United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503

In Reply Refer to:
FWS/IR11/AFES/MMM

INCIDENTAL TAKE AUTHORIZATION
(IHA-21-01)

ISSUED: July 15, 2021
EXPIRES: December 31, 2021

The National Science Foundation and the Lamont-Doherty Earth Observatory and the National Science Foundation (NSF/L-DEO) are authorized to take, by non-lethal Level B harassment, small numbers of northern sea otters (*Enhydra lutris kenyoni*: hereafter "sea otters") during high-energy seismic surveys in the Northeast Pacific Ocean along the coast of Southeast Alaska. This Incidental Harassment Authorization (IHA) is valid between the date of issuance and December 31, 2021. It is issued by the Regional Director-Alaska Region, the U.S. Fish and Wildlife Service (Service) in accordance with section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA), as amended (16 U.S.C. 1371).

Activities are described in full in the following documents:

- Notice of receipt of application; proposed incidental harassment authorization; request for comments. Proposed Incidental Harassment Authorization for Southeast Alaska Stock of Northern Sea Otters in the Queen Charlotte Fault Region, Alaska (86 FR 30613, June 9, 2021, the "Proposed IHA").
- LGL Limited 2020. "Request by Lamont-Doherty Earth Observatory for an Incidental Harassment Authorization to Allow the Incidental Take of Marine Mammals during Marine Geophysical Surveys by R/V Marcus G. Langseth of the Queen Charlotte Fault in the Northeast Pacific Ocean, Summer 2021." Prepared for: Lamont-Doherty Earth Observatory, Palisades, New York.

General Conditions

1) The taking of Northern sea otters from the Southeast, Alaska, stock whenever the required conditions, mitigation, monitoring, and reporting measures are not fully implemented as required by the IHA is prohibited. Failure to follow measures specified may result in the suspension or revocation of the IHA.

2) If incidental take exceeds the level or type identified in this IHA (e.g., greater than 49 incidents of incidental take of 27 otters by Level B harassment), this IHA may be invalidated and the Service will reevaluate its findings. If project activities cause unauthorized take, such as any injury due to seismic noise, acute distress, or any indication of the separation of mother from pup, NSF/L–DEO must take the following actions:

a) cease its activities immediately (or reduce activities to the minimum level necessary to maintain safety);
b) report the details of the incident to the Service's MMM within 48 hours; and
c) suspend further activities until the Service has reviewed the circumstances, determined whether additional mitigation measures are necessary to avoid further unauthorized taking, and notified NSF/L–DEO that it may resume project activities.

3) All operations managers and vessel operators must receive a copy of this IHA and maintain access to it for reference at all times during project work. These personnel must understand, be fully aware of, and be capable of implementing the conditions of this IHA at all times during project work.

4) This IHA will apply to activities associated with the project as described in this document and in NSF/L–DEO's amended application (LGL 2020). Changes to the project without prior authorization may invalidate this IHA.

5) NSF/L–DEO's IHA application is approved and fully incorporated into this IHA. The application includes:

    a) NSF/L–DEO's original request for an IHA, dated December 19, 2019;
    b) NSF/L–DEO's response to requests for additional information from the Service, dated January 22, February 19 and February 26, 2020; and
    c) A revised application, dated October 29, 2020.

6) Operators will allow Service personnel or the Service's designated representative to visit project work sites to monitor impacts to sea otters and subsistence uses of sea otters at any time throughout project activities so long as it is safe to do so. "Operators" are all personnel operating under the NSF/L–DEO's authority, including all contractors and subcontractors.

Avoidance and Minimization

7) Seismic surveys must be conducted using equipment that generates the lowest practicable levels of underwater sound within the range of frequencies audible to sea otters.

8) Vessels will not approach within 100 meters (m) (328 feet[ft]) of individual sea otters or 500 m (0.3 miles [mi]) of rafts of otters. Operators will reduce vessel speed if a sea otter approaches or surfaces within 100 m (328 ft) of a vessel.

9) Vessels may not be operated in such a way as to separate members of a group of sea otters from other members of the group.

10) All vessels must avoid areas of active or anticipated subsistence hunting for sea otters as determined through community consultations.

Mitigation During Seismic Activities

11) Designated trained and qualified Protected Species Observers (PSO) must be employed to monitor for the presence of sea otters, initiate mitigation measures, and monitor, record, and report the effects of the activities on sea otters. NSF/L–DEO is responsible for providing training to PSOs to carry out mitigation and monitoring.

12) NSF/L–DEO must establish mitigation zones for their 2D seismic surveys, which generate underwater sound levels at or more than or 160 decibel (dB) between 125 Hertz (Hz) and 38 Kilohertz (kHz). Mitigation zones must include all in-water areas where work-related sound received by sea otters will match the levels and frequencies above. Mitigation zones will be designated as follows:

    a) Exclusion Zones (EZ) will be established with the following minimum radii: 500 m (0.3 mi) from the source for the full seismic array and 100 m (328 ft) for the single bolt airgun (655 cubic centimeter [cm^3] or 40 cubic inch [in^3]).
    b) A Safety Zone (SZ) is an area larger than the EZ and will include all areas within which sea otters may be exposed to noise levels that will likely result in Level B take.
    c) Both the EZ and SZ will be centered on the sound source (the seismic array).
    d) The radius of the SZs are shown in Table 1 (as calculated based on modeling techniques described in the Proposed IHA and in Appendix A of NSF/L–DEO's application).

Table 1. Estimated radial distances from the seismic sound source to the 160-dB isopleth. The area within the isopleth is designated as the Safety Zone (SZ).

Source and Volume	Water Depth (m)	Predicted distances (in m) to the 160 dB Received Sound Level
Single Bolt airgun, 40 in^3	>1,000 m	431[1]
	100–1,000 m	647[2]
	<100 m	1,041[3]
4 strings, 36 airguns, 6600 in^3	>1,000 m	6,733[1]
	100–1,000 m	9,468[4]
	<100 m	12,650[4]

[1] Distance is based on L–DEO model results.
[2] Distance is based on L–DEO model results with a 1.5 × correction factor between deep and intermediate water depths.
[3] Distance is based on empirically derived measurements in the Gulf of Mexico with scaling applied to account for differences in tow depth.
[4] Based on empirical data from Crone et al. (2014); see Appendix A of the NSF/L–DEO IHA application for details.

13) PSOs must conduct visual monitoring of the entire EZ and the visible SZ continuously during all seismic work occurring in daylight hours.

14) Prior to seismic work, a "ramp-up" procedure must be used to increase the levels of underwater sound at a gradual rate:
    a) A ramp-up will be used at the initial start of airgun operations and prior to restarting after any period greater than 30 minutes (min) without airgun operations, including a power-down or shutdown event.
    b) Visual monitoring must begin at least 30 min prior to and continue throughout ramp-up efforts.
    c) During geophysical work, the number and total volume of airguns will be increased incrementally until the full volume is achieved.
    d) The rate of ramp-up will be no more than 6 dB per 5-min period. Ramp-up will begin with the smallest gun in the array that is being used for all airgun array configurations. During the ramp-up, the applicable mitigation zones (based on type of airgun and sound levels produced) must be maintained.
    e) In thick fog or at other times when the outer part of the EZ is not visible, it is not allowed to ramp-up the full array from a complete shutdown, until visibility allows for visual observations of sea otters.
    f) Ramp-up of the airguns will not be initiated if a sea otter is sighted within the EZ at any time.
    g) If sea otters are observed during a ramp-up effort or prior to startup, a PSO must record the observation and monitor the animal's position until it moves out of visual range. Seismic work may commence if, after a full and gradual effort to ramp up the underwater sound level, the sea otter is outside of the EZ and does not show signs of visible distress (for example, vocalizing, repeatedly spy-hopping, or fleeing).

15) The following actions must be taken in response to sea otters in mitigation zones:

    a) Seismic work will be shut down completely if a sea otter is observed within the 500-m (0.3-mi) EZ for the full array or the 100-m (328-ft) EZ for the 40-in^3 array.
    b) When sea otters are observed in visible distress (for example, vocalizing, repeatedly spy-hopping, or fleeing), seismic work must be immediately shut down or powered down to reduce noise exposure.
    c) The shutdown procedure will be accomplished immediately upon determination that a sea otter is in the applicable EZ or as soon as practicable considering worker safety and equipment integrity.
    d) Following a shutdown, seismic work will not resume until the sea otter has cleared the EZ. The animal will be considered to have cleared the EZ if it is visually observed to have left the EZ or has not been seen within the EZ for 30 min or longer.
    e) Any shutdown due to sea otters sighted within the EZ must be followed by a 30-min all-clear period and then a standard full ramp-up.
    f) Any shutdown for other reasons resulting in the cessation of seismic work for a period greater than 30 min must also be followed by full ramp-up procedures.

16) Operators may reduce power to seismic equipment as an alternative to a shutdown to prevent a sea otter from entering the EZ. A power-down procedure involves reducing the volume of underwater sound generated. Vessel speed or course may be altered to achieve the same task.

a) Whenever a sea otter is detected outside the EZ and, based on its position and motion relative to the seismic work, appears likely to enter the EZ but has not yet done so, the operator may power down to reduce high-level noise exposure.
b) When a sea otter is detected in the SZ, an operator may choose to power down when practicable to reduce Level B take, but is not required to do so.
c) During a power-down, the number of airguns in use will be reduced to a single mitigation airgun (airgun of small volume such as the 655-cm^3 (40-in^3) gun), such that the EZ is reduced, making the sea otters unlikely to enter the EZ.
d) After a power-down, noise-generating work will not resume until the sea otter has cleared the EZ for the full airgun array. The sea otter will be considered to have cleared the EZ if it is visually observed to have left the EZ and has not been seen within the zone for 30 minutes.

17) Visual monitoring must continue for 30 min after the use of the acoustic source ceases or the sun sets, whichever is sooner.

Monitoring

18) Operators shall work with PSOs to apply mitigation measures and shall recognize the authority of PSOs up to and including stopping work, except where doing so poses a significant safety risk to vessels or personnel.

19) Duties of PSOs include: watching for and identifying sea otters, recording observation details, documenting presence in any applicable monitoring zone, identifying and documenting potential harassment, and working with vessel operators to implement all appropriate mitigation measures.

20) A sufficient number of PSOs will be onboard to meet the following criteria: 100 percent monitoring coverage during all daytime periods of seismic activity; a maximum of 4 consecutive hours on watch per PSO; a maximum of approximately 12 hours on watch per day per PSO; and at least 1 observer each on the source vessel and support vessel.

21) All PSOs will complete a training course designed to familiarize individuals with monitoring and data collection procedures. A field crew leader with prior experience as a marine mammal observer will supervise the PSO team. New or inexperienced PSOs will be paired with experienced PSOs so that the quality of marine mammal observations and data recording is kept consistent. Resumes for candidate PSOs will be made available for the Service to review.

22) Observers will be provided with reticule binoculars (10×42), big-eye binoculars or spotting scopes (30×), inclinometers, and range finders. Field guides, instructional handbooks, maps and a contact list will also be made available.

Measures to Reduce Impacts to Alaska Native Subsistence Users

23) Prior to conducting the work, NSF/L–DEO will take the following steps to reduce potential

effects on Alaska Native subsistence harvest of sea otters:

a) Avoid work in areas of known Alaska Native sea otter subsistence harvest;
b) Discuss the planned activities with Alaska Native subsistence stakeholders including Southeast Alaska tribal governments and traditional councils that may be impacted by the activities;
c) Identify and work to resolve concerns of Alaska Native stakeholders, if any, regarding the project's effects on Alaska Native subsistence hunting of sea otters; and
d) If any concerns are not resolved, develop a in consultation with the Service and Alaska Native subsistence stakeholders to address these concerns.

Reporting Requirements

24) NSF/L–DEO must notify the Service at least 48 hours prior to commencement of activities.

25) Reports will be submitted to the Service's MMM weekly during project activities. The reports will summarize project work and monitoring efforts.

26) A final report will be submitted to the Service's MMM within 90 days after completion of work or expiration of the IHA. It will summarize all monitoring efforts and observations, describe all project activities, and discuss any additional work yet to be done. Factors influencing visibility and detectability of marine mammals (e.g., sea state, number of observers, fog, and glare) will be discussed. The report will describe changes in sea otter behavior resulting from project activities and any specific behaviors of interest. Sea otter observation records will be provided in the form of electronic database or spreadsheet files. The report will assess any effects NSF/L–DEO's operations may have had on the availability of sea otters for subsistence harvest and if applicable, evaluate the effectiveness of the POC for preventing impacts to subsistence users of sea otters.

27) Injured, dead, or distressed sea otters that are not associated with project activities (e.g., animals found outside the project area, previously wounded animals, or carcasses with moderate to advanced decomposition or scavenger damage) must be reported to the Service within 24 hours of discovery. Photographs, video, location information, or any other available documentation shall be provided to the Service.

28) All reports shall be submitted by email to *fw7_mmm_reports@fws.gov*.

29) NSF/L–DEO must notify the Service upon project completion or end of the work season.

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Assistant Regional Director
Fisheries and Ecological Services, Alaska Region
U.S. Fish and Wildlife Service

Date

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

INCIDENTAL HARASSMENT AUTHORIZATION

The Lamont-Doherty Earth Observatory of Columbia University (L-DEO) 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 incidentally harass marine mammals, under the following conditions.

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

2. This IHA authorizes take incidental to geophysical survey activity in the northeast Pacific Ocean, as specified in L-DEO's IHA application.

3. General Conditions

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

   (b) The species authorized for taking are listed in Table 1. The taking, by Level A and Level B harassment only, is limited to the species and numbers listed in Table 1.

   (c) The taking by serious injury or death of any of the species listed in Table 1 or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA. Any taking exceeding the authorized amounts listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this IHA.

   (d) During use of the acoustic source, if any marine mammal species that are not listed in Table 1, or a species for which authorization has been granted but the takes have been met, appears within or enters the Level B harassment zone (Table 3) the acoustic source must be shut down.

   (e) L-DEO must ensure that relevant vessel personnel and PSO team participate in a joint onboard briefing led by the vessel operator and lead PSO to ensure that responsibilities, communication procedures, protected species monitoring protocols, operational procedures, and IHA requirements are clearly understood.

4. Mitigation Requirements

   (a) L-DEO must use independent, dedicated, trained visual and acoustic PSOs, meaning that the PSOs must be employed by a third-party observer provider, must not have tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of

protected species and mitigation requirements (including brief alerts regarding maritime hazards), and must have successfully completed an approved PSO training course appropriate for their designated task (visual or acoustic). Individual PSOs may perform acoustic and visual PSO duties (though not at the same time).

(b) At least one visual and two acoustic PSOs must have a minimum of 90 days at-sea experience working in those roles, respectively, during a deep penetration seismic survey, with no more than 18 months elapsed since the conclusion of the at-sea experience

(c) Visual Observation

(i) During survey operations (e.g., any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of two PSOs 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) and 30 minutes prior to and during ramp-up of the airgun array. Visual monitoring of the exclusion and buffer zones must begin no less than 30 minutes prior to ramp-up and must continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset.

(ii) Visual 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. Estimated harassment zones are provided in Tables 2-3 for reference.

(iii) Visual PSOs must immediately communicate all observations to the acoustic PSO(s) on duty, including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination.

(iv) During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 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.

(v) Visual 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 of observation per 24-hour period. Combined observational duties (visual and acoustic but not at same time) may not exceed 12 hours per 24-hour period for any individual PSO.

(d) Acoustic Monitoring

(i) The source vessel must use a towed passive acoustic monitoring system (PAM) which must be monitored by, at a minimum, one on-duty acoustic PSO beginning at least 30 minutes prior to ramp-up and at all times during use of the acoustic source.

(ii) When both visual and acoustic PSOs are on duty, all detections must be immediately communicated to the remainder of the on-duty PSO team for potential verification of visual observations by the acoustic PSO or of acoustic detections by visual PSOs.

(iii) Acoustic 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 of observation per 24-hour period. Combined observational duties may not exceed 12 hours per 24-hour period for any individual PSO.

(iv) Survey activity may continue for 30 minutes when the PAM system malfunctions or is damaged, while the PAM operator diagnoses the issue. If the diagnosis indicates that the PAM system must be repaired to solve the problem, operations may continue for an additional five hours without acoustic monitoring during daylight hours only under the following conditions:

a. Sea state is less than or equal to BSS 4;

b. With the exception of delphinids, no marine mammals detected solely by PAM in the applicable exclusion zone in the previous two hours;

c. NMFS is notified via email as soon as practicable with the time and location in which operations began occurring without an active PAM system; and

d. Operations with an active acoustic source, but without an operating PAM system, do not exceed a cumulative total of five hours in any 24-hour period.

(e) Exclusion zone and buffer zone

(i) Except as provided below in 4(e)(ii), the PSOs must establish and monitor a 500-m exclusion zone and additional 500-m buffer zone (total 1,000 m). The 1,000-m zone shall serve to focus observational effort but not limit such effort; observations of marine mammals beyond this distance shall also be recorded as described in 5(d) below and/or trigger shutdown as

described in 4(g)(iv) below, as appropriate. The exclusion zone encompasses the area at and below the sea surface out to a radius of 500 m from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself) (0–500 m). The buffer zone encompasses the area at and below the sea surface from the edge of the exclusion zone, out to a radius of 1,000 meters from the edges of the airgun array (500–1,000 m). During use of the acoustic source, occurrence of marine mammals within the buffer zone (but outside the exclusion zone) must be communicated to the operator to prepare for the potential shutdown of the acoustic source. PSOs must monitor the exclusion zone and buffer zone for a minimum of 30 minutes prior to ramp-up (i.e., pre-start clearance).

(ii) An extended 1,500-m exclusion zone must be established for all beaked whales. No buffer zone is required.

(f) Pre-start clearance and Ramp-up

(i) A ramp-up procedure must be followed at all times as part of the activation of the acoustic source, except as described under 4(f)(vi).

(ii) Ramp-up must not be initiated if any marine mammal is within the exclusion or buffer zone. If a marine mammal is observed within the exclusion zone or the buffer zone during the 30 minute pre-start clearance period, ramp-up may not begin until the animal(s) has been observed exiting the zone or until an additional time period has elapsed with no further sightings (15 minutes for small odontocetes and pinnipeds, and 30 minutes for mysticetes and all other odontocetes, including sperm whales, beaked whales, killer whales, and Risso's dolphins).

(iii) Ramp-up must begin by activating a single airgun of the smallest volume in the array and must continue in stages by doubling the number of active elements at the commencement of each stage, with each stage of approximately the same duration. Duration must not be less than 20 minutes.

(iv) PSOs must monitor the exclusion and buffer zones during ramp-up, and ramp-up must cease and the source must be shut down upon visual observation or acoustic detection of a marine mammal within the exclusion zone. Once ramp-up has begun, observations of marine mammals within the buffer zone do not require shutdown, but such observation must be communicated to the operator to prepare for the potential shutdown.

(v) Ramp-up may occur at times of poor visibility, including nighttime, if appropriate acoustic monitoring has occurred with no detections in the 30 minutes prior to beginning ramp-up.

(vi) If the acoustic source is shut down for brief periods (i.e., less than 30 minutes) for reasons other than that described for shutdown (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant visual and/or acoustic observation and no visual or acoustic detections of marine mammals have occurred within the applicable exclusion zone. For any longer shutdown, pre-start 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, but if the shutdown period was brief and constant observation was maintained, pre-start clearance watch is not required.

(vii) Testing of the acoustic source involving all elements requires ramp-up. Testing limited to individual source elements or strings does not require ramp-up but does require pre-start clearance watch.

(g) Shutdown

(i) Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the acoustic source.

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

(iii) When the airgun array is active (i.e., anytime one or more airguns is active, including during ramp-up) and (1) a marine mammal (excluding delphinids of the species described in 4(g)(v)) appears within or enters the exclusion zone and/or (2) a marine mammal is detected acoustically and localized within the exclusion zone, the acoustic source must be shut down. When shutdown is called for by a PSO, the airgun array must be immediately deactivated. Any dispute regarding a PSO shutdown must be resolved after deactivation.

(iv) The airgun array must be shut down if any of the following are detected at any distance:

1. North Pacific right whale.

2. Large whale (defined as a sperm whale or any mysticete species) with a calf (defined as an animal less than two-thirds the body size of an adult observed to be in close association with an adult).

3. Aggregation of six or more large whales.

(v) The shutdown requirement shall be waived for Pacific white-sided dolphins and northern right whale dolphins.

a. If a Pacific white-sided dolphin or northern right whale dolphin is visually and/or acoustically detected and localized within the exclusion zone, no shutdown is required unless the acoustic PSO or a visual PSO confirms the individual to be of a species other than those listed above, in which case a shutdown is required.

b. If there is uncertainty regarding identification, visual PSOs may use best professional judgment in making the decision to call for a shutdown.

(vi) Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone (i.e., animal is not required to fully exit the buffer zone where applicable) or following a clearance period (15 minutes for small odontocetes and pinnipeds, and 30 minutes for mysticetes and all other odontocetes, including sperm whales, beaked whales, killer whales, and Risso's dolphins) with no further observation of the marine mammal(s).

(h) Vessel strike avoidance:

(i) Vessel operator and crew must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammals. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel (distances stated below). Visual observers monitoring the vessel strike avoidance zone may be third-party observers (i.e., PSOs) or crew members, but crew members responsible for these duties must be provided sufficient training to 1) distinguish marine mammals from other phenomena and 2) broadly to identify a marine mammal as a right whale, other whale (defined in this context as sperm whales or baleen whales other than right whales), or other marine mammal.

(ii) Vessel speeds must be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near a vessel.

(iii) The vessel must maintain a minimum separation distance of 500 m from right whales. If a whale is observed but cannot be confirmed as a species other than a right whale, the vessel operator must assume that it is a right whale and take appropriate action.

(iv) The vessel must maintain a minimum separation distance of 100 m from sperm whales and all other baleen whales.

(v) The vessel must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals, with an understanding that at times this may not be possible (e.g., for animals that approach the vessel).

(vi) When marine mammals are sighted while a vessel is underway, the vessel shall take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If marine mammals are sighted within the relevant separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear or any vessel that is navigationally constrained.

(vii) 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.

5. Monitoring Requirements

(a) The operator must provide PSOs with bigeye binoculars (e.g., 25 x 150; 2.7 view angle; individual ocular focus; height control) of appropriate quality solely for PSO use. These must be pedestal-mounted on the deck at the most appropriate vantage point that provides for optimal sea surface observation, PSO safety, and safe operation of the vessel.

(b) The operator must work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals. Such equipment, at a minimum, must include:

(i) PAM must include a system that has been verified and tested by an experienced acoustic PSO that will be using it during the trip for which monitoring is required.

(ii) Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups).

(iii) Global Positioning Unit (GPS) (plus backup).

(iv) Digital single-lens reflex cameras of appropriate quality that capture photographs and video (plus backup).

(v) Compass (plus backup).

(vi) Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups).

(vii) Any other tools necessary to adequately perform necessary PSO tasks.

(c) Protected Species Observers (PSOs, Visual and Acoustic) Qualifications

(i) PSOs must have successfully completed an acceptable PSO training course appropriate for their designated task (visual or acoustic). Acoustic PSOs are required to complete specialized training for operating PAM systems and are encouraged to have familiarity with the vessel with which they will be working.

(ii) NMFS must review and approve PSO resumes.

(iii) NMFS shall have one week to approve PSOs from the time that the necessary information is submitted, after which PSOs meeting the minimum requirements shall automatically be considered approved.

(iv) One visual PSO with experience as shown in 4(b) shall be designated as the lead for the entire protected species observation team. The lead must coordinate duty schedules and roles for the PSO team and serve as primary point of contact for the vessel operator. (Note that the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator.) To the maximum extent practicable, the lead PSO must devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.

(v) PSOs must successfully complete relevant training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program.

(vi) PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics.

(vii) The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver must be submitted to NMFS and must include written justification.

Requests must be granted or denied (with justification) by NMFS within one week of receipt of submitted information. 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 protected species 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

(i) PSOs must use standardized data collection 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. If required mitigation was not implemented, PSOs should record a description of the circumstances.

(ii) At a minimum, the following information must be recorded:

a. Vessel name and call sign;

b. PSO names and affiliations;

c. Date and participants of PSO briefings (as discussed in General Requirement);

d. Dates of departures and returns to port with port name;

e. Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;

f. Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;

g. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;

h. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including BSS and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;

i. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions changed (e.g., vessel traffic, equipment malfunctions); and

j. 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-start clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.).

(iii) Upon visual observation of any marine mammal, the following information must 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) and 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/breaths, 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 any element 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) and time and location of the action.

(iv) If a marine mammal is detected while using the PAM system, the following information must be recorded:

a. An acoustic encounter identification number, and whether the detection was linked with a visual sighting;

b. Date and time when first and last heard;

c. Types and nature of sounds heard (e.g., clicks, whistles, creaks, burst pulses, continuous, sporadic, strength of signal);

d. Any additional information recorded such as water depth of the hydrophone array, bearing of the animal to the vessel (if determinable), species or taxonomic group (if determinable), spectrogram screenshot, and any other notable information.

6. Reporting

(a) L-DEO must submit a draft comprehensive report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the IHA, whichever comes sooner. A final report must be submitted within 30 days following resolution of any comments on the draft report. The draft report must include the following:

(i) Summary of all activities conducted and sightings of marine mammals near the activities;

(ii) Summary of all data required to be collected (see 5(d));

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

(iii) Summary of dates and locations of survey operations (including (1) the number of days on which the airgun array was active and (2) the percentage of time and total time the array was active during daylight vs. nighttime hours (including dawn and dusk)) and all marine mammal sightings (dates, times, locations, activities, associated survey activities);

(iv) Geo-referenced time-stamped vessel tracklines for all time periods during which airguns were operating. Tracklines should include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off, or when they changed from full array to single gun or vice versa);

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

(vi) Raw observational data.

(b) Reporting Injured or Dead Marine Mammals

(i) Discovery of Injured or Dead Marine Mammal – In the event that personnel involved in the survey activities covered by the authorization discover an injured or dead marine mammal, L-DEO must report the incident to the Office of Protected Resources (OPR), NMFS and the NMFS Alaska Regional Stranding Coordinator as soon as feasible. The report must include the following information:

a. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

b. Species identification (if known) or description of the animal(s) involved;

c. Condition of the animal(s) (including carcass condition if the animal is dead);

d. Observed behaviors of the animal(s), if alive;

e. If available, photographs or video footage of the animal(s); and

f. General circumstances under which the animal was discovered.

(ii) Vessel Strike – In the event of a ship strike of a marine mammal by any vessel involved in the activities covered by the authorization, L-DEO must report the incident to OPR, NMFS and to the Alaska Regional Stranding Coordinator as soon as feasible. The report must include the following information:

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

b. Species identification (if known) or description of the animal(s) involved;

c. Vessel's speed during and leading up to the incident;

d. Vessel's course/heading and what operations were being conducted (if applicable);

e. Status of all sound sources in use;

f. Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;

g. Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;

h. Estimated size and length of animal that was struck;

i. Description of the behavior of the marine mammal immediately preceding and following the strike;

j. If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

k. Estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

l. To the extent practicable, photographs or video footage of the animal(s).

7. Actions to minimize additional harm to live-stranded (or milling) marine mammals – In the event of a live stranding (or near-shore atypical milling) event within 50 km of the survey operations, where the NMFS stranding network is engaged in herding or other interventions to return animals to the water, the Director of OPR, NMFS (or designee) will advise L-DEO of the need to implement shutdown procedures for all active acoustic

sources operating within 50 km of the stranding. Shutdown procedures for live stranding or milling marine mammals include the following:

(a) If at any time, the marine mammal(s) die or are euthanized, or if herding/intervention efforts are stopped, the Director of OPR, NMFS (or designee) will advise L-DEO that the shutdown around the animals' location is no longer needed.

(b) Otherwise, shutdown procedures will remain in effect until the Director of OPR, NMFS (or designee) determines and advises L-DEO that all live animals involved have left the area (either of their own volition or following an intervention).

(c) If further observations of the marine mammals indicate the potential for re-stranding, additional coordination with L-DEO will be required to determine what measures are necessary to minimize that likelihood (*e.g.*, extending the shutdown or moving operations farther away) and to implement those measures as appropriate.

(d) Additional information requests – If NMFS determines that the circumstances of any marine mammal stranding found in the vicinity of the activity suggest investigation of the association with survey activities is warranted, and an investigation into the stranding is being pursued, NMFS will submit a written request to L-DEO indicating that the following initial available information must be provided as soon as possible, but no later than 7 business days after the request for information.

(i) Status of all sound source use in the 48 hours preceding the estimated time of stranding and within 50 km of the discovery/notification of the stranding by NMFS; and

(ii) If available, description of the behavior of any marine mammal(s) observed preceding (*i.e.*, within 48 hours and 50 km) and immediately after the discovery of the stranding.

In the event that the investigation is still inconclusive, the investigation of the association of the survey activities is still warranted, and the investigation is still being pursued, NMFS may provide additional information requests, in writing, regarding the nature and location of survey operations prior to the time period above.

8. This Authorization may be modified, suspended or revoked if the holder fails to abide by the conditions prescribed herein (including, but not limited to, failure to comply with monitoring or reporting requirements), or if NMFS determines: (1) the authorized taking is likely to have or is having more than a negligible impact on the species or stocks of affected marine mammals, (2) the authorized taking is likely to have or is having an unmitigable adverse impact on the availability of the affected species or stocks for

subsistence uses, or (3) the prescribed measures are likely not or are not effecting the least practicable adverse impact on the affected species or stocks and their habitat.

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

   (a) A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (recognizing that the Renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA).

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

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

      (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 will remain the same and appropriate, and the findings in the initial IHA remain valid.

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Catherine Marzin,
Acting Director, Office of Protected Resources,
National Marine Fisheries Service.

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

Species	Authorized Take	
	Level B	Level A
North Pacific right whale	2	0
Humpback whale	403	14
Blue whale	31	1
Fin whale	873	44
Sei whale	34	1
Minke whale	57	2
Gray whale (ENP)	1,448	45
Gray whale (WNP)	2	0
Sperm whale	131	0
Baird's beaked whale	29	0
Cuvier's beaked whale	114	0
Stejneger's beaked whale	120	0
Pacific white-sided dolphin	1,374	0
Northern right-whale dolphin	927	0
Risso's dolphin	22	0
Killer whale	290	0
Dall's porpoise	5,661	178
Harbor porpoise	990	26
Northern fur seal	5,812	0
California sea lion	1,258	0
Steller sea lion (eDPS)	2,381	0
Steller sea lion (wDPS)	54	0
Northern elephant seal	6,850	0
Harbor seal	6,012	0

Table 2. Modeled Radial Distances (m) to Isopleths Corresponding to Level A Harassment Thresholds.

Airgun Configuration	Threshold	Level A harassment zone (m)				
		LF cetaceans	MF cetaceans	HF cetaceans	Phocids	Otariids
36-airgun array (6,600 in^3)	SEL_{cum}	320	0	1	10	0
	Peak	39	14	268	44	11

Table 3. Modeled Radial Distances (m) to Isopleths Corresponding to Level B Harassment Threshold.

Airgun Configuration	Water Depth (m)	Level B harassment zone (m)
36-airgun array (6,600 in^3)	>1,000	6,733
	100-1,000	9,468
	<100	12,650

APPENDIX C: Passive Acoustic Monitoring System Specifications

1.1 Heavy tow table with separate hydrophone array
Main tow cable serial number SM 6043
Spare tow cable serial number SM 6041

Mechanical Information
Length = 230 m
Outer diameter = 16.5 mm (+/- 0.5 mm)
Ship-side connector: ITT 19-way, male
Wet-end connector: Seiche, with 36-way Lemo insert, female.
Weight = approximately 94 kg (in air)

1.2 Hydrophone array cable
Main array cable serial number SM 4073
Spare array cable serial number SM 4964

Mechanical Information
Type = Detachable 20 m, 4-ch Array
Length = 20 m
Diameter = 17 mm (over cable), 32 mm (over mouldings), 65 mm (over connector)
Connector = Seiche connector with 36-way Lemo insert, male.
Weight = approximately 10 kg (in air)

Hydrophone elements
Array elements = four spherical hydrophones / preamplifiers, one depth sensor
Hydrophone 1 = 200-200,000 Hz (-3 dB), sensitivity -166dB re 1V/uPa; 0.00 m
Hydrophone 2 = 200-200,000 Hz (-3 dB), sensitivity -166dB re 1V/uPa; at 2.00 m
Hydrophone 3 = 2,000-200,000 Hz (-3 dB), sensitivity -166dB re 1V/uPa; at 15.00 m
Hydrophone 4 = 2,000-200,000 Hz (-3 dB), sensitivity -166dB re 1V/uPa; at 15.25 m
Depth sensor = 10-bar pressure rating.

1.3 Deck cable
Main deck cable serial number SM 4952
Spare deck cable serial number SM 3447

Mechanical Information
Length 100m
Diameter 14mm cable, 45mm at male connector, 65mm at female connector
Weight 25kg
Connectors ITT 19 pin

APPENDIX D: PAM Hydrophone Deployment

Deployment requires the PAM operator and at least one additional person to complete.

Overview

Two identical hydrophone cables were supplied to the *Langseth* for this survey. The cables consisted of a 230-meter steel reinforced tow cable with a detachable 20-meter hydrophone array. The arrays consisted of two LF hydrophones (200 Hz to 200 kHz), two HF hydrophone elements (2 kHz to 200 kHz) and a depth gauge (100m capacity) potted directly into the cable. The four hydrophones were positioned in two pairs, with the first pair positioned roughly 13 meters ahead of the second pair (Figure 8).

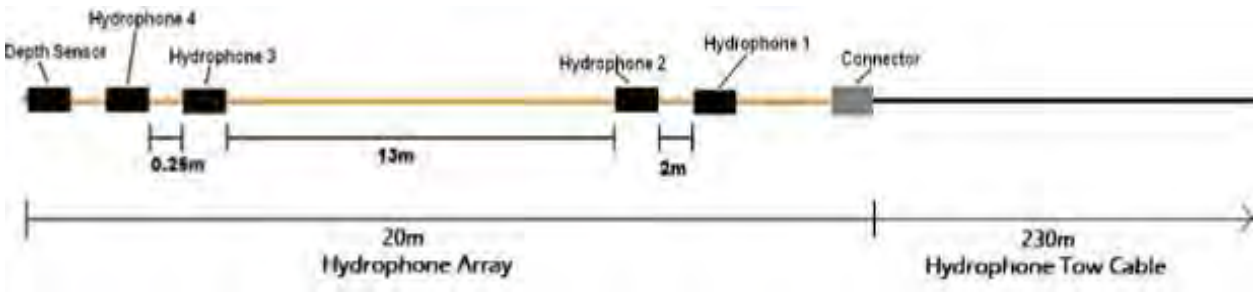

Figure 1: Two-part hydrophone cable with a 230-meter tow cable and detachable 20-meter hydrophone array

The hydrophone cable was spooled onto a hydraulic winch located on the port stern of the vessel's aft deck. A 100-meter deck cable connected the hydrophone cable to the PAM station in the main science lab. Due to the structural design of the vessel, two 100-meter deck cables were installed prior to the project. One of the deck cables was designated as the main cable and the other acted as a spare. The main deck cable was connected to an electronic processing unit (EPU) at the PAM station in the main science lab. The rack-mounted EPU was secured in the event of rough weather. A GPS feed (GNGGA string) was supplied to the system by the ships navigation Seapath 200. Additional monitoring equipment included two secured monitors supplied by the vessel, a keyboard, a mouse, and headphones for aural monitoring.

The hydrophone cable was deployed from a hydraulic winch on the port stern of the vessel's aft deck where the acoustic source arrays were deployed. Two deck cables, a main and a spare, were installed along the deck-head running from the winch to the main science lab. A Chinese finger attached to the tow cable approximately 120 meters ahead of the connector to the hydrophone array was secured to the port side boom via lifting rope. This reduced the tension on the cable remaining on the winch, and also served as a method to pull the cable further to port and away from the source arrays. This deployment method placed the trailing end of the hydrophone cable approximately 120 meters from the port stern of the vessel, and approximately 73 meter forward of the first elements on the acoustic source arrays (Figure 4). On 22 June 2021, two pieces of chain of seven kilograms each were attached and secured to the tow cable to increase tow depth and to decrease the chance of entanglement with the source arrays'

umbilicals. The tow depth of the hydrophones varied between 7.8 and 11.9 meters and averaged 10.3 meters throughout the seismic survey.

Deployment Tasks

- Ensure that the data processing unit is powered down.
- Alert the bridge of the pending hydrophone deployment.
- Ensure that the deck cable is disconnected from the hydrophone tow cable. Do not allow connectors to rotate with the winches unless they are strapped down as they can impact or snag and snap.
- Power on the winch.
- Avoid excess tension on the cable.
- Deploy in a slow controlled manner to prevent crossover on the winch.
- Respect the cables minimum bend angles and ensure are not bent on either side of cable mouldings/pottings.
- Protect cable from abrasions and chaffing.
- Let out the proper length of hydrophone cable off the winch for the deployment method used.
- Connect the hydrophone cable to the offset rope via Chinese finger.
- Power off the winch.
- Connect the hydrophone tow cable to the deck cable.
- Power on the data processing unit.

Retrieval Tasks

- Ensure that the data processing unit is powered down.
- Alert the bridge of the pending hydrophone able retrieval.
- Disconnect the hydrophone cable from the tow cable. Tape the connectors and ensure they are stowed/secured clear of the moving winch.
- Power on the winch.
- Disconnect the Chinese fingers on the cable from the offset rope.
- Retrieve the cable in a slow controlled manner to prevent crossover on the winch.
- Power off the winch.

<u>Always ensure that if the winch is powered on that the tow cable is disconnect from the deck cable and the connectors properly stowed.</u>

Health Safety and Environment (HSE) Requirements

Normal working deck Personal Protective Equipment (PPE) was required (hard hat, boots, gloves, eye protection). A life vest was required for any work involving items going over the side. The operation carried relatively low risk. Hazards included working close to the side of the vessel, trip hazards, and pinch points at the winch.

A Job Safety Analysis (JSA) was completed for this task. Further review of JSA was required in the event of modifications to the procedures.

APPENDIX E: Photographs of Protected Species Visually Detected during the Survey Program.

Figure 1: Humpback Whale- Visual Detection # 03

Figure 2: Humpback Whale-Visual Detection #04

Figure 3: California Sea Lion- Visual Detection # 13

Figure 4: Sei Whale-Visual Detection #55

Figure 5: North Pacific Right Whale- Visual Detection # 72

Figure 6: Minke Whale- Visual Detection #84

Figure 7: Dall's Porpoise- Visual Detection #87

Figure 8: Dall's Porpoise- Visual Detection #89

Figure 9: Dall's Porpoise- Visual Detection # 92

Figure 10: Fin Whale-Visual Detection #103

Figure 11: Fin Whale- Visual Detection #104

Figure 12. Dall's porpoises observed on 2021-08-01 (VD105).

Figure 13. Blue whales observed on 2021-08-01 (VD106).

Figure 14: Blue Whale- Visual Detection # 107

Figure 15: Fin Whale-Visual Detection #113

Figure 16: Blue Whale-Visual Detection #115

Figure 17: Humpback Whale- Visual Detection # 119

Figure 18: Humpback Whale-Visual Detection #120

Figure 19: Humpback Whale-Visual Detection #121

Figure 20: Humpback Whale-Visual Detection # 122

Figure 21: Sei Whale-Visual Detection #127

Figure 22: Fin Whale- Visual Detection # 128

Figure 23:Humpback Whale-Visual Detection #129

Figure 24. Humpback whale observed on 2021-08-07 (VD130).

Figure 25. Humpback whale observed on 2021-08-07 (VD131

Appendix F: Birds and Other Wildlife Observed

Birds: Common Name	Taxonomic Identification	Approximate Number Individuals Observed	Approximate Number of Days Species Was Observed
Black footed Albatross	*Phoebastria nigripes*	590	27
Caspian tern	*Hydroprogne caspia*	1	1
Common Murre	*Uria aalge*	19	3
Fork-tailed Storm-Petrel	*Oceanodroma furcata*	55	3
Glacous-winged Gull	*Larus glaucescens*	1	1
Glaucous Gull	*Larus hyperboreus*	4	1
Herring gull	*Larus heermanni*	50	3
Horned Puffin	*Fratercula corniculata*	1	1
Layson Albatross	*Phoebastria immutabilis*	3	1
Long-tailed Jaeger	*Stercorarius longicaudus*	4	1
Northern Fulmar	*Fulmarus glacialis*	104	15
Parasitic Jaeger	*Stercorarius parasiticus*	6	1
Peregrine falcon	*Falco peregrinus*	4	3
Sabine's gull	*Xema sabini*	1	1
Sooty Shearwater	*Puffinus griseus*	2	1
South Polar Skua	*Stercorarius maccormicki*	2	1
Thayer's gull	*Larus thayeri*	3	1
Tufted Puffin	*Fratercula cirrhata*	34	6

Fish: Common Name	Taxonomic Identification	Approximate Number Individuals Observed	Approximate Number of Days Species Was Observed
Blue shark	*Prionace glauca*	10	3
Great white shark	*Carcharodon carcharias*	1	1
Oceanic Sunfish	*Mola mola*	28	7
Salmon shark	*Lamna ditropis*	7	3
Spiny dogfish shark	*Squalus acanthias*	1	1

Marine Invertebrates: Common Name	Taxonomic Identification	Approximate Number Individuals Observed	Approximate Number of Days Species Was Observed
Lion's mane jellyfish	*Cyanea capillata*	129	17
Moon jelly	*Aurelia aurita*	356	5