PO/SS/DI	UN
	441	1670	ROI	ST	SR/SS/DI/SA	UN
	446	155	ROI	ST	SA/MI/DI	UN
Southern Elephant seal	207	1	ROI	ST	DI	UN

6.2 Implementation and Effectiveness of the Biological Opinion and IHA

In order to minimize the potential impacts to marine mammals during the Antarctic Seismic Survey Program, the PSOs were prepared to implement mitigation measures whenever these protected species were detected approaching, entering, or within the exclusion zones designated in the IHA and ITS. There were two mitigation actions implemented during the Antarctic seismic survey program due to detections of protected species, consisting of one delay of the initiation of the source and one shut down.

In the event that an injured or dead protected species was discovered during the course of the survey program, and the lead visual observer determined that the cause of death was unknown or unrelated to the activities of the vessel, the incident was to be immediately reported. The report would include a detailed description of the incident, including pictures when possible, and information about the vessel's activities within the 24 hours prior to the discovery of the injured/dead protected species. Throughout the Antarctic survey program, there were two sightings of dead protected species, one of a Weddell seal and one of an unidentified seal (Appendix G). The PSOs concluded that the deaths of the seals were not the result of research activities.

For Level B harassment under the MMPA, and behavioral responses under the ESA, NMFS has historically relied on an acoustic threshold for 160 dB re: 1 µPa (rms) for impulsive sound sources (airguns) and 120 dB re: 1 µPa (rms) for non-impulsive sound sources (icebreaking). These values are based on observations of behavioral responses of mysticetes, but is used for all marine mammals species. For the proposed action, the NMFS Permits and Conservation Division continued to rely on these historic NMFS acoustic thresholds to estimate the number of takes by MMPA Level B harassment, and accordingly, take of ESA-listed marine mammals that are proposed in the incidental harassment authorization for the airgun array operations during the low-energy seismic survey and icebreaking.

For the entire survey, a total of 4,775 individual marine mammals from 18 species (including four whale species listed as endangered species) were authorized for takes in the IHA and ITS. All of which were authorized for Level B takes. Accountability of takes were registered during seismic operations (animals observed within the 160 dB re: 1 µPa (rms) predicted distance: 979 meters), and during icebreaking activities (animals observed in the water within the 120 dB re: 1 µPa (rms) predicted distance: 6.1 kilometers). During the Antarctic survey program, five protected species were observed within the Level B harassment radii, totaling 547 animals that were considered takes. Of this total, 39 animals were takes accounted for seismic source and 508 animals during icebreaking maneuvers. These numbers are under the approved number of takes in the IHA and ITS provided by NMFS.

PSOs likely did not detect all animals present, however, it is highly unlikely that the actual number of animals present during survey operations reached anywhere near the fully authorized levels for all species. The combination of conservative predicted mitigation zones combined with conservative take estimation by NMFS (i.e., the precautionary approach), appears for most species to have resulted in an overestimation of

take and of overall impact on marine species from the activity. The monitoring and mitigation measures required by the IHA and ITS appear to have been an effective means to protect the marine species encountered during survey operations.

Appendix A Incidental Harassment Authorization

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

INCIDENTAL HARASSMENT AUTHORIZATION

The National Science Foundation (NSF) Office of Polar Programs, on behalf of the University of Houston, is hereby authorized under section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(D)) to harass marine mammals incidental to low-energy marine geophysical survey and icebreaking activity in the Amundsen Sea, when adhering to the following terms and conditions.

1. This Incidental Harassment Authorization (IHA) is valid for a period of one year from the date of issuance.

2. This IHA is valid only for marine geophysical survey and icebreaking activities associated with the THwaites Offshore Research (THOR) Project in the Amundsen Sea, Antarctica.

3. General Conditions

   (a) A copy of this IHA must be in the possession of the NSF, the vessel operator and other relevant personnel, the lead protected species observer (PSO), and any other relevant designees of NSF operating under the authority of this IHA.

   (b) The species authorized for taking are listed in Table 1. The taking, by Level B harassment only, is limited to the species and numbers listed in Table 1. Any taking exceeding the authorized amounts listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this IHA.

   (c) The taking by serious injury or death of any species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.

   (d) During use of the airgun(s), if marine mammal species other than those listed in Table 1, or species whose authorized take numbers have been met, are detected by PSOs, the acoustic source must be shut down.

   (e) The NSF must ensure that the vessel operator and other relevant vessel personnel are briefed on all responsibilities, communication procedures, marine mammal monitoring protocol, operational procedures, and IHA requirements prior to the start of survey activity, and when relevant new personnel join the survey operations.

4. Mitigation Measures

   The holder of this Authorization is required to implement the following mitigation measures:

   (a) NSF must employ at least three (3) dedicated, trained, NMFS-approved Protected Species Observers (PSO). The PSOs must have no tasks other than to conduct observational effort, record observational data, and communicate with and

instruct relevant vessel crew with regard to the presence of marine mammals and mitigation requirements. PSO resumes must be provided to NMFS for approval.

(b) At least one PSO must have a minimum of 90 days at-sea experience working as a PSO during a deep penetration seismic survey, with no more than eighteen months elapsed since the conclusion of the at-sea experience. One "experienced" visual PSO must be designated as the lead for the entire protected species observation team. The lead PSO must serve as primary point of contact for the vessel operator.

(c) Visual Observation

(i) During survey operations (*e.g.*, any day on which use of the acoustic source is planned to occur; whenever the acoustic source is in the water, whether activated or not), PSO(s) must be on duty and conducting visual observations at all times during daylight hours (*i.e.*, from 30 minutes prior to sunrise through 30 minutes following sunset).

(ii) Visual monitoring must begin not less than 30 minutes prior to ramp-up, including for nighttime ramp-ups of the airgun array, and must continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset.

(iii) PSOs must coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts and must conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.

(iv) PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours observation per 24 hour period.

(v) During good conditions (*e.g.*, daylight hours; Beaufort sea state 3 or less), visual PSOs must conduct observations when the acoustic source is not operating for comparison of sighting rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.

(d) Exclusion Zone (EZ) and buffer zone – PSOs shall establish and monitor applicable exclusion and buffer zones. These zones shall be based upon the radial distance from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself). During use of the acoustic source (i.e., anytime the acoustic source is active, including ramp-up), occurrence of marine mammals within the relevant buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown of the acoustic source (when required).

(i) Two exclusion zones are defined, depending on the species and context. A standard exclusion zone encompassing the area at and below the sea surface out to a radius of 100 meters from the edges of the airgun array (0-100 m) is defined. For special circumstances, the exclusion zone encompasses an extended distance of 500 meters (0-500 m). These

circumstances include observation of the following:

(A) All beaked whales and southern right whales.

(B) Large whales (*i.e.*, sperm whale or any baleen whale) with calf, with "calf" defined as an animal less than two-thirds the body size of an adult observed to be in close association with an adult.

(C) An aggregation (*i.e.*, six or more animals) of large whales of any species (*i.e.*, sperm whale or any baleen whale).

(ii) During pre-clearance monitoring (i.e., before ramp-up begins), the buffer zone acts as an extension of the exclusion zone in that observations of marine mammals within the buffer zone would also preclude airgun operations from beginning (i.e., ramp-up). For all marine mammals (except where superseded by the extended 500-m exclusion zone), the buffer zone encompasses the area at and below the sea surface from the edge of the 0-100 meter exclusion zone out to a radius of 200 meters from the edges of the airgun array (100-200 m). The buffer zone is not applicable when the exclusion zone is greater than 100 meters, i.e., the observational focal zone is not increased beyond 500 meters.

(e) Pre-Clearance and Ramp-up – A ramp-up procedure, involving a step-wise increase in the number of airguns firing and total active array volume until all operational airguns are activated and the full volume is achieved, is required at all times as part of the activation of the acoustic source. A 30-minute pre-clearance observation period must occur prior to the start of ramp-up. NSF must adhere to the following pre-clearance and ramp-up requirements:

(i) The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up.

(ii) Ramp-ups must be scheduled so as to minimize the time spent with source activated prior to reaching the designated run-in.

(iii) A designated PSO must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed.

(iv) During pre-clearance and ramp-up, two PSOs must monitor the relevant EZs and buffer zone. Ramp-up must not be initiated if any marine mammal is within the applicable exclusion zone or the buffer zone. If a marine mammal is observed within the exclusion zone or the buffer zone during the 30-minute pre-clearance period, ramp-up must not begin until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small odontocetes and pinnipeds and 30 minutes for all other species).

(v) Ramp-up must begin by activating a single airgun of the smallest volume in the array and shall continue by activating additional airguns at five-minute intervals until the full array is active.

(vi) Ramp-up must cease and the source shut down upon observation of marine mammals within the applicable exclusion zone. Once ramp-up has begun, observations of marine mammals within the buffer zone do not require shutdown.

(vii) If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than implementation of prescribed mitigation (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant visual observation and no visual detections of any marine mammal have occurred within the applicable exclusion zone. For any longer shutdown, pre-clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (e.g., BSS 4 or greater), ramp-up is required.

(viii) Ramp-up at night and at times of poor visibility must only occur where operational planning cannot reasonably avoid such circumstances. Ramp-up may occur at night and during poor visibility if the relevant zones have been continually monitored by PSOs for 30 minutes prior to ramp-up with no marine mammal detections.

(f) Shutdown requirements – When the airgun array is active (i.e., anytime one or more airguns is active, including during ramp-up) and a marine mammal appears within or enters the applicable exclusion zone, the acoustic source must be shut down.

(i) Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the airgun array. When there is certainty regarding the need for mitigation action on the basis of visual detection, the relevant PSO(s) must call for such action immediately.

(ii) The operator must establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the airgun array to ensure that shutdown commands are conveyed swiftly while allowing PSOs to maintain watch.

(iii) When a shutdown is called for by a PSO, the shutdown must occur and any dispute resolved only following shutdown.

(iv) Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone or following a 30-minute clearance period with no further detection of the marine mammal(s).

(v) Shutdown of the array is required upon observation of a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized number of takes has been met, approaching or observed within the Level B harassment zone (Table 2).

(g) Vessel Strike Avoidance – Vessel operator and crew must maintain a vigilant watch for all marine mammals and slow down or stop the vessel or alter course, as appropriate, to avoid striking any marine mammal. These requirements do not

apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel according to the parameters stated below. Visual observers monitoring the vessel strike avoidance zone can be either third-party observers or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena.

(i) The vessel must maintain a minimum separation distance of 100 m from large whales, including sperm whales and all mysticetes. The following avoidance measures must be taken if a large whale is within 100 m of the vessel:

(A) The vessel must reduce speed and shift the engine to neutral, when feasible, and must not engage the engines until the whale has moved outside of the vessel's path and the minimum separation distance has been established.

(B) If the vessel is stationary, the vessel must not engage engines until the whale(s) has moved out of the vessel's path and is beyond 100 m.

(ii) The vessel must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals. If an animal is encountered during transit, the vessel must attempt to remain parallel to the animal's course, avoiding excessive speed or abrupt changes in course.

(iii) Vessel speeds must be reduced to 10 knots or less when mother/calf pairs or large assemblages of cetaceans are observed near the vessel; the vessel operator may use professional judgment as to when such circumstances warranting additional caution are present.

5. Monitoring Requirements

The holder of this Authorization is required to conduct marine mammal monitoring during survey activity. Monitoring must be conducted in accordance with the following requirements:

(a) The operator must provide a night-vision device suited for the marine environment for use during nighttime ramp-up pre-clearance, at the discretion of the PSOs. At minimum, the device should feature automatic brightness and gain control, bright light protection, infrared illumination, and optics suited for low-light situations.

(b) PSOs must also be equipped with reticle binoculars (*e.g.*, 7 x 50) of appropriate quality (*i.e.*, Fujinon or equivalent), GPS, compass, and any other tools necessary to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals.

(c) PSO Qualifications

(i) PSOs must have successfully completed relevant training, including completion of all required coursework and passing a written and/or oral examination developed for the training program.

(ii) PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences and a minimum of 30 semester hours or equivalent in the biological sciences and at least one undergraduate course in math or statistics. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver must include written justification. Alternate experience that may be considered includes, but is not limited to (1) secondary education and/or experience comparable to PSO duties; (2) previous work experience conducting academic, commercial, or government-sponsored marine mammal surveys; or (3) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

(d) Data Collection – PSOs must use standardized data forms, whether hard copy or electronic. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of animals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the acoustic source to resume survey. If required mitigation was not implemented, PSOs should submit a description of the circumstances. We require that, at a minimum, the following information be reported:

(i) PSO names and affiliations

(ii) Dates of departures and returns to port with port name

(iii) Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort

(iv) Vessel location (latitude/longitude) when survey effort begins and ends; vessel location at beginning and end of visual PSO duty shifts

(v) Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change

(vi) Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions change significantly), including wind speed and direction, Beaufort sea state, Beaufort wind force, swell height, weather conditions, cloud cover, sun glare, and overall visibility to the horizon

(vii) Factors that may be contributing to impaired observations during each PSO shift change or as needed as environmental conditions change (*e.g.*, vessel traffic, equipment malfunctions)

(viii) Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in the array, tow depth

of the array, and any other notes of significance (*i.e.*, pre-ramp-up survey, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.)

(ix) If a marine mammal is sighted, the following information should be recorded:

(A) Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);

(B) PSO who sighted the animal;

(C) Time of sighting;

(D) Vessel location at time of sighting;

(E) Water depth;

(F) Direction of vessel's travel (compass direction);

(G) Direction of animal's travel relative to the vessel;

(H) Pace of the animal;

(I) Estimated distance to the animal and its heading relative to vessel at initial sighting;

(J) Identification of the animal (*e.g.*, genus/species, lowest possible taxonomic level, or unidentified); also note the composition of the group if there is a mix of species;

(K) Estimated number of animals (high/low/best);

(L) Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, etc.);

(M) Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

(N) Detailed behavior observations (*e.g.*, number of blows, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior);

(O) Animal's closest point of approach (CPA) and/or closest distance from the center point of the acoustic source;

(P) Platform activity at time of sighting (*e.g.*, deploying, recovering, testing, shooting, data acquisition, other); and

(Q) Description of any actions implemented in response to the sighting (*e.g.*, delays, shutdown, ramp-up, speed or course alteration, etc.) and time and location of the action.

6. Reporting

(a) NSF must submit a draft comprehensive report on all activities and monitoring results within 90 days of the completion of the survey or expiration of the IHA, whichever comes sooner. The draft report must include the following:

(i) Summary of all activities conducted and sightings of protected species near the activities;

(ii) Full documentation of methods, results, and interpretation pertaining to all monitoring;

(iii) Summary of dates and locations of survey operations and all protected species sightings (dates, times, locations, activities, associated survey activities);

(iv) Geo-referenced time-stamped vessel track lines for all time periods during which airguns were operating. Track lines should include points recording any change in airgun status (*e.g.*, when airguns began operating, when they were turned off);

(v) GIS files in ESRI shapefile format and UTC date and time, and latitude and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system;

(vi) Raw observational data;

(vii) Estimates of the number and nature of exposures that occurred above the harassment threshold, including an estimate of those that were not detected in consideration of both the characteristics and behaviors of the species of marine mammals that affect detectability, as well as the environmental factors that affect detectability;

(viii) A final report must be submitted within 30 days following resolution of any NMFS comments on the draft report.

(b) The report must describe all activities conducted and sightings of marine mammals near the activities, must provide full documentation of methods, results, and interpretation pertaining to all monitoring, and must summarize the dates and locations of survey operations and all marine mammal sightings (dates, times, locations, activities, associated survey activities). The report must also include estimates of the number and nature of exposures that occurred above the harassment threshold based on PSO observations, including an estimate of those that were not detected in consideration of both the characteristics and behaviors of the species of marine mammals that affect detectability, as well as the environmental factors that affect detectability. Geospatial data regarding locations where the acoustic source was used must be provided as an ESRI shapefile with all necessary files and appropriate metadata. In addition to the report, all raw observational data must be made available to NMFS. The report must summarize the data collected as required under condition 5(d) of this IHA. A final report must be submitted within 30 days following resolution of any comments from NMFS on the draft report.

(c) Reporting injured or dead marine mammals:

(i) In the event that the specified activity clearly causes the take of a marine mammal in a manner not permitted by this IHA, such as serious injury or mortality, NSF must immediately cease the specified activities and immediately report the incident to the NFMS Office of Protected Resources (301-427-8401). The report must include the following information:

(A) Time, date, and location (latitude/longitude) of the incident;

(B) Vessel's speed during and leading up to the incident;

(C) Description of the incident;

(D) Status of all sound source use in the 24 hours preceding the incident;

(E) Water depth;

(F) Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);

(G) Description of all marine mammal observations in the 24 hours preceding the incident;

(H) Species identification or description of the animal(s) involved;

(I) Fate of the animal(s); and

(J) Photographs or video footage of the animal(s).

(ii) Activities must not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with NSF to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. NSF must not resume their activities until notified by NMFS.

(iii) In the event that NSF discovers an injured or dead marine mammal, and the lead observer determines that the cause of injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition), NSF must immediately report the incident to the NMFS Office of Protected Resources (301-427-8401). The report must include the same information identified in condition 6(c)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with NSF to determine whether additional mitigation measures or modifications to the activities are appropriate.

(iv) In the event that NSF discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the specified activities (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), NSF must report the incident to NMFS Office of Protected Resources (301-427-8401) within 24 hours of the discovery. NSF must photographs or video footage or other documentation of the sighting to NMFS.

7. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if NMFS determines the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.

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

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

   (b) The request for renewal must include the following:

      (i) An explanation that the activities to be conducted beyond the initial dates either are identical to the previously analyzed activities or include changes so minor (e.g., reduction in pile size) that the changes do not affect the previous analyses, take estimates, or mitigation and monitoring requirements.

      (ii) 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.

   (c) 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 remain the same and appropriate, and the original findings remain valid.

Donna S. Wieting,
Director, Office of Protected Resources,
National Marine Fisheries Service.

Date

JAN 24 2020

Table 1. Numbers of Potential Incidental Take of Marine Mammals Authorized.

Species	Calculated Level B Take Seismic	Calculated Level B Take Icebreaking	Authorized Total Take[a]
Low-frequency cetaceans			
Blue whale	1	1	2
Fin whale	27	54	81
Humpback whale	1	1	40[c]
Antarctic minke whale	2149	4318	6467
Common (dwarf) minke whale	2149	4318	6467
Sei whale	1	2	6[b]
Mid-frequency cetaceans			
Arnoux's beaked whale	23	47	70
Killer whale	1067	2144	3211
Layard's beaked whale	2	5	7
Long-finned pilot whale	29	59	88
Southern bottlenose whale	25	51	76
Sperm whale	64	128	191
Gray's beaked whale	1	2	3
Phocids			
Crabeater seal	28	57	2000[d]
Leopard seal	0	0	50[d]
Ross seal	0	0	10[d]
Southern Elephant Seal	8897	7748	16645
Weddell seal	0	1	100[d]

Table 2 — Level B - Predicted Distances to the Level B Threshold (160 re 1μPa$_{rms}$ isopleths)

Source and volume (cm^3)[in^3]	Tow depth (m)	Water depth (m) [1]	Predicted 160 re 1μPa$_{rms}$ (m) isopleth[2]
2 x 45/105 in^3 (300 in^3) GI guns	3	100-1000	979
		>1000	653
1 x 45/105 in^3 (150 in^3) GI guns	3	100-1000	503
		>1000	335
2 x 105/105 in^3 (420 in^3) GI guns	3	100-1000	1044
		>1000	696
1 x 105/105 in^3 (210 in^3) GI guns	3	100-1000	531
		>1000	354

Appendix B Basic Data Summary Form

BASIC DATA FORM					
Project Number	207354				
Seismic Contractor	National Science Foundation (NSF)				
Area Surveyed During Reporting Period	Line Number	Start Latitude	Start Longitude	End Latitude	End Longitude
	01	74° 32.49' S	106° 30.30' W	74° 30.50' S	105° 20.24' W
	02	74° 29.63' S	105° 14.94' W	74° 29.77' S	104° 50.47' W
	03	74° 29.69' S	104° 50.17' W	74° 20.04' S	104° 27.23' W
	04	74° 20.03' S	104° 27.50' W	74° 24.64' S	104° 12.16' W
	05	74° 24.71' S	104° 12.09' W	74° 37.96' S	104° 46.89' W
	06	74° 38.03' S	104° 46.91' W	74° 47.83 S	104° 19.66' W
	07	74° 47.82' S	104° 19.47' W	74° 39.55 S	103° 51.52' W
	08	74° 30.36' S	104° 13.86' W	74° 28.21' S	104° 50.25' W
	09	74° 28.51' S	104° 50.01' W	74° 40.00 S	103° 37.77' W
	12	74° 55.62' S	102° 13.47' W	75° 03.28' S	101° 03.21' W
	13	75° 03.34' S	101° 03.43' W	75° 05.34' S	101° 14.73' W
	14	75° 05.32' S	101° 14.91' W	74° 56.54' S	100° 48.80' W
	15	74° 56.47' S	100° 56.95' W	74° 54.55' S	100° 56.95' W
	16	74° 53.78' S	100° 57.46' W	74° 40.24' S	103° 18.48' W
	17	74° 40.20' S	103° 18.91' W	74° 27.46' S	104° 06.85' W
	18	74° 27.40' S	104° 06.95' W	74° 19.61' S	103° 56.63' W
	19	74° 19.54' S	104° 56.63' W	74° 17.15' S	104° 21.94' W
Survey Type	2-D				
Vessel and/or Rig Name	RVIB *Nathaniel B. Palmer*				
Permit Number	IHA issued on 24 January 2020				
Location / Distance of Airgun Deployment	75 meters astern				
Water Depth	17 to 6077 meters				
Dates of Project	25 January 2020	THROUGH	28 March 2020		

Total time airguns operating – all power levels:	56:09
Time airguns operating on survey lines:	50:39
Time airguns operating not on a survey line:	05:13
Amount of time mitigation gun (40 in³) operations:	N/A
Amount of time in ramp-up:	00:15
Number daytime ramp-ups:	3
Number of night time ramp-ups:	0
Number of ramp-ups from mitigation source:	N/A
Amount of time conducted in airgun testing:	00:02
Duration of visual observations:	1062:38
Duration of observations while source active:	42:35
Duration of observation during source silence:	1043:03
Lead Protected Species Observer:	Yessica Vicencio Murillo
Protected Species Observers:	Lorena Figueroa, Valeria Hernández
Number of whale detections:	92
Number of beaked whale detections:	01
Number of dolphins detections:	08
Number of pinniped detections:	430
Total Number of Protected Species Detections:	531 (five det. with more than one species; total number of events: 526)
List Mitigation Actions	One delay to initiate source and one shutdown
Duration of operational downtime due to mitigation:	00:26

Appendix C Survey Lines Acquired

Survey Line	Date Started	Time Started (UTC)	Date Concluded	Time Concluded (UTC)	Length (km)
NBP20-02_L01	2020-02-08	10:50	2020-02-08	15:42	43.1
NBP20-02_L02	2020-02-08	16:03	2020-02-08	17:20	12.5
NBP20-02_L03	2020-02-08	17:31	2020-02-08	19:58	22.5
NBP20-02_L04	2020-02-08	20:11	2020-02-08	21:20	12.9
NBP20-02_L05	2020-02-08	21:41	2020-02-09	01:20	31.7
NBP20-02_L06	2020-02-09	01:21	2020-02-09	06:15	23.1
NBP20-02_L07	2020-02-09	06:15	2020-02-09	06:38	21.9
NBP20-02_L08	2020-02-09	19:48	2020-02-09	22:04	21.3
NBP20-02_L09	2020-02-09	22:14	2020-02-10	03:23	44.1
NBP20-02-L012	2020-02-24	13:58	2020-02-24	18:41	43.1
NBP20-02-L013	2020-02-24	18:41	2020-02-24	19:25	7.0
NBP20-02-L014	2020-02-24	19:25	2020-02-24	21:58	23.5
NBP20-02-L015	2020-02-24	21:58	2020-02-24	22:48	7.9
NBP20-02-L016	2020-02-24	22:59	2020-02-25	07:43	81.4
NBP20-02-L017	2020-02-25	07:43	2020-02-25	11:19	33.7
NBP20-02-L018	2020-02-25	11:19	2020-02-25	12:59	15.6
NBP20-02-L019	2020-02-25	12:59	2020-02-25	14:42	15.0

Appendix D Summary of Visual Detections of Protected Species During the Survey

Movement Codes: **TV**: towards vessel; **AV**: away from vessel; **PV (SD/OD)**: parallel vessel (same direction or opposite direction); **PE (AH/BH):** perpendicular (crossing ahead or behind); **MI**: milling; **SA**: stationary; **V:** variable, **UN**: unknown**; OM**: other movement

Behavioural Codes: **NS**: normal swimming; **FT**: fast travel; **ST**: slow travel; **MI**: milling; **BA**: resting/basking at surface; **FL:** floating; **SR**: surfacing/swimming at the surface; **SS**: swimming below surface; **BR**: bow/wake riding; **PO**: porpoising; **JP**: jumping; **SA**: surface active (lob tailing/pectoral slapping, full/partial breaching)**; R:** rolling; **DI**: dive; **DF**: dive with fluke; **FF**: feeding/foraging; **SB**: social behavior; **MT**: mating behavior; **BV**: blow visible (whale); **SV**: only splashes visible (dolphins); **DV**: dorsal fin visible; **OB**: other behavior

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
1	25/01/2020	16:28	Sei Whale	2	53.18210°S 070.62428°W	Source not deployed	TV	ST/MISS/BV	200/Silent	None	
2	25/01/2020	18:55	Unidentifiable Baleen Whale	1	53.12317°S 070.72150°W	Source not deployed	UN	NS/BV	500/Silent	None	
3	25/01/2020	19:10	Unidentifiable Baleen Whale	2	53.17633°S 070.88950°W	Source not deployed	PV(OD)	BV	3545/Silent	None	
4	25/01/2020	19:40	Peale's Dolphin	4	53.18317°S 070.89167°W	Source not deployed	TV	FT/SS/JP	301/Silent	None	
5	26/01/2020	21:06	South American Fur Seal	3	53.92753°S 066.04768°W	Source not deployed	PV(OD)	BA/SA/DI	300/Silent	None	
6	26/01/2020	21:20	South American Sea Lion	1	53.92753°S 066.04768°W	Source not deployed	UN	SR/DI	10/Silent	None	
7	26/01/2020	22:30	South American Fur Seal	3	54.0787°S 065.79160°W	Source not deployed	PV(OD)	BA/JP/DI	50/Silent	None	
8	26/01/2020	22:54	South American Fur Seal	24	54.11952°S 065.71982°W	Source not deployed	PV(SD)	FT/BR/JP/SS	150/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
9	26/01/2020	23:02	South American Fur Seal	2	54.13912°S 065.68478°W	Source not deployed	TV	BA	200/Silent	None	
10	26/01/2020	23:09	South American Fur Seal	5	54.13917°S 064.70090°W	Source not deployed	PV(SD)	FT/PO	100/Silent	None	
11	26/01/2020	23:25	South American Fur Seal	5	54.15317°S 065.63783°W	Source not deployed	PV(OD)	FT/PO/ BA	250/Silent	None	
12	28/01/2020	22:15	Unidentifiable Dolphin	3	60.33460°S 071.68648°W	Source not deployed	OM	BR/FT/SS	150/Silent	None	
13	30/01/2020	12:33	Unidentifiable Baleen Whale	1	64.41207°S 079.21683°W	Source not deployed	PV(SD)	BV/NS	900/Silent	None	
14	30/01/2020	14:22	Fin Whale	1	64.64417°S 079.74300°W	Source not deployed	PV(OD)	BV/DI	1150/Silent	None	
15	30/01/2020	16:45	Fin Whale	2	64.94354°S 080.43321°W	Source not deployed	SA	BV/SS	485/Silent	None	
16	30/01/2020	17:19	Unidentifiable Baleen Whale	2	64.99513°S 080.55248°W	Source not deployed	SA	BV/MI	800/Silent	None	
17	30/01/2020	17:35	Fin Whale	5	64.99983°S 080.56017°W	Source not deployed	SA	BV/SS	3200/Silent	None	
18	30/01/2020	18:30	Fin Whale	3	64.99983°S 080.56017°W	Source not deployed	PV(OD)	BV	1180/Silent	None	Certainty of identification: Possible.
19	30/01/2020	19:03	Leopard Seal	1	65.01317°S 080.57967°W	Source not deployed	TV	MI/SR	120/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
20	30/01/2020	20:06	Fin Whale	2	65.09900°S 080.71567°W	Source not deployed	PV(OD)	BV	1414/Silent	None	
21	30/01/2020	20:52	Sei Whale	3	65.32162°S 081.03955°W	Source not deployed	PV(OD)	BA/BV	1500/Silent	None	
22	30/01/2020	23:32	Fin whale	2	65.32162°S 081.03955°W	Source not deployed	SA	BV/SR	500/Silent	None	
22	30/01/2020	23:32	Sei Whale	3	65.32162°S 081.03955°W	Source not deployed	SA	BV/SR	500/Silent	None	
23	30/01/2020	23:35	Humpback whale	5	65.32162°S 081.03955°W	Source not deployed	SA	BV/SR	10/Silent	None	Avoidance maneuver implemented.
24	31/01/2020	2:20	Humpback whale	2	65.73370°S 081.67002°W	Source not deployed	PV(OD)	BV/SS	1362/Silent	None	
25	31/01/2020	2:36	Humpback whale	2	65.77930°S 081.73140°W	Source not deployed	TV	BV/SR	70/Silent	None	
26	31/01/2020	11:20	Unidentifiable Baleen Whale	1	57.03820°S 083.68547°W	Source not deployed	AV	BV	4080/Silent	None	
27	31/01/2020	12:55	Humpback whale	3	67.26817°S 084.04983°W	Source not deployed	PV(OD)	BV/DF	1880/Silent	None	
28	31/01/2020	13:35	Southern bottlenose whale	3	67.36217°S 084.20117°W	Source not deployed	PE(AH)	BV/SR	1310/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
29	31/01/2020	14:53	Humpback whale	7	67.54933°S 084.50783°W	Source not deployed	UN	BV/DF	6180/Silent	None	
30	31/01/2020	16:20	Humpback whale	3	67.76868°S 084.86211°W	Source not deployed	PV(OD)	NS/SR	600/Silent	None	
31	31/01/2020	16:17	Humpback whale	1	67.84364°S 084.99135°W	Source not deployed	PV(OD)	NS/SR	1400/Silent	None	
32	31/01/2020	16:59	Unidentifiable Baleen Whale	1	67.87336°S 085.04051°W	Source not deployed	UN	BV	4190/Silent	None	
33	31/01/2020	18:20	Humpback whale	1	68.07450°S 085.37467°W	Source not deployed	PV(OD)	BV/DF	3000/Silent	None	
34	31/01/2020	20:14	Humpback whale	1	68.35267°S 085.83583°W	Source not deployed	PV(OD)	BV/DF	5420/Silent	None	
35	31/01/2020	21:17	Antarctic Fur Seal	1	68.49120°S 086.07061°W	Source not deployed	MI	SU/MI	720/Silent	None	Certainty of identification: Probable.
36	01/02/2020	2:50	Unidentifiable Whale	1	68.95903°S 086.90263°W	Source not deployed	PV(OD)	ST/DI/SR	780/Silent	None	
37	01/02/2020	13:00	Humpback whale	2	68.95903°S 086.90263°W	Source not deployed	PV(OD)	NS/BV/BV/ SR	400/Silent	None	
38	01/02/2020	14:13	Crabeater Seal	2	69.91600°S 088.78417°W	Source not deployed	TV	FT/SS/SR/DI	20/Silent	None	Certainty of identification: Possible.
39	01/02/2020	14:15	Crabeater Seal	96	69.91600°S 088.78417°W	Source not deployed	OM	SR/OB/SR	180/Silent	None	Two potential level B takes.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
40	01/02/2020	16:46	Weddell Seal	1	69.94093°S 088.97341°W	Source not deployed	OM	DI/OB	360/Silent	None	
41	01/02/2020	17:46	Leopard Seal	1	69.97572°S 088.94602°W	Source not deployed	OM	OB	535/Silent	None	
42	01/02/2020	18:23	Killer Whale	3	70.07817°S 088.84533°W	Source not deployed	PV(OD)	NS/BV/SR	1334/Silent	None	
43	01/02/2020	18:51	Crabeater Seal	228	70.14600°S 088.79000°W	Source not deployed	OM	SR/OB	180/Silent	None	16 potential level B takes. Two avoidance maneuvers.
44	01/02/2020	20:08	Leopard Seal	1	70.31500°S 088.73533°W	Source not deployed	OM	OB	200/Silent	None	
45	01/02/2020	22:44	Leopard Seal	1	70.41406°S 088.65239°W	Source not deployed	OM	OB	520/Silent	None	
46	02/02/2020	0:45	Leopard Seal	1	70.43193°S 088.56733°W	Source not deployed	OM	OB	450/Silent	None	
47	02/02/2020	0:46	Crabeater Seal	15	70.43193°S 088.56733°W	Source not deployed	OM	OB	120/Silent	None	
48	02/02/2020	2:33	Leopard Seal	1	70.49172°S 088.51813°W	Source not deployed	OM	OB/DI	936/Silent	None	
49	02/02/2020	4:20	Crabeater Seal	3	70.50678°S 088.52378°W	Source not deployed	OM	SR/MI/DI	735/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
50	02/02/2020	5:02	Crabeater Seal	2	70.51508°S 088.50935°W	Source not deployed	OM	SR/OB	315/Silent	None	One potential level B take.
51	02/02/2020	7:10	Crabeater Seal	152	70.42650°S 088.75383°W	Source not deployed	OM	SR/OB	25/Silent	None	21 potential level B takes.
52	02/02/2020	10:12	Ross seal	1	70.26450°S 089.79983°W	Source not deployed	OM	OB	300/Silent	None	Certainty of identification: Possible.
53	02/02/2020	17:01	Crabeater Seal	49	69.86678°S 091.90748°W	Source not deployed	OM	OB/DI	30/Silent	None	One potential level B take.
54	02/02/2020	19:07	Crabeater Seal	20	69.77817°S 092.76850°W	Source not deployed	OM	OV	200/Silent	None	
55	03/02/2020	0:14	Humpback whale	1	69.75608°S 095.27965°W	Source not deployed	TV	BV/SR/SS	315/Silent	None	
56	03/02/2020	0:32	Crabeater Seal	34	69.73113°S 095.40875°W	Source not deployed	OM	OB/SR/SS	180/Silent	None	10 potential level B takes.
57	03/02/2020	1:30	Leopard Seal	3	69.58863°S 095.76888°W	Source not deployed	OM	OB	630/Silent	None	
58	03/02/2020	3:28	Humpback whale	2	69.52783°S 096.56778°W	Source not deployed	SA	BV/SR/ DF	50/Silent	None	
59	03/02/2020	3:32	Unidentifiable Seal	1	69.52783°S 096.56778°W	Source not deployed	MI	SA/DI	195/Silent	None	
60	03/02/2020	3:53	Humpback whale	1	69.52483°S 096.68617°W	Source not deployed	AV	BV/SS/DF	435/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
61	03/02/2020	4:02	Crabeater Seal	3	69.52512°S 096.80623°W	Source not deployed	MI	SR/SS/ OB	435/Silent	None	Certainty of identification: Probable.
62	03/02/2020	11:32	Crabeater Seal	9	69.89263°S 099.99323°W	Source not deployed	OM	OB/SR	215/Silent	None	Four potential level B takes.
63	03/02/2020	12:00	Leopard Seal	1	69.91032°S 100.16220°W	Source not deployed	OM	OB	200/Silent	None	Two potential level B takes.
64	03/02/2020	13:00	Crabeater Seal	6	69.97400°S 100.49100°W	Source not deployed	OM	SR/OB	200/Silent	None	
65	03/02/2020	13:40	Humpback whale	2	70.01433°S 100.71183°W	Source not deployed	MI	SR/BV/ BA	115/Silent	None	
66	03/02/2020	13:51	Leopard Seal	1	70.03200°S 100.80367°W	Source not deployed	OM	OB	50/Silent	None	
67	03/02/2020	14:25	Humpback whale	1	70.07350°S 101.01867°W	Source not deployed	PE(AH)	BV	180/Silent	None	
68	03/02/2020	20:20	Crabeater Seal	30	70.42900°S 103.40833°W	Source not deployed	OM	OB	120/Silent	None	20 potential level B takes.
69	03/02/2020	20:30	Leopard Seal	1	70.43150°S 103.46000°W	Source not deployed	OM	OB	220/Silent	None	
70	03/02/2020	21:17	Weddell Seal	1	70.47997°S 103.75290°W	Source not deployed	OM	OB	130/Silent	None	Avoidance maneuver implemented.
71	03/02/2020	21:38	Crabeater Seal	5	70.50376°S 103.88608°W	Source not deployed	OM	OB	293/Silent	None	Detection with two species.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
71	03/02/2020	21:52	Weddell Seal	1	70.50376°S 103.88608°W	Source not deployed	OM	OB	293/Silent	None	Detection with two species.
72	03/02/2020	22:21	Crabeater Seal	1	70.54234°S 104.11282°W	Source not deployed	OM	OB	400/Silent	None	
73	03/02/2020	22:56	Crabeater Seal	3	70.54380°S 104.36954°W	Source not deployed	OM	OB/DI	325/Silent	None	One potential level B take.
74	04/02/2020	0:00	Unidentifiable Seal	2	70.53917°S 104.77472°W	Source not deployed	OM	OB	230/Silent	None	One potential level B take.
75	04/02/2020	0:54	Crabeater Seal	1	70.53775°S 105.15137°W	Source not deployed	OM	OB	20/Silent	None	One potential level B take.
76	04/02/2020	1:22	Crabeater Seal	9	70.55820°S 105.33420°W	Source not deployed	OM	OB/SR/SS	100/Silent	None	Five potential level B takes.
77	04/02/2020	2:55	Crabeater Seal	1	70.71817°S 105.68877°W	Source not deployed	OM	OB	280/Silent	None	One potential level B take.
78	04/02/2020	5:31	Crabeater Seal	1	70.97868°S 105.96075°W	Source not deployed	OM	OB/DI/SR	200/Silent	None	One potential level B take.
79	04/02/2020	11:18	Crabeater Seal	1	71.37410°S 105.78300°W	Source not deployed	OM	OB/SR	190/Silent	None	One potential level B take.
80	04/02/2020	11:24	Unidentifiable Seal	1	71.37410°S 105.78300°W	Source not deployed	OM	OB	800/Silent	None	
81	04/02/2020	12:45	Crabeater Seal	7	71.52537°S 105.54800°W	Source not deployed	OM	OB/SR	150/Silent	None	Three potential level B takes.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
82	04/02/2020	15:14	Unidentifiable Seal	3	71.73775°S 105.38272°W	Source not deployed	OM	OB	500/Silent	None	
83	04/02/2020	16:11	Weddell Seal	3	71.77982°S 105.33803°W	Source not deployed	OM	OB	400/Silent	None	
84	04/02/2020	18:00	Crabeater Seal	69	71.85183°S 105.24267°W	Source not deployed	OM	OB	130/Silent	None	One potential level B take.
85	04/02/2020	18:47	Leopard Seal	1	71.90000°S 105.17983°W	Source not deployed	AV	SROB	430/Silent	None	One potential level B take.
86	04/02/2020	21:10	Unidentifiable Seal	3	72.17545°S 104.76166°W	Source not deployed	OM	OB	300/Silent	None	
87	04/02/2020	21:32	Unidentifiable Seal	4	72.24191°S 104.71533°W	Source not deployed	PV(OD)	SA/SR/ OB	350/Silent	None	
88	04/02/2020	22:15	Unidentifiable Seal	37	72.36191°S 104.63031°W	Source not deployed	OM	OB	375/Silent	None	
89	04/02/2020	23:10	Unidentifiable Seal	3	72.49931°S 104.47506°W	Source not deployed	PE(AH)	PO/SS/FT	210/Silent	None	
90	05/02/2020	0:05	Unidentifiable Seal	1	72.64565°S 104.49223°W	Source not deployed	OM	OB	1100/Silent	None	
91	06/02/2020	5:51	Antarctic Minke whale	2	73.96638°S 102.86403°W	Source not deployed	AV	FT/BV	1880/Silent	None	
92	06/02/2020	10:19	Unidentifiable Seal	1	73.88650°S 102.98850°W	Source not deployed	AV	NS/ DI	210/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
93	07/02/2020	1:32	Crabeater seal	1	73.95406°S 102.43603°W	Source not deployed	AV	NS	220/Silent	None	
94	07/02/2020	2:50	Weddell Seal	1	74.04222°S 103.18107°W	Source not deployed	OM	OB	535/Silent	None	
95	07/02/2020	3:10	Unidentifiable Seal	2	74.04102°S 103.39455°W	Source not deployed	OM	OB	1000/Silent	None	
96	07/02/2020	6:45	Unidentifiable Seal	1	74.51688°S 102.94333°W	Source not deployed	MI	MI	550/Silent	None	
97	07/02/2020	6:45	Unidentifiable Seal	6	74.69033°S 102.54517°W	Source not deployed	MI	SR/SS	1073/Silent	None	
98	07/02/2020	8:00	Crabeater Seal	2	74.72717°S 102.47850°W	Source not deployed	MI	SR/SS/DI	530/Silent	None	
99	07/02/2020	8:15	Crabeater Seal	5	74.85567°S 102.17433°W	Source not deployed	TV	SR/FT/PO/SS	30/Silent	None	
100	07/02/2020	23:14	Unidentifiable Seal	1	74.56995°S 196.53870°W	Source not deployed	PV(SD)	NS/PO/SS	170/Silent	None	
101	08/02/2020	1:13	Crabeater seal	2	74.58003°S 106.46330°W	Not Firing/Silent	V	SB/S/ MI	150/Silent	None	
102	08/02/2020	6:51	Crabeater seal	3	74.58000°S 106.46350°W	Not Firing/Silent	TV	NS/PO	50/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
103	08/02/2020	20:00	Unidentifiable Whale	1	74.34500°S 104.34350°W	Full Volume While On Survey Line	SA	BV	1460/Single gun firing	None	
104	08/02/2020	21:20	Crabeater seal	1	74.39393°S 104.24973°W	Full Volume While On Survey Line	TV	FT/SA/PO/ DI	150/Single gun firing	None	One potential level B take.
105	09/02/2020	17:47	Crabeater seal	1	74.57059°S 103.98730°W	Not Firing/Silent	TV	NS/SR/PO/ DI	1/Silent	Delay	
106	09/02/2020	20:43	Crabeater seal	1	74.46217°S 104.43067°W	Full Volume While On Survey Line	SA	OB	300/Full volume	None	
107	09/02/2020	23:29	Antarctic Minke Whale	1	74.54478°S 104.55871°W	Full Volume While On Survey Line	PE(AH)	SS	970/Full volume	None	Certainty of identification: Possible.
108	10/02/2020	3:29	Crabeater seal	1	74.66788°S 103.59795°W	Not deployed	TV	SR/NS	5/Full volume	None	
109	10/02/2020	6:41	Unidentifiable Seal	1	74.67442°S 103.45298°W	Not deployed	TV	NS/SS/DI	170/Full volume	None	
110	10/02/2020	7:26	Crabeater seal	2	74.67333°S 103.45183°W	Not deployed	TV	FT/NS	50/Full volume	None	Certainty of identification: Probable.
111	10/02/2020	8:11	Killer whale	2	74.67283°S 103.45050°W	Not deployed	PV(SD)	NS/SS/SB	2910/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
112	10/02/2020	10:09	Crabeater seal	3	74.75627°S 103.43182°W	Not deployed	OM	OB	120/Silent	None	
113	10/02/2020	11:23	Unidentifiable Whale	1	74.90350°S 102.97300°W	Not deployed	SA	BV	1886/Silent	None	
114	10/02/2020	13:50	Crabeater seal	2	75.07183°S 102.84717°W	Not deployed	MI	MI	65/Silent	None	
115	10/02/2020	14:56	Unidentifiable Seal	1	75.03100°S 103.24933°W	Not deployed	MI	MI	1132/Silent	None	Certainty of identification: Probable.
116	12/02/2020	13:28	Unidentifiable Seal	8	75.09617°S 102.53267°W	Not deployed	MI	MI	600/Silent	None	
117	12/02/2020	15:16	Crabeater seal	3	74.96775°S 102.92597°W	Not deployed	OM	OB	250/Silent	None	
118	12/02/2020	15:30	Crabeater seal	1	74.94381°S 103.05796°W	Not deployed	OM	OB	300/Silent	None	
119	12/02/2020	17:18	Unidentifiable Seal	3	74.76419°S 104.05503°W	Not deployed	OM	OB	1000/Silent	None	
120	12/02/2020	17:53	Weddell seal	1	74.69998°S 104.32061°W	Not deployed	OM	OB	600/Silent	None	
121	12/02/2020	17:55	Unidentifiable Seal	3	74.69998°S 104.32061°W	Not deployed	OM	OB	760/Silent	None	
122	12/02/2020	18:16	Crabeater seal	12	74.66017°S 104.34267°W	Not deployed	OM	OB	300/Silent	None	Two potential level B takes.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
123	12/02/2020	18:33	Unidentifiable Seal	2	74.62650°S 104.33683°W	Not deployed	MI	SR/DI	300/Silent	None	
124	12/02/2020	21:18	Unidentifiable Seal	6	74.51344°S 105.23234°W	Not deployed	OM	OM	460/Silent	None	
125	13/02/2020	3:36	Weddell seal	1	74.52927°S 106.14717°W	Not deployed	OM	OM	520/Silent	None	
126	13/02/2020	4:08	Unidentifiable Seal	1	74.56263°S 106.31930°W	Not deployed	TV	FT/PO/SR/OB	110/Silent	None	
127	13/02/2020	7:48	Unidentifiable Seal	3	74.60667°S 106.11983°W	Not deployed	OM	OB	600/Silent	None	
128	13/02/2020	9:08	Weddell seal	1	74.53682°S 106.20232°W	Not deployed	OM	OB	100/Silent	None	
129	13/02/2020	9:12	Unidentifiable Seal	1	74.53682°S 106.20232°W	Not deployed	OM	OB	470/Silent	None	
130	13/02/2020	11:56	Crabeater seal	7	74.60633°S 106.29400°W	Not deployed	OM	OB/SR/SS	300/Silent	None	Certainty of identification: Probable.
131	13/02/2020	16:03	Unidentifiable Seal	1	74.60764°S 106.29280°W	Not deployed	TV	SR/PO/DI	70/Silent	None	
132	14/02/2020	0:58	Crabeater seal	2	74.55298°S 106.34680°W	Not deployed	OM	OB	500/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
133	14/02/2020	1:05	Weddell seal	4	74.52892°S 106.31105°W	Not deployed	OM	OB	30/Silent	None	One potential level B take. Avoidance maneuver implemented.
134	14/02/2020	2:16	Crabeater seal	1	74.39363°S 105.91615°W	Not deployed	OM	SR/OB	400/Silent	None	One potential level B take. Certainty of identification: Probable.
135	14/02/2020	5:23	Weddell seal	1	74.13978°S 104.92353°W	Not deployed	OM	OB	350/Silent	None	
136	14/02/2020	6:44	Weddell seal	1	73.94868°S 104.53062°W	Not deployed	OM	OB	400/Silent	None	
137	14/02/2020	6:58	Unidentifiable Seal	1	73.92233°S 104.51567°W	Not deployed	V	SS/MI	280/Silent	None	
138	14/02/2020	7:28	Leopard seal	1	73.84267°S 104.50117°W	Not deployed	PV(SD)	SA/NS	40/Silent	None	Certainty of identification: Possible.
139	14/02/2020	7:42	Unidentifiable Seal	3	73.80367°S 104.54750°W	Not deployed	SA	OB	400/Silent	None	
140	14/02/2020	8:37	Crabeater seal	1	73.64000°S 104.46900°W	Not deployed	UN	SA/DI	130/Silent	None	
141	14/02/2020	10:00	Crabeater seal	2	73.44393°S 104.61497°W	Not deployed	OM	OB	100/Silent	None	
142	14/02/2020	12:07	Weddell seal	1	73.19653°S 105.10088°W	Not deployed	OM	OB	250/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
143	14/02/2020	12:24	Crabeater seal	3	73.15423°S 105.13128°W	Not deployed	V	OB	150/Silent	None	
144	14/02/2020	12:58	Crabeater seal	13	73.06620°S 105.22007°W	Not deployed	PE(AH)	FT/PO/OB/	800/Silent	None	
145	14/02/2020	13:15	Crabeater seal	18	73.00500°S 105.20800°W	Not deployed	OB	OB	200/Silent	None	
146	14/02/2020	13:51	Crabeater seal	1	72.92783°S 105.28167°W	Not deployed	UN	SR/DI	250/Silent	None	
147	14/02/2020	15:19	Weddell seal	2	72.77978°S 105.50372°W	Not deployed	AV	OB	290/Silent	None	Two potential level B takes.
148	14/02/2020	15:34	Crabeater seal	2	72.77406°S 105.56104°W	Not deployed	AV	SR/OB	195/Silent	None	Two potential level B takes. Avoidance maneuver implemented.
149	14/02/2020	15:48	Crabeater seal	8	72.76321°S 105.63238°W	Not deployed	OB	OB	620/Silent	None	
150	14/02/2020	16:21	Crabeater seal	5	72.75135°S 105.70737°W	Not deployed	OB	SR/OB	170/Silent	None	Avoidance maneuver implemented.
151	14/02/2020	18:16	Unidentifiable Seal	4	72.73350°S 105.83000°W	Not deployed	OB	OB	800/Silent	None	One potential level B take.
152	14/02/2020	18:33	Crabeater seal	25	72.68933°S 105.56367°W	Not deployed	OB	OB	100/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
153	14/02/2020	21:30	Crabeater seal	3	75.46484°S 105.90958°W	Not deployed	OB	OB	150/Silent	None	
154	14/02/2020	21:59	Crabeater seal	9	72.45465°S 105.81986°W	Not deployed	OB	OB/DI	110/Silent	None	Two potential level B takes.
155	14/02/2020	22:59	Crabeater seal	6	72.41589°S 105.79383°W	Not deployed	OB	OB	130/Silent	None	
156	15/02/2020	0:05	Crabeater Seal	4	72.35860°S 105.93278°W	Not deployed	OM	OB/DI	120/Silent	None	Two potential Level B takes
157	15/02/2020	2:03	Weddell seal	1	72.26382°S 106.18185°W	Not deployed	OM	OB	100/Silent	None	
158	15/02/2020	2:21	Weddell seal	7	72.24925°S 106.18737°W	Not deployed	OM	OB/NS/MI	100/Silent	None	One potential level B take.
159	15/02/2020	3:45	Weddell seal	2	72.13059°S 106.32100°W	Not deployed	OM	OB/FT/DI	425/Silent	None	
160	15/02/2020	4:02	Weddell seal	19	72.11252°S 106.31840°W	Not deployed	OM	OB	80/Silent	None	
161	15/02/2020	4:51	Crabeater Seal	2	72.05738°S 106.25585°W	Not deployed	V	SS/SB/MI	170/Silent	None	Two potential level B takes.
162	15/02/2020	7:57	Crabeater Seal	1	71.68417°S 106.24633°W	Not deployed	SA	OB/ DI	380/Silent	None	One potential level B take.
163	15/02/2020	8:39	Crabeater Seal	1	71.72783°S 106.28283°W	Not deployed	PA(SD)	OB	300/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
164	15/02/2020	11:31	Unidentifiable seal	2	71.44917°S 106.24933°W	Not deployed	SA	OB	943/Silent	None	
165	15/02/2020	12:03	Unidentifiable seal	1	71.39422°S 106.21587°W	Not deployed	OM	OB	940/Silent	None	
166	15/02/2020	12:20	Weddell seal	2	71.37570°S 106.19183°W	Not deployed	AV	OB/DI	190/Silent	None	One potential level B take.
167	15/02/2020	13:45	Crabeater Seal	7	71.20733°S 105.99050°W	Not deployed	OM	OB	120/Silent	None	
168	15/02/2020	14:17	Unidentifiable seal	2	71.14900°S 105.96667°W	Not deployed	OM	OB	700/Silent	None	
169	15/02/2020	15:02	Crabeater Seal	1	71.07035°S 105.99210°W	Not deployed	OM	OB	1225/Silent	None	
170	15/02/2020	15:28	Unidentifiable seal	5	71.06878°S 150.99867°W	Not deployed	OM	OB	560/Silent	None	
171	15/02/2020	15:31	Crabeater Seal	1	71.06878°S 150.99867°W	Not deployed	OM	OB	425/Silent	None	
172	15/02/2020	15:56	Crabeater Seal	4	71.13572°S 105.97331°W	Not deployed	OM	OB	545/Silent	None	
173	15/02/2020	16:10	Weddell seal	1	71.17530°S 105.95281°W	Not deployed	OM	OB	1230/Silent	None	
174	15/02/2020	19:01	Unidentifiable seal	2	71.44033°S 106.17650°W	Not deployed	OM	OB	420/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
175	15/02/2020	19:43	Crabeater Seal	4	71.51717°S 106.21467°W	Not deployed	OM	OB	200/Silent	None	
176	15/02/2020	22:16	Crabeater Seal	1	71.71125°S 106.44988°W	Not deployed	OM	OB	970/Silent	None	
177	15/02/2020	22:27	Weddell seal	1	71.73689°S 106.43498°W	Not deployed	OM	OB/FT/DI	200/Silent	None	One potential level B take.
178	16/02/2020	0:00	Crabeater Seal	1	71.82963°S 106.53267°W	Not deployed	OM	OB	300/Silent	None	
179	16/02/2020	0:05	Weddell seal	1	71.82963°S 106.53267°W	Not deployed	OM	OB	110/Silent	None	
180	16/02/2020	0:55	Weddell seal	2	71.90580°S 106.49890°W	Not deployed	OM	OB	100/Silent	None	
181	16/02/2020	3:05	Weddell seal	6	72.04766°S 106.57985°W	Not deployed	OM	OB	235/Silent	None	One potential level B take.
182	16/02/2020	4:07	Weddell seal	8	72.13385°S 106.54618°W	Not deployed	AV	OB/DI	70/Silent	None	One potential level B take.
183	16/02/2020	7:05	Weddell seal	1	72.29233°S 106.41467°W	Not deployed	OM	OB	120/Silent	None	
184	16/02/2020	8:38	Unidentifiable Seal	1	72.40767°S 106.51433°W	Not deployed	OM	OB	420/silent	None	
185	16/02/2020	10:33	Weddell seal	1	72.58708°S 106.30278°W	Not deployed	OM	OB/DI	110/Silent	None	One potential level B take.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
186	16/02/2020	11:46	Weddell seal	1	72.68800°S 106.15600°W	Not deployed	OM	OB	220/Silent	None	
187	16/02/2020	13:27	Weddell seal	1	72.90667°S 105.61767°W	Not deployed	OM	OB	200/Silent	None	
188	16/02/2020	14:34	Unidentifiable Seal	2	73.07867°S 105.33633°W	Not deployed	OM	OB	600/Silent	None	
189	16/02/2020	15:50	Unidentifiable seal	1	73.26109°S 104.93745°W	Not deployed	OM	OB	631/Silent	None	
190	16/02/2020	16:22	Unidentifiable seal	4	73.32179°S 104.78063°W	Not deployed	OM	OB	555/Silent	None	
191	16/02/2020	17:05	Weddell seal	1	73.41400°S 704.57115°W	Not deployed	OM	OB	600/Silent	None	Certainty of identification: probable.
192	16/02/2020	17:17	Crabeater Seal	1	73.45915°S 104.54449°W	Not deployed	OM	OB	400/Silent	None	
193	16/02/2020	17:37	Unidentifiable seal	1	73.51692°S 104.54370°W	Not deployed	OM	OB	925/Silent	None	
194	16/02/2020	17:39	Weddell seal	1	73.51692°S 104.54370°W	Not deployed	OM	OB	600/Silent	None	
195	16/02/2020	18:05	Crabeater Seal	41	73.56467°S 104.55350°W	Not deployed	OM	OB	100/Silent	None	
196	16/02/2020	18:35	Unidentifiable seal	3	73.64917°S 104.49817°W	Not deployed	OM	OB	943/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
197	16/02/2020	20:31	Unidentifiable seal	1	73.98700°S 104.56800°W	Not deployed	OM	OB	1132 / Silent	None	
198	16/02/2020	20:49	Killer whale	8	74.05817°S 104.61667°W	Not deployed	PE(AH)	SR	1595 / Silent	None	
199	16/02/2020	21:48	Crabeater Seal	1	74.15193°S 105.08445°W	Not deployed	OM	OB	600 / Silent	None	
199	16/02/2020	21:48	Weddell seal	6	74.15193°S 105.08445°W	Not deployed	OM	OB	600 / Silent	None	
200	16/02/2020	21:59	Weddell seal	1	74.15270°S 105.20278°W	Not deployed	OM	Dead	450 / Silent	None	Dead animal, determined not to be associated with survey operations.
201	16/02/2020	22:04	Weddell seal	2	74.15270°S 105.20278°W	Not deployed	OM	OB	735 / Silent	None	
202	16/02/2020	22:19	Crabeater Seal	1	74.16937°S 105.36895°W	Not deployed	OM	OB	235 / Silent	None	
203	16/02/2020	22:25	Weddell seal	2	74.17912°S 107.13023°W	Not deployed	OM	OB	700 / Silent	None	
204	16/02/2020	22:39	Crabeater Seal	3	74.19785°S 105.55286°W	Not deployed	OM	OB	330 / Silent	None	
205	16/02/2020	23:44	Weddell seal	1	74.33532°S 105.86004°W	Not deployed	OM	OB	800 / Silent	None	
206	17/02/2020	0:35	Unidentifiable seal	1	74.46412°S 106.24965°W	Not deployed	OM	OB	450/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
207	17/02/2020	1:25	Southern Elephant Seal	1	74.55732°S 106.37238°W	Not deployed	OM	OB/DI	70/Silent	None	One potential level B take.
208	17/02/2020	17:10	Crabeater Seal	2	74.60641°S 106.29134°W	Not deployed	OM	OB	600/Silent	None	
209	17/02/2020	18:10	Unidentifiable seal	3	74.60650°S 106.29117°W	Not deployed	OM	OB	943/Silent	None	
210	17/02/2020	22:59	Crabeater Seal	1	74.55947°S 106.64067°W	Not deployed	OM	OB/DI	100/Silent	None	One potential level B take.
211	18/02/2020	0:10	Weddell seal	1	74.39660°S 106.79727°W	Not deployed	OM	OB	200/Silent	None	
212	18/02/2020	1:06	Unidentifiable seal	1	74.24923°S 107.19340°W	Not deployed	OM	OB	500/Silent	None	
213	18/02/2020	1:55	Crabeater Seal	2	74.16520°S 107.35688°W	Not deployed	OM	OB	250/Silent	None	
214	18/02/2020	12:30	Crabeater Seal	1	73.88013°S 107.99395°W	Not deployed	OM	OB	80/Silent	None	
215	18/02/2020	13:10	Unidentifiable seal	4	73.87150°S 108.17150°W	Not deployed	OM	OB	500/Silent	None	
216	18/02/2020	14:32	Crabeater Seal	2	73.88717°S 108.01450°W	Not deployed	AV	OB/SR	300/Silent	None	Two potential level B takes.
217	18/02/2020	17:28	Crabeater Seal	1	73.87522°S 108.17523°W	Not deployed	OM	OB	500/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
218	19/02/2020	23:30	Unidentifiable seal	6	75.05083°S 101.07038°W	Not deployed	MI	MI/SS/ PO/JP/DI	75/Silent	None	
219	19/02/2020	23:43	Unidentifiable whale	1	75.06755°S 101.14007°W	Not deployed	UN	BV	760/Silent	None	
220	20/02/2020	1:38	Crabeater Seal	5	75.03293°S 100.99373°W	Not deployed	OM	OB	350/Silent	None	
221	20/02/2020	2:20	Unidentifiable seal	1	75.03047°S 100.87047°W	Not deployed	MI	MI/SA/DI	210/Silent	None	
222	20/02/2020	9:09	Crabeater Seal	3	75.13765°S 101.08437°W	Not deployed	TV	FT/PO	30/Silent	None	
223	20/02/2020	11:36	Crabeater Seal	2	75.11883°S 100.98817°W	Not deployed	MI	SS/SR/DI	100/Silent	None	
224	21/02/2020	9:52	Crabeater Seal	2	74.93237°S 100.59380°W	Not deployed	MI	SB/MI/NS	100/Silent	None	
225	21/02/2020	11:40	Crabeater Seal	2	74.97733°S 100.60017°W	Not deployed	AV	SR/NS	380/Silent	None	
226	21/02/2020	15:27	Crabeater Seal	2	74.89862°S 100.56936°W	Not deployed	TV	SR/DI	600/Silent	None	
227	21/02/2020	19:00	Crabeater Seal	3	74.90150°S 100.59783°W	Not deployed	TV	FT/PO/SS	10/Silent	None	
228	21/02/2020	20:10	Crabeater Seal	8	74.91350°S 100.66150°W	Not deployed	OM	OB/NS	130/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
229	21/02/2020	21:33	Unidentifiable seal	1	74.97161°S 100.95845°W	Not deployed	MI	MI/SR/OB/DI	325/Silent	None	
230	21/02/2020	23:14	Crabeater Seal	16	74.97147°S 100.95872°W	Not deployed	MI	MI/SR/SA/BA/SS/DI	180/Silent	None	
231	22/02/2020	1:08	Crabeater seal	6	74.97148° 100.95878°W	Not deployed	AV	NS/SS/PO/MI	100/Silent	None	
232	22/02/2020	7:52	Crabeater seal	5	75.01883°S 100.90817°W	Not deployed	MI	NS/SS/MI	100/Silent	None	
233	22/02/2020	8:20	Crabeater seal	2	75.04050°S 101.15283°W	Not deployed	MI	NS/SS/SB/MI	200/Silent	None	
234	22/02/2020	8:50	Crabeater seal	4	75.08200°S 101.36617°W	Not deployed	MI	NS/SS/SB/MI	170/Silent	None	
235	22/02/2020	10:32	Unidentifiable Cetacean	1	75.05772°S 100.98798°W	Not deployed	PE(AH)	SR/NS	370/Silent	None	
236	22/02/2020	11:10	Crabeater seal	6	74.98600°S 100.62483°W	Not deployed	OM	OB/SS/SB/MI	100/Silent	None	
237	22/02/2020	11:34	Crabeater seal	6	74.94817°S 100.60467°W	Not deployed	TV	FT/SS/PO	100/Silent	None	
238	22/02/2020	16:27	Crabeater seal	2	75.04965°S 102.05939°W	Not deployed	SA	BA/OB	473/Silent	None	
239	13/02/2020	1:42	Crabeater seal	1	75.04650°S 103.31872°W	Not deployed	MI	SB/MI	100/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
240	13/02/2020	13:15	Crabeater seal	1	75.03610°S 103.17657°W	Not deployed	MI	MI/SR/SA/SS	60/Silent	None	
241	23/02/2020	11:30	Crabeater seal	1	75.03617°S 103.17667°W	Not deployed	MI	MI/SR/SS	250/Silent	None	
242	23/02/2020	13:15	Crabeater seal	1	75.03610°S 103.17657°W	Not deployed	MI	MI/SR/SA/SS	320/Silent	None	
243	23/02/2020	15:24	Crabeater seal	36	75.05469°S 102.41468°W	Not deployed	OM	OB/MI/SR/SS	400/Silent	None	
244	23/02/2020	16:20	Crabeater seal	1	75.04655°S 102.31159°W	Not deployed	OM	OB	450/Silent	None	
245	23/02/2020	18:14	Crabeater seal	1	75.05483°S 102.29800°W	Not deployed	MI	MI/SS/SR	180/Silent	None	
246	23/02/2020	19:32	Crabeater seal	3	75.05617°S 102.13917°W	Not deployed	TV	FT/PO/SS	80/Silent	None	
247	23/02/2020	21:02	Unidentifiable Seal	1	75.05387°S 102.12613°W	Not deployed	AV	SR/DI/SS	172/Silent	None	
248	24/02/2020	2:27	Crabeater seal	2	75.03846°S 103.30161°W	Not deployed	TV	SR/SR/SS/ DI/MI	75/Silent	None	
249	24/02/2020	10:39	Crabeater seal	6	74.94033°S 102.47967°W	Not deployed	OM	OB/SS/MI	400/Silent	None	
250	24/02/2020	11:33	Crabeater seal	2	74.94113°S 102.47242°W	Not deployed	MI	MI/SS/SA	40/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
251	24/02/2020	13:08	Crabeater seal	10	74.93417°S 102.37783°W	Not deployed	MI	MI/SS/OB	500/Silent	None	
252	24/02/2020	14:15	Crabeater seal	14	74.92583°S 102.13583°W	Full Volume While Not On Survey Line	MI	SA/MI/OB	628/300db	None	14 potential level B takes.
253	24/02/2020	15:53	Crabeater seal	18	74.98145°S 101.68842°W	Full Volume While Not On Survey Line	OM	OB	300/300db	None	
254	24/02/2020	16:01	Crabeater seal	3	74.98915°S 101.64541°W	Full Volume While Not On Survey Line	TV	SR/PO/FT/ SS	150/300db	None	Three potential level B takes.
255	24/02/2020	16:59	Crabeater seal	27	75.04548°S 101.48449°W	Full Volume While Not On Survey Line	OM	OB	1200/300db	None	
256	24/02/2020	17:26	Antarctic Minke Whale	1	75.05993°S 101.35275°W	Full Volume While Not On Survey Line	PV(SD)	SS/SR	635/300db	None	One potential level B take. Certainty of identification: Probable.
257	24/02/2020	17:47	Unidentifiable seal	2	75.06980°S 101.24146°W	Full Volume While Not On Survey Line	OM	OB	1700/300db	None	
258	24/02/2020	18:35	Crabeater seal	1	75.05650°S 101.05933°W	Full Volume While On Survey Line	MI	MI/SR	300/300db	None	One potential level B take.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
259	24/02/2020	19:01	Crabeater seal	29	75.07633°S 101.13233°W	Full Volume While On Survey Line	OB	OB	800/300db	None	Certainty of identification: Possible.
260	24/02/2020	19:30	Crabeater seal	1	75.07883°S 101.26233°W	Full Volume While On Survey Line	MI	MI/FT/PO/SR	200/300db	None	One potential level B take.
261	24/02/2020	20:20	Crabeater seal	3	75.03367°S 101.12567°W	Full Volume While On Survey Line	OM	OB	320/300db	None	
262	24/02/2020	20:27	Antarctic Minke Whale	1	75.02600°S 101.07867°W	Full Volume While On Survey Line	PV(OD)	SR/BV/DI	210/300db	None	One potential level B take. Avoidance maneuver implemented.
263	24/02/2020	20:45	Crabeater seal	10	75.01433°S 101.02233°W	Full Volume While On Survey Line	OM	OB	30/300db	None	
264	24/02/2020	21:06	Crabeater seal	1	74.99320°S 100.97875°W	Full Volume While On Survey Line	PV(OD)	SR/FT/SS/DI	200/300db	None	One potential level B take.
265	24/02/2020	22:04	Crabeater seal	3	74.94266°S 100.85709°W	Full Volume While On Survey Line	OM	OB	910/300db	None	
266	24/02/2020	22:44	Crabeater seal	5	74.90835°S 100.94952°W	Full Volume While On Survey Line	TV	SR/PO/DI/MI	0/300db	Shutdown	00:13 minutes of production loss. Three potential level B takes.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
267	24/02/2020	23:23	Crabeater seal	1	74.86662°S 101.00340°W	Full Volume While On Survey Line	MI	SR/MI/DI	150/300db	None	One potential level B take.
268	24/02/2020	23:46	Crabeater seal	5	74.84707°S 101.09598°W	Full Volume While On Survey Line	OM	OB	950/300db	None	
269	25/02/2020	0:07	Crabeater seal	7	74.83183°S 101.18678°W	Full Volume While On Survey Line	OM	OB/MI/SS	200/300db	None	Three potential level B takes.
270	25/02/2020	1:19	Crabeater seal	4	74.76770°S 101.50923°W	Full Volume While On Survey Line	OM	OB?MI/SS	500/300db	None	Two potential level B takes.
271	25/02/2020	1:46	Crabeater seal	3	74.74060°S 101.48658°W	Full Volume While On Survey Line	MI	MI/SS/ SR/SA	600/300db	None	Three potential level B takes.
272	25/02/2020	2:45	Antarctic Minke Whale	2	74.72006°S 101.78162°W	Full Volume While On Survey Line	TV	BV/SR/DI .SS	1070/300db	None	
273	25/02/2020	10:08	Crabeater seal	3	74.52445°S 103.85080°W	Full Volume While On Survey Line	MI	MI/SS	560/300db	None	Three potential level B takes.
274	25/02/2020	13:45	Unidentifiable Seal	22	74.28233°S 104.11050°W	Not deployed	OM	OB	1400/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
275	25/02/2020	13:45	Crabeater seal	12	74.28233°S 104.11050°W	Not deployed	OM	OB	400/Silent	None	
276	25/02/2020	16:32	Unidentifiable Seal	16	74.26267°S 104.39900°W	Not deployed	OM	OB	1400/Silent	None	
277	25/02/2020	16:32	Crabeater seal	1	74.26267°S 104.39900°W	Not deployed	OM	OB	800/Silent	None	
278	25/02/2020	17:45	Crabeater seal	30	74.26033°S 104.43783°W	Not deployed	OM	OB/DI	220/Silent	None	Two potential level B takes.
279	25/02/2020	17:45	Unidentifiable Seal	5	74.26033°S 104.43783°W	Not deployed	OM	OB	800/Silent	None	
280	25/02/2020	17:55	Weddell seal	2	74.27200°S 104.54367°W	Not deployed	OM	OB	300/Silent	None	
281	25/02/2020	18:41	Crabeater seal	18	74.29125°S 104.76946°W	Not deployed	OM	OB/DI/	400/Silent	None	Four potential level B takes.
282	25/02/2020	18:59	Weddell seal	1	74.28915°S 104.89275°W	Not deployed	OM	OB	930/Silent	None	
283	25/02/2020	19:43	Unidentifiable Seal	7	74.33574°S 105.11966°W	Not deployed	OM	OB	1000/Silent	None	
284	25/02/2020	19:53	Unidentifiable Seal	1	74.35706°S 105.13466°W	Not deployed	OM	OB	1120/Silent	None	
285	25/02/2020	20:43	Unidentifiable Seal	2	74.46548°S 105.22579°W	Not deployed	AV	SR/SS/DI	470/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
286	25/02/2020	21:07	Crabeater seal	2	74.48817°S 105.41150°W	Not deployed	OM	OB	200/Silent	None	One potential level B take.
287	25/02/2020	22:24	Weddell seal	5	74.48783°S 106.07900°W	Not deployed	OM	OB	100/Silent	None	
288	25/02/2020	22:39	Crabeater seal	3	74.50650°S 106.18050°W	Not deployed	OM	OB	300/Silent	None	
289	26/02/2020	0:14	Unidentifiable Seal	5	74.66464°S 106.26128°W	Not deployed	OM	OB	520/Silent	None	
290	26/02/2020	6:18	Unidentifiable Seal	2	74.67537°S 106.10850°W	Not deployed	AV	Dead	200/Silent	None	
291	26/02/2020	12:22	Unidentifiable Seal	1	74.91500°S 106.22333°W	Not deployed	OM	OB	130/Silent	None	Dead animal, determined not to be associated with survey operations.
292	26/02/2020	13:14	Crabeater seal	1	74.47727°S 106.02293°W	Not deployed	OM	OB	800/Silent	None	
293	26/02/2020	13:14	Unidentifiable Seal	1	74.47727°S 106.02293°W	Not deployed	OM	OB	500/Silent	None	
294	26/02/2020	13:37	Unidentifiable Seal	4	74.46835°S 105.91280°W	Not deployed	OM	OB	300/Silent	None	
294	26/02/2020	13:37	Weddell seal	9	74.46835°S 105.91280°W	Not deployed	OM	OB	120/Silent	None	
294	26/02/2020	13:37	Crabeater seal	1	74.46835°S 105.91280°W	Not deployed	OM	OB	150/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
295	26/02/2020	18:46	Crabeater seal	1	74.56724°S 105.75951°W	Not deployed	OM	OB	780/Silent	None	
296	26/02/2020	21:14	Weddell seal	10	74.57000°S 105.75200°W	Not deployed	OM	OB	200/Silent	None	
297	28/02/2020	11:10	Crabeater seal	1	74.43217°S 104.55283°W	Not deployed	OM	OB	800/Silent	None	
298	28/02/2020	11:39	Unidentifiable seal	7	74.38333°S 104.58283°W	Not deployed	OM	OB	700/Silent	None	
299	28/02/2020	14:16	Crabeater seal	130	74.35920°S 104.61502°W	Not deployed	OM	OB/SS/DI/SA	20/Silent	None	Two potential level B takes.
300	28/02/2020	14:28	Unidentifiable seal	5	74.36910°S 104.86000°W	Not deployed	OM	OB	600/Silent	None	
301	28/02/2020	14:50	Weddell seal	3	74.37048°S 104.95627°W	Not deployed	OM	OB	120/Silent	None	
302	28/02/2020	16:20	Crabeater seal	85	74.38017°S 105.29583°W	Not deployed	OM	OB/SR	200/Silent	None	
303	28/02/2020	16:50	Unidentifiable seal	5	74.38367°S 105.19183°W	Not deployed	OM	OB	1415/Silent	None	
304	28/02/2020	18:31	Crabeater seal	21	74.36869°S 105.32373°W	Not deployed	OM	OB	285/Silent	None	
305	28/02/2020	18:31	Unidentifiable seal	11	74.36869°S 105.32373°W	Not deployed	OM	OB	735/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
306	28/02/2020	19:21	Crabeater seal	5	74.38086°S 105.41450°W	Not deployed	OM	OB/DI	210/Silent	None	
307	28/02/2020	23:11	Crabeater seal	7	74.37133°S 105.42233°W	Not deployed	OM	OB/SR	200/Silent	None	
308	28/02/2020	23:14	Unidentifiable Seal	3	74.37133°S 105.42233°W	Not deployed	OM	OB	300/Silent	None	
309	29/02/20	0:47	Crabeater seal	2	74.38542°S 105.93194°W	Not deployed	OM	OB/DI	400/Silent	None	
310	29/02/20	2:58	Crabeater seal	1	74.43747°S 106.47065°W	Not deployed	OM	OB	510/Silent	None	
311	29/02/20	4:40	Crabeater seal	1	74.36303°S 106.68787°W	Not deployed	SA	SR	200/Silent	None	One potential level B take. Certainty of identification: Probable.
312	29/02/20	17:03	Crabeater seal	3	74.39017°S 107.61817°W	Not deployed	OM	OB/DI	200/Silent	None	
313	29/02/20	17:05	Unidentifiable Seal	2	74.39017°S 107.61817°W	Not deployed	OM	OB	1415/Silent	None	
314	29/02/20	19:21	Weddell seal	1	74.31934°S 107.74297°W	Not deployed	OM	OB	450/Silent	None	
315	01/03/20	4:13	Unidentifiable Seal	1	74.22837°S 107.43052°W	Not deployed	PA(SD)	NS	270/Silent	None	
316	01/03/20	16:01	Crabeater seal	12	74.11617°S 105.65300°W	Not deployed	OM	OB/DI	300/Silent	None	One potential level B take.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
317	01/03/20	16:01	Unidentifiable Seal	13	74.11617°S 105.65300°W	Not deployed	OM	OB	500/Silent	None	
318	01/03/20	16:44	Weddell seal	1	74.13050°S 105.57883°W	Not deployed	OM	OB	300/Silent	None	
319	01/03/20	17:42	Crabeater seal	5	74.12817°S 105.38683°W	Not deployed	OM	OB	150/Silent	None	Two potential level B takes.
320	01/03/20	17:42	Unidentifiable Seal	7	74.12817°S 105.38683°W	Not deployed	OM	OB/SR	500/Silent	None	
321	01/03/20	19:26	Crabeater seal	5	74.11501°S 105.41417°W	Not deployed	OM	OB	500/Silent	None	Avoidance maneuver implemented.
322	01/03/20	19:26	Unidentifiable Seal	13	74.11501°S 105.41417°W	Not deployed	OM	OB	700/Silent	None	
323	01/03/20	19:33	Weddell seal	1	74.10616°S 105.43375°W	Not deployed	OM	OB	535/Silent	None	One potential level B take.
324	01/03/20	19:44	Unidentifiable Seal	3	74.09789°S 105.50260°W	Not deployed	OM	OB	1200/Silent	None	
325	01/03/20	19:53	Crabeater seal	4	74.09184°S 105.54094°W	Not deployed	OM	OB	400/Silent	None	
326	01/03/20	20:21	Weddell seal	1	74.02465°S 105.69397°W	Not deployed	OM	OB	300/Silent	None	
327	01/03/20	20:37	Antarctic minke whale	1	73.99324°S 105.78159°W	Not deployed	PE(AH)	BV	400/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
328	01/03/20	20:47	Weddell seal	1	73.97087°S 105.81021°W	Not deployed	OM	OB	200/Silent	None	Avoidance maneuver implemented.
329	01/03/20	21:06	Crabeater seal	6	73.93733°S 105.80200°W	Not deployed	OM	OB	800/Silent	None	
330	01/03/20	21:26	Crabeater seal	2	73.91267°S 105.74750°W	Not deployed	OM	OB	1415/Silent	None	
331	01/03/20	21:26	Weddell seal	1	73.91267°S 105.74750°W	Not deployed	OM	OB	200/Silent	None	
332	02/03/20	21:06	Crabeater seal	27	74.20433°S 107.35517°W	Not deployed	OM	OB/SR/DI	20/Silent	None	Three potential level B takes.
333	02/03/20	23:20	Crabeater seal	1	74.34350°S 106.68783°W	Not deployed	ST	SA/DI	200/Silent	None	
334	03/03/20	15:16	Crabeater seal	1	74.65472°S 106.09890°W	Not deployed	OM	OB/DI/ PO/SS	120/Silent	None	One potential level B take.
335	03/03/20	17:51	Unidentifiable Seal	1	74.70783°S 106.19517°W	Not deployed	OM	OB	500/Silent	None	
336	03/03/20	17:51	Crabeater seal	3	74.70783°S 106.19517°W	Not deployed	OM	OB	400/Silent	None	
337	03/03/20	18:39	Unidentifiable Seal	3	74.65444°S 106.04481°W	Not deployed	OM	OB	800/Silent	None	
338	03/03/20	20:34	Crabeater seal	4	74.60667°S 106.29133°W	Not deployed	ST	SR/OB/DI	980/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
339	03/03/20	23:55	Crabeater seal	1	74.60683°S 106.29133°W	Not deployed	AV	SA/SR/ OB/DI	780/Silent	None	
340	04/03/20	21:56	Unidentifiable Seal	7	74.59250°S 106.12200°W	Not deployed	OM	OB	1800/Silent	None	
341	04/03/20	21:56	Crabeater seal	4	74.59250°S 106.12200°W	Not deployed	OM	OB	1800/Silent	None	
342	04/03/20	22:26	Weddell seal	1	74.57583°S 106.01983°W	Not deployed	OM	OB	420/Silent	None	
343	05/03/20	0:22	Unidentifiable Seal	2	74.54661°S 106.00428°W	Not deployed	OM	OB	750/Silent	None	
344	05/03/20	11:45	Crabeater seal	3	74.75000°S 103.04050°W	Not deployed	MI	SA/PO/DI	4200/Silent	None	
345	05/03/20	12:10	Crabeater seal	6	74.73383°S 103.04050°W	Not deployed	PE(AV)	PO/SS/ MI/SR	10/Silent	None	
346	05/03/20	20:35	Weddell seal	1	74.27879°S 103.11515°W	Not deployed	AV	SR/DI	195/Silent	None	Certainty of identification: Possible.
347	05/03/20	21:18	Crabeater seal	1	74.29050°S 103.03117°W	Not deployed	MI	MI/SB	200/Silent	None	
348	05/03/20	22:05	Weddell seal	1	74.27850°S 103.03067°W	Not deployed	PA(SD)	NS	220/Silent	None	
349	05/03/20	23:34	Antarctic minke whale	1	74.24650°S 103.27067°W	Not deployed	TV	BV/DI	400/Silent	None	Certainty of identification: Probable.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
350	07/03/20	21:55	Unidentifiable Seal	3	74.87767°S 104.22317°W	Not deployed	OM	OB	630/Silent	None	
351	07/03/20	22:15	Southern Elephant Seal	1	74.87767°S 104.22317°W	Not deployed	OM	OB	300/Silent	None	
352	08/03/20	12:45	Unidentifiable Seal	2	74.84333°S 104.45517°W	Not deployed	OM	OB	1420/Silent	None	
353	08/03/20	14:12	Crabeater seal	1	74.91163°S 104.24020°W	Not deployed	OM	OB	460/Silent	None	
354	08/03/20	15:15	Crabeater seal	1	74.90417°S 103.69250°W	Not deployed	MI	MI/NS	100/Silent	None	
355	08/03/20	15:40	Unidentifiable Seal	1	74.78583°S 103.66367°W	Not deployed	OM	OB	800/Silent	None	
356	08/03/20	16:22	Unidentifiable Seal	3	75.07295°S 103.85792°W	Not deployed	OM	OB	500/Silent	None	
357	08/03/20	16:22	Crabeater seal	4	75.07295°S 103.85792°W	Not deployed	OM	OB	300/Silent	None	
358	08/03/20	16:23	Weddell seal	4	75.07295°S 103.85792°W	Not deployed	OM	OB	150/Silent	None	
359	08/03/20	16:46	Crabeater seal	2	75.08140°S 103.98655°W	Not deployed	UN	DI/SS	120/Silent	None	
360	08/03/20	17:48	Crabeater seal	3	75.08382°S 103.95728°W	Not deployed	OM	OB	630/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
361	08/03/20	17:57	Weddell seal	1	75.08517°S 103.87148°W	Not deployed	OM	OB	460/Silent	None	
362	08/03/20	18:34	Unidentifiable Seal	2	74.98974°S 103.80361°W	Not deployed	OM	OB	720/Silent	None	
363	08/03/20	20:53	Crabeater seal	8	74.91329°S 103.57400°W	Not deployed	AV	SR/PO	170/Silent	None	
364	08/03/20	23:23	Unidentifiable Seal	12	74.82000°S 103.26717°W	Not deployed	OM	OB	2800/Silent	None	
365	09/03/20	1:30	Crabeater seal	2	74.73593°S 102.83189°W	Not deployed	PE(AH)	SR/PO	150/Silent	None	
366	10/03/20	13:59	Unidentifiable Seal	1	74.11333°S 102.69950°W	Not deployed	MI	MI/SS	190/Silent	None	
367	11/03/20	11:32	Unidentifiable Seal	2	73.99417°S 102.84318°W	Not deployed	UN	NS/SR	470/Silent	None	
368	11/03/20	11:58	Antarctic Minke Whale	1	73.91520°S 102.98582°W	Not deployed	PA(OD)	NS/SR	420/Silent	None	Certainty of identification: Probable.
369	11/03/20	12:17	Weddell seal	8	73.88627°S 102.99623°W	Not deployed	OM	OB	80/Silent	None	
370	11/03/20	20:35	Crabeater seal	4	73.95898°S 102.83346°W	Not deployed	PA(OD)	SS/FT	170/Silent	None	
371	11/03/20	22:17	Crabeater seal	7	74.04400°S 102.30417°W	Not deployed	TV	NS/SS	5/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
372	12/03/20	1:07	Unidentifiable Seal	1	74.18231°S 102.54038°W	Not deployed	TV	NS/PO	250/Silent	None	
373	12/03/20	11:23	Unidentifiable Seal	1	74.02933°S 102.22890°W	Not deployed	TV	SS/SR	140/Silent	None	
374	12/03/20	22:02	Crabeater seal	43	73.94150°S 102.95450°W	Not deployed	PA(SD)	PO/FT	100/Silent	None	
375	12/03/20	22:20	Unidentifiable Baleen Whale	1	73.87883°S 103.13667°W	Not deployed	UN	BV	680/Silent	None	Certainty of identification: Probable.
376	12/03/20	22:35	Crabeater seal	7	73.85900°S 103.18683°W	Not deployed	MI	MI/SB	120/Silent	None	
377	12/03/20	22:39	Weddell seal	3	73.85900°S 103.18683°W	Not deployed	OM	OB	400/Silent	None	
378	12/03/20	22:40	Crabeater seal	11	73.85900°S 103.18683°W	Not deployed	OM	OB	400/Silent	None	
379	12/03/20	22:52	Antarctic Minke Whale	1	73.83467°S 103.24733°W	Not deployed	UN	BV/SS/DI	580/Silent	None	
380	12/03/20	23:03	Antarctic Minke Whale	1	73.82183°S 103.30667°W	Not deployed	AV	SR/BV/DI	180/Silent	None	One potential level B take.
381	12/03/20	23:08	Crabeater seal	5	73.82183°S 103.30667°W	Not deployed	UN		320/Silent	None	Five potential level B takes.
382	12/03/20	23:39	Weddell seal	4	73.77233°S 103.39367°W	Not deployed	OM	OB	200/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
383	12/03/20	23:49	Unidentifiable seal	2	73.77233°S 103.39367°W	Not deployed	OM	OB	980/Silent	None	
384	13/03/20	0:12	Crabeater seal	1	73.71883°S 103.39150°W	Not deployed	OM	OB	200/Silent	None	
385	13/03/20	0:23	Crabeater seal	17	73.70133°S 103.40700°W	Not deployed	MI	MI/PO	30/Silent	None	
386	13/03/20	11:16	Weddell seal	1	72.69427°S 104.01020°W	Not deployed	OM	OB	140/Silent	None	Avoidance maneuver implemented.
387	13/03/20	11:58	Weddell seal	1	72.66563°S 104.10853°W	Not deployed	AV	OB	260/Silent	None	
388	13/03/20	20:03	Weddell seal	1	72.66261°S 104.19462°W	Not deployed	MI	SB/DI	220/Silent	None	
389	14/03/20	2:23	Crabeater Seal	1	72.72707°S 104.36224°W	Not deployed	OM	OB/DI	500/Silent	None	One potential level B take. Certainty of identification: Possible.
390	14/03/20	13:09	Weddell Seal	4	72.70122°S 104.23223°W	Not deployed	OM	OB	110/Silent	None	
391	14/03/20	13:33	Crabeater Seal	3	72.62847°S 104.22545°W	Not deployed	AV	PO/NS/SS	630/Silent	None	Three potential level B takes.
392	14/03/20	14:25	Weddell Seal	1	72.64567°S 104.08867°W	Not deployed	OM	OB	692/Silent	None	
393	14/03/20	15:53	Crabeater Seal	1	72.73217°S 103.81900°W	Not deployed	OM	OB	400/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
394	14/03/20	18:48	Unidentifiable seal	1	73.24616°S 103.75087°W	Not deployed	OM	OB	1020/Silent	None	
395	14/03/20	19:11	Unidentifiable seal	3	73.32772°S 103.74955°W	Not deployed	OM	OB	535/Silent	None	
396	14/03/20	19:24	Weddell Seal	2	73.37859°S 103.79500°W	Not deployed	OM	OB	250/Silent	None	Certainty of identification: Probable.
397	14/03/20	19:39	Unidentifiable seal	1	73.41402°S 103.92587°W	Not deployed	PA(OD)	SR/NS	570/Silent	None	
398	14/03/20	20:02	Unidentifiable seal	2	73.44167°S 104.12389°W	Not deployed	OM	OB	600/Silent	None	
399	14/03/20	20:04	Crabeater Seal	3	73.44167°S 104.12389°W	Not deployed	OM	OB	300/Silent	None	
400	14/03/20	22:40	Weddell Seal	1	73.39000°S 105.12383°W	Not deployed	OM	OB/DI	130/Silent	None	One potential level B take.
401	15/03/20	13:37	Weddell Seal	1	73.27133°S 105.27855°W	Not deployed	OM	OB	250/Silent	None	
402	15/03/20	15:20	Crabeater Seal	2	73.29383°S 104.81417°W	Not deployed	PA(OD)	OB	320/Silent	None	
403	15/03/20	16:09	Crabeater Seal	1	73.37733°S 104.87517°W	Not deployed	OM	OB	320/Silent	None	
404	15/03/20	16:43	Weddell Seal	1	73.44533°S 104.74867°W	Not deployed	OM	OB	130/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
405	15/03/20	17:00	Weddell Seal	1	73.46200°S 104.64383°W	Not deployed	OM	OB	300/Silent	None	Certainty of identification: Probable.
406	15/03/20	17:15	Crabeater Seal	3	73.45582°S 104.26953°W	Not deployed	OM	OB	180/Silent	None	
407	15/03/20	22:13	Crabeater Seal	1	72.70150°S 104.13183°W	Not deployed	OM	OB	320/Silent	None	
408	15/03/20	22:13	Weddell Seal	1	72.70150°S 104.13183°W	Not deployed	OM	OB	300/Silent	None	
409	15/03/20	23:25	Weddell Seal	1	72.70200°S 104.14033°W	Not deployed	AV	OB/DI	460/Silent	None	One potential level B take.
410	15/03/20	23:54	Crabeater Seal	1	72.70200°S 104.14033°W	Not deployed	OM	OB/DI	300/Silent	None	One potential level B take.
411	16/03/20	1:35	Weddell Seal	2	72.64045°S 104.08611°W	Not deployed	OM	OB	250/Silent	None	Avoidance maneuver implemented.
412	16/03/20	1:46	Unidentifiable seal	2	72.63675°S 104.10629°W	Not deployed	UN	SR/DI	240/Silent	None	
413	16/03/20	13:32	Crabeater Seal	3	72.51328°S 104.82117°W	Not deployed	TV	SS/PO/DI	180/Silent	None	Three potential level B takes.
414	16/03/20	14:14	Weddell Seal	1	72.55150°S 105.00150°W	Not deployed	OM	OB	300/Silent	None	
415	16/03/20	19:47	Crabeater Seal	3	72.46631°S 104.18872°W	Not deployed	OM	OB	300/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
416	16/03/20	19:59	Weddell Seal	2	72.45104°S 104.18371°W	Not deployed	OM	OB	300/Silent	None	
417	16/03/20	20:23	Weddell Seal	2	72.43560°S 104.10677°W	Not deployed	OM	OB/DI	395/Silent	None	Three potential level B takes.
418	16/03/20	22:27	Weddell Seal	2	72.43950°S 104.16600°W	Not deployed	OM	OB	300/Silent	None	
419	16/03/20	22:32	Crabeater Seal	1	72.43950°S 104.16600°W	Not deployed	OM	OB	300/Silent	None	
420	17/03/20	20:43	Crabeater Seal	1	72.44655°S 104.03353°W	Not deployed	OM	OB	470/Silent	None	
421	17/03/20	21:03	Crabeater Seal	5	72.43350°S 103.98633°W	Not deployed	MI	SR/MI/DI	190/Silent	None	Five potential level B takes.
422	17/03/20	21:05	Crabeater Seal	17	72.43350°S 103.98633°W	Not deployed	OM	OB	200/Silent	None	
423	17/03/20	21:21	Weddell Seal	4	72.41917°S 103.83633°W	Not deployed	OM	OB	400/Silent	None	
424	17/03/20	21:30	Unidentifiable seal	1	72.41483°S 103.77033°W	Not deployed	OM	OB	600/Silent	None	
425	17/03/20	23:40	Antarctic Minke whale	2	72.13050°S 103.68783°W	Not deployed	AV	BV/NS/DI	480/Silent	None	Three potential level B takes.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
426	18/03/20	0:35	Crabeater Seal	15	71.99926°S 103.44438°W	Not deployed	UN	SR/MI/SB/DI	350/Silent	None	15 potential level B takes.
427	18/03/20	0:42	Crabeater Seal	7	71.98106°S 103.41284°W	Not deployed	OM	OB	300/Silent	None	
428	18/03/20	0:46	Unidentifiable seal	8	71.97304°S 103.38992°W	Not deployed	OM	OB/SR/DI	265/Silent	None	
429	18/03/20	1:05	Weddell Seal	1	71.95167°S 103.57833°W	Not deployed	OM	OB	250/Silent	None	
430	18/03/20	1:25	Unidentifiable seal	1	71.91879°S 103.34313°W	Not deployed	PA(SD)	SS/SR	370/Silent	None	
431	18/03/20	1:39	Unidentifiable seal	1	71.89491°S 103.30800°W	Not deployed	PE(AH)	NS/SR	210/Silent	None	
432	18/03/20	1:50	Unidentifiable seal	2	71.87499°S 103.24944°W	Not deployed	OM	OB	450/Silent	None	
433	18/03/20	2:11	Unidentifiable seal	1	71.83208°S 103.17391°W	Not deployed	AV	NS/PO/SS/DI	220/Silent	None	
434	18/03/20	2:39	Crabeater Seal	1	71.79172°S 103.17191°W	Not deployed	OM	OB/DI	30/Silent	None	One potential level B take. Avoidance maneuver implemented.
435	18/03/20	12:45	Crabeater Seal	4	71.62487°S 102.95375°W	Not deployed	AV	OB/DI	50/Silent	None	One potential level B take.
436	18/03/20	13:19	Crabeater Seal	6	71.57095°S 102.90590°W	Not deployed	MI	NS/SS/DI/OB	110/Silent	None	Six potential level B takes.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
437	18/03/20	14:04	Crabeater Seal	198	71.50533°S 102.87333°W	Not deployed	OM	OB/SB/MI/PO	100/Silent	None	55 potential level B takes.
438	18/03/20	15:27	Weddell Seal	4	71.38083°S 102.91283°W	Not deployed	OM	OB	300/Silent	None	
439	18/03/20	15:50	Antarctic Minke whale	1	71.33850°S 102.94900°W	Not deployed	AV	BV/SR	200/Silent	None	One potential level B take.
440	18/03/20	16:00	Antarctic Minke whale	2	71.31567°S 102.97083°W	Not deployed	UN	SR/BV/DI	300/Silent	None	Two potential level B takes.
441	18/03/20	16:00	Crabeater Seal	1670	71.31567°S 102.97083°W	Not deployed	OM	OB/NS/SS/DI	50/Silent	None	255 potential level B takes. Avoidance maneuver implemented.
442	18/03/20	16:17	Antarctic Minke whale	2	71.29557°S 102.99157°W	Not deployed	AV	NS/SS/DI	230/Silent	None	Two potential level B takes.
443	18/03/20	17:15	Antarctic Minke whale	2	71.20883°S 103.12400°W	Not deployed	AV	NS/SS/DI	80/Silent	None	Two potential level B takes.
444	18/03/20	17:34	Antarctic Minke whale	3	71.19588°S 103.15385°W	Not deployed	AV	NS/SS/DI	470/Silent	None	Three potential level B takes.
445	18/03/20	17:44	Antarctic Minke whale	1	71.15763°S 103.22652°W	Not deployed	AV	NS/SS/DI	520/Silent	None	One potential level B take.
446	18/03/20	18:03	Crabeater Seal	155	71.13612°S 103.26235°W	Not deployed	OM	OB/SB/MI/DI	100/Silent	None	27 potential level B takes. Avoidance maneuver implemented.
447	18/03/20	18:09	Antarctic Minke whale	3	71.12181°S 103.28803°W	Not deployed	MI	SA/SS/SR/BV	560/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
448	18/03/20	18:31	Antarctic Minke whale	1	71.06140°S 103.32269°W	Not deployed	AV	SR/SS	460/Silent	None	
449	18/03/20	18:36	Antarctic Minke whale	1	71.05597°S 103.31491°W	Not deployed	PA(OD)	SR/SS	660/Silent	None	
450	18/03/20	18:47	Antarctic Minke whale	2	71.03259°S 103.27500°W	Not deployed	PE(AH)	SR/BV/SS/OB	550/Silent	None	Two potential level B takes.
451	18/03/20	21:21	Humpback whale	1	70.63200°S 103.28150°W	Not deployed	PA(OD)	BV/SA	2500/Silent	None	
452	19/03/20	0:53	Sei whale	4	70.40049°S 103.20149°W	Not deployed	PA(OD)	BV/SR/FT/SS	895/Silent	None	Certainty of identification: Probable.
453	19/03/20	19:54	Antarctic fur seal	1	69.68684°S 095.66363°W	Not deployed	PE(AH)	BA/PO	420/Silent	None	
454	20/03/20	11:51	Humpback whale	2	69.50870°S 089.69833°W	Not deployed	TV	BV/SR/SS	200/Silent	None	
455	20/03/20	12:05	Humpback whale	6	69.50310°S 089.51035°W	Not deployed	AV	BV/SR/SS	280/Silent	None	
456	20/03/20	13:59	Antarctic fur seal	6	69.47283°S 088.66233°W	Not deployed	SA	BA/MI	200/Silent	None	
457	20/03/20	15:46	Antarctic fur seal	1	69.46783°S 088.62217°W	Not deployed	SA	BA	1052/Silent	None	
458	20/03/20	16:15	Antarctic fur seal	1	69.44950°S 088.38983°W	Not deployed	SA	BA	1132/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
459	20/03/20	16:16	Humpback whale	1	69.44950°S 088.38983°W	Not deployed	AV	SR/BV/DF	260/Silent	None	
460	20/03/20	16:45	Humpback whale	1	69.43015°S 088.15675°W	Not deployed	PA(OD)	BV/SR	1390/Silent	None	
461	20/03/20	16:53	Antarctic fur seal	1	69.43015°S 088.15675°W	Not deployed	SA	BA	300/Silent	None	
462	20/03/20	17:41	Humpback whale	3	69.39477°S 087.70850°W	Not deployed	UN	BV/SR/DF	2930/Silent	None	
463	20/03/20	17:54	Antarctic fur seal	1	69.38900°S 087.63345°W	Not deployed	TV	SR/NS/DI	190/Silent	None	
464	20/03/20	19:42	Antarctic fur seal	1	69.32342°S 086.79070°W	Not deployed	TV	BA/SB/DI	220/Silent	None	
465	20/03/20	20:55	Antarctic fur seal	1	69.27618°S 086.21755°W	Not deployed	PA(OD)	BA/SS/PO	200/Silent	None	
466	20/03/20	21:54	Humpback whale	5	69.24150°S 085.75933°W	Not deployed	UN	BV/DF	1414/Silent	None	
467	20/03/20	22:30	Humpback whale	2	69.21733°S 085.47333°W	Not deployed	MI	BV/DF	800/Silent	None	
468	20/03/20	22:40	Antarctic fur seal	3	69.20533°S 085.32517°W	Not deployed	SA	BA/DI	200/Silent	None	
469	20/03/20	22:49	Humpback whale	3	69.20533°S 085.32517°W	Not deployed	UN	BV	2800/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
470	20/03/20	23:10	Humpback whale	3	69.18583°S 085.10850°W	Not deployed	OM	SA/BV/DI	1415/Silent	None	
471	20/03/20	23:31	Antarctic fur seal	1	69.17683°S 084.98950°W	Not deployed	UN	SR/DI	130/Silent	None	
472	21/03/20	0:26	Humpback whale	4	69.14292°S 084.53533°W	Not deployed	PA(SD)	BV/SS/DF	520/Silent	None	
473	21/03/20	12:39	Humpback whale	3	68.68747°S 078.95202°W	Not deployed	SA	BV/BA/NS/SR	100/Silent	None	Avoidance maneuver implemented.
474	21/03/20	13:03	Humpback whale	1	68.67633°S 078.81133°W	Not deployed	SA	SR/BV/DI	400/Silent	None	
475	21/03/20	13:15	Antarctic fur seal	1	68.67017°S 078.72683°W	Not deployed	SA	BA/PO	200/Silent	None	
476	21/03/20	13:30	Antarctic fur seal	3	68.65983°S 078.58583°W	Not deployed	MI	MI/PO/DI	150/Silent	None	
477	21/03/20	13:52	Antarctic fur seal	1	68.65083°S 078.47350°W	Not deployed	SA	BA/PO	180/Silent	None	
478	21/03/20	14:46	Humpback whale	2	68.61767°S 078.08800°W	Not deployed	SA	BV/SR/DI	180/Silent	None	Avoidance maneuver implemented.
479	21/03/20	14:57	Antarctic fur seal	2	68.61033°S 074.01067°W	Not deployed	UN	SR/PO/DI	230/Silent	None	
480	21/03/20	17:01	Antarctic fur seal	1	68.54003°S 077.17010°W	Not deployed	UN	SR/DI	360/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
481	21/03/20	17:08	Antarctic fur seal	2	68.53850°S 077.15087°W	Not deployed	AV	PO/FT	100/Silent	None	
482	21/03/20	17:48	Humpback whale	2	68.50922°S 076.78565°W	Not deployed	SA	SA/BV/SR	850/Silent	None	
483	21/03/20	19:10	Antarctic fur seal	1	68.46933°S 076.29883°W	Not deployed	UN	SR/DI	280/Silent	None	
484	22/03/20	12:29	Antarctic fur seal	1	67.91197°S 069.65378°W	Not deployed	TV	PO	110/Silent	None	
485	22/03/20	13:30	Humpback whale	2	67.86000°S 069.11700°W	Not deployed	UN	BV	300/Silent	None	Certainty of identification: Probable.
486	22/03/20	13:35	Humpback whale	2	67.86000°S 069.11700°W	Not deployed	MI	BV/MI/NS/DI	400/Silent	None	Avoidance maneuver implemented.
487	22/03/20	15:01	Humpback whale	2	67.78085°S 068.53191°W	Not deployed	PE(AH)	BV/NS/DI	10/Silent	None	Avoidance maneuver implemented.
488	22/03/20	15:18	Antarctic fur seal	2	67.76692°S 068.42423°W	Not deployed	AV	FT/SS/PO	235/Silent	None	
489	22/03/20	16:52	Crabeater seal	2	67.58183°S 068.14486°W	Not deployed	OM	OB	235/Silent	None	
490	22/03/20	21:20	Antarctic fur seal	4	67.71910°S 068.23517°W	Not deployed	PE(AH)	PO/NS	120/Silent	None	
491	22/03/20	21:42	Crabeater Seal	1	67.76318°S 068.37658°W	Not deployed	PA(OD)	SR/NS/PO	6/Silent	None	Certainty of identification: Probable.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
492	22/03/20	21:51	Antarctic fur seal	6	67.77248°S 068.43678°W	Not deployed	PA(OD)	NS/PO/SS/FT	100/Silent	None	
493	22/03/20	22:07	Antarctic fur seal	4	67.78753°S 068.55757°W	Not deployed	PA(SD)	MI/SB/PO	150/Silent	None	
494	22/03/20	22:36	Antarctic fur seal	5	67.81340°S 068.78020°W	Not deployed	AV	SR/SS/PO/FT	175/Silent	None	
495	23/03/20	10:59	Antarctic fur seal	1	66.52828°S 068.13673°W	Not deployed	PE(AH)	PO/FT	220/Silent	None	
496	23/03/20	13:35	Antarctic fur seal	1	66.18767°S 067.56283°W	Not deployed	PA(SD)	SR/PO/SB	130/Silent	None	
497	23/03/20	14:00	Antarctic fur seal	1	66.11800°S 067.44350°W	Not deployed	PA(SD)	SR/PO/DI	170/Silent	None	
498	23/03/20	15:48	Antarctic fur seal	1	65.86760°S 067.03160°W	Not deployed	TV	SR/PO/SS	420/Silent	None	
499	23/03/20	16:49	Antarctic fur seal	1	65.72168°S 066.79968°W	Not deployed	TV	FT/PO/SS	370/Silent	None	
500	23/03/20	17:12	Humpback whale	1	65.65543°S 066.69500°W	Not deployed	SA	BV/BA/SR	360/Silent	None	
501	23/03/20	19:11	Antarctic fur seal	1	65.42383°S 066.09700°W	Not deployed	TV	SS/SR/SB/PO	230/Silent	None	
502	23/03/20	19:49	Unidentifiable Baleen Whale	1	65.37333°S 065.93700°W	Not deployed	UN	BV	6000/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
503	23/03/20	19:54	Antarctic fur seal	1	65.37333°S 065.93700°W	Not deployed	UN	SR/PO/DI	230/Silent	None	
504	23/03/20	20:05	Antarctic fur seal	2	65.35467°S 065.88500°W	Not deployed	AV	SR/PO	380/Silent	None	
505	23/03/20	20:20	Humpback whale	4	65.35467°S 065.88500°W	Not deployed	UN	BV	2500/Silent	None	Certainty of identification: Probable.
506	23/03/20	21:39	Humpback whale	1	65.25279°S 065.57258°W	Not deployed	SA	BV/SR/SS	35/Silent	None	Avoidance maneuver implemented.
507	23/03/20	21:42	Antarctic fur seal	2	65.24558°S 065.55091°W	Not deployed	PA(OD)	SR/SS/SB/DI	180/Silent	None	
508	23/03/20	22:06	Antarctic fur seal	8	65.22810°S 065.49832°W	Not deployed	AV	SR/SB/PO/SS	150/Silent	None	
509	23/03/20	22:33	Antarctic fur seal	2	65.20294°S 065.41248°W	Not deployed	V	PO/SS/FT	180/Silent	None	
510	24/03/20	15:53	Humpback whale	1	64.83558°S 064.01657°W	Not deployed	PE(AH)	BV/SR/SS	215/Silent	None	
511	24/03/20	16:16	Humpback whale	1	64.85861°S 063.88691°W	Not deployed	PE(AH)	BV/NS/SR	720/Silent	None	
512	24/03/20	16:24	Humpback whale	3	64.86636°S 063.82454°W	Not deployed	SA	BV	720/Silent	None	
513	24/03/20	19:29	Humpback whale	1	64.66217°S 062.97783°W	Not deployed	UN	BV/DF	600/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
514	24/03/20	19:58	Humpback whale	2	64.61117°S 062.79850°W	Not deployed	PE(AH)	BV/DF	920/Silent	None	
515	24/03/20	20:26	Crabeater Seal	1	64.56767°S 062.62517°W	Not deployed	OM	OB	600/Silent	None	
516	24/03/20	20:29	Humpback whale	2	64.56767°S 062.62517°W	Not deployed	PA(SD)	BV/SA/DF	1500/Silent	None	
517	24/03/20	21:29	Humpback whale	2	64.46545°S 062.22345°W	Not deployed	PE(AH)	BV/SR/DF	550/Silent	None	Avoidance maneuver implemented.
518	24/03/20	21:52	Humpback whale	2	64.43298°S 062.07795°W	Not deployed	PA(OD)	BV/SR/DF	850/Silent	None	
519	24/03/20	21:57	Humpback whale	2	64.41780°S 062.03797°W	Not deployed	PE(AH)	SA/SA/SR/FF	640/Silent	None	
520	24/03/20	22:09	Humpback whale	1	64.41102°S 062.01495°W	Not deployed	PE(AH)	BV	470/Silent	None	
521	24/03/20	22:23	Humpback whale	1	64.35220°S 061.96346°W	Not deployed	UN	BV/DF	920/Silent	None	
522	25/03/20	12:00	Sei whale	10	62.15833°S 062.56500°W	Not deployed	PE(AH)	BV/SR/SS	175/Silent	None	Certainty of identification: Probable. Avoidance maneuver implemented.
523	27/03/20	12:31	Unidentifiable otariid	1	54.10518°S 065.74335°W	Not deployed	PA(SD)	PO/SS	150/Silent	None	
524	28/03/20	10:46	Commerson's dolphin	7	52.93140°S 070.48325°W	Not deployed	TV	PO/SS/NS	120/Silent	None	

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement/ Behavior		CPA Source (m)/ Source Activity	Mitigation Action	Comments
525	28/03/20	11:47	Peale's dolphin	2	52.98760°S 070.65463°W	Not deployed	AV	SA	320/Silent	None	
526	28/03/20	12:02	Peale's dolphin	4	53.03762°S 070.70713°W	Not deployed	V	PO/FT/DI	180/Silent	None	

Appendix E Photographic records

Figure E- 1: Visual detection #4. Peale's dolphin (*Lagenorhynchus australis*)

Figure E- 2: Visual detection #8. South American fur seals (*Actocephalus australis*)

Figure E- 3: Visual detection #19. Leopard seal (*Hydruga leptonyx*)

Figure E- 4: Visual detection #20. Fin whale (*Balaenoptera physalus*)

Figure E- 5: Visual detection #21. Sei whale (*Balaenoptera borealis*)

Figure E- 6: Visual detection #24. Humpback whale (*Megaptera novaeangliae*)

Figure E- 7: Visual detection #28. Southern bottlenose whale (*Hyperoodon planifrons*)

Figure E- 8: Visual detection #39. Crabeater seal (*Lobodon carcinophagus*)

Figure E- 9: Visual detection #42. Orca *(Orcinus orca*)

Figure E- 10: Visual detection #44. Leopard seal (*Hydruga leptonyx*)

Figure E- 11: Visual detection #111. Orca (*Orcinus orca*)

Figure E- 12: Visual detection #158. Weddell seal (*Leptonychotes weddellii*)

Figure E- 13: Visual detection #193. Crabeater seal (*Lobodon carcinophagus*)

Figure E- 14: Visual detection #196. Orca (*Orcinus orca*)

Figure E- 15: Visual detection #207. Juvenile Southern elephant seal (*Mirounga leonina*)

Figure E- 16: Visual detection #253. Crabeater seal (*Lobodon carcinophagus*)

Figure E- 17: Visual detection #255. Crabeater seal (*Lobodon carcinophagus***)**

Figure E- 18: Visual detection #348. Weddell seal (*Leptonychotes weddellii*)

Figure E- 19: Visual detection #351. Southern elephant seal (*Mirounga leonina*)

Figure E- 20: Visual detection #371. Crabeater seal (*Lobodon carcinopagus*)

Figure E- 21: Visual detection #380. Antarctic Minke whale (*Balaenoptera bonaerensis*)

Figure E- 22: Visual detection #477. Antarctic fur seal (*Arctocephalus gazella*)

Figure E- 23: Visual detection #510. Humpback whale (*Megantera novaeangliae*)

Figure E- 24: Visual detection #519. Humpback whale (*Megaptera novaeangliae*)

Figure E- 25: Visual detection #525. Commerson's dolphin (*Cephalorhynchus commersonii*)

Figure E- 26: Visual detection #525. Peale's dolphin (*Lagenorhynchus australis*)

Appendix F Species of Birds and Other Wildlife Observed During the Survey

Common Name	Family	Genus	Species	# of Individuals	# of days sighted
Adélie penguin	Spheniscidae	*Pygoscelis*	*adeliae*	1930	25
Antarctic petrel	Procellariidae	*Thalassoica*	*antartica*	129	6
Antarctic prion	Procellariidae	*Pachyptila*	*desolata*	41	8
Antarctic shag	Phalacrocoracidae	*Phalacrocorax (atriceps)*	*bransfieldensis*	11	2
Artic tern	Laridae	*Sterna*	*paradisaea*	38	3
Black browed Albatross	Diomedeiae	*Thalassarche (melanophrys)*	*melanophrys*	118	11
Black-bellied Storm petrel	Hydrobatidae	*Fregetta*	*tropica*	1	1
Cape Petrel	Procellariidae	*Daption*	*capense*	395	8
Chilean skua	Stercorariidae	*Catharacta*	*chilensis*	3	2
Emperor penguin	Spheniscidae	*Aptenodytes*	*forsteri*	430	29
Gentoo penguin	Spheniscidae	*Pygoscelis*	*papua*	50	1
Giant petrel	Procellariidae	*Macronectes*	*sp*	12	1
Great shearwater	Procellariidae	*Puffinus*	*gravis*	22	2
Grey headed Albatross	Diomedeiae	*Thalassarche*	*chrysostoma*	36	5
Kelp Gull	Laridae	*Larus*	*dominicanus*	68	2
Light-mantled sooty albatross	Diomedeiae	*Phoebetria*	*palpebrata*	2	2
Magellanic penguin	Spheniscidae	*Spheniscus*	*magellanicus*	37	2
Northern Royal Albatross	Diomedeiae	*Diomedea (epomophora)*	*sanfordi*	1	1
Pale-faced Sheathbill	chionidae	*Chionis*	*alba*	1	1
Snow petrel	Procellariidae	*Pagodroma*	*nivea*	272	27
Sooty shearwater	Procellariidae	*Puffinus*	*griseus*	225	2
South american tern	Sternidae	*Sterna*	*hirundinacea*	4	1
South polar skua	Stercorariidae	*Catharacta (skua)*	*maccormicki*	434	42
Southern fulmar	Procellariidae	*Fulmarus*	*glacialoides*	264	12
Southern Giant Petrel	Procellariidae	*Macronectes*	*giganteus*	117	25
Southern Royal Albatross	Diomedeiae	*Diomedea (epomophora)*	*epomophora*	5	1
UnID Crested pinguin	Spheniscidae	*Eudyptes*	*sp*	3	1
UnID penguin	Spheniscidae	*N/A*	*N/A*	3	2
UnID prion	Procellariidae	*Pachyptila*	*sp*	8	2
UnID shag	Phalacrocoracidae	*Phalacrocorax (atriceps)*	*sp*	1133	2
UnID skua	Stercorariidae	*Catharacta*	*sp*	6	2
UnID Storm-Petrel	Hydrobatidae	*Fregetta*	*sp*	20	3
UnID tern	Sternidae	*Sterna*	*sp*	16	2
Wandering Albatros	Diomedeiae	*Diomedea*	*exulans*	19	7
White-bellied Storm petrel	Hydrobatidae	*Fregetta*	*grallaria*	3	3
White-chinned petrel	Procellariidae	*Procellaria*	*aequinoctialis*	31	4

Antarctic prion *(pachyptila desolata)*

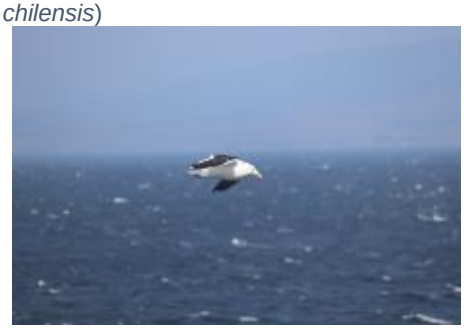
Black bellied storm petrel (*Fregetta tropica*)

Black browed albatross (*Thalassarche (melanophrys) melanophrys*)

Chilean skua (*Catharacta chilensis*)

Great shearwater (*Puffinus gravis*)

Gray headed albatross (*Thalassarche chrysistoma*)



Kelp gull *(Larus dominicanus)*

Light-mantled Sooty albatross (*Phoebetria palpabrata*)

Magellanic penguin (*Spheniscus magellanicus*)

South polar Skua (Catharacta (skua) maccormicki)

Wandering albatross (*Diomedea exulans*)

White-bellied storm petrel (*Fregetta grallaria*)

Southern Giant petrel *(Macronectes giganteus*)

White chinned petrel *(Procellaria aequinoctialis)*

Adélie penguin *(Pigoscelys adeliae)*

Antarctic petrel *(Thalassoica antartica)*

Artic tern *(Sterna paradisaea)*

Cape petrel *(Daption capense)*

Emperor penguin *(Aptenodytes forsteri)*

Snow petrel *(Pagodroma nivea)*

Pale-faced sheathbill (*Chionis alba*)

Southern fulmar *(Fulmarus glacialoides)*

Southern Giant petrel white morph (*Macronectes giganteus*)

Antarctic shag (*Phalacrocorax (atriceps) bransfieldensis*)

Gentoo penguin (*Pygoscelis papua*)

Appendix G Mortality Reports

Nathaniel B. Palmer
Antarctic Survey Program
Incident Report: Pinniped Mortality
16/02/2020

Observer's full name: Yessica Vicencio

Reporter's full name: Yessica Vicencio

Species Identification: Weddell Seal

Name and type of platform: Nathaniel B. Palmer/ research vessel icebreaker

Position of vessel at time of sighting: Latitude: 74°09.16'S Longitude: 105°12.16'W

Date animal observed: 16-02-2020

Time animal observed: 21:59 UTC

Date animal collected: Animal was not collected

Time animal collected: Animal was not collected

Environmental conditions at time of observation: Cloud coverage at the time of the detection was 90% with light fog, no precipitation and no glare. Seas were B1 on the Beaufort scale.

Water temperature (°C) and depth (m/ft) at site: water temperature unknown, but air temperature was -0.8°C. Depth of 846 meters.

Description of sighting event:

At 21:59 UTC, the body of a Weddell seal was sighted lying on the ice pack at 450 meters off the port bow of the *Nathaniel B. Palmer*. At the time of the detection, the vessel was transiting parallel to the limit of the thick ice, passing the seal on the portside. Upon closer look of the animal with the binoculars and zooming in on the pictures, a spot of fresh blood was visible, along with a south polar skua (Stercorarius maccormicki) next to the body's head (see Figure 1).

The animal had a robust body of about two meters in length, with irregular white blotches scattered on its sides. Most of the body was of normal aspect, and only the head of the animal was observed with blood that, by the intense colour, looked fresh (see Figure 2), which suggests a recent death. Due to the distance of the sighting and the lack of a closer observation, the PSO on watch was unable to stablish a probable cause of dead. However, a pod of killer whales had previously been observed at 20:49 UTC in the vicinity of the dead animal sighting.

At the time of the detection, the acoustic source was not deployed. The lead PSO determined that the animal's death was not related to the vessel's activities. No mitigation actions were implemented. The last sighting occurred at 22:01 UTC when the animal was left behind.

Photograph/Video taken: Yes, see below

If Yes, was the data provided to NMFS? Yes (photos included in the report, see below)

Figure 1. Dead Weddell seal. 21:59 UTC.

Figure 2. Dead Weddell seal. 22:00 UTC.

Pinniped Species Information: (please designate cm/m or inches)

Species: Leptonychotes weddellii

Weight (kg or lbs): Unknown

Sex: Unknown

Straight body length: about 2.00 meter (visual estimate, animal was not collected)

Straight body width: about 1.00 meters (visual estimate, animal was not collected)

Curved carapace length: N/A

Curved carapace width: N/A

Plastron length: N/A

Plastron width: N/A

Tail length: N/A

Head width: N/A

Condition of specimen/description of animal: No signs of decomposition or scavenger feeding visible

Existing Flipper Tag Information: Unknown

Miscellaneous:

Genetic biopsy collected: No

Photographs taken: Yes, included above

Pinniped Release Information: N/A

State: N/A

County: Antarctic

Remarks: (note if pinniped was involved with tar or oil, gear or debris entanglement, wounds, or mutilations, propeller damage, papillomas, old tag locations, etc.): The damage on the body could suggest an animal attack.

Nathaniel B. Palmer
Antarctic Survey Program
Incident Report: Pinniped Mortality
26/02/2020

Observer's full name: Valeria Hernandez Urraca, Lorena Figueroa Oyosa

Reporter's full name: Valeria Hernandez Urraca

Species Identification: Unidentified Seal

Name and type of platform: Nathaniel B. Palmer/ research vessel icebreaker

Position of vessel at time of sighting: Latitude: 74.91500°S Longitude: 106.22333°W

Date animal observed: 26-02-2020

Time animal observed: 12:22 UTC

Date animal collected: Animal was not collected

Time animal collected: Animal was not collected

Environmental conditions at time of observation: Cloud coverage 100% with a visibility of 6 to 9 kilometres, light snow and no glare. Sea B1 on the Beaufort scale.

Water temperature (°C) and depth (m/ft) at site: water temperature unknown and water depth 435 meters.

Description of sighting event:

At 12:22 UTC, the body of an unidentified seal was detected on the ice pack at 100 meters off the *Nathaniel B. Palmer*'s port bow. At the time of the detection, the vessel was performing icebreaking operations and approached as close as 50 meters from the seal's body. The cadaver was covered with snow and a pair of holes were present where the face/head appeared to be, one of them might have a presence of blood. Several bird prints were around the body (see Figure 1).

The animal had a slender body of about one and a half meters in length and no other features were visible due to the presence of snow covering the entire body. The PSO on watch was unable to establish a probable cause of death but resolved that the animal's death was not related to any of the vessel's activities. No mitigation actions were implemented or required. The last sighting occurred at 13:02 UTC when the animal was left behind.

Photograph/Video taken: Yes, see below

If Yes, was the data provided to NMFS? Yes (photos included in the report, see below)

Figure 1. Dead unidentifiable seal at first detection 12:22 UTC.

Figure 2. Dead unidentifiable seal at its closest distance from the vessel.

Pinniped Species Information: (please designate cm/m or inches)

Species: Unknown

Weight (kg or lbs): Unknown

Sex: Unknown

Straight body length: about 1.5 meter (visual estimate, animal was not collected)

Straight body width: about 0.5 meters (visual estimate, animal was not collected)

Curved carapace length: N/A

Curved carapace width: N/A

Plastron length: N/A

Plastron width: N/A

Tail length: N/A

Head width: about 0.25 meters (visual estimate, animal was not collected)

Condition of specimen/description of animal: No signs of decomposition. Two holes on the area of the face and presence of bird's prints around the corpse suggest scavenger's feeding.

Existing Flipper Tag Information: Unknown

Miscellaneous:

Genetic biopsy collected: No

Photographs taken: Yes, included above

Pinniped Release Information: N/A

State: N/A

County: Antarctic

Remarks: (note if pinniped was involved with tar or oil, gear or debris entanglement, wounds, or mutilations, propeller damage, papillomas, old tag locations, etc.): none of these could have been visible due to the snow covering the body.