ENVIRONMENTAL ASSESSMENT

Issuance of an Incidental Harassment Authorization to the Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Eastern Tropical Pacific Ocean offshore of Costa Rica April – June, 2011

March 2011

LEAD AGENCY: USDOC, National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Office of Protected Resources
1315 East West Highway
Silver Spring, MD 20910

RESPONSIBLE OFFICIAL: James H. Lecky, Director, Office of Protected Resources

FOR INFORMATION CONTACT: Office of Protected Resources
National Marine Fisheries Service
1315 East West Highway
Silver Spring, MD 20910
(301) 713-2332

LOCATION: An area (bounded by 8.5–9° N, 83.75–84.25° W) within the Exclusive Economic Zone of Costa Rica in the Eastern Tropical Pacific Ocean.

ABSTRACT: The National Marine Fisheries Service proposes to issue an Incidental Harassment Authorization to the Lamont-Doherty Earth Observatory for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a marine geophysical (seismic) survey in the Eastern Tropical Pacific Ocean, April through June, 2011.

CONTENTS

1. Chapter 1 – Purpose and Need for Action 4

1.1 Description of Proposed Action 4

1.1.1 Background 4

1.1.2 Incorporation of NSF's Analysis and Report by Reference 5

1.1.3 MMPA Purpose and Need 5

1.2 NEPA Requirements and Scope of NEPA Analysis 6

1.2.2 Comments on NSF's NEPA Analysis and Report 7

1.3 Applicable Laws and Necessary Federal Permits 8

1.3.1 The National Environmental Policy Act 8

1.3.2 The Endangered Species Act 9

1.3.3 The Marine Mammal Protection Act 9

1.3.4 Executive Order 12114 – Environmental Effects Abroad of Major Federal Actions 10

2. Chapter 2 – Alternatives Including the Proposed Action 11

2.1 Project Objectives 11

2.2 Alternative 1 – No Action Alternative 12

2.3 Alternative 2 – Issuance of an IHA with Mitigation (Preferred) 12

2.3.1 Seismic Acquisition Operations 12

2.3.2 Mitigation and Monitoring Measures 13

2.4 Alternatives Considered but Eliminated from Detailed Study 14

3. Chapter 3 – Affected Environment 15

3.1 Physical Environment 15

3.1.1 Bathymetry and Oceanography 15

3.2 Biological Environment 15

3.2.1 Marine Mammals 15

3.2.2 Seabirds 15

3.2.3 Marine Turtles 15

3.2.4 Fish 16

3.2.5 Invertebrates 16

4. Chapter 4 –Environmental Consequences 17

4.1 Effects of Alternative 1 – No Action Alternative 19

4.2 Effects of Alternative 2 – Preferred Alternative 19

4.2.1 Compliance with Necessary Laws – Necessary Federal Permits 20

4.2.2 Unavoidable Adverse Impacts 20

4.3 Cumulative Effects 20

5. List of Preparers and Agencies Consulted 21

6. References 22

LIST OF ACRONYMS, ABBREVIATIONS, AND INITIALISMS

ARF	Academic Research Fleet
ARRA	America Reinvestment and Recovery Act
BiOp	Biological Opinion
CFR	Code of Federal Regulations
CEQ	President's Council on Environmental Quality
EA	Environmental Assessment
EEZ	Economic Exclusion Zone
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ETP	Eastern Tropical Pacific Ocean
FONSI	Finding of No Significant Impact
FR	Federal Register
IHA	Incidental Harassment Authorization
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
km	kilometer
L-DEO	Lamont-Doherty Earth Observatory
MMPA	Marine Mammal Protection Act
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOR	Notice of Receipt
NSF	National Science Foundation
OPR	Office of Protected Resources
U.S.C.	United States Code

1. CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 DESCRIPTION OF PROPOSED ACTION

NMFS has received an application from Lamont-Doherty Earth Observatory (L-DEO), a part of Columbia University, for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to conducting a marine geophysical (seismic) survey in the eastern tropical Pacific Ocean (ETP) within the Exclusive Economic Zone (EEZ) of Costa Rica, April through May, 2011. L-DEO's seismic survey activities, which have the potential to cause marine mammals to be behaviorally disturbed, warrant an incidental take authorization from NMFS under section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1631 *et seq*.).

The proposed action considered in this EA is the issuance of an IHA, by NMFS, for the incidental taking, Level B harassment only, of small numbers of marine mammals, incidental to the conduct of L-DEO's seismic survey from April to June, 2011, pursuant to section 101(a)(5)(D) of the MMPA.

This Environmental Assessment (EA), titled "*Issuance of an Incidental Harassment Authorization to the to the Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Eastern Tropical Pacific Ocean offshore of Costa Rica April – June, 2011*" (hereinafter, EA), addresses the impacts on the human environment that would result from issuance of this IHA for MMPA Level B takes of marine mammals during the L-DEO survey under the required mitigation and measures specified in the authorization.

1.1.1 BACKGROUND

The National Science Foundation (NSF; Foundation) supports basic scientific research in the mathematical, physical, medical, biological, social, and other sciences pursuant to the National Science Foundation Act of 1950, as amended (NSF Act; 42 U.S.C. 1861-75). The Foundation considers proposals submitted by organizations and makes contracts and/or other arrangements (i.e., grants, loans, and other forms of assistance) to support research activities.

NSF also invests in research infrastructure, including the Academic Research Fleet (ARF) which allows NSF-funded scientists to conduct marine research in coastal and open waters. These funds support ship operations; shipboard scientific support equipment; oceanographic instrumentation and technical services; and submersible support. NSF owns the R/V *Marcus G. Langseth* (*Langseth*), a 235-foot research vessel that L-DEO, a part of Columbia University, operates under a cooperative agreement with the Foundation.

In 2009, an NSF-expert panel recommended a research proposal titled, "*Collaborative Research: A 3D seismic investigation of the transition to seismogenic behavior along the southern Costa Rica subduction zone*" (NSF Award # 0851380) for funding and ship time on the *Langseth*. As the federal action agency, the NSF has funded L-DEO's proposed seismic survey in the Pacific Ocean off Costa Rica as a part of the American Recovery and Reinvestment Act of 2009 (ARRA; Public Law 111-2).

L-DEO's seismic survey activities— which have the potential to cause marine mammals to be behaviorally disturbed—warrant an incidental take authorization from NMFS under section 101(a)(5)(D) of the MMPA. Accordingly, L-DEO has submitted a permit application requesting

NMFS to issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals, incidental to conducting a proposed seismic survey in the ETP offshore of Costa Rica from April 7, 2011 through May 9, 2011. Some minor deviation from these dates is possible, depending upon logistics and weather. Therefore, NMFS plans to issue an authorization that extends to June 6, 2011.

The NSF actions of funding Award #0851380 and NMFS' action of issuing an IHA to L-DEO that authorizes incidental takes, Level B harassment only, of small numbers of marine mammals, incidental to the conduct of the seismic survey are interrelated.

1.1.2 INCORPORATION OF NSF'S ANALYSIS AND REPORT BY REFERENCE

After conducting an independent review of the information and analyses for sufficiency and adequacy, NMFS incorporates by reference the NSF's Final National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) Analysis Pursuant To Executive Order (E.O.) 12114 (NSF, 2010a) (hereinafter, the NSF NEPA Analysis) and an associated report prepared by LGL Limited Environmental Research Associates (LGL) for NSF, titled "*Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Pacific Ocean off Costa Rica, April – May, 2011*", (LGL, 2010), (hereinafter, the NSF/L-DEO Report) by reference pursuant to 40 CFR 1502.21 and NOAA Administrative Order (NAO) 216-6 § 5.09(d). In summary, the NSF NEPA Analysis and the NSF/L-DEO Report concluded that with incorporation of the proposed monitoring and mitigation measures the potential impacts of the proposed action to marine mammals and sea turtles would be limited to short-term, localized changes in behavior and distribution near the seismic vessel.

1.1.3 MMPA PURPOSE AND NEED

The MMPA and Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.) prohibit "takes" of marine mammals and of threatened and endangered species, respectively, with only a few specific exceptions. The applicable exceptions in this case are an exemption for incidental take of marine mammals in Sections 101(a)(5)(D) of the MMPA and 7(a)(4) of the ESA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and, if the taking is limited to harassment. Section 101(a)(5)(D) of the MMPA also establishes a 45-day time limit for NMFS' review of an application for an IHA followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, NMFS must either issue or deny the IHA.

Purpose: The primary purpose of NMFS issuing an IHA to L-DEO is to provide an exception to L-DEO from the take prohibitions under the MMPA for the take of marine mammals, incidental to the conduct of L-DEO's seismic survey from April – June, 2011. The purpose of issuing an IHA to L-DEO is to regulate the incidental take of marine mammals associated with the conduct of the seismic survey from April through June, 2011.

Need: As noted above this section, the MMPA establishes a general moratorium or prohibition on the take if marine mammals, including take by behavioral harassment. The MMPA

establishes a process by which individuals engaged in specified activities within a specified geographic area may request and NMFS must authorize the take of small numbers of marine mammals if, among other things, it complies with the process described above this section, makes certain determinations, and requires the implementation of mitigation and monitoring to minimize potential adverse impacts and resulting take. Specifically, NMFS shall grant the IHA if it finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The IHA must set forth the permissible methods of taking, other means of effecting the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring and reporting of such takings.

L-DEO has submitted a complete application demonstrating potential eligibility for issuance of an IHA. NMFS now has a corresponding duty to determine whether and how it can fashion an IHA authorizing take by harassment incidental to the activities described in L-DEO's application. The need for this action, is therefore, established and framed by the MMPA and NMFS's responsibilities under Section 101(a)(5)(D) of that Act, its implementing regulations, and other applicable requirements which will influence its decision making, such as Section 7 of the Endangered Species Act which is discussed in more detail below this section.

The foregoing purpose and need guide NMFS in developing alternatives for consideration, including alternative means of mitigating potential adverse effects.

1.2 NEPA REQUIREMENTS AND SCOPE OF NEPA ANALYSIS

This EA focuses primarily on the environmental effects of authorizing MMPA Level B incidental takes of marine mammals during seismic surveys in the ETP. The MMPA and its implementing regulations governing issuance of an IHA (50 CFR § 216.107) require that upon receipt of a valid and complete application for an IHA, NMFS must publish a notice of proposed IHA in the *Federal Register* (FR). The notice issued for the L-DEO action summarizes the purpose of the requested IHA, includes a statement that NMFS would prepare an EA for the proposed action, and invited interested parties to submit written comments concerning the application and NMFS' preliminary analyses and findings including those relevant to consideration in the EA.

NOAA Administrative Order 216-6 (NAO 216-6) established agency procedures for complying with NEPA and the implementing regulations issued by the President's Council on Environmental Quality (CEQ). Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, , NMFS structures the decision-making process for issuance of IHAs to provide for public participation in the NEPA scoping process by requesting comments on the draft NEPA document.

Under the requirements of NAO 216-6, the proposed issuance of authorization for incidental take of marine mammals is an action that is not categorically excluded from NEPA review. In addition, it is not the type of action normally requiring preparation of an Environmental Impact Statement (EIS). Therefore, NMFS has prepared this EA to assist in determining whether the direct, indirect and cumulative impacts related to its issuance of the authorization for incidental take under the MMPA of 19 marine mammal species are likely to result in significant impacts to the human environment, or whether the analysis, contained herein, including documents referenced and incorporated by reference and public comments received, supports the issuance of a Finding of No Significant Impact. Given the limited scope of the decision for which NMFS is responsible (i.e. whether or not

to issue the authorization including prescribed means of take, mitigation measures and monitoring requirements) that this EA is intended to inform, the scope of analysis is limited to evaluating and disclosing the impacts to living marine resources and their habitat likely to be affected by the L-DEO seismic surveys. As described more fully below this section, the EA identifies all marine mammals, and species protected under the ESA, that are likely to occur within the action area.

The primary analysis focuses on the impacts to certain marine mammal and sea turtle species likely to result from the proposed L-DEO seismic survey in the ETP in April, May, and June, 2011; impacts that would result from the alternatives presented; and the consideration of potential cumulative environmental impacts. Impacts to other marine species and habitat located in the action area were considered unlikely, and, thus received less detailed evaluation.

The need for this EA is to provide a NEPA analysis informing the decision of whether or not to issue the IHA to L-DEO and to determine whether the L-DEO proposed action has any potential significant impacts. NOAA has relied on and incorporated the more comprehensive environmental analysis prepared by NSF addressing the direct, indirect and cumulative impacts of the underlying activities associated with the seismic cruise described in the application and its supporting documents.

1.2.1 NEPA Scoping Summary

In order to identify environmental issues and impacts to be addressed in this EA, NMFS undertook several steps.

- NMFS independently evaluated and determined the sufficiency of the scope of the NSF/L-DEO Report and has incorporated those documents by reference (see Section 1.1.2).
- NMFS also made available the NSF/L-DEO Report to the public at (http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications) concurrently with the release of the *Federal Register* notice of request for comments on the proposed IHA (76 FR 6430, February 4, 2011).

In addition, the NSF also made available the NSF/L-DEO Report on the agency's website (http://www.nsf.gov/geo/oce/envcomp/index.jsp) for a 30-day public comment period.

As noted in Section 1.1.3, the *Federal Register* notice of receipt of an MMPA IHA application and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and by offering the public a meaningful opportunity to provide comments to NMFS for consideration in the MMPA and NEPA decision-making processes.

1.2.2 COMMENTS ON NSF'S NEPA ANALYSIS AND REPORT

The Marine Mammal Commission (Commission) provides comments on all proposed IHAs as part of their established role under the MMPA (§ 202 (a)(2), *humane means of taking marine mammals*). No other organizations or private citizens submitted comments on NSF's NEPA Analysis and Report to date. NMFS has evaluated all comments and did not identify any comments: (1) that raised substantial questions as to whether the project may cause significant degradation to any marine mammal species or its habitat; or (2) that established a substantial dispute concerning the survey's size, nature, or effect.

The Commission's comments to NSF are briefly summarized here. Generally, the Commission recommended that NSF:

- require the applicant to take in-situ measurements at the survey location to verify, refine, and if needed, recalculate safety zone estimates;
- extend the required monitoring period to at least one hour before firing the airguns;
- extend the monitoring period to at least one hour before resuming airgun activities after a power-down due to a marine mammal sighting within the exclusion zone;
- provide additional justification for its preliminary determination that the planned visual and acoustic monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion zones;
- extend the required monitoring period at start-up to at least one hour before the initiations of seismic activities and one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within the safety zone; and

NMFS has considered the comments regarding additional mitigation measures within the context of the MMPA requirement to effect the least practicable adverse effect to marine mammals and their habitats. NMFS has developed responses to specific comments and will provide those responses in the *Federal Register* notice announcing the issuance of the IHA. NMFS does not repeat those responses here. NMFS notes, however, that it fully considered the Commission's comments, particularly those related to mitigation and monitoring. Based on those comments, NMFS re-evaluated the mitigation and monitoring proposed for incorporation in the IHA and determined, based on the best available data, that the proposed mitigation measures are presently the most feasible and effective measures capable of implementation by L-DEO during the proposed cruise. It did not make any substantive changes in the response.

1.3 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action.

1.3.1 THE NATIONAL ENVIRONMENTAL POLICY ACT

NEPA's Environmental Impact Statement requirement (EIS) requirement is applicable to all "major" federal actions with the potential to significantly affecting the quality of the human environment. A major federal action is an activity that is fully or partially funded, regulated, conducted, or approved by a federal agency. NMFS' issuance of an IHA for incidental harassment of marine mammals represents approval and regulation of takes of marine mammals incidental to the applicant's activities and thus amounts to a major Federal action for which environmental review is required. While NEPA does not dictate substantive outcome for an IHA, it requires consideration of environmental issues in federal agency planning and decision making, and requires an analysis of alternatives and analysis of direct, indirect, and cumulative environmental effects of the NMFS proposed action to authorize MMPA level B incidental take. As noted, NMFS has prepared this EA to assist in determining whether an EIS is necessary for the action.

1.3.2 THE ENDANGERED SPECIES ACT

Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that "may affect" a listed species or critical habitat. NMFS' issuance of an IHA affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these section 7 consultation requirements. Accordingly, NMFS is required to insure that its action is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species. Regulations specify the requirements for these consultations (50 CFR § 402).

NMFS has determined that issuance of the IHA is likely to result in adverse effects to listed marine mammal species and, therefore, NMFS has completing formal Section 7 consultation and prepared a Biological Opinion (BiOp) to consider whether or not the action is likely to jeopardize such species or result in the adverse modification or destruction of critical habitat designated for such species, if applicable.

1.3.3 THE MARINE MAMMAL PROTECTION ACT

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock, for periods of not more than one year, by United States citizens who engage in a specified activity (other than commercial fishing) within a specific geographic region if certain findings are made and a *Federal Register* notice of a proposed authorization is provided to the public for review.

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild ["Level A harassment"]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering ["Level B harassment"].

Section 101(a)(5)(D) of the MMPA establishes a 45-day time limit for NMFS' review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Not later than 45 days after the close of the public comment period, if the Secretary makes the findings set forth in Section 101(a)(5)(D)(i) of the MMPA, the Secretary shall issue the authorization with appropriate conditions to meet the requirements of clause 101(a)(5)(D)(ii) of the MMPA.

NMFS has promulgated regulations to implement the permit provisions of the MMPA (50 CFR Part 216) and has produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the MMPA. Applications for an IHA must be submitted according to regulations at 50 CFR § 216.104.

1.3.4 EXECUTIVE ORDER 12114 – ENVIRONMENTAL EFFECTS ABROAD OF MAJOR FEDERAL ACTIONS

The requirements for Executive Order (E.O.) 12114, discussed in the NSF/L-DEO Report (LGL, 2010) are incorporated herein, by reference. Briefly, the provisions of E.O. 12114 apply to major federal actions that occur or have effects outside of U.S. territories (the United States, its territories, and possessions). Accordingly, NMFS is required to be informed of environmental considerations and take those considerations into account when making decisions on major federal actions which could have environmental impacts anywhere beyond the borders of the United States.

2. CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

The NEPA implementing regulations (40 CFR § 1502.14) and NAO 216-6 provide guidance on the consideration of alternatives to a federal proposed action and require rigorous exploration and objective evaluation of all reasonable alternatives. Each alternative must be feasible and reasonable in accordance with the President's Council on Environmental Quality (CEQ) regulations (40 CFR §§ 1500-1508). This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated purpose and need, as well as alternatives eliminated from detailed study and also summarizes the expected outputs and any related mitigation of each alternative.

This EA evaluates the alternatives to ensure that they would fulfill the purpose and need, namely: (1) the issuance of an IHA for the take of marine mammals by level B behavioral harassment, incidental to L-DEO's conduct of a marine geophysical survey the ETP offshore of Costa Rica from April 7, 2011 through June 6, 2011; and (2) compliance with the MMPA which sets forth specific standards (i.e., unmitigable adverse impact and negligible impact) that must be met in order for NMFS to issue an IHA.

NMFS' Proposed Action (Preferred) alternative represents the activities proposed by the applicant for the IHA, along with required monitoring and mitigation measures that would minimize potential adverse environmental impacts.

Under the requirements of the MMPA, if the proposed action will have no more than a negligible impact on the species or stocks; will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses; and sets forth the appropriate level of mitigation measures and monitoring, then NMFS shall issue the IHA.

2.1 PROJECT OBJECTIVES

L-DEO's proposed survey will use three dimensional (3-D) seismic methodologies to image the structure and properties of the rocks along a major plate boundary fault off Costa Rica that has a history of generating large earthquakes and tsunamis. The proposed seismic survey will involve one source vessel, the *Langseth* which will deploy a 36-airgun array that will discharge alternating sub arrays of 18 airguns with a total volume of 3,300 cubic inches (in^3).

The airgun array is towed through the water column along the survey lines, introducing sound into the water column. Airguns function by venting high-pressure air into the water, which creates an air bubble that transmits sounds downward through the seafloor (Figure 1) (NSF, 2010b). The sound penetrates the seafloor and returns to a receiver called a hydrophone. The reflected data provides information on sub-sea floor sediment layers.

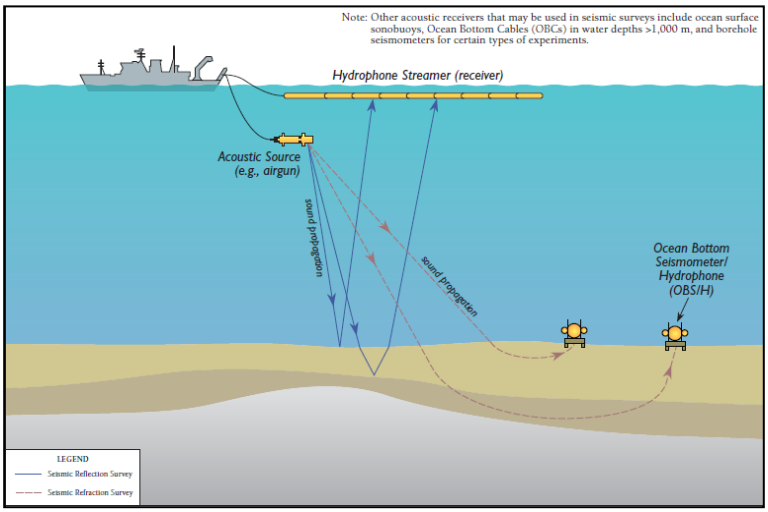

Figure 1 General concept of airgun arrays and hydrophones (NSF, 2010).

2.2 ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Evaluation of the No Action Alternative is required by regulations of the CEQ as a baseline against which the impacts of the Proposed Action are compared.

Under the No Action Alternative, NMFS would not issue an IHA to L-DEO for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a marine geophysical (seismic) survey in the Eastern Tropical Pacific Ocean, April through June, 2011. L-DEO would not conduct the seismic survey and marine mammals present in the survey area would not be incidentally harassed. This alternative would eliminate any potential risk to the environment from the proposed research activities, and the applicant would not receive an exemption from the MMPA and ESA prohibitions against take.

2.3 ALTERNATIVE 2 – ISSUANCE OF AN IHA WITH MITIGATION (PREFERRED)

The Proposed Action is the Preferred Alternative. This alternative, analyzed in the NSF/L-DEO Report and in NSF's NEPA Analysis, is hereby incorporated by reference (LGL, 2010; NSF, 2010a). Under this alternative, NMFS would issue an IHA (valid from April 7 through June 6, 2011) to L-DEO allowing the incidental take, by Level B harassment, of 19 species of marine mammals in the ETP. The project is scheduled to commence on April 7, 2011 and scheduled to end on May 9, 2011.

NMFS will incorporate the mitigation and monitoring measures and reporting requirements described in Sections II(3) of the NSF/L-DEO Report into the IHA. Accordingly, this NEPA Preferred Alternative (Issuance of an IHA with Mitigation) would satisfy the purpose and need of the NMFS MMPA action—issuance of an IHA, along with required mitigation measures and monitoring, and would enable NSF and L-DEO to comply with the statutory and regulatory requirements of the MMPA and ESA.

2.3.1 SEISMIC ACQUISITION OPERATIONS

The NSF/L-DEO Report describes the survey protocols in detail and this EA briefly summarizes them here. The proposed study (e.g., equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) will take place in the EEZ of Costa Rica in water depths ranging from less than 100 meters (m) (328 feet (ft)) to greater than 2,500 m (1.55 miles (mi)). The survey would require approximately 32 days (d) to complete approximately 19 transects in a racetrack configuration that will cover an area of approximately 57 x 12 kilometers (km) (35.4 x 7.5 mi). In all, the proposed survey will complete approximately 2,145 km (1,333 mi) of survey lines with an additional 365 km (227 mi) of turns. Data acquisition will include approximately 672 hours (hr) of airgun operations (28 d x 24 hr).

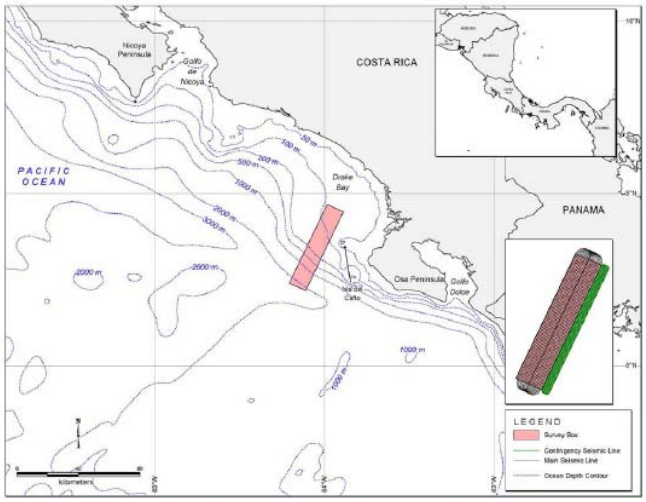

Figure 2 Proposed study area and proposed seismic transect (tracklines) for the L-DEO survey planned for April - June, 2011.

2.3.2 MITIGATION AND MONITORING MEASURES

The NSF/L-DEO Report describes the required mitigation and monitoring measures in detail and this EA briefly summarizes them here. To reduce the potential for disturbance from acoustic stimuli associated with the activities, L-DEO and/or its designees have proposed to implement the following mitigation measures for marine mammals: (1) proposed exclusion zones; (2) power-down procedures; (3) shutdown procedures; (4) ramp-up procedures; (5) visual monitoring by Protected Species Visual Observers (PSVO); and (6) passive acoustic monitoring.

Proposed Exclusion Zones: NMFS has determined that for acoustic effects, using acoustic thresholds in combination with corresponding exclusion zones are an effective way to consistently apply measures to avoid or minimize the impacts of an action. L-DEO uses the thresholds to establish a mitigation shut-down or exclusion zone, i.e., if an animal enters an area calculated to be ensonified above the level of an established threshold a sound source is shut down.

Power-Down Procedures: L-DEO would decrease the number of airguns in use such that the radius of the 180 decibel (dB) exclusion zone (EZ) is decreased to the extent that marine mammals are no longer in or about to enter the exclusion zone.

Shut-Down Procedures: L-DEO would shut down the operating airgun(s) if a marine mammal is seen within or approaching the exclusion zone for the single airgun. L-DEO will not resume airgun activity until the marine mammal has cleared the EZ, or until the PSVO is confident that the animal has left the vicinity of the vessel.

Ramp-Up Procedures: L-DEO would initiate a ramp-up procedure with the smallest airgun in the array after a specified period of non-active airgun operations or when a power down has exceeded that period. L-DEO has used similar periods during previous L-DEO surveys.

Visual Monitoring: During seismic operations off Costa Rica, at least three PSVOs would be based aboard the *Langseth* for the duration of the cruise and would watch for marine mammals near the vessel during daytime airgun operations and during any start-ups at night. PSVOs would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document reactions or lack thereof. They would also provide information needed to order a shutdown of the seismic source when a marine mammal is within or near the EZ. L-DEO would use the data to estimate numbers of animals potentially ‘taken’ by harassment (as defined in the MMPA).

Passive Acoustic Monitoring: L-DEO would use acoustical monitoring in addition to visual observations to improve detection, identification, and localization of cetaceans. The acoustic monitoring would serve to alert visual observers (if on duty) when vocalizing cetaceans are detected.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

NMFS considered the alternative where NMFS issues an IHA without the mitigation measures described in Alternative 2–Issuance of an IHA with Mitigation (the Preferred Alternative). However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA (e.g., negligible impact, effecting the least practicable adverse impact, and monitoring and reporting of such takings). Accordingly, NMFS did not consider this alternative further.

NMFS also considered an alternative whereby NMFS issues the IHA for another time. This alternative, analyzed in the NSF/L-DEO Report and the NSF NEPA Analysis, is hereby incorporated by reference (LGL, 2010; NSF, 2010a). However, this alternative failed to meet the statutory and regulatory requirements of the MMPA for an IHA as L-DEO did not submit an application (i.e., NMFS shall issue an IHA upon request) to conduct the seismic survey at an alternate time. The proposed dates for the cruise (April through June, 2011) are the most suitable dates would best suit the purpose and need, from a logistical perspective, for NSF, L-DEO, the *Langseth*, and its crew. The potential environmental impacts of this alternative would be very similar to the impacts of the proposed action.

3. CHAPTER 3 – AFFECTED ENVIRONMENT

The summary of the physical and biological environment of the study area, as analyzed the NSF/L-DEO Report, are hereby incorporated by reference (LGL, 2010). The NSF/L-DEO Report presents baseline information necessary for consideration of the alternatives and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. Section 3.1 and 3.2 of the EA briefly summarizes them.

In addition to the marine mammal stocks and species that are the subject of the IHA, an assortment of sea birds, sea turtles, fish and invertebrates may be found in the action area. Section 3.2.2 – 3.2.4 of the EA briefly summarizes them.

3.1 PHYSICAL ENVIRONMENT

3.1.1 BATHYMETRY AND OCEANOGRAPHY

The survey will encompass the area bounded by 8.5–9° N, 83.75–84.25° W offshore from Costa Rica in the Pacific Ocean which lies between the westward-flowing South Equatorial and North Equatorial Currents. The coast is an active continental margin with a narrow continental shelf.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 MARINE MAMMALS

Twenty-eight marine mammal species may occur in the proposed survey area, including 20 odontocetes (toothed cetaceans), 6 mysticetes (baleen whales) and two pinnipeds. Of these, 19 cetacean species are likely to occur in the proposed survey area in the ETP during April through June. Five of these species are listed as endangered under the ESA, including the humpback (*Megaptera novaeangliae*), sei (*Balaenoptera borealis*), fin (*Balaenoptera physalus*), blue (*Balaenoptera musculus*), and sperm (*Physeter macrocephalus*) whales.

The species of marine mammals that could be commonly encountered in the survey area (all delphinids) include the short-beaked common dolphin (*Delphinus delphis*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*Stenella attenuata*), striped dolphin (*Stenella coeruleoalba*), melon-headed whale (*Peponocephala electra*), and bottlenose dolphin (*Tursiops truncatus*). More information about each stock may be found in the respective Stock Assessment Reports, which are available online at http://www.nmfs.noaa.gov/pr/sars/species.htm.

3.2.2 SEABIRDS

Two seabird species of conservation concern, the California least tern (*Sternula antillarum browni*) and the Galápagos petrel (*Pterodroma phaeopygia*), are known to occur in or near the proposed study area off Costa Rica. The California least tern is listed as Endangered under the ESA.

3.2.3 MARINE TURTLES

Five species of marine turtles could occur in the proposed study area during the proposed seismic activities. They include the green (*Chelonia mydas*); hawksbill (*Eretmochelys imbricata*); leatherback (*Dermochelys coriacea*); loggerhead (*Caretta caretta*); and olive ridley

(*Lepidochelys olivacea*) sea turtles. The species of marine turtle that could be commonly encountered in the survey area include foraging or migrating individuals, olive ridley sea turtles, and some extralimital leatherback hatchlings.

3.2.4 FISH

Examples of fish present in the Costa Rican EEZ (SAUP, 2011) include species important to commercial and recreational fisheries such as the Atlantic anchoveta (*Cetengraulis edentulous*); Atlantic blue marlin (*Makaira nigricans)*; Atlantic bonito (*Sarda sarda*); Atlantic sailfish (*Istiophorus albicans*); Atlantic white marlin (*Tetrapturus albidus*); bigeye tuna (*Thunnus obesus*); black marlin (*Makaira indica*); blackfin tuna (*Thunnus atlanticus*); blacktip shark (*Carcharhinus limbatus*); cobia (*Rachycentron canadum*); northern bluefin tuna (*Thunnus thynnus*); and swordfish (*Xiphias gladius*) to name a few.

3.2.5 INVERTEBRATES

Examples of crustaceans, mollusks, and other invertebrates present in the Costa Rican EEZ (SAUP, 2011) include the longfin squid (*Loligo pealeii*); jumbo flying squid (*Dosidicus gigas*); royal red shrimp (*Pleoticus robustus*); Caribbean spiny lobster (*Panulirus argus*); and the blue crab (*Callinectes sapidus*).

4. CHAPTER 4 –ENVIRONMENTAL CONSEQUENCES

The NSF/L-DEO Report and NSF's NEPA Analysis, which address potential direct, indirect, and cumulative impacts of the proposed marine seismic survey on marine mammals, sea turtles, fish, and invertebrates, and impacts to prey species and marine mammal habitats, are hereby incorporated by reference (LGL, 2010; NSF, 2010a).

Under MMPA NMFS has evaluated the potential impacts of L-DEO's action in order to determine whether to authorize incidental take of marine mammals. Based on the MMPA evaluation NMFS has determined that an EA is appropriate to evaluate the potential significance of environmental impacts to the marine environment resulting from the proposed L-DEO action that would occur after issuance of this IHA. NMFS expects that marine mammals, including species that are depleted and strategic due to listing as threatened or endangered species under the ESA, may be present throughout the study area and throughout the seasons during which the project might occur.

NMFS' evaluation indicates that any direct or indirect effects of the action would not result in a substantial impact to living marine resources or their habitats and would not have any adverse impacts on biodiversity or ecosystem function. Most effects of the proposed action are considered to be short-term, temporary in nature, and negligible, and unlikely to affect normal ecosystem function or predator/prey relationships; therefore, there will not be a substantial impact on marine life biodiversity or on the normal function of the near shore or offshore marine environment. NMFS finds that the NSF/L-DEO Report and NSF's NEPA Analysis include appropriate mitigation measures to allow a meaningful analysis of the direct, indirect, and cumulative effects of the L-DEO proposed action on marine mammals and other marine species, including marine turtles, seabirds, fish, and invertebrates.

L-DEO proposes to conduct the proposed open-water marine geophysical survey for a short period of time (i.e., no longer than 28 days) in shallow (< 100 m; 328 ft); intermediate (100 – 1,000 m; 328 – 3,280 ft); and deep-water (> 1,000 m; 3,280 ft) depths. As the *Langseth* transits the area while conducting the survey, any displacement of marine fish species by the proposed action would be temporary. Many fish species (i.e., those that do not have swim bladders, have rudimentary swim bladders (such as bottom-dwelling species, including flatfish), or well-developed swim bladders that are not directly connected to the ears) tend to have relatively poor auditory sensitivity and are not likely to be affected by exposure to intense noise. The seismic survey may potentially displace prey items of marine mammals, such as fish. However, prey items would return after the *Langseth* and the towed airgun array have transited through the area and the ambient sound has returned to baseline levels.

The overall response of fishes and squids is to exhibit startle responses and undergo vertical and horizontal movements away from the sound source. NMFS expects that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species and no cumulative effects on the environment. Although there is a potential for injury to fish or marine life in close proximity to the seismic airguns, the impacts of the seismic survey on fish and other marine life specifically related to acoustic activities are expected to be temporary in nature, negligible, and would not result in substantial impact to these species or to their role in the ecosystem.

NMFS conducted additional literature reviews for purposes of the MMPA analyses, and applicable information is included here to support this finding. Sperm whales regularly feed on squid and some fishes and may be feeding while in the area during the proposed survey. One study[1] investigating behavioral response of southern calamari squid (*Sepioteuthis australis*) exposed to seismic survey sound reported that the squid exhibited both startle and avoidance responses. It is expected that sperm whales remaining in this area would experience indirect effects from airgun activities through temporary behavioral disruptions and reduced feeding opportunities. Like their prey, sperm whales are expected to move out of the survey area temporarily and return to the area once survey activities are complete and prey species return.

Available data suggest that sound energy from the airguns will diminish dramatically by the time it travels more than 1,000 m (3,820 ft) to the ocean floor. The seismic program in the ETP is not expected to significantly impact benthic and invertebrate communities in the study area.

The existing body of information on the impacts of seismic survey sound on marine invertebrates and benthic fauna is very limited. Recent controlled field experiments[2] on adult crustaceans exposed to seismic energy found no pathological impacts to the research animals. The study reported that the seismic survey did not: (1) cause any acute or mid-term mortality of the crab; (2) alter feeding behavior; or (3) affect embryo survival or post-hatch locomotion of larvae.

The impacts of the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impact to marine mammals or to their role in the ecosystem. These temporary acoustic activities would not affect physical habitat features, such as substrates and water quality. Additionally, the effects from vessel transit and routine operation of one seismic source vessel would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitats. The potential for striking marine mammals and sea turtles is a concern with vessel traffic. The probability of a ship strike resulting in an injury or mortality of an animal has been associated with ship speed; however, it is highly unlikely that the proposed seismic survey would result in a serious injury or mortality to any marine mammal or sea turtle as a result of vessel strike given the *Langseth's* slow survey speed (8.5 km/h; 5.3 mph; 4.6 knots).

NMFS anticipates, and would authorize, the incidental, Level B harassment only, in the form of temporary behavioral disturbance, of several species of cetaceans. NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death would occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures required by the proposed IHA and analyzed in this EA, the NSF/L-DEO Report and NSF's NEPA Analysis. The Level B harassment is not expected to affect biodiversity or ecosystem function. As with marine mammals, sea turtles may experience temporary hearing threshold shifts and may exhibit relatively minor and short-term behavioral responses.

---

[1] McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe. 2000b. Marine seismic surveys – a study of environmental implications. APPEA J. 40:692-706.

[2] Christian, J.R., A. Mathieu, D.H. Thomson, D. White, and R.A. Buchanan. 2003. Effect of seismic energy on snow crab (*Chionoecetes opilio*). Environmental Studies Research Funds Report No. 144. Calgary, AB, Canada. November.

4.1 EFFECTS OF ALTERNATIVE 1 – NO ACTION ALTERNATIVE

The summary of the effects of the No Action alternative, analyzed in the NSF/L-DEO Report and NSF's NEPA Analysis, are hereby incorporated by reference (LGL, 2010; NSF, 2010a). There are no direct or indirect effects on the environment of not issuing the IHA. The incidental take of marine mammals, including those listed as threatened or endangered, resulting from L-DEO's survey would not be exempted. It is unlikely the applicant would conduct the research in the absence of a permit, because to do so would risk sanctions and enforcement actions under the MMPA and ESA.

4.2 EFFECTS OF ALTERNATIVE 2 – PREFERRED ALTERNATIVE

The NSF/L-DEO Report and NSF's NEPA Analysis, incorporated by reference (LGL, 2010; NSF, 2010a), describe, in detail, the potential effects of airgun sounds, multibeam echosounder and sub-bottom profiler signals on marine species, particularly marine mammals and marine turtles of particular concern (see Section IV and Appendices B through E of the NSF/L-DEO Report). The NSF/L-DEO Report also includes analyses of effects on sea turtles, fish, and invertebrates.

L-DEO proposed a number of monitoring and mitigation measures for marine mammals as part of the action evaluated in the NSF/L-DEO Report and NSF's NEPA Analysis. In analyzing the effects of the preferred alternative, NMFS has considered the following monitoring and mitigation measures as part of the preferred alternative as considered by NSF:

(1) proposed exclusion zones;
(2) power-down procedures;
(3) shut-down procedures;
(4) ramp-up procedures;
(5) visual monitoring by PSVOs; and
(6) passive acoustic monitoring.

Inclusion of these monitoring and mitigation measures is anticipated to minimize and/or avoid impacts to marine resources. With the above planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and sea turtle that could be encountered are expected to be limited to short-term, localized changes in behavior (such as brief masking of natural sounds) and short-term changes in animal distribution near the seismic vessel. At most, effects on marine mammals may be interpreted as falling within the MMPA definition of "Level B behavioral harassment" for those species managed by NMFS. Under the proposed action, NMFS expects no long-term or substantial adverse effects on marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats.

NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death will occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures proposed in the application, NSF/L-DEO Report and NMFS' notice of proposed IHA (76 FR 6430, February 4, 2011), nor is take by injury, serious injury, or mortality authorized by this IHA.

4.2.1 COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS

NMFS has determined that the IHA is consistent with the applicable requirements of the MMPA, ESA, and NMFS' regulations. The applicant has secured or applied for necessary permits from NMFS.

4.2.2 UNAVOIDABLE ADVERSE IMPACTS

The summary of unavoidable adverse impacts to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in the NSF/L-DEO Report and NSF's NEPA Analysis are hereby incorporated by reference (LGL, 2010; NSF, 2010a).

NMFS does not expect L-DEO's activities to have adverse consequences on the viability of marine mammals in the study area. Further, NMFS does not expect the marine mammal populations in that area to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. Numbers of individuals of all species taken by harassment are expected to be small (relative to species or stock abundance), and the marine seismic survey will have a negligible impact on the affected species or stocks of marine mammals. The MMPA requirement of ensuring the proposed action has no unmitigable adverse impact to subsistence uses does not apply here because of the location of the proposed activity.

4.3 CUMULATIVE EFFECTS

The summary of cumulative effects to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in the NSF/L-DEO Report and NSF's NEPA Analysis, are hereby incorporated by reference (LGL, 2010; NSF, 2010a). The impacts of conducting the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impacts to marine mammals or to their role in the ecosystem. NMFS does not expect that the survey would have any adverse cumulative effect on any fish or invertebrate species.

NMFS has issued incidental take authorizations for other seismic research surveys (to L-DEO and other parties) that may have resulted in the harassment of marine mammals, but the other research surveys are dispersed both geographically (throughout the world) and temporally, are short-term in nature, and all are required to use mitigation and monitoring measures to minimize impacts to marine mammals and other living marine resources in the activity area. There are no other NSF-sponsored seismic surveys scheduled for the ETP in 2011 and therefore, NMFS is unaware of any synergistic impacts to marine resources associated with reasonably foreseeable future actions that may be planned or occur within the same region of influence.

5. LIST OF PREPARERS AND AGENCIES CONSULTED

Agencies Consulted
No other persons or agencies were consulted in preparation of this EA.

Prepared By
Jeannine Cody, M.Sc.
Fishery Biologist
Permits, Conservation, and Education Division
Office of Protected Resources, NOAA/National Marine Fisheries Service

6. REFERENCES

LGL. (2010). LGL Ltd. environmental research associates. Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Pacific Ocean, April - May 2011 (pp. pp. 199). King City,Ontario.

NSF. (2010a). *National Science Foundation. Final National Environmental Policy Act of 1969 Analysis Pursuant To Executive Order 12114: Marine Geophysical Survey by the R/V Marcus G. Langseth in the Pacific Ocean, April - May 2011*. Arlington, VA.

NSF. (2010b). *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*. Arlington, VA.

SAUP. (2011). Sea Around Us Project. EEZ Waters of Costa Rica: Biodiversity. Retrieved January 14, 2011, from http://www.seaaroundus.org/eez/188.aspx