



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.)

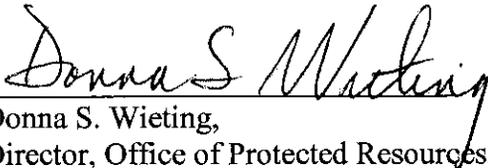
- (ix) If a marine mammal is sighted, the following information should be recorded:
- (A) Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
 - (B) PSO who sighted the animal;
 - (C) Time of sighting;
 - (D) Vessel location at time of sighting;
 - (E) Water 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 NMFS 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,
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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
<i>Low-frequency cetaceans</i>			
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
<i>Mid-frequency cetaceans</i>			
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
<i>Phocids</i>			
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 1 μ Pa_{rms} isopleths)

Source and volume (cm ³)[in ³]	Tow depth (m)	Water depth (m) ¹	Predicted 160 re 1 μ Pa _{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