UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

SEP - 1 2010

Finding of No Significant Impact
Issuance of Scientific Research Permit Nos. 14233 and 14603

Background

In January 2009, the National Marine Fisheries Service (NMFS) received an application for a permit (File No. 14233) from Dr. Scott Kraus to conduct research on North Atlantic whales along the U.S. east coast. In July 2009, the NMFS received an application for a permit (File No. 14603) from Provincetown Center for Coastal Studies (CCS) to conduct research on North Atlantic whales along the U.S. east coast. In accordance with the National Environmental Policy Act, NMFS has prepared a batched Environmental Assessment (EA) analyzing the impacts on the human environment associated with permit issuance (EA on the Issuance of Two Scientific Research Permits for Aerial and Vessel Surveys of North Atlantic Right Whales; September 2010). In addition, a Biological Opinion was issued under the Endangered Species Act (ESA) (September 2010) summarizing the results of an intra-agency consultation. The analyses in the EA, as informed by the Biological Opinion, support the below findings and determination.

Analysis

National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in Fishery Management Plans?

Response: Although Essential Fish Habitat (EFH) may be present in the action area, the Proposed Action would only affect large whales authorized for research by the permits. Because in-water research would only involve routine vessel movements at the water surface and the temporary deployment of equipment to measure oceanographic parameters in the water column, the Proposed Action would not be expected to cause damage to other aspects of ocean and coastal habitat such as reefs, seagrass beds, soft-bottom sediment, etc. Therefore, no EFH consultation was required.

2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

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Response: The effects of the action on target species, including ESA-listed species, and their habitat, EFH, marine sanctuaries, and other marine mammals were all considered. The Proposed Action would target large whales for biopsy, tagging, and observation, which is expected to result in short-term minimal disturbance to individual whales. This work is not expected to affect an animal's susceptibility to predation, alter dietary preferences or foraging behavior, or change distribution or abundance of predators or prey. Although research conducted under Permit No. 14603 would investigate the effect that prey resources have on distribution, behavior, and social organization of right whales, the research is not anticipated to affect predator-prey relationships, biodiversity, or other non-target species. Therefore, the Proposed Action is not expected to have a substantial impact on biodiversity or ecosystem function.

3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Response: The Proposed Action involves aerial surveys and close approach of vessels for biopsy sampling, tagging, tag monitoring, behavioral observation, prey mapping, and photo-identification of large whales. It would not involve hazardous methods, toxic agents or pathogens, or other materials that would have a substantial adverse impact on public health and safety. Research would be conducted by or under the close supervision of experienced personnel, as required by the permits. Therefore, no negative impacts on human health or safety are anticipated during research.

4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

Response: The Proposed Action would affect the target species, North Atlantic right whales, during aerial and vessel surveys. The Proposed Action would also affect humpback, fin, and minke whales incidental to right whale vessel surveys conducted by CCS. The 2010 biological opinion prepared for the Proposed Action concluded that the effects of the Proposed Action would not be severe and would be short-term in nature to individual right, humpback and fin whales. There would be no significant population- or species-level impacts. Likewise, the Proposed Action is not expected to significantly impact non-ESA listed minke whales. The Proposed Action would not likely jeopardize the continued existence of any ESA-listed species and would not likely destroy or adversely modify designated critical habitat. No other non-target species would be affected by the proposed research. The permits would contain mitigation measures to minimize the effects of the research and to avoid unnecessary stress to any protected species by requiring use of specific research protocols.

5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: Effects of the research would be limited to the short-term harassment of right, humpback, fin, and minke whales. Permitting the proposed research could result in a low level of economic benefit to local economies in the action area. However, such

impacts would be negligible on a national or regional level and therefore are not considered significant. These impacts are not interrelated with any natural or physical impacts. The Proposed Action would not result in inequitable distributions of environmental burdens or affect access (short- or long-term use) to any natural or depletable resources in the action area.

6) Are the effects on the quality of the human environment likely to be highly controversial?

Response: NMFS does not consider the Proposed Action controversial nor has it been considered controversial in the past. All of the proposed research activities are standard research activities that have been conducted on these species by the scientific community for decades. No other portion of the environment beyond the whale species identified above would be impacted by the Proposed Action.

7) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

Response: The proposed research would not be expected to result in substantial impacts to any such area. The majority of these habitats are not part of the action area. EFH would not be substantially impacted since all research would not affect bottom habitat (see Question 1). The research would not result in impacts to National Marine Sanctuaries.

8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: The proposed research is not unique. The proposed activities have been previously authorized as research activities for large whales; some activities have occurred for decades. There have been no reported serious injuries or mortalities of cetacean species or risks to any other portion of the human environment as a result of these research activities. Therefore, the risks to the human environment are not unique or unknown.

9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: The Proposed Action is not related to other actions with individually insignificant, but cumulatively significant impacts. While these species are impacted by other human activities, including other scientific research, these activities are not occurring simultaneously on the same individuals of a population/stock. Both applicants are members of the North Atlantic Right Whale Consortium, a highly-coordinated community of researchers who meet annually to share their findings and coordinate research activities at the start of each field season. The short-term stresses (separately and cumulatively when added to other stresses right whales face in the environment)

resulting from the research activities would be expected to be minimal. Behavioral reactions suggest that harassment is brief, lasting minutes, before animals resume normal behaviors. Hence, NMFS expects any effects of research to dissipate before animals could be harassed by other human activities. Significant cumulative impacts are not expected since no serious injury or mortality is expected (resulting in no direct loss of animals from the population) nor an appreciable reduction in the fecundity of target individuals. Furthermore, the permits would contain conditions to mitigate and minimize any impacts to the animals from research activities, including the coordination of research activities with other researchers in the area.

10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Response: The Proposed Action would not take place in any district, site, highway, structure, or object listed in or eligible for listing in the National Register of Historic Places, thus none would be impacted. The Proposed Action would not occur in other areas of significant scientific, cultural or historical resources and thus would not cause their loss or destruction. None of these resources are expected to be directly or indirectly impacted.

11) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

Response: The action would not be removing or introducing any species; therefore, it would not likely result in the introduction or spread of a non-indigenous species. Researchers would not be exchanging ballast water or moving between large water bodies during the course of research.

12) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

Response: The decision to issue the permits would not be precedent setting and would not affect any future decisions. Issuance of a permit to a specific individual or organization for a given research activity does not in any way guarantee or imply that NMFS will authorize other individuals or organizations to conduct the same research activity. Any future request received would be evaluated upon its own merits relative to the criteria established in the MMPA, ESA, and NMFS' implementing regulations.

13) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: The action would not result in any violation of Federal, State, or local laws for environmental protection. The permits would continue to contain language stating that the Holder is required to obtain any state and local permits necessary to carry out the action.

14) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: The action is not expected to result in any cumulative adverse effects to the target or non-target species. For targeted species, the Proposed Action would not be expected to have more than short-term effects to individuals and negligible effects to large whale populations. The effects on non-target species were also considered and no substantial effects are expected as research would not be directed on these species. Therefore, no cumulative adverse effects that could have a substantial effect on any species, target or non-target, would be expected.

DETERMINATION

In view of the information presented in this document and the analysis contained in the batched EA prepared for Issuance of Permit Nos. 14233 and 14603, pursuant to the ESA and MMPA, and the ESA section 7 biological opinion, it is hereby determined that the issuance of Permit Nos. 14233 and 14603 will not significantly impact the quality of the human environment as described above and in the EA. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an Environment Impact Statement for this action is not necessary.

For James H. Lecky
Director, Office of Protected Resources

Sept 1, 2010
Date

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

ENVIRONMENTAL ASSESSMENT

On the Issuance of Two Scientific Research Permits for Aerial and Vessel Surveys of North Atlantic Right Whales

September 2010

Lead Agency: U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources

Responsible Official James H. Lecky, Director, Office of Protected Resources

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Abstract: The National Marine Fisheries Service (NMFS), Office of Protected Resources, proposes to issue two scientific research permits for takes of marine mammals in the wild, pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*) and the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). The permits would be valid for five years from the date of issuance and would authorize: the observation, photo-identification, videography, passive acoustic recording, biopsy sampling, and tagging of North Atlantic right whales (*Eubalaena glacialis*) during vessel surveys; aerial surveys for photo-identification; and the import and/or export of right whale parts. The action area of Dr. Kraus' (File No. 14233) proposed study is the U.S. Exclusive Economic Zone from Florida to Maine. The purpose of Dr. Kraus' proposed research is to monitor the health and status of the North Atlantic right whale population. The action area of the Center for Coastal Studies' (CCS; File No. 14603) proposed study is the Gulf of Maine. The purpose of CCS' research is to monitor demographics, life history traits, habitat use, and behavior of North Atlantic right whales. Under NOAA Administrative Order 216-6, NMFS issuance of scientific research permits pursuant to Section 104 of the MMPA is generally categorically excluded from the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) requirements to prepare an environmental assessment (EA) or environmental impact statement (EIS). However, an EA has been prepared to facilitate a more thorough assessment of potential impacts on endangered and threatened species.

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Table of Contents

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION **4**

1.1 DESCRIPTION OF ACTION 4
1.1.1 Purpose and Need *4*
1.1.2 Research Objectives *7*
1.2 OTHER EA/EIS THAT INFLUENCE SCOPE OF THIS SUPPLEMENTAL EA (SEA) 8
1.3 SCOPING SUMMARY 8
1.4 FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS NECESSARY TO IMPLEMENTATION OF THE ACTION ... 9
1.4.1 National Environmental Policy Act *9*
1.4.2 Endangered Species Act *9*
1.4.3 Marine Mammal Protection Act *10*
1.4.4 Other Laws *11*

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION **11**

2.1 ALTERNATIVE 1 – NO ACTION 12
2.2 ALTERNATIVE 2 – PROPOSED ACTION (ISSUANCE OF PERMITS WITH STANDARD CONDITIONS) 12
2.2.1 Scott Kraus, File No. 14233 ..... *12*
2.2.2 Center for Coastal Studies, File No. 14603 ..... *17*

CHAPTER 3 AFFECTED ENVIRONMENT **25**

3.1 SOCIAL AND ECONOMIC ENVIRONMENT 26
3.2 PHYSICAL ENVIRONMENT 27
3.2.1 Areas of Biological or Ecological Importance to Right Whales *27*
3.2.2 Sanctuaries *29*
3.2.3 Essential Fish Habitat *30*
3.3 BIOLOGICAL ENVIRONMENT 30
3.3.1 Target Species: North Atlantic Right Whale *30*
3.3.2 Non-target Species *31*

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES **33**

4.1 EFFECTS OF ALTERNATIVE 1: NO ACTION 34
4.2 EFFECTS OF ALTERNATIVE 2: ISSUE PERMITS WITH STANDARD CONDITIONS 34
4.2.1 Effects to Physical Habitat *34*
4.2.2 Effects to the Biological Environment *34*
4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS 46
4.3.1 Endangered Species Act *46*
4.3.2 Marine Mammal Protection Act *46*
4.3.3 Other Laws *47*
4.4 COMPARISON OF ALTERNATIVES 47
4.5 MITIGATION MEASURES 47
4.6 UNAVOIDABLE ADVERSE EFFECTS 48
4.7 CUMULATIVE EFFECTS 48
4.7.1 Shipping and Ship Strikes *49*
4.7.2 Conservation Efforts *51*
4.7.3 Fishing Gear Entanglement *51*
4.7.4 Habitat Degradation *52*
4.7.5 Noise *53*
4.7.6 Contaminants *55*
4.7.7 Military Activities *55*
4.7.8 Climate and Ecosystem Change *56*
4.7.9 Energy Development *57*
4.7.10 Other Scientific Research Permits and Authorizations *59*

4.7.11 Summary of Cumulative Effects *63*
CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED **63**
LITERATURE CITED **64**
APPENDIX 1 ..... **70**

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 Description of Action

In response to requests from Dr. Scott Kraus, New England Aquarium, (File No. 14233), and the Provincetown Center for Coastal Studies (CCS; File No. 14603; Responsible Party: Richard Delaney), the National Marine Fisheries Service (NMFS), Office of Protected Resources, proposes to issue two scientific research permits that authorize "takes"[1] by "Level A and B harassment"[2] of marine mammals in the wild pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*) and the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). The permits would be valid for five years from the date of issuance.

1.1.1 Purpose and Need

The primary purpose of the permits is to provide an exemption from the take prohibitions under the MMPA and ESA to allow "takes" by "Level A and B harassment" of marine mammals, including endangered species, for *bona fide*[3] scientific research. The need for issuance of the permits is related to NMFS's mandates under the MMPA and ESA. Specifically, NMFS has a responsibility to implement both the MMPA and the ESA to protect, conserve, and recover marine mammals and threatened and endangered species under its jurisdiction. The MMPA and ESA prohibit takes of marine mammals and threatened and endangered species, respectively, with only a few very specific exceptions, including for scientific research and enhancement purposes. Permit issuance criteria require that research activities are consistent with the purposes and policies of these federal laws and will not have a significant adverse impact on the species or stock.

Under the ESA and MMPA, NMFS is responsible for the conservation and recovery of most endangered and threatened marine mammals. Scientific research is an important means of gathering valuable information about these species and is necessary to conserve them and promote their recovery. The following sections provide the purpose and need for each of the requested permits.

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1 Under the MMPA, "take" is defined as to "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect." [16 U.S.C. 1362(18)(A)] The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term "harm" is further defined by regulations (50 CFR §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering."

2 "Harass" is defined by regulation (50 CFR §216.3) 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 a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but does not have the potential to injure a marine mammal or marine mammal stock in the wild (Level B harassment)."

3 The MMPA defines bona fide research as "scientific research on marine mammals, the results of which – (A) likely would be accepted for publication in a refereed scientific journal; (B) are likely to contribute to the basic knowledge of marine mammal biology or ecology; or (C) are likely to identify, evaluate, or resolve conservation problems."

Scott Kraus, File No. 14233

The purpose of Dr. Kraus' research is to monitor the health and status of the North Atlantic right whale (*Eubalaena glacialis*) population. This would be accomplished through aerial and vessel surveys. Aerial surveys would occur for photo-identification, to prevent fatal encounters between right whales and shipping, or to assist disentanglement events or spot checks on unusual whale sightings involving aerial reconnaissance. These surveys are also the primary source of information on the annual right whale calf production of this population. Vessel surveys would collect information on the distribution, abundance, age, sex, health, reproduction, survival, and genetics of right whales through photo-identification, biopsy sampling, passive acoustic recordings and fecal sampling. By collecting photo-id data, and cataloging individual whales, researchers throughout the Atlantic can use the catalog data to track individuals, monitor reproduction and mortality, identify migrations, follow age and sex dependent behavior and habitat use patterns, and monitor health. Skin and blubber samples of right whales would be collected for studies on genetics, contaminants, disease, and energetics. Genetics studies include identifying carcass identity after mortalities, developing a full family tree for the population, determining the genetic constraints on reproduction and survival, and clarifying the evolutionary features of the right whale's reproductive system. Non-genetic biopsy samples would be used for health studies if animals have skin lesions or a history of disease. In addition, skin samples from younger whales would be used to develop immortal cell lines for testing the effects of contaminants on cellular reproduction, mutation, and survival. Additionally, blubber samples collected with each biopsy would be archived for contaminant content studies. Passive acoustic recordings allow researchers to associate whale calls with particular observed behaviors. Fecal samples would be collected to assess reproductive hormones, stress, parasites, red tide effects, diet composition, energetics, and nutrition. The import or export of right whale parts would allow samples to be archived for future genetic studies, comparative studies on genetics and disease, or to determine historic stock divisions, matrilineal history, historical habitat use, and historical feeding habits from genetic or radio-isotope analysis.

Biopsy Sampling Young Calves

Part of the proposed research includes biopsy sampling whales at least one month of age. The applicant provided the following justification and need for sampling young calves.

Photo-identification techniques have been the primary source of individual-specific data of right whales and is an important element in the recovery of this species. Objective 4.4.7 of the North Atlantic right whale recovery plan states that "as often as possible and where feasible, photo-identification photographs should be obtained at each sighting" and goes on to state that "photo-identification should be used as a standard data-collection tool during right whale surveys whenever possible" (NMFS 2005b). However, one group of right whales cannot be assessed in this way: calves that are not seen in known summer feeding/nursery areas. Although most calves are seen in the southeast U.S. calving grounds, they do not develop their callosity patterns until the latter half of their first year (Hamilton et al. 1998), and, therefore, cannot be photo-identified until they are observed in summer feeding/nursery areas. Approximately 40 percent of all calves are only seen in the southeast calving ground (when they are less than 6 months old), and they do not migrate to any other identified habitat area during their first year of life (Malik et al. 1999). Thus, the only time that these calves are seen is when they are in the southeast U.S. waters, when they are less than 6 months old before they develop identifiable markings. Because

these calves cannot be photo-identified, biopsy sampling is necessary to genetically identify these animals; and it is therefore not possible to collect samples from them at any other time of year when they are older. Although the remaining ~60 percent of the calves migrate to known habitat areas during the spring and summer months, the extreme heterogeneity in habitat use patterns between years (e.g. Malik et al. 1999; Brown et al. 2001) makes it almost impossible to predict which calves will or will not be seen later in the year. As a result, if these whales are seen later in life, when they are no longer associated with their mother, it is not possible to link them to a calving event or to their mother and the associated demographic information such as sex, age, and lineage-based calving histories is lost. Absent biopsy sampling, there is no method to link these calves back to a specific calving event; therefore, this information will be lost for almost half of the individuals in this species, greatly limiting the ability to assess and monitor trends over time. In addition, genetic profiles of these calves and their mothers allow us to refine our assessments of population structure and habitat use patterns (which are linked to matrilineal site fidelity – Frasier et al. 2007a). Given the uncertainties in juvenile sighting probabilities, the most efficient approach (both financially and temporally) is therefore to collect samples from calves of at least one month of age in the calving ground, the only habitat area where the majority of calves are observed (Kraus et al. 1986). Although NMFS Northeast Fisheries Science Center (NEFSC) has a permit for collecting calves under the age of 6 months in the southeastern United States, Dr. Kraus' request anticipates additional calving outside of the primary southeastern calving ground, the inadequacy of a single permitted biopsy team in the southeastern United States (given that some calves are born outside the southeastern critical habitat in the Carolinas and northward), as well as increases in calf production beyond the current NEFSC permit levels. Calf production in 2009 (39 whales) has already exceeded the 35 annual permitted takes for calves by NMFS NEFSC (Permit No. 775-1875-01). It is also important to note that missed sampling attempts count against this take number, thereby reducing the number of successful samples that can be collected. Therefore in order to sample each new calf, Dr. Kraus' proposed biopsy sampling of this age class needs to be authorized.

Molecular methods can be used to link the genetic profiles from whales of unknown age to the profiles of calves that were sampled but not photographically identified in the calving ground. If samples are collected from calves while in the calving ground, individual-specific genetic profiles of those calves are generated (Frasier 2005). Then, when these whales are seen later in their lives and a sample is collected, it is possible to compare these genetic profiles to those from sampled calves of previous years, and therefore genetically link a specific calving event to a whale that was not photo-identified as a calf. This approach makes it possible to obtain all of the demographic data associated with a calving event, and will prevent the loss of these life history data for almost half of the whales in this species. As a result, using the photo-identification data in association with the genetic data will allow for the fine-scale monitoring necessary to assess and monitor trends in this species through time, which is recognized as one of the main objectives of the right whale recovery plan (NMFS 2005). Molecular methods can also be used to improve estimates of population size through the genetic inference of individuals. Paternity analysis of all sampled mother-calf pairs from 1980 through 2001 revealed that only 45 percent of the fathers had been genetically sampled (Frasier et al. 2007b). Analyses are currently underway to use these data to develop a robust correction factor for use in population estimation, but this finding would not have been possible without cow-calf biopsy sampling. Therefore,

sampling of young calves can identify males in the population and help to further refine population estimates.

Center for Coastal Studies, File No. 14603
The purpose of CCS' research is to monitor demographics, life history traits, habitat use, and behavior of North Atlantic right whales in the Gulf of Maine. Aerial surveys would be conducted for photo-identification and behavioral observation. Vessel surveys would be conducted for photo-identification, behavioral observation, and collection of prey. Habitat sampling during vessel surveys would support habitat quality assessment, forecasting of whale distribution, and determination of foraging behavior and depth selection that exposes whales to risk of ship strike or entanglement. Suction-cup tags would be attached to adults or juveniles to study diving patterns and compare them to vertical distribution and migration of food layers to define shifting patterns of ship strike and entanglement risk associated with feeding behavior. Research results would provide a better understanding of right whale population status, relationship to habitat conditions, distribution and abundance, movement patterns, and interactions with human activities. Data would be provided to management agencies, including NOAA Fisheries and the Massachusetts Division of Marine Fisheries, for near-real-time dynamic management of right whale habitat, and long-term refinement of conservation and recovery plans. CCS' aerial surveys provide the majority of the data for the NMFS Sighting Advisory System (SAS) in the northeast during the winter.

1.1.2 Research Objectives

The objectives of Dr. Kraus' proposed research are to: 1) determine whether the North Atlantic right whale population is growing, declining, or remaining stable; 2) determine whether human impacts, including fishing, shipping, pollution, red tides, parasites, diseases, and acoustic disturbance, are affecting health, reproduction, and survival of this species; 3) determine whether natural perturbations, including climate change, are affecting health, reproduction, and survival of this species; and 4) determine if individual variability in health, reproduction, survival, and behavior is dependent upon habitat use preferences, behavior, genetics, and/or movement patterns.

The objectives of CCS' proposed research are to: 1) document North Atlantic right whales in the Cape Cod Bay Right Whale Critical Habitat area and adjacent waters and collect information on the age, sex, reproduction, distribution, abundance, and residency patterns in Cape Cod bay to refine long-term, range-wide analyses of sources of mortality, incidence of scarring, demographics, and predictability of occurrence; 2) provide sighting data to NMFS' SAS to reduce the probability that right whales will be killed by collisions with large vessels; 3) monitor right whales for evidence of entanglement; 4) collect food resource data to provide information on food conditions that cue movements and activities of right whales in Cape Cod Bay and adjacent waters and forecast whale movements and residency times; and 5) describe the diving patterns of right whales as related to vertical distribution and migration of food layers to define the shifting patterns of risk associated with feeding behavior. Data would be collected on the distribution and abundance of other marine mammals and shipping activity in Cape Cod Bay and adjacent waters incidental to right whale research.

1.2 Other EA/EIS that Influence Scope of this EA

On October 17, 2005, NMFS issued a notice of intent to voluntarily prepare an EIS (70 FR 60285) for issuance of permits for research on Northern right whales, in order to consider long-range planning needs and efficiencies in the permitting process. In accordance with NEPA and its implementing regulations at 40 CFR Section 1506.1, nothing precludes NMFS from issuing permits in the interim while the EIS is being developed. NMFS is evaluating the applicants' requests for right whale research to determine whether the action would result in significant impacts to the species or other portions of the environment.

1.3 Scoping Summary

The purpose of scoping is to identify the issues to be addressed and the significant issues related to the proposed action, as well as identify and eliminate from detailed study the issues that are not significant or that have been covered by prior environmental review. An additional purpose of the scoping process is to identify the concerns of the affected public and Federal agencies, states, and Indian tribes.

The MMPA and its implementing regulations governing issuance of special exception permits for scientific research (50 C.F.R. §216.33) require that, upon receipt of a valid and complete application for a new permit, NMFS publish a notice of receipt in the *Federal Register*. The notice summarizes the purpose of the requested permit and invites interested parties to submit written comments concerning the application.

A Notice of Receipt was published in the *Federal Register*, announcing the availability of Dr. Kraus' application for public comment (74 FR 46570, September 10, 2009). NMFS received two comments, one of which opined that we deny the request. However, the commenter did not provide substantive information to support the request to deny and did not contact the Permits Division for additional information. The other commenter does not oppose the proposed permit but raised concern about the level of effort and coordination among the scientific community to biopsy sample the species. However, North Atlantic right whale research and sampling is a well-coordinated effort among all North Atlantic right whale researchers (see Ch.4 for details). Given the degree of coordination and the increase in right whale calving rates in recent years, Dr. Kraus' proposed biopsy sampling is warranted. The receipt of these comments is not considered indicative of a high degree of controversy regarding this proposed action.

A Notice of Receipt was published in the *Federal Register*, announcing the availability of CCS' application for public comment (74 FR 54959, October 26, 2009). NMFS received one comment, which opined that we deny the request. However, the commenter did not provide information to support the request to deny and did not contact the Permits Division for additional information.

Concurrently, pursuant to 50 CFR §216.33 (d)(2), the applications were sent to the Marine Mammal Commission (MMC) for review. The MMC did not provide comments on either request but asked how this request would be analyzed in reference to the EIS being developed. Section 1.2 lays out how this is being handled.

1.4 Federal Permits, Licenses, and Entitlements Necessary to Implementation of the Action

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the Proposed Action, as well as who is responsible for obtaining them. Even when it is the applicant's responsibility to obtain such permissions, NMFS is obligated under NEPA to ascertain whether the applicant is seeking other federal, state, or local approvals for their action.

1.4.1 National Environmental Policy Act

The National Environmental Policy Act was enacted in 1969 and is applicable to all "major" federal actions 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 permits for research represents approval and regulation of activities. While NEPA does not dictate substantive requirements for permits, licenses, etc., it requires consideration of environmental issues in federal agency planning and decision making. The procedural provisions outlining federal agency responsibilities under NEPA are provided in the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508).

NMFS has, through NOAA Administrative Order (NAO) 216-6, established agency procedures for complying with NEPA and the implementing regulations issued by the Council on Environmental Quality. NAO 216-6 specifies that issuance of scientific research permits under the MMPA and ESA is among a category of actions that are generally exempted (categorically excluded) from further environmental review, except under extraordinary circumstances. When a proposed action that would otherwise be categorically excluded is the subject of public controversy based on potential environmental consequences, has uncertain environmental impacts or unknown risks, establishes a precedent or decision in principle about future proposals, may result in cumulatively significant impacts, or may have an adverse effect upon endangered or threatened species or their habitats, preparation of an EA or EIS is required.

While issuance of scientific research permits is typically subject to a categorical exclusion, as described in NAO 216-6, NMFS is preparing an EA for this action to provide a more detailed analysis of effects to ESA-listed species. This EA is prepared in accordance with NEPA, its implementing regulations, and NAO 216-6.

1.4.2 Endangered Species Act

Section 9 of the ESA, as amended, and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption such as by a permit. Permits to take ESA-listed species for scientific purposes, or for the purpose of enhancing the propagation or survival of the species, may be granted pursuant to Section 10(a)(1)(A) of the ESA.

NMFS has promulgated regulations to implement the permit provisions of the ESA (50 CFR Part 222) and has produced Office of Management and Budget-approved application instructions that prescribe the procedures necessary to apply for permits. Applicants must comply with these regulations and application instructions in addition to the provisions of the ESA.

Section 10(d) of the ESA stipulates that, for NMFS to issue permits under section 10(a)(1)(A) of the ESA, the Agency must find that the permit: was applied for in good faith; if granted and exercised will not operate to the disadvantage of the species; and will be consistent with the purposes and policy set forth in Section 2 of the ESA.

Section 2 of the ESA sets forth the purposes and policy of the Act. The purposes of the ESA are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in section 2(a) of the ESA. It is the policy of the ESA that Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA. In consideration of the ESA's definition of conserve, which indicates an ultimate goal of bringing a species to the point where listing under the ESA is no longer necessary for its continued existence (i.e., the species is recovered), exemption permits issued pursuant to section 10 of the ESA are for activities that are likely to further the conservation of the affected species.

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 adversely modify critical habitat. NMFS issuance of a permit affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these Section 7 consultation requirements. Section 7 requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. NMFS is further required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of habitat for such species. Regulations specify the procedural requirements for these consultations (50 Part CFR 402).

1.4.3 Marine Mammal Protection Act

The MMPA prohibits takes of all marine mammals in the United States (including territorial seas) with a few exceptions. Permits for bona fide scientific research on marine mammals, or to enhance the survival or recovery of a species or stock, issued pursuant to section 104 of the MMPA are one such exception. These permits must specify the number and species of animals that can be taken, and designate the manner (method, dates, locations, etc.) in which the takes may occur. Section 104 also allows bona fide scientific research that would result only in taking by Level B harassment of marine mammals under a General Authorization. NMFS has sole jurisdiction for issuance of such permits and authorizations for all species of cetacean, and for all pinnipeds except walrus[4].

NMFS may issue a permit or authorization pursuant to section 104 of the MMPA to an applicant who submits with their application information indicating that the taking is required to further a bona fide scientific purpose. An applicant must demonstrate to NMFS that the taking will be consistent with the purposes of the MMPA and applicable regulations. If lethal taking of a marine mammal is requested, the applicant must demonstrate that a non-lethal method of

[4] The U.S. Fish and Wildlife Service has jurisdiction for walrus, polar bears, sea otters, and manatees.

conducting research is not feasible. NMFS must find that the manner of taking is "humane"[5] as defined in the MMPA. In the case of proposed lethal taking of a marine mammal from a stock listed as "depleted" NMFS must also determine that the results of the research will directly benefit the species or stock, or otherwise fulfill a critically important research need.

NMFS has promulgated regulations to implement the permit provisions of the MMPA (50 CFR Part 216) and has produced OMB-approved application instructions that prescribe the procedures (including the form and manner) necessary to apply for permits. Applicants must comply with these regulations and application instructions in addition to the provisions of the MMPA.

1.4.4 Other Laws

National Marine Sanctuaries Act (NMSA): The NMSA (32 U.S.C. 1431 *et seq.*) authorizes the Secretary of Commerce to designate and manage areas of the marine environment with special national significance. The National Marine Sanctuary Program, operating under the NMSA and administered by NOAA's National Ocean Service (NOS) has the authority to issue special use permits for research activities that would occur within a National Marine Sanctuary. Obtaining special use permits is the responsibility of individual researchers. However, as a courtesy, the Office of Protected Resources consults with NOS when proposed research would occur in or near a National Marine Sanctuary.

Convention on International Trade in Endangered Species of Wild Fauna (CITES): CITES is an international agreement between governments with the goal of ensuring that international trade in specimens of wild animals and plants does not threaten their survival. All import, export, re-export and introduction from the sea of species covered by CITES has to be authorized through a licensing system. In the United States, the Fish and Wildlife Service is the Management Authority for CITES. Obtaining CITES permits is the responsibility of individual researchers.

Animal Welfare Act (AWA): The AWA (7 U.S.C. 2131 – 2156) sets forth standards and certification requirements for the humane handling, care, treatment, and transportation of mammals. Enforcement of these requirements for non-federal facilities is under jurisdiction of the U.S. Department of Agriculture's Animal and Plant Health Inspection Service. Each research facility is required to establish an Institutional Animal Care and Use Committee (IACUC) which reviews study areas and animal facilities for compliance with the AWA standards. The IACUC also reviews research protocols and provides written approvals for those that comply with AWA requirements. For federal research facilities, the head of the federal agency is responsible for ensuring compliance with the AWA requirements. It is the responsibility of the researcher to seek and secure IACUC reviews and approvals for their research.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objective, as well as alternatives eliminated from detailed study. This chapter also summarizes the expected outputs and any related mitigation of each alternative.

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[5] The MMPA defines humane in the context of the taking of a marine mammal, as "that method of taking which involves the least possible degree of pain and suffering practicable to the mammal involved."

One alternative is the "No Action" alternative where the proposed permit would not be issued. The No Action alternative is the baseline for rest of the analyses. The Proposed Action alternative represents the research proposed in the submitted application for a permit, with standard permit terms and conditions specified by NMFS.

2.1 Alternative 1 – No Action

Under the No Action alternative, permits would not be issued for the activities proposed by the applicants. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, it would not allow the research to be conducted and the opportunity would be lost to collect information that would contribute to better understanding North Atlantic right whales and provide information to NMFS that is needed to implement NMFS management activities. This alternative would have no influence on other scientific research permit requests received by NMFS Office of Protected Resources (NMFS PR). Current research permits would remain active and NMFS PR would continue to evaluate new permit requests as they are received, including any requests from the applicants. Further, this action would not set a precedent for basing decisions on future permit requests.

2.2 Alternative 2 – Proposed Action (Issuance of Permits with Standard Conditions)

Under the Proposed Action alternative, a five-year research permit would be issued for activities as proposed by each applicant, with the permit terms and conditions standard to such permits as issued by NMFS.

2.2.1 Scott Kraus, File No. 14233

Dr. Kraus' permit would authorize scientific research on North Atlantic right whales in the U.S. Exclusive Economic Zone (EEZ) from Florida to Maine during vessel and aerial surveys. It would also authorize right whale tissues and parts to be received, imported from or exported to other researchers around the world.

Action Area

Dr. Kraus' permit would authorize research in the U.S. EEZ from Florida to Maine, bounded by the Hague Line to the north, the Gulf of Mexico to the south, the U.S. coastline to the west, and the boundary of the EEZ to the east (see Appendix 1 for map). Corresponding map coordinates that define this area are:

North latitude: 44°54' N	East longitude: 66°50' W
South latitude: 24°30' N	West longitude: 81°42' W

Dr. Kraus' study area is composed of three parts: New England waters, mid-Atlantic waters, and the Southeastern United States. He may work in three areas of right whale critical habitat within his study area (see Ch. 3 for more information).

Table 1. Proposed annual take activities under Permit No. 14233 during vessel surveys in the North Atlantic U.S. EEZ from Florida to Maine.

Species	Listing Stock	Life Stage	Expected Takes[6] or Number of Samples to be Imported/Exported	Procedures	Details
North Atlantic right whale *Eubalaena glacialis*	Western Atlantic Stock	All	20	Acoustic, passive recording; Count/survey; Observations, behavioral; Photo-id; Photograph/Video; Sample, skin and blubber biopsy	Calves ~ 1 month old; if < 20 calves are sampled in a year, remaining takes may be used for older (non-calf) animals.
		Adult/ Juvenile	30	Acoustic, passive recording; Count/survey; Observations, behavioral; Photo-id; Photograph/Video; Sample, skin and blubber biopsy	
		All	2,000	Acoustic, passive recording; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	
	Range-wide	All	50	Import/export/receive parts	
To comply with regulations (50 CFR 224.103) prohibiting approaches within 500 yards of North Atlantic right whales without a permit, the permit would authorize right whale aerial surveys flown at 1,000 feet (333 yds) with brief circling no lower than 900 ft. Take numbers are not required for this activity.					

6 Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually in each row of the table. If any animal is harassed more than once during research, each additional attempt (i.e., take) reduces the number of total takes remaining. E.g., if two *attempts* were required to tag an animal for which 10 annual *takes* are authorized, the researcher has used 2 takes and has 8 takes remaining

Aerial Surveys
Dr. Kraus would operate aerial surveys in the southern most portion of his study area: waters off the Southeast United States. Surveys would use Cessna Skymasters, a high-wing twin-engine aircraft flown at 1,000 feet (ft) (333 yards) at approximately 100 knots. Transect lines would be spaced 3 nm apart. All southeastern aerial surveys would use two pilots, two observers, and an electronic data logger. At each right whale sighting, the aircraft would break track and descend to no lower than 900 ft to circle the animal, record the location, and to take photographs for individual identification. Right whale locations would be transmitted in near-real time through the Early Warning System to all inbound and outbound shipping. When photographs and locations have been obtained, the aircraft would return to the trackline at the point of departure and resume the survey.

Under MMPA regulations, cetacean surveys conducted at this altitude do not typically require permitting because the activity is not expected to result in harassment of animals. I.e., surveys at 1,000 ft may be conducted without a Letter of Confirmation under the General Authorization. Consistent with these regulations and NMFS marine wildlife viewing guidelines, given the proposed altitude of surveys, NMFS does not expect that Dr. Kraus' aerial surveys would result in harassment, or takes, of right whales. However, ESA regulations at 50 CFR 224.103 prohibit approaches, by vessel or aircraft, within 500 yards of right whales without a scientific research permit. The approach regulations do not state at what distance a 'take' of a right whale would occur. In order to comply and be consistent with both MMPA and ESA regulations, Permit No. 14233 would authorize the proposed aerial surveys to occur; but no actual take numbers would be associated with the activity. Essentially, NMFS does not expect the surveys to result in take under the ESA or MMPA but would provide the authority under Permit No. 14233 to conduct the surveys to comply with right whale approach regulations.

Vessel Surveys
Shipboard surveys would be conducted in the U.S. EEZ waters from Florida to Maine. Photographic identifications of right whales would be collected on all surveys, and would be frequently supplemented by biopsy sampling or other activities that address multiple studies. Several types of vessels would be used including a 17ft zodiac with an outboard Honda engine, a 21 ft center console Mako with an outboard Honda engine, a 30 ft Dyer Bass boat with an inboard diesel engine, and a 46 ft Jarvis Newman with an inboard diesel engine. Both the Zodiac and the Mako would be trailered to specific locations for rapid response. Shipboard surveys would usually take place along pre-determined tracklines, and at least two observers keep watches during all daylight hours. Data on all sightings would be recorded using electronic data loggers. At each right whale sighting, the vessel would leave the track to approach and photograph the animal. Details on approaches are given under specific sampling activities below. Collected data would be pooled with past data from multiple years, use re-sampling methods (e.g. Monte Carlo simulations), and other modeling approaches to answer significant demographic questions.

Photo-identification during Vessel and Aerial Surveys
Photographic identification (photo-id) is the accepted method for collecting information on individual right whales. Photographs will be collected from both ships and aircraft. Photographs of the callosity patterns on the heads of right whales would be used to identify individuals.

Supplementary photographs would be taken of the tails and bodies, as well as any unusual scars or markings. Photographic data will be added to the North Atlantic right whale catalog and entered into the right whale consortium database curated by Dr. Robert Kenney at the University of Rhode Island.

During vessel surveys, researchers would attempt to approach and photograph all right whales; if the entire population were seen each year, up to 450 right whales would be photographed annually. A small percentage of individual right whales may be photographed up to ten times in a given year. To yield good photographs that can be used for photo-identification of individuals, researchers would minimize their impact on each whale's behavior as they approach so it will not swim away. From ships, a slow, converging course technique is used to get between 20 and 100 meters alongside an animal for photographs. Researchers would limit attempts to three breathing sequences of the whale; if it demonstrates avoidance all three times, they would break off any photographic attempts. This generally limits photographic encounters with any right whale to less than 30 minutes in a day.

For aerial surveys, the aircraft would circle over the whale at altitudes around 1,000 ft (no lower than 900 ft) for photographic purposes, until good photographs of the callosity patterns on the heads are obtained. The three breathing sequence rule would be applied, so that encounters are typically 30 minutes. Encounters would be documented on electronic logging systems.

Biopsy Sampling

Dr. Kraus would be authorized 50 annual takes to biopsy sample right whales: 20 takes for new whales (calves approximately one month old or older), 10 takes for whales (juveniles and adults of both sexes) in the population who have not been previously sampled, and 20 takes for whales (juveniles and adults of both sexes) for other studies. If researchers are unable to sample 20 calves (assuming each attempt is successful) each year, remaining takes would be used for sampling older animals. The latter 20 takes for 'other studies' includes samples for cell line growth, lesion and health assessments, and/or contaminant sampling. In these cases, the number of samples required are dictated by either the condition of an individual whale, or by the minimum number of demographic classes need to sample a representative of each age (2), sex (2), and haplotype (5), in other words, 20 whales. With regard to sampling for genetics, Dr. Kraus' goal is to minimize these by sampling primarily unsampled right whales (10 takes), since once sampled adequately, an individual's genetic record is permanently archived. Researchers intend to collect only one sample from a given whale per year. When appropriate, biopsy samples would be subsampled to accommodate multiple study requirements while minimizing harassment to the species.

To collect biopsy samples, vessel approaches would be made at an idling speed on a converging course with the whale (never directly toward or from behind the whale). Early in the approach, attempts would be made to make a field identification of the individual to determine if it is an individual that needs to be biopsied--if the identification shows previous biopsies have been collected, no biopsy attempt would be made for genetic purposes. Other biopsy sampling would be made on the basis of individual whale condition (i.e., a whale with skin disease) and/or study requirements (i.e. a juvenile whale appropriate for cell lines). Dr. Kraus' biopsy sampling experience is over 90 percent successful in collecting samples. If a biopsy attempt is missed,

researchers would attempt to sample that whale again. No whale would be biopsied more than once per year, and where possible, researchers would subsample each biopsy for multiple studies. Biopsy attempts would be made from distances of 5 to 15 meters using crossbows and small diameter darts fitted with biopsy tips. Surgical stainless steel biopsy tips would be 0.7mm in diameter and 2.5 cm deep, and fitted with a stop-collar backing to prevent deeper penetration. Whales would be darted in conjunction with approaches for photo-identification. Darting would always follow photo-identification efforts to ensure the animal is identified in any future analysis and to reduce unnecessary darting of previously sampled individuals.

Skin biopsies would be preserved immediately in a saturated brine solution and DMSO. For certain pathological or contaminant sampling, samples would be frozen or stored on ice in sterile containers for shipment and storage. Sample labeling would be integrated with the photo-identification labeling system, and samples would be shipped to the relevant collaborating laboratories as soon as the field schedule and CITES procedures (if needed) allow. Research vessel approaches to the whales will follow slow-moving and gradual approach procedures designed to minimize disturbance.

Passive Acoustic Recording
Occasionally, during vessel surveys researchers would drop a hydrophone into the water to listen for right whale calls associated with particular behaviors. These recordings would be done while the vessel is shut down, and generally last less than an hour.

Fecal Sampling
Fecal sampling would not require approaching animals directly, as usually the sample is left floating at the surface after the whale is gone. Researchers would not attempt to contact whales to collect samples. Sampling could occasionally occur within 100 yards of an animal, particularly if a known individual has defecated nearby. Samples could be collected from any right whale during vessel surveys in association with other activities that do not involve physical contact, such as photo-identification and passive acoustic recordings. Samples would be collected from a stationary boat with a handheld 333-micron mesh dip net.

Receipt, Import or Export of Parts
Right whale biopsy samples collected in the United States would be exported to Trent University in Canada for genetic analysis. Shipments would be handled by courier, and all applicable hazmat standards for dry-ice shipments would be met. After use, right whale samples would be archived indefinitely at -80° C for future genetic studies or destroyed. Biopsy samples from other North Atlantic groups of right whales could be imported from other researchers for comparative studies on genetics and disease. Historic samples of right whale bones or baleen (or bones/baleen that may potentially be from right whales) could be imported or exported to determine historic stock divisions, matrilineal history, historical habitat use, and historical feeding habits from genetic or radio-isotope analysis.

Mitigation Measures
Conditions would be included in the permit to mitigate potential impacts to right whales and other protected species during research. This includes the following:

- taking precautions to minimize disturbance to mother-calf pairs of right whales;

- limiting the number of times an individual can be harassed in a day;
- preventing approaches to young calves that appear unhealthy;
- terminating aerial circling if animals respond to the aircraft;
- avoiding repeated sampling of an individual;
- terminating sampling if an animal exhibits repetitive strong adverse reactions;
- using trained and experienced personnel to minimize disturbance;
- using sterile or appropriately sanitized equipment to sample whales; and
- remaining a safe distance from non-target protected species.

In addition, Dr. Kraus has identified the following practices to minimize the potential for harassment, serious injury or mortality of right whales during research. During vessel approaches, boat speeds would be constant and as slow as possible, and vessel encounter trajectories would be from the side and are slowly convergent with the whale. These methods habituate the whale to the immediate presence of the vessel, and cause minimal (if any) alteration of behavior. For biopsy activities, Dr. Kraus would minimize the number of samples needed by identifying individual whales before darting, cross referencing the id to determine if a whale has been darted, and minimizing or eliminating repeat dartings of each known (identified) whale. When animals are darted, researchers usually would divide a single sample several times for multiple studies, further minimizing the need for frequent biopsy sampling. Biopsy darts would be only used once per day on a single animal to minimize any chance of infection or contamination. Used biopsy tips would be returned to the field station each day, washed and disinfected in a 30-second bath of 5.25 percent sodium hypochlorite. At the end of each field season, all biopsy tips would be steam autoclaved.

For aerial surveys in the southeastern United States, coordination of activities occurs on a daily basis between all right whale research teams in the area. All biopsy darting is done selectively through a photo-identification effort by the New England Aquarium that identifies the cow and calves that have been darted in a given year, and coordinates with the biopsy and aerial survey teams in the area on a daily basis to identify cows whose calves have not yet been darted. Darting teams are then contacted from the aircraft to coordinate sampling of animals that are not yet biopsied. The right whale research community is a small one, and all scientists know each other. Coordination of efforts in other habitats is done by email and phone as right whales move through the different habitats. However, in most habitats Dr. Kraus expects to be the only research team in the area at that time.

2.2.2 Center for Coastal Studies, File No. 14603

CCS' permit would authorize scientific research on North Atlantic right whales in the Gulf of Maine during vessel and aerial surveys, habitat sampling, and suction cup tagging.

<u>Action Area</u>

CCS' permit would authorize research in the Gulf of Maine throughout the year; research activities would primarily occur in Cape Cod Bay (CCB), including Cape Cod Bay Critical Habitat, and within 100 km of Cape Cod during right whale residency (December to May).

Aerial and vessel surveys, including habitat sampling, would occasionally occur in the Great South Channel Critical Habitat if other institutions are not collecting sighting and habitat information. Tagging efforts would be limited to CCB and the vicinity. Tagging would not occur in the Great South Channel or in the northern and eastern Gulf of Maine.

Weather, levels of human activities, whale behavior, movement and composition of the calanoid resource, funding levels, and large-scale patterns of whale movement not defined by food distribution would direct the duration, focus, and extent of efforts.

Table 2. Activities authorized annually under Permit No. 14603 during vessel and aerial surveys in the Gulf of Maine.

Species	Life Stage	Authorized Take*	Observe/ Collect Method	Procedures	Details
Whale, right, North Atlantic	All	700	Survey, aerial	Observations, behavioral; Photo-id	
Whale, right, North Atlantic	All	350	Survey, vessel	Acoustic, sonar for prey mapping; Observations, behavioral; Other; Photograph/Video	"Other" = plankton collections by net or pump
Whale, right, North Atlantic	Adult/ Juvenile	20	Survey, vessel	Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-id	Maximum 10 successful tag attachments annually; individuals may be tagged up to 3 times annually
Whale, unidentified baleen	All	20	Survey, vessel	Incidental harassment; Observation, monitoring; Photo-id	Harassment incidental to right whale surveys; opportunistic ID photos may be taken; intended for humpback, fin, and minke whales
Whale, unidentified baleen	All	20	Survey, aerial	Incidental harassment; Observation, monitoring	Harassment incidental to right whale surveys; intended for humpback, fin, and minke whales

*Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually in each row of the table. If any animal is harassed more than once during research, each additional attempt (i.e., take) reduces the number of total takes remaining. E.g., if two *attempts* were required to tag an animal for which 10 annual *takes* are authorized, the researcher has used 2 takes and has 8 takes remaining.

Aerial Surveys

Aerial surveys would be flown in either a Cessna 336 (Skymaster) or 337, both high-wing twin-engine aircraft, at 750 ft (229 m) altitude at approximately 100 knots using methodology developed by the Cetacean and Turtle Assessment Program (CETAP 1982; Scott and Gilbert 1982) and adapted for right whale surveys by the North Atlantic Right Whale Consortium (NARWC). Survey track lines would typically be spaced at 1.5 nm (2.8 km) intervals to provide 100 percent coverage of the study area and thus maximize the potential to detect right whales. Surveys would be flown in sea conditions up to and including Beaufort sea state 4. Surveys would be aborted in Beaufort sea state 5 and/or when visibility decreases below two miles in fog, rain, or snow.

Aerial surveys would be conducted using two pilots, two observers, and an electronic data logger. All sightings of marine animals except birds would be recorded. At every sighting, the observers would record species, reliability of species identification, and the number of animals. Sightings identified as species other than right whales would be counted, logged, and passed without breaking the track line. CCS would not circle over other large whale species unless they are associated with target right whales. Based on past surveys, other species are rarely in such close association with right whales. Survey and sighting data would be submitted to the North Atlantic Right Whale Consortium (NARWC) database maintained at the University of Rhode Island (URI) (Kenney 2001).

At each right whale sighting, and at rare sightings of large whales not immediately identified to species, the aircraft would break track to circle the animal, record the location, and take photographs for individual identification. Right whale locations would be transmitted in near-real time through the NMFS' SAS to all inbound and outbound shipping. For each right whale sighting, the plane would circle while observers obtain accurate counts, observe and document behavior, and take photographs for individual identification. The average amount of time spent circling an individual right whale for photo-identification would be 15-20 minutes. The plane would generally leave an individual after 30 minutes, regardless of whether good identification photographs have been obtained. At the conclusion of photographic effort at each sighting, the aircraft would return to the track line at the point of departure indicated by the GPS position recorded in the log. If entangled right whales are spotted during surveys, the aircraft would circle for extended periods of time. In the past, CCS has circled an entangled whale for up to 3 hours.

The entire population of right whales would be harassed annually during aerial surveys. To account for population growth over the life of the permit and the potential for some individuals to be harassed multiple times (up to ten) annually, a total of 700 annual "takes" by harassment would be authorized by Permit No. 14603. Other baleen whale species that would be incidentally harassed during right whale surveys include humpback (*Megaptera novaeangliae*), minke (*Balaenoptera acutorostrata*), and fin whales (*B. physalus*). Most sightings of these species would not involve approach or circling because they can be identified from outside of 100 yards. CCS anticipates that less than two sightings per survey would involve an approach of a non-target balaenopterid to determine species. Permit No. 14603 would authorize the harassment of up to 20 unidentified baleen whales each year. Annual reports would require a description of the number of animals of each species approached annually.

Planned surveys would occur from December to May, but the permit would authorize surveys year-round for response to entanglements or out-of-season sightings. Approximately 175 flight hours would be conducted annually; the number of annual surveys would depend on the duration of each survey. A full survey of CCB takes 4 hours if no whales are sighted; duration would increase as more whales are encountered.

Vessel Surveys

Shipboard surveys would be conducted using one of two CCS research vessels: the 40' twin diesel engine R/V Shearwater or the 40' twin outboard engine R/V Ibis. Although it is unlikely that any other vessel would be used for the principal study in Cape Cod Bay, other potential platforms include twin engine outboard vessels between 17-30 feet and single or twin inboard diesel powered vessels up to 45 feet in length. Shore-launched inflatable vessels also could be used in the case of an aggregation of whales sighted off beaches that are difficult to access during periods of heavy weather in winter time. The R/V Shearwater is the only boat CCS anticipates using in the foreseeable future.

Surveys would be conducted at a speed of 12 knots or less, in sea state of Beaufort four or less and in visibility of greater than two km. Vessel surveys would follow designated track lines. Three to five experienced right whale researchers would conduct the surveys, and the vessel would be operated by an experienced captain. Observer positions would include a helmsperson, a data recorder, and two observers on watch supplemented by one or two relief observers. As needed, watch positions would be rotated to reduce fatigue and exposure to cold. The two observers would be positioned on the flying bridge or at the bow. Each observer would scan the water surface from the bow to the port or starboard, respectively, to a perpendicular distance of three nm.

When right whales are sighted, the vessel would approach for photo-identification purposes. Approaches would be conducted from the side at slow or idle speed (< 4 knots) with no sudden changes in vessel speed or direction. Photographs would be taken from a distance of 10 to 100 meters. When possible, photographs would be taken of both sides of the head. The amount of time taken to photograph a whale from the vessel would be limited to the minimum time required to secure photographs of sufficient quality for individual identification. All sightings of marine animals would be counted and recorded. The location of each sighting would be determined using a GPS navigation system. Sighting data from the shipboard surveys would be submitted to the NARWC database.

If right whales are sighted from the vessel or during aerial surveys, habitat sampling might occur as described below if time allows, particularly of calanoids that are causing the aggregation of whales.

During the regular season of right whale residency in CCB not more than two vessel surveys and three aerial surveys each week are likely, dependent on weather conditions.

Habitat Sampling and Prey Mapping

Habitat research would be conducted from the 40' twin diesel engine R/V Shearwater or R/V Ibis; however, other vessels of similar size and type (described under *Vessel Surveys*) would

occasionally be used. The primary objective of these cruises is right whale food resource sampling; surveys would focus on sampling zooplankton in the CCB area to assess the quality of the food resource that dictates the locations where right whales are or will be, and to report forecasts from recently developed computer modeling and analysis to the state and federal agencies with recommendations regarding action, if necessary. The majority of the surveys would focus on areas where right whales are not present; samples would be collected from the wider CCB environment at stations that have been sampled since 1984 or using vessel-based food resource sampling equipment. Some sampling efforts would be directed at locations where right whales are aggregated.

Right whales would be approached opportunistically, using the methods described under *Vessel Surveys*, for photo-identification purposes and to check for entanglements during sampling and on transits to and from sampling sites. Data collection would include the recording of survey tracks, behavior and location of whales observed during cruises, and opportunistic photographic identification.

The R/V Shearwater is equipped with oceanographic and food resource sampling equipment including a CTD (conductivity, temperature, and depth) recorder, plankton nets, and vertical plankton pump. A Remote Sampling Sensor Package (RSSP), composed of a tow-body (Acrobat II) and a seabird SBE 19 CTD/flourometer/incident light PAR meter package multiplexed with an Optical Plankton Counter, would be used to document oceanographic conditions and to enumerate zooplankton food resources in right whale habitats. Conditions in the upper 50 meters of the water column throughout the habitats under study (with a focus on CCB) would be documented. The data collected using the RSSP would be compared with data from up to 18 fixed stations, established for sampling in 1984, to develop a profile of the food resources that support right whales and control the distribution and occurrence of the whale population in the Cape Cod region.

The RSSP would be towed at 2-6 knots behind R/V Shearwater. The depth of the sampling in the upper 50 meters of the water column would be controlled by computer commands from the vessel. The tow pattern of the RSSP would be determined by both incoming real-time data and by the overall goal of developing a synoptic description of the resources controlling the health and success of the right whales. The RSSP would generally not be towed within 1 km of right whales. The equipment used would allow an accurate assessment of food resources in the vertical and horizontal planes. These data would be used to continue to refine understanding of the characteristics of the habitat to which right whales respond and to provide the foundation for predicting occurrence and distribution patterns of the whales that may be used in forecasting locations and times of risk of ship strike and entanglement. Sampled variables that have previously been and would continue to be used to characterize patterns of habitat use and to forecast exposure of whales to anthropogenic risk include:

- zooplankton counted to lowest taxon (1984 to present) over 13,000 samples,
- CTD data to demonstrate basic oceanographic conditions, and
- associated behavioral and distributional information that indicate the quality of the habitat and the patterns of habitat use.

Zooplankton sampling would be conducted using techniques and equipment identical to those used in CCB since 1984 and summarized in Jaquet et al. (2006, 2007) and evaluated by Johanson and Allan (2005). Nets would be 30 and 50 cm in diameter with 333 micrometer mesh and a ratio of 3:1 or 5:1 towed, tended, by nylon ½-inch line behind the research vessel. The sampling would usually be conducted more than 100 meters from right whales, and in most cases sampling at fixed stations would exceed 2 km from whale aggregations. Data would also be collected in the vicinity of actively feeding whales, likely less than 10 times per year. Tows would be taken behind the whale as it feeds or travels to sample at the edge of the feeding cylinder (the imaginary cylinder of water passed through by the open mouth). In these cases right whales would usually be 50 – 100 meters or more from the nets. Regular zooplankton collections would not last for more than 5 minutes.

A hose and pump system would be used to sample the vertical characteristics of the zooplankton resource. A 1.5" hose would be hung from the vessel with a CTD cage attached (Jaquet et al. 2006) and water would be pumped at 15 gallons/min into collection nets on deck. Pump sampling would be conducted in the regions where whales are aggregated, generally more than a kilometer from the whales. In the past, whales have occasionally approached the vessel, while drifting with the engine running. If a close approach by a right whale is expected to occur, the pump hose would be lifted aboard.

Standard fish finders operating at 38 and 200 kHz would be used to assess and map the distribution of zooplankton, but regular sampling less than 1 km from right whales is not anticipated. On occasion, 120 and 710 kHz frequencies would also be used.

A maximum of 350 right whales would be harassed annually during vessel surveys and habitat sampling. Individual whales would not be taken more than five times annually.

Suction Cup Tagging

Digital archival recording tags would be attached to right whales with suction cups to compare information on foraging movements and behavior with zooplankton information collected by acoustic, pump, and net sampling to yield a detailed perspective on the depth of feeding, allowing an analysis of the exposure of whales to ship strike and entanglement throughout the water column. Suction cup tagging would be conducted separately from the habitat documentation effort, using a small (< 8 m) rigid-hulled inflatable boat (RIB), outboard powered and modified for tagging. Tagging efforts might be nested within regular vessel surveys. Tagging efforts would only be undertaken in sea states of less than Beaufort 3.

Suction cup tag attachment would be conducted in three stages: 1) identification and assessment of an individual right whale as a suitable tagging candidate (i.e., juvenile or adult, not currently injured or entangled, and not a mother of a calf < 6 months of age); 2) careful small vessel maneuvering for a close approach to less than 5 meters from the individual whale by trained personnel for tag attachment; and 3) small vessel follow of the tagged whale to monitor behavior and assess prey field dynamics near the tagged whale.

An observation vessel would be used to locate a suitable right whale for tagging. The observers from this vessel would monitor the whale before and during tagging for any effects of the tagging process on the whale. The RIB would be maneuvered to less than 5 meters from the target whale for application of the tag. A 10-20 m (30-60 ft) pole cantilevered from the bow of the RIB or a long 7-10m (21-30') hand-held pole would be used to attach the tag to the whale (Johnson and Tyack 2003). Tags would be attached on the dorsal surface of the animal posterior of the blowhole and pectoral flippers to minimize potential disturbance. After successful tag attachments, whales would be followed at distances of more than 300 meters until the tag falls off, generally from 2 minutes to 6 hours with a maximum of 24 hours. The observation vessel would be used to track the tagged whale using a VHF beacon on the tag and observe the behavior and document the position of the whale when it is at the surface.

Two types of technology, both of which have been deployed successfully on numerous whale species, would be used:

- Dtags, developed by the Woods Hole Oceanographic Institution (Johnson and Tyack 2003a), and
- Acousonde or BProbe tags, developed by Greenridge Sciences.

The dimensions of the current version of the Dtag are approximately 4.25 in x 1.6 in x 0.9 in (11 cm x 4 cm x 2 cm) for the tag, and 7.7 in x 3.8 in x 1.8 in (20 cm x 10 cm x 4 cm), for the tag in its deployment housing. The weight of the tag, including attachment, is 330 g (12 oz) in air, and it is slightly buoyant in water. The Dtag includes sensors for acoustic recordings, pressure, pitch, roll, heading, surfacing events, and temperature. The Dtag housing is designed to provide a low drag hydrodynamic attachment.

The Acousonde (the second generation of the Bprobe) is approximately 8.7 in long x 1.25 in diameter (22 cm x 3 cm), and weighs 86 g in water. The Acousonde is an electronic data-logging tag that records calibrated acoustic pressure data with a sensitivity of -190 dB re: 1 V/μPa and a flat frequency response between 10 and 7400 Hz, digitized with 16-bit resolution. The Acousonde also records temperature, depth, and 3-axis acceleration, enabling the derivation of instantaneous body orientation (i.e., tilt and roll), as described by Goldbogen et al. (2006, 2008), resulting in a 3-D track of the whale relative to the external cues in the environment.

Permit No. 14603 would authorize a maximum of 20 animals to be harassed annually for an intended total of 10 successful tag attachments. Up to three attempts would be made per day to attach a tag to a whale. Tags would not be attached to calves less than six months old or their mothers. Whales would be tagged up to three times in any 12-month period. The type of tag to be used would depend on availability at the time of the project. Only one tag would be attached to a whale at a time.

The average encounter time for all activities would vary depending on whale behavior. For whales on long-diving patterns, with dives exceeding 20 minutes, the vessel would remain in the area for more than 40 minutes (through three surfacings). More realistically, the vessel would remain in the vicinity of a diving location for little more than 10 minutes. During prey sampling the encounter time often is as much a reflection of whales approaching the vessel as the reverse.

Average encounters would be approximately 3 to 40 minutes, with photo ID and D-tagging efforts lasting less than 20 minutes, depending on behavior.

Mitigation Measures
Conditions would be included in the permit to mitigate potential impacts to right whales and other protected species during research. This includes:

- taking precautions to minimize disturbance to mother-calf pairs of right whales;
- limiting the number of times an individual can be harassed in a day;
- preventing approaches to young calves that appear unhealthy;
- terminating aerial circling if animals respond to the aircraft;
- terminating vessel approach or tagging attempts if an animal exhibits repetitive strong adverse reactions;
- using trained and experienced personnel to minimize disturbance; and
- remaining a safe distance from non-target protected species.

In addition, CCS has identified the following practices to minimize the potential for harassment, serious injury or mortality of right whales during research:

- If an animal exhibits evidence of significant disturbance, such as evasive behavior, cessation of feeding, significant increase in dive times, and high energy behavior (e.g., breaching or lob tailing), approaches would be terminated and no further attempts will be made to approach that day.
- When plankton sampling in the vicinity of right whales, vessels would not approach closer than 50 meters.
- Approaches to right whales would be limited to three surface sequences (i.e., the time between rising to the surface after a long-duration dive and the next long-duration dive) per cruise.

No additional alternatives are evaluated in this EA.

CHAPTER 3 AFFECTED ENVIRONMENT

This chapter 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. The effects of the alternatives are discussed in Chapter 4.

File No. 14233 Action Area
Permit No. 14233 would authorize research in the U.S. EEZ from Florida to Maine, bounded by the Hague Line to the north, the Gulf of Mexico to the south, the U.S. coastline to the west, and

the boundary of the EEZ to the east (see Appendix 1 for map). Corresponding map coordinates that define this area are:

North latitude: 44°54' N	East longitude: 66°50' W
South latitude: 24°30' N	West longitude: 81°42' W

Dr. Kraus' study area is composed of three parts: New England waters, mid-Atlantic, and the Southeastern United States.

File No. 14603 Action Area
CCS' permit would authorize research in the Gulf of Maine throughout the year; research activities would primarily occur in CCB, including Cape Cod Bay Critical Habitat, and within 100 km of Cape Cod during right whale residency (December to May). Aerial and vessel surveys would occasionally occur in the Great South Channel Critical Habitat if other institutions are not collecting sighting and habitat information. Tagging efforts would be limited to CCB and the vicinity. Tagging would not occur in the Great South Channel or in the northern and eastern Gulf of Maine.

3.1 Social and Economic Environment

Economic and social factors are listed in the definition of effects in the NEPA regulations. However, the definition of human environment states that "economic and social effects are not intended by themselves to require preparation of an EIS." An EA must include a discussion of a proposed action's economic and social effects when these effects are related to effects on the natural or physical environment.

The social and economic effects of the Proposed Action mainly involve the effects on the people involved in the research, as well as any industries that support the research, such as local charter vessels and suppliers of equipment needed to accomplish the research. Due to the small scale (few research vessels and aircraft distributed over a large action area) of the proposed research, NMFS does not expect that the proposed action would result in significant socioeconomic impacts. Permitting the proposed research could result in a low level of economic benefit to local economies in the action area. However, such impacts would be negligible on a national or regional level and therefore are not considered significant. There are no significant social or economic impacts of the Proposed Action interrelated with significant natural or physical environmental effects. Further, neither permit would differentially affect access to natural or depletable resources. NMFS does not consider the proposed activities to be dangerous to human health or safety more so than other routine vessel movements in the water or flights in aircraft and consequently does not expect human health or safety to be significantly impacted by the proposed research. Research would be conducted by trained crew and supervised by experienced, qualified individuals. The research does not pose a risk of exposure to hazardous materials, waste or diseases. Thus, the EA does not include further analysis of social or economic effects of the Proposed Action.

3.2 Physical Environment

U.S. EEZ Atlantic Waters

Dr. Kraus' research would occur in U.S. EEZ waters from Florida to Maine. The area includes the Gulf of Maine, a highly productive region boasting 22 species of whales including sperm, humpback and North Atlantic right whales. CCS' research would only occur in the Gulf of Maine. Research may occur in the National Marine Sanctuaries (NMS) along the U.S. East Coast. It is each applicant's responsibility to apply for any permit required to work in a National Marine Sanctuary.

3.2.1 Areas of Biological or Ecological Importance to Right Whales

Research would occur in the following areas along the U.S. East Coast considered to be of biological or ecological importance to the North Atlantic right whale.

Great South Channel (GSC)

The GSC is a large funnel-shaped bathymetric feature at the southern extreme of the Gulf of Maine between Georges Bank and Cape Cod, Massachusetts. The channel is bordered on the west by Cape Cod and Nantucket Shoals, and on the east by Georges Bank. The average depth is 175m with a maximum depth to about 200m to the north. The V-shaped 100-m isobath effectively delineates the steep drop-off from Nantucket Shoals and Georges back to the deeper basins. On the southwestern fringe of the GSC lies the GSC Sliver Restricted Area, a region established as a Marine Managed Area in 1977. Both the GSC and the Sliver Region are subjected to fisheries management and lie within the Mandatory Ship Reporting System boundaries.

The GSC is one of the most used cetacean habitats off the northeastern United States (Kenney & Winn 1986). The late winter/early spring mixing of warmer shelf waters with the cold Gulf of Maine water funneled through the channel causes a dramatic increase in faunal productivity in the area (Sherman et al. 1987). This increase in zooplankton fauna, the main food source for baleen whales, attracts an abundance of mysticetes to the GSC region. Three "high-use" shipping corridors and numerous fisheries operate within the GSC, making ship-strikes and fishing gear entanglements major threats to baleen whale survival in this region.

Cape Cod Bay

CCB is a large embayment on the U.S. Atlantic Ocean off the state of Massachusetts that is bounded on three sides by Cape Cod and the Massachusetts coastline from Plymouth, MA, south. To the north, CCB opens to Massachusetts Bay and the Gulf of Maine. CCB has an average depth of about 25 m (82 ft) and a maximum depth of about 65 m (213 ft). The deepest area of CCB is in the northern section, bordering Massachusetts Bay.

The general water flow is counter-clockwise, running from the Gulf of Maine south into the western half of CCB, over to eastern CCB, and back into the Gulf of Maine through the channel between the north end of Cape Cod (Race Point) and the southeast end of Stellwagen Bank, a submarine bank that lies just north of Cape Cod. Flow within the bay is driven by density gradients caused by freshwater river run-off from the Gulf of Maine (Franks and Anderson 1992; Geyer et al. 1992) and by a predominantly westerly wind.

Thermal stratification occurs in the bay during the summer months. Surface water temperatures typically range from 0 to 19°C throughout the year. Salinity is fairly stable at around 31-32 ppt. Much of the bottom is comprised of unconsolidated sediments, with finer sediments occurring in the deeper waters (Davis 1984). In shallow areas, or where there is sufficient current, sediments tend to be coarser.

The late winter/early spring zooplankton fauna of CCB consists primarily of copepods, represented predominantly by two species, *Arcartia clausi* and *A. tonsa*. Samples taken in the daytime indicated greater densities of copepods at greater depths. The copepod *C. finmarchicus* is found throughout inshore CCB waters at densities of 100 individuals per cubic meter from April through June (Mayo and Marx 1990). Mayo and Marx (1990) found that the density of surface zooplankton samples collected in the path of feeding right whales during mid-winter was significantly higher than for the samples taken where whales were absent (median = 3,904 organisms/m^3). The threshold value below which feeding by northern right whales is not likely to occur in CCB is approximately 1,000 organisms/m^3 (Mayo and Marx 1990). CCB, like the GSC, is a primary feeding ground for the right whales, most likely because of the high densities of zooplankton species found there.

Southeastern United States (SEUS)

The South Atlantic Bight (also referred to as the SEUS) extends roughly from Cape Hatteras, North Carolina, to West Palm Beach, Florida. These waters average about 30 m in depth with a maximum depth of about 60 m. The deepest waters occur along the coast of Florida, just south of Cape Canaveral. Right whales migrate through the northern portion of the South Atlantic Bight on their way to and from the calving grounds off the Georgia and northern Florida coast.

The South Atlantic Bight contains three large cape areas: Raleigh Bay, Onslow Bay, and Long Bay (Milliman and Imamura 1992). The dominant bathymetric features are the continental shelf, the continental slope, and the Blake Plateau. The continental shelf slopes gently from the coast to approximately the 50 m (164 ft) isobath; where it drops off to the 200 m (656 ft) isobath. The continental slope is steeply angled and extends approximately from the 200 m (656 ft) to the 700 m (2,297 ft) isobath. The slope is widest off Jacksonville, FL (30°N). The Gulf Stream flows along the Florida-Hatteras Slope over the Blake Plateau's western flank (DoN August 2002).

The substrate composition of the SEUS ranges from mixed fine sand and gravel near the coast to an increasingly higher percentage of calcium carbonate material at greater depths. There are also traces of gravelly sand, sand and clay, and fine-grained sand and silt found in deeper waters. Continental slope sediments in the SEUS area are primarily composed of silt and clay. The inner part of the Blake Plateau contains a minimal amount of sediments due to the sweeping action of the Gulf Stream. The Plateau is also covered by a thick layer of phosphoritic sediments and a thin layer of carbonate sands (DoN August 2002).

Seasonal water temperatures and salinity for this area are higher than in northern waters. The SEUS is considered a transition zone, where waters change from hosting subtropical marine communities to temperate marine communities. Large, cyclic changes in abundance and dominance of plankton species occur seasonally and annually. Annual variation may be so great that short-term monitoring studies may not be sensitive enough to assess the temporal variability

of the plankton community. The recorded preferred food of the northern right whale, *C. finmarchicus*, does not occur in these waters, and the area is not considered a foraging area for northern right whales. The SEUS is believed to be the primary calving and nursery ground for the species.

3.2.2 Sanctuaries

Research may occur in the Stellwagen Bank National Marine Sanctuary. Dr. Kraus has not identified immediate plans to work in other Sanctuaries on the East Coast; however they are being considered at this time since they are within the action area in the event Dr. Kraus' may work in them during the life of the permit.

Stellwagen Bank National Marine Sanctuary

The Gerry E. Studds Stellwagen Bank NMS, at the mouth of Massachusetts Bay between Cape Cod and Cape Ann, is important to North Atlantic right whales as a feeding ground and migratory path along the eastern coast of North America. This 842 square mile sanctuary is also important to the local economy, particularly regarding its use by the shipping, fishing, and whale-watching industries. In addition to its importance to right whales, Stellwagen Bank is important habitat for a variety of marine species including leatherback and loggerhead sea turtles, humpback whales, and fin whales, as well as harbor porpoises, Atlantic white-sided dolphins, harbor seals and gray seals, numerous fish species (*e.g.*, basking sharks, Atlantic bluefin tuna, Atlantic cod, winter flounder), 40 species of sea birds (Wilson's storm petrel, shearwaters, northern fulmar, and northern gannets, terns, gulls and, in the winter, alcids and large numbers of black-legged kittiwakes), and a variety of invertebrates (*e.g.*, sea scallops, northern lobster, sponges, soft corals, anemones, sea stars, sand dollars and sea urchins, marine worms, and squid). Water depths range from 65 ft on the southwest corner to depths of about 600 ft in deep passages to the northeast. Massachusetts Basin on the western side of the sanctuary levels off at about 300 ft in depth, while the top of the bank averages about 100 to 120 ft.

Monitor National Marine Sanctuary

The Monitor NMS protects the wreck of the famed Civil War ironclad *USS Monitor*. In 1974 the wreck was listed on the National Register of Historic Places. Since its designation as our nation's first marine sanctuary in 1975, the *Monitor* has been the subject of intense investigation. Located 16 miles off the North Carolina coast in 73 m of water, biologists are studying how the *Monitor* acts as a living artificial reef for marine life.

Gray's Reef National Marine Sanctuary

Gray's Reef NMS, located 17.5 nm (32 km) off the coast of Georgia, protects 17 square miles of open ocean that is home to a wide variety of marine life, as well as the "Bone yard," which has provided scientists with relics and fossils possibly dating back 20,000 years. Its sea floor is considered a "live bottom", where rocky ledges and limestone outcroppings are densely covered by sessile marine invertebrates, interspersed with sandy areas. In addition to being a known foraging and resting ground of loggerhead sea turtles and a right whale calving ground, Gray's Reef is important habitat for over 150 species of fish. Gray's Reef is a common recreational resource for fishing, boating, and diving; however, commercial industries are prohibited.

3.2.3 Essential Fish Habitat

EFH has been designated for many of the fish species within the action area. Details of the designations and descriptions of the habitats are available in the Atlantic Fishery Management Plans. Activities that have been shown to affect EFH include disturbance or destruction of habitat from stationary fishing gear, dredging and filling, agricultural and urban runoff, direct discharge, and the introduction of exotic species. Researchers would conduct vessel surveys at the surface of the water. Gear would enter the water column but would not contact any substrate and therefore would not affect any sediment, hard bottom, structures underlying the waters, or associated biological communities. Nor would equipment affect the ocean's physical or chemical properties. Therefore, although additional EFH is found within the action area, none of the activities in the Proposed Action are directed at or likely to have any impact on any designated EFH. Therefore, this EA does not include further analysis of effects to EFH within the action area.

3.3 Biological Environment

The Proposed Action would affect North Atlantic right whales as the focus of the applicants' research.

3.3.1 Target Species: North Atlantic Right Whale

The western North Atlantic stock of right whales range from their winter calving grounds in coastal waters of the southeastern United States to their spring feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian shelf in summer. However, the location of a large segment of the population is unknown during winter, and data from a limited number of satellite-tagged whales suggests an extended range, at least for some individuals. At least five major habitats or congregation areas are identified for this stock of right whales: the coastal waters of the southeastern United States, the Great South Channel, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Scotian Shelf. Like most mysticetes, right whales fast during the winter calving season and feed predominantly during spring, summer, and fall (Clapham 2004). They may also feed opportunistically while migrating. Right whales are large whales that grow to at least 10 m long, weigh at least 20 tons, and have baleen plates instead of teeth to trap and filter prey from the water column. They primarily feed on the copepod *Calanus finmarchicus* but also consume other zooplankton. Researchers estimate that right whales consume as much as 2,000 pounds of zooplankton per day (Kraus and Mallory 2003). They are inquisitive and may be approachable. Right whales are usually found alone or in small groups, although large aggregations may occur on the feeding grounds.

Right whale populations worldwide were brought to extremely low levels by hunting over the last five centuries (Brownell et al. 1986). Right whales in the North Atlantic were the first to be reduced (Reeves et al. 2007), and remain at low numbers and low growth rates (< 2 percent) despite international protection. The western North Atlantic population is estimated to include at least 325 individuals (Waring et al. 2008) but birth interval data and population models suggest that the population declined in the 1990s (Caswell et al. 1999; Fujiwara et al. 2001). The size of the stock relative to the Optimum Sustainable Population is extremely low and the stock is considered to be critically endangered. Continued low population growth has been attributed to human sources of mortality and impaired reproduction (Fujiwara et al. 2001; Kraus and Rolland 2007b). Human caused mortality, primarily from collisions with large ships and entanglements

in fixed fishing gear, remained high through 2005 (Kraus et al. 2005; Kraus and Rolland 2007b; Moore et al. 2007). The passage of the NMFS right whale ship strike rule (NMFS 2008) should reduce ship kills of right whales, and progress on reducing entanglements may help. Impaired reproduction may be due to low genetic diversity (Frasier et al 2007a), loss of habitat (Reeves et al. 1978), food limitation (Greene and Pershing 2004; Baumgartner et al. 2007), disease, parasites, biotoxins, contaminants (Rolland et al. 2007a), and global warming (Kenney 2007). Calving has increased since 2001, although North Atlantic right whale calving rates are still only two-thirds of comparable southern hemisphere right whale populations (Frasier et al. 2007b).

3.3.2 Non-target Species

In addition to the target right whales, a variety of marine species, including other cetaceans, sea turtles, and marine fish, can be found within the action area and were considered for this EA. Dr. Kraus has frequently observed bottlenose dolphins (*Tursiops truncatus*), sea turtles, sharks, and occasionally other species of dolphins during aerial surveys in the southeastern United States. During shipboard surveys in all areas, sightings of non-target species are recorded, but those species are not approached within 100 meters. In northern areas of the Gulf of Maine, right whales appear to occupy waters where few other species are found. The one exception in some areas is the co-occurrence of basking sharks, also a copepod feeder. Dr. Kraus anticipates that he would unintentionally approach less than three basking sharks per year during vessel surveys.

Endangered Florida manatees (*Trichecus manatus latirostris*) also are found within Dr. Kraus' action area and could be observed during aerial surveys in the southeast United States. However, because Dr. Kraus' aerial surveys would be conducted at 1,000 ft., NMFS does not expect impacts to this species. On December 9, 2009 the U.S. Fish and Wildlife Service concurred (via email) with NMFS' determination that the proposed research activities are not likely to adversely affect manatees. As a precautionary measure, Permit No. 14233 would contain permit conditions to ensure that interactions with manatees are avoided. Therefore, this species is not considered further in this analysis.

Although the range of some non-target species are within the action area, some species, such as blue whales (*B. musculus*) rarely visit U.S. Atlantic coastal to mid-shelf waters or are not found in the action area year-round. Such species are less likely to be encountered or sighted during research. A portion of adult sea turtles along the U.S. Atlantic coast move inshore to nest and mate during summer months and, hence, would be less likely to be seen during summer research activities in the northeast. Leatherbacks (*Dermochelys coriacea*), greens (*Chelonia mydas*), Kemp's ridleys (*Lepidochelys kempii*), and loggerheads (*Caretta caretta*) could be present in the area but are less prevalent in winter months in northeast Atlantic U.S. waters. Most sea turtle species are not expected to be encountered from January to March in the mid-Atlantic study area. Most turtles move farther south to warmer waters during the winter, and are not likely to be encountered in the Virginia to northern Florida area during this time of year. Further, while protected species could be present in the study area, researchers would not attempt to approach within 100 meters of non-target species.

Based on previous research in CCB, CCS expects to encounter humpback, minke, and fin whales during aerial and vessel surveys. As discussed in Ch. 2.2.2., Permit No. 14603 would authorize

40 annual takes (20 aerial and 20 vessel) for the incidental harassment of these species during surveys. Humpbacks and fin whales are common in CCB from March onwards; sightings of up to 5-10 individuals per CCB survey would be expected from March onwards. Less then 15 sightings of minkes would be expected per year. Most of these sightings do not involve any approaching or circling as they can be identified from a distance. Less than 1 to 2 sightings per survey might involve an approach to a non-target balaenopterid to determine species.

Humpback whale: The humpback whale is a mid-sized baleen whale. This species is distributed worldwide in all ocean basins, though it is less common in Arctic waters. Humpback whales migrate seasonally. In the winter breeding season, most humpback whales are found in temperate and tropical waters of both hemispheres. During the summer feeding season, most are in waters of high biological productivity, usually in higher latitudes. Humpback whales were listed as endangered throughout their range on June 2, 1970, under the Endangered Species Conservation Act (a precursor to the ESA) and also are protected under the MMPA.

In the Northwest Atlantic, Mitchell and Reeves (1983) estimated a pre-exploitation humpback whale population size of 4,700 animals based on 1865 whaling records in the areas around and between Davis Strait, Iceland, and the West Indies. Current population estimates based on mark-recapture of photographed animals suggest that there are 10,600 humpback whales in the entire North Atlantic (Smith et al. 1999). It is estimated that there are fewer than 7,000 humpbacks in U.S. waters. NMFS recognizes one stock of humpback whales in the action area: the Gulf of Maine stock (Waring et al. 2008).

The Gulf of Maine stock includes relatively discrete sub-populations which feed during summer in the waters of the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). Other North Atlantic feeding grounds occur off Iceland and northern Norway (Christensen et al. 1992). The research activity proposed for permitting focuses on the whales present in the winter off the west coast of Puerto Rico. In the winter, whales from all six feeding areas (including the Gulf of Maine) mate and calve primarily in the West Indies, where spatial and genetic mixing among sub-populations occurs (Clapham et al. 1993; Katona and Beard 1990; Stevick et al. 1998).

Although the most recent estimates of abundance indicate continued population growth, the size of the Gulf of Maine humpback whale stock may be below the optimum sustainable population in the U.S. Atlantic EEZ. There are at least 647 animals in the Gulf of Maine stock, though the best estimate of the population size is 902 whales (Waring et al. 2007). Humpback whales in both the Gulf of Maine and the North Atlantic overall appear to be increasing in abundance (Smith et al. 1999; Waring et al. 2007). The overall North Atlantic population was recently estimated from genetic tagging data at 4,894 males and 2,804 females. The annual rate of population increase was estimated at nine percent (Katona and Beard 1990) and for the Gulf of Maine at 6.5% by Barlow and Clapham (1997).

The total level of human-caused mortality and serious injury is unknown, but may be slowing recovery of the population. The main sources of human-caused serious injury and mortality are entanglement in fishing gear (including lobster gear and pelagic drift gillnets) and vessel collisions. Humpback whales use the Mid-Atlantic as a migratory pathway and apparently as a

feeding area, at least for juveniles. Since 1989, observations of juvenile humpbacks in that area have been increasing during the winter months, peaking January through March, particularly in the Chesapeake and Delaware Bays (Swingle et al. 1993). Biologists theorize that non-reproductive animals may be establishing a winter feeding range in the Mid-Atlantic because they are not participating in reproductive behavior in the Caribbean.

Fin whale: The fin whale is classified as endangered under the ESA and is protected under the MMPA. The fin whale is found throughout the North Atlantic and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic ice pack. Overall distribution may be based on prey availability, and fin whales are found throughout the proposed action area in most months of the year. This species preys opportunistically on both invertebrates and fish (Watkins et al. 1984). Fin whales are larger and faster than humpback and right whales and are less concentrated in nearshore environments. Sergeant (1977) estimated a pre-exploitation stock abundance of 30,000-50,000 animals for the entire North Atlantic. Current fin whale abundance on the continental shelf waters of the northeastern U.S. during spring and summer has been estimated at about 5,000 animals (Hain et al. 1992), while surveys from Georges Bank to the Gulf of St. Lawrence during August, 1999 suggested that 2,814 individuals occupy this region (Waring et al. 2007). Major threats to the Western North Atlantic stock are ship strike and fishery interactions or entanglement.

Minke whale: Minke whales are small baleen whales found in polar, temperate, and tropical waters in most seas and areas worldwide. They prefer temperate to boreal waters, but are also found in tropical and subtropical areas. Minke whales feed most often in cooler waters at higher latitudes. They can be found in both coastal/inshore and oceanic/offshore areas. Minkes migrate seasonally and are capable of traveling long distances. The distribution of minke whales varies by age, reproductive status, and sex. Older mature males are commonly found in polar regions in and near the ice edge, and often in small social groups, during the summer feeding season. Mature females will also migrate farther into the higher latitudes, but generally remain in coastal waters. Immature animals are more solitary and usually stay in lower latitudes during the summer. Minke whales have a widespread distribution in the Northern Hemisphere, and are found throughout the northern Atlantic and Pacific Oceans. Their range extends from the ice edge in the Arctic during the summer to close to the equator during winter.

Minke whales are the most abundant rorqual in the world, and their population status is considered stable throughout almost all of its range. Minkes are protected under the MMPA but are not listed under the ESA. For management purposes, NMFS recognizes the Canadian East Coast Stock within the action area. These animals are found along the U.S. east coast with greatest abundance in New England waters from April to November. The stock is estimated to include at least approximately 1,900 whales; however, there are insufficient data to determine population trends for this stock.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA

require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

4.1 EFFECTS OF ALTERNATIVE 1: No Action

Not issuing the proposed permits would eliminate any potential risk to the social, economic, physical, and biological environment from the proposed research activities. Although denying the permits would reduce the chance of harassment of marine mammals during research, the opportunity would be lost to collect information that would contribute to the monitoring and understanding of the distribution, demographics, abundance, habitat use, behavior, health, reproduction, survival, and genetics of right whales status of the North Atlantic right whales. It would thereby hamper the growth and maintenance of the North Atlantic right whale photo-identification catalogue which is a valuable tool to managers and the Right Whale Consortium. This alternative may then limit or delay management and conservation practices that NMFS could implement as a result of this research.

4.2 EFFECTS OF ALTERNATIVE 2: Issue permits with standard conditions

4.2.1 Effects to Physical Habitat

Since the Proposed Action would occur within the upper portion of the water column and equipment would not contact substrate, the action would not affect any sediment, hard bottom, structures underlying the waters, or associated biological communities. Research gear would not be expected to affect its physical or chemical properties. CCS' proposed prey sampling is not expected to significantly impact physical habitat. In addition, researchers would be required to obtain any necessary permits to conduct work in a National Marine Sanctuary.

4.2.2 Effects to the Biological Environment

This section presents a discussion of the potential impacts of the Proposed Action to the target endangered right whales and non-target species in the action area. The issue most relevant to the analysis is the potential for negative impacts on endangered large whales within the action area. However, it is important to recognize that an adverse effect on a single marine mammal or a small group of marine mammals does not translate into an adverse effect on the population or species *unless* that adverse effect results in reduced reproduction or survival that causes an appreciable reduction in the likelihood of survival or recovery for the species. Therefore, in order for the Proposed Action to have an adverse effect on a species, the exposure of individual animals of a given species to the research activities would first have to result in direct mortality or serious injury that would result in mortality of the exposed individual, or disrupt essential behaviors of the exposed individual, such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival was substantially reduced. Second, that mortality of an individual or substantial reduction in the individual's likelihood of successful reproduction or survival would have to result in a net reduction in the number of individuals of its species. In other words, the loss of the individual or its future offspring would not be offset by the addition, through birth or emigration, of other individuals into the population. Third, that net loss to the species would have to be reasonably expected, directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of the listed species in the wild.

Whether or not a marine organism may be affected by the Proposed Action is dependent on two factors. The first factor is whether or not the organism is likely to be present within the action area at the time of the research. Some target species are only in the action area at certain times of year, such as individuals that seasonally migrate, while others may only be present at certain times of day. The second factor is whether or not the organism, when exposed to research activities, will respond. Response can take a variety of forms ranging from overt changes in behavior to less obvious, even undetectable, physiological changes such as elevated levels of hormones associated with stress. In the case of obvious behavioral reactions, the researchers would be able to detect them and the permit would contain conditions appropriate to minimize or mitigate such reactions. While physiological changes may not be immediately obvious unless they result in acute signs, if they are chronic or persistent, they tend to result in detectable signs over time such as illness or reduced reproduction. Thus far, marine mammal research has not been directly attributed to any population-level changes. In addition, other marine mammal species have been the subject of similar research activities, and studies on the effects of the research have not implicated research as a factor in reduced reproduction or overall fitness.

For the Proposed Action, close vessel approaches, photo-identification, behavioral observation, biopsy sampling, passive acoustic recording, fecal sampling, suction-cup tagging, and/or incidental harassment (should it happen) would occur during vessel and aerial surveys of right whales as listed in Tables 1 and 2 for the applicants. This chapter discusses the effects of research activities as applicable for the proposed permits.

4.2.2.1 Effects to Target Species: Right whales

Effects of Import/Export of Biological Samples

No direct or indirect effects would be incurred by right whales by the import and export of biological samples. This activity is done after the animal has already been harassed for either another Level B harassment activity or a Level A harassment activity (e.g., biopsy sampling). No effects beyond those described for the initial activity in which the sample is collected are incurred by the target species. Given that the import/export of parts collected during research involves only the transport of non-living parts, NMFS believes that these activities are not likely to have a significant cumulative effect on any research animals.

Effects of Close Approach during Aerial and Vessel Surveys

With the exception of the import/export of parts previously discussed, biopsy sampling, and suction-cup tagging, the proposed research activities are expected to result in Level B harassment of the target whales. Level B harassment is that which has the potential to disturb marine mammals in the wild, but does not have the potential to result in injury to marine mammals or marine mammal stocks. Level B harassment activities have the potential to disturb individual large whales during aerial and vessel surveys. As noted in Ch. 2, due to the altitude of Dr. Kraus' aerial surveys in which no close approach is required, these surveys are not expected to result in harassment and therefore, are not discussed further in this EA. The following is a discussion of documented effects of the proposed activities by researchers.

Aerial surveys for CCS

NMFS recognizes that approaches to marine mammals by aircraft below certain altitudes could harass marine mammals and, as a result, has recommended guidelines for approaching and viewing marine mammals, and, in the case of North Atlantic right whales, has promulgated regulations for minimum approach distances. Behavioral alterations are possible if the shadow of the aircraft flashes across the animal; however, those changes are usually minor and temporary. Annual reports from CCS' current permit, No. 633-1763, indicate that no evasive behaviors were observed from right whales during aerial surveys. The approach of the aircraft to the whales is not expected to result in long-term changes in the whales' behavior that would suggest long-term adverse effects on individuals, populations, or the species. Typically, the researchers only remain in the area long enough to photograph and count the animals.

Vessel surveys

Vessel surveys would be conducted for photo-identification, behavioral observation, passive acoustic recording, biopsy sampling, suction-cup tagging, fecal sampling, and prey mapping (via fish finder) and sampling. For the proposed vessel surveys, the presence of a vessel can lead to disturbance of cetacean although animals' reactions are generally short-term and of a low impact. Annual reports from CCS' current permit, No. 633-1763, indicate that no evasive behaviors were observed from right whales during close approach for photo-identification, behavioral observation, and habitat sampling. Several researchers have studied the short-term responses of humpback whales to disturbance (Hall 1982; Baker et al. 1983; Krieger and Wing 1984; Bauer and Herman 1986). Baker et al. (1983) described two responses of whales to vessels, including: (1) "horizontal avoidance" of vessels 2,000 to 4,000 meters away characterized by faster swimming and fewer long dives; and (2) "vertical avoidance" of vessels from 0 to 2,000 meters away during which whales swam more slowly, but spent more time submerged. Additional studies of baleen whales, specifically bowhead and gray whales, have clearly documented a pattern of short-term, behavioral disturbance in response to a variety of actual and simulated vessel activity and noise (Malme et al. 1983; Richardson et al. 1985). Studies of bowhead whales revealed that these animals oriented themselves in relation to a vessel when the engine was on; furthermore, a significant avoidance response was invoked simply by turning the engine on, even at a distance of approximately 900 m. Watkins et al. (1981) found that both fin and humpback whales appeared to react to vessel approach by increasing swim speed, exhibiting a startled reaction, and moving away from the vessel with strong fluke motions. Studies of humpback whales on their summering grounds, as summarized by Baker et al. (1983) and Baker and Herman (1987), and on their wintering grounds, as summarized by Bauer and Herman (1986), found similar patterns of disturbance in response to vessel activity. However, several researchers (including North Gulf Oceanic Society (NGOS), James Darling, and Janice Straley) noted in prior permit annual reports that most whales showed no reaction to their research vessels. For example, NGOS noted in their 1999 permit report that they observed signs that whales were disturbed in only 3 out of 51 encounters. Reactions from these encounters included breaching, slapping tail and pectoral fin, and diving away from the research vessel.

In general, the reactions of whales to close vessel approaches are minimal. A number of studies involving close approach of research vessels (for tagging or biopsy sampling) of humpback whales indicate that the responses of the whales are generally minimal to non-existent when approaches are slow and careful, and when more pronounced behavioral changes occur, the

effects appear to be short-lived (e.g., Gauthier and Sears 1999; Weinrich et al. 1991, 1992; Clapham and Mattila 1993; Clapham et al. 1993).

The proposed research activities (except the actual biopsy sampling and tagging) have the potential to result in Level B harassment and are not new activities; therefore, NMFS feels that the effects of close approach to large whales would be minimal and short-term. As described in the proposed action, close approaches would be made in a controlled manner so as not to alarm the whale. Research efforts would be abandoned if an animal exhibits strong reactions to close approaches or it continually exhibits evasive behaviors. Further, the permit would be conditioned to mitigate any potential impacts of harassment due to close approaches to the target species, as discussed in the following section.

Based on published information on the effects of these activities on large cetacean species, unpublished reports from research conducted by permit holders, and expert advice of agency marine mammal biologists, NMFS expects vessel approaches for photo-identification, videography, focal follows, behavioral observation, passive acoustic recording, and collection of sloughed skin to result in no more than temporary, minimal harassment to the target individuals. Researchers have noted that large whales often exhibit no response or mild responses, such as local movements away from the vessel or a startle/flinch, to the proposed Level B activities. Animals would be expected to recover from such harassment within minutes. No serious injury or mortality would result from these activities. Further, the proposed activities considered individually and as a group are not likely to disrupt the migration, breathing, nursing, feeding, breeding, or sheltering behavior of large whales. Therefore, NMFS does not expect that disturbance from these activities will have a significant effect on target animals, populations, or species of endangered large whales.

Effects of Acoustic Sampling: Passive Acoustics & Sonar for Prey Mapping

The proposed acoustic recording of whales involves the use of a hydrophone suspended from the vessel. As a passive system, the hydrophone would not emit any sounds or signals into the water column. The actual presence of the hydrophone in the water column is not expected to have any impact on marine mammals or critical habitat. NMFS does not expect that the array poses a risk of entanglement with target or non-target species.

Indirect indications are that baleen whales are most sensitive to low-frequency sounds below 1 kHz, but some can hear higher frequency sounds. Baleen whales have been observed to react to sounds at frequencies up to 28 kHz, but did not respond to pingers and sonar at and above 36 kHz (Richardson et al. 1995). Frequencies of fish finders that would be used for prey mapping would be a minimum of 38 kHz, above the dominant vocalization frequencies used by baleen whales, and above their highest recorded vocalization frequencies (Thomson and Richardson 1995; Au 2000). Wartzok and Ketten (1999) suggest that mysticete hearing is most sensitive at the same frequencies at which they vocalize; therefore, the frequencies of the fish finders are expected to be outside of the functional hearing range of the target baleen whales.

Effects of Right Whale Prey Sampling

Plankton sampling is a routine activity conducted regularly by oceanographers and scientists amid a suite of methods to examine seawater properties. Such work is often conducted in oceanic waters with no relation to studies of marine mammals or protected species.

Studies on the effects of such sampling in close proximity to right whales have not been conducted. However, CCS has been conducting such surveys for years in Cape Cod Bay Critical Habitat and adjacent waters to characterize the durability of the resource, as well as to forecast the likelihood of continued whale aggregation and residency in those specific areas. Prey sampling is only occasionally conducted in the vicinity of feeding right whales in order to characterize the abundance, species composition, and spatial extent of the zooplankton resource on which the animals were feeding. Annual reports indicate that none of the right whales encountered during habitat studies exhibited behavior that was characterized as evasive in response to vessel approaches.

Another large whale researcher, Mark Baumgartner (pers. comm. 2009), has not observed any signs of disturbance or effects on right whales when plankton sampling from a 180 foot vessel within 50 to 100 m. No physical interactions with whales occurred during sampling and Dr. Baumgartner stated that animals seemed "perfectly relaxed" as they did not alter their behavior/activity (logging, feeding and diving) while in their presence. In regard to the potential for gear interactions, Dr. Baumgartner noted that he has towed nets or profiled instruments hundreds of times close to whales and has never observed interactions, which would be easily detectable given the tautness of the towing cables used. While the vessel size and approach distance differ between Dr. Baumgartner's observations and the proposed action, plankton sampling is often conducted in oceanic waters with no relation to studies of marine mammals, so there is little available information on the effects of plankton nets in the vicinity of a whale (NMFS 2009).

CCS has many years of experience conducting research on large whales in the action area and therefore NMFS expects that any impacts from the proposed research would be comparable to behavioral responses (or lack thereof) described in past annual reports. Based on CCS and Dr. Baumgartner's past observations and CCS's manner of sampling, NMFS does not expect that the proposed sampling would physically interact with any animals, pose a risk of ingestion or entanglement to feeding animals or result in significant impact to targeted right whales. Entanglement or ingestion as a result of plankton tows has never been observed, and it is considered unlikely that there would be interactions with this gear type as proposed (NMFS 2009).

Effects of Biopsy Sampling and Suction-Cup Tagging

Biopsy sampling and suction-cup tagging have the potential to result in Level A harassment because physical contact is required which could injure target animals. Under Dr. Kraus' permit, biopsy sampling would be authorized for right whales approximately one month of age or older. Under CCS' permit, suction-cup tagging would be authorized for adult and juvenile right whales. Tags would not be attached to calves less than six months old or their mothers. Whales would be tagged up to three times in any 12-month period. Actual injury would be minimized by conditions of the permits that limit how sampling may occur, such as preventing sampling of

sensitive areas of the body (see Ch. 2 for more details). The following is a discussion of expected effects of biopsy sampling and suction-cup tagging, including a discussion of sampling young calves and accompanying females.

Biopsy Sampling

Dr. Kraus is requesting authority to biopsy sample up to 50 right whales annually. Of these animals, up to 20 would be from calves at least approximately one month old.

The effects of biopsy sampling on a variety of large whale species, including humpback, gray, fin, blue, right, and sperm whales, have been studied by numerous researchers. As with any instance where the dermis is penetrated, there is the possibility of infection associated with biopsy sampling. However, no evidence of infection has been seen at the point of penetration or elsewhere among the many whales re-sighted in days following the taking of a biopsy sample by NMFS permitted researchers. The biopsy darts do not contain any hazardous materials. In addition, a fast rate of wound-healing from biopsy sampling has been documented in cetaceans (Weller et al. 1997; Krützen et al. 2002; Parsons et al. 2003). Therefore, the effects of the actual penetration of the dart during biopsy sampling would generally not be considered to result in any significant impact to an individual whale, age class, or group of whales authorized.

Biopsy sampling has been conducted successfully on a variety of whale species with little or no behavioral reactions (e.g., Weinrich et al. 1992; Clapham and Mattila 1993; Brown et al. 1994; Gauthier and Sears 1999; Cerchio 2003), and consistently, it has been demonstrated that biopsy sampling, when conducted properly, has no lasting effect. Any changes in behavior associated with the sampling itself have been observed to be momentary and a biopsied individual (small calf or adult) will almost always continue the original behavior, or resume the behavior within a few minutes (see section below for descriptions of reactions by age class). Previously analyzed data on right whale biopsy sampling showed that less than 20 percent of the target animals displayed disturbance responses (Brown et al. 1991), and most of those were short term (less than 5 minutes).

Weinrich et al. (1991, 1992) measured a variety of quantitative and qualitative parameters to assess the behavioral reactions of humpback whales to biopsy procedures. The authors found that the few "strong reactions" (less than 6 percent in both studies) involved unusual instances such as a biopsy dart retrieval line being snagged on a fluke; such lines are not proposed here by the applicant. Observations of whales in the days and years following darting indicated no long-term effects of the procedure. The researchers concluded that the biopsy procedure was momentarily painful or startling to the animals, but that there were no long-term effects. Importantly, these studies also indicate that mother/calf pairs are no more sensitive to biopsy procedures than other groups, although mothers tended to be more evasive of approaching boats.

A study by Clapham and Mattila (1993) echo the conclusions of Weinrich et al. (1991, 1992). They found that 66.6 percent of humpback whales that had been biopsied showed no reaction or low-level reaction to the procedure. Further, out of more than 900 attempts Clapham and Mattila (1993) observed only 1 strong reaction and documented evasive behavior 12 percent of the time. Clapham et al. 1993 noted that studies on biopsy procedures showed no evidence of significant impact on cetaceans in either the short or long term.

Using Weinrich et al.'s (1991) response scale, Ocean Alliance (Permit No. 751-1614) reported that the average response of sperm whales to sampling on a scale of one to four (one being the lowest) was one. The response to close approaches and/or focal follows was less than one where there was no significant change in behavior at all. Brief behavioral (e.g., quick tail slashes and diving) and physiological (e.g., breathing rate) changes, lasting seconds to several minutes, may occur in a subgroup of individuals upon approach and darting. These behaviors were observed less than 10 percent of the time during their last voyage under Permit No. 751-1614.

Gauthier and Sears (1999) studied the behavioral responses of minke, fin, blue, and humpback whales to biopsy samples taken using punch-type tips fired from crossbows. These whales showed no behavioral reaction to about 45 percent of successful biopsies. In the remainder of cases, behavioral responses to biopsies were minimal to moderate, and ranged from tail flicks, hard tail flicks, submerging below water surface, or some combination of these responses. Humpback whales displayed more of these responses than fin or blue whales, but most individuals of any of these species resumed their normal behavior within a few minutes after the biopsy sampling. Even whales that had been inadvertently biopsied more than once displayed either no response (52 percent displayed no behavioral response to the first biopsy, 57 percent displayed no response to the second biopsy) or short-term behavioral responses. Clapham and Mattila (1993) found that 66.6 percent of humpback whales that had been biopsied showed no reaction, or low-level reaction to the procedure. A study by Clapham et al. (1993) noted that studies on biopsy procedures showed "no evidence of significant impact on [cetaceans] in either the short or long term." However this study made no mention of attempts to approach the animals slowly or quietly.

Other studies involving biopsies and tagging of whales indicate that whales often react to engine noise, and that slow and quiet approaches tend to minimize individual animals' reactions (Clapham et al. 1993; Watkins et al. 1981). It is possible then that the startling observed by Whitehead et al. (1990) was the result of, or exacerbated by, the presence of the boat. In any event, the study found no long-term effects of the biopsy procedure. In requesting authorization to conduct biopsy sampling, NMFS' Northeast Fisheries Science Center (NEFSC) stated that "we have seen little effect from biopsy activities conducted on right and humpback whales both in the short and long term based on records maintained for biopsy operations. The available data suggest that in all cases, the activity has had little effect on right and humpback whales (Clapham et al. in prep)." The NEFSC also noted that:

- Most right whales darted (80.6 percent; Brown et al. 1991) have shown no reaction. Those who did react either responded by "flinching" or through a tail flick or dive.

- The approach itself seems to have more of an effect; however, in those few cases where animals responded to the approach, they returned to normal behaviors quickly after the approach had been broken off.

- There have been no documented cases of infection or injury to large whales resulting from biopsies, including well-monitored populations with repeatedly observed identified individuals.

- Long-term impacts have been evaluated for humpback whale mothers and calves, and a similar analysis is underway for right whales. The humpback whale data indicates that survival of biopsied (n = 106) and unbiopsied (n = 112) calves is not significantly different. Similarly, the fecundity and return rates of biopsied adult females (n = 52) and unbiopsied mature females (n = 144) were not significantly different.

The potential for serious injury and/or long-term effects on individual adult whales from remote biopsy sampling is considered minimal. Ultrasound measurements of juvenile and adult right whale blubber thickness taken by Moore *et al.* (2001) from whales in the Cape Cod Bay varied between 12 cm and 23 cm. Evans *et al.* (2003) noted juvenile and adult sperm whale blubber thickness was positively linked to body length and ranged from 4.3 cm to 16.8 cm. Blubber thickness of fin whales in the North Atlantic also depended on length as well as class, with pregnant females having the thickest blubber, followed by mature females, mature males, immature females, and immature males (Lockyer 1986). The blubber depths of necropsied right whale calves that died off the coast of Georgia and Florida ranged from 2.75 cm to 5 cm (Moore *et al.* 2004). Work by Best et al (2005) showed that biopsy activities on Southern right whales had no effect on reproduction or survivorship. The penetration depth of the dart relative to the blubber depth of large whales, and the mitigation measures employed to prevent deeper penetration, make it highly unlikely that any serious injury would occur. The smaller size and thinner blubber layer of young calves may make them somewhat more susceptible to the potential for serious injury from remote biopsy sampling. However, the intended penetration depth of the dart compared to the blubber depth, in addition to the dart's stop collar which prevents deeper penetration, make it highly unlikely that any serious injury would occur. The proposed darts for calves would yield samples 2 cm in length, which is less than the blubber thickness of healthy right whale calves.

With respect to sampling young calves (one to six months old) and females with such calves, the main consideration for potential impacts from biopsy sampling this age class and pairing is the potential for the close presence of the vessel to disrupt the important mother/calf pair bond or otherwise interfere with mother or calf fitness or survival. As noted above, the actual penetration of the dart would not be expected to have significant impact. There have been a number of studies that have collected biopsy samples from large whales, including young calves, with the following results:

- Clapham and Mattila (1993) conducted a detailed, directed study of the effects of biopsy sampling on humpback whales, including individual calves less than 6 months old (in wintering areas) and concluded "biopsies can be obtained from mothers and their calves with little effect on the animals." They analyzed behaviors before and after biopsy sampling, and the immediate reactions of 565 biopsied humpback whales (in addition to 427 misses). They found that most whales did not react (or did so minimally), and those behaviors, before and after, most often did not change. Additionally, mothers were the *least* likely to react to a biopsy hit, and calves reacted the same as other non-calf whales that were not anticipating contact (*e.g.*, noncompetitive and not mothers). Minimal reaction has been observed in studies of biopsy-sampled calves (Clapham and Mattila 1993, Cerchio 2003). Calves reacted more to biopsy hits than mothers, principal

escorts, challengers and secondary escorts, but not significantly different than all the other classes of whales (Clapham and Mattila 1993). In no instance was a calf ever observed to separate from a mother, and many hundreds of mothers and calves have been observed and biopsied. The reactions were always short-term and the mothers and calves resumed normal behavior after the sampling ended (Clapham and Mattila 1993).

- Gauthier and Sears (1999) studied reactions of three baleen whales species, including humpback, fin and blue whales, revealing differences between the species. The majority of fin and blue whales exhibited no behavioral response to biopsy sampling, including two fin whale calves biopsied. No strong reactions were observed for these species (Gauthier and Sears 1999). The majority of humpback responses were moderate, consisting of hard tail flicks. Of the humpback whale calves biopsied, 4 out of 7 had a moderate to low reaction while the rest had no reaction (Gauthier and Sears 1999). They also noted that reactions of whales typically lasted at the most only a few minutes.

- Minimal reactions of biopsied adult females, including mothers, have been observed in many studies (Weinrich et al. 1992; Clapham and Mattila 1993; Brown et al. 1994). Mothers reacted significantly less to the biopsy strike than all other classes combined (Clapham and Mattila 1993). Reactions were always short in duration.

- A study of the long-term effects of biopsy sampling southern right whales (*E. australis*) found that the majority of cows that accompanied calves elicited a non-forceful fluke movement or lesser reaction (Best et al. 2005). Calves of cow/calf pairs on average showed a lesser response akin to a startle when biopsied (Best et al. 2005). Their data also suggested that cows may become more sensitive to repeated biopsy sampling within short time frames (less than 1 year) while this could not be detected in calves due to low sample sizes (Best et al. 2005). The authors also were unable to detect any difference in reproductive success or the proportion of normal calving intervals based on whether an animal was biopsy sampled in the prior two years, but this could be due to low sample sizes and statistical power. Despite this fact, no major effects to the population were detected and the authors cautiously approve of the biopsy sampling of southern right whale cow/calf pairs when done with care.

In addition, with regard to long-term effects, one researcher has data indicating that there are no long-term effects of biopsy sampling this age class. According to Knowlton (pers. comm. 2007), a female right whale calf that was biopsied off the coast of Georgia in 1997 was re-identified in 2006 with her first calf. This illustrates that 1) the calf was not seriously injured or killed as a result of the sampling in 1997 and 2) the reproductive fitness of the biopsied calf was not appreciably reduced.

Based on this information, NMFS expects that the effects of biopsy sampling large whale calves and females with calves would be similar to sampling adult large whales. These procedures would be expected to result only in short-term stress and discomfort and no long-term effects would be anticipated. Any behavioral impacts to this age class and pairing would likely be short-term and considered minimal. In addition, conditions and mitigation measures would be placed in Kraus' permit to further limit the potential for negative effects from these activities.

In addition, NMFS' decision to authorize biopsy sampling right whale calves would not establish a precedent for issuing other permits to biopsy sample young calves. Issuance of a permit to a specific individual or organization for a given research activity does not guarantee or imply that NMFS will authorize other individuals or organizations to conduct the same research activity. Each permit application received is evaluated upon its own merits relative to the criteria established in the MMPA, ESA, and NMFS implementing regulations.

To summarize, the proposed biopsy sampling (of all ages) is not expected to result in more than short-lived, minimal harassment of individual animals of any age class or sex. No serious injury or mortality of animals would be expected. Researchers have reported behavioral reactions ranging from none to moderate (tail or fin slap), and rarely strong (repeated tail/fin slapping, breaching). Similar to Level B activities, animals are expected to resume previous behaviors within minutes of sampling. Re-sightings of sampled large whales suggest that animals would not significantly alter their range or habitat use and that any wounds at the biopsy site would heal over time, resulting in no long-term adverse effects to animal health or reproductive success. Given this information, NMFS does not believe disturbances from biopsy sampling would likely reduce the reproduction, numbers, or distribution of these whales and, consequently, would not likely have a significant effect on right whales individuals, populations, or species. Furthermore, a Biological Opinion (NMFS 2010) completed on the Proposed Action concluded that research activities are not likely to jeopardize the continued existence of right whales or other endangered species.

Suction-cup Tagging

CCS requests to take a maximum of 20 animals for suction-cup tagging annually, for an intended total of 10 successful tag attachments. Up to three attempts would be made per day to attach a tag to a whale. Whales would be tagged up to three times in any 12-month period. Tags would not be attached to calves less than six months old or their mothers. In addition, the applicant has stated that efforts to tag would be discontinued if an animal exhibits evasive behaviors or is difficult to approach (see Description of Proposed Action). Analysis of the effects of close vessel approaches that take place during tagging activities has been outlined above. Therefore, the following information focuses on the known effects and potential impacts of the actual attachment of scientific instruments by suction-cup tags. Because these activities involve physical contact of some sort with the animal, they are generally categorized as having the potential to injure the animal.

It is not expected that the actual use of any suction-cup tags would have a long-term, negative effect on the animals. No abrasion or intrusion into the skin of the whale would be caused by the attachment of the tag. In addition, the suction-cup assembly would not remain attached to the whale for any significant length of time (less than 24 hours). Suction-cup tags typically release within several hours either due to pressure changes related to repeated dives by the whale or releasing with sloughed skin. The whale can also dislodge the tag by maneuvering rapidly, breaching or rubbing the tag against a solid surface. The tag assembly can migrate along the skin of the whale; however, there would be no danger that the tag would migrate to cover the blowholes since it would be attached posterior to the blowholes and hydrodynamic drag would move it away from the blowholes and toward the fluke.

Cetaceans frequently react when hit by tags delivered by remote devices such as tagging poles. In many cases, cetaceans also react when tags miss the animal and hit the water. However, in most cases, the reactions of the tagged whale and neighboring whales last little more than a few minutes, after which behavior appears to return to normal (e.g., Watkins and Tyack 1991; Goodyear 1993; Hooker et al. 2001). The presence of a tag could lead to an alteration in the normal behavior of the tagged whales, including a temporary interruption of feeding or mating activities. There is some concern over the hydrodynamic drag created by the presence of a tag on the whale's body, however, the proportion of that drag from the tag package to the animal's size and weight is such that the energetic demand on the animal would likely be insignificant.

Researchers have attached non-invasive tag packages via suction-cups to numerous cetacean species. These packages have contained a variety of scientific instruments including, but not limited to, DTAGs, time-depth recorders, satellite and radio transmitters, and CRITTERCAMs. In addition, tags are easily dislodged by the animal rolling or shaking. The ease and speed with which some of the tagged animals can remove the tag suggests any stress from attachments would be short-term.

Multiple tagging methods have been used and evaluated by many researchers. CCS researchers would manually apply tags via a handheld or cantilevered pole system (Moore et al. 2001) to the back of the target whale. These attachment methods make it possible to deliver the tag while alongside the whale with as little disturbance as possible. Baird et al. (2000) used a combination VHF and TDR tag weighing 400 g that was attached by an 8-cm suction cup. Mate et al. (1998) used a satellite transmitter (UHF) tag with dimensions 2.5 x 17 cm, weight of 495 g, shot from a crossbow and attached by two subdermal barbs. Both studies reported minimal impact to the animals despite the different attachment methods and invasiveness of the tags. Mate et al. (2007) more recently evaluated the evolution of tag units and their effects to target animals. The authors did not distinguish effects of surface mounted tags versus intrusive tag units but did conclude that tagging does not result in a "significant detriment to animal health" based on evidence that 1) behavioral responses were short-term (tens of minutes), 2) resighted animals appeared healthy and behaved normally up to three years after tagging, and 3) tagged animals were resighted as frequently as non-tagged individuals.

DTAGs have also been successfully used on whales in the wild by other researchers (Matthews et al. 2001; Nowacek et al. 2001a; Johnson and Tyack 2003; Zimmer et al. 2003). DTAGs would cause no more than momentary pain or distress to the whale. In addition, the permit would be conditioned to minimize any effects of tagging activities (see Mitigation and Minimization Measures).

Sensors and transmitters on suction-cup tags to be used in the proposed action would emit sounds vital to the proper function and retrieval of the tags. Indirect indications are that baleen whales are most sensitive to low-frequency sounds below 1 kHz, but some can hear higher frequency sounds. Baleen whales have been observed to react to sounds at frequencies up to 28 kHz, but did not respond to pingers and sonar at and above 36 kHz (Richardson et al. 1995).

The proposed tag units would include a radio tag operating at a VHF frequency in the MHz range, well above the dominant vocalization frequencies used by baleen whales, and above their highest recorded vocalization frequencies (Thomson and Richardson 1995; Au 2000). Wartzok and Ketten (1999) suggest that mysticete hearing is most sensitive at the same frequencies at which they vocalize; therefore, the frequency of the radio tag is expected to be outside of the functional hearing range of the target baleen whales.

This signal is not anticipated to interfere with acoustics of whale communication, foraging or behavior since baleen whales utilize low frequency sounds for hearing and communication. Therefore, NMFS would not expect that target whales would be impacted by the transmitting signals of the tags.

Overall, suction-cup tagging is a relatively safe method of collecting pertinent data from marine mammals because the non-invasive nature of the attachment eliminates the threat of infection and the absence of attachment lines eliminates the risk of entanglement (Weinrich et al. 1992). The possibility of injury to an animal comes from the remote risk of the apparatus landing in or striking a sensitive part of the animal's body, such as the eye, mouth, or blowhole; however, there is no reason to believe that such risk would be involved given the nature of the attachment techniques and mitigating conditions of the proposed permit. Therefore, NMFS concludes that effects from suction-cup tagging would not result in significant negative impacts on the individual, population, or species of whales proposed.

Summary of Effects to Right Whales

The most likely cause for harassment during research is disturbance from the proposed activities. However, disturbance would be temporary and animals would be expected to recover from any harassment fairly quickly (within a day). Conditions within the permits would also limit the potential for harassment during research. NMFS expects that such harassment is not likely to have a measurable long-term effect on large whale stocks or populations. Further, these activities would not be expected to result in any serious injury or mortality. Therefore, NMFS does not expect the proposed activities to significantly impact the target large whales.

4.2.2.2 Effects to Non-target Species

Since the Proposed Action is specific to right whales, research activities would not be expected to have significant effects on other marine species, including protected and listed large whales beyond those identified in Table 2 for CCS based on the nature of their surveys.

NMFS does not expect Dr. Kraus' surveys at 1,000 ft to result in harassment of non-target species as discussed in Ch. 2. In addition, Dr. Kraus noted that during research he has not observed sea turtles reacting to aircraft at 1,000 ft, and since the survey aircraft do not circle dolphins or sea turtles, contact time with those species is extremely limited. During vessel surveys, Dr. Kraus would not attempt to approach or interact with non-target species. Dr. Kraus noted that although basking sharks could be present during vessel surveys, they do not respond to boats until they are within approximately 6 meters, and usually react to a close approach by turning and diving. He does not expect to encounter other species during vessel surveys.

There is the potential for incidental harassment of a small number of fin, humpback, or minke whales that may be in the vicinity of CCS' surveys. Researchers would not approach species other than right whales unless they cannot be identified to species from outside of 100 yards. The mere presence of researchers is not expected to result in harassment of every animal present. Therefore, the number of non-target marine mammals that may be harassed by the proposed action is expected to be small and any harassment would not likely have a measurable long-term, significant effect on stocks or populations of non-target species.

Given the applicants' study designs, NMFS does not expect non-target species in the action area to be significantly impacted by the proposed research.

4.3 Summary of Compliance with Applicable Laws, Necessary Federal Permits, Licenses, and Entitlements

As summarized below, NMFS has determined that the proposed research is consistent with the purposes, policies, and applicable requirements of the MMPA, ESA, and NMFS regulations. NMFS issuance of the permit would be consistent with the MMPA and ESA.

4.3.1 Endangered Species Act

This section summarizes conclusions resulting from consultation as required under section 7 of the ESA. The consultation process was concluded after close of the comment periods on the applications to ensure that no relevant issues or information were overlooked during the initial scoping process summarized in Chapter 1. For the purpose of the consultation, the draft EA represented NMFS' assessment of the potential biological impacts. The consultation determined that the proposed action would not jeopardize any endangered species or destroy or modify any critical habitat (NMFS 2010).

4.3.2 Marine Mammal Protection Act

Each applicant submitted an application which included responses to all applicable questions in the application instructions. The requested research is consistent with applicable issuance criteria in the MMPA and NMFS implementing regulations. The views and opinions of scientists or other persons or organizations knowledgeable of the marine mammals that are the subject of the application or of other matters germane to the application were considered, and support NMFS' initial determinations regarding the application.

The permits would contain standard terms and conditions stipulated in the MMPA and NMFS' regulations. As required by the MMPA, the permits would specify: (1) the effective date of the permit; (2) the number and kinds (species and stock) of marine mammals that may be taken; (3) the location and manner in which they may be taken; and (4) other terms and conditions deemed appropriate. Other terms and conditions deemed appropriate relate to minimizing potential adverse impacts of specific activities (e.g. capture, sampling, etc.), coordination among permit holders to reduce unnecessary duplication and harassment, monitoring of impacts of research, and reporting to ensure permit compliance.

4.3.3 Other Laws

National Marine Sanctuaries Act (NMSA):
The applications were sent to the Sanctuaries in the action area (identified in Ch. 3) in which researchers might work. Sanctuary reviewers support Dr. Kraus' proposed work. The Stellwagen Bank National Marine Sanctuary supports CCS' proposed work, and will take part in the digital tagging of right whales. As the Permit Holders, CCS and Dr. Kraus would be responsible for obtaining any NMSP permits that are required.

Convention on International Trade in Endangered Species of Wild Fauna (CITES):
Dr. Kraus is applying for a CITES import permit to cover the necessary import of samples collected during research. According to Dr. Kraus, a NMFS permit is required before a CITES permit will be issued. In addition, as a standard condition of all NMFS research permits, Permit No. 14233 and No. 14603 will state that issuance of the permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

Animal Welfare Act (AWA):
In compliance with the AWA, Dr. Kraus has acquired IACUC review and approval for its proposed research activities. CCS' activities do not require IACUC review as their work meets the AWA definition of a field study.

4.4 Comparison of Alternatives

Under the No Action alternative, Permit Nos. 14233 and 14603 would not be issued, thereby preventing potential harassment of the target species and any potential impacts to other portions of the marine environment. However, research needs and data gaps in the knowledge of these cetaceans would persist. Under the Proposed Action alternative a limited number of large whales would be temporarily harassed during research activities; however, harassment would be minimal and short-term. The level and nature of take is not expected to significantly impact the target species or any other portion of the human environment, as the activities would not result in serious injury, mortality, or reduced fecundity. The Proposed Action would require that research activities be conducted in compliance with mitigating conditions of the permits. In terms of research objectives, the Proposed Action would allow researchers to answer important biological and ecological questions, particularly in relation to the abundance, demographics, health, habitat use and behavior of North Atlantic right whales, which have the potential to impact the conservation, management, and recovery of the target stocks/species. The No Action alternative would impede these efforts.

4.5 Mitigation Measures

A number of measures are built into the proposed studies that are intended to minimize the potential for adverse effects on marine mammals. Permit conditions in addition to measures identified by the applicants are described in Chapter 2. Some of these measures are standard conditions placed in all research permits along with special conditions added based on the proposed research activities and target species. Together these conditions are expected to reduce the potential for harassment of non-target protected species during research and minimize the extent and degree of harassment to the target cetacean species. For instance, conditions would be placed in the permits to prevent vessel surveys from interfering with the mother-calf pair bond

of the target cetacean species. Given the permit conditions and the precautions the applicants would take during research, NMFS expects that the Proposed Action would result in no more than temporary, minimal harassment of individual whales. Population- or species-level impacts are expected to be negligible. No impacts to other species, physical habitat or other portions of the human environment would be expected. No irreversible or irretrievable commitments of resources would be expected.

4.6 Unavoidable Adverse Effects

The mitigation measures imposed by permit conditions are intended to reduce, to the maximum extent practical, the potential for adverse effects of the research on the targeted species as well as any other species that may be incidentally harassed. However, as discussed above, the most likely effect would be disturbance to some of the target whales and dolphins from research activities. All activities are non-invasive except for biopsy sampling. Because this sampling is minimally invasive animals are expected to heal quickly and have no long-term effects. Disturbing animals may temporarily interrupt normal activities such as feeding and resting, with animals resuming previous behaviors within minutes of research. Harassment of animals is not expected to have a significant long-term effect on individuals, populations or the target species. In other words, while individual whales may exhibit temporary disturbance or evasive behaviors in response to the research activities, the impact to individual animals is not likely to be significant because the reactions will be short-lived and animals will recover physically within minutes of the activities. No serious injury or mortality would be expected. No other adverse impacts to the human environment would be expected as a result of the Proposed Action.

4.7 Cumulative Effects

Cumulative effects are defined as those that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

North Atlantic right whales in the proposed study areas are regularly exposed to human activities. A summary of the identified anthropogenic activities that may impact right whales is presented here to assess the potential for cumulatively significant impacts resulting from the proposed action. Impacts may be chronic as well as sporadic effects like behavioral changes that can stress the animal and ultimately lead to increased vulnerability to parasites and disease (Minerals Management Service 2000). The net effect of disturbance is dependent on the size and percentage of the population affected, the ecological importance of the disturbed area to the animals, the parameters that influence an animal's sensitivity to disturbance or the accommodation time in response to prolonged disturbance (Geraci and St. Aubin 1980).

Considering the nature of the proposed research activities, the minimal, temporary harassment that target animals would experience, the mitigation measures that would be employed, and that these types of research activities are not novel in the marine environment, the proposed research would contribute a negligible increment over and above the effects of the baseline activities currently occurring in the marine environment where the proposed research would occur. The following activities have been identified as factors that may impact North Atlantic right whales.

Anthropogenic Factors That May Affect North Atlantic Right Whales

Deaths resulting from human activities account for at least one-third of all known mortalities in the western North Atlantic right whale population (Kraus 1990), primarily from ship collisions and entanglement in fishing gear (Kenney and Kraus 1993). Other potential threats include habitat degradation, noise, contaminants, military activities, climate and ecosystem change, and energy development projects. These impacts are discussed in the following subsections.

The total estimated human-caused mortality and serious injury rate to right whales from 2000 through 2004 is estimated at 2.8 per year (US waters 1.6, Canadian waters 1.2) (Waring et al. 2007). This is a decrease of 0.40 from the previous estimate (1999 through 2003) but an increase of 0.80 from the estimate for the period of 1997 through 2001. "A serious injury" is defined in 50 CFR part 229.2 as an injury that was likely to lead to mortality. The figure of 2.8 right whales per year must be regarded as a minimum estimate due to the fact that not all deaths become known to researchers, and the cause of death cannot always be determined.

Eight right whale deaths were recorded over a 16-month period, ending in July 2005. Six of these animals were adult females, three of which were carrying near-term fetuses (Kraus et al. 2005). According to Moore et al. (2004), the extent of this type of loss of right whales, especially reproductively active females, is unprecedented over the 25 year study history of the species. Kraus et al. (2005) calculated that the deaths of the four reproductively active females represent a lost reproductive potential of as many as 21 animals, based on the fact that the average lifetime calf production is 5.25 calves (Fujiwara and Caswell 2001).

4.7.1 Shipping and Ship Strikes

Ship strikes are responsible for the majority of human-caused right whale mortalities (Knowlton and Kraus 2001; Jensen and Silber 2003; NMFS 2005b). As such, ship strikes are a primary factor in the lack of recovery of the species. In waters off the U.S. and Canadian East Coast, several major shipping corridors overlap with, or are adjacent to, right whale habitat and migratory routes and pose a grave threat to these animals. Presumably, right whales are either unable to detect approaching vessels or ignore them if they are involved in important activities such as feeding, nursing, or mating. On the other hand, given the density of ships and the distribution of right whales, overlap is nearly inevitable, thereby increasing the probability of a collision, even if one entity or the other is actively trying to avoid a collision. Additionally, right whales are very buoyant and slow swimmers, which may make it difficult for them to avoid oncoming vessels, even if they are aware of a vessel's approach. Similarly, it is difficult to detect a right whale from the bow of the ship because of its dark coloration, and it maintains a low profile while swimming (WWF 2005, as cited in USCG and Environmental Resources Management Inc. 2006).

NMFS published a database in 2003 of all known ship strikes to large whales worldwide. Although this database is perhaps the most comprehensive one available, it cannot be considered exhaustive and almost certainly underestimates the actual number of strikes, because not all ship strikes are documented. Based on a recent estimate of the mortality rate and records of ship strikes to large whales, scientists estimate that less than a quarter (17 percent) of ship strikes are actually detected (Kraus et al. 2005). Collisions occur off almost every U.S. coastal state, but strikes are most common along the East Coast. More than half (56 percent) of the recorded ship

strikes from 1975 to 2002 occurred off the coasts of the Northeast U.S. and Canada, while the mid-Atlantic and SEUS areas each accounted for 22 percent (Jensen and Silber 2003). Records from Knowlton and Kraus' (2001) account of right whale deaths show similar results: of 15 confirmed ship strikes in the western North Atlantic (including Canada) from 1970 to 1999, nine (60 percent) occurred in the Northeast, and three (20 percent) occurred in both the mid-Atlantic and Southeast.

Records of deaths from 1970 to 1999 indicate that ship strikes were responsible for over one-third (16 out of 45, or 35.5 percent) of all confirmed right whale mortalities (Knowlton and Kraus 2001). The authors also noted two possibly fatal; and seven nonfatal ship strike injuries during this time period. Another study conducted over a similar period, 1970 to 2002, examined 30 (18 adults and juveniles and 12 calves) out of 54 reported right whale mortalities from Florida to Canada (Moore et al. 2004). Human interaction (ship strike or gear entanglement) was evident in 14 of the 18 adults examined, and trauma, presumably from vessel collision, was apparent in ten out of 14 cases. Trauma was also present in four out of 12 calves; although the cause of death was more difficult to determine in these cases. In 14 cases, the assumed cause of death was vessel collision, and an additional four deaths were attributed to entanglement. The cause of death was undetermined in the other 12 cases (Moore et al. 2004).

A NMFS reference document on mortality and serious injury determinations for large whales contains 50 reports of right whale events from 1999 to 2003, including five right whale mortalities resulting from ship strike, which represent 27.8 percent of the 18 verified right whale mortalities from 1999-2003 (Cole et al. 2005). More recently, NMFS documented 58 reports of right whale events from 2003 to 2007, including nine mortalities and two serious injuries from confirmed ship strikes. These nine mortalities represent 45 percent of the 20 verified right whale mortalities from 2003-2007 (Glass et al. 2009).

Many types and sizes of vessels have been involved in ship strikes, including container/cargo ships/freighters, tankers, steamships, U.S. Coast Guard (USCG) vessels, U.S. Navy vessels, cruise ships, ferries, recreational vessels, fishing vessels, whale watching vessels, and other vessels (Jensen and Silber 2003). Vessel speed (when recorded) at the time of a large whale collision has ranged from two to 51 knots (Jensen and Silber 2003). Vessels can be damaged during ship strikes; of the 13 records that include vessel damage, all of these vessels were traveling at a speed of at least ten knots (Jensen and Silber 2003). Occasionally, collisions with large whales have even harmed or killed humans on board the vessel. A summary paper on ship collisions and whales by Laist et al. (2001), reported that of 28 recorded collisions causing lethal or severe injuries to whales, 89 percent involved vessels traveling at 14 knots or faster, and the remaining 11 percent involved vessels traveling at ten to 14 knots. None occurred at speeds below ten knots, although there is a predicted 45 percent chance of death or serious injury to the whale at ten knots (Pace and Silber 2005).

Researchers believe that the primary causes for right whale ship strikes relate to their hearing and ability to detect the presence of the vessels. Aside from these issues though, a whale must perceive a ship as a threat in order to avoid it. Unless a given individual has had a previous close encounter with a ship, survived the encounter, and learned the threat posed by the vessel, then the urge to avoid a ship may not be great.

4.7.2 Conservation Efforts

Concern has been raised over the possible adverse effects of whale-watching activities on right whale aggregations, particularly in CCB and the lower Bay of Fundy. While adverse effects from this activity are possible, there are no data that conclusively establish adverse effects beyond the possibility of ship strikes. Furthermore, whale-watching in these regions is typically focused on other large whale species since a federal regulation (50 CFR 224.103) prohibits vessels from approaching right whales in U.S. Atlantic waters within 500 yards (460 m). There are a few exceptions to this regulation, such as permitted researchers, but whale-watching vessels must maintain the 500-yard distance. As a result, most effects from whale-watching activities are likely limited to behavioral changes or perhaps relatively small changes in distribution. Given the above-mentioned regulations on vessel approaches to right whales, the potential for temporary, perhaps relatively minor, effects has been reduced. However, relatively recent collisions between whale-watching boats and a humpback (2001) and a minke whale (1998) indicate that much more serious consequences (e.g., death or serious injury) are also possible. Each NMFS region issues guidelines for viewing whales.

In November 2006, NMFS established a set of recommended vessel routes in four locations to reduce the likelihood of collisions in key right whale habitats. More recently, in October 2008, NMFS issued new regulations to reduce the likelihood of vessel collisions with North Atlantic right whales. The regulations implement speed restrictions of 10 knots or less for vessels 65 ft (19.8 m) and greater in certain areas and at certain times of the year along the U.S. Atlantic seaboard that correspond to right whale occurrence. Exempted from the rule are State enforcement vessels and U.S. government vessels that will be expected to adhere to guidance provided under ESA Section 7 consultations. The rule also contains a provision exempting vessels from speed restrictions in poor sea and weather conditions, thereby ensuring safe vessel maneuverability under those special conditions. The rule also provides for establishment of temporary, voluntary dynamic management areas (DMAs) in times and/or areas where the seasonal management measures are not in effect, and where whales occur. In these locations, mariners would have the option to cross through the DMA at a speed no greater than 10 knots or route around the area.

4.7.3 Fishing Gear Entanglement

Entanglement in fishing gear is another common anthropogenic cause of right whale mortality and serious injury. Because right whale occurrence can overlap with frequented fishing areas, gear entanglements are common and can cause death by drowning or serious injuries such as lacerations, which in turn can lead to severe infections. Most right whale entanglements appear to be with gillnets, lobster pots, crab pots, seines, fish weirs, and aquaculture equipment (NMFS 2005a). Because right whales are skimmers and feed by swimming with their mouth agape, it is quite common for gear to become entangled amongst the baleen plates in their mouths. Entanglements of juveniles are particularly dangerous because wrapped line can become imbedded in tissue as the whale grows, cause infections, and/or restrict growth.

According to the 2006 Stock Assessment Report, 57 percent of right whale mortalities or serious injuries reported from 2000 through 2004 resulted from entanglements or fishery interactions (Waring et al. 2007). In January 1997, NMFS changed the classification of two lobster pot fisheries (the Gulf of Maine and the U.S. mid-Atlantic) from Category III to Category I based on

the number of large whales entangled by lobster pot gear during the time period of 1990 to 1994 (62 FR 33, January 2, 1997). A fishery qualifies as a Category I if the annual mortality and serious injury of a marine mammal stock in that fishery is greater than or equal to 50 percent of the PBR level, whereas a Category III fishery is a fishery where the annual mortality and serious injury is less than or equal to one percent of the PBR level (16 U.S.C. § 1387).

Although entanglements do not always result in death or serious injury, they pose a serious threat to North Atlantic right whales. Analysis of the North Atlantic Right Whale Catalog[7] indicates that 61.6 percent of the overall population shows physical evidence of entanglements, such as scars (Hamilton et al. 1998), and between 10 and 28 percent of whales experience entanglements each year (Knowlton et al. 2001). Injuries and entanglements that are not initially lethal may result in a gradual weakening of entangled individuals, making them more vulnerable to some other direct cause of mortality (Kenney and Kraus 1993). For example, entanglement may reduce a whale's ability to maneuver, making it more susceptible to ship strikes. Entanglement-related stress may decrease an individual's reproductive success or reduce its life span, which may in turn depress population growth.

Records of deaths from 1970 to 1999 indicate that three out of 45 (6.7 percent) were due to entanglement in fishing gear (Knowlton and Kraus 2001). The authors also noted eight possibly fatal and 20 nonfatal ship strike injuries during this time period. A NMFS reference document on mortality and serious injury determinations for large whales contains 50 reports of right whale events from 1999 to 2003, including three right whale mortalities and seven reports of serious injury resulting from entanglement. These three mortalities represent 16.7 percent of the 18 verified right whale mortalities from 1999-2003 (Cole et al. 2005). From 2003 to 2007, 20 right whale entanglement events were confirmed, three of which resulted in mortality and one serious injury (Glass et al. 2009).

The number of deaths attributed to fishing gear interactions may be grossly underestimated. In many cases, veterinarians and researchers are unable to determine a cause of death from a whale carcass. Another possibility is that some whales become entangled, drown, and fail to resurface, so their carcasses are never recovered and examined.

4.7.4 Habitat Degradation

A continued threat to the coastal habitat of the right whale in the western North Atlantic is the undersea exploration and development of mineral deposits, as well as the dredging of major shipping channels. Offshore oil and gas activities have been proposed off the coast of the mid- and south-Atlantic U.S. (NMFS 2005b), but NMFS is not aware of any current plans to explore or develop oil resources in this region. If these activities occur, there may be consequent adverse effects to the right whale population by vessel movements, noise, spills, or effluents. These activities may possibly result in disturbance of the whales or their prey and/or disruption of the habitat and should be subject to ESA Section 7 consultations.

Right whales also frequent coastal waters where dredging and its associated disposal operations occur on a regular basis, such as along the SEUS coast. The U.S. Army Corps of Engineers

[7] The Right Whale Catalog is a database of whale sightings and photographs maintained by the New England Aquarium.

(USACE) has responsibility/oversight for many of these dredging and disposal operations and has consulted with NMFS under Section 7 of the ESA on these activities. As a result, engaging in dredging operations and related activities requires protective measures such as posting lookouts on dredge vessels and adherence to recommended precautionary guidelines for operations to reduce the risk of collision.

Discharge from municipal, industrial, and non-point sources, dredging activities, dredge spoil disposal, and sewage disposal may degrade essential habitat in Massachusetts Bay and northern CCB.

4.7.5 Noise

A review of impacts of noise of all types on marine mammals is provided by Richardson et al. (1995). Noise, as defined by Richardson et al. (1995), is a sound that impairs reception of signals of interest that affects the animal in a way that interrupts normal behavior. Although certain species of large whales have shown behavioral changes to anthropogenic noise sources in the marine environment, there have been few studies of the effects of anthropogenic noise on right whales specifically. In general, the impact of noise from shipping or industrial activities on the communication, behavior, and distribution of right whales remains unknown. Several of the activities described in this section also have the possibility of creating a noise nuisance to right whales.

Noise from ships is one of the biggest problems facing right whales related to their hearing abilities. Even though research indicates that right whales should be able to hear vessels, they do not appear to avoid vessels. Several researchers have confirmed that right whales should be able to hear approaching vessels, which emit sounds in a range they can perceive. Parks (2003) established that whales have the ability to locate a sound and even remember where it originated from for around 20 minutes after the sound stops. Masking and habituation are two phenomena that may help to explain right whale behavior regarding vessels and other anthropogenic sounds.

Background ambient noise, or underwater noise, including that produced by human activities (e.g., dredging, shipping, seismic exploration, and drilling for oil), may interfere with or mask the ability of a marine mammal to detect sound signals, such as calls from other animals (Richardson et al. 1995). There are many sources of low frequency noises from human activities that overlap with the low frequency calls of mysticetes. To compensate and reduce masking, some mysticetes may alter the frequencies of their communication sounds (Richardson et al. 1995).

Masking may also prevent right whales from being able to detect and avoid approaching vessels because they might not be able to distinguish the sound of an approaching ship from the ambient noise in the ocean. This hypothesis has not been tested. Areas with continuous loud distant shipping may mask the sound of individual ships until they are too close to the whales (Terhune and Verboom 1999), which may make right whales more susceptible to ship strikes.

Research has been conducted on the effects of vessel noise on certain species of large whales yet there are still unknowns about right whale hearing capacities. Research suggests that right whale hearing is concentrated in the low frequency range, thus some high frequency noise such as

propellers might not be detected (Terhune and Verboom 1999). Large vessels cause the most lethal and serious injury to whales and also produce low frequency sounds which may interfere with right whale hearing (Koschinski 2002).

The ability of a right whale to detect a vessel is related to a variety of factors including bottom reflections, frequency of sounds, location of the whale with respect to the vessel, and its depth in the water column. Multipath propagation of vessel noise may confuse the whale as to the direction the ship is going and generally is problematic with low frequency noise. Ships generate higher noise levels towards the stern of the boat than in front of the bow, and even louder noises directly under the ship, so there might be instances in which a whale would not actually hear a vessel until after it has passed. Ship noises are not as loud near the surface as they are five to ten meters beneath, due to the reflective nature of the surface (Terhune and Verboom 1999). This is known as the Lloyd-mirror effect, which is amplified in the low frequency range, in calm sea states, and when the source and/or receiver are near the surface (Richardson et al. 1995). Therefore, in certain conditions, a whale might be less likely to hear a vessel when the whale is at or near the surface, where it is at a high risk of being struck by a vessel.

Habituation is a phenomenon whereby whales may not respond to anthropogenic sources of noise, such as vessel noise, because they have become accustomed to continuous noise in certain areas. For example, right whales may become habituated to vessel noise in areas of heavy vessel traffic and as a result, are less reactive to the approaching ships.

Attempts have been made to try to better understand the connection between the hearing abilities of right whales, vessel noise, and the incidence of ship strikes. One study utilized an archival DTAG to record whale behavioral reaction to an alert signal, vessel noise, other whale social sounds, and a silent control (Nowacek et al. 2004). The whales did not have a significant response to any of the signals other than an alert signal broadcast ranging from 500 to 4,500 Hz. In response to the alert signal, whales abandoned current foraging dives, began a high power ascent, remained at or near the surface for the duration of the exposure, and spent more time at subsurface depths of one to ten meters (Nowacek et al. 2004). This increased time just below the surface could substantially increase their risk of ship strike because whales are susceptible to being struck but are not visible at the surface. The consequences of the whales' altered behavior, aside from increased risk of ship strike, are reduced foraging time and an excess use of energy, a problem for an endangered species. The whale's lack of response to a vessel noise stimulus from a container ship and from passing vessels indicated that whales were unlikely to respond to the sounds of approaching vessels even when they could hear them (Nowacek et al. 2004).

A second study that utilized a DTAG had similar results. The scientists played a recording of a tanker using an underwater sound source and observed no response to a tagged whale 600 m away (Johnson and Tyack 2003). This non-avoidance behavior could be an indication that right whales have become habituated to the vessel noise in the ocean and therefore do not feel the need to respond to the noise or may not perceive it as a threat. These various hypotheses aside, it has not been established why the species is so susceptible to strikes. Also, caution should be used when extending study results from deep water environs to shallow water environs, for example, in the SEUS. (See section 4.7.1 for a more detailed discussion about the threat of ship strikes on right whale survival.)

It is unknown to what extent these activities described in the sections above may disturb or otherwise affect right whales. It appears that whale behavior and the type of activity in which they are engaged influence right whale sensitivity to, and tendency to avoid, noise disturbance and vessel activity (Watkins 1986; NMFS 1991), but more studies are needed. Additional factors aside from masking and habituation may also interfere with a whales' ability to hear approaching vessels.

4.7.6 Contaminants

Contaminant data on right whales are restricted to data from biopsy-derived samples. These data appear to be relevant to the whole animal given that lipid-normalized contaminant burden is comparable between different blubber depths and locations in large whales (Gauthier et al. 1997). Data for right whales are limited to only two studies (Moore et al. 1998; Woodley et al. 1991). These data show a range of total PCBs of 80 to 1,000 ng/g wet weight, i.e., in the parts per billion range. No obvious geographic trends were evident in samples from South Africa, South Georgia, CCB, and Bay of Fundy, Canada (Moore et al. 1998). In contrast, most odontocete (i.e., toothed whales, porpoises, and dolphins) values were in the parts per million range (Aguilar and Borrell 1996). Organic chemical contaminants have been regarded as of less significance for mysticetes than odontocetes and are not considered primary factors in slowing the recovery of any stocks of large whale species (O'Shea and Brownell 1994). This is especially true for planktivorous baleen whales such as right whales, given their lower accumulated contaminant burdens as compared to other marine mammals. However, assessment of contaminant body burden ignores toxic non-halogenated aromatic hydrocarbons (polynuclear aromatic hydrocarbons: PAH) from crude oil and combusted fossil fuels that do not bioaccumulate. Such compounds are metabolized, induce their effects, and are mostly excreted. Contaminant impact is therefore insufficiently assayed by blubber burden analysis of parent compounds alone.

Right whales may be exposed to a variety of anthropogenic chemical contaminants throughout their range, which can lead to reproductive dysfunction. Theoretically, a loss of genetic diversity can lead to "inbreeding depression," where inbreeding adversely affects a population's reproduction and recruitment rates. Genetic factors might be affected by external factors, including toxic chemicals and poor nutrition (Reeves et al. 2001).

Pollutants may also affect phytoplankton and zooplankton populations in a way that decreases the density and abundance of specific zooplankton patches on which northern right whales feed. In addition, pollution may affect the feeding patterns and habitat use of other components of the marine ecosystem, which in turn could impact food and habitat availability for the right whale. A study conducted by Doucette et al. (2006) suggests that the trophic transfer of marine algal toxins is a factor contributing to the recovery failure of the North Atlantic right whale.

4.7.7 Military Activities

Although no evidence conclusively links military activities in the North Atlantic to impacts on right whales, activities such as underwater explosions and military exercises in this ocean basin have the potential for disturbing, injuring, or killing these and other whales.

In early 1996, six right whale deaths were documented. Five (one attributed to a ship strike) occurred in waters adjacent to the SEUS critical habitat. Navy facilities adjacent to the critical habitat use offshore areas for gunnery exercises. Because several of the carcasses were found near a U.S. Navy gunnery range, it was suspected that some deaths were related to underwater explosions, and there was concern that Navy activities may have been involved in some deaths. However, no such link was established. Although a link to military activities was not established, the Navy entered into consultation with NMFS under Section 7 of the ESA on the potential effect of some of its operations on protected species, as described in Appendix A of the Recovery Plan (NMFS 2005b). In addition, Navy activities that introduce loud sounds into the marine environment are required to be reviewed to ensure compliance with those provisions of the MMPA regarding the incidental harassment of marine mammals. The Navy has made a number of significant modifications to its operations to facilitate protection of right whales in their critical habitat in the SEUS. NMFS and the Navy both understand the need to continue to keep an open dialogue and to evaluate ways to mitigate possible environmental impacts of naval operations throughout the eastern seaboard.

The Navy has also been issued Letters of Authorization (LOAs) to take North Atlantic right whales by Level B harassment of animals incidental to Navy training, maintenance, and research, development, testing, and evaluation activities to be conducted along the Atlantic and Gulf of Mexico coasts, over the course of 5 years. They are authorized 662 takes for the harassment of right whales annually. These training activities are classified as military readiness activities. These training activities may incidentally take whales present within the AFAST Study Area by exposing them to sound from mid-frequency or high frequency active sonar or to underwater detonations at levels that NMFS associates with the take of marine mammals.

4.7.8 Climate and Ecosystem Change

There is a close linkage between right whale foraging and the physical forcing processes that concentrate prey in the oceanic environment (Kenney et al. 2001). Interannual, decadal, and longer time-scale variability in climate can alter the distribution and biomass of prey available to right whales. For example, decade-scale climatic regime shifts have been related to changes in zooplankton in the North Atlantic (Fromentin and Planque 1996). Decadal trends in the North Atlantic Oscillation (NAO) (Hurrell 1995) can affect the position of the Gulf Stream (Taylor et al. 1998) and other circulation patterns in the North Atlantic that may be important to right whales. The effects of climate-induced shifts in productivity, biomass, and species composition of zooplankton on the foraging success of right whales have received little attention. Such shifts in community structure and productivity may alter the distribution and occurrence of foraging right whales in coastal habitats and affect their reproductive potential as well.

"The North Atlantic Oscillation is a complex climatic phenomenon in the North Atlantic Ocean (especially associated with fluctuations of climate between Iceland and the Azores). It is characterized predominantly by cyclical fluctuations of air pressure and changes in storm tracks across the North Atlantic."[8] The NAO index measures the difference in sea-level pressure between the subtropical high (Azores) and the subpolar (Iceland) low. The climactic change

[8] http://www.cpc.ncep.noaa.gov/data/teledoc/nao.shtml

caused by the NAO can have an impact on right whale foraging. During a positive phase[9] in the 1980s, slope water temperatures were warmer than average in the Gulf of Maine, and *C. finmarchicus* abundance was relatively high. Modeling studies indicate that the stable calving rates of right whales in the 1980s were related to the high abundance of *C. finmarchicus* during this time (Greene et al. 2003). Then a decrease in the NAO index in the mid-1990s resulted in low *C. finmarchicus* abundance in the late 1990s, which coincided with declining calving rates from 1993 to 2001 (Greene et al. 2003).

Data from Gulf of Maine Ocean Observing System (GoMOOS) Buoy N (in the Northeast Channel) can provide forecasts of right whale births based on water temperature at the buoy. As mentioned above, the NAO affects water temperatures in the Atlantic Ocean and specifically, the Gulf of Maine. Water temperatures in turn, influence right whales' food supply, which affects reproduction and the number of calves born. "After a positive [NAO] index, whale food becomes plentiful, and right whales produce many calves. After a negative NAO index, food becomes scarce, resulting in few calves being born" (GoMOOS 2006). Based on these data, 13 births were predicted for 2006 and 16 for 2007.

4.7.9 Energy Development

Steady increases in oil prices and a desire to decrease U.S. dependence on foreign sources of oil have led to the development of alternative energy projects in U.S. waters. These include wind farms and liquefied natural gas installations. Another factor driving some of these projects is the desire to find cleaner, more environmentally-friendly sources from which to derive and maintain our energy needs. Offshore oil and gas exploration and its effects on right whales are discussed above in the section on habitat degradation.

Wind Farms

Using wind to produce energy is not a new concept. Archaeologists have found evidence that the Chinese and ancient Egyptians used windmills to grind grain and pump water, dating back more than 2,000 years. However, it was not until the oil embargoes of the early 1970s that the development of wind farms became an important project in the United States. Currently, there are several wind farms throughout the world, mostly in the U.S. and Europe. In the United States, some of these farms are located in California and Iowa, though there has been recent interest to establish wind farms offshore.

In 2001, Cape Wind Associates, LLC filed a permit application with the USACE, New England District, in anticipation of constructing a wind park located on Horseshoe Shoals in Nantucket Sound, Massachusetts. The proposed park would consist of 130 offshore wind turbine generators with a maximum potential electric output of approximately 454 megawatts (MW). The installation would require a 30 kilovolt submarine transmission cable to transmit the electricity to a centrally located electric service platform (71 CFR 30693, May 30, 2006).

According to a study conducted by ESS Group Inc. (2006), the construction and existence of the Cape Wind park will have a minimal impact on right whale feeding. The primary feeding

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[9] A positive phase occurs when subtropical pressures are higher than normal and subpolar pressures are lower than normal, resulting in above average temperatures in the eastern US (http://www.cpc.ncep.noaa.gov/data/teledoc/nao.shtml).

grounds for many whales found in the study area, including right whales, are located further offshore from Nantucket Sound at locations such as Stellwagen Bank, CCB, and the Gulf of Maine. The bathymetric and oceanographic features that favor dense aggregations of whale prey species are not developed in Nantucket Sound to the same extent that they are farther north, around Stellwagen Bank, Jeffrey's Ledge, Browns and Baccaro Banks, and in the GSC (Kenney and Winn 1986). "Historically and at present, Nantucket Sound does not appear to be an important area for these species of whales" (ESS Group Inc. 2006).

Minerals Management Service (MMS) is also currently drafting an EIS regarding a proposal from the Long Island Power Authority and Florida Power and Light Energy to construct an eight square mile wind park of 40, 3.6 MW wind turbine generators in Federal waters, approximately 3.6 miles south of Jones Beach Island, Long Island, New York. This area is not currently known to be a critical habitat location for the western North Atlantic right whale population. However, there is a possibility that the whales may use this area as they migrate between the calving grounds in the south and the feeding grounds in the north.

The possible effects of wind turbines on marine mammals differ depending on the location of the structures (i.e. < 20 m or 20 to 100 m depth). Dangers can be posed to the animals both during the construction and the operating phases of the projects. The possibilities for acoustic harassment will be greater during the construction/pile-driving phase (Madsen et al. 2006). Based on a review of airgun studies, Madsen et al. (2006) noted that right whales may demonstrate avoidance responses to transient signals from the pile-driving above some 120 dB (RMS) re 1 μPa. "Thus, pile-driving has the potential to affect right whales over very large ranges, depending on the propagation conditions" (Madsen et al. 2006). However, to date, there have been few studies that examine the effects of pile-driving or other high-level, low-frequency impulsive sounds on marine mammals. Similarly, no studies have been conducted to determine the effects of turbine noise on baleen whales. The data suggest that the noise emitted from the turbines may affect right whales up to a few kilometers away; however, the behavioral effects are likely to be minor (USACE 2004; Madsen et al. 2006).

Other potential impacts to marine mammals during the construction and/or operational phases of the project include increased vessel traffic, which pose both a noise threat and a ship strike threat, elevated total suspended solids, habitat shift from structure-oriented to non-structure oriented system once the monopiles are removed, submarine vibrations, and electromagnetic/thermal emissions from submarine cables and inner-array cables (USACE 2004). The Cape Wind Project DEIS (USACE 2004) also indicates some potential indirect impacts: prey mortality and/or displacement and bioaccumulation from consuming contaminated prey. As more of these wind parks are built in marine environments, studies will need to be done to understand the full range of effects the noise of such operations will have on right whales.

Liquefied Natural Gas Installations

Liquefied Natural Gas (LNG) will be an increasingly important supply component to meet domestic demand for natural gas. According to the Federal Energy Regulatory Commission (FERC) website (http://www.ferc.gov/industries/lng.asp#skipnavsub), approximately 40 LNG terminals are either before FERC or being discussed by the LNG industry. Six terminals are already operating along the eastern seaboard, Puerto Rico, and Alaska. Of the 16 facilities

currently under FERC jurisdiction, 12 are land-based. However, two of the most recently proposed sites received by the USCG/Maritime Administration (MARAD) are located off of Boston, MA near Stellwagen Bank NMS.

Northeast Gateway Energy Bridge, LLC (NEG) submitted a proposal for a LNG facility approximately 13 miles south-southeast of the city of Gloucester, MA in Massachusetts Bay waters (71 FR 29211, May 19, 2006). NMFS issued an incidental harassment authorization (IHA) to NEG in May 2007 to begin construction of the terminal facility (72 FR 27077, May 14, 2007). Construction was expected to take place between May and November 2007. Neptune LNG, LLC also submitted a proposal to the USCG/MARAD to construct an installation 22 miles northeast of Boston, Massachusetts in the Federal waters of the Outer Continental Shelf (70 FR 58729, October 7, 2005). Neptune received an IHA in summer 2008 to cover the first phase of construction of a port facility. A second IHA was issued in June 2009 and is effective from July 1, 2009, through June 30, 2010. This IHA covers the completion of construction, which was done in late 2009 and the beginning of operations. There is currently a proposed IHA notice for a third 1-year IHA to cover operation and repair/maintenance activities until July 1, 2011. At that time, NMFS hopes to have 5-year regulations in place to cover operation and repair/maintenance activities of the LNG port facility. Both of these facilities, if approved, will be in areas deemed as primary late winter/early spring feeding habitat for the western North Atlantic right whale.

According to the EIS prepared by the USCG and its contracting company, Environmental Resources Management, Inc. (2006), right whales have the potential to be affected by construction activities as the result of physical harassment, vessel strikes, alteration to habitat, acoustic harassment, alteration of prey species abundance and distribution, and entanglement. However, the findings in the EIS (USCG and Environmental Resources Management Inc. 2006) indicate that impacts from these activities will be minimal, especially when mitigation measures are employed. The greatest risk from these activities is the increased chance of ship strikes because of the increased vessel traffic in the area, especially during the construction phase. NMFS and the National Ocean Service noted other potential impacts to the USCG during the comment period for the DEIS: ingestion of marine debris, fuel spills, impingement and entrainment during ballast water intake (including prey species), and bioaccumulation of contaminants. NMFS issued Biological Opinions (Neptune, January 12, 2007; NEG, February 5, 2007) for each facility. Both documents state that construction and operation of each deepwater port are likely to adversely affect but are not likely to jeopardize the continued existence of the North Atlantic right whale.

4.7.10 Other Scientific Research Permits and Authorizations

Marine mammals have been the subject of field studies for decades. The primary purposes of most studies are generally for monitoring populations and gathering data for behavioral and ecological studies. As discussed in Chapter 1, NMFS is currently drafting a PEIS for all right whale research. The PEIS analysis is not tied to any specific proposed action but rather evaluates the level and magnitude of research as a whole that NMFS expects to permit in the foreseeable future. The PEIS analysis is not associated with any prior finding of significant impacts to right whales as a result of any individual proposed permit action and therefore does not impede the current analysis of right whale takes in this EA for Permit Nos.14233 and 14603.

Over time, NMFS has issued dozens of permits for the take of marine mammals throughout the North Atlantic by harassment from a variety of activities, including aerial and vessel surveys, photo-identification, remote biopsy sampling, and attachment of scientific instruments. The number of research permits and associated takes by harassment indicate a high level of research effort relative to the population size of some endangered marine mammal species throughout the North Atlantic. This is due, in part, to intense interest in developing appropriate management and conservation measures to recover these species. One permit, NMFS Marine Mammal Health and Stranding Response Program (MMHSRP), File No. 932-1905, authorizes takes of stranded or distressed marine mammals, including the disentanglement and health assessment of large whales.

Beyond the MMHSRP permit, nine permits currently authorize research on North Atlantic right whales in the action area, one of which is the applicant's current permit, No. 655-1652-01 (see Table 3).

Table 3: Active NMFS Scientific Research Permits Authorizing Take of North Atlantic Right Whales

Permit No.	**Holder**	**Expiration Date**
655-1652-01	Scott Kraus	**until new permit is issued
633-1763-01	Center for Coastal Studies	**until new permit is issued
594-1759	Georgia DNR	5/1/2011
948-1692	Ann Pabst	5/31/2011
1058-1733-01	Mark Baumgartner	5/31/2012
775-1875	NMFS, NEFSC	1/15/2013
779-1633-01	NMFS, SEFSC	**until new permit is issued
605-1904-01	Whale Center of New England	2/15/2013
13545	Ocean Alliance	2/15/2015

The current permits issued to Dr. Kraus and CCS would expire upon issuance of the proposed permits. It is also important to note that Dr. Kraus' proposed research, File No. 14233, is a reduction in research effort compared to the level of take authorized by Permit No. 655-1652-01 because he will not be conducting as many research activities, including tagging and ultrasound measurements.

Tables 4 and 5 illustrate the level of harassment each species would receive by the Proposed Action in addition to currently authorized research over the next five years. Takes in Table 5 are in addition to takes authorized in Table 4. Level A activities, such as biopsy sampling, that require close approach of the vessel would occur simultaneously with Level B activities; they are listed separately here simply to distinguish the level of harassment (Level A versus B) that would be authorized by all permitted research over the life of the proposed permits. However, noted in both tables, the current number of takes authorized would gradually decrease over the next five years as current permits expire.

Table 4. **Level B Harassment** during Aerial and Vessel Surveys.

Year End	**Current**	**Kraus Proposed**	**CCS Proposed**
2011	1,295	2,000	750
2012	995	2,000	750
2013	695	2,000	750
2014	20	2,000	750
2015	20	2,000	750

Table 5. **Level A Harassment** (includes associated close vessel approach).

Year End	**Biopsy**			**Tagging**		
	Current	**Kraus Proposed**	CCS Proposed	**Current**	Kraus Proposed	**CCS Proposed**
2011	60	50	0	175	0	20
2012	60	50	0	175	0	20
2013	60	50	0	40	0	20
2014	0	50	0	0	0	20
2015	0	50	0	0	0	20

In addition to current permits that authorize take of North Atlantic right whales, NMFS PR is processing three other permit requests to conduct right whale research in the North Atlantic. One applicant, Dr. Jim Hain, has been conducting right whale research for decades until his permit recently expired; he is now applying for a new permit to continue his long-term monitoring of the population. He is currently working under Dr. Kraus' current permit while Dr. Hain's permit request is processed. A review of Dr. Kraus' annual reports for the permit indicates that he has not used all authorized takes each year. For example, he reported using 40 percent of his annual takes in its first year, seven percent in both the second and third years, and 18 percent during the fourth. Based on the nature of field work, PR expects that for the foreseeable future, Permit Holders as a whole will continue to have a portion of authorized takes that are not used each year due to a host of factors, such as weather, funding, whale sightings, etc., that affect the success of field research. Therefore, although additional take of right whales may be authorized during the next five years, NMFS expects that the Proposed Action would not significantly change the cumulative level of research effort on the North Atlantic right whale and that potential impacts to the right whale population over the next five years are expected to remain similar to that authorized by existing permits.

None of the current permits or new requests involves activities that are likely to result in the serious injury or mortality of an animal. And no such incidences have been reported by permitted right whale researchers. Hence, the number of takes proposed by the applicants, when added, cumulatively, to the currently authorized research activities in the action area, is not expected to result in a significant adverse impact on North Atlantic right whales or any other endangered species.

In addition, all permits issued by NMFS, including the Proposed Action, for research on marine mammals contain conditions requiring the Permit Holders to coordinate their activities with the NMFS regional offices and other Permit Holders conducting research on the same species in the same areas, and, to the extent possible, share data to avoid unnecessary duplication of research and disturbance of animals. More specifically, research on North Atlantic right whales, including the Proposed Action, is closely coordinated by the North Atlantic Right Whale Consortium, a group of non-government and government organizations and individuals in the United States and Canada who share the common goals to research, protect, and ultimately conserve this species. Members of the Consortium contribute to two major, centralized datasets: the survey and "Sightings database" and the "Identification database". The Identification database contains all known photographed sightings of right whales since 1935 and any record that can lead to an individual identification, including "sightings" with skin or fecal samples collected from un-photographed whales. In addition, several other databases contain biological data on right whales, including genetics, which link data to individuals in the Identification database. Collectively, these databases represent a scientific resource, and access to the data for scientific, educational, conservation and management purposes is encouraged and not limited to contributors. These databases not only promote collaboration among researchers but minimize harassment of individual right whales by allowing researchers to target known data gaps, such as photographic and genetic identification, of animals within the population. For example, upon approaching a whale, researchers can determine whether it is an individual that already has been photographed or sampled, thereby preventing unnecessary or duplicative sampling and harassment. Sighting information is also provided through the Sighting Advisory System, limiting repeated harassment of individuals in the population.

NMFS acknowledges that repeated disturbance of some individual right whales could occur during research. However, in the event that repeated disturbance occurs, NMFS expects that the temporary harassment of individuals would dissipate (within minutes) before animals could be targeted for research by another Permit Holder. Further, NMFS has taken steps to limit repeated harassment and avoid unnecessary duplication of effort through permit conditions requiring coordination among Permit Holders. NMFS continues to monitor the effectiveness of these conditions in avoiding unnecessary repeated disturbances, and would do so for the Proposed Action, if approved.

Because a portion of future requests represent research effort that is currently occurring under active permits, NMFS PR does not expect the cumulative level of research on right whales to significantly increase in the foreseeable future. Rather, NMFS expects new permit requests would gradually replace current permits as they expire. However, the level of take these new requests would add to the cumulative take on the species must be regarded, again, as a worst-case scenario; these requests are still being processed and as such the permits, if issued, may authorize a lower level of take than applicants have requested based on reviewer and public comments, an evaluation of the request in accordance with MMPA and ESA issuance criteria, and the environmental analyses and biological opinion prepared for that action.

It is also important to note that the target right whales are migratory and may transit in and out of U.S. waters. NMFS does not have jurisdiction over the activities of individuals conducting field

studies in other nations' waters and cumulative effects from all scientific research on these species beyond the Proposed Action area cannot be fully assessed. However, where possible, NMFS attempts to collaborate with foreign governments to address management and conservation of transboundary ESA-listed species.

4.7.11 Summary of Cumulative Effects

All of the issues noted above are likely to have some level of impact on marine mammal populations in the Proposed Action area, particularly where ESA-listed (endangered and threatened) and MMPA depleted species are involved. Historically North Atlantic right whales were hunted to near extinction, and, despite being under protection for 70 years, the population remains small. Past commercial harvests are the primary reason that the population has declined to its present level. In addition, other human activities continue to result in some level of impact to right whales in the Proposed Action area, but the most common threats to this species remain entanglement in fishing gear and vessel collisions which have the potential to seriously injure or kill whales. Conservation efforts, research, and recent regulations are aimed at eliminating these threats and have positive benefits for right whales, reducing the number of animals killed and seriously injured by ship strikes and fishing gear interactions. It is too early to measure the value of some of these measures; however, the threat to whales from shipping is the lowest it has been in the last 50 years due to a number of changes in shipping traffic rules. Other impacts, such as habitat degradation, energy development, and noise, may temporarily harass individual right whales but are not likely to be life threatening. Although right whales are impacted by a number of human activities, it is important to note that these activities are not occurring simultaneously on the same individuals of a population/stock on a daily basis and most human impacts are not known to cause serious injury or mortality of right whales. Further, right whales are not exposed to all human activities at all times, particularly given this species' migratory nature. The short-term stresses (separately and cumulatively when added to other stresses right whales face in the environment) resulting from the proposed research activities would be expected to be minimal to targeted right whales. Behavioral reactions suggest that harassment is brief, lasting minutes, before animals resume normal behaviors. NMFS expects any effects of harassment to dissipate before animals could be harassed by other human activities. Significant cumulative impacts are not expected since no serious injury or mortality is expected (resulting in no direct loss of animals from the population) nor an appreciable reduction in the fecundity of target individuals. Therefore, the proposed research would contribute a negligible increment of harassment over and above the effects of the baseline activities currently occurring in the marine environment of the Proposed Action area over the life of the permits. Though the effects of repeated or chronic disturbance from scientific research activities should not be dismissed, the potential long-term benefits and value of information gained on these species also must be considered. The proposed research would provide valuable information on right whale biology and ecology which in turn may be used to improve their management and reduce the effects of human activities to this species.

CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED

This document was prepared by Amy Hapeman and Kristy Beard with the Permits, Conservation and Education Division of NMFS' Office of Protected Resources in Silver Spring, Maryland.

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Marine Mammal Commission
National Ocean Service, National Marine Sanctuary Program
U.S. Fish and Wildlife Service

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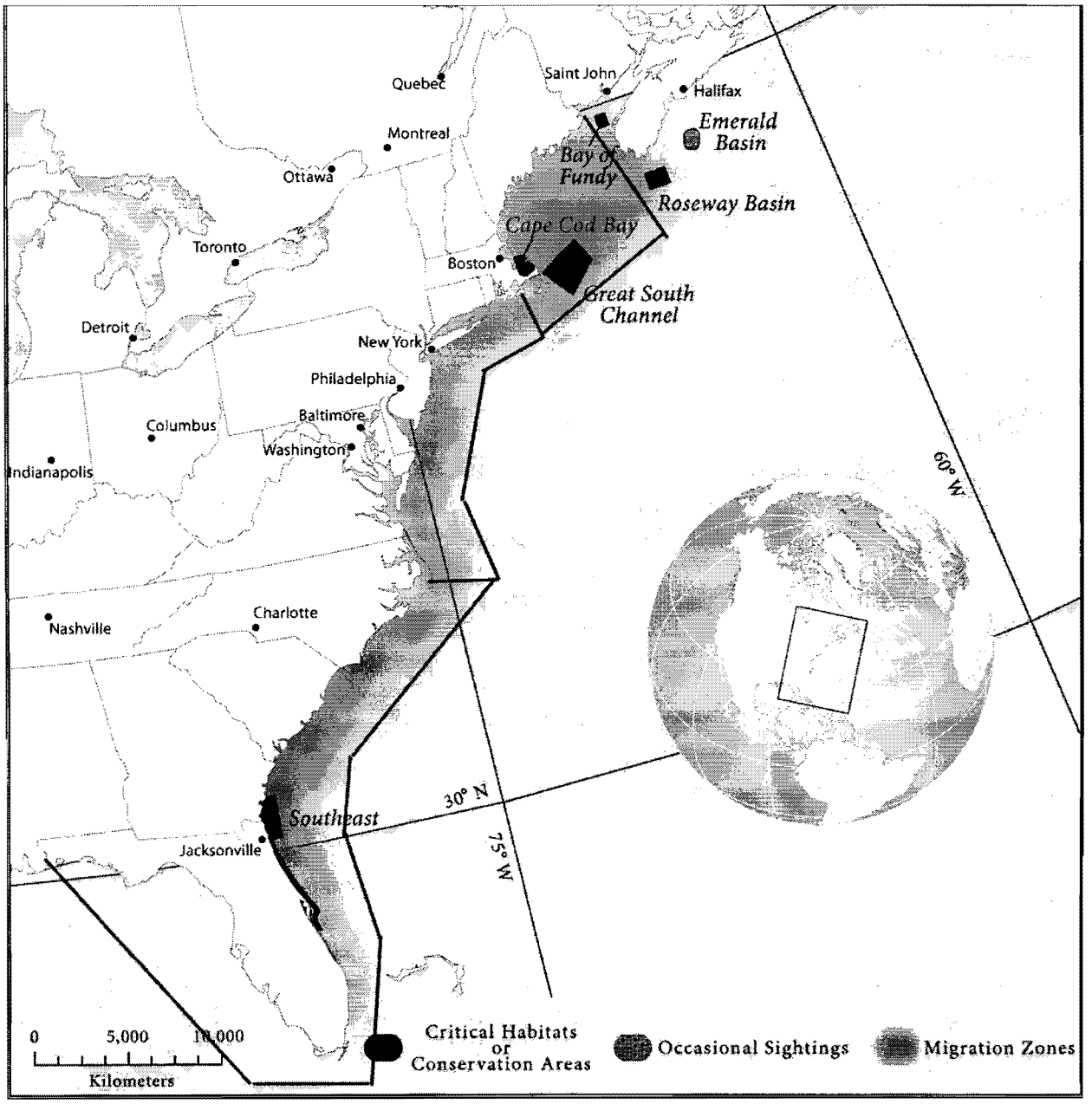
APPENDIX 1: U.S. EEZ study area for Permit No. 14233, delineated in black line is broken into 3 parts: New England waters, mid-Atlantic, and the Southeastern United States.