NOAA's National Marine Fisheries Service
Endangered Species Act Section 7 Consultation

Biological Opinion

Agency:	Permits, Conservation and Education Division of the Office of Protected Resources, NOAA's National Marine Fisheries Service
Activity Considered:	The NMFS Office of Protected Resources - Permits, Conservation and Education Division's proposal to issue permit No. 14791 to Douglas Nowacek of Duke University for research on North Atlantic right whales (*Eubalaena glacialis*) within waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay and coastal waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S.
Consultation Conducted by:	Endangered Species Division of the Office of Protected Resources, NOAA's National Marine Fisheries Service
Approved by:	for J. H. Lecky
Date:	July 1, 2010

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1531 *et seq.*) requires that each federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action "may affect" listed species or critical habitat that has been designated for them, that agency is required to consult formally with either NOAA's National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service, depending upon the listed resources that may be affected. Federal agencies are exempt from this requirement if they have concluded that an action "may affect," but is "unlikely to adversely affect" listed species or designated critical habitat, and NMFS or USFWS conclude with that conclusion (50 CFR 402.14[b]).

For the actions described in this document, the action agency is NMFS' Office of Protected Resources – Permits, Conservation and Education Division. The consulting agency is NMFS' Office of Protected Resources – Endangered Species Division. NMFS' Office of Protected Resources – Permits, Conservation and Education Division proposes to issue permit No. 14791 to Douglas Nowacek of Duke University for the passive recording, attachment of digital sound recording tags (DTAGs) via suction cups, and the collection of samples of mucous from exhaled air and sloughed skin on up to 40 North Atlantic right whales (*Eubalaena glacialis*) per year for five years within waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay and coastal

waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S. pursuant to the Marine Mammal Protection Act (MMPA) and the ESA. These actions will result in direct "takes" of North Atlantic right whales listed as endangered under the ESA. This ESA Section 7 consultation (Opinion) considers the effects of the proposed studies on endangered and threatened species and designated critical habitat.

Consultation History

On March 30, 2010, NMFS Office of Protected Resources - Permits, Conservation and Education Division requested consultation with NMFS Office of Protected Resources - Endangered Species Division on a proposal to issue permit No. 14791 for research on North Atlantic right whales within waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay, and coastal waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S. The permit application, discussion of the effects of the research on the target species, as well as a draft of the proposed permit, was submitted with this request. On April 12, 2010, NMFS Endangered Species Division initiated formal consultation on this proposed action.

BIOLOGICAL OPINION

Description of the Proposed Action

The National Marine Fisheries Service (NMFS) proposes to issue a permit to Douglas Nowacek, of Duke University, Beaufort NC for direct "takes" of North Atlantic right whales, pursuant to the Marine Mammal Protection Act (MMPA) of 1972, as amended (MMPA; 16 U.S.C. 1361) and section 10(a)1(A) of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*). The permit would exempt the applicant from the MMPA's and ESA's prohibition against "takes" of cetaceans and would last for five years. 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. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

The ESA does not define harassment nor has NMFS defined the term pursuant to the ESA through regulation. However, the MMPA of 1972, as amended, defines harassment as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal population in the wild or has the potential to disturb a marine mammal or marine mammal population in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [16 U.S.C. 1362(18)(A)]. The latter portion of this definition (that is, "...causing disruption of behavioral patterns including...migration, breathing, nursing, breeding, feeding, or sheltering") is almost identical to the U.S. Fish and Wildlife

Service's regulatory definition of "harass"[1] pursuant to the ESA. For this Opinion, we define harassment similarly as an intentional or unintentional human act or omission that creates the probability of injury to an individual animal by disrupting one or more behavioral patterns that are essential to the animal's life history or its contribution to the population the animal represents.

These proposed activities under permit No. 14791 include the passive recording of, attachment of digital archival recording tags (DTAGs) via suction cups to, and collection of samples of mucous from exhaled air and sloughed skin from North Atlantic right whales (*Eubalaena glacialis*) for five years within waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay, and coastal waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S. Activities would occur at any time of year for five years. **Table 1** identifies the number of "takes" of listed species to be permitted under the proposed permit. The individuals exposed may be of either sex. Calves and mother calf pairs would be avoided.

Table 1. Proposed takes to North Atlantic right whales from the proposed activities over the duration of the proposed permit (five years).

NUMBER OF ANIMALS TAKEN PER YEAR	NUMBER OF ANIMALS TAKEN OVER FIVE YEAR DURATION	TAKES PER ANIMAL	DETAILS
80	400	3	Acoustic, passive recording; Collect, sloughed skin; Incidental harassment; Suction cup tagging of DTAGS*; Observations, behavioral; Photo-id; Sample, exhaled air; Tracking
90	450	1	Acoustic, passive recording; Incidental harassment; Observations, behavioral; Photo-id

* No more than 40 animals will be tagged per year

Passive Recording, Photography and Focal Follows

Passive recording, focal follows and photography are proposed to occur from aboard small vessels, usually <3 m rigid hull inflatable boats (RHIBs) with small outboard engines (usually <90 hp), with propeller guards. Depending on conditions, 4-5m RHIBs may be used. For passive recording, investigators employ a hydrophone or a series of hydrophones to monitor the presence of vocalizing target animals. This method has been used extensively and successfully in many past activities (see Richardson et al., 1995; Mellinger et al., 2007; Van Parijs and Southall., 2007). A larger 20-30m ship will be

1 An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3)

used to track and observe whales after tag attachment. The vessels travel at or less than the speed of the whale being tracked.

Focal follows are defined as the close and targeted prolonged approach and pursuit of individual animals or groups of individuals. These focal follows are proposed to occur from 100 – 500m from individual animals. During focal follows, whales are proposed to be photographed in order to document identifying marks as well as to document individual and group behaviors.

Tagging

Target animals are proposed to be closely approached up to 10 m and be fitted with digital archival recording tags DTAGs to measure sounds, vocalizations, depth, water temperature and the orientation of the tagged animals. The DTAGs have a volume of 1 liter, a dry weight of 500 g and are designed to be attached to an animal by the use of suction cups. Tagging is proposed to be carried out by approaching to within 10 m of target animals and attaching the DTAG to the dorsal surface, approximately midway between the blowhole and the caudal peduncle (after Nowacek et al., 2001). Whales will be approached at speeds of <5 knots.

The DTAGs are designed to remain adhered to the target animal for around 5 to 20 hours and can be removed as a result of breaching, social rubbing, skin sloughing or the deliberate activation of a release mechanism in the tag (see Nowacek et al., 2001; Johnson and Tyack, 2003). Tags similar to the proposed DTAGs have been used successfully in numerous past studies on baleen whales and other marine mammals (see Burgess et al., 1998; Johnson et al., 2004; Tyack et al., 2006; Watwood et al., 2006).

A 12 m cantilevered pole in an oarlock on the bow of the research vessel will be used to attach the tags to the target animals (Johnson and Tyack, 2003). Whales would be tagged using the same small boats described in the previous section. Animals that are exhibiting normal behavior, do not appear to have calves and have not already been tagged, will be selected for tagging. Mother and calf pairs will be avoided.

Collection of Sloughed Skin and Mucous from Exhaled Air

The proposed activities include the opportunistic collection of sloughed skin and mucous from blowhole output. Sloughed skin will be collected from suction cups when DTAGs detach from the target animals. Mucous from blowhole output is proposed to be collected passively by using of a piece of nylon mesh stretched across a ring, mounted on the opposite side of the pole used for tagging. When target animals exhale, mucous samples are to be collected in the mesh. The mucous samples are proposed to be collected during tag attachment.

Mitigation Measures

The following mitigating conditions apply to the proposed permit:

1. Investigators must suspend all permitted activities in the event serious injury or mortality of protected species occurs.

2. Any "approach"[2] of a cetacean constitutes a take by harassment and must be counted and reported.

3. Regardless of success, any attempt, which includes the associated close approach, to tag an animal constitutes a take and must be counted and reported.

4. No individual animal may be taken more than 3 times in one day.

5. If authorized take is exceeded, investigators must cease all permitted activities and notify the Chief, NMFS Permits, Conservation and Education Division as soon as possible, but no later than within two business days.

6. To minimize disturbance of the subject animals, the Permit Holder must exercise caution when approaching animals and must retreat from animals if behaviors indicate the approach may be interfering with reproduction, feeding, or other vital functions.

7. Before attempting to sample an individual, investigators must take reasonable measures (e.g., compare photo-identifications) to avoid repeated sampling of any individual.

8. No calves of any age will be tagged.

9. A tag attachment attempt must be discontinued if an animal exhibits repetitive strong adverse reactions to the activity or the vessel.

Approach to the Assessment

NMFS approaches its section 7 analyses of agency actions through a series of steps. The first step identifies those aspects of proposed actions that are likely to have direct and indirect physical, chemical, and biotic effects on listed species or on the physical, chemical, and biotic environment of an action area. As part of this step, we identify the spatial extent of these direct and indirect effects, including changes in that spatial extent over time. The result of this step includes defining the *Action Area* for the consultation. The second step of our analyses identifies the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. Once we identify which listed resources are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to

2 An "approach" is defined as a continuous sequence of maneuvers involving a vessel or researcher's body in the water, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for large whales, or 50 yards for smaller cetaceans.

determine whether and how those listed resources are likely to respond given their exposure (these represent our *Response Analyses*).

The final steps of our analyses – establishing the risks those responses pose to listed resources – are different for listed species and designated critical habitat (these represent our *Risk Analyses*). Our jeopardy determinations must be based on an action's effects on the continued existence of threatened or endangered species as those "species" have been listed, which can include true biological species, subspecies, or Distinct Population Segments (DPSs) of species. The continued existence of these "species" depends on the fate of the populations that comprise them. Similarly, the continued existence of populations are determined by the fate of the individuals that comprise them – populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our risk analyses reflect these relationships between listed species, the populations that comprise that species, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individual risks to identify consequences to the populations those individuals represent. Our analyses conclude by determining the consequences of those population-level risks to the species those populations comprise.

We measure risks to listed individuals using the individuals' "fitness," or the individual's growth, survival, annual reproductive success, and lifetime reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual's probable lethal, sub-lethal, or behavioral responses to an action's effect on the environment (which we identify during our response analyses) are likely to have consequences for the individual's fitness.

When individual, listed plants or animals are expected to experience reductions in fitness in response to an action, those fitness reductions are likely to reduce the abundance, reproduction, or growth rates (or increase the variance in these measures) of the populations those individuals represent (see Stearns, 1992). Reductions in at least one of these variables (or one of the variables we derive from them) is a *necessary* condition for reductions in a population's viability, which is itself a *necessary* condition for reductions in a species' viability. As a result, when listed plants or animals exposed to an action's effects are *not* expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (e.g., Brandon, 1978; Mills and Beatty, 1979; Stearns, 1992; Anderson, 2000). As a result, if we conclude that listed plants or animals are *not* likely to experience reductions in their fitness, we would conclude our assessment.

Although reductions in fitness of individuals is a *necessary* condition for reductions in a population's viability, reducing the fitness of individuals in a population is not always *sufficient* to reduce the viability of the population(s) those individuals represent.

Therefore, if we conclude that listed plants or animals are likely to experience reductions in their fitness, we determine whether those fitness reductions are likely to reduce the viability of the populations the individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, variance in these measures, or measures of extinction risk). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of listed Resources* sections of this Opinion) as our point of reference. If we conclude that reductions in individual fitness are not likely to reduce the viability of the populations those individuals represent, we would conclude our assessment.

Reducing the viability of a population is not always *sufficient* to reduce the viability of the species those populations comprise. Therefore, in the final step of our analyses, we determine if reductions in a population's viability are likely to reduce the viability of the species those populations comprise using changes in a species' reproduction, numbers, distribution, estimates of extinction risk, or probability of being conserved. In this step of our analyses, we use the species' status (established in the *Status of the Species* section of this Opinion) as our point of reference. Our final determinations are based on whether threatened or endangered species are likely to experience reductions in their viability and whether such reductions are likely to be appreciable.

To conduct these analyses, we rely on all of the evidence available to us. This evidence might consist of monitoring reports submitted by past and present permit holders, reports from NMFS Science Centers, reports prepared by State or Tribal natural resource agencies, reports from non-governmental organizations involved in marine conservation issues, the information provided by the Permits, Conservation and Education Division when it initiates formal consultation, and the general scientific literature. We supplement this evidence with reports and other documents – environmental assessments, environmental impact statements, and monitoring reports – prepared by other federal and state agencies like the Minerals Management Service, U.S. Coast Guard and U.S. Navy whose operations extend into the marine environment.

During the consultation, we conducted searches of peer reviewed scientific literature, doctoral dissertations, government reports and commercial studies. These searches included the use of literature search engines such as *Science Direct, Ingenta Connect, JSTOR,* and *Google Scholar* as well as the use of NOAA and university libraries. These searches focused on identifying recent information on the biology, ecology, distribution, status, and trends of the threatened and endangered species considered in this opinion. We considered the results of these searches based on the quality of their study design, sample sizes and study results.

Action Area

The proposed activities are to occur in waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay and coastal waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S.

Exposure Analysis

Exposure analysis identifies the co-occurrence of ESA-listed species within the action's effects in space and time, and identifies the nature of that co-occurrence. They identify as possible, the number, age or life stage, and gender of the individuals likely to be exposed to the action's effects and the population(s) or subpopulation(s) those individuals represent.

Status of Listed Resources

Species and Critical Habitat that may be Adversely Affected
NMFS has determined that the actions considered in this Opinion may affect the following listed resources provided protection under the endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*; ESA):

Atlantic salmon (Gulf of Maine DPS)	*Salmo salar*	Endangered
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
North Atlantic right whale	*Eubalaena glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Green turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley turtle	*Lepidochelys kempii*	Endangered
Leatherback turtle	*Dermochelys coriacea*	Endangered
Loggerhead turtle	*Caretta caretta*	Threatened

The proposed activities could occur in the designated critical habitat for Gulf of Maine Distinct Population Segment (DPS) of Atlantic salmon. This critical habitat includes all perennial rivers, streams, and estuaries and lakes connected to the marine environment within the range DPS.

Species and Critical Habitat Not Likely to be Adversely Affected
Listed sea turtles occur in the action area and could therefore be disturbed or harmed by boat strikes from the proposed activities. However, because these activities are to be targeted specifically to whales and because of the relatively small size and slow speeds of the vessels employed, threats to these species are extremely unlikely and therefore discountable. The proposed activities are entirely aquatic in nature and therefore will not affect the nesting activities of any sea turtles. These species are therefore not considered in this consultation.

Endangered sperm (*Physeter macrocephalus*), humpback (*Megaptera novaeangliae*), blue, (*Balaenoptera musculus*), sei (*Balaenoptera borealis*) and fin (*Balaenoptera physalus*) whales occur in the range of the proposed action and could be subject to disturbance and boat strikes from the proposed activities. However, because of the highly targeted nature of these activities and the relatively small sizes and slow speeds of the ships to be employed, these species are very unlikely to be exposed and therefore no effects to them are expected. These species are therefore not considered in this consultation.

Atlantic salmon (*Salmo salar*) may occur in the action area and could potentially be affected by disturbance and boat strikes from the proposed activities. However, because of the small sizes and relatively slow speeds of the boats to be used, no negative impacts to any listed fish are expected. Atlantic salmon are therefore not considered in this consultation.

The Primary Constituent Elements (PCEs) for the Gulf of Maine DPS of Atlantic salmon include sites for spawning and incubation, sites for juvenile rearing and sites for migration. The essential physical and biological features include substrate of suitable size and quality; rivers and streams of adequate flow, depth, water temperature and water quality; rivers, streams, lakes and ponds with sufficient space; diverse, abundant food resources to support growth and survival; waterways that allow for free migration of both adult and juvenile Atlantic salmon and diverse habitat and native fish communities in which salmon interact with while feeding, migrating, spawning, and resting.

The proposed activities should have no effect on any of these PCEs. Because of their targeted nature and limitation to offshore locations, the proposed activities are not likely to destroy or adversely modify the critical habitat of the Gulf of Maine DPS of Atlantic salmon. Therefore, critical habitat will not be considered in this consultation. Critical habitat has not been designated for the sperm, humpback, sei, fin or the blue whale.

Species Likely to be Adversely Affected

NMFS has determined that the actions considered in this Opinion are likely to adversely affect the following listed resources provided protection under the endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*; ESA):

North Atlantic right whale	*Eubalaena glacialis*	Endangered

The biology and ecology of this species are described in the *Species Descriptions* Section below, and will contribute to the effects analysis for this Opinion.

Species Description

North Atlantic Right Whale

Species Description and Distribution

A western and an eastern population of right whales are recognized in the North Atlantic: (IWC, 1986). The western population migrates along the North American coast from Nova Scotia to Florida. Sightings of the eastern North Atlantic population of right whales are very rare (Best et al., 2001).

Right whales occur in sub-polar to temperate waters in all major ocean basins in the world. Most sightings in the western north Atlantic are concentrated within five primary habitats or high-use areas: coastal waters off the southeastern U.S., Cape Cod and Massachusetts Bays, the Great South Channel, the Bay of Fundy, and the Nova Scotian Shelf (Winn et al., 1986). In 1994, the first three of these areas were designated as critical habitat for the North Atlantic right whale.

Right whales have been observed from the mid-Atlantic Bight northward through the Gulf of Maine during all months of the year. In New England, peak abundance of right whales in feeding areas occurs in Cape Cod Bay beginning in late winter. In early spring, peak right whale abundance occurs in Wilkinson Basin to the Great South Channel (Kenney et al., 1995b). In late June and July, right whale distribution gradually shifts to the northern edge of Georges Bank. In late summer and fall, much of the population is found in waters in the Bay of Fundy and around Roseway Basin (Winn et al., 1986; Kenney et al., 1995b; Kenney, 2001).

Life History Information

In the western North Atlantic, calving takes place between December and March in shallow, coastal waters. Females give birth to their first calf at an average age of 9 years (Best and Kishino, 1998; Hamilton et al., 1998). Gestation lasts from 357 to 396 days in southern right whales, and it is likely similar in the northern species (Best, 1994). Weaning seems to be variable, but has been reported to be 8 to 17 months in North Atlantic populations (Hamilton et al., 1995). Calves are 5.5-6.0 meters in length at birth (Best, 1994). The calving interval for right whales is between 2 and 7 years (Knowlton et al., 1994; Best et al., 2001; Burnell, 2001; Cooke et al., 2001). Interestingly, from 2001-2005, a dramatic increase in North Atlantic right whale calving (23 calves per year) indicated that the calving interval may have decreased in this population (Kraus et al., 2005).

Right whales fast during the winter and feed during the summer, although some may opportunistically feed during migration. Right whales use their baleen to sieve prey, from the water. They rely on dense patches of copepods, found in highly variable and spatially unpredictable locations in the Bay of Fundy, Roseway Basin, Cape Cod Bay, the Great South Channel, and other areas off northern U.S. and Canada (Wishner et al., 1988; Murison and Gaskin, 1989; Mayo and Marx, 1990; Baumgartner et al., 2003). Although right whales feed on copepod aggregations at the surface (Mayo and Marx, 1990), they

more commonly dive below the surface to exploit areas of high prey density (Kenney et al., 1995a; Baumgartner et al., 2003).

Listing Status

The North Atlantic right whale was originally listed as endangered under the precursor to the Endangered Species Act (ESA) and under the ESA since its inception in 1973 (35 FR 8495). The original listing included both the North Atlantic and the North Pacific 'populations.' Following a comprehensive status review, NMFS concluded that North Atlantic right whales are indeed two separate species. On December 27, 2006 (71 FR 77704 and 71 FR 77694), NMFS published two proposed rules to list these species separately. The final rule published on March 6, 2008 (73 FR 12024). The North Atlantic right whale is also protected by CITES and the MMPA.

Status and Trends

Because of a lack of data, precise distribution and migration patterns of the eastern North Atlantic right whale population are largely unknown. The 1998 IWC Workshop on the Comprehensive Assessment of Right Whales agreed that only animals found in the western North Atlantic can be considered a functioning extant unit based on current sighting information.

Based on a census of individual whales identified using photo-identification techniques and an assumption of mortality of whales not seen in seven years, the western North Atlantic stock size was estimated to be 295 individuals in 1992 (Knowlton et al., 1994). An updated analysis using the same method gave an estimate of 299 animals in 1998 (Kraus et al., 2001). A more recent review of the photo-id recapture database on June 15, 2006, indicated that 313 individually recognized North Atlantic right whales were known to be alive during 2002 (Waring et al., 2008).

Since the early 1990s NMFS has reported the population size of northern right whales as being around 300 animals. A population of this size is sufficiently small for the population to experience deleterious phenomena such as demographic stochasticity, inbreeding depression and Allee effects. Based on their small population size and population ecology, right whales will have elevated extinction probabilities.

Caswell et al. (1999) determined that the western North Atlantic right whale population is declining at a rate of 2.4% per year. The authors also determined that if the mortality rate as of 1996 is not slowed and reproduction not improved, extinction could occur within 100 years. The population growth rate reported by Knowlton et al (1994) observed a 2.5% growth rate for the period between 1986 to 1992, suggesting some recovery. However, the work by Caswell et al. (1999) suggested that crude survival probability declined from about 99% in the early 1980's to about 94% in the late 1990s. Additional work conducted in 1999 (Best et al., 2001) and 2002 (Clapham, 2002) confirmed this decline

Environmental Baseline

By regulation, environmental baselines for biological opinions include the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR §402.02).

The *Environmental Baseline* for this Opinion includes the effects of many activities on the survival and recovery of ESA listed species in the action area; it focuses primarily on past and present impacts to these species. A number of human activities have contributed to the current status of listed marine species in the action area. Some of those activities, (e.g. commercial whaling and intentional shooting) no longer regularly occur. However, the effects from these activities may still persist. Other human activities are ongoing and appear to be directly or indirectly affecting these species. Additionally, unrelated factors may be acting together to affect listed species. For example, vessel effects combined with the stresses of reduced prey availability or increased contaminant loads may reduce foraging success and lead to chronic energy imbalances and poorer reproductive success; or all three factors may work to lower an animal's ability to suppress disease (Williams et al., 2002; NMFS, 2008).

Taken together, the components of the environmental baseline for the action area include sources of natural mortality as well as influences from natural oceanographic and climatic features in the action area. Circulation and productivity patterns influence prey distribution and habitat quality for listed species. The effects of climatic variability on these species in the action area and the availability of prey remain largely undetermined; however, it is likely that any changes in weather and oceanographic conditions resulting in effects on prey populations would have consequences for marine mammals.

The baseline also includes human activities resulting in disturbance, injury or mortality of individuals. Historically, commercial harvest of whales occurred and significantly affected these species. Although these activities are not conducted as in the past, effects from these activities may still persist today. Current anthropogenic activities and effects on individuals in the action area are thought to include habitat degradation (e.g., due to contaminants, risk of oil spills, underwater sound sources, changes in prey availability), interactions with fishing gear and with vessels (including ship strikes), alternative energy projects, and scientific research. Conservation and management efforts are ongoing and have a positive effect on the status of listed marine mammals within the action area.

The following discussion summarizes the natural and human phenomena in the action area that may affect the likelihood that these species will survive and recover in the wild. These include natural mortality; oceanographic and climate conditions; commercial harvest; habitat degradation due to environmental contaminants and the risk of oil spills,

sound and changes in prey availability; interactions with fishing gear and vessels and scientific research and conservation efforts.

Natural Stressors in the Action Area

Natural Sources of Stress and Mortality

Large sharks and killer whales may conceivably prey on right whales (Kraus, 1990; NMFS, 2005). However, no such predation has been observed (Kraus, 1990; NMFS, 2005). Scars, presumably from killer whale attacks, have been reported, but it is not known what impact this has on right whale populations (Kraus, 1990).

Oceanographic Features and Climatic Variability

Climatic variability and change may be affecting listed species through change in habitat and prey availability. However, these effects are not well understood. Possible effects of climatic variability for marine species include the alteration of community composition and structure, changes to migration patterns or community structure, changes to species abundance, increased susceptibility to disease and contaminants, alterations to prey composition and altered timing of breeding (MacLeod et al., 2005; Robinson et al., 2005; Kintisch, 2006; Learmonth et al., 2006; McMahon and Hays, 2006). Naturally occurring climatic patterns, such as the Pacific Decadal Oscillation and the El Niño and La Niña events, are identified as major causes of changing marine productivity worldwide and may also therefore influence listed species' prey abundance (Mantua et al., 1997; Francis et al., 1998; Beamish et al., 1999; Hare et al., 1999; Benson and Trites, 2002). Gaps in information and the complexity of climatic interactions complicate the ability to predict the effects of climate change and variability may have to these species (Kintisch, 2006; Simmonds and Isaac, 2007).

Anthropogenic Stressors

Commercial Harvest

Although commercial harvesting no longer targets North Atlantic right whales, prior exploitation may have altered the population structure and social cohesion of the species such that effects on abundance and recruitment can continue for years after harvesting has ceased.

Conclusions based on historical whaling data suggest that the numbers of right whales in the western North Atlantic numbered in the hundreds before commercial exploitation (Reeves and Mitchell., 1987). More recent analysis concluded that these numbers may have been closer to 1,000, and that the greatest population decline occurred in the early 1700s (Reeves et al. in Breiwick et al., 1993). However, the authors caution that these estimates were based on incomplete records. Although extensively hunted historically, there has been little hunting of right whales in the 20th century. Hunting in the 19th and early 20th centuries, largely by Norwegian whaling operations, are likely to have irreversibly damaged or extirpated this stock (Collett, 1909; Brown, 1976).

Pollution

Pesticides and Contaminants

Exposure to pollution and contaminants has the potential to cause adverse health effects in marine species. In the eastern North Pacific, marine ecosystems receive pollutants from a variety of local, regional, and international sources and their levels and sources are therefore difficult to identify and monitor (Grant and Ross, 2002). Marine pollutants come from multiple municipal, industrial and household as well as from atmospheric transport (Iwata, 1993; Grant and Ross, 2002; Garrett, 2004; Hartwell, 2004).

The accumulation of persistent pollutants through trophic transfer may cause mortality and sub-lethal effects in long-lived higher trophic level animals (Waring et al., 2008), including immune system abnormalities, endocrine disruption and reproductive effects (Krahn et al., 2007). Recent efforts have led to improvements in regional water quality and monitored pesticide levels have declined, although the more persistent chemicals are still detected and are expected to endure for years (Mearns, 2001; Grant and Ross, 2002).

Hydrocarbons

Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Marine mammals are generally able to metabolize and excrete limited amounts of hydrocarbons, but exposure to large amounts of hydrocarbons and chronic exposure over time pose greater risks (Grant and Ross, 2002). Acute exposure of marine mammals to petroleum products causes changes in behavior and may directly injure animals (Geraci, 1990). Cetaceans have a thickened epidermis that greatly reduces the likelihood of petroleum toxicity from skin contact with oils (Geraci, 1990), but may inhale these compounds at the water's surface and ingest them while feeding (Matkin and Saulitis, 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability.

Marine Debris

Types of marine debris include plastics, glass, metal, polystyrene foam, rubber, and derelict fishing gear from human marine activities or transported into the marine environment from land. The sources of this debris include littering, dumping and industrial loss and discharge from land. Marine animals can become entangled in marine debris, or ingest it, which may lead to injury or death.

Noise

Noise generated by human activity has the potential to affect listed species. This includes sound generated by commercial and recreational vessels, aircraft, commercial sonar, military activities, seismic exploration, in-water construction activities and other human activities. These activities all occur within the action area to varying degrees throughout the year. Marine mammals generate and rely on sound to navigate, hunt and communicate with other individuals. As a result, anthropogenic noise can interfere with these important activities. The effects of noise on marine mammals can range from behavioral effects to physical damage (Richardson et al., 1995).

Commercial shipping traffic is a major source of low frequency anthropogenic noise in (NRC, 2003). Although large vessels emit predominantly low frequency sound, studies report broadband noise from large cargo ships that includes significant levels above 2kHz, which may interfere with important biological functions of cetaceans (Holt, 2008). Commercial sonar systems are used on recreational and commercial vessels and may affect marine mammals (NRC, 2003). Although, little information is available on potential effects of multiple commercial sonars to marine mammals, the distribution of these sounds would be small because of their short durations and the fact that the high frequencies of the signals attenuate quickly in seawater (Richardson et al., 1995).

Research employing seismic surveys using towed airguns also occurs within the action area. Airguns generate intense low-frequency sound pressure waves capable of penetrating the seafloor and are fired repetitively at intervals of 10-20 seconds for extended periods (NRC, 2003). Most of the energy from the guns is directed vertically downward, but significant sound emission also extends horizontally. Peak sound pressure levels from airguns usually reach 235-240dB at dominant frequencies of 5-300Hz (NRC, 2003). Most of the sound energy is at frequencies below 500Hz. In the United States, all seismic projects for oil and gas exploration and most research activities involving the use of airguns with the potential to take marine mammals are covered by incidental harassment authorizations under the MMPA.

Fishing Activities

Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in large whale species (see Dietrich et al., 2007). These entanglements also make whales more vulnerable to additional dangers (e.g., predation and ship strikes) by restricting agility and swimming speed. There is concern that many marine mammals that die from entanglement in commercial fishing gear tend to sink rather than strand ashore thus making it difficult to accurately determine the extent of such mortalities.

North Atlantic right whales feed almost exclusively on copepods and therefore are not in direct competition with human fishing operations. However, reduced zooplankton abundance due to habitat degradation is a potential indirect threat to these species.

Ship Strikes and Other Vessel Interactions

Ships have the potential to affect whales through strikes and from noise and visual disturbance by their physical presence. Responses to vessel interactions include disturbance of vital behaviors and social groups, separation of mothers and young and abandonment of resting areas (Kovacs and Innes., 1990; Kruse, 1991; Wells and Scott, 1997; Samuels and Gifford., 1998; Bejder et al., 1999; Colburn, 1999; Cope et al., 1999; Mann et al., 2000; Samuels et al., 2000; Boren et al., 2001; Constantine, 2001; Nowacek et al., 2001). Whale watching, a profitable and rapidly growing business with more than 9 million participants in 80 countries and territories, may increase these types of disturbance and negatively affect listed species (Hoyt, 2001).

Ship strikes are considered a serious and widespread threat to whales. This threat is increasing as commercial shipping lanes cross important breeding and feeding habitats and as whale populations recover and populate new areas or areas where they were previously extirpated (Swingle et al., 1993; Wiley et al., 1995). As ships continue to become faster and more widespread, an increase in ship interactions with whales is to be expected. Studies show that the probability of fatal injuries from ship strikes increases as vessels operate at speeds above 14 knots (Laist et al., 2001).

However, ships moving at relatively slow speeds may be a threat as well. On Oct. 19, 2009 a ship mapping the seafloor off CA for NOAA reported a "a shudder underneath the[ir] ship" (NMFS unpublished data). A whale was spotted soon thereafter and was observed to be bleeding profusely. A dead 20m long blue whale was found washed up on Ft. Bragg beach in northern CA soon thereafter and was the apparent victim of a ship strike (Unpublished report from Fugro Pelacos, Inc. to NMFS). The vessel that struck the whale was only traveling at approximately 5.5 knots (NMFS unpublished data).

Twenty-one confirmed mortalities of large whales resulted from 42 confirmed ship strikes in the North Atlantic between the years of 2000-2004 alone (Cole et al., 2006). Fin whales are the most frequently struck whale, although right whales, humpback whales and sperm whales are also commonly struck (Laist et al., 2001). In some locations, one-third of all fin whale and right whale strandings appear to involve ship strikes (Laist et al., 2001) and ship strikes are directly implicated in impeding the recovery of North Atlantic right whales (Caswell et al., 1999).

U.S. Navy Activities

Vessel operations and ordnance detonations adversely affect listed marine species in the action area. From early July through early August 2007, the U.S. Navy conducted a Composite Training Unit-Joint Task Force Exercise within and seaward of the Cherry Point and Jacksonville-Charleston Operating Areas located off South Carolina, North Carolina, Georgia, and Florida. These exercises employed between 340 and 355 hours of mid-frequency active sonar. The Navy reported that observers spotted a group of dolphins during these exercises. Active sonar usage was shut down in response to this sighting. However, the actual number of marine animals that might have been exposed to mid-frequency active sonar during that exercise, and their resulting responses, is unknown.

In August and September 2008, the U.S. Navy conducted a ship shock trial on the MESA VERDE in waters east of Jacksonville, Florida, using high blast explosives. Surveys conducted after these activities did not detect any dead or injured listed marine animals. In addition, no marine mammal or sea turtle stranding has been attributed to the shock trial. However, the lack of observations of adverse responses to these activities does not mean that no such responses occurred.

In June 2009, NMFS issued a biological opinion on the NMFS Office of Protected Resources - Permits, Conservation and Education Division's proposal to promulgate regulations that would authorize the U.S. Navy to "take" marine mammals incidental to

(1) the U.S. Navy's proposal to continue to conduct training activities within and adjacent to (a) waters off the Northeast coast of the United States, (b) the Virginia Capes Range Complex; (c) the Cherry Point Range Complex, and (d) the Charleston-Jacksonville Range Complex over a five-year period and the U.S. Navy's proposal to establish a transit protection system at Naval Submarine Base Kings Bay, Georgia, to escort nuclear powered ballistic submarines during transit between the Naval Submarine Base and the dive/surface site. NMFS expects these activities to harass listed marine animals by exposing them to sound fields produced by underwater detonations or ship noise at received levels that would cause individual animals to change their behavior from activities that require lower energy expenditures those that require higher energy expenditures.

Between January and August 2009, the U.S. Navy conducted three Composite Training Unit Exercises and one Southeastern Anti-Submarine Warfare Integrated Training Initiative. The U.S. Navy also conducted three Integrated Anti-Submarine Warfare courses in conjunction with three of the Composite Training Unit Exercises it conducted during this time. The total number of sonar hours that were associated with each of these exercises is classified and are thus not reported here.

On 28 July 2009, NMFS issued a final biological opinion on the U.S. Navy's proposal to place a network of underwater transducer devices and undersea cables in a 1,713 km^2 (500 nautical $mile^2$) area of the ocean about 93 km (50 nautical miles) offshore of northeastern Florida, beginning in 2012 or 2013 with operations scheduled to begin in 2014 or 2015. The instrumented area, which would be called the Undersea Warfare Tracking Range (USWTR), would be connected by cable to a facility that would be located on shore where the data collected on the range would be used to evaluate the performance of participants in shallow water training exercises. NMFS concluded that 106 humpback whales and 47 North Atlantic right whales might be exposed to active sonar operations at received levels that might result in behavioral harassment. However, the Opinion concluded that these exposures were not likely to jeopardize the continued existence of these species.

Scientific Research

Large whales in the action area have been the subject of scientific research activities, as authorized by NMFS permits. Research in the action area has included biopsy sampling, close vessel and aircraft approaches, the opportunistic collection of sloughed skin and mucous, tagging, active acoustic experiments and anatomical data gathering using ultrasound devices. No mortalities are authorized for any animal of any age and no mortalities have been reported. There are currently 10 active permits authorizing research on North Atlantic right whales. These permits allow 1345 takes of adults, 190 takes of juveniles and 45 takes of calves per year for five years. Appendix A lists the permit holders, permit numbers and expiration dates for these permits.

Conservation and Management Efforts

Several conservation and management efforts have been undertaken for listed marine mammals in the action area. Recovery plans under the ESA help guide the protection and

conservation of listed species and a final plan is in place for the north Atlantic right whale (NMFS, 2005). NMFS implements conservation and management activities for these species through its Regional Offices and Fishery Science Centers in cooperation with states, conservation groups, the public, and other federal agencies. In addition, the status of protected whale species is monitored by surveys conducted every three years.

In the North Atlantic, NMFS has several programs in place to help reduce ship strikes to whales. One of these measures is the implementation of new rules that limit vessel traffic of ships greater than 65 feet to speeds of 10 knots or less in areas when right whales are known to congregate. Other programs include the modification of shipping lanes from areas of high right whale concentrations. Although these efforts are targeted primarily to help conserve North Atlantic right whales, they are also beneficial to other whales which inhabit the same waters and are subject to similar threats.

Similarly, in an effort to reduce fishing gear entanglement by whales in the North Atlantic, NMFS developed the Atlantic Large Whale Take Reduction Plan. This plan has improved safety measures in fishing gear in order to reduce entanglements by whales. This plan also expanded restrictions on fishing grounds and prohibited gillnet fishing in restricted areas during the calving season.

Effects of the Proposed Action

Pursuant to Section 7(a)(2) of the ESA, federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Direct adverse effects of the permitted activities on listed species that are within the action area would include disruption of feeding, breeding, resting and other behaviors. Some displacement may result from these activities. The duration of the behavioral disruptions and displacements are expected to vary by species and type of disturbance.

In this section, we describe the potential physical, chemical, or biotic stressors associated with the proposed action, the probability of individuals of listed species being exposed to these stressors based on the best scientific and commercial evidence available, and the probable responses of those individuals (given probable exposures) based on the available evidence. As described in the *Approach to the Assessment* section, for any responses that would be expected to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, and lifetime reproductive success), the assessment would consider the risk posed to the viability of the population(s) those individuals comprise and to the listed species those populations represent. The purpose of this assessment is to determine if it is reasonable to expect the proposed studies to have effects on listed species that could appreciably reduce their likelihood of surviving and recovering in the wild.

For this consultation, we are particularly concerned about behavioral disruptions that may result in animals failing to feed or breed successfully or failing to complete their life

history because these responses are likely to have population-level consequences. The proposed permit would authorize non-lethal "takes" by harassment of listed species during activities.

Potential Stressors

The assessment for this consultation identified several possible stressors associated with the activities proposed to be authorized under proposed permit: (1) potential ship strikes; (2) noise and visual disturbance from boats engaged in the proposed activities and (3) effects from tagging and collection activities. The following section describes these stressors in greater detail and explains the probability of interactions and the probable responses of listed animals based on the best available evidence.

Response Analyses

As discussed in the *Approach to the Assessment* section of this Opinion, response analyses determine how listed resources are likely to respond after being exposed to an action's effects on the environment or directly on listed animals themselves. For the purposes of consultation, our assessments try to detect potential lethal, sub-lethal, physiological or behavioral responses that might reduce the fitness of individuals. The proposed activities have the potential to produce disturbances that may affect listed marine mammals.

The responses by animals to human disturbance are similar to their responses to potential predators (Harrington and Veitch, 1992; Lima, 1998; Gill and Sutherland, 2001; Frid and Dill, 2002; Frid, 2003; Beale and Monaghan, 2004; Romero, 2004). These responses include interruptions of essential behavior and physiological processes such as feeding, mating, nursing, resting, digestion etc. This can result in stress, injury and increased susceptibility to disease and predation (Frid and Dill, 2002; Romero, 2004; Walker et al., 2006).

Risks to listed individuals are measured in terms of changes to an individual's "fitness." Fitness is defined as the individual's growth, survival, annual reproductive success and lifetime reproductive success. When listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (Brandon, 1978; Mills and Beatty, 1979; Stearns, 1992; Anderson, 2000). As a result, if the assessment indicates that listed plants or animals are not likely to experience reductions in their fitness, we conclude our assessment. If possible reductions in individuals' fitness are likely to occur, the assessment considers the risk posed to populations to which those individuals belong, and then to the species those populations represent.

All of the proposed activities require that investigators closely approach listed whales by boat. This creates disturbance as well as the possibility of vessels striking an animal. Tagging activities require direct physical contact with individuals and have the potential

wound, injure, or kill listed whales. In addition, these animals may undergo changes in behavior in response to disturbances from the proposed activities.

Boat Strikes, Noise and Visual Disturbance

The proposed close approaches, photography, tracking, focal follows, pursuit, tagging activities and skin collections give rise to the possibility for ship strikes and can cause noise and visual disturbance to listed North Atlantic right whales. Adult and juvenile whales of both sexes are proposed to be tracked, and close approaches of as close as 10 m are to be made after visual contact is established. During these approaches, whales are proposed to be photographed. Focal follows would also be conducted at distances of as close as 100 to approximately 500 m from the target animals.

Cetaceans exhibit a variety of responses to noise and visual disturbances from boat based human activities. These include short-term changes in swimming and feeding behaviors, as well as diving and staying submerged for longer periods of time (Watkins et al., 1981; Malme et al., 1984; Richardson et al., 1985; Baker and Herman., 1987; Brown et al., 1991; Clapham and Mattila, 1993; Jahoda et al., 1997; Patenaude et al., 2002; Best et al., 2005). These responses create additional energy expenditures that result in the animal incurring an energy debt that must be compensated for by increased foraging. This can further interrupt normal behavior. Individually and collectively, these disturbances can adversely affect already imperiled individuals and populations.

Expected Responses to Potential Boat Strikes, Noise and Visual Disturbance

The proposed permit allows up to 450 "takes" to North Atlantic right whales as a result of acoustic, passive recording, behavioral observations and photography activities over the duration of the permit. There is a potential for boat strikes to North Atlantic right whales resulting from the proposed activities. However, because of their small size, maneuverability and slow operating speeds, boat strikes are extremely unlikely. As a result, boat strikes to listed species are not expected and no reduction in the fitness of any individual listed whale is expected from contact with the vessels proposed to be employed in these activities.

The possible responses of listed baleen whales to anthropogenic noises are not well known. Blue whales have been observed to continue vocalizing at the same rate as before exposure to airgun pulses, suggesting that behavior was undisturbed by the sound (McDonald et al., 1993). However, meta-analysis of combined study data from all years by Stone (2003) indicated that baleen whales altered their course more often, and were headed away from the vessel more frequently during periods of acoustic and seismic activities.

Noise and visual disturbances that would result from the proposed activities are expected to be brief and not to have long-term consequences to any animal. Whales often display great tolerance to vessel traffic (Richardson et al., 1995). Studies involving the close approaches of research vessels to balaenopterid humpback whales showed that responses were minimal when approaches were slow (Clapham and Mattila, 1993). These behavioral changes, if they even occurred, were short lived (Clapham and Mattila, 1993).

Watkins (1986) found that several species of baleen whales simply ignored weak vessel noises altogether.

Actions will be terminated if animals are observed to display unusual behavior, aggravation or distress. In addition, no mortality or physical injury is expected as a result of these proposed activities. Therefore, based on the fact that these species are not likely to significantly alter their behavior or physiology as a result of these disturbances no reduction in the fitness of any individual whale is expected.

Acoustic Masking

Marine mammals use acoustic signals for a variety of purposes, which differ among species, but include communication, navigation, foraging, and reproduction (Erbe and Farmer, 2000; Tyack, 2000). Auditory masking occurs when the interfering noise is louder than, and of a similar frequency to, the auditory signal produced or received by the affected animal. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations. For whales, the potential impacts that masking may have on individual survival and the energetic costs of changing behavior to reduce masking are poorly understood. Baleen whales are subject to masking effects from the lower frequency noises produced by the boats to be used in the proposed activities (Clark et al., 2009; Dunlop et al., 2010).

While acoustic masking in North Atlantic right whales is possible from the proposed activities, the low sound levels and short durations of these noises should reduce the possibility of these events and reduce their severity should they occur. Any interruptions in behavior due to acoustic masking are expected to be temporary and minor and not to have significant impacts on the fitness of any listed animal. The effects of acoustic masking to listed species from these proposed activities are therefore discountable.

Tagging and Mucous and Sloughed Skin Collection

Up to 400 whales are proposed to be "taken" from tagging activities over the duration of the permit. All tags are proposed to be attached by using a hand-held 12 m cantilevered pole from 3-5m RHIBs. These activities have the potential to injure listed species as well as harass them via the process of approaching and tagging as well as from the effects that the tags themselves have on the target animals while attached.

Target animals are proposed to be fitted with DTAGs to measure received sound exposure, animal vocalizations and behavior. The DTAGs have a volume of 1 liter, a dry weight of 500 g. The tags are attached via suction cups and are designed to be attached to an animal for relatively short periods of time (5 to 20 hours). Tags similar to the proposed DTAGs have been used successfully in numerous past studies on both toothed and baleen whales (see Burgess et al., 1998; Johnson et al., 2004; Tyack et al., 2006; Watwood et al., 2006).

Expected Responses to Tag Attachment and Mucous and Sloughed Skin Collection

Suction-cup tags have been deployed multiple times in the past on whales for the attachment of various instruments. The proposed suction-cup attachment method is non

invasive and the duration of the attachment is limited. The tagging protocol involves careful observation of potential behavioral reactions to the approach of the tagging vessel and to the actual tag attachment. Attempts to tag will be terminated if the animal shows any adverse reactions or after the third failed attachment attempt.

Few studies have investigated the effects of tagging on cetaceans and the available data are often limited to visual assessments of behavior (Walker and Boveng, 1995). To further complicate matters, reactions to tagging are difficult to differentiate from reactions to the close vessel approaches necessary to ensure proper tag placement.

Evidence available on the short-term effects of tagging whales indicates that responses vary from little or no observable change in behavior to momentary changes such as skin twitching, startle reactions, altered swimming, diving, rolling, head lifts, high back arching and tail swishing (Goodyear, 1981; Watkins, 1981; Watkins et al., 1984; Goodyear, 1989; Goodyear, 1993; Mate et al., 1997; Mate et al., 1998; Hooker et al., 2001). Rarely, aerial displays like breaching are also noted (Goodyear, 1989). Behavioral responses are usually short-term (Mate et al., 2007), and possibly dependant on the animal's behavioral state at the time of tagging (Hooker et al., 2001). Observed reactions to tagging include disturbances in foraging and diving behavior soon after the tag attachment (see Jochens et al., 2006).

Davis et al. (2007) tagged odontocete sperm whales with barbed attachments and observed reactions of tail strokes and shallow dives but researchers noted no unusual behaviors or aggression to the tagging vessel. Sperm whales tagged with suction cups (similar to those proposed) exhibited a high rate of breaching (Palka and Johnson., 2007). Jochens et al. (2003) analyzed the behavior of suction cup sperm whales during foraging dives. The behavior during the first dive differed significantly from subsequent dives and the researchers attributed the difference to the tag operation.

Although there is evidence of minor short-term effects on tagged whales, no research has been done to assess long-term impacts of these activities. However, Goodyear (1989) observed that humpback whales did not appear to exhibit altered behavior when monitored several days after being suction-cup tagged. In addition, Mate et al. (2007) observed that tagged whales re-sighted up to three years later did not appear to be affected or to behave differently than untagged whales.

Although these tags would create drag, the proportion of this tag to a whale's size and weight is such that any drag effects would be insignificant. Tags are not expected to significantly alter the long-term behavior of any animal. In addition, investigators must exercise caution when approaching animals and immediately terminate activities if the animals appear to be adversely affected by the activities.

The proposed tagging activities are not likely to result in injuries to any listed animal. Tag attachment is expected to only change a whale's short-term behavior and these disruptions are not expected to lead to the reduction in fitness of any individual animal. Any effects of the proposed tagging activities are therefore discountable.

The collection of mucous and sloughed skin is proposed to occur incidentally to tagging activities. These activities are non-invasive and are not expected to further harass any animal. As such, these proposed activities are not expected to adversely affect any North Atlantic right whale.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions, including research authorized under ESA Section 10(a)1(A), that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. After reviewing available information, NMFS is not aware of effects from any additional future non-federal activities in the action area that would not require federal authorization or funding and are reasonably certain to occur during the foreseeable future.

NMFS expects the natural phenomena in the action area (e.g., oceanographic features, storms, and natural mortality) will continue to influence listed whales as described in the *Environmental Baseline*. We also expect current anthropogenic effects will also continue, including the introduction of sound sources into marine mammal habitat, changes in prey availability, vessel traffic and scientific research. Potential future effects from climate change on marine mammals in the action area are not definitively known. However, climatic variability has the potential to affect these species in the future, including indirectly by affecting prey availability.

As the size of human communities increases, there is an accompanying increase in habitat alterations resulting from an increase in housing, roads, commercial facilities and other infrastructure. This results in increased discharge of sediments and pollution into the marine environment. These activities are expected to continue to degrade the habitat of cetaceans as well as that of the prey on which they depend.

Integration and Synthesis of Effects

The following text integrates and synthesizes the *Status of the Species*, the *Environmental Baseline* and the *Effects of the Action* sections of this Opinion. This information, in addition to the known cumulative effects, is used to assess the risk the proposed activities pose to North Atlantic right whales.

As explained in the *Approach to the Assessment* section, risks to listed individuals are measured using changes to an individual's "fitness." When listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (e.g., Brandon, 1978; Mills and Beatty, 1979; Stearns, 1992; Anderson, 2000).

When individual, listed plants or animals are expected to experience reductions in fitness in response to an action, those fitness reductions can reduce the abundance, reproduction, or growth rates of the populations that those individuals represent (see Stearns, 1992). If we determine that reductions in individual plants' or animals' fitness reduce a population's viability, we consider all available information to determine whether these reductions are likely to reduce the viability of any species as a whole.

The proposed issuance by PR1 of scientific research Permit No. 14791 would authorize direct "takes" of North Atlantic right whales within waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay and coastal waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S. The proposed activities under this permit include passive recording, close approaches, photography, focal follows, tagging and the opportunistic collection of mucous and sloughed skin. The permit would be valid for five years and allow for total "takes" of 850 North Atlantic sperm whales.

Current and Historic Stressors

The current and historic stressors to these species are detailed in the *Environmental Baseline* section of this Opinion. These stressors include natural mortality, depletion of populations due to historic harvesting, pollution, noise, fishing interactions, ship strikes, vessel interactions and scientific research. Of these, the reduction of whale populations from historic harvest has likely had the most detrimental and long lasting effects.

Although commercial harvesting no longer targets any listed species in the proposed action area, prior exploitation may have altered the population structure and social cohesion of the species. These effects continue even after harvesting has ceased. Commercial whaling has depleted worldwide whale numbers, but populations have increased since whaling was banned in 1966 (Reilly, 2008). North Atlantic right whale hunting in the 19th and early 20th centuries is likely to have irreversibly damaged or extirpated the species (Collett, 1909; Brown, 1976).

Possible Stressors from the Proposed Activities

The assessment for this consultation identified several possible stressors associated with the activities to be authorized under proposed permit: (1) potential ship strikes; (2) noise and visual disturbance from boats engaged in the proposed activities and (3) effects from tagging and sample collection activities. For this consultation, we are particularly concerned about behavioral disruptions that may result in animals failing to feed or breed successfully or failing to complete their life history because these responses are likely to have population-level consequences for North Atlantic right whales.

Expected Responses to Stressors from the Proposed Activities

As explained in the *Response Analyses* section of this Opinion, because of their small size, maneuverability and slow operating speeds, boat strikes are extremely unlikely. As a result, any risk of boat strikes to listed species is therefore discountable. Similarly, noise and visual disturbances that would result from proposed activities are expected to

be brief and not to have any long-term consequences to individual North Atlantic right whales or the populations or species that they comprise.

Proposed tagging procedures will be non-invasive and will incorporate several mitigation procedures to limit harassment. Any behavioral responses to tagging activities are expected to be minor and temporary and any effects from these activities are therefore discountable. Similarly, sample collection activities are proposed to occur incidentally to tagging activities. These activities are non-invasive and are not expected to further harass any animal. As such, these propose activities are not expected to adversely affect any listed North Atlantic right whale.

Therefore, based on the proposed mitigation measures and the fact that these animals are not likely to significantly alter their behavior or physiology as a result of disturbances from of the proposed activities, these proposed activities are not expected to reduce the fitness or the likelihood of survival and recovery of listed individual North Atlantic right whale or the populations or species that they comprise.

Conclusion

After reviewing the current status of species; the environmental baseline for the action area; the anticipated effects of the proposed activities and the cumulative effects, it is NMFS Office of Protected Resources - Endangered Species Division's opinion that the NMFS Office of Protected Resources - Permits, Conservation and Education Division's permit No. 14791 to Douglas Nowacek, of Duke University, Beaufort NC for direct "takes" of North Atlantic right whales, pursuant to the Marine Mammal Protection Act (MMPA) of 1972, as amended (MMPA; 16 U.S.C. 1361) and section 10(a)1(A) of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*), as proposed, is not likely to jeopardize the continued existence of North Atlantic right whales under NMFS' authority.

Incidental Take Statement

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the "take" of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Sections 7(b)(4) and 7(o)(2), taking that is incidental and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

However, as discussed in the accompanying Opinion, only the species targeted by the proposed research activities will be harassed as part of the intended purpose of the proposed action. Therefore, the NMFS does not expect the proposed action will incidentally take threatened or endangered species.

Conservation Recommendations

Section 7(a) (1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information.

We recommend the following conservation recommendations, which would provide information for future consultations involving the issuance of marine mammal permits that may affect endangered whales as well as reduce harassment related to the authorized activities:

1. *Cumulative Impact Analysis.* The Permits Division should work with the Marine Mammal Commission, International Whaling Commission, and the marine mammal research community to identify a research program with sufficient scope and depth to determine cumulative impacts of existing levels of research on whales. This includes the cumulative sub-lethal and behavioral impacts of research permits on listed species.

2. *Estimation of Actual Levels of "Take."* For future permits authorizing activities similar to those contained in the proposed permit, the Permits Division should continue to review all annual and final reports submitted by investigators that have conducted whale research as well as any data and results that can be obtained from the permit holders. This should be used to estimate the amount of harassment that occurs given the level of research effort, and how the harassment affects the life history of individual animals. The results of the study should be provided to the endangered Species Division for use in the consultations on future research activities.

3. *Assessment of Permit Conditions.* The Permits Division should periodically assess the effectiveness of its permit conditions, including those for notification and coordination of research.

4. *Data Sharing.* For any permit holders planning to be in the same geographic area during the same year, the Permits Division should encourage investigators to coordinate their efforts by sharing research vessels and the data they collect as a way of reducing duplication of effort and the level of harassment threatened and endangered species experience as a result of field investigations.

In order for NMFS' Endangered Species Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, listed species or their habitats,

the Permits Division should notify the Endangered Species Division of any conservation recommendations it implements in its final action.

Reinitiation Notice

This concludes formal consultation on the proposal to issue scientific research permit No. 14791 for research on North Atlantic right whales (*Eubalaena glacialis*) within waters of the Western North Atlantic Ocean, including the Gulf of Maine, Cape Cod Bay and coastal waters within 50 nautical miles of the shore along the entire eastern seaboard of the U.S. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of proposed take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of authorized take is exceeded, NMFS Permits, Conservation and Education Division must immediately request reinitiation of section 7 consultation.

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Appendix A. Active NMFS Scientific Research Permits Authorizing Take of Target Species.

APPENDIX C: ACTIVE PERMITS THAT AUTHORIZE RIGHT WHALE TAKES

Permit No.	Holder	Expiration Date
655-1652-01	Kraus	**until new permit is issued
633-1763-01	Center for Coastal Studies	5/1/2010
1036-1744	DiGiovanni	5/1/2010
594-1759	Georgia DNR	5/1/2010
948-1692	Pabst	5/31/2011
1058-1733-01	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