



MARINE MAMMAL COMMISSION

30 December 2010

Ms. Holly Smith
Division of Ocean Sciences, Room 725
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Ms. Smith:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Science Foundation's draft environmental assessment for a marine geophysical survey by the R/V *Langseth* off Costa Rica in April and May 2011. The Commission also has reviewed the draft environmental assessment report on the same activity prepared by LGL, Ltd., which the Foundation has incorporated by reference.

The proposed survey is scheduled from 7 April through 9 May 2011 within Costa Rica's Exclusive Economic Zone. It would consist of approximately 2,500 km of transect lines in water depths ranging from less than 100 m to greater than 1,000 m. The survey would deploy a 36-airgun array discharging alternating subarrays of 18 airguns with a maximum discharge of 3,300 in³. The survey also would deploy continuously a multibeam echosounder and a sub-bottom profiler.

The proposed study area off Costa Rica is biologically diverse, and at least 28 marine mammal species occur in the area, including five species that are listed as endangered (i.e., sperm, sei, blue, humpback, and fin whales). Some marine mammal species occur in the area year-round, whereas others migrate through the area seasonally, and still others are observed but only rarely. The Commission offers the following recommendations and rationale to protect marine mammal species and other biological components of the affected ecosystem.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Science Foundation—

- broaden the environmental assessment to include alternatives that sharply define the issues and expand the assessment by providing a full analysis of those alternatives;
- require scientists aboard the R/V *Langseth* to take in-situ measurements to verify and, if need be, refine the exclusion zones and take estimates prior to or at the beginning of the survey;
- extend the monitoring period to at least one hour before initiation of geophysical activities and at least one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within an exclusion zone; and
- provide additional justification for its determination that the mitigation and monitoring measures that depend on visual observations, complemented by passive acoustic monitoring, would be sufficient to detect, with a high level of confidence, all marine mammals within or entering identified exclusion zones.

RATIONALE

On 24 November 2010 the Commission commented on the programmatic environmental impact statement/overseas environmental impact statement for marine seismic research funded by the National Science Foundation or conducted by the U.S. Geological Survey (copy enclosed). The Commission concurred that a programmatic analysis may help streamline subsequent environmental reviews needed for marine seismic research. However, the Commission noted that the analyses in the programmatic environmental impact statement were limited to “exemplary areas” and that the Foundation and the Survey should be prepared to conduct supplemental environmental analyses under the National Environmental Policy Act when the details of specific studies become clear. The subject environmental assessment is the first project-specific assessment to follow the programmatic analysis, and the Commission’s comments are intended to help the agencies improve the overall analysis so that it meets the objectives of the National Environmental Policy Act.

Action Alternatives

An environmental assessment should provide a robust analysis of a proposed action to determine whether it will have a significant impact on the environment. Such an analysis need not include multiple alternatives for consideration. If it is judged that the proposed action will not have a significant impact, then further consideration of the action or possible alternatives is not necessary to meet the requirements of the National Environmental Policy Act. However, in this case, the Commission believes that the inclusion of multiple alternatives is prudent because the programmatic environmental impact statement did not contain the specifics of this or any other project and because any estimation of the likely significance of impacts is confounded by a considerable amount of uncertainty. In the face of such uncertainty, decision-makers are best served by the broadest analysis of the potential impacts of the proposed action and alternatives to that action.

The environmental assessment identifies three alternatives: (1) the proposed survey at the planned time, (2) the proposed survey at an alternative time, and (3) the no-action alternative. Both alternatives (1) and (2) would include issuance of an incidental harassment authorization. The Commission supports the inclusion of the second alternative (i.e., the proposed survey at an alternative time), but it still considers the set of alternatives to be too narrow to define sharply the environmental issues. It also believes that each alternative warrants more in-depth analysis.

The primary issue with regard to the proposed activity is the amount of sound introduced to the marine environment and the potential impact of that sound on the marine ecosystem. Marine mammals may hear but tolerate the airgun sound. However, airgun sounds may mask other natural sounds important to them or cause behavioral disturbance, temporary or permanent hearing impairment, or even non-auditory physical or physiological impact. The impact of an airgun sound on a marine mammal at any given time is a factor of sound source level, distance from the sound source, oceanographic parameters, bathymetric features, time of year, and numerous variables pertaining to the marine mammal (e.g., its species, age, behavior, physical condition, reproductive status, and previous exposure).

At a minimum, the Foundation should include alternatives that help clarify if and why this is the appropriate place for the survey, whether the survey could be conducted at another time (season) with less risk to the marine ecosystem, whether alternative technology that poses less risk might be used, and whether the use of the proposed technology might be modified in such a way as to lessen environmental risk. To serve its function, the analysis should provide decision-makers with a clear description of the risks associated with each of these alternatives. In this regard, the Foundation's analysis of the alternative to conduct the proposed action at a different time is incomplete. The analysis does not describe a specific alternative time (season) and therefore does not (and cannot) provide a detailed analysis of how the environmental impacts might differ as a result. Although the environmental assessment provides some background information on seasonal distribution of certain species, the analysis of impacts only considers information regarding the expected abundance of marine mammals during the proposed survey time frame.

To address these concerns, the Marine Mammal Commission recommends that the National Science Foundation (1) broaden the environmental assessment to include alternatives that sharply define the issues and (2) expand the assessment by providing a full analysis of those alternatives. Doing so is essential if decision-makers are to make informed decisions as to whether the project should be allowed to go forward and how to achieve the best balance between benefits and risks.

Modeling Exclusion Zones and Takes

The Lamont-Doherty Earth Observatory uses a generalized model to predict the sound fields produced by the airguns. In turn, those sound fields are used to determine the appropriate size of the exclusion zone around the vessel and to estimate the number of marine mammals that may be taken during the survey. However, the sound fields, appropriate size of the exclusion zone, and estimated number of takes all depend on tow depth and various survey-specific environmental parameters including sound speed profiles, surface ducts, wind speed, bathymetry, and water depth. Therefore, the most accurate and reliable way to determine the size of exclusion zones and estimate the number of takes is to use survey-specific conditions in the model. For those reasons, the Marine Mammal Commission recommends that the National Science Foundation require scientists aboard the R/V *Langseth* to take in-situ measurements to verify and, if need be, refine the exclusion zones and take estimates prior to or at the beginning of the survey.

Responding to Marine Mammals in the Exclusion Zone

The environmental assessment states that (1) observers will monitor the exclusion zones for at least 30 minutes prior to the planned initiation of airgun operations and (2) if a marine mammal is detected near or within the exclusion zone, airguns will be powered down until observers have sighted the marine mammal outside the exclusion zone or 15 or 30 minutes (for small and large cetaceans, respectively) have passed. However, dive times typically exceed 30 minutes for several species of cetaceans found in the study area. Sperm whales and beaked whales, in particular, may stay submerged for periods far exceeding 30 minutes. For example, Blainville's beaked whales dive to considerable depths (> 1,400 m) and can remain submerged for nearly an hour (Baird et al. 2006, Tyack et al. 2006). In addition, observers may not detect these animals each time they return to the

Ms. Holly Smith
30 December 2010
Page 4

surface. For that reason, monitoring for 30 minutes prior to the planned initiation or resumption of airgun operations is not sufficient to ensure that marine mammals within the exclusion zone will be detected. Therefore, the Marine Mammal Commission recommends that the National Science Foundation extend the monitoring period to at least one hour before initiation of geophysical activities and at least one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within the exclusion zone.

Finally, as noted in the Commission's 24 November 2010 letter, the Foundation's analysis of impacts on marine mammals is based, in part, on the presumed efficacy of the proposed visual mitigation and monitoring measures, complemented by passive acoustic monitoring. The Commission supports using both of these methods but also considers them to be limited in their effectiveness. For example, as acknowledged on page 7 of the environmental assessment, visual observations are limited by environmental conditions and passive acoustic monitoring can detect only those species that vocalize or make other sounds. Moreover, acoustic detection alone provides no information on the distance between the vocalizing animal and the receiver, which means that, particularly at night and during periods of poor visibility when acoustic detection is the sole monitoring option, it effectively is infeasible to enforce the exclusion zone as intended (notwithstanding the availability of night vision devices as noted on page 6 of the environmental assessment). For those reasons, the Marine Mammal Commission repeats its recommendation that the National Science Foundation provide additional justification for its determination that the mitigation and monitoring measures that depend on visual observations, complemented by passive acoustic monitoring, would be sufficient to detect, with a high level of confidence, all marine mammals within or entering identified exclusion zones.

The Commission hopes that these recommendations and comments are helpful. Please contact me if you have any questions

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

Enclosure

Literature Cited

- Baird, R.W., D.L. Webster, D.J. McSweeney, A.D. Ligon, G.S. Schorr, and J. Barlow. 2006. Diving behavior and ecology of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales in Hawaii. *Canadian Journal of Zoology* 84(8):1120–1128.
- Tyack, P.L., M. Johnson, N. Aguilar Soto, A. Sturlese, and P.T. Madsen. 2006. Extreme diving of beaked whales. *Journal of Experimental Biology* 209(21):4238–4253.



MARINE MAMMAL COMMISSION

November 24, 2010

Ms. Holly Smith
National Science Foundation
Division of Ocean Sciences, Room 725
4201 Wilson Boulevard
Arlington, VA 22230

Dear Ms. Smith:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Draft Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research funded by the National Science Foundation or conducted by the U.S. Geological Survey. The Commission also has reviewed the Foundation's 8 October 2010 *Federal Register* notice (75 Fed. Reg. 62433) requesting comments. When appropriate, the Commission will comment in more detail on site-specific research activities associated with this program. For now, the Commission offers the following recommendations and rationale.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey—

- be prepared to conduct supplemental environmental analyses under the National Environmental Policy Act once the details pertaining to specific proposed seismic studies become available;
- redefine the alternatives considered in the programmatic analysis to encompass the broad technological, monitoring, and mitigation issues that pertain to all marine seismic research and provide a clear basis for choosing among options by decision-makers and the public;
- require for each proposed project specific mitigation and monitoring requirements tailored to such things as the species present in the research area, their natural history and status (e.g., endangered, threatened), pertinent oceanographic and bathymetric features, and the proposed operations;
- develop guidelines for cruise research design and planning that would minimize the potential impacts of seismic research on marine mammals and other protected species;
- work with their observers, observer service providers, the National Marine Fisheries Service, the Fish and Wildlife Service, and other stakeholders to establish and implement standards for protected species observers to improve the quality and usefulness of information collected during marine seismic surveys;
- establish requirements for analysis of data collected by the observers to ensure that those data are used both to estimate potential effects on marine mammals and to inform the continuing development of mitigation and monitoring measures;

- provide additional justification for their preliminary determination that the mitigation and monitoring measures that depend on visual observations would be sufficient to detect, with a high level of confidence, all marine mammals within or entering identified mitigation zones; and
- provide, to the extent possible, a comprehensive analysis of the cumulative impacts expected from seismic surveys themselves, but then be prepared to conduct additional cumulative impact analyses for future specific seismic studies in the context of all the other factors in the pertinent human environment; that is, the human environment where seismic studies have been proposed.

RATIONALE

Programmatic Approach and Site-Specific Analyses

Federal agencies are required to comply with the National Environmental Policy Act before they make final decisions about proposed federal actions that could impact the human environment. The National Science Foundation has identified proposed marine seismic research that it will fund or that the U.S. Geological Survey will conduct as federal actions requiring such environmental review. In the past, the Foundation has prepared environmental assessments to analyze the environmental impact of individual cruises or surveys and posted the assessments on the Foundation's website for public review and comment¹. The Marine Mammal Commission concurs with the Foundation and the Survey that a programmatic analysis such as the one under consideration here may help streamline environmental reviews needed for marine seismic research.

However, a programmatic approach also has its limitations. The Foundation and the Survey state that they cannot anticipate fully the actual types of research activities that they will fund or conduct during the next several years and therefore have limited their programmatic analyses to "exemplary areas" based on past activities. Although a focus on such areas may be useful for the purpose of completing a programmatic analysis, such a focus does not provide assurance that all area-specific considerations are adequately described in the analysis. In addition, other factors such as season, protected resources at risk, environmental conditions, and the precise nature of future studies may not be adequately described using a programmatic approach based on exemplary areas. The Foundation's *Federal Register* notice acknowledges such limitations and states that subsequent project- and cruise-specific analyses will be needed to evaluate specific research projects. The Marine Mammal Commission concurs with this assessment and recommends that the National Science Foundation and the U.S. Geological Survey be prepared to conduct supplemental environmental analyses under the National Environmental Policy Act once the details pertaining to specific proposed seismic studies become available. The Marine Mammal Commission requests that the National Science Foundation and the U.S. Geological Survey provide the Commission with copies of these supplemental environmental analyses as they are made available for public review and comment.

¹ <http://www.nsf.gov/geo/oce/envcomp/index.jsp>

Action Alternatives

Past environmental assessments have generally discussed only two alternatives; the No Action Alternative (i.e., research is not conducted) and the Preferred Alternative (a single statement of proposed mitigation measures for a specific research program). This narrow range of alternatives is contrary to guidance provided by the Council on Environmental Quality in regulations implementing the National Environmental Policy Act. This guidance states that environmental documents “should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public.”

The draft programmatic environmental impact statement identifies two action alternatives. Alternative A would require cruise-specific mitigation measures for all energy sources, whereas Alternative B (the preferred alternative) would require cruise-specific mitigation measures except for low-energy acoustic sources, which would require only generic mitigation measures. The Commission does not consider these proposed alternatives to be sufficient to define sharply the issues and provide a clear basis for choice among alternatives. Indeed, both of these alternatives would be carried out in identical fashion for all but low-energy sources. Undoubtedly, the programmatic analysis will be limited because the specifics of future seismic studies are not known. However, in developing the analysis, the Foundation and the Survey should be able to provide a full description of the various types of technology that are involved, their utility for various purposes and in various locations, their characteristics (in addition the amount of energy involved), and the types and severities of the risks involved. By including such information in the analysis the agencies will inform the public and decision-makers regarding the various technologies and research approaches that are available and the tradeoffs in terms of information gained versus risks presented. In addition, the agencies should be able to provide a full description of the kinds of mitigation measures that might be used, and their utility and shortcomings under different circumstances. Also, the Commission understands that the Foundation helps researchers design their proposed actions in ways that minimize effects on marine mammal populations. The Commission gratefully acknowledges such efforts, and believes that the guidance given to researchers should be described in the programmatic analysis and may provide a basis for additional alternatives to be considered.

The alternatives in the programmatic analysis will determine whether and to what extent it provides an adequate foundation from which to tier future project-specific analyses. To that end, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey redefine the alternatives considered in the programmatic analysis to encompass the broad technological, monitoring, and mitigation issues that pertain to all marine seismic research and provide a clear basis for choosing among options by decision-makers and the public. Doing so should then allow the agencies to focus their attention on specific matters when particular studies are analyzed.

Site- and Species-Specific Mitigation and Monitoring Measures

The National Marine Fisheries Service has indicated that cruise-specific analyses of impacts will be required for the issuance of incidental take authorizations under the Marine Mammal Protection Act and/or incidental take statements under the Endangered Species Act. These authorizations likely will have cruise-specific mitigation and monitoring requirements based on potential impacts on the marine mammal species expected to be in the study area. The Marine Mammal Commission agrees with the need for such specificity and recommends that the National Science Foundation and the U.S. Geological Survey require for each proposed project specific mitigation and monitoring requirements tailored to such things as the species present in the research area, their natural history and status (e.g., endangered, threatened), pertinent oceanographic and bathymetric features, and the proposed operations.

Guidance for Applicants

The draft programmatic environmental impact statement indicates that the design of any specific survey requires consideration of the trade-off among the range and resolution of different sound sources, the timing of the survey and seasonal sea conditions, research vessel transit times, and the availability of properly outfitted vessels. Whether and to what extent researchers consider potential impacts on marine mammals and other protected species is not clear. If staff from the Foundation and/or Survey spend considerable time and effort helping researchers redesign their studies to minimize impacts on marine mammals, then it may be useful for the agencies to provide guidelines for research that scientists could incorporate into their original research design and planning efforts. For that reason, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey develop guidelines for cruise research design and planning that would minimize the potential impacts of seismic research on marine mammals and other protected species. The Commission would be pleased to assist in developing such guidelines.

Collection of Information by Protected Species Observers

The Foundation and the Survey propose to deploy protected species observers aboard seismic survey vessels, whether the research is funded by the Foundation or conducted by the Survey. The agencies would consult with the Office of Protected Resources at the National Marine Fisheries Service regarding the observers' qualifications. The National Marine Fisheries Service has developed standards for the selection and training of fisheries observers, and it has made preliminary recommendations to improve protected species observer programs generally, including recommendations for program management, data reporting, training and eligibility, standards of conduct and conflict of interest, and safety. Those recommendations have not yet been implemented in the training of observers for seismic studies and the qualifications and training of observers on seismic vessels varies considerably. The lack of uniform standards undermines the quality (e.g., accuracy, reliability) of information available to assess the impact of seismic activities on marine mammals. To address this concern, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey work with their observers, observer service providers, the National Marine Fisheries Service, the Fish and Wildlife Service, and other

stakeholders to establish and implement standards for protected species observers to improve the quality and usefulness of information collected during marine seismic surveys. In addition, the Commission recommends that the Foundation and Survey establish requirements for analysis of data collected by the observers to ensure that those data are used both to estimate potential effects on marine mammals and to inform the continuing development of mitigation and monitoring measures.

Visual Mitigation and Monitoring Measures

The Foundation's analysis of impact on marine mammals is based, in part, on the presumed efficacy of the proposed visual mitigation and monitoring measures. The effectiveness of visual monitoring is limited and varies considerably depending on conditions, as has been determined from extensive data and experience in the field of marine mammal assessment. For example, visual monitoring typically is not effective at night or during periods of bad weather and, even with good visibility, observers are unable to detect marine mammals when they are below the surface or beyond visual range. Determining the efficacy of mitigation and monitoring measures may require not only collecting opportunistic data but also designing and conducting studies to test specific hypotheses regarding the utility of visual observations and to evaluate responses of the various species encountered. Because the efficacy of visual observation can vary markedly depending on circumstances, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey provide additional justification for their preliminary determination that the mitigation and monitoring measures that depend on visual observations would be sufficient to detect, with a high level of confidence, all marine mammals within or entering identified mitigation zones. At a minimum, such justification should describe (1) detection probability as a function of distance from the vessel and (2) changes in detection probability under various sea state and weather conditions. If such information is not available, the Foundation and the Survey should undertake the studies needed to verify that the proposed mitigation and monitoring measures are likely to detect all or nearly all marine mammals in or near mitigation zones and, if necessary, to develop alternative means of detecting marine mammals in or near those zones. The Commission would be pleased to continue discussions with the Foundation and the Survey regarding the design of such experiments to promote a better understanding of the utility and shortcomings of visual observations for monitoring and mitigation purposes.

Analysis of Cumulative Impacts

The Council on Environmental Quality's regulations implementing the National Environmental Policy Act require that an analysis of cumulative impacts include not only the impacts of the proposed action, but also the "incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7). Therefore, the Foundation and the Survey must not limit their analysis of cumulative effects only to the expected impact of research funded by the Foundation or conducted by the Survey.

Contrary to the Council's regulations, that appears to be exactly what the Foundation and Survey have done in the draft impact statement. The statement lists other activities, such as oil and

Ms. Holly Smith
24 November 2010
Page 6

gas exploration and production, recreation, tourism and commercial vessel traffic, military exercises and operations, fishing operations, hunting and/or incidental mortality, and pollution, but provides few details regarding the impact of these activities on marine mammals. It also does not mention other potentially important natural and human-related impacts, such as disease, natural toxins, predation, weather and climatic influences, or ingestion of debris. More importantly, the impact statement provides little analysis or discussion of how the proposed action, together with the total effects of all of these factors, might affect marine mammals. Instead, the draft impact statement mentions only the impacts of proposed marine seismic research funded by the Foundation or conducted by the Survey when it concludes there would not be any significant cumulative impacts to marine resources.

Furthermore, the Foundation justifies this conclusion simply by stating that pre-cruise planning and coordination with other ongoing and planned activities, as well as mitigation and monitoring during proposed seismic operations, would minimize cumulative impacts to an insignificant level. The Commission does not agree that such a blanket statement can be made without a reasoned analysis to support it. First, it is not possible to do a cumulative effects analysis that encompasses all future seismic projects. Such an analysis must take into account not only the effects of a specific project, but also the effects of all other human impacts in the area and at the time of the proposed study. Because the Foundation and the Survey have recognized already that they cannot predict exactly where and when they will fund or conduct such studies, the Commission does not see how the agencies can describe in advance the other factors that must be considered in a cumulative effects analysis. Second, the added effects of a specific project cannot be dismissed based simply on an expectation or promise of future remedies. To do so would be contrary to the whole purpose of an environmental impact statement. To address this shortcoming, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey provide, to the extent possible, a comprehensive analysis of the cumulative impacts expected from seismic surveys themselves, but then be prepared to conduct additional cumulative impact analyses for future specific seismic studies in the context of all the other factors in the pertinent human environment; that is, the human environment where seismic studies have been proposed.

The Commission hopes that these recommendations and comments are helpful. Please contact me if you have any questions about them.

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

cc: Jon Childs, U.S. Geological Survey