

Draft Addendum to the Draft IHA Application for a Marine Geophysical Survey of the Dumont d'Urville Sea by the National Science Foundation in 2014

1.0 INTRODUCTION

This addendum supplements the Incidental Harassment Authorization Application (IHAA) for the proposed marine seismic survey of portions of the Dumont d'Urville Sea, Antarctica to be conducted by the National Science Foundation (NSF) in the late austral summer-of 2014 (NSF, 2013a). NSF conducted early coordination with the National Marine Fisheries Service (NMFS) and solicited their comments on the preliminary draft of the subject EA (NSF, 2013b). Supplemental information to the draft EA was requested by NMFS to address potential marine mammal "takes" from icebreaking activity intrinsic to the project.

Icebreaking is considered by NMFS to be a continuous sound and NMFS (2005) indicates the existing threshold for Level B harassment by continuous sounds is a received sound level of 120 dB SPL. Potential takes of marine mammals may ensue from the icebreaking activity in which the RVIB *Nathaniel B. Palmer (NBP)* is expected to engage, i.e. along the George V and Oates Coast of East Antarctica (>65°0'S, between 140°0'E and 165°E. The draft IHAA and draft Initial Environmental Evaluation/Environmental Assessment (IEE/EA) presents take estimates based exclusively on the seismic survey component of the project. If icebreaking does occur in Antarctica region, we expect it will occur during transit operations to gain access to dredging or sampling locations and not during seismic survey operations. The research activities and associated contingencies are designed to avoid areas of heavy sea ice condition. If the *NBP* breaks ice during transit operations within the Dumont d'Urville Sea or other areas of the Southern Ocean, seismic operations will not be conducted concurrently. .

Data characterizing the sound levels generated by icebreaking activities conducted by the *NBP* are not available. Therefore data for noise generated from an icebreaking vessel such as the USCGC *Healy* will be used for purposes of this addendum.

This addendum presents calculations of exposures to marine mammals due to icebreaking when the RVIB *NBP* is transiting through ice. It is noted that the RVIB *NBP* is a smaller vessel and has less icebreaking capability than the Coast Guard's polar icebreakers, being only capable of breaking ice up to 1 m thick at speeds of 3 knots. Therefore, the sound levels that may be generated by the *NBP* are expected to be lower than the conservative levels estimated and measured for the USCGC *Healy*.

It is important to note that non-icebreaking vessels, as well as natural sounds such as those arising from sea ice motion and whale flukes hitting the ocean surface, also present similar sound impacts. Underwater noise from various vessels, including tug boats, oceanographic research vessels, and fisheries research vessels in open water, as well as icebreakers traversing sea ice, often exceed 120 dB, the existing threshold for Level B harassment set by NMFS (2005).

The sound level and other estimates provided in this addendum are for information purposes only and do not represent any conclusions with regard to harassment. Further studies are needed before a precedent can be established.

The objectives and plans of the proposed project remain unchanged. The following includes specifics of the estimation of trackline while the RVIB *NBP* breaks ice outside U.S. waters and the calculation of the resulting potential takes. The supplemental information has been organized in a manner consistent with the draft IHAA. The estimated takes provided in this addendum are in addition to the number of estimated takes due to seismic activities within U.S. waters that are presented in the IHAA and IEE/EA submitted to the NMFS on 15 August 2013.

2.0 DATES, DURATION, AND REGION OF ACTIVITY

The proposed geophysical survey will be conducted for ~45 days from approximately 29 January to 16 March 2014. Icebreaking will occur, as necessary, between the latitudes of ~66 to 70°S and between 140°E and 165°E. The total distance in the region the vessel will travel include the proposed seismic survey and transit to dredging or sampling locations and will represent approximately 5,600 kilometers (km), with seismic survey covering a distance of up to 2,800 km.

Researchers will work to minimize time spent breaking ice as science operations are more difficult to conduct in icy conditions since the ice noise degrades the quality of the geophysical and ADCP data and time spent breaking ice takes away from time supporting research. Logistically, if the vessel were in heavy ice conditions, researchers would not tow the air gun and streamer, as this would likely damage equipment and generate noisy data. It is possible that the seismic survey can be performed in low ice conditions if the RVIB *NBP* vessel could generate an open path behind the vessel.

Because the RVIB *NBP* is not rated to break multiyear ice routinely, operations generally avoid transiting through older ice (i.e., 2 years or older, thicker than 1 m). If sea ice is encountered during the cruise, it is anticipated the *NBP* will proceed primarily through one year sea ice, and possibly some new, very thin ice, and would follow leads wherever possible. Satellite imagery from the Totten region documents that sea ice is at its minimum extent during the month of February. The most recent ice image for the region, from November 21, 2013, shows that the sea ice is currently breaking up, with a significant coastal lead of open water.

Based on a maximum sea ice extent of 250 km and estimating that we will transit to the innermost shelf and back into open water twice – a round trip transit in each of potential work regions, we estimate that the RVIB *NBP* will actively break ice up to a distance of 1000 km. Based on a ship's speed of 5 knots under moderate ice conditions, this distance represents approximately 108 hours of icebreaking operation. It is noted that typical transit through areas of primarily open water and containing brash ice or pancake ice will not be considered icebreaking for the purposes of this addendum.

The seismic survey is estimated to esonify an area of approximately 5,628 sq km. This estimate is based on the maximum number of kilometers for the seismic survey (2,800 km) times the Predicted RMS radii (m) based on modeling and empirical measurements (assuming 100% use of 2 x 105in³ GI guns in 100-1000 m water depths) which was calculated to be 1,005 m (1.005 km) times two. Takes associated with these activities were requested in the main body of the IHAA.

3.0 TYPE AND ABUNDANCE OF MARINE MAMMALS IN PROJECT AREA

A description of the cetacean and pinniped species that were previously observed by marine mammal observers (MMOs) during surveys conducted in the region from February 1991 through November 2004 are described in Section 3.0 of the IHA (NSF, 2013a). These species may be expected to be present in the project area during icebreaking operations.

4.0 DESCRIPTION OF MARINE MAMMALS IN PROJECT AREA

Within the latitudes of the proposed survey where the *NBP* will be breaking ice, cetaceans and pinnipeds may be in the area. A description of the cetacean and pinniped species that were previously observed Protected Species Visual Observers (PSVOs) during surveys conducted in the region from February 1991 through November 2004 are described in Section 3.0 of the IHA (NSF, 2013a).

At least one PVSVO will stand watch at all times while the RVIB *NBP* is operating airguns during the seismic survey; this procedure will also be followed when the vessel is conducting icebreaking during transit. We expect that PVSVOs will observe few cetaceans during icebreaking activities, and will be limited to those species in

proximity to the ice margin habitat. Observations would utilize the Proposed Mitigation Zone (MZ) and Full Mitigation Zone (FMZ) criteria described in Section 6.0 of the IHA (NSF, 2013a).

Observations within the FMZ would also include searching for pinnipeds that may be present on the surface of the sea ice (i.e., hauled out) and that could potentially dive into the water as the vessel approaches, indicating disturbance from noise generated by icebreaking activities.

5.0 REQUESTED TYPE OF INCIDENTAL TAKE AUTHORIZATION

As described in Section 5.0 of the IHA (NSF, 2013a), marine mammals in the general vicinity of the vessel tracklines may display disturbance reactions to the operating airguns (Level B Harassment). These reactions may also occur as a result of icebreaking operations. No serious injury or lethal takes (Level A) are anticipated, given the nature of the planned icebreaking operations and implementation of related mitigation measures.

As described in the draft IEE/EA, marine mammals in the general vicinity of the vessel tracklines may display disturbance reactions to the operating airguns (non-lethal harassment). These reactions may also occur as a result of icebreaking operations. Therefore, the authors request non-lethal 'take' of odontocetes and mysticetes protected under the Endangered Species Act that may be in the area where icebreaking activities may occur during the cruise. The estimated 'take' is listed in Tables Add-1 and Add-2.

6.0 NUMBER OF INCIDENTAL TAKES BY ACTIVITY

All anticipated takes caused by icebreaking activities would be "takes by harassment", as described in Section 5 of the original IHAA, involving temporary changes in behavior. The mitigation measures to be applied will minimize the possibility of injurious takes. Few data are available on the distribution and numbers of marine mammals in the Dumont d'Urville Sea.

There are no stock assessments of marine mammals and very limited population information for the Dumont d'Urville Sea. The lack of population data is furthered acknowledged in the NMFS recovery plans for several endangered (blue, fin, sei whales). The lack of abundance estimates and population trend data for marine mammals in the southern hemisphere including animals which are not threatened hinders traditional quantitative analysis of potentially affected organisms.

Because published estimates of marine mammal densities are not available for the Dumont d'Urville Sea, the numbers of marine mammals that may be encountered during the survey and potentially exposed to underwater sound (Tables Add-1 and Add-2) were calculated as described below.

The number of different individuals that could be exposed to airgun sounds on one or more occasions was estimated in the original application by considering the estimated density of animals and the distance expected to be covered during the 300-hour seismic survey and conservatively assuming all animals sighted within 600 or 1,005 m depending on the airgun array used would be exposed to sound levels ≥ 160 dB re 1 μ Pa (rms) resulting in Level B Harassment. This method will be used for estimating the number of individuals that may be disturbed by icebreaking activities

The following estimates are based on a consideration of the number of marine mammals that might be disturbed appreciably over the ~1,000 kilometers of icebreaking that may occur during the proposed project as described above.

Marine Mammal Density Estimates

Numbers of marine mammals that might be present and potentially disturbed are estimated below based on available data about mammal sightings in the area. "Take by harassment" is calculated by multiplying the expected presence of marine mammals likely to occur in the vicinity of icebreaking by the estimated distance of potential

icebreaking operations. The estimated density of cetaceans was provided on Table 13 in the original application (NSF, 2013a) while the estimated density of pinnipeds was provided on Table 16 in the same document; these densities will be used to estimate takes from icebreaking activities during the proposed cruise in the Dumont d’Urville Sea. Table Add-1 summarizes the estimated number of cetacean takes anticipated during icebreaking operations, and Table Add-2 summarizes the estimated number of pinniped takes that are expected during icebreaking. The estimated number of takes for pinnipeds accounts for both seals that may be in the water and those hauled-out on ice surfaces. While the number of cetaceans that may be encountered within the ice margin habitat would expected to be less than open water, the estimates below utilize the estimated densities for the open water and therefore; represent conservative estimates.

Table Add-1. Projected Number of Cetacean Takes in the Proposed Study Areas from Icebreaking Operations

Common Name	Estimated Density of Animals (no/km²)	Number of Estimated Takes and Requested Authorization ²
Mysticetes¹		
<i>Blue whale</i>	0.0008654	19
<i>Fin whale</i>	0.1003808	2,162
<i>Humpback whale</i>	0.1025441	2,218
Minke whale	0.0588439	1,267
<i>Sei whale</i>	0.0017307	37
Odontocetes¹		
Dolphin, Cruciger (hourglass)	0.0112496	242
Spectacled porpoise	0.0142783	308
Killer whale	0.0268259	578
Long-finned pilot whale	0.0103842	224
<i>Sperm whale</i>	0.0138456	298

Note:

Species listed as endangered are in italics

¹ For cetaceans, conservatively assumes all sightings could result in Level B harassment

² Calculated take is estimated density multiplied by the area ensonified to 120 dB (rms) around the possible icebreaking lines (21.54 km x 1,000 km).

Table Add-2. Projected Number of Pinniped Takes in the Proposed Study Areas from Icebreaking Operations

Common Name	Estimated Density of Animals on sea ice and in water (no/km²)	Number of Estimated Takes and Requested Authorization¹
Crabeater	0.62	18,697
Leopard	0.0514860	1,109
Ross	0.127201 0	2,740
Weddell	0.0756	1,628
<i>Elephant²</i>	0.0000	-
<i>Antarctic Fur²</i>	0.0000	-

Note:

Species listed as endangered are in italics

¹ Calculated take is estimated density multiplied by the area ensonified to 120 dB (rms) around the potential icebreaking tracklines (21.54 km x 1,000)

² A take was not requested for elephant seals and Antarctic fur seals because preferred habitat for these species is not within the project area.

Potential Number of “Takes by Harassment”

Numbers of marine mammals that might be present and potentially disturbed are estimated below based on available data about mammal distribution and densities in the Dumont d’Urville Sea during the austral summer as described above.

It is conservatively assumed that individual marine mammals that are sighted are potentially exposed to received levels ≥ 120 dB re 1 μ Pa (rms) by icebreaking operations. Some of the animals estimated to be exposed to sound levels ≥ 120 dB re 1 μ Pa, might show avoidance reactions before actual exposure to this sound level. Thus, these calculations estimate the number of individuals potentially exposed to ≥ 120 dB rms that would occur if there were no avoidance of the area ensonified to that level.

In 2008, acousticians from Scripps Institute of Oceanography Marine Physical Laboratory and University of New Hampshire Center for Coastal and Ocean Mapping conducted measurements of sound pressure levels (SPL) of *Healy* icebreaking under various conditions (Roth and Schmidt 2010). The results indicated that the highest mean sound pressure level (SPL; 185 dB) was measured at survey speeds of 4 to 4.5 knots in conditions of 5/10 ice and greater. Mean SPL under conditions where the ship was breaking heavy ice by backing and ramming was actually lower (180 dB). In addition, when backing and ramming, the vessel is essentially stationary, so the ensonified area is limited for a short period (on the order of minutes to tens of minutes) to the immediate vicinity of the boat until the ship breaks free and once again makes headway.

NMFS (2005) indicates the existing threshold for Level B harassment for continuous sounds is a received sound level of 120 dB SPL. NMFS provided the results of noise modeling using a practical spreading model with a source level of 185 dB. The model results showed a sound level decay to 120 dB in about 21.54 km. Therefore, as the ship travels through the ice, a swath 43.08 km wide would be subject to sound levels ≥ 120 dB. This results in the potential exposure of 43,080 km² to sounds ≥ 120 dB from icebreaking. As previously mentioned in Section 1, the *NBP* is a smaller vessel and has less icebreaking capability than the *Healy*, being only capable of breaking ice up to 1 m thick at speeds of 3 knots. Therefore, the sound levels that may be generated by the *NBP* are expected to be lower than the conservative levels estimated and measured for the *Healy*.

Based on the operational plans and marine mammal densities described above, the estimates of marine mammals potentially exposed to sounds ≥ 120 dB during icebreaking are included in Table Add-1 and Add-2.

7.0 NUMBER OF INCIDENTAL TAKES BY ACTIVITY

A description of the potential effects of airgun sounds and multibeam echosounders (MBES) and sub-bottom profilers (SBPs) are described in Section 7.0 of the IHA (NSF, 2013a). These effects to marine mammals as result of icebreaking operations are expected to be similar.

8.0 DESCRIPTION OF IMPACT ON SUBSISTENCE USES

There are no indigenous or native people in the Antarctic, and subsequently there is no subsistence hunting of marine mammals near the survey areas. Therefore, the proposed action would not have an adverse impact on the availability of the species or stocks used as a food source.

9.0 DESCRIPTION OF IMPACT ON MARINE MAMMAL HABITAT

The *RVIB NBP* is designed for continuous passage at 3 knots through ice 1 m thick. During this project the *NBP* will typically encounter first- or second-year ice while avoiding thicker ice floes, particularly large intact multi-year ice, whenever possible. In addition, the vessel will follow leads when possible while following the survey route. As the vessel passes through the ice, the ship causes the ice to part and travel alongside the hull. This ice typically returns to fill the wake as the ship passes. The effects are transitory, i.e. hours at most, and localized, i.e. constrained to a relatively narrow swath perhaps 10 m to each side of the vessel.

The *NBP*'s maximum beam is 18.3 m. Applying the maximum estimated amount of icebreaking, i.e. 1,000 km, to the corridor opened by the ship, we anticipate that a maximum of ~18 km² of ice may be disturbed. This represents an insignificant amount of the total ice present in the Southern Ocean.

10.0 ANTICIPATED IMPACT OF LOSS OR MODIFICATION OF HABITAT ON MARINE MAMMALS

Icebreaking may damage seal breathing holes and will also reduce the haulout area in the immediate vicinity of the ship's track. Icebreaking along a maximum of 1,000 km of trackline will alter local ice conditions in the immediate vicinity of the vessel. This has the potential to temporarily lead to a reduction of suitable seal haul-out habitat. However the dynamic sea-ice environment requires that seals be able to adapt to changes in sea, ice, and snow conditions, and they therefore create new breathing holes and lairs throughout winter and spring (Hammill and Smith 1989). In addition, seals often use open leads and cracks in the ice to surface and breathe (Smith and Stirling 1975). Disturbance to the ice will occur in a very small area relative to the Southern Ocean icepack and no significant impact on marine mammals is anticipated by icebreaking during the proposed project.

11.0 MEASURES TO REDUCE IMPACTS TO MARINE MAMMALS

A description of the mitigating measure that will be conducted to reduce potential effects of are described in Section 11.0 of the IHA (NSF, 2013a). The applicable measures will also be used during icebreaking operations.

12.0 MEASURES TO REDUCE IMPACTS TO SUBSISTENCE USERS

The activity would not take place in the Arctic, and there is no subsistence hunting near the proposed survey area; therefore, the proposed activities would not have any impact on the availability of the species or stocks for subsistence users

13.0 MONITORING AND REPORTING

A description of the monitoring and reporting procedures that will be performed during the cruise are described in Section 13.0 of the IHA (NSF, 2013a). The applicable measures will also be used during icebreaking operations.

14.0 RESEARCH COORDINATION

A description of the research co-ordination that will be performed as a result of the cruise are described in Section 14.0 of the IHA (NSF, 2013a). The applicable measures will also be used during icebreaking operations.

15.0 LITERATURE CITED

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