NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL OPINION

Title:	Biological Opinion on the Issuance of Scientific Research Permit No. 18059 to David Wiley, Research Coordinator, Stellwagen Bank National Marine Sanctuary, for research on fin and sei whales
Consultation Conducted By:	Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
Action Agency:	Permits and Conservation Division of the Office of Protected Resources, National Oceanic and Atmospheric Administration's National Marine Fisheries Service
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Approved:

Donna S. Wieting
Director, Office of Protected Resources

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

1 INTRODUCTION

The Endangered Species Act (ESA) of 1973, as amended (16 USC 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat they depend on. Section 7(a)(2) of the ESA requires Federal agencies to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with the National Marine Fisheries Service (NMFS) for threatened and endangered species and designated critical habitat under NMFS' jurisdiction that may be affected by the action. If a Federal agency's action may affect a listed species or designated critical habitat, the agency must consult with the NMFS (50 CFR §402.14(a)). If a Federal action agency determines that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS concurs with that determination for threatened and endangered species and designated critical habitat under NMFS' jurisdiction, consultation concludes informally (50 CFR §402.14(b)).

Section 7(b)(3) of the ESA requires that at the conclusion of consultation NMFS provides a biological opinion (opinion) stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify their designated critical habitat. If NMFS determines that the action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat, NMFS provides a reasonable and prudent alternative that allows the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is the NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter the Permits Division). The agency proposes to issue a scientific research permit (Appendix A) pursuant to the ESA and the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC 1361 et seq.) to David Wiley, PhD, Research Coordinator, Stellwagen Bank National Marine Sanctuary, 175 Edward Foster Rd, Scituate, Massachusetts 02066. The purpose of the proposed permit is to allow an exception to the moratoria and prohibition on takes established under the ESA and MMPA in order to allow the applicants to conduct scientific research on ESA-listed fin (*Balaenoptera physalus*) and sei (*Balaenoptera borealis*) whales, as well as non-ESA-listed humpback (*Megaptera novaeangliae*) (West Indies Distinct Population Segment (DPS)) and minke (*Balaenoptera acutorostrata*) whales in the greater Gulf of Maine, in the United States (U.S.) North Atlantic Ocean.

Under the ESA 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 regulation (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." While the U.S. Fish and Wildlife Service further defines harass by regulation (50 CFR §17.3), until NMFS promulgates a regulatory definition, we rely on NMFS' interim guidance, which defines harass as an act that "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (NMFSPD 02-110-19).

Under the MMPA take is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1361 et seq.) and further defined by regulation (50 CFR §216.3) as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following:

- the collection of dead animals, or parts thereof
- the restraint or detention of a marine mammal, no matter how temporary
- tagging a marine mammal
- the negligent or intentional operation of an aircraft or vessel
- the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal
- feeding or attempting to feed a marine mammal in the wild"

Two levels of harassment are further defined under the MMPA as, any act of pursuit, torment, or annoyance which:

- has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or,
- has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (Level B Harassment).

NMFS interim ESA harass definition does not specifically equate to MMPA Level A or Level B harassment, but shares some similarities with both in the use of the terms "injury/injure" and a focus on a disruption of behavior patterns. Since the proposed permit would authorize take under both the ESA and MMPA, our ESA analysis, which relies on NMFS interim guidance on the ESA term harass, may result in different outcomes compared to those reached by the Permits Division in their MMPA analysis. Given that the MMPA takes a more conservative approach in considering any act that has the *potential* to disrupt behavioral patterns harassment, and under the ESA such acts must *significantly* disrupt normal behavioral patterns, there may be circumstances in which an act is considered harassment, and thus take, under the MMPA but not the ESA.

Consultation in accordance with section 7(a)(2) of the statute (16 U.S.C. 1536(a)(2)), associated implementing regulations (50 CFR §402), and agency policy and guidance was conducted by the

NMFS Office of Protected Resources ESA Interagency Cooperation Division (hereafter we). This opinion and incidental take statement were prepared by the NMFS Office of Protected Resources ESA Interagency Cooperation Division in accordance with section 7(b) of the ESA and implementing regulations at 50 CFR §402.

This document represents NMFS' opinion on the effects of the action on endangered and threatened species and designated critical habitat for those species. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

This is the first time the Permits Division has consulted with us on a scientific research permit for Dr. Wiley as the Principal Investigator. However, they have consulted with us on numerous scientific research permits on which Dr. Wiley was a Co-Investigator, starting in 2003. These include Permit Nos. 981-1707, 655-1652-01, 605-1904, 775-1875, 633-1778, 0605-1607, 14233, 14809, 14791, and 19674. Given that Dr. Wiley conducts long-term research on large whales in the greater Gulf of Maine, all of the research activities that would be authorized under the proposed Permit No. 18059 (Section 3) are the same or similar to those Dr. Wiley has been permitted to conduct as a Co-Investigator under these previous research permits (e.g., NMFS 2011a; NMFS 2013b; NMFS 2016b). Such activities include vessel surveys and close approaches, photography, fecal sampling, suction-cup tagging, exhaled breath sampling, prey mapping, observation, and biopsy sampling. Previous consultations that considered these activities all resulted in biological opinions that concluded that the issuance of the research permits to authorized these activities was not likely to jeopardize the continued existence of ESA-listed species, nor adversely modify designated critical habitat (e.g., NMFS 2011a; NMFS 2013b; NMFS 2016b). Thus, the effects of the same or similar research activities on ESA-listed species that would be authorized under Permit No. 18059 have been previously evaluated and undergone formal consultation with Dr. Wiley as one of the researchers permitted to carry out the activities. However, in this consultation, these previously permitted research activities are considered part of the environmental baseline (Section 7), and we evaluate the effects of authorizing Dr. Wiley to continue to conduct research on large whales in the greater Gulf of Maine under Permit No. 18059.

1.2 Consultation History

This opinion is based on information provided in the applicant's permit application (NMFS 2016d), correspondence and discussions with the Permits Division and the applicant, previous biological opinions for research permits on which Dr. Wiley was a Co-Investigator (NMFS 2011a; NMFS 2013b; NMFS 2016b), annual reports from previous research activities on which Dr. Wiley was a Co-Investigator (NMFS 2016c), and the best scientific and commercial data available from the literature. Our communication with the Permits Division regarding this consultation is summarized as follows:

- On June 21, 2016, the Permits Division requested technical assistance from us on the application for Permit No. 18059.
- On June 30, 2016, we provided comments to the Permits Division on the application for Permit No. 18059, which were passed on to the applicants.
- On July 27, 2016, the Permits Division sent us memorandum and initiation package requesting formal consultation on the proposed issuance of Permit Nos. 19674, 19315, and 18059.
- On August 3, 2016, we met with the Permits Division to discuss the initiation package and requested additional information, much of which was received the following day.
- On August 5, 2016, we informed the Permits Division that there was sufficient information to initiate formal consultation on Permit Nos. 19674 and 19315, but not 18059 as this permit application was not complete and the applicant had not responded to any of our comments. As a result, that day we sent the Permits Division a memorandum initiating formal consultation on the issuance of Permit Nos. 19674 and 19315, which was completed with a biological opinion issued on October 21, 2016 (NMFS 2016b).
- On August 15 and 17, 2016, the Permits Division provided us with the information we requested from the applicant on June 30 and August 3, 2016. We had no further questions at this time.
- On August 29, 2016, the Permits Division sent us memorandum and initiation package requesting formal consultation on the proposed issuance of Permit No. 18059.
- On September 6, 2016, we provided the Permits Division our review of the initiation package, and requested additional information from both the applicant and the Permits Division in order for the package to be complete.
- On October 5, 2016, we received the information requested from the applicant on September 6, 2016.
- On November 14, 2016, we received the information requested from the Permits Division on September 6, 2016.
- On November 16, 2016, we met with the Permits Division to clarify a few remaining items regarding the initiation package, after which we determined the package to be complete.
- On November 23, 2016, we sent the Permits Division a memorandum informing them that we had initiated formal consultation on the issuance of Permit No. 18059 as of November 16, 2016.
- On December 28, 2016, we provided the Permits Division with a document detailing our *Description of the Proposed Action* (see Section 3 below), including several minor questions about the action. We received answers back from the Permits Division on February 16, 2017.

2 THE ASSESSMENT FRAMEWORK

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species; or adversely modify or destroy their designated critical habitat.

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 CFR §402.02.

"Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of an ESA-listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR §402.02).

An ESA section 7 assessment involves the following steps:

Description of the Proposed Action (Section 3), *Interrelated and Interdependent Actions* (Section 4), and *Action Area* (Section 5)*:* We describe the proposed action, identify any interrelated and interdependent actions, and describe the action area with the spatial extent of those stressors.

Status of Species and Designated Critical Habitat (Section 6): We identify the ESA-listed species and designated critical habitat that are likely to co-occur with those stressors in space and time and evaluate the status of those species and habitat. In this Section, we also identify those *Species and Designated Critical Habitat Not Considered Further* (Section 6.1), because these resources will either not be affected or are not likely to be adversely affected.

Environmental Baseline (Section 7): We describe the environmental baseline in the action area including: past and present impacts of Federal, state, or private actions and other human activities in the action area; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, impacts of state or private actions that are contemporaneous with the consultation in process.

Effects of the Action (Section 8): We identify the number, age (or life stage), and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. We also consider whether the action "may affect" designated critical habitat. This is our exposure analysis. We evaluate the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure. We also consider how the action may affect designated critical habitat. This is our response analyses. We assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. This is our risk analysis. The adverse modification analysis considers the

impacts of the proposed action on the essential habitat features and conservation value of designated critical habitat.

Cumulative Effects (Section 9): Cumulative effects are the effects to ESA-listed species and designated critical habitat of future state or private activities that are reasonably certain to occur within the action area 50 CFR §402.02. Effects from future Federal actions that are unrelated to the proposed action are not considered because they require separate ESA section 7 compliance.

Integration and Synthesis (Section 10): In this section, we integrate the analyses in the opinion to summarize the consequences to ESA-listed species and designated critical habitat under NMFS' jurisdiction.

Conclusion (Section 11); With full consideration of the status of the species and the designated critical habitat, we consider the effects of the action within the action area on populations or subpopulations and on essential habitat features when added to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

- Reduce appreciably the likelihood of survival and recovery of ESA-listed species in the wild by reducing its numbers, reproduction, or distribution, and state our conclusion as to whether the action is likely to jeopardize the continued existence of such species; or
- Appreciably diminish the value of designated critical habitat for the conservation of an ESA-listed species, and state our conclusion as to whether the action is likely to destroy or adversely modify designated critical habitat.

If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, then we must identify reasonable and prudent alternative(s) to the action, if any, or indicate that to the best of our knowledge there are no reasonable and prudent alternatives. See 50 C.F.R. §402.14.

In addition, we include an incidental take statement that specifies the impact of the take, reasonable and prudent measures to minimize the impact of the take, and terms and conditions to implement the reasonable and prudent measures. ESA section 7 (b)(4); 50 CFR §402.14 (i). We also provide discretionary conservation recommendations that may be implemented by action agency. 50 CFR §402.14 (j). Finally, we identify the circumstances in which reinitiation of consultation is required. 50 CFR §402.16.

To comply with our obligation to use the best scientific and commercial data available, we collected information identified through searches of *google scholar*, *web of science*, literature cited sections of peer reviewed articles, species listing documentation, and reports published by government and private entities. This opinion is based on our review and analysis of various information sources, including:

- Information submitted by the Permits Division and the applicant

- Government reports (including NMFS biological opinions and stock assessment reports)
- NOAA technical memos
- Peer-reviewed scientific literature

These resources were used to identify information relevant to the potential stressors and responses of ESA-listed species and designated critical habitat under NMFS' jurisdiction that may be affected by the proposed action to draw conclusions on risks the action may pose to the continued existence of these species and the value of designated critical habitat for the conservation of ESA-listed species.

3 DESCRIPTION OF THE PROPOSED ACTION

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies. The proposed action for this consultation is the Permits Division's issuance of a scientific research permit pursuant to the ESA and MMPA to David Wiley, PhD, Research Coordinator, Stellwagen Bank National Marine Sanctuary, 175 Edward Foster Rd, Scituate, Massachusetts 02066.

The Permits Division proposes to issue scientific research Permit No. 18059 to Dr. Wiley to conduct research on fin, sei, humpback, and minke whales. The purpose of the research is to investigate the foraging ecology, habitat use, physiology, and acoustic and social behavior of these large whale species in order to provide information in support of ecosystem-based management and to mitigate mortality or serious injury caused by collision with ships or entanglement in commercial fishing gear, major issues impacting endangered and protected whales in the greater Gulf of Maine (Van Der Hoop et al. 2013). The permit would authorize Dr. Wiley to take ESA-listed fin (endangered range-wide) and sei whales (endangered range-wide), as well as non-ESA listed humpback (West Indies DPS) and minke whales during his research. Table 1 below displays the annual takes of ESA-listed species that would be authorized under Permit No. 18059. For the purposes of research permits, the Permits Division counts one take per cetacean per day including all approaches and procedure attempts, regardless of whether a behavioral response to the permitted activity is observed. Researchers would be permitted to attempt the procedures in Table 1 only once during an approach, where an "approach" is defined as a continuous sequence of maneuvers involving a vessel or equipment, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards.

Table 1: Proposed annual take of Endangered Species Act listed species under Permit No. 18059

Species	Listing Unit/Status	Life Stage	Annual No. of Takes	Takes Per Animal	Observe/ Collect Method	Procedures	Details
Whale, fin	Range-wide Endangered	Adult/ Juvenile	20	3	Survey, vessel	Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, fecal	Up to 20 animals will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. Some animals might receive two tags. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
			10			Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to 10 animals will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. Some animals might receive two tags. Animals may also be approached up to three additional times to obtain expired gas (blow). One to four samples will be taken from each animal. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
			30			Photo-identification; Photograph/Video; Sample, fecal; Sample, skin and blubber biopsy	Up to 30 animals will be approached up to three times each for biopsy sampling, photo-identification, and fecal sampling.
		Calf	3			Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, fecal	Up to three calves on the feeding, but not breeding, ground will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. Calves will not be tagged prior to the month of June and will be >~7.5 meters in length. Some animals might receive two tags. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
			2			Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to two calves on the feeding, but not breeding, ground will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. Calves will not be tagged prior to the month of June and will be >~7.5 meters in length. Some animals might receive two tags. Animals may also be approached up to three additional times to obtain expired gas (blow). One to four samples will be taken from each animal. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
		All	30			Observations, behavioral; Photo-identification; Photograph/Video; Sample, fecal	Up to 30 animals will be approached up to three times each for the purpose of fecal sampling and photo-identification for inclusion in regional databases.
			480	1		Incidental harassment	Up to 480 animals that might be in groups with whales targeted for research activities could be incidentally harassed.

Species	Listing Unit/Status	Life Stage	Annual No. of Takes	Takes Per Animal	Observe/ Collect Method	Procedures	Details
Whale, sei	Range-wide Endangered	Adult/ Juvenile	10	3	Survey, vessel	Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to 10 animals will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. Some animals might receive two tags. Animals may also be approached up to three additional times to obtain expired gas (blow). One to four samples will be taken from each animal. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
			30			Photo-identification; Photograph/Video; Sample, fecal; Sample, skin and blubber biopsy	Up to 30 animals will be approached up to three times each for biopsy sampling, photo-identification, and fecal sampling.
		Calf	2			Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to two calves on the feeding, but not breeding, ground will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. Some animals might receive two tags. Animals may also be approached up to three additional times to obtain expired gas (blow). One to four samples will be taken from each animal. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
			1			Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., Very High Frequency, Time Depth Recorder); Observations, behavioral; Photo-identification; Photograph/Video; Sample, fecal	Up to one calf on the feeding, but not breeding, ground will be approached up to three times each for placement of suction cup tags, photo-identification, and fecal sampling. The animal might receive two tags. The animal will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
		All	30			Observations, behavioral; Photo-identification; Photograph/Video; Sample, fecal	Up to 30 animals will be approached up to three times each for the purpose of fecal sampling and photo-identification for inclusion in regional databases.
			370	1		Incidental harassment	Up to 370 animals that might be in groups with whales targeted for research activities could be incidentally harassed.

3.1 Proposed Activities

The proposed research would include a variety of activities that would take place during vessel surveys including photography, fecal sampling, suction-cup tagging, exhaled breath sampling, observation, prey mapping, and biopsy sampling. These activities would be directed towards a particular target whale or group of whales and are described in more detail below. In addition, non-target whales that are in association with target whales may be incidentally harassed during these research activities.

3.2 Vessel Surveys and Close Approaches

Vessel surveys are the primary means by which cetacean researchers collect data on large whale species as they provide a platform for researchers to collect a wealth of information on whale biology. Here we describe the proposed vessel surveys and associated close approaches more generally and then in each section below, detail the individual research activities that would follow close approaches.

The Permits Division proposes to authorize Dr. Wiley to take up to 95 fin and 74 sei whales three times annually by harassment during vessel surveys (although see *Exposure Analysis* for discussion on the feasibility of this three-time limit). For fin whales, this includes 30 whales from any age class, 60 whales that are either adults or juveniles, and five calves. For sei whales, this includes 30 whales from any age class, 40 whales that are either adults or juveniles, and four calves. In addition, single annual takes in the form of incidental harassment of up to 480 fin and 370 sei whales of any age class would be authorized as the result of these whales associating with individuals approached during directed research. These takes could be of either males or females. In general, researchers would only approach an animal by vessel up to three times in one day. However, in the event of suction-cup tagging, followed by exhaled breath sampling, up to six approaches per day would be authorized in order to allow up to three approaches for tagging, and an additional three for exhaled breath sampling.

On any given day, researchers would search for whales within the greater Gulf of Maine (Section 3.2.7) from a support vessel, usually the National Oceanic and Atmospheric Administration (NOAA) research vessel the Auk (15-meter catamaran, twin 484 horsepower diesel engines, cruising speed of 16 knots) or the Nancy Foster (57-meter, single 1,250 horsepower diesel engine, cruising speed of 10.5 knots). Once a whale is spotted, the team would launch a rigid inflatable boat (between four to seven meters, single approximately 60 horsepower outboard engine) in order to closely approach the whale(s) on a converging course at slow speeds, usually four to eight knots, to within three to 25 meters. As researchers would attempt to match the target whale's speed, in some cases an approach may be faster than eight knots if the target whale is rapidly swimming. In between animal surfacing, the survey vessel would be at idle or proceed at slowest speed possible in order to maintain a heading.

Following the close approach, one or several researcher activities would occur. Researchers would always photograph whales and opportunistically collect fecal samples. In addition,

depending on the day's research focus, weather, whale behavior, etc., researchers would attempt one of two suites of research activities: 1) suction-cup tagging, exhaled breath sampling (for some whales), observation, and/or prey mapping, or 2) biopsy sampling. Thus, whales would either be targeted for suction-cup tagging (and associated research activities) or biopsy sampling, but not both on any given day. Each of these research activities is further described below. Depending of the suite of research activities conducted, the full duration of an encounter with a whale(s) could be anywhere from 30 seconds up to an entire day (approximately 9 hours).

3.2.1 Photography

Photographic identification (photo-ID) is a widely used method for identifying individual cetaceans, allowing researchers to track individuals, monitor reproduction and mortality, identify migrations, follow age and sex dependent behavior and habitat use patterns, and monitor health (Hammond et al. 1990). Photo-ID also allows researchers to determine if anthropogenic risk varies by age and/or reproductive class (Van Der Hoop et al. 2013), which helps inform protected species management.

The Permits Division proposes to authorize Dr. Wiley to take all whales that are closely approached by means of photography (95 fin and 74 sei whales, three times annually, Table 1, although see *Exposure Analysis* for discussion on this three-time limit). Close approaches to take photographs would follow those described above. In cases where researchers are approaching a whale only for the purposes of photography, the vessel would only come to within 15 to 25 meters alongside a whale(s). Since identification of individuals from photographs requires high quality images, researchers would minimize their impact on whale behavior during the approach so as not to cause the whale to swim away. Photographs of whales could be taken at any time during vessel surveys (i.e., during the initial approach and during all research activities further described below).

Photographs of whale dorsal fins and flanks would be used to identify individual animals (Blackmer et al. 2000; Katona and Whitehead 1981). These photos would be directly used by Dr. Wiley in his research and be submitted to regional photo-ID databases. For fin whales, photographs would be curated by the Provincetown Center for Coastal Studies whose database would be used to identify the age, gender, and reproductive history of each whale photographed. Photo-identification would also allow researchers to target specific animal classes as needed and avoid un-needed duplicative takes.

3.2.2 Fecal Sampling

Fecal sampling is a well-established noninvasive sample collection method that can be used to assess reproductive hormones, stress, parasites, red tide effects, diet composition, energetics, and nutrition (reviewed in Hunt et al. 2013). Dr. Wiley aims to collect fecal samples in an effort to better understand the ecological roles large whales have in cycling nutrients (Roman and McCarthy 2010) and to study baleen whale gut flora.

Fecal sample collection does not usually require approaching animals directly, as the fecal matter is often left floating at the surface after the whale is gone. However, fecal sampling could take place near whales, and occasionally within 100 yards of whales, particularly if a known individual has defecated nearby. Due to this potential for close proximity during fecal sample collection, the Permits Division proposes to authorize Dr. Wiley to collect fecal samples near all whales targeted for vessel surveys (95 fin and 74 sei whales, three times annually, demographics as specified in Table 1). As fecal samples would be opportunistically collected during other research activities, fecal sampling would not require any additional approaches.

When fecal matter is observed in the water, researchers would approach the sample (not the whale) and collect it with a standard plankton net and a 2-gallon glass container. As no particular whale is expected to be taken during fecal sampling, there is no limit on the number of samples that can be taken, but the researcher would only be authorized to take whales as specified in Table 1 as a result of the close approaches that may occur during fecal sampling.

3.2.3 Suction-cup Tagging

Recent advances in tagging technologies have provided unprecedented detail on cetacean biology, allowing researchers to better understand their physiology, foraging, ranging, diving, and sociality, and have improved efforts to protect and conserve these species (Nowacek et al. 2016). For example, tagging North Atlantic right whales has provided much needed information on foraging and diving behavior, improving our ability to assess the vulnerability of right whales to ship strikes and entanglement (Nowacek et al. 2004; Parks et al. 2011). Tagging calves is also important, as little is known about this age group's diving behavior and how it might influence their risk to anthropogenic threats. Given their under-developed diving capabilities, calves likely spend increased time at the surface and in shallower water, but currently few data exist on baleen whale calf diving behavior (although see Stimpert et al. 2012; Tyson et al. 2012))

The Permits Division proposes to authorize Dr. Wiley to take 35 fin (30 adults/juveniles, five calves greater than six months old) and 13 sei whales (10 adults/juveniles, three calves greater than six months old) up to three times annually during vessel surveys for the purposes of suction-cup tagging. Both males and females would be suction-cup tagged and researchers could attempt to suction-cup tag a whale up to three times per day. Suction-cup tags would be equipped with a variety of sensors to collect video, audio, orientation, pitch, roll, heading, acceleration, temperature, light, and pressure. Researchers would be authorized to simultaneously attach up to two suction-cup tags to a single whale for the purposes of combining tag technologies (e.g., video from one suction-cup tag, movement data from another).

Tag Specifications

Currently, Dr. Wiley plans to utilize four difference types of suction-cup tags, specifications for which are detailed below. However, as technologies advance over the course of the proposed permit, he would be authorized to use additional suction-cup tag types as long as they are smaller and/or are expected to have less impact than those described below.

The Digital Acoustic Recording Tags, hereafter DTAGs, that would be used [(Johnson and Tyack 2003), Woods Hole Oceanographic Institution, http://soundtags.st-andrews.ac.uk/dtags/, Figure 1] come in three versions (DTAG-1, DTAG-2, and DTAG-3), two of which are currently in use (DTAG-2 and DTAG-3). In their deployment housing, they are approximately 19.6 centimeters by 9.7 centimeters by 4.6 centimeters or smaller, weigh approximately 330 grams or less in air, and are slightly buoyant in water in order to allow retrieval after release from the animal. The housing is hydrodynamic, has low drag, and is equipped with four suction-cups for attachment. DTAGs include sensors for acoustic recordings, pressure, pitch, roll, heading, surfacing events, temperature, GPS, as well as a very high frequency (VHF) antenna that transmits radio waves at 148 or 220 Megahertz (MHz) to aid in tracking and tag retrieval. DTAGs feature a programmable release mechanism for detachment. The latest version has a memory-limited data collection duration of 3 days (previous version limitations are shorter), but tags often come off earlier either by design or due to whale behavior (Szesciorka et al. 2016).

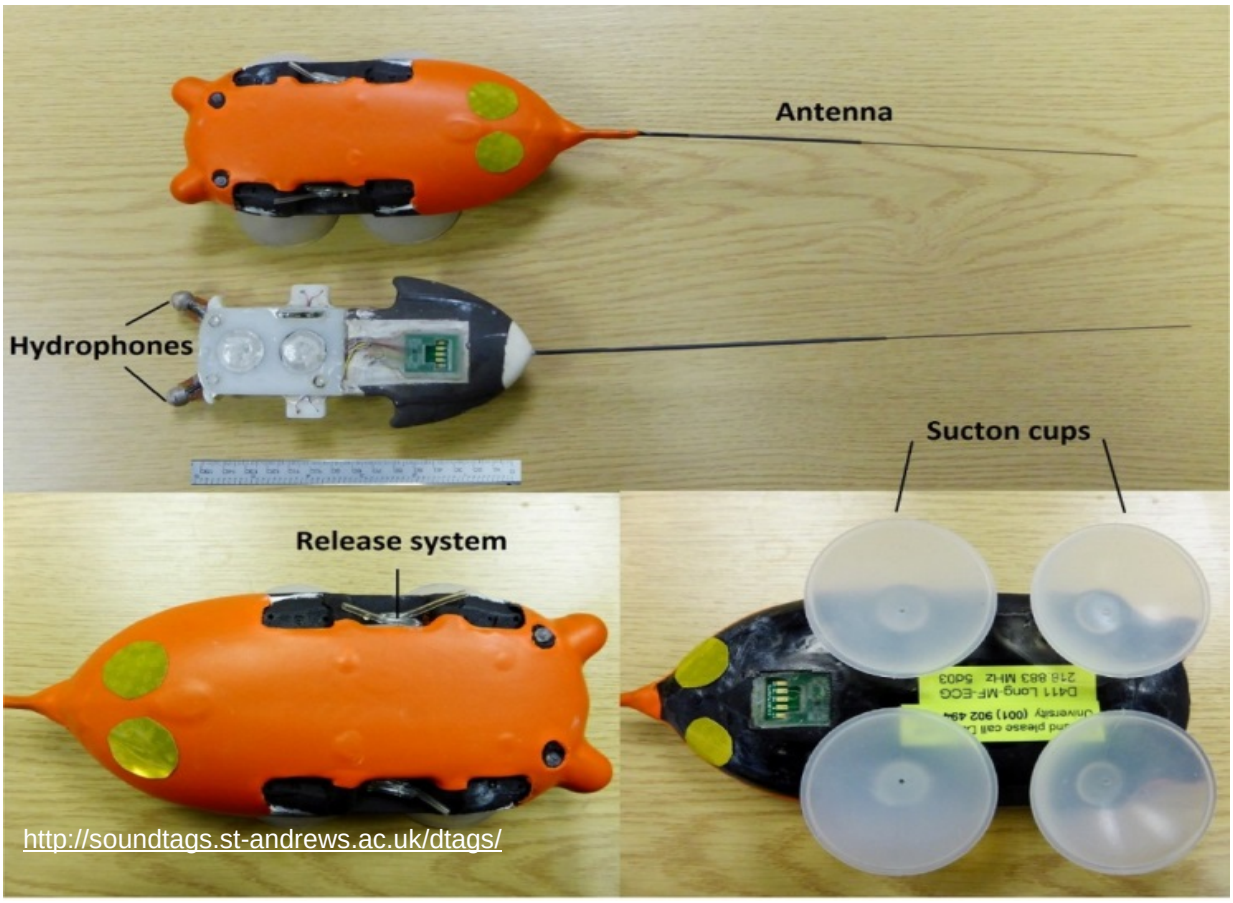
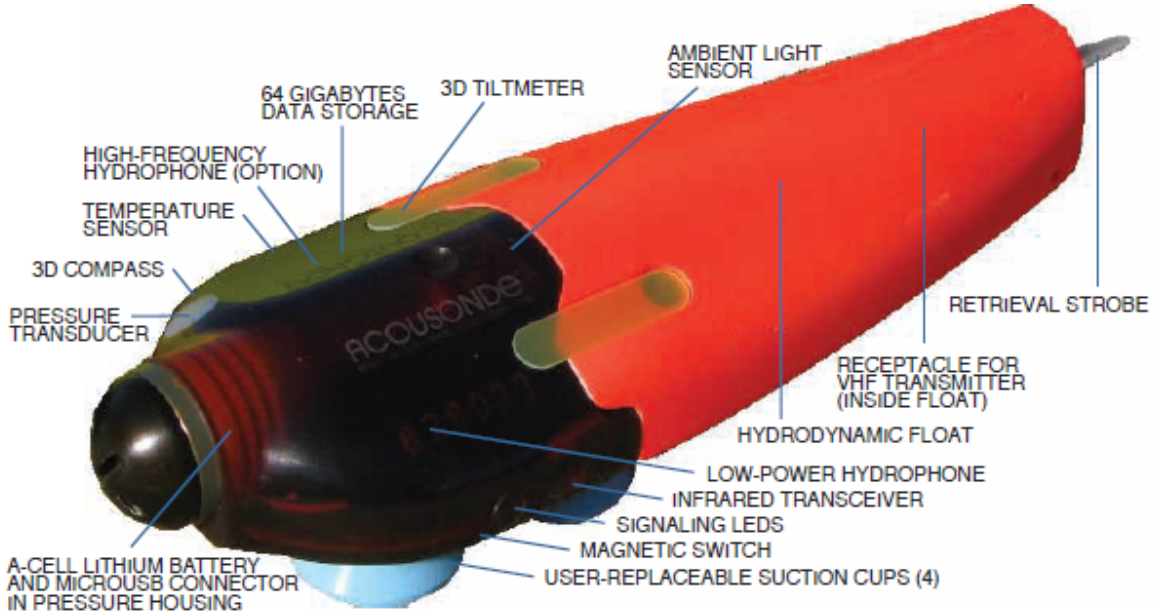


Figure 1: Digital Acoustic Recording Tag, Version 3

The Acousonde tags that would be used (B003B Acousonde, Acoustimetrics, http://acousonde.com/, Figure 2) are miniature, self-contained, autonomous acoustic/ultrasonic recorders, designed specifically for use on marine mammals. They have a hydrodynamic shape and measures approximately 4.2 centimeters by 7.9 centimeters by 24.1 centimeters when fully

equipped with a VHF radio transmitter and retrieval strobe. They are positively buoyant in water and weigh approximately 360 grams in air when used with four suction cups, and approximately 391 grams if used with a single, large suction cup. Acousonde tags incorporate hydrophones as well as depth, attitude and orientation sensors, digital recording electronics, data storage, a field-replaceable battery, a VHF radio beacon for tracking and retrieval, and a retrieval strobe. Unlike current DTAG models, Acousonde's 3B model cannot be programmed for release. However, given its greater storage capacity when compared to DTAGs, Acousonde tags are typically power limited rather than storage limited and can last from six to 14 days depending on the ambient temperature and the extent to which auxiliary sensors are sampled. In practice, Acousonde tag attachment durations are usually much shorter, with Dr. Wiley reporting a maximum duration of approximately 20 hours from his previous work (NMFS 2016d).



http://www.acousonde.com/downloads/Acousonde3B_Brochure.pdf

Figure 2: Acousonde 3B tag.

The Crittercam suction-cup tags that would be used (National Geographic, http://animals.nationalgeographic.com/animals/crittercam-about/, Figure 3) are specifically designed for large whales and are primarily designed for capturing video and audio. Crittercam tags are approximately 13.0 centimeters by 30.0 and are attached with a single suction-cup approximately 22.9 centimeters in diameter. In air, the tags weigh 1.9 kilograms and are buoyant in water. In addition to the video and audio recording equipment, Crittercam tags have sensors to collect environmental data including depth, temperature, and acceleration and VHF radio beacons to aide in tracking animals and tag recovery. Like DTAGs, Crittercam tags have a programmable release mechanism for detachment. Given its focus on video data collection, its use is limited to daytime applications with typical attachment durations of approximately 8 hours.

Figure 3: National Geographic Crittercam attached to a pole for deployment. Photo from (NMFS 2016d).

The CATS-CAM tag that would be used (Customized Animal Tracking Solutions, http://www.cats.is/, Figure 4) are similar to Crittercams in that their focus is on video data collection. They measure approximately 20.0 centimeters by 15.0 centimeters by 8.0 centimeters, are buoyant in water, and weigh 400 grams in air. As with the other tags, they attach to the animal through suction-cups. CATS-CAM tags are equipped with two integrated high definition video cameras that are controlled intelligently by other onboard sensors, which include light, pressure, acceleration, compass, and gyroscope. Currently, its maximum recording duration is 35 hours. Like Acousonde tags, CATS-CAM tags do not have a programmable release mechanism and rely solely on passive suction-cup detachment that would occur at a similar duration (approximately 20 hours).

Figure 4: CATS-CAM attached to a humpback whale

Initial Tag Attachment

Currently, Dr. Wiley proposes to attach all suction-cup tags to whales using one of two pole systems. During vessels surveys, and concurrent with photography and opportunistic fecal sampling, researchers would slowly approach a focal whale from behind and parallel at a low speed (four to eight knots) designed to slowly overtake and then match the whale's swim pace. Once the vessel is close enough to the whale (within three to five meters), researchers would use a 15-meter, cantilevered pole, mounted to the bow of the survey vessel (Figure 5a), or a seven- to eight-meter hand-held pole to attach a suction-cup tag (Figure 5b). To minimize the potential for the tag to disturb the whale during the attachment period, tags would be placed on the animal's dorsal surface posterior to the blowholes (Figure 5c) and at no time near the animal's blowhole (Johnson and Tyack 2003). Depending on the tag technologies and the desired data set, researchers would simultaneously deploy two tags on the same animal during the same approach using a combination of poles (Figure 5d).

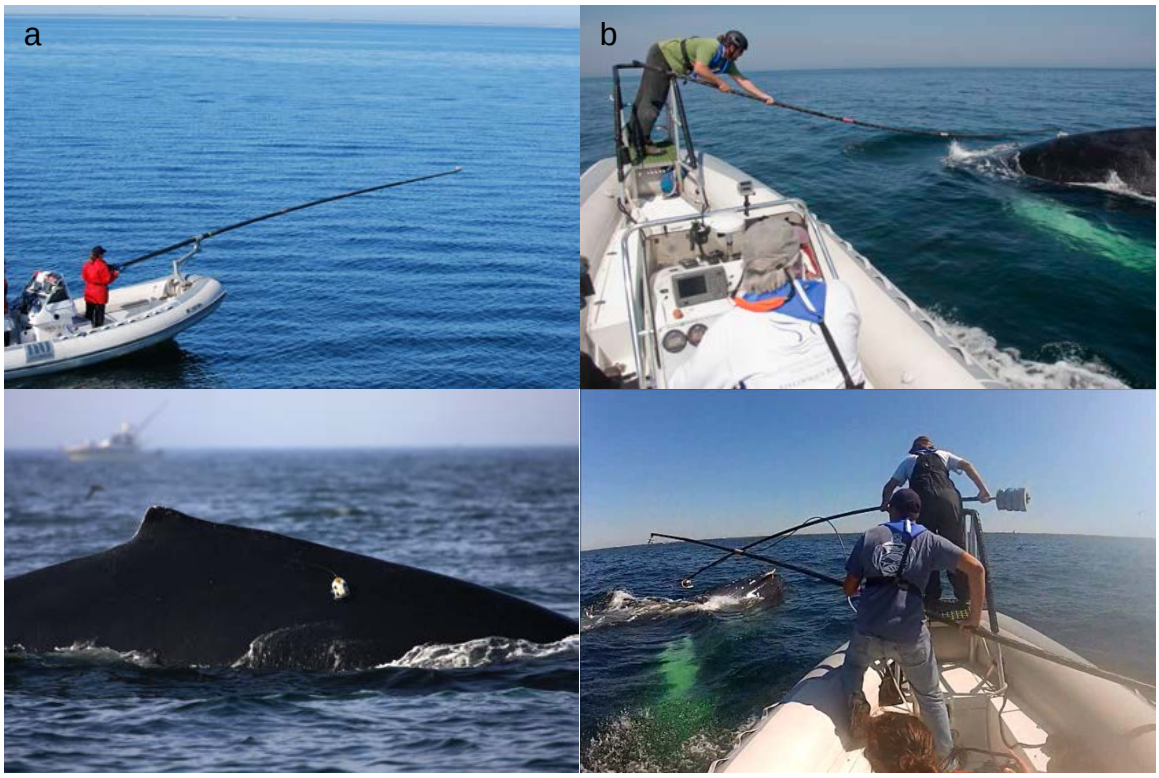


Figure 5: Suction-cup tag attachment: a) cantilevered pole attached to vessel, b) hand-held pole, c) typical attachment location, d) simultaneous attachment of two suction-cup tags. Photos from (NMFS 2016d).

While currently Dr. Wiley only plans to attach suction-cup tags to whales using the above pole-based methods, as tags become smaller, he would be authorized to use more remote attachment methods, such as a modified Barnett Wildcat crossbow or similar product, which would allow tags to be attached from a greater distance from the focal animal (approximately 20 meters) (Figure 6) (Hooker et al. 2001b). However, such devices would not have a draw weight of greater than 140 pounds.

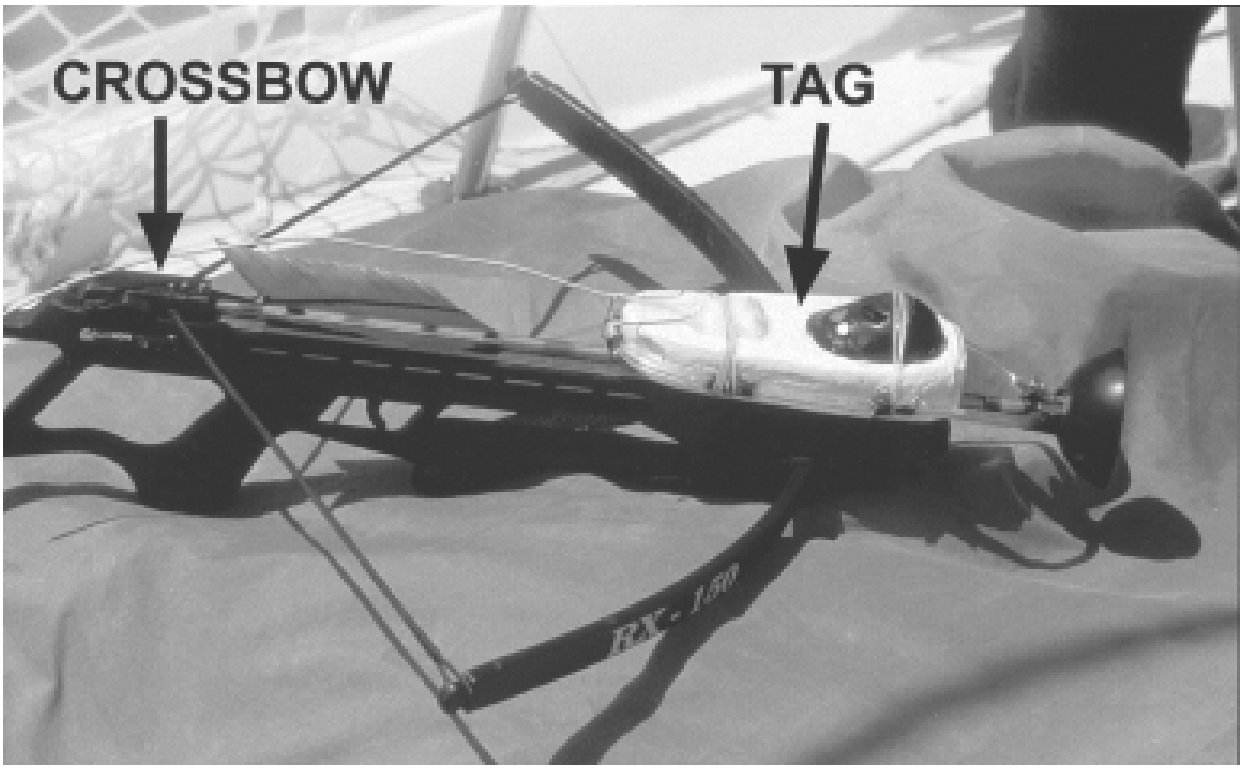


Figure 6: Modified crossbow for use with suction-cup tags. Photo from (Hooker et al. 2001b)

Continued Tag Attachment

Once a tag is attached, the whale would be followed by the tagging vessel, and at a distance, the support vessel, for continued photography and fecal sampling, exhaled breadth sampling, observation, and/or prey mapping as described below. With the exception of Acousonde and CATS-CAM tags, all tags would be set to release at a pre-defined time, which would be determined by a series of factors including memory capacity, weather conditions, and the programmed release of other simultaneously deployed tags.

3.2.4 Exhaled Breath Sampling

A relatively new noninvasive methodology that Dr. Wiley would be authorized to conduct under Permit 18059 is that of exhaled breath sampling. Analysis of the exhaled breath from cetaceans can be used to assess reproductive and stress hormones (Hunt et al. 2014), genetics (Frere et al. 2010), disease (Acevedo-Whitehouse et al. 2010), and likely other aspects of cetacean biology (reviewed in Hunt et al. 2013). Dr. Wiley aims to use exhaled breath sampling to estimate the metabolic rate of animals that are already carrying suction-cup tags. These tags have hydrophones and 3-axis accelerometers making it possible to relate flow noise and activity to expired tidal volume (Sumich and May 2009) and diving metabolic rate (Fahlman et al. 2013; Fahlman et al. 2008).

The Permits Division proposes to authorize Dr. Wiley to collect exhaled breath from up to 12 fin (ten adults and two calves greater than six months old) and 12 sei whales (ten adults and two

calves greater than six months old) that have already been suction-cup tagged. As with suction-cup tagging, both males and females could be targeted for exhaled breath sampling. Given that these animals may have already been approached up to three times during suction-cup tagging, the Permits Division proposes to authorize Dr. Wiley to approach these whales an additional three times (six approaches in a single day) for exhaled breath sampling.

To collect exhaled breath samples, researchers would approach whales in an identical fashion as described above for suction-cup tagging. Once close enough (approximately three to five meters), exhaled gas samples and flow rates would be collected by placing a custom-made Fleisch type pneumotachometer (Micah VMD Consulting, Miami, Florida) attached to a five meter, hand-held, carbon-fiber pole briefly over an animal's blowhole as it breaths (Fahlman et al. 2015)(Figure 7). While possible, no contact with the animal is expected during this procedure. Dr. Wiley would attempt to collect gases and flow rates during one to four breaths during each approach as the whale ventilates during a surfacing.

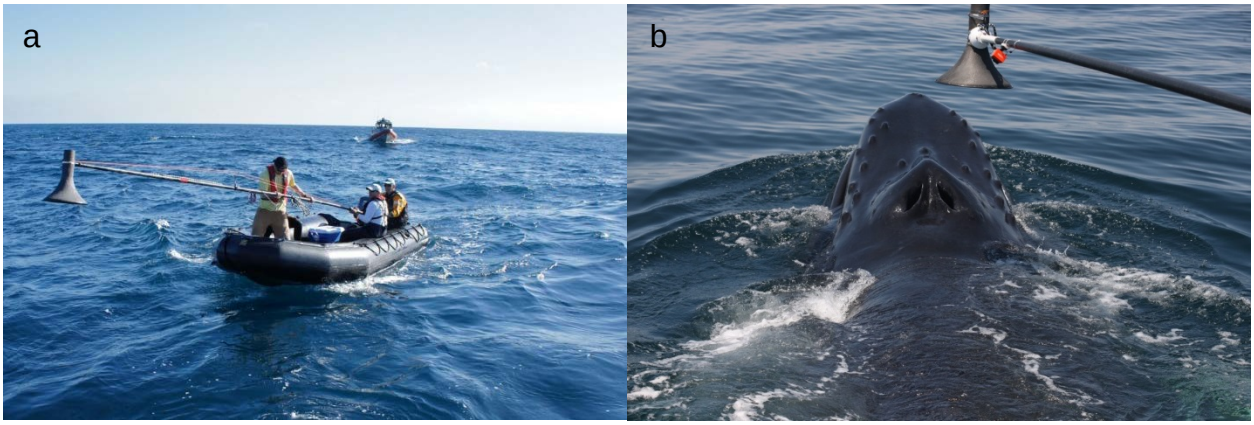


Figure 7: Exhaled breath sampling: a) hand-held pole with flow meter, b) flow meter hovering over humpback blowhole. Photos from (NMFS 2016d).

The researcher would remain as far away from the whale as possible, while still being close enough to allow sample collection. If a whale is resting at the surface when approached and does not move, the boat would reverse its course at idle speed and back away. Once a sample is collected, the boat would go into neutral and allow the whale to continue on its course and surfacing pattern. Subsequently, the survey, and support vessel at a distance, would attempt to follow the whale for continued photography and fecal sampling, observation, and/or prey mapping.

3.2.5 Observation

Direct behavioral observations of cetaceans provide a wealth of information on their biology and important information needed by managers to effectively conserve and protect these species (see Mann 1999; Nowacek et al. 2016 for reviews). When combined with tagging data, these observations provide detailed information on both the surface and underwater behavior of cetaceans (Nowacek et al. 2016). Following suction-cup tagging, and where applicable exhaled

breath sampling, Dr. Wiley aims to conduct behavioral observations of whales in order to relate tagging and exhaled breath data to surface behavior.

The Permits Division proposes to authorize Dr. Wiley to take all whales that would be suction-cup tagged (35 fin and 13 sei whales, demographics as specified in Table 1) by means of behavioral observation, up to three times annually. As with suction-cup tagging, both males and females would be observed.

Since the aim of behavioral observation is to record natural animal behavior, Dr. Wiley would not usually approach whales for the purposes of observation. Instead, his team would conduct focal follows on tagged whales from survey vessels at distances between 100 and 400 meters or, if necessary, at greater distances by larger support vessels. During daylight hours and when weather permits, surface behaviors and the time (to the second) at which they occur would be recorded. Focal animal surface locations would be derived from Leica laser-range finder binoculars combined with the survey vessel's GPS position. On occasion whales might be approached to document tag placement, as movement of the tag would require recalibration of body orientation during analysis, or to document a specific behavior for correlation with the tag record. Surface behavior observations would later be synchronized to tag-derived data using the time and position. The duration of the focal follow will depend on the duration of the tag deployment, or in most cases, weather, available light, and or sea-state conditions. During focal follows, Dr. Wiley may also conduct prey mapping as further detailed below.

3.2.6 Prey Mapping

Recent advances in whale tagging technologies, combined with scientific echo-sounders used the map prey abundance, have provided unprecedented data on predator-prey relationships among large whale species (e.g., Friedlaender et al. 2009; Hazen et al. 2009). As part of his research, Dr. Wiley aims to combine suction-cup tag, exhaled breath sample, and observational data with concurrent data on prey abundance and bathymetry collected by scientific echo-sounders (Friedlaender et al. 2009; Hazen et al. 2009; Wiley et al. 2011).

Accordingly, the Permits Division proposes to authorize Dr. Wiley to take all whales that would be suction-cup tagged (35 fin and 13 sei whales, demographics as specified in Table 1) by using scientific echo-sounders to map prey densities near tagged whales. As with suction-cup tagging, both males and females would be taken during prey mapping. Prey mapping would occur concurrently with behavioral observations.

During prey mapping, a duel frequency (38 and 120 kilohertz (kHz)) SIMRAD EK60 echo-sounder and/or a single frequency (120 kHz) SIMRAD ES60 would be towed at approximately two to five knots depending on the sea-state and currents. Emitted source levels would be a maximum of 224 dB re 1µPa at one meter with a duration of one millisecond and 0.5 hertz (Hz) repetition rate. As with Dr. Wiley's previous research using this equipment (Friedlaender et al. 2009; Hazen et al. 2009) the aim is to map prey densities near whales during natural foraging behavior. Thus, no additional approaches to whales specifically for prey mapping would occur.

The duration of an individual whale's exposure to prey mapping will vary depending on the duration of the focal follow but would not exceed eight hours in any given day.

3.2.7 Biopsy Sampling

Biopsy sampling is a widely used method for obtaining skin and blubber tissue from cetaceans for use in studies on genetics, contaminants, disease, foraging ecology, reproduction, and other physiological and biological processes (reviewed in Noren and Mocklin 2012). At least 42 species of cetacean have been biopsy sampled (33 odontocetes and nine mysticetes) since the method was initially developed in 1973 (Noren and Mocklin 2012). In his research, Dr. Wiley aims to use biopsy sampling to collect skin and blubber tissue from large whales in order to investigate the feeding habits and trophic relationships of baleen whales in the greater Gulf of Maine through stable isotope analysis and to investigate the mechanics of somatosensory reception in marine mammals.

The Permits Division proposes to authorize Dr. Wiley to biopsy sample up to 30 adult or juvenile fin and 30 adult or juvenile sei whales. Both males and females could be targeted for biopsy sampling. While Dr. Wiley's intent would be to only sample each individual once per year, he would be authorized to approach animals up to three times during attempts to collect biopsy samples and would be authorized to biopsy sample the same individual up to three times per year. As previously noted, whales targeted for biopsy samples would not be targeted for suction-cup tagging (and associated subsequent activities), and vice versa. Thus, biopsy sampling would take place as part of vessel surveys following and/or concurrent only with photography and fecal sampling.

To collect biopsy samples, the survey vessel would approach a whale at a slow converging course as previously described in Section 3.2, while researchers are simultaneously taking photographs of the whale for identification purposes. Once the survey vessel is within 10 to 30 meters of the whale, a biopsy sample would be collected from the dorsal surface of the individual, posterior to its pectoral fin, using a crossbow equipped with a biopsy dart (Palsbøll et al. 1991) (Figure 8). The crossbow would be a Barnett Wildcat model or similar and have a draw weight of approximately 140 pounds. The biopsy dart would have a surgical stainless steel tip measuring approximately three centimeters in length and nine millimeters in diameter, fitted with a 2.5-centimeter stop to ensure recoil and prevent deeper penetration. Prior to, and between sample collections biopsy dart tips would be: scrubbed with a small diameter test tube brush to remove tissue residues, sprayed with RNase-Zap (Ambion), soaked for five minutes in a Liqui-Nox soap solution, rinsed in reverse osmosis water, soaked for five min in a five percent chlorine bleach, rinsed in reverse osmosis water, dipped in isopropanol alcohol, rinsed in reverse osmosis water, then air dried on hexane-rinsed foil. Biopsy samples would be initially preserved in four percent paraformaldehyde (for immunohistochemistry), 2.5 percent gluteraldehyde (for electron microscopy), or RNA-Later (for gene expression). Because these studies require the entirety of the retrieved biopsy plugs, researchers are unable to subsample or share samples collected for other investigations.

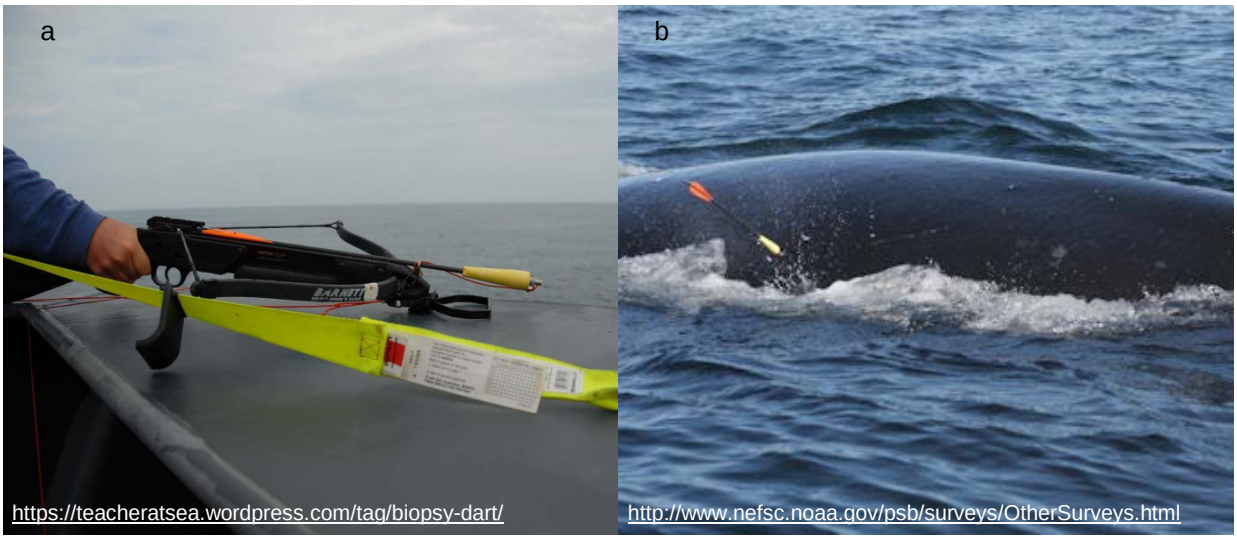


Figure 8: Biopsy sampling: a) Loaded Barnett biopsy crossbow, b) example of biopsy dart sampling location on a North Atlantic right whale (*Eubalaena glacialis*).

4 INTERRELATED AND INTERDEPENDENT ACTIONS

Interrelated actions are those that are part of a larger action and depend on that action for their justification. *Interdependent* actions are those that do not have independent use, apart from the action under consideration. For this consultation, we consider all vessel transit associated with research activities within the action area as interdependent. Thus, we evaluate the effects this vessel transit on ESA-list species.

5 ACTION AREA

Action area means all areas affected directly, or indirectly, by the Federal action, and not just the immediate area involved in the action (50 CFR §402.02). The action area for research that would be authorized under Permit No. 18059 is the greater Gulf of Maine. The Gulf of Maine is a large gulf in the Atlantic Ocean off the east coast of North America. It includes the Bay of Fundy, Massachusetts Bay, and the Great South Chanel. The greater Gulf of Maine also includes the waters over Georges Bank. The action area overlaps designated critical habitat for North Atlantic right whales, several Seasonal Management Areas in which vessel speed restrictions are in place during certain times of the years to help reduce the risk of ship strike for large whales (78 FR 73726, see Section 6.1.2 for more details), and the Stellwagen Bank National Marine Sanctuary in which a variety of human activities are regulated (15 CFR Part 922, Subpart N). The specific boundaries of the action area in reference to several marine geographic features and designated critical habitat within the area can be seen in Figure 9 below.

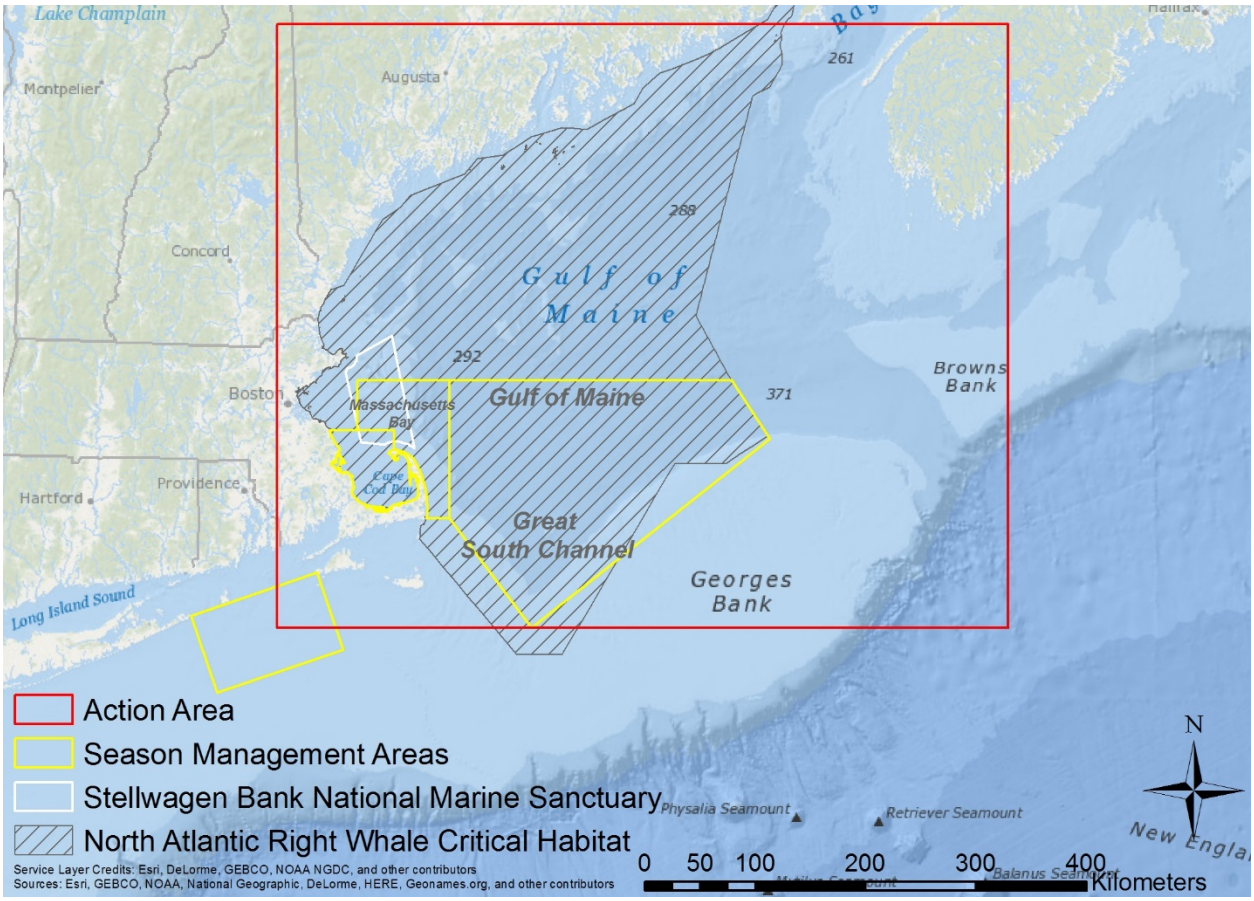


Figure 9: Action Area for Permit No. 18059 outlined in red, Seasonal Management Areas outlined in yellow, the Stellwagen Bank National Marine Sanctuary outlined in white, and North Atlantic right whale critical habitat denoted by black diagonal lines.

Research within this area would occur primarily between April and November annually, the proposed permit would not limit Dr. Wiley to this time period. The proposed duration of the permit is five years, which would begin March 1, 2017 and end March 1, 2022. In accordance with Federal Regulations (50 CFR §216.39), the duration of a permit may be extended for up to one year via a minor amendment to allow uninterrupted continuation of research if a new five-year permit application has been received and is in-process. In such cases, no additional takes would be authorized during the extension; any takes that were allocated for the fifth year of the permit that were not used may be used during the extension. Thus, the permit duration could be five or six years but in either case, the extent of take that would be authorized is the same (Table 1).

6 STATUS OF SPECIES AND DESIGNATED CRITICAL HABITAT

This section identifies the ESA-listed species that potentially occur within the action area (Figure 9) that may be affected by the issuance of Permit No. 18059 (Table 2). Following this, we detail our analysis of species that we have determined are not likely to be adversely affected by the

proposed action. For those species that are likely to be adversely affect, we then summarize their biology and ecology and what is known about their life histories in the action area.

Table 2. Threatened and endangered species that may be affected by the Permit and Conservation Division's proposed action of the issuance of researcher Permit No. 18059.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	76 FR 43985
North Atlantic Right Whale (*Eubalaena glacialis*)	E – 73 FR 12024	59 FR 28805 and 81 FR 4837	70 FR 32293
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998
Marine Reptiles			
Green Turtle, (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	63 FR 28359
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	63 FR 46693	57 FR 38818
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	75 FR 12496
Leatherback Turtle (*Dermochelys coriacea*)	E – 61 FR 17	44 FR 17710 and 77 FR 4170	63 FR 28359
Loggerhead Turtle, (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39855	63 FR 28359

6.1 Species and Designated Critical Habitat Not Considered Further

NMFS uses two criteria to identify the ESA-listed or designated critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are interrelated to or interdependent with the Federal agency's proposed action. The first criterion is exposure, or some reasonable expectation of a co-occurrence, between one or more potential stressors associated with the proposed activities and ESA-listed species or designated critical habitat. If we conclude that an ESA-listed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude that the species or critical habitat is not likely to be adversely affected by those activities.

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitats that are exposed to potential stressors but are likely to be unaffected by the exposure are also not likely to be adversely affected by the proposed action. We applied these criteria to the ESA-listed species in Table 2 and we summarize our results below.

An action warrants a "may affect, not likely to be adversely affected" finding when its effects are wholly *beneficial*, *insignificant* or *discountable*. *Beneficial* effects have an immediate positive effect without any adverse effects to the species or habitat. Beneficial effects are usually discussed when the project has a clear link to the ESA-listed species or its specific habitat needs and consultation is required because the species may be affected.

Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. That means the ESA-listed species may be expected to be affected, but not harmed or harassed.

Discountable effects are those that are extremely unlikely to occur. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did impact a listed species), but it is very unlikely to occur.

During this consultation, we determined that several ESA-listed species and one designated critical habitat may be affected by the issuance of Permit No. 18059 but are not likely to be adversely affected. These include green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, loggerhead turtles (Northwest Atlantic Ocean DPS), blue and North Atlantic right whales, and designated critical habitat for North Atlantic right whales. While critical habitat has been designated for a number of ESA-listed turtle species that occur within the action area (Table 2), these critical habitats do not spatially overlap with the action area, and thus they are not considered in this opinion.

6.1.1 Turtles

The proposed action spatially overlaps and may affect green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, and loggerhead turtles (Northwest Atlantic Ocean DPS). Interactions with these turtle species could potentially involve disturbance and ship strikes. However, the possibility of these interactions is considered remote because the proposed research activities are directed at cetaceans, specifically fin, sei, humpback, and minke whales.

Activities that have the potential to cause sea turtles disturbance include close vessel approach and prey mapping. However, researchers would not approach sea turtles, and thus, no disturbance is expected to occur. In support of this, while turtles have been seen in the action area by the researchers during past surveys, such observations are rare (10 observations or less since 2004) and do not appear to cause disturbance (NMFS 2016d). Therefore, we find that disturbance of these ESA-listed turtles is extremely unlikely to occur, and thus discountable.

The likelihood of ships strikes is also expected to be extremely low, given that the researchers will adhere to slow (usually 10 knots or less) transit speeds, specifically designed to avoid ship strikes with whales (see Section 6.1.2 below for more details), which have less maneuverability

than sea turtles. In addition, observers would always be on the lookout for marine animals to help vessels avoid close approach to non-target species. Finally, we are not aware of any turtle being struck by a research vessel in the action area despite a relatively active research community within the area for at least 40 years. Therefore, we find that a ship strike of these ESA-listed turtles is extremely unlikely to occur, and thus discountable. We conclude that the issuance of Permit No. 18059 is not likely to adversely affect green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, nor loggerhead turtles (Northwest Atlantic Ocean DPS), and we will not discuss these species further in this opinion.

6.1.2 Cetaceans

The proposed action spatially overlaps with and may affect blue and North Atlantic Right whales. Interactions with these species could potentially involve disturbance and ship strikes. However, the possibility of these interactions is considered remote due to the species-specific nature of the cetacean research and the conservation measures taken by the researchers during vessel operations to avoid whale ship strikes.

The only activity that has the potential to cause disturbance to these non-target whale species is a close vessel approach. Researchers would not purposefully approach these species, and thus, no disturbance is expected to occur. Nonetheless, a close approach to these species could occur if researchers are unable to identify whale species from a distance. This situation, however, is unlikely since both species are easily distinguished from the target species by size, color, and morphology (e.g., North Atlantic right whales lack a dorsal fin and blue whales are much larger than all other species). Thus, researchers should be able to identify and avoid these species if in the area. In fact, as specified in the terms and conditions of the proposed permit, researchers would be required to maintain a distance of 460 meters from North Atlantic right whales. Given that blue whales are much larger, they will likely be observed and identified at greater distances, meaning researchers will be able to maintain an even greater distance from blue whales. Vessels operations at this distance are extremely unlikely to cause disturbance to baleen whales (Nowacek et al. 2004), and thus are discountable.

The transit of any vessel within waters inhabited by whales carries the risk of a whale ship strike. Responses to a ship strike can involve death, serious injury, or minor, non-lethal injuries. The probability of a vessel collision and the associated response depends, in part, on the size and speed of the vessel. The majority of ship strikes of large whales occur when vessels are traveling at speeds greater than approximately 10 knots, with vessels traveling faster, especially large vessels (80 meters or greater), being more likely to cause serious injury or death (Conn and Silber 2013; Jensen and Silber 2004; Laist et al. 2001; Vanderlaan and Taggart 2007). Because of this, in 2008 the NMFS established regulations requiring all vessels 19.8 meters or longer to travel at 10 knots or less in Seasonal Management Areas along the U.S. East Coast at certain times of the year to reduce the threat of ship collisions (78 FR 73726). Several of these Seasonal Management Areas occur within and around the action area (Figure 9). In addition, the NMFS establishes voluntary Dynamic Management Areas throughout the year in other areas where right

whales have been observed, requesting mariners to route around these areas or transit through at 10 knots or less.

While ship strikes during research operations are possible, we are aware of only two instances of any research vessel ever striking a whale in thousands of hours at sea (Wiley et al. 2016). One of these strikes occurred within the action area and involved the NOAA research vessel the Auk. While transiting to port on April 9, 2009, in Massachusetts Bay the Auk struck a North Atlantic right whale (Wiley et al. 2016). A captain and mate each of whom had logged many hours of ship time during marine mammal research activities operated the vessel. The vessel was traveling at 19.7 knots, which, while not required for a vessel of its size (15 meters), is well above the 10 knot restrictions that were active at the time within the area for larger vessels (greater than 19.8 meters). Winds were 20-23 out of the northeast, and wave heights were approximately 1.3 meters, not ideal conditions for spotting marine mammals. Six marine mammal observers were on the lookout when the mate spotted a whale approximately nine meters in front of the vessel, which was subsequently seen by an observer when the whale's fluke was directly in front of the vessel. There was no time to notify the captain, nor adjust course and speed; the whale was struck. The whale exhibited minor bleeding from seven to eight lacerations on the tip of its left tail fluke, which follow up photographs show eventually healed with the tip of the fluke falling off. After assessing the whale's condition, the research vessel departed approximately one hour following the initial strike, since at this point the animal appeared to be behaving normally. Since the event, the whale has been seen at least 46 times, with the injury being fully healed by day 719 after the strike and the whale appears to be healthy (Wiley et al. 2016).

The Auk ship strike incident is an important reminder that even with well-trained marine mammal observers and vessel operators, all vessels, even research vessels, have the potential to strike whales. In this particular instance, there were six dedicated observers, but no indication of the whale's presence prior to the initial, nine-meter sighting by the mate. We consider this event extremely rare given that only two instances of research vessel ship strikes have ever been reported, neither of which appear to be lethal (Wiley et al. 2016). It is important to note that Dr. Wiley was not directly associated with this event; he was not on board nor were operations of the vessel under his direction on the day of the strike. Thus, this ship strike is not a direct reflection of his research vessel operations. Furthermore, during the course of consultation we confirmed with the Permits Division and Dr. Wiley that even though all research vessels that would be use are smaller than those required to follow Seasonal Management Area vessel speeds restrictions, he would abide these restrictions as well as voluntary Dynamic Management Area vessel speed recommendations. Given the rarity of ships strikes of large whale species during all research activities from historical data, the slow speeds at which Dr. Wiley would operate, and the extensive experience he and his research team have in spotting large whales at sea, we believe the likelihood of one of his research vessels striking a blue or North Atlantic right whale is extremely low, and thus discountable.

In summary, we conclude that the issuance of Permit No. 18059 is not likely to adversely affect blue whales, nor North Atlantic right whales, and we will not discuss these species further in this opinion.

6.1.3 Critical Habitat

The proposed action overlaps spatially with designated critical habitat for North Atlantic right whales. However, given the nature of the activities, it is extremely unlikely that any of the physical and biological features essential to the conservation of North Atlantic right whales species found in this habitat would be altered, as outlined below.

In 1994,NMFS designated critical habitat for North Atlantic right whales (59 FR 28805), which was expanded in 2016 (81 FR 4837). The designated areas include important foraging waters in the Gulf of Maine and Georges Bank Region and calving waters off the coast of North Carolina, South Carolina, Georgia, and Florida. Only the northern, Gulf of Maine Georges Bank region overlaps with the action area for Permit No. 18059. The physical and biological features essential to the conservation of the species found in this area include the physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate the zooplankton species C. *finmarchicus* for right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes; low flow velocities in Jordan, Wilkinson, and Georges Basins that allow diapausing C. *finmarchicus* to aggregate passively below the convective layer so that the copepods are retained in the basins; late stage C. *finmarchicus* in dense aggregations in the Gulf of Maine and Georges Bank region; and diapausing C. *finmarchicus* in aggregations in the Gulf of Maine and Georges Bank region.

While the proposed research activities would directly overlap with these essential features, very few if any, effects are possible. The proposed activities would not significantly alter the physical or oceanographic conditions within the action area, as only very minor changes in water flow and current would be expected from vessel traffic and no changes in ocean bathymetry would occur. Furthermore, during daylight hours, when all research would occur, *C. finmarchicus* are often found below the surface, which would minimize disturbance from vessel traffic (Baumgartner et al. 2011). Thus, effects to these features are discountable. Vessel pollution, vessel noise, and prey sampling could also directly impact *C. finmarchicus*. However, vessel pollution would be minimal, diluted, and likely not reach them, and we could not find any evidence suggesting that sound (from vessels or prey mapping equipment) alters the densities of copepods (Bennet et al. 1994). Finally, the proposed activities would in no way alter the sea state, temperature, or water depth and so effects to these features are also deemed discountable. Thus, we conclude that the issuance of Permit No. 18059 is not likely to adversely affect designated North Atlantic critical habitat.

6.2 Species Likely to be Adversely Affected

This section examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of risk that the ESA-listed species face based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR §402.02. More detailed information on the status, trends, biology, and ecology of these ESA-listed species can be found in the listing regulations and critical habitat designations published in the Federal Register, status reviews, recovery plans, and on the NMFS Web site: http://www.nmfs.noaa.gov/pr/species/esa/listed.htm.

6.2.1 Fin Whale

Table 3: Information bar provides species Latin name, common name, Federal Register notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan for fin whale.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Balaenoptera physalus	**Fin whale**	**None**	**Endangered:** range-wide	2011	35 FR 18319	2010	None Designated

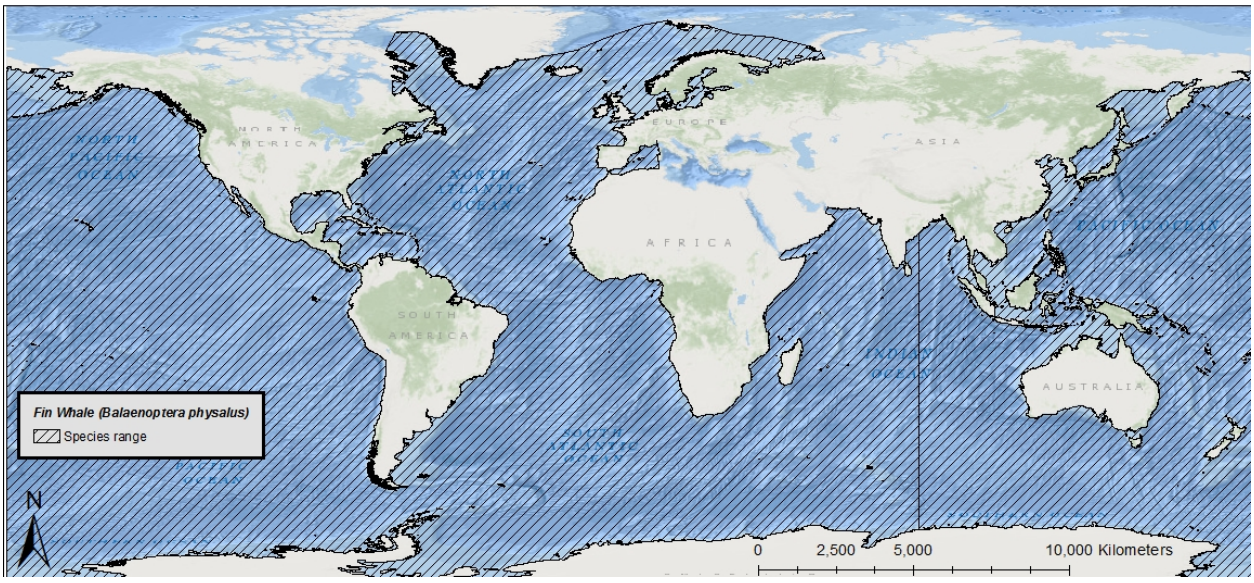


Figure 10: Map showing the range of the fin whale.

Species Description

The fin whale is a large, widely distributed baleen whale found in all major oceans and comprised of three subspecies: *B. p. physalus* in the Northern Hemisphere, and *B. p. quoyi* and *B. p. patachonica* (a pygmy form) in the Southern Hemisphere. Fin whales are distinguishable from

other whales by a sleek, streamlined body with a V-shaped head, a tall, falcate dorsal fin, and a distinctive color pattern of a black or dark brownish-gray body and sides with a white ventral surface (Figure 11). The fin whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Information available from the recovery plan (NMFS 2010), recent stock assessment reports (Carretta et al. 2016; Muto et al. 2016; Waring et al. 2016), and status review (NMFS 2011b) were used to summarize the status of the species as follows.

Figure 11: Fin whale (*Balaenoptera physalus*). Photo: National Oceanic and Atmospheric Administration

Life History

Fin whales can live, on average, 80 to 90 years. They have a gestation period of less than one year, and calves nurse for six to seven months. Sexual maturity is reached between six to 10 years of age with an average calving interval of two to three years. They mostly inhabit deep, offshore waters of all major oceans. They winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed. Fin whales eat pelagic crustaceans (mainly euphausiids or krill) and schooling fish such as capelin, herring, and sand lice.

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section is broken down into: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the fin whale.

Abundance

The pre-exploitation estimate for the fin whale population in the North Pacific was 42,000 to 45,000 (Ohsumi and Wada 1974). In the North Pacific, at least 74,000 whales were killed between 1910 and 1975. In the North Atlantic, at least 55,000 fin whales were killed between 1910 and 1989. Approximately 704,000 whales were killed in the Southern Hemisphere from 1904 to 1975. Of the three to seven stocks in the North Atlantic (approximately 50,000 individuals), one occurs in U.S. waters, where the best estimate of abundance is 1,618 individuals (N_{min}=1,234); however, this may be an underrepresentation as the entire range of the stock was not surveyed (Palka 2012). There are three stocks in U.S. Pacific waters: Northeast Pacific (approximately 1,368 individuals N_{min}=1,368), Hawaii (approximately 58 individuals, N_{min}=27) and California/Oregon/Washington (approximately 3,051 individuals, N_{min}=2,598). Abundance data for the Southern Hemisphere stock are limited; however, there were an estimated 85,200 fin whales in 1970.

Population Growth Rate

Current estimates indicate an annual growth rate of 4.8 percent in the Alaska stock and 3.5 percent in the California/Oregon/Washington stock. Overall population growth rates for the Hawaii and western north Atlantic stocks are not available at this time.

Genetic Diversity

Archer et al. (2013) recently examined the genetic structure and diversity of fin whales globally. Full sequencing of the mtDNA genome for 154 fin whales sampled in the North Atlantic, North Pacific, and Southern Hemisphere, resulted in 136 haplotypes, none of which were shared among ocean basins suggesting differentiation at least at least at this geographic scale. However, North Atlantic fin whales appear to be more closely related to the Southern Hemisphere population, as compared to fin whales in the North Pacific, which may indicate a revision of the subspecies delineations is warranted. In general, haplotype diversity was found to be high both within ocean basins, and across. Such high genetic diversity and lack of differentiation within ocean basins may indicate that despite some population's having small abundance estimates, the species may persist long-term and be somewhat protected from substantial environmental variance and catastrophes.

Distribution

Fin whales occur primarily in the North Atlantic, North Pacific, and Southern Hemisphere (Figure 10) where they appear to be reproductively isolated. The availability of sand lance, in

particular, is thought to have had a strong influence on the distribution and movements of fin whales.

Status

The fin whale is endangered as a result of past commercial whaling. Prior to commercial whaling, hundreds of thousands of fin whales existed. Today, fin whales may be killed under "aboriginal subsistence whaling" in Greenland, under Japan's scientific whaling program, and Iceland's formal objection to the Commission's ban on commercial whaling. Additional threats include ship strikes, reduced prey availability due to overfishing or climate change, and anthropogenic sound. The species' large population size may provide some resilience to current threats, but trends are largely unknown.

Status of Species within the Action Area

Several subpopulations of fin whales are thought to exist within the North Atlantic, although some studies have found substantial gene flow between these populations and little genetic divergence suggesting there may only be one function population (excluding the Mediterranean). The stock found within the action area, and the only within U.S. waters, is the Western North Atlantic Stock, which as mentioned previously, is estimated to comprise 1,618 individuals (N_{min}=1,234), although this is likely and underestimate (Waring et al. 2016). Within the area, fin whales are the most abundant large cetacean during all seasons. Like many other baleen whales, fin whales exhibit strong site fidelity, and whales of the Western North Atlantic stock are no exception. Waters off New England represent an important feeding area for this stock and calving is thought to occur to the south, along the U.S. mid-Atlantic, although the exact location of breeding remains unknown. Thus, the life stages that would be present within the action area of Permit No. 18059 include adults, juveniles, and non-neonate calves. At this time, not enough data are available to estimate population trends, including mortality and reproductive rates for the Western North Atlantic stock.

Critical Habitat

No critical habitat has been designated for the fin whale.

Recovery Goals

See the 2010 Final Recovery Plan for the fin whale for complete down listing/delisting criteria for both of the following recovery goals:

1. Achieve sufficient and viable population in all ocean basins.
2. Ensure significant threats are addressed.

6.2.2 Sei Whale

Table 4: Information bar provides species Latin name, common name, Federal Register notice of listing status, designated critical habitat, Distinct Population Segment/Evolutionary Significant Unit, recent status review, and recovery plan for sei whale.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Balaenoptera borealis	**Sei whale**	**None**	**Endangered:** range-wide	2012	35 FR 18316	2011	None Designated

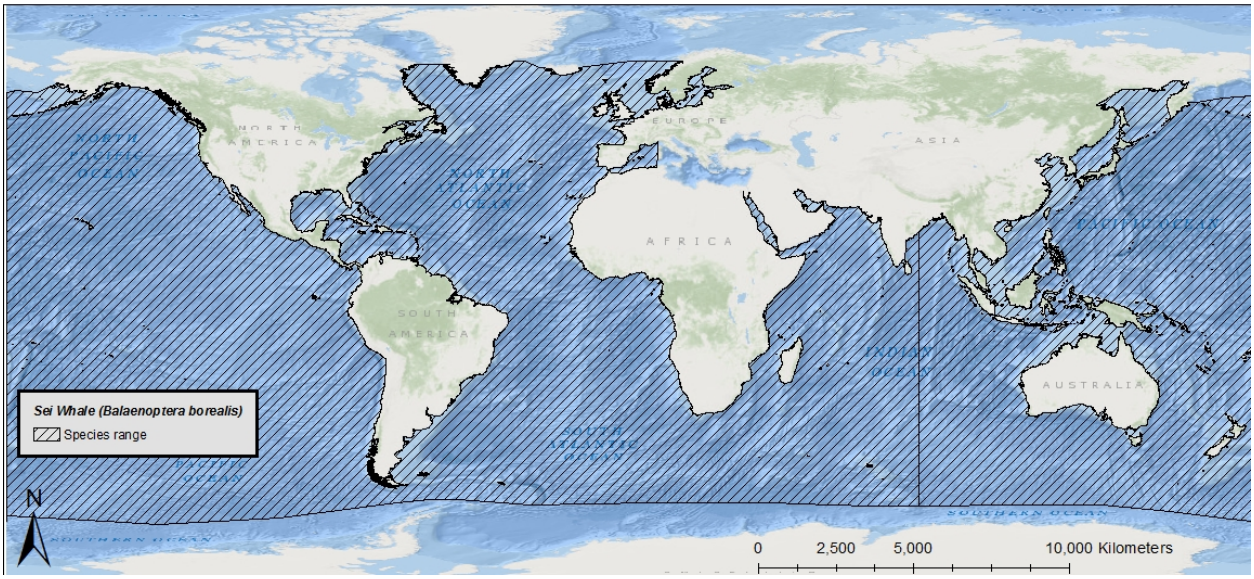


Figure 12: Map showing the range of the sei whale.

Species Description

The sei whale is a widely distributed baleen whale found in all major oceans. Sei whales are distinguishable from other whales by a long, sleek body that is dark bluish-gray to black in color and pale underneath, and a single ridge located on their rostrum (Figure 13). The sei whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Information available from the recovery plan (NMFS 2011c), recent stock assessment reports (Carretta et al. 2016; Muto et al. 2016; Waring et al. 2016), and status review (NMFS 2012b) were used to summarize the status of the species as follows.

Figure 13: Sei whale (*Balaenoptera borealis*). Photo: National Oceanic and Atmospheric Administration

Life History

Sei whales can live, on average, between 50 to 70 years. They have a gestation period of 10 to 12 months, and calves nurse for six to nine months. Sexual maturity is reached between six and 12 years of age with an average calving interval of two to three years. Sei whales mostly inhabit continental shelf and slope waters far from the coastline. They winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed on a range of prey types, including zooplankton (copepods and krill), small schooling fishes, and cephalopods.

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section is broken down into: abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the sei whale.

Abundance

Two subspecies of sei whale are recognized, *B. b. borealis* in the Northern Hemisphere and *B. b. schlegellii* in the Southern Hemisphere. There are no estimates of pre-exploitation abundance for

sei whales in the North Atlantic. Models indicate that total abundance declined from 42,000 to 8,600 between 1963 and 1974 in the North Pacific. In the Southern Hemisphere, pre-exploitation abundance is estimated at 65,000 whales, with recent abundance estimated at 9,700. Three relatively small stocks occur in U.S. waters: Nova Scotia (N=357, N_{min}=236), Hawaii (N=178, N_{min}=93), and Eastern North Pacific (N=126, N_{min}=83).

Population Growth Rate

Population growth rates for sei whales are not available at this time.

Genetic Diversity

While some genetic data exist sei whales, current samples sizes are small limiting our confidence in their estimates of genetic diversity (NMFS 2011c). However, genetic diversity information for similar cetacean population sizes can be applied. Stocks that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Stocks that have a total population 500 individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Stock populations at low densities (<100) are more likely to suffer from the 'Allee' effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density. All stocks of sei whales within U.S. waters are estimated to be below 500 individuals indicating they may be at risk of extinction due to inbreeding.

Distribution

Sei whales are distributed worldwide, occurring in the North Atlantic, North Pacific, and Southern Hemisphere (Figure 12).

Status

The sei whale is endangered as a result of past commercial whaling. Now, only a few individuals are taken each year by Japan; however, Iceland has expressed an interest in targeting sei whales. Current threats include ship strikes, fisheries interactions (including entanglement), climate change (habitat loss and reduced prey availability), and anthropogenic sound. Given the species' overall abundance, they may be somewhat resilience to current threats. However, trends are largely unknown, especially for individual stocks, many of which have relatively low abundance estimates.

Status of Species within the Action Area

The IWC recognizes seven stocks of sei whales within the North Atlantic. Of these, the Nova Scotia stock is the only found in U.S. waters and the only stock that would be found within the action areas. Consistent with many other baleen whales, sei whales of this stock spend spring and summer foraging in higher latitudes, including the Gulf of Maine, although sei whales are typically found in deeper waters compared to many other baleen whales. While the stock is suspected to migrate south for breeding, little is known about sei whale movement patterns and

migration compared to other, better-studied baleen whales. Thus, as with fin whales adults, juveniles, and non-neonate calves are likely to be found within the action area. This stock is estimated to be small at only 357 individuals (N_{min}=236) and data are currently insufficient to estimate population trends, including mortality and reproductive rates (Waring et al. 2016).

Critical Habitat

No critical habitat has been designated for the sei whale.

Recovery Goals

See the 2011 Final Recovery Plan for the sei whale for complete down listing/delisting criteria for both of the following recovery goals:

1. Achieve sufficient and viable populations in all ocean basins.
2. Ensure significant threats are addressed.

7 ENVIRONMENTAL BASELINE

The "environmental baseline" includes the past and present impacts of all Federal, state, 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 which are contemporaneous with the consultation in process (50 CFR §402.02).

A number of human activities have contributed to the status of populations of large whales in the action areas. Some of those activities, most notably commercial whaling, occurred extensively in the past, continue at low levels, and no longer appears to significantly affect these whale populations, although the effects of these reductions persist today. Other human activities are ongoing and appear to continue to affect whale populations in the action areas for this consultation. The following discussion summarizes these impacts, which include climate change, whaling, ship strikes, whale watching, sound, military activities, fisheries, pollution, and scientific research.

7.1 Climate Change

There is no question that our climate is changing. The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 0.85° Celsius over the period 1880 to 2012 (IPCC 2014). Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850 (IPCC 2014). Burning fossil fuels has increased atmospheric carbon dioxide concentrations by 35 percent with respect to pre-industrial levels, with consequent climatic disruptions that include a higher rate of global warming than occurred at the last global-scale state shift (the last glacial-interglacial transition, approximately 12,000 years ago) (Barnosky et al. 2012). Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90 percent of the energy accumulated between 1971 and 2010 (IPCC 2014). It is virtually certain that the upper ocean (zero to 700 meters) warmed from 1971 to 2010 and it likely warmed

between the 1870s and 1971 (IPCC 2014). On a global scale, ocean warming is largest near the surface, and the upper 75 meters warmed by 0.11° Celsius per decade over the period 1971 to 2010 (IPCC 2014). There is high confidence, based on substantial evidence, that observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. Higher carbon dioxide concentrations have also caused the ocean rapidly to become more acidic, evident as a decrease in pH by 0.05 in the past two decades (Doney 2010).

This climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine ecosystems in the near future. It is most likely to have the most pronounced effects on species whose populations are already in tenuous positions (Isaac 2008). As such, we expect the extinction risk of ESA-listed species to rise with global warming. Primary effects of climate change on individual species include habitat loss or alteration, distribution changes, altered and/or reduced distribution and abundance of prey, changes in the abundance of competitors and/or predators, shifts in the timing of seasonal activities of species, and geographic isolation or extirpation of populations that are unable to adapt. Secondary effects include increased stress, disease susceptibility, and predation. Cetaceans with restricted distributions linked to water temperature may be particularly exposed to range restriction (Issac 2009; Learmonth et al. 2006). MacLeod (2009) estimated that, based on expected shifts in water temperature, the ranges of 88 percent of cetaceans would be affected, 47 percent would be negatively affected, and 21 percent would be put at risk of extinction. Fin whales have a fairly global, cosmopolitan distribution, and so are not predicted to significantly alter their ranges, but sei whales are expected to expand their ranges into higher latitudes. However, even if the range of fin whales is not expected to shift, changes in the timing of migratory events such as the arrival at and departure from feeding grounds may still occur (Ramp et al. 2015).

In the western North Atlantic, surface temperatures have been unusually warm in recent years (Blunden and Arndt 2016). A study by Polyakov et al. (2009), suggests that the North Atlantic overall has been experiencing a general warming trend over the last 80 years of 0.031 ± 0.006 ºCelsius per decade in the upper 2,000 meters of the ocean. These sea surface temperatures are closely related to the North Atlantic Oscillation, which results from variability in pressure differences between a low-pressure system that lies over Iceland and a high-pressure system that lies over the Azores Islands. The North Atlantic Oscillation Index, which is positive when both systems are strong and negative when both systems are weak, varies from year to year. In years when the North Atlantic Oscillation Index is positive, sea surface temperature generally increases, which is thought to produced favorable conditions for prey species of at least some baleen whales (e.g., North Atlantic right whales, Conversi et al. 2001). In years when the index is negative, sea surface temperatures are generally lower, and as a result, so is the abundance some prey species. These oscillations appear to affect North Atlantic right reproduction (Drinkwater et al. 2003; Greene et al. 2003; Pershing et al. 2010), and could similarly impact fin and sei whales. In recent years, the oscillation has been mostly positive, leading to increases in copepod

abundance and North Atlantic right whale reproduction (Meyer-Gutbrod and Greene 2014). However, climate change models suggest that increases in ocean temperature may produce more severe fluctuations in the North Atlantic Oscillation, which may cause dramatic shifts in the reproductive North Atlantic right whales (Drinkwater et al. 2003; Greene et al. 2003). While the relationship between sea surface temperature, prey, and the reproduction of fin and sei whales within the action is unknown, it is likely that these species will be affected by future climatic changes in a similar way to that predicted for North Atlantic right whales.

7.2 Whaling

It is not known how many whales were taken by aboriginal hunting and early commercial whaling, though some stocks were already reduced by 1864 (the beginning of the era of modern commercial whaling using harpoon guns as opposed to harpoons simply thrown by men). From 1864 to 1985, at least 2.4 million baleen whales (excluding minke whales) and sperm whales were killed (Gambell 1999). In 1982, the IWC issued a moratorium on commercial whaling beginning in 1985. There is currently no legal commercial whaling by IWC Member Nations party to the moratorium; however, whales are still killed commercially by countries that filed objections to the moratorium (Iceland and Norway). Since the moratorium on commercial whaling in 1985, 551 fin whales have been documented as killed for commercial purposes (IWC 2016b). Additionally, the Japanese whaling fleet carries out whale hunts under the guise of "scientific research," though very few peer-reviewed papers have been published as a result of the program, and meat from the whales killed under the program is processed and sold at fish markets. Since 1985, 310 fin and 1,249 sei whales have been documented as killed for "scientific research" under these IWC special permits (IWC 2016c). Whales are also killed for subsistence purposes; since 1985, an estimated 356 fin and three sei whales have been killed for subsistence purposes (IWC 2016a).

While most current whaling activities occur outside of the action area, it is possible that the whales that are killed as part of some these activities may be part of the population that inhabit the action areas for this consultation. Whaling for commercial purposes still occurs off the coast of Norway and Iceland in the Eastern North Atlantic, and while unlikely, it is possible some of these whales will be exposed to the research activities that would be authorized under Permit No. 18059. Regardless, prior exploitation is likely to have altered population structure and social cohesion of all whale species within the action area, such that effects on abundance and recruitment continued for years after harvesting has ceased.

7.3 Ship Strikes

Ship strikes are considered a serious and widespread threat to ESA-listed 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 cetaceans is to be expected. The vast majority of commercial ship strike mortalities of cetaceans are likely undocumented, as most are likely

never reported and most whales killed by ships strike likely end up sinking rather than washing up on shore. Kraus et al. (2005) estimated that 17 percent of ship strikes are actually detected. Of 11 cetacean species known to be threatened by ship strikes, fin whales are the mostly commonly struck species (Laist et al. 2001; Vanderlaan and Taggart 2007). While any vessel has the potential to hit whales, in most cases, lethal or severe injuries are caused by ships 80 meters or greater, travelling 14 knots or faster (Laist et al. 2001).

Vessel traffic within the action area can come from both private (e.g., commercial, recreational) and federal ships (e.g., military, research), but traffic that is most likely to result in ship strikes comes from commercial shipping. The North Atlantic is one of the most traveled areas in the world for marine shipping. While the Port of Boston, the only major port within the action area, is by no means the busiest of U.S. ports (U.S. Maritime Administration 2016), it experiences high vessel traffic (Table 5), posing a substantial risk of ship strike to fin and sei whales.

Table 5: Number of port calls for the Port of Boston from 2013 to 2016 by month. Data from https://www.massport.com/port-of-boston/about-port-of-boston/port-statistics/

Month	2013	2014	2015	2016
January	2,588	6,203	5,990	4,978
February	4,554	5,038	2,907	3,230
March	5,103	4,016	4,954	4,335
April	4,252	4,751	3,653	4,923
May	4,051	3,918	5,526	5,302
June	3,405	5,678	4,048	4,055
July	3,159	5,341	7,181	5,093
August	5,886	4,319	4,695	5,018
September	2,506	4,737	4,408	4,465
October	5,916	4,996	5,276	2,647
November	5,966	4,852	5,957	6,156
December	4,625	6,199	5,400	Not yet available
Total	**52,011**	**60,048**	**59,995**	**50,202**

The potential lethal effects of ship strikes are particularly profound on species with low abundance. However, all large whale species have the potential to be affected by ship strikes. The latest mortalities and serious injuries related to ship strikes for the fin and sei whale stocks most likely to be found in the action area are given in Table 6 below.

Table 6: Mortalities and serious injuries related to ship strikes for fin and sei whale stocks within the action area (Henry et al. 2016)

Species	Date Range	Ship Strikes	Annual Average
Fin whales	2010 to 2014	10	2
Sei whales	2010 to 2014	4	0.8

As previously mentioned in Section 6.1.2, to help reduce large whale ship strikes the NMFS established regulations requiring all vessels 65 feet or longer to travel at 10 knots or less in several locations along the U.S. East Coast at certain times of the year (78 FR 73726). Several of these Seasonal Management Areas are located within or near the action area (Figure 9). The NMFS also establishes voluntary Dynamic Management Areas in areas where North Atlantic right whales have been observed outside of established Seasonal Management Areas, requesting mariners to avoid these areas and/or reduce speeds to 10 knots or less when transiting through. In addition, in collaboration with the U.S. Coast Guard, the NMFS established several recommended shipping routes (see http://www.fisheries.noaa.gov/pr/shipstrike/#routes for more information) aimed at reducing large whale ship strikes from commercial vessels.

7.4 Whale Watching

Whale watching is a rapidly-growing business with more than 3,300 operators worldwide, serving 13 million participants in 119 countries and territories (O'Connor et al. 2009). Although considered by many to be a non-consumptive use of cetaceans with economic, recreational, educational and scientific benefits, whale watching has the potential impact whales in a variety of whales (reviewed in Parsons 2012). In some cases, whale watching vessels have a high frequency of collision with whales (Parsons 2012). Whale watching vessels can also contribute to underwater noise that may affect whales (Parsons 2012). Harassment from whale watching vessels has been known to cause whales to alter surfacing, acoustic, and swimming behavior and can lead to changes in direction, group size, and coordination (Parsons 2012). In addition, preferred habitats may be abandoned if disturbance levels are too high (Parsons 2012). The particular response observed appears to be dependent on factors such as vessel proximity, speed, and direction, as well as the number of vessels in the vicinity. While numerous short-term behavioral responses to whale watching vessels are well documented, much less is known about long-term negative effects. However, in a recent study of humpback whales off the coast of New England, Weinrich and Corbelli (2009) found no detectable impacts on calf production or survival. Nonetheless, as longitudinal research on these species continues, including that conducted by Dr. Wiley (see below), we will soon have a better understanding of the population-level, long-term impacts of whale watching.

With the high density of whales found in the action area, there are numerous whale watching operations that may impact fin and sei whales here (Wiley et al. 2008). While a voluntary conservation program aimed at protecting whales from the impacts of whale watching was implemented in the northeastern U.S. in 1998, there is little compliance with the program, indicating that whales in this region are almost certainly subject to many of the threats that can result from whale watching (Wiley et al. 2008).

7.5 Sound

Cetaceans generate and rely on sound to navigate, hunt, and communicate with other individuals and anthropogenic sound can interfere with these important activities (Nowacek et al. 2007). Anthropogenic sound in the action area may be generated by commercial and recreational

vessels, sonar, aircraft, military activity (discussed in Section 7.6), seismic exploration, in-water construction activities, wind farms, and other human activities. However, within the Stellwagen Bank National Marine Sanctuary, some of these activities are banned or regulated (15 CFR Part 922, Subpart N). These activities occur to varying degrees throughout the year and may lead to behavioral disturbance or even physical damage, both of which have the potential to negatively impact fitness. Behavioral disturbances may include changes in surfacing, diving, orientation, and vocalizations (Gomez et al. 2016; Nowacek et al. 2007). Physiological responses can include stress related changes such as increases in heart rate, respiratory rates, stress hormones, and temporary or permanent hearing threshold shifts (Kunc et al. 2016; Nowacek et al. 2007).

Commercial shipping traffic is a major source of low frequency anthropogenic sound in the action areas (NRC 2003) (Section 7.3). Large vessels emit predominantly low frequency sound which overlaps with many mysticetes predicted hearing ranges [7 Hertz (Hz) to 35 kHz, (NOAA 2016)] and may mask their vocalizations and cause stress (Rolland et al. 2012). Studies also report broadband sound from large cargo ships above two kHz that may interfere with important biological functions of odontocetes, including foraging (Blair et al. 2016; Holt 2008). Other commercial vessels (e.g., whale watching, fisheries, etc.) and recreational vessels also operate within the action area and may produce similar sounds, although to a lesser extent given their much smaller size. Nonetheless, even sound from small whale watching vessels can cause auditory masking, behavioral responses, and temporary threshold shifts in cetaceans (Nowacek et al. 2007). Anthropogenic sound from vessel traffic may be particularly prevalent in shallower waters (13 to 19 meters). At greater foraging depths, less but still substantial vessel traffic sound can be heard. Anthropogenic noise from commercial vessel traffic within the action area can be seen in Figure 14 below.

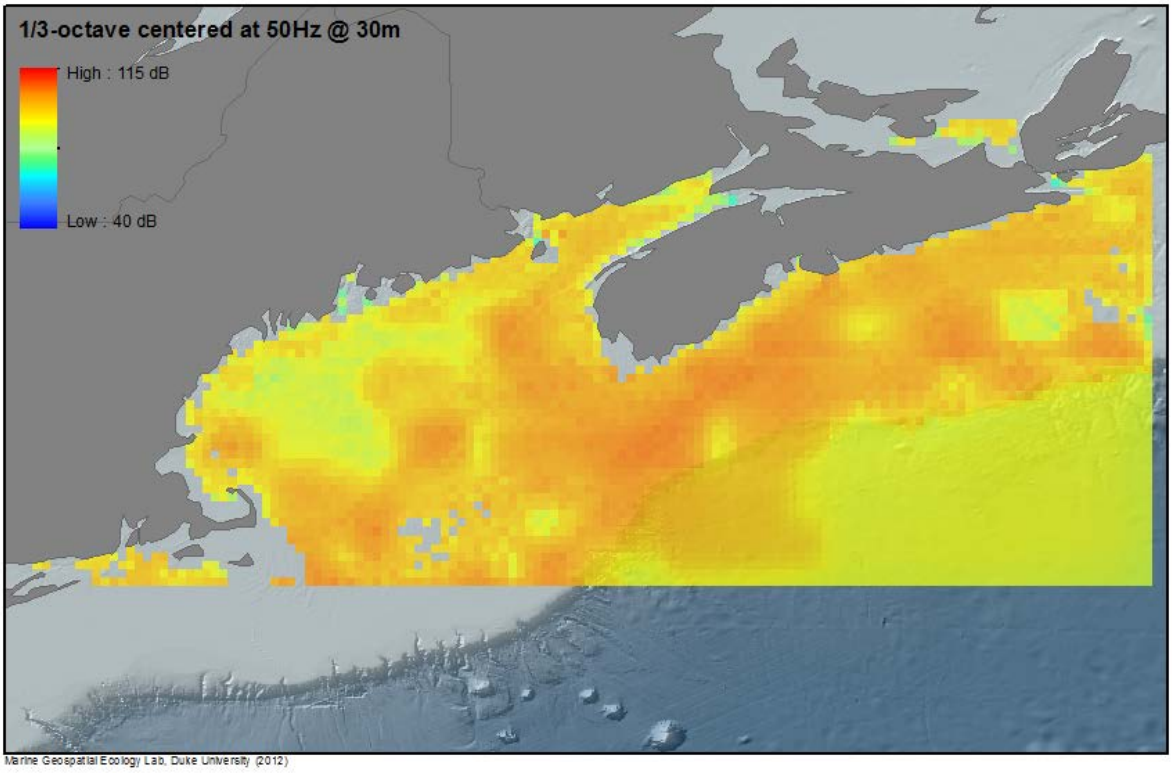


Figure 14: Commercial vessel traffic sound in decibels (dB) at 50 Hertz at 30 meters depth within the action area. Data from http://cetsound.noaa.gov/

Sonar systems are used on recreational, commercial, and military vessels and may also affect marine mammals (NRC 2003). Although little information is available on potential effects of multiple commercial and recreational 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 (Nowacek et al. 2007). However, military sonar, particularly low frequency active sonar, often produces intense sounds at high source levels, and these may impact cetacean behavior (Southall et al. 2016).

Aircraft within the action area may consist of small commercial or recreation airplanes or helicopters, to large commercial airliners. These aircraft produce a variety of sounds that could potentially enter the water and impact cetaceans. While it is difficult to assess these impacts, several studies have documented what appear to be minor behavioral disturbances in response to aircraft presence (Nowacek et al. 2007).

While the North Atlantic Ocean has been subject to drilling and seismic exploration for oil and gas in the past, there is currently a ban on drilling in federal waters off the Atlantic coast through 2022 (80 FR 4941) and no seismic exploration (BOEM 2017). However, scientific research and/or geological seismic surveys involving airguns have and do occur here. These airguns generate intense low-frequency sound pressure waves capable of penetrating the seafloor and are

fired repetitively at intervals of 10 to 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 to 240 dB at dominant frequencies of five to 300 Hz (NRC 2003). Most of the sound energy is at frequencies below 500 Hz, which is within the hearing range of fin and sei whales (Nowacek et al. 2007). In the United States, seismic surveys involving the use of airguns with the potential to take marine mammals are covered by incidental harassment authorizations under the MMPA, and if they involve ESA-listed species, undergo formal ESA section 7 consultation.

Marine construction in the action area that produces sound includes drilling, dredging, pile driving, cable laying, and explosions. These activities are known to cause behavioral disturbance and physical damage (NRC 2003). While most of these activities are coastal, offshore construction does occur and is often associated with wind farms. Currently there is one operational offshore windfarms off the east coast of the U.S., the Block Island wind farm, but more are likely to become operation in the near future (DOE and DOI 2016). The Block Island wind farm is just outside the action area, located off Block Island, Rhode Island, and only recently became operational (December 2016). Within the action area, there are three wind farm projects (75 FR 81637; 78 FR 33897; 79 FR 70545) consisting of five active leases, and another area where leasing may occur. Construction on these projects has not begun, but it may during the 5-year extent of Permit No. 18059. While the full extent of impacts from wind farms is unknown, there are likely much greater impacts during construction than during operation (Madsen et al. 2006).

7.6 Military Activities

The U.S. Navy has a major submarine facility (Portsmouth Naval Shipyard) and conducts military readiness activities within the action area (Atlantic Fleet Training and Testing [AFTT], Figure 15). These activities can be categorized as either training or testing exercises. During training, existing and established weapon systems and tactics are used in realistic situations to simulate and prepare for combat. Activities include: routine gunnery, missile, surface fire support, amphibious assault and landing, bombing, sinking, torpedo, tracking, and mine exercises. Testing activities are conducted for different purposes and include at-sea research, development, evaluation, and experimentation. The U.S. Navy performs testing activities to ensure that its military forces have the latest technologies and techniques available to them.

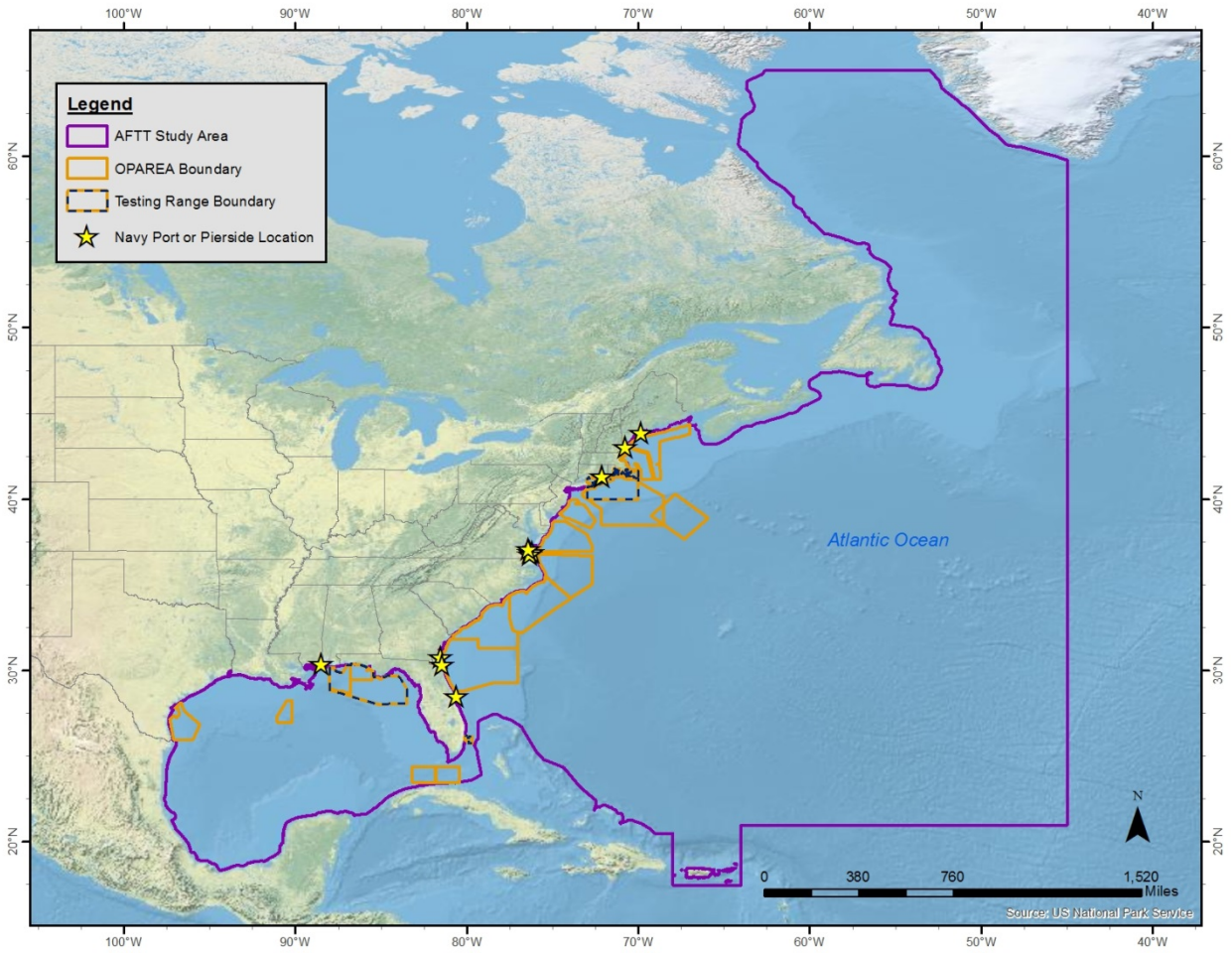


Figure 15: Navy Atlantic fleet training and testing area. OPAREA stands for at-sea Operating Area and is where training exercise and system qualification tests are routinely conducted.

U.S. Navy activities are likely to produce sound and visual disturbance to cetaceans and may result in ship strikes (NMFS 2013a). Take of fin and sei whales for these Navy activities that has been authorized and previously consulted on within the action area can be seen in Table 7 (NMFS 2013a). Takes are listed according to the level of harassment as defined by the MMPA. Level A harassment has the potential to injure a marine mammal or marine mammal stock in the wild, whereas level B harassment has the potential to disturbed a marine mammal by causing disruption of behavioral patterns including but not limited to migration, breathing, nursing, feeding, or sheltering but does not have the potential to injure a marine mammal or marine mammal stock in the wild. Even though our previous consultations considering the effects of Navy activities within the action area resulted in an incidental take statement, we concluded that the Navy's actions were not likely to jeopardize the continued existence of ESA-listed species, nor destroy or adversely modify designated critical habitat.

Table 7: Authorized annual take for Navy Atlantic fleet training and testing area. (NMFS 2013a).

Species	Level A Harassment	Level B Harassment
Fin whales	1	5,089

Species	Level A Harassment	Level B Harassment
Sei whales	1	10,984

7.7 Fisheries

Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in marine mammals (see Dietrich et al. 2007). Materials entangled tightly around a body part may cut into tissues, enable infection, and severely compromise an individual's health (Derraik 2002). Entanglements also make animals more vulnerable to additional threats (e.g., predation and ship strikes) by restricting agility and swimming speed. The majority of cetaceans that die from entanglement in fishing gear likely sink at sea rather than strand ashore, making it difficult to accurately determine the extent of such mortalities. Cetaceans are also known to ingest fishing gear, likely mistaking it for prey, which can lead to fitness consequences and mortality. Necropsies of stranded whales have found that ingestion of net pieces, ropes, and other fishing debris has resulted in gastric impaction and ultimately death (Jacobsen et al. 2010).

As with ship strikes, entanglement or entrapment in fishing gear likely has the greatest impact on populations of ESA-listed cetaceans with the lowest abundance (e.g., Kraus et al. 2016). Nevertheless, all species of cetacean may face threats from derelict fishing gear. The latest mortalities and serious injuries related to fishing gear entanglement for the stock of each fin and sei whales most likely to be found in the action area are given in Table 8 below.

Table 8: Mortalities and serious injuries related to fishing gear entanglements for Endangered Species Act listed whale species within the action area (Henry et al. 2016)

Species	Date Range	Entanglements	Annual Average
Fin whales	2010 to 2014	10	2
Sei whales	2010 to 2014	0	0

In addition to these direct impacts, cetaceans may also be subject to indirect impacts from fisheries. Many cetacean species (particularly fin and humpback whales) are known to feed on species of fish that are harvested by humans (Waring et al. 2016). Thus, competition with humans for prey is a potential concern. Reductions in fish populations, whether natural or human-caused, may affect the survival and recovery of ESA-listed populations. Even species that do not directly compete with human fisheries could be indirectly affected by fishing activities through changes in ecosystem dynamics. However, in general the effects of fisheries on whales through changes in prey abundance remain unknown.

7.8 Pollution

Contaminants cause adverse health effects in cetaceans. Contaminants may be introduced by rivers, coastal runoff, wind, ocean dumping, dumping of raw sewage by boats and various industrial activities, including offshore oil and gas or mineral exploitation (Garrett 2004; Grant

and Ross 2002; Hartwell 2004). The accumulation of persistent organic pollutants, including polychlorinated-biphenyls, dibenzo-p-dioxins, dibenzofurans and related compounds, through trophic transfer may cause mortality and sub-lethal effects in long-lived higher trophic level animals such as marine mammals (Waring et al. 2016), including immune system abnormalities, endocrine disruption, and reproductive effects (Krahn et al. 2007). Persistent organic pollutants may also facilitate disease emergence and lead to the creation of susceptible "reservoirs" for new pathogens in contaminated marine mammal populations (Ross 2002). 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 (Law 2014).

Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Cetaceans 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). Cetaceans have a thickened epidermis that greatly reduces the likelihood of petroleum toxicity from skin contact with oils (Geraci 1990), but they 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 ESA-listed species indirectly by reducing food availability.

Cetaceans are also impacted by marine debris, which includes: plastics, glass, metal, polystyrene foam, rubber, and derelict fishing gear (Baulch and Perry 2014; Li et al. 2016). Marine debris is introduced into the marine environment through ocean dumping, littering, or hydrologic transport of these materials from land-based sources. Even natural phenomena, such as tsunamis and continental flooding, can cause large amounts of debris to enter the ocean environment. Cetaceans often become entangled in marine debris (Johnson et al. 2005). The ingestion of marine debris has been documented to result in blockage or obstruction of the digestive tract, mouth, and stomach lining of various species and can lead to serious internal injury or mortality (Derraik 2002). In addition to interference with alimentary processes, plastics lodged in the alimentary tract could facilitate the transfer of pollutants into the bodies of whales and dolphins (Derraik 2002).

Aquatic nuisance species are aquatic and terrestrial organisms, introduced into new habitats throughout the United States and other areas of the world, that produce harmful impacts on aquatic ecosystems and native species (http://www.anstaskforce.gov). They are also referred to as invasive, alien, or nonindigenous species. Introduction of these species is cited as a major threat to biodiversity, second only to habitat loss (Wilcove et al. 1998). They have been implicated in the endangerment of 48 percent of ESA-listed species (Czech and Krausman 1997).

7.9 Scientific Research

Scientific research similar to that which would be conducted under Permit No. 18059 has and will continue to impact ESA-listed cetaceans within the action are. The primary objective of these studies is generally to monitor populations or gather data for behavioral and ecological studies. These activities may directly or incidentally result in harassment, stress, and injury.

Annual takes of fin and sei whales resulting from research activities that are currently permitted by the NMFS within the action can be seen in Table 9 (Permit Nos. 13927, 14118, 14233, 14245, 14450, 14603, 14809, 14856, 15488, 15575, 15682, 16109, 16325, 16388, 16473, 17312, 17355, 18786, 19091). The table is broken down based on the nature of the take and when applicable, in a matter that matches the description of research activities in Section 3. No mortalities are authorized for any animal of any age and no mortalities have been reported from the permits currently active in the action area. It is important to note that the research activities that would be conducted under Permit No. 18059 would be in addition to those listed in Table 9. Many individuals would be subject to more than one activity within in a given year, and in some cases could be subject to the same activity multiple times within a single year. All of these permits have undergone ESA section 7 consultation and for each permit, we concluded that the permits and research was not likely to jeopardize the continued existence of ESA-listed species, nor adversely modify designated critical habitat.

Table 9: Authorized scientific research takes of fin and sei whales within in the action area[1].

Take Activity	Fin whale	Sei whale
Aerial surveys	14,140	4,555
Vessel Survey	15,770	4,670
Photography and Observation	14,975	5,115
Biopsy Sampling	1,225	650
Sloughed Skin Sampling	6,725	1,930
Exhaled Breadth Sampling	6,130	1,335
Fecal Sampling	1,665	1,870
Passive Acoustic Recording	3,200	3,085
Import and Export of Parts	1,505	1,730
Prey Mapping and Sampling	0	0
Suction-cup Tagging	625	550
Implantable Tagging	330	255
Ultrasound	40	40
Acoustic Playback	40	40
Auditory Brainstem Response Test	40	40
Total Takes	66,410	25,865

Substantial research effort relative to species abundance in the action area with repeated disturbances of individuals is likely to occur each year under 19 research permits[1] currently in effect (Table 9). However, all permits contain conditions requiring the permit holders to coordinate their activities with the NMFS' regional offices and other permit holders and, to the extent possible, share data to avoid unnecessary duplication of research. In addition, many values represent permitted research activities occurring over the entire range of the species or in areas

[1] Permit Nos. 13927, 14118, 14245, 14450, 14809, 14856, 15488, 15575, 15682, 16109, 16325, 16388, 16473, 17312, 17355, 18786, 19091, 19674, 19315

extending further than the limits of the action area considered in this opinion. Nevertheless, these numbers represent a worst-case scenario of the level of non-injury harassment related to scientific research for fin and sei whales in the action area.

As detailed below, whales may respond to research activities in a variety of ways including; no obvious response, minor behavioral disturbances, avoidance and stress response, temporary abandonment of important behaviors such as feeding and breeding. In rare cases whales may become injured, infected, and possibly even die when biological samples are taken or implantable tags are used (NMFS 2016a).

8 EFFECTS OF THE ACTION

Section 7 regulations define "effects of the action" as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR §402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur. This effects analyses section is organized following the stressor, exposure, response, risk assessment framework.

As was stated in Section 2, this opinion includes both a jeopardy analysis and an adverse modification analysis.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR §402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

In this section, we describe the potential stressors associated with the proposed actions, the probability of individuals of ESA-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 Section 2, for any responses that would be expected to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, or lifetime reproductive success), the assessment would consider the risk posed to the viability of the population(s) those individuals comprise and to the ESA-listed species those populations represent. For this consultation, we are particularly concerned about behavioral and stress-based physiological disruptions and potential unintentional mortality that may result in animals that fail to feed, reproduce, or survive because these responses are likely to have population-level consequences. The purpose of this assessment and, ultimately, of this consultation is to determine if it is reasonable to expect the proposed action to have effects on ESA-listed species that could appreciably reduce their likelihood of surviving and recovering in the wild.

8.1 Stressors Associated with the Proposed Action

Stressors are any physical, chemical, or biological entity that may induce an adverse response either in an ESA-listed species or their designated critical habitat. The issuance of Permit No. 18059 would authorize several research activities that may expose fin and sei whales to a variety of stressors. Each research activity directed at fin and sei whales presents a unique set of stressors, as further detailed below. Given the directed nature of the proposed research, the research activities directed at humpback and minke whales that would be authorized under Permit No. 18059 are not expected to present any stressors to fin and sei whales, and so these activities are not considered further.

Vessel surveys and close approaches would present a range of stressors including vessel traffic, discharge, and visual and auditory disturbances. Photography would follow close approaches, but would not present any additional stressors other than those associated with vessel surveys and close approaches. The remainder of the research activities would also follow close approaches, and so include the previously mentioned associated stressors, but also present other stressors unique to the particular activity. Fecal sampling could present the additional stressor of interaction with scientific equipment, if whales happen to approach researchers during fecal sampling. Suction-cup tagging would present the additional stressors of a very close approach and direct physical contact to apply suction-cup tags and then the continued attachment of tags. Exhaled breath sampling also carries the stressor of a very close approach to collect breath samples, and in addition, the potential stressor of interaction with scientific equipment. Prey mapping would present the additional stressor of noise from fish finders. Prolonged, focal follow observations of whales carry the same stressors as described for vessel surveys and close approaches above, but for a longer duration than a typical vessel survey or close approach. Finally, biopsy sampling carries the stressor of direct physical contact with the animal and the unique stressor of tissue collection.

8.2 Mitigation to Minimize or Avoid Exposure

Several aspects of the proposed action are designed to minimize ESA-listed species' exposure to the potential stressors associated with the research activities. These include the experience and measures taken by the researchers themselves and the terms and conditions specified in the permits, as proposed by the Permits Division.

Dr. Wiley has over 25 years of experience conducting research on large whales within the action area using many of the methods being proposed here (Payne et al. 1990). While this is his first time as the Principal Investigator on a research permit, he has been a Co-Investigator on at least ten scientific researcher permits. As noted in Section 1.1, those permits underwent section 7 consultation, all resulting in biological opinions concluding that the research was not likely to jeopardize the continued existence of ESA-listed species, nor destroy or adversely modify designated critical habitat. In this research, Dr. Wiley primarily uses non-invasive techniques (except for biopsy sampling) in order to minimize impacts to ESA-listed cetaceans. For example, the exhaled breath sampling proposed hear is a novel, non-invasive method for accurately

estimating the metabolic rate of large cetaceans, which otherwise typically requires capture (e.g., Wahrenbrock et al. 1974; but see Blix and Folkow 1995; Folkow and Blix 1992). In addition, in his permit application he outlines the following mitigation measures designed to minimize exposure to ESA-listed species:

> "All of our techniques are designed to minimize effects on the study animals. Such minimization is both ethically and scientifically sound (Smolowitz and Wiley 1998). To minimize any pain or potential injury, we exclusively use suction cup attachment to animals. In addition, attachments will be limited to a maximum of 48 hours. Approaches for tagging or photographic identification of individuals will be conducted a low speed designed to slowly overtake and then match speed with the focal animal. To further safeguard calves, we will not place tags on calves prior to the month of June or on calves less than approximately five meters in length for humpback whales or approximately 7.5 meters for fin and sei whales. We will not place tags on minke whale calves. To minimize potential approach disruption, we will not make more than three tag attempts on an individual in a single day. We will also discontinue an approach if a mother and calf appear to be nursing and will not position the tag boat between the mother and calf. When tagging mothers and calves, we will attempt to tag the calf first to minimize the mother's reaction. We will also not place tags on or biopsy animals that appear emaciated, as indicated by convexity or concavity just posterior to the blowholes (cervical region) (Pettis et al. 2004). We will also make approaches for photo-identification of individual tagged or biopsied animals. To limit approaches, we will attempt to use the same approach to photograph and sample (tag, biopsy, or exhaled gas) animals. Directed approaches for photo-identification of individuals not involved with sampling operations will also be accomplished at low speed (approximately four to eight knots) to a distance of approximately 15-25 meters or at speeds designed to slowly overtake and match the swim speed of the focal animal. To minimize overlap with other scientists, we will notify the Greater Atlantic Regional Fisheries Office, Northeast Fisheries Science Center, Center for Coastal Studies, Woods Hole Oceanographic Institution, and College of the Atlantic at least two weeks prior to beginning fieldwork. We will also notify naturalists working in the Stellwagen Bank or other areas selected for work through their existing naturalist list serve."

In addition to these mitigation measures taken by the applicant himself, the Permits Division proposed to include the following terms and conditions, which include several mitigation measures:

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including attachments and appendices. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through March 1, 2022. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, NMFS Office of Protected Resources, pursuant to applicable regulations and the requirements of the MMPA and ESA.

2. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, NMFS Permits and Conservation Division (hereinafter "Permits Division") for written permission to resume

   a. If serious injury or mortality[2] of protected species occurs.

   b. If authorized take[3] is exceeded in any of the following ways:

      i. More animals are taken than allowed in Table 1.

      ii. Animals are taken in a manner not authorized by this permit.

      iii. Protected species other than those authorized by this permit are taken.

   c. Following incident reporting requirements at Condition E.2.

3. The Permit Holder may continue to possess biological samples[4] acquired[5] under this permit after permit expiration without additional written authorization, provided the samples are maintained as specified in this permit.

B. Number and Kind(s) of Protected Species, Location(s) and Manner of Taking

1. Table 1 outlines the number of protected species, by species and stock, authorized to be taken, and the locations, manner, and time period in which they may be taken.

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[2] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[3] By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

[4] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

[5] Authorized methods of sample acquisition are specified in Table 1.

2. Researchers working under this permit may collect visual images (e.g., photographs, video) in addition to the photo-identification or behavioral photo-documentation authorized in Table 1 as needed to document the permitted activities, provided the collection of such images does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 18059. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided

    a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

    b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

    c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

    d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

<u>Counting and Reporting Takes</u>

    a. Count and report a take of a cetacean regardless of whether you observe a behavioral response to the permitted activity.

    b. Count and report 1 take per cetacean per day including all approaches in water and attempts to remotely biopsy, breath sample, photograph, tag.

    c. During an approach, Researchers may attempt the procedures in a take table row once.

<u>General</u>

    d. Researchers may approach an animal up to 6 times in one day.

    e. Researchers must approach animals cautiously and retreat if behaviors

indicate the approach may be interfering with reproduction, feeding, or other vital functions.

f. Where females with calves are authorized to be taken, Researchers:

i. Must immediately terminate efforts if there is any evidence that the activity may be interfering with pair-bonding or other vital functions;

ii. Must not position the research vessel between the mother and calf;

iii. Must approach mothers and calves gradually to minimize or avoid any startle response;

iv. Must discontinue an approach if a calf is actively nursing; and

v. Must, if possible, sample the calf first to minimize the mother's reaction when sampling mother/calf pairs.

<u>Biopsy, Tagging, Ultrasound, Breath collection</u>

g. Researchers may attempt (deploy or discharge/fire) each procedure (biopsy, breath sample, and tag) on an animal 3 times a day.

h. A biopsy, breath sample, or tag attachment attempt must be discontinued if an animal exhibits repetitive, strong, adverse reactions to the activity or vessel.

i. Biopsy tips must be sterile before use in the field and disinfected prior to re-use during the same field trip. If the biopsy tip becomes contaminated and is no longer sterile (e.g., missed attempt, contacts seawater, physical contact) prior to use, a new sterile biopsy tip must be used. If a new, sterile biopsy tip is not available, the contaminated tip must be completely cleaned and disinfected following the IACUC-approved protocol described in the application.

j. Females attending calves greater than 6 months of age may be biopsy sampled and/or tagged. Calves of any age or females attending calves younger than 6 months of age may not be tagged or biopsy sampled.

k. Before attempting to biopsy/tag/sample an individual, researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated sampling of any individual.

l. Researchers must not attempt to biopsy or tag a cetacean anywhere forward of the pectoral fin.

<u>Non-target Species</u>

m. For North Atlantic Right Whales:

If a right whale is seen, Researchers must maintain a distance of at least 460 meters (500 yards) from the animal(s). Please report all right whale sightings to NMFS Sighting Advisory System:

- in any location to the U.S. Coast Guard on channel 16
- from VA to ME to 978-585-8473

6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).

b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the

i. species and, where known, age and sex;

ii. date of collection, acquisition, or import;

iii. type of sample (e.g., blood, skin, bone);

iv. origin (i.e., where collected or imported from); and

v. legal authorization for original sample collection or import.

c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. The Permit Holder may request approval of Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the

i. name and affiliation of the recipient;

ii. address of the recipient;

iii. types of samples to be sent (species, tissue type); and

iv. type of analysis or whether samples will be curated.

e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E. 3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

a. Principal Investigator – David Wiley, Ph.D.

b. Co-Investigators – See list of names and corresponding activities.

c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to

   a. individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

   b. individuals included as backup for those personnel essential to the conduct of the permitted activity, and

   c. individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

7. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

8. Submit requests to add CIs or change the PI by one of the following:

   a. the online system at https://apps.nmfs.noaa.gov;

   b. an email attachment to the permit analyst for this permit; or

   c. a hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when

   a. Engaged in a permitted activity.

   b. A protected species is in transit incidental to a permitted activity.

   c. A protected species taken under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reports

1. The Permit Holder must submit incident, annual, and final reports containing the information and in the format specified by the Permits Division.

   a. Reports must be submitted to the Permits Division by one of the following:

      i. the online system at https://apps.nmfs.noaa.gov;

      ii. an email attachment to the permit analyst for this permit; or

      iii. a hard copy mailed or faxed to the Chief, Permits Division.

   b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

2. Incident reports: must be submitted within two weeks of a serious injury or mortality, or exceeding authorized takes, as specified in Conditions A.2.

   a. The incident report must include a complete description of the events and identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

   b. If the total number of mortalities is reached or takes have been exceeded:

      i. in addition to the written report, the Permit Holder must contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than within two business days of the incident.

      ii. the Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

3. Annual reports describing activities conducted during the previous permit year (from 03/01 to 02/28) must

   a. be submitted by April 30 each year for which the permit is valid, and

   b. include a tabular accounting of takes and a narrative description of activities and effects.

4. A final report summarizing activities over the life of the permit must be submitted by September 1, 2022, or, if the research concludes prior to permit expiration, within 180 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division.

F. Notification and Coordination

1. The Permit Holder must provide written notification of planned field work to the applicable NMFS Region at least two weeks prior to initiation of each field trip/season. If there will be multiple field trips/seasons in a permit year, a single summary notification may be submitted per year.

   a. Notification must include the

      i. locations of the intended field study and/or survey routes;

      ii. estimated dates of activities; and

      iii. number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant "in training").

   b. Notification must be sent to the following Assistant Regional Administrator for Protected Resources to the location of your activity:

      For activities in ME, VT, NH, MA, NY, CT, NJ, DE, RI, MD, and VA: Greater Atlantic Region, NMFS, 55 Great Republic Drive, Gloucester, MA 01930; phone (978)281-9328; fax (978)281-9394

      Email (*preferred*): NMFS.GAR.permit.notification@noaa.gov

2. To the maximum extent practical, the Permit Holder must coordinate permitted activities with activities of other Permit Holders conducting the same or similar activities on the same species, in the same locations, or at the same times of year to avoid unnecessary disturbance of animals. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by

   a. allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe permitted activities; and

   b. providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part

   a. in order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under section 103 of the MMPA and section 4 of the ESA;

   b. in a case in which a violation of the terms and conditions of the permit is found;

   c. in response to a written request[6] from the Permit Holder;

   d. if NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and

   e. if NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

[6] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR part 904.
2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.
    a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.
    b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

As detailed above, the Permits Division would require individuals conducting the research activities to possess qualifications commensurate with their roles and responsibilities. In accordance, the only personnel authorized to conduct the research would be Dr. Wiley, listed Co-Investigators, and research assistants. We anticipate that requiring that the research be conducted by experienced personnel will further minimize impacts to the ESA-listed cetaceans that may be exposed to the stressors, as these individuals should be able to recognize adverse responses and cease or modify their research activities accordingly.

8.3 Exposure Analysis

In this section, we quantify the likely exposure of ESA-listed species to the activities and associated stressors that may result from the proposed action (Section 8.1). Table 1 specifies the Permits Division's proposed exposure to ESA-listed species associated with vessel surveys and close approaches, photography, fecal sampling, suction-cup tagging, exhaled breath sampling, observation, prey mapping, and biopsy sampling. In accordance with our regulations (50 CFR §402), here we evaluate whether or not this proposed level of exposure is reasonably certain to occur.

In his application Dr. Wiley states that his estimated "…number of approaches is based on our past experience with regards to approaches needed to successfully apply tags to animals and the fact that we will often be targeting a specific age, sex, or reproductive class (i.e., we have moved past the concept of tagging the first available or easiest animal). The requested number of approaches is additionally important because one of our goals is to investigate the cooperative/coordinated behavior of animals with a feeding group (see Wiley et al 2011, Ware et al. 2013 and Parks et al. 2014). This requires attaching tags to multiple animals within the same feeding group." In regards to the estimated take for incidental disturbance, during consultation Dr. Wiley confirmed that he estimated these numbered based on the average group size of each

species and his directed research take requests (e.g., to calculate the expected incidental disturbance to fin whales, one would multiple the directed take by the average group size of fin whales observed from past data). With this explanation of take number estimates, our own evaluation of these take numbers in comparison to exposure analysis for similar activities (NMFS 2012a), and the conservative assumption that all take that the Permit Division authorized *could* occur, we adopt the exposure of ESA-listed species that is reasonably certain to occur as that specified in Table 1.

Table 1 indicates the maximum number of takes, not necessarily individuals, that would be authorized under Permit No. 18059. Researchers would only be authorized to approach any individual whale up to three times per day, unless attempting exhaled breath sampling in which case up to six approaches per day would be authorized. This exposure would occur primarily during field research operations from April through November annually, with the duration of each exposure ranging from 30 seconds to approximately nine hours as described in Section 3.

Given the Permits Division's issuance and counting of takes[7] and the fact that researchers may often not be able to identify individual whales in the field, the numbers specified in *Annual No. of Takes* and *Takes Per Animal* in Table 1 do not necessarily reflect the number of animals that would be exposed or their repeat exposure, respectively. For example, if Dr. Wiley takes a whale on one day it would count as one individual taken. If the same individual is taken on another day that same year without recognizing it as an animal previously sampled, it would be counted as a different individual taken, but the total annual number of individuals taken would be less than in Table 1. Because it is difficult to identify specific individual whales in the field, we find it unlikely that Dr. Wiley will be able to confidently adhere to the number of times each individual can be taken as specified in *Takes Per Animal* in Table 1. However, given the nature of fieldwork (unpredictability, reliance on equipment, personnel availability, and weather for operations, etc.) and the vast areas these whale species inhabit, it is likely that many, if not all whales, would be taken fewer times than as specified in the *Takes Per Animal* column of Table 1.

Given the inability to identify each individual whales in the field, the *Annual No. of Takes* presented in Table 1 represents the maximum number of individuals that could be exposed annually, and the *Takes Per Animal* column represents the maximum number of repeat exposures an animal may experience in a year. It is important to note that the two cannot be simultaneously maximized. That is, because takes are counted based on the instances of taking of an animal, not necessarily different animals, if an animal is taken more than once in a year as described above, than this counts against the *Annual No. of Takes*, and the total number of individuals exposed annually would be less than as specified in *Annual No. of Takes*.

[7] The Permits Division directs researchers to count and report one take per cetacean per day including all approaches and procedure attempts, regardless of whether a behavioral response to the permitted activity is observed.

This exposure from directed research represents a relatively small number of both fin and sei whales. The population size of the Western North Atlantic Stock of fin whales is estimated to be approximately 1,618 individuals, whereas population size of the Nova Scotia stock is estimated to be 357 individuals. As such, a maximum of approximately four percent and 21 percent of the fin and sei populations within the action area would be exposed annually to directed research. In addition, a maximum of approximately 30 percent and 100 percent of the fin and sei populations within the action area would be exposed annually to incidental harassment. While this incidental harassment exposure is substantial, in the case of sei whales representing the entire population, we expect the response to incidental harassment to be minimal as detailed in the next section below.

8.4 Response Analysis

Given the exposure detailed above, in this section we describe the range of responses among ESA-listed cetaceans that may result from the stressors associated with the research activities that would be authorized under Permit No. 18059. These include stressors associated with the following activities: vessel surveys and close approaches, photography, fecal sampling, suction-cup tagging, exhaled breath sampling, observation, and biopsy sampling. We assess potential lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. Our response analysis considers and weighs evidence of adverse consequences, as well as evidence suggesting the absence of such consequences.

In general, all the research activities described in Section 2 have the potential to cause some sort of disturbance. Responses by animals to human disturbance are similar to their responses to potential predators (Beale and Monaghan 2004; Frid 2003; Frid and Dill 2002; Gill et al. 2001; Harrington and Veitch 1992; Lima 1998; Romero 2004). These responses manifest themselves as stress responses in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response or more serious physiological changes with chronic exposure to stressors. They can also lead to interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Frid and Dill 2002; Romero 2004; Sapolsky et al. 2000; Walker et al. 2005). Further, these responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Mullner et al. 2004), and the death of individual animals (Bearzi 2000; Daan 1996; Feare 1976).

The mammalian stress response involves the hypothalamic-pituitary-adrenal axis being stimulated by a stressor, causing a cascade of physiological responses, such as the release of the stress hormones adrenaline (epinephrine), glucocorticosteroids, and others (Busch and Hayward 2009; Gulland et al. 1999; St. Aubin and Geraci 1988; St. Aubin et al. 1996; Thomson and Geraci 1986). These hormones can subsequently cause short-term weight loss, the liberation of glucose into the blood stream, impairment of the immune and nervous systems, elevated heart rate, body temperature, blood pressure, and alertness, and other responses (Busch and Hayward 2009; Cattet et al. 2003; Dickens et al. 2010; Dierauf and Gulland 2001a; Dierauf and Gulland

2001b; Elftman et al. 2007; Fonfara et al. 2007; Kaufman and Kaufman 1994; Mancia et al. 2008; Noda et al. 2007; Thomson and Geraci 1986). In some species, stress can also increase an individual's susceptibility to gastrointestinal parasitism (Greer 2008). In highly stressful circumstances, or in species prone to strong "fight-or-flight" responses, more extreme consequences can result, including muscle damage and death (Cowan and Curry 1998; Cowan and Curry 2002; Cowan and Curry 2008; Herraez et al. 2007). The most widely recognized indicator of vertebrate stress, cortisol, normally takes hours to days to return to baseline levels following a significantly stressful event, but other hormones of the hypothalamic-pituitary-adrenal axis may persist for weeks (Dierauf and Gulland 2001b). Mammalian stress levels can vary by age, sex, season, and health status (Hunt et al. 2006; Keay et al. 2006; Peters 1983). In addition, smaller mammals tend to react more strongly to stress than larger mammals (Hunt et al. 2006; Keay et al. 2006; Peters 1983).

In sum, the common underlying stressor of a human disturbance caused by the research activities that would occur under Permit No. 18059 may lead to a variety of different stress related responses. However, given the relatively short duration of the activities (30 seconds to approximately nine hours) relative to fin and sei whale life histories (e.g., life expectancies greater than 50 years), we do not anticipate these responses to result in negative fitness consequences. In addition to possibly causing a stress related response, each research activity is likely to produce unique responses as detailed further below. For incidental harassment that may result when whales are associated with individuals targeted for directed research, we expect responses to be similar to, or in most cases less than, those described below for each research activity, and above for general human disturbances.

8.4.1 Vessel Surveys and Close Approaches

Vessel surveys and close approaches would expose ESA-listed whales within the action area to vessel traffic, discharge, and visual and auditory disturbances. The purpose of vessel surveys and close approaches are to allow researchers to conduct other activities, responses to which are described below in individual sections.

Vessel surveys necessarily involve transit within the marine environment, and as noted in Sections 6.1.2 and 7.3, the transit of any vessel carries the risk of striking a whale. Responses to a ship strike depend in part on the size and speed of the vessel, but can involve death, serious injury, or minor, non-lethal injuries (Conn and Silber 2013; Jensen and Silber 2004; Laist et al. 2001; Vanderlaan and Taggart 2007). However, as discussed in Section 6.1.2 we believe the likelihood of a research vessel striking a large whale is extremely low given the low occurrence of such events from historical data, the slow speeds at which Dr. Wiley would operate, and the extensive experience his research team has in spotting large whales at sea. As such, we do not expect ship strikes to occur, and in turn, we find effects from this stressor to be discountable and do not expect impacts to the fitness of individual whales.

Discharge from research vessels in the form of leakages of fuel or oil is possible, though effects of any spills would have minimal, if any, effects on ESA-listed whales. Given the experience of

the researchers and boat operators in conducting research activities in the action area, it is unlikely that spills or discharges will occur. If discharge does occur, the amounts of leakage would be small, disperse into the water, and not affect fin or sei whales directly, or pose measurable hazards to their food sources. Therefore, we conclude that effects from this stressor are discountable, and it is not likely to affect the fitness of individual whales.

Close approaches by research vessels may cause visual or auditory disturbances to whales and more generally disrupt their behavior, which may negatively influence essential functions such as breeding, feeding, and sheltering. Cetaceans react in a variety of ways to close vessel approaches. Responses range from little to no observable change in behavior to momentary changes in swimming speed and orientation, diving, surface and foraging behavior, and respiratory patterns, (Au and Green. 2000; Baker et al. 1983; Baumgartner and Mate 2003; Hall 1982; Isojunno and Miller 2015; Jahoda et al. 2003; Koehler 2006; Malme et al. 1983; Richardson et al. 1985; Scheidat et al. 2006; Watkins et al. 1981). These responses are similar to those described by Dr. Wiley concerning his past research (NMFS 2016d). Changes in cetacean behavior can correspond to vessel speed, size, and distance from the whale, as well as the number and frequency of vessels approaches (Baker et al. 1988; Beale and Monaghan 2004). Characteristics of the whale and/or the context of the approach, including age, sex, the presence of offspring, whether or not habituation to vessels has occurred, individual differences in reactions to stressors, and the behavioral state of the whales can also influence the responses to close vessel approaches (Baker et al. 1988; Gauthier and Sears 1999; Hooker et al. 2001a; Koehler 2006; Lusseau 2004; Richter et al. 2006; Weilgart 2007; Wursig et al. 1998). Observations of large whales indicate that cow-calf pairs, smaller groups, and groups with calves appear to be particularly responsive to close vessel approaches (Bauer 1986; Bauer and Herman 1986; Clapham and Mattila 1993; Hall 1982; Williamson et al. 2016). Cetaceans may become sensitized or habituated to vessels as the result of multiple approaches (Constantine 2001), which could increase or decrease stress levels associated with additional approaches and or research activities following an approach. Reactions to vessel noise by bowhead (*Balaena mysticetes*) and gray (*Eschrichtius robustus*) whales have been observed when engines are started at distances of 3,000 feet (Malme et al. 1983; Richardson et al. 1985), suggesting that some level of disturbance may result even if the vessel does not closely approach. It should be noted that human observations of a whale's behavioral response may not reflect a whale's actual experience; thus our use of behavioral observations as indicators of a whale's response to research may or may not be correct (Clapham and Mattila 1993).

Despite the varied observed responses to vessel approaches documented in the literature, and the multitude of factors that may affect an individual whale's response, we expect affects from close vessel approaches that would be authorized under Permit No. 18059 to Dr. Wiley to be minimal for several reasons. First, Dr. Wiley has years of experience approaching whales at a slow and converging course, designed to minimize disturbance and associated responses. In fact, any such disturbance is problematic for his research as he aims to study natural (undisturbed) whale behavior. Second, the source levels of sounds that would be generated by his research vessels are

below that which could cause physical injury or temporary hearing threshold shifts, and they are unlikely to negatively affect fin and sei whales' ability to hear mates and other conspecifics (Hildebrand 2009; NOAA 2016). Finally, no long-term effects on behavior or fitness from disturbances caused by close vessel approaches for research have been documented, both by Dr. Wiley and more generally in the literature. Thus, based on accounts from the applicant, responses documented in the literature, and the proposed method for closely approaching whales by vessel, we expect the proposed vessel surveys and close approaches may produce short- to mid-term stress responses, but no long-term behavioral changes that would result in fitness consequences for individual whales.

8.4.2 Photography

As noted previously, photography would occur following close approaches, and as such, photography is expected to produce the same responses as previously described in Section 8.4.1. Simply taking an animal's photograph is not expected to present any unique stressors that would cause additional responses. Therefore, no response is expected to photography that has not already been described above. Photography itself would not affect the fitness of individual whales.

8.4.3 Fecal Sampling

Fecal sampling would occur during vessel surveys and may affect fin and sei whales within the action area. Fecal sampling is not expected to occur where whales currently are, but rather in the path previously traveled by whales. No approach to whales would be made and the possibility that a whale surfaces at the same time and place as the fecal sample collection is remote. Nevertheless, if a whale where to approach researchers collecting a fecal sample, the sampling net may present a stressor if the whale were to interact with (i.e., contact). However, if a whale were to come near the net, given its small size and form, it is very unlikely to injury the whale. Thus, we do not anticipate any response from whales to fecal sampling, and as a result, no effects on the fitness of individual whales.

8.4.4 Suction-cup Tagging

Suction-cup tagging carries the stressors and responses associated with a very close approach (to within three to five meters), the initial attachment of the suction-cup tag, and the continued attachment of suction-cup tags, all of which have the potential to adversely affect fin and sei whales.

Initial Tag Attachment

Whales are likely to respond to very close approaches for suction-cup tag attachment in a similar way as previously described above for general close approaches. However, given the closer proximity of these approaches (three to five meters) we anticipate these responses will consist of the greater responses noted above such as momentary changes in swimming speed and orientation, diving, surface and foraging behavior, and respiratory patterns. Concurrent with this

response would be a response to the actual physical application of the suction-cup tag, which may be similar in nature. In fact, current research examining how whales respond to suction-cup attachment does not distinguish between a whale's response to the very close approach from that of the response to the physical tag attachment. Possible reasons for this include: (1) such responses are indistinguishable to researchers, (2) no proper controls exist to make such a distinction given that researcher generally do not approach very close unless they are also tagging, and (3) such a distinction is not warranted as whales themselves may not differentiate between the two stressors. As such, below we describe what is known about whales response to the initial suction-cup tag attachment, which includes the response to both the very close approach and the physical attachment of the tag.

Previous studies have found that whales respond to suction-cup tag attachment (and missed attachment attempts), in a variety of ways. In humpback whales, Goodyear (1989a; 1989b) observed quickened dives, high back arches, tail swishes (31 percent) or no reaction (69 percent) to suction-cup attachment. One breach was observed in roughly 100 taggings and no damage to skin was found (Goodyear 1989a; 1989b). Baird et al. (2000) observed only low (e.g., tail arch or rapid dive) to medium (e.g., tail flick) level reactions by humpbacks in response to suction-cup tag attachment. Baumgartner and Mate (2003) reported that strong reactions of North Atlantic right whales to suction-cup tag attachment were uncommon, and that 71 percent of the 42 whales closely approached for suction-cup tagging showed no observable reaction (22 of 28 that were successfully tagged and 8 of 14 that were unsuccessfully tagged individuals). The remaining whales reacted by lifting their heads or flukes, rolling, back-arching, beating their flukes, or performing head lunges. In a review on the effects of marking and tagging on marine mammals, Walker et al. (2012) found that cetaceans exhibited short-term behavioral responses to suction-cup tag attachment including changes in frequency of leaps and group speed, flinching, tail slapping, rapid swimming, and rapid surfacing attempts, but no long term fitness consequences.

From his past research, Dr. Wiley has observed similar responses to suction-cup tag attachment. For example, in 2012 he observed the following responses from humpback whales: 12 cases of no response, 30 cases of minor responses, seven cases of moderate responses, and only one case of an extreme response (NMFS 2016d; responses categorized based on Weinrich et al. 1991, see Section 6.4.8). The single extreme response consisted of an animal swimming at increased speed for approximately 15 minutes following tag application.

Based on the available information presented above, we expect responses to the initial suction-cup tag attachment (including unsuccessful attempts) to consist of brief, low-level to moderate behavioral responses. As a result, we do not anticipate that the initial attachment of suction-cup tags will affect the fitness of individual whales.

Continued Tag Application

Once tagged, the continued attachment does not appear to have a measurable impact on whale behavior. In suction-cup tagging humpback whales, Baird et al. (2000) observed pre-tagging behavior within minutes and no long term or strong reactions. Baumgartner and Mate (2003)

reported that suction-cup tagged North Atlantic right whales resumed normal foraging dives within two dives post tag attachment, indicating that the continued attachment of the tag had little effect on their behavior. This is not surprising given that the heaviest of tags described in Section 3.2.2 weigh approximately 0.01 and 0.005 percent of the weight of a sei and fin whale respectively, and they have hydrodynamic designs to minimize drag (Aguilar 2009; Horwood 2009). In Dr. Wiley's previous research, regardless of the response to the initial tag attachment, almost animals returned to pre-tag behavior within one or two dives following tag application, and Dr. Wiley observed no indication that the continued attachment of suction-cup tags impacted whale behavior (NMFS 2016d).

Based on the available information, we expect responses to the continued tag attachment to consist of very low to no behavioral response. We expect that individuals would return to baseline behavior within a few minutes. As a result, we do not anticipate the continued attachment of suction-cup tags will affect the fitness of individual whales.

8.4.5 Exhaled Breath Sampling

Exhaled breath sampling would occur during vessel surveys and close approaches, and as such, carries all the stressors associated with vessel surveys described above. Like the initial suction-cup tag attachment, a very close approach is required for this activity, and so we anticipate the previously mentioned responses to a very close approach including momentary changes in swimming speed and orientation, diving, surface and foraging behavior, and respiratory patterns. In addition, since sampling equipment (a carbon fiber pole with a sampling device) would extend from the vessel, out over and above the whale, it is possible that this activity may present the additional stressor of interaction with (i.e., contact) scientific equipment. Given that this is a relatively new technique, few data exist on the impacts of exhaled breath sampling on cetaceans, including possible interaction with sampling equipment. However, the technique was deliberately developed to provide an entirely non-invasive way to biologically sample free-ranging cetaceans with minimal impact (Hunt et al. 2013). We anticipate that researchers will make every effort not to contact whales, as doing so would result in contamination or possible loss of their sample or equipment. Furthermore, even if a whale were to contact the sampling equipment, it is unlikely to cause injury, although it could produce respond in a similar way as described above for the initial suction-cup tag attachment. Thus, while we do not anticipate any contact between the sampling equipment and the whale, and thus no response from whales to exhaled breath sampling, even if there were to be contact, we do not anticipate any effects to the fitness of individual whales.

8.4.6 Observation

Observation of whales would occur after a successful suction-cup tag attachment, and on occasion, exhaled breath sampling. Given that observation itself does not present any unique stressors not already described in detail for vessel surveys and close approaches, we do not anticipate unique responses to observation. However, the duration of observations following suction-cup tagging would generally be greater than a typical vessel survey. Researchers may

observe a whale for up to an entire day if a whale is tagged early in the morning and weather allows. This extended duration may increase the likelihood a whale will respond to the vessels close proximity. However, as detailed in Section 3.2.5, most of the time the research vessel would be at distances between 100 and 400 meters, or greater, and would only be closer to inspect the position of the tag. If the whale were to exhibit and indication of disturbance, then we anticipate the researchers would move away and take all possible actions to minimize such disturbance since such disruption of natural behavior invalidates their dataset. Thus, given the possible responses to close vessel approach during vessel surveys (Section 8.4.1), the far distances at which most observations would occur, and the motivation of the researchers to minimize disturbing the whales during observations, we expect no effects on fitness as the result of observations under Permit No. 18059.

8.4.7 Prey Mapping

Prey mapping would occur during observations of foraging whales that have already been suction-cup tagged, and on occasion subject to exhaled breath sampling. Most of the responses to prey mapping are associated with the vessel survey and observations described above. While prey mapping does present the unique stressors of sound used to map prey and closes approaches to foraging whales, we do not anticipate these will have significant impacts on fin and sei whales. The prey mapping equipment frequencies of 38 and 120 kHz are outside the predicted hear ranges of baleen whales (7 Hz to 35 kHz, NOAA 2016), and thus, we do not anticipate a response to these sounds. Close approaches to actively feeding whales could cause dense pre patches to break up or redistribute, but the amount of prey that would be disturbed would be insignificant compared to that which the whale consumes in any given mouthful. While approaching foraging whales has to potential to cause them to abandon foraging (Jahoda et al. 2003), we expect that if this were to occur, Dr. Wiley would cease prey mapping given that the focus of his research is on the whales foraging behavior. Thus, we do not anticipate the unique stressors associated with prey mapping to affect the fitness of individual fin and sei whales in any way.

8.4.8 Biopsy Sampling

Under Permit No. 18059, Dr. Wiley would be authorized to biopsy sample adult and juvenile fin and sei whales that have previously been subject to vessel surveys and close approaches, photography, and possibly fecal sampling, but no other activities (suction-cup tagging, exhaled breath sampling, observation, or prey mapping). While many of the responses we expect to biopsy sampling are associated with these other activities, biopsy sampling itself presents the stressor of physical contact and the unique stressor of tissue collection. Responses to biopsy sampling may be physiological or behavioral in nature.

Physiological responses of cetaceans to biopsy sampling may include the biopsy site wound and associated healing, a stress response, serious injury, or even death (reviewed in Noren and Mocklin 2012). Responses vary by species, biopsy tip dimensions, the draw weight of the sampling method, and the distance from which animals are sampled (Noren and Mocklin 2012).

However, generally speaking wounds from biopsy sampling heal quickly, often within a month or less, and show no signs of infection (Noren and Mocklin 2012). In fact, for at least some large whale species (e.g., southern right whales, *Eubalaena australis*) immediately after sampling takes place, biopsy sites are hardly noticeable (Reeb and Best 2006). This is perhaps not surprising given that cetaceans have high rates of cell proliferation that enable them to heal from large shark inflicted wounds within months (Corkeron et al. 1987; Dwyer and Visser 2011; Lockyer and Morris 1990).

Beyond the wound itself, biopsy sampling could cause a physiological stress response similar to that described above in the beginning of this section, even if the biopsy dart does not successfully penetrate the animal's tissue. Such a response may involve the release of stress hormones, short-term weight loss, susceptibility to gastrointestinal parasitism, the liberation of glucose into the blood stream, impairment of the immune and nervous systems, an elevated heart rate, body temperature, blood pressure, and alertness, muscle damage, and death. However, given the small size of wounds created by biopsy sampling and the short duration in which the sampling occurs, stress responses to remote biopsy sampling are likely minimal.

Finally, biopsy sampling could result in serious injury or death. However, in over 40 years of researchers collecting biopsy samples from cetaceans, we are aware of only one example of such an event: a common dolphin death following biopsy sampling in 2000 (Bearzi 2000). Several possibly explanations exist for why this particular animal died including a dart stopper malfunction, the location of the biopsy wound, the thinness of the animal's blubber, the handling of the animal, and possibly this animal having a predisposition to catatonia and death during stressful events (Bearzi 2000). It is important to note that due to this animal's unusually thin blubber layer, the biopsy tip penetrated the animal's muscle, which is not the intent of most researchers' biopsy sampling efforts.

While the above discussion indicates a range of physiological responses to biopsy sampling, only minor wounds and low-level stress responses are anticipate as the result of biopsy sampling that would be conducted under Permit No. 18059. This is because all biopsy dart tips that Dr. Wiley would use would be 1) thoroughly sterilized before sampling, thus minimizing any chances of infection, and 2) only penetrate 2.5 centimeters, less than the typical thickness of fin and sei whale blubber (five to 10 centimeters, Lockyer et al. 1985), and so would not penetrate any individual's muscle, and thus result in no serious injury or death.

Cetaceans also exhibit a wide range of behavioral responses to biopsy sampling (reviewed in Noren and Mocklin 2012). Most researchers report either no behavioral response or minor behavioral responses including changes in dive behavior, heading, or speed, and startle responses and tail flicks (Noren and Mocklin 2012). On occasion, researchers report similar low-level responses from animals nearby those being biopsied and to darts entering the water, suggesting that some observed responses are a general startle response and not necessarily due to being contacted by the biopsy dart (Gorgone et al. 2008; Noren and Mocklin 2012). On rare occasions (zero to six percent of animals biopsied), researchers have reported more severe behavioral

responses such as a flight response, breaching, multiple tail slaps, and/or numerous trumpet blows (Noren and Mocklin 2012). These more severe responses appear to coincide with instances where biopsy tips struck an unintended body part (e.g., dorsal fin) or when tips remain lodged in the animal (Berrow et al. 2002; Gauthier and Sears 1999; Weinrich et al. 1991; Weinrich et al. 1992). This being said, when darts remain in animals it does not appear to result in mortality, infection, or lasting behavioral changes (Barrett-Lennard et al. 1996; Clapham and Mattila 1993; Parsons et al. 2003). For all of these responses, it is important to keep in mind that in many cases it is hard to distinguish the behavioral response to biopsy sampling from the response to the close vessel approach (Pitman 2003). Regardless, in most instances animals return to pre-biopsying/close approach behavior quickly, usually within 30 seconds to three minutes (Noren and Mocklin 2012). In fact, biopsied individuals do not appear to avoid vessels during subsequent biopsy attempts (within one week to five months), and in many cases show the same or a lesser response the a second biopsying event (Noren and Mocklin 2012, although see Best et al. 2005).

A variety of factors influence how cetaceans behavioral respond to biopsy sampling including the species, age and sex, behavioral context, location, methods and or equipment used, type and size of the boat, size of the biopsy dart, season, water depth, and sea state (Noren and Mocklin 2012). For example, a higher proportion of odontocetes respond the biopsy sampling compared to mysticetes (Noren and Mocklin 2012). In some cases (Best et al. 2005), but not others (Weinrich et al. 1991), mothers and calves appear to be more sensitive to biopsy sampling than other age groups. Migrating humpback whales appear to be less responsive than those on the feeding grounds (Clapham and Mattila 1993; Weinrich et al. 1991), but on the feeding grounds, foraging whales are less likely to respond than resting whales (Weinrich et al. 1992).

Given the above overview of possible behavioral responses of cetaceans to biopsy sampling, and the mitigation measures proposed by the Permits Division and Dr. Wiley (Section 8.2, e.g., discontinuing biopsy attempts if animals exhibit repetitive, strong, adverse reactions), we expect fin and sei whales to behavioral respond to biopsy sampling by exhibiting short-term, minor to moderate changes in behavior, which we do not expect to impact any individual's fitness.

In summary, of the large number of cetaceans that have been biopsy sampled in recent decades (probably in the tens of thousands), there has been only one documented case of an immediate fitness consequence associated with biopsy sampling (Bearzi 2000). While studies on the delayed, long-term impacts of biopsy sampling are lacking, the available data suggests no effects to fitness (Best et al. 2005; Noren and Mocklin 2012). As such, we expect biopsy sampling to result in minor wounds, low-level stress responses, and temporary behavior changes, but we do not expect any individuals to experience reductions in fitness.

8.5 Risk Analysis

In this section we assess the consequences of the responses to the individuals that have been exposed, the populations those individuals represent, and the species those populations comprise. Whereas the *Response Analysis* (Section 8.4) identified the potential responses of ESA-listed

species to the proposed action, this section summarizes our analysis of the expected risk to individuals, populations, and species given the expected exposure to those stressors (as described in Section 8.3) and the expected responses to those stressors (as described in Section 8.4).

We measure risks to individuals of endangered or threatened species using changes in the individuals' "fitness," which may be indicated by changes the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When we do not expect ESA-listed animals exposed to an action's effects 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. As a result, if we conclude that ESA-listed animals are *not* likely to experience reductions in their fitness, we would conclude our assessment. If, however, we conclude that individual animals are likely to experience reductions in fitness, we would assess the consequences of those fitness reductions on the population(s) those individuals belong to.

As noted in the *Response Analysis*, none of the research activities as proposed with the mitigation measures to minimize exposure and associated responses, are expected reduce the fitness of any individual fin or sei whale. As such, the issuance of Permit No. 18059 is not expected to present any risk to individuals, populations, or species listed under the ESA.

9 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402.02). Future Federal actions 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.

This section attempts to identify the likely future changes and their impact on ESA-listed and their critical habitats in the action area. This section is not meant to be a comprehensive socio-economic evaluation, but a brief outlook on future changes on the environment. Projections are based upon recognized organizations producing best-available information and reasonable rough-trend estimates of change stemming from these data. However, all changes are based upon projections that are subject to error and alteration by complex economic and social interactions. During this consultation, we searched for information on future state, tribal, local, or private (non-Federal) actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the *Environmental Baseline* (Section 7), which we expect will continue in the future. Anthropogenic effects include climate change, whaling, ship strikes, whale watching, sound, military activities, fisheries, pollution, and scientific research, although some of these activities would involve a federal nexus and thus be subject to future ESA section 7 consultation. An increase in these activities could result in an increased effect on ESA-listed species; however, the magnitude and significance of any anticipated effects remain unknown at this time. The best scientific and

commercial data available provide little specific information on any long-term effects of these potential sources of disturbance on whale populations.

10 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the *Effects of the Action* (Section 8) to the *Environmental Baseline* (Section 7) and the *Cumulative Effects* (Section 9) to formulate the agency's opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the *Status of Species and Designated Critical Habitat* (Section 6).

The following discussions separately summarize the probable risks the proposed action poses to threatened and endangered species and critical habitat that are likely to be exposed. These summaries integrate the exposure profiles presented previously with the results of our response analyses for each of the actions considered in this opinion.

As discussed in Section 6.1, several ESA-listed species occur within the action area of Permit No. 18059 but are not likely to be adversely affected because the effects of the proposed actions are insignificant, or discountable. These include green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, loggerhead turtles (Northwest Atlantic Ocean DPS), and blue and North Atlantic right whales

In addition, designated North Atlantic right whale critical habitat occurs within the action area, but it is not expected to be adversely modify or destroyed.

The remaining ESA-listed species that may be affected by the proposed action, fin and sei whales, are likely to be adversely affected by the proposed action. On an annual basis over the five-year life of the permit, a maximum of 95 fin whales and 73 sei whales would be exposed to directed research activities. In addition, a maximum of 480 fin and 370 sei whales could be incidentally harassed. Based on the best available data, responses to these research activities from ESA-listed whales within the action areas range from no response, to mild behavioral and stress responses. In no case are any effects on individual fitness expected.

The status of each species, as described in Section 6.2, varies greatly. Fin whales' status varies by population; in some areas, populations may be substantial and increasing, while data are lacking for other areas leaving the overall status of the species uncertain. Little is known about the population trends of sei whales, but all populations within U.S. waters are relatively small.

A variety of anthropogenic threats impacts these ESA-listed cetaceans within the action area including climate change, whaling (although at very low levels), ship strikes, whale watching, sound, military activities, fisheries, pollution, and scientific research. Perhaps the most

significant direct anthropogenic threats these whales currently face are ship strikes and entanglement in fishing gear. In fact, it is these threat that the Dr. Wiley is trying to reduce through his research (NMFS 2016d). All of these activities are expected to continue into the future, but the magnitude at which, and their future impacts on the survival and recovery of ESA-listed species is not reliably predictable.

Considering the activities to which the ESA-listed species within the action area are likely to be exposed, their potential responses to these activities, the status of each species, and the baseline anthropogenic threats they face, we determined that the issuance of research Permit No. 18059 will result in minimal, low level behavioral responses to the individual whales exposed to the activities which are not likely to result in negative consequences to the fitness of the animals researched.

11 CONCLUSION

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is the NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence or recovery of fin whales, sei whales, North Atlantic right whales, blue whales, green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, or loggerhead turtles (Northwest Atlantic DPS), or destroy or adversely modify designated North Atlantic right whale critical habitat.

12 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a 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 regulation to include significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is further defined as an act that "creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (NMFSPD 02-110-19). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

All activities associated with the issuance of Permit No. 18059 involve directed take for the purposes of scientific research. Therefore, the NMFS does not expect the proposed action would incidentally take threatened or endangered species.

13 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 the threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans or develop information (50 CFR §402.02).

We make the following conservation recommendations, which would provide information for future consultations involving the issuance of permits that may affect ESA-listed whales as well as reduce harassment related to the authorized activities:

1. **Aggregate Take Tracking**

   We recommend that the Permits Division develop a system for tracking and evaluating the extent of take issued and that which is realized for any given population of ESA-listed species. While the Permits Division's current permit tracking allows tracking of individual permit takes, and for understanding the extent of research at broad scales (e.g., number of research permits in a particular region), it remains difficult to quantify the extent of take each individual population of ESA-listed species may be subject to across permits for any given period of time. Such aggregate take tracking would better enable the Permits Division and us to evaluate the impacts of multiple, simultaneous research efforts on ESA-listed species.

2. **Reporting**

   We recommend the permits division tailor the required reporting for research permits to go beyond that needed to demonstrate compliance, in order to aid managers in collecting the information needed to better protect and conserve ESA-listed species. In requiring researchers to provide annual reports, the Permit's Division is positioned to collect unprecedented, nation-wide data on ESA-listed species, which in some cases may take years to surface in the peer-reviewed public literature. For large baleen whale species, the Permits Division may consider discussing what data gaps exist with designated recovery coordinators and work on specific reporting requirements that aid those managers in obtaining the necessary data, and then make an annual report of these data available to managers and the public. We also recommend that the Permits Division require at least basic behavioral response reports from all relatively new procedures that would be permitted. For the purposes of this consultation, this would include Exhaled Breath Sampling since little information is available about how whales respond to this procedure. However, this recommendation applies to all relatively new methodologies including the use of unmanned aerial systems.

3. **Data Sharing**

   We recommend the Permits Division work to establish protocols for data sharing among all permit holders. While many researchers in the community collaborate, having a national standard for data sharing among all researchers permitted by the NMFS will reduce impacts to trusted resources by minimizing duplicated research efforts. We recommend basic information be required from each researcher including the species, location, number of individuals, and age, sex, and identity if known be reported at the expiration of each permit. This information could be further refined based on our second conservation recommendation above and then be made available to all other permit holders and/or applicants, and preferably the public.

4. **Coordination Meetings**

   The Permits Division should continue to work with the NMFS' Regional Offices to conduct meetings among regional species coordinators, permit holders conducting research within a region, and future applicants to ensure that the results of all research programs or other studies on specific threatened or endangered species are coordinated among the different investigators. Such meetings may be a venue to discuss the details outlined in our second conservation recommendation.

In order for the NMFS' Office of Protected Resources Endangered Species Act Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their critical habitat, the Permits Division should notify the Endangered Species Act Interagency Cooperation Division of any conservation recommendations they implement in their final action.

14 REINITIATION OF CONSULTATION

This concludes formal consultation for the Permits Division's proposal to issuance Permit No. 18059. As 50 CFR §402.16 states, reinitiating 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 incidental take is exceeded, (2) new information reveals effects of the agency action that may affect ESA-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 ESA-listed species or critical habitat that was not considered in this opinion, or (4) a new species is ESA-listed or critical habitat designated that may be affected by the action.

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APPENDICES

Appendix A: Draft Permit No. 18059 (February, 15 2017)

*Final permit may have minor changes that would not affect this opinion.

Permit No. 18059

Expiration Date: March 1, 2022

Reports Due: April 30, annually

PERMIT TO TAKE PROTECTED SPECIES[8] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to David Wiley, Ph.D., Stellwagen Bank National Marine Sanctuary, 175 Edward Foster Rd, Scituate, MA 02066 (hereinafter "Permit Holder"), pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*) and the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*).

II. Abstract

The objectives of the permitted activity, as described in the application, are to research is to investigate the foraging ecology, habitat use, physiology, and acoustic and social behavior of large baleen whales in the Gulf of Maine and use these results to enhance ecosystem-based management and mitigate mortality and serious injury of these species in the Great South Channel.

III. Terms and Conditions

[8] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including attachments and appendices. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through March 1, 2022. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, NMFS Office of Protected Resources, pursuant to applicable regulations and the requirements of the MMPA and ESA.

2. Researchers must immediately stop permitted activities and the Permit Holder must contact the Chief, NMFS Permits and Conservation Division (hereinafter "Permits Division") for written permission to resume

   b. If serious injury or mortality[9] of protected species occurs.

   d. If authorized take[10] is exceeded in any of the following ways:

      iv. More animals are taken than allowed in Table 1.

      v. Animals are taken in a manner not authorized by this permit.

      vi. Protected species other than those authorized by this permit are taken.

   e. Following incident reporting requirements at Condition E.2.

3. The Permit Holder may continue to possess biological samples[11] acquired[12] under this permit after permit expiration without additional written authorization, provided the samples are maintained as specified in this permit.

B. Number and Kind(s) of Protected Species, Location(s) and Manner of Taking

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[9] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[10] By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

[11] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

[12] Authorized methods of sample acquisition are specified in Table 1.

1. Table 1 outlines the number of protected species, by species and stock, authorized to be taken, and the locations, manner, and time period in which they may be taken.

2. Researchers working under this permit may collect visual images (e.g., photographs, video) in addition to the photo-identification or behavioral photo-documentation authorized in Table 1 as needed to document the permitted activities, provided the collection of such images does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 18059. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided

    d. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

    e. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

    f. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

    d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

<u>Counting and Reporting Takes</u>

    n. Count and report a take of a cetacean regardless of whether you observe a behavioral response to the permitted activity.

    o. Count and report 1 take per cetacean per day including all approaches in water and attempts to remotely biopsy, breath sample, photograph, tag.

    p. During an approach, Researchers may attempt the procedures in a take table row once.

<u>General</u>

q. Researchers may approach an animal up to 6 times in one day.

r. Researchers must approach animals cautiously and retreat if behaviors indicate the approach may be interfering with reproduction, feeding, or other vital functions.

s. Where females with calves are authorized to be taken, Researchers:

i. Must immediately terminate efforts if there is any evidence that the activity may be interfering with pair-bonding or other vital functions;

ii. Must not position the research vessel between the mother and calf;

iii. Must approach mothers and calves gradually to minimize or avoid any startle response;

iv. Must discontinue an approach if a calf is actively nursing; and

v. Must, if possible, sample the calf first to minimize the mother's reaction when sampling mother/calf pairs.

<u>Biopsy, Tagging, Ultrasound, Breath collection</u>

t. Researchers may attempt (deploy or discharge/fire) each procedure (biopsy, breath sample, and tag) on an animal 3 times a day.

u. A biopsy, breath sample, or tag attachment attempt must be discontinued if an animal exhibits repetitive, strong, adverse reactions to the activity or vessel.

v. Biopsy tips must be sterile before use in the field and disinfected prior to re-use during the same field trip. If the biopsy tip becomes contaminated and is no longer sterile (e.g., missed attempt, contacts seawater, physical contact) prior to use, a new sterile biopsy tip must be used. If a new, sterile biopsy tip is not available, the contaminated tip must be completely cleaned and disinfected following the IACUC-approved protocol described in the application.

w. Females attending calves greater than 6 months of age may be biopsy sampled and/or tagged. Calves of any age or females attending calves younger than 6 months of age may not be tagged or biopsy sampled.

x. Before attempting to biopsy/tag/sample an individual, researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated sampling of any individual.

y. Researchers must not attempt to biopsy or tag a cetacean anywhere forward of the pectoral fin.

Non-target Species

z. For North Atlantic Right Whales:

If a right whale is seen, Researchers must maintain a distance of at least 460 meters (500 yards) from the animal(s). Please report all right whale sightings to NMFS Sighting Advisory System:

- in any location to the U.S. Coast Guard on channel 16
- from VA to ME to 978-585-8473

6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

h. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).

i. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the

i. species and, where known, age and sex;

ii. date of collection, acquisition, or import;

iii. type of sample (e.g., blood, skin, bone);

iv. origin (i.e., where collected or imported from); and

v. legal authorization for original sample collection or import.

j. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

k. The Permit Holder may request approval of Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the

v. name and affiliation of the recipient;

vi. address of the recipient;

vii. types of samples to be sent (species, tissue type); and

viii. type of analysis or whether samples will be curated.

l. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

m. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

n. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E. 3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

a. Principal Investigator – David Wiley, Ph.D.

b. Co-Investigators – See Table 2 for list of names and corresponding activities.

c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to

a. individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

b. individuals included as backup for those personnel essential to the conduct of the permitted activity, and

c. individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

9. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

10. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

11. Submit requests to add CIs or change the PI by one of the following:

d. the online system at https://apps.nmfs.noaa.gov;

e. an email attachment to the permit analyst for this permit; or

f. a hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when

   a. Engaged in a permitted activity.

   b. A protected species is in transit incidental to a permitted activity.

   c. A protected species taken under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reports

4. The Permit Holder must submit incident, annual, and final reports containing the information and in the format specified by the Permits Division.

   a. Reports must be submitted to the Permits Division by one of the following:

      iv. the online system at https://apps.nmfs.noaa.gov;

      v. an email attachment to the permit analyst for this permit; or

      vi. a hard copy mailed or faxed to the Chief, Permits Division.

   c. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

5. Incident reports: must be submitted within two weeks of a serious injury or mortality, or exceeding authorized takes, as specified in Conditions A.2.

   c. The incident report must include a complete description of the events and identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

   d. If the total number of mortalities is reached or takes have been exceeded:

      iii. in addition to the written report, the Permit Holder must contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than within two business days of the incident.

iv. the Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

6. Annual reports describing activities conducted during the previous permit year (from 03/01 to 02/28) must

   a. be submitted by April 30 each year for which the permit is valid, and

   b. include a tabular accounting of takes and a narrative description of activities and effects.

4. A final report summarizing activities over the life of the permit must be submitted by September 1, 2022, or, if the research concludes prior to permit expiration, within 180 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division.

F. Notification and Coordination

1. The Permit Holder must provide written notification of planned field work to the applicable NMFS Region at least two weeks prior to initiation of each field trip/season. If there will be multiple field trips/seasons in a permit year, a single summary notification may be submitted per year.

   c. Notification must include the

      i. locations of the intended field study and/or survey routes;

      ii. estimated dates of activities; and

      iii. number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant "in training").

   d. Notification must be sent to the following Assistant Regional Administrator for Protected Resources to the location of your activity:

      For activities in ME, VT, NH, MA, NY, CT, NJ, DE, RI, MD, and VA: Greater Atlantic Region, NMFS, 55 Great Republic Drive, Gloucester, MA 01930; phone (978)281-9328; fax (978)281-9394

      Email (*preferred*): NMFS.GAR.permit.notification@noaa.gov

3. To the maximum extent practical, the Permit Holder must coordinate permitted activities with activities of other Permit Holders conducting the same or similar activities on the same species, in the same locations, or at the same times of year

to avoid unnecessary disturbance of animals. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by

   a. allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe permitted activities; and

   b. providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part

   a. in order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under section 103 of the MMPA and section 4 of the ESA;

   b. in a case in which a violation of the terms and conditions of the permit is found;

   c. in response to a written request[13] from the Permit Holder;

   d. if NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and

   e. if NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.

[13] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

c. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.

d. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder

a. agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;

b. acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

c. acknowledges that this 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.

Donna S. Wieting

Director, Office of Protected Resources

National Marine Fisheries Service

Date Issued

David Wiley, Ph.D.

Research Coordinator,

Stellwagen Bank National Marine Sanctuary

Permit Holder

Date Effective

Table 1 Specifying the Kinds of Protected Species, Location, and Manner of Taking

Table 1: Authorized annual takes by harassment of marine mammals during aerial and vessel surveys in the Gulf of Maine. Animals may be taken more than once per year during surveys.								
Line	Species	Stock/ Listing Unit	Lifestage	Number of Takes	Takes Per Animal	Take Action	Procedures	Details
1	Whale, fin	Western North Atlantic Stock (NMFS Endangered)	Calf	2	3	Harass/ Sampling	Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to 10 adult/juveniles and 2 calves may be suction cup tagged and approached up to 3 times to obtain blow. 1 - 4 samples taken from each animal. Calves will not be tagged prior to June and will be >~7.5m in length. An animal could receive up to 2 tags.
2			Adult/ Juvenile	10				
3				20			Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	Up to 20 adult/juveniles and up to 3 calves on the feeding, but not breeding, ground will be approached up to 3 times each for tag placement. Calves will not be tagged prior to the month of June and will be >~7.5m in length. An animal could receive up to 2 tags. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity.
4			Calf	3				
5	Whale, fin	Western North Atlantic	Adult/ Juvenile	30	3	Harass/ Sampling	Photo-id; Photograph/Video; Sample, fecal ; Sample, skin and blubber biopsy	Up to 30 animals will be approached up to 3 times each for biopsy sampling.

Table 1: Authorized annual takes by harassment of marine mammals during aerial and vessel surveys in the Gulf of Maine. Animals may be taken more than once per year during surveys.								
Line	Species	Stock/ Listing Unit	Lifestage	Number of Takes	Takes Per Animal	Take Action	Procedures	Details
6		Stock (NMFS Endangered)	All	30		Harass/ Sampling	Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	Up to 30 animals will be approached up to 3 times each for the purpose of photo-identification for inclusion in regional data bases.
7	Whale, fin	Western North Atlantic Stock (NMFS Endangered)	All	480	1	Harass	Incidental harassment	Up to 480 animals that might be in groups being tagged, sampled for exhaled gas, biopsied or photographically identified could be incidentally harassed.
8	Whale, humpback	Western North Atlantic Stock (NMFS Endangered)	Calf	2	3	Harass/ Sampling	Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to 10 adult/juveniles and up to 2 calves, may be suction cup tagged and approached up to 3 times to obtain blow. We will take 1 - 4 samples from each animal. Calves will not be tagged prior to the month of June and will be >~7.5m in length. An animal could receive up to 2 tags.
9			Adult/ Juvenile	10				
10	Whale, humpback	Western North Atlantic	Adult/ Juvenile	40	3	Harass/ Sampling	Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF,	Up to 40 adult/juveniles and up to 8 calves on the feeding, but not breeding ground, will be

Table 1: Authorized annual takes by harassment of marine mammals during aerial and vessel surveys in the Gulf of Maine. Animals may be taken more than once per year during surveys.								
Line	Species	Stock/ Listing Unit	Lifestage	Number of Takes	Takes Per Animal	Take Action	Procedures	Details
		Stock (NMFS Endangered)					TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	approached up to 3 times for tag placement. Calves will not be tagged prio to the month of June (~6 months in age) and will be > ~5 m in length. Some animals might receive two tags. Animals will be followed for behavioral sequencing observations and active acoustics will be used to map prey in the vicinity of the animals.
11	Whale, humpback	Western North Atlantic Stock (NMFS Endangered)	Calf	8	3	Harass/ Sampling		
12			Adult/ Juvenile	30			Observations, behavioral; Photo-id; Photograph/Video; Sample, skin and blubber biopsy	Up to 30 animals will be approached up to 3 times each for the purpose of biopsy.
13			All	50			Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	Up to 50 animals will be approached up to 3 times each for the purpose of photo-identification for inclusion in regional data bases.
14				690	1	Harass	Incidental harassment	Up to 690 animals that might be in groups being tagged, sampled for exhaled gas, biopsied or photographically identified could be incidentally harassed.
15	Whale, minke		Adult/ Juvenile	7	3	Harass/ Sampling	Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF,	Up to 7 animals will be approached up to 3 times each for the purpose of suction cup

Table 1: Authorized annual takes by harassment of marine mammals during aerial and vessel surveys in the Gulf of Maine. Animals may be taken more than once per year during surveys.								
Line	Species	Stock/ Listing Unit	Lifestage	Number of Takes	Takes Per Animal	Take Action	Procedures	Details
							TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	tag placement. Some animals might receive two tags.
16		Canadian East Coastal Stock		3			Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, exhaled air; Sample, fecal	Up to 3 animals, may be suction cup tagged, as well as approached up to 3 times to obtain expired gas (blow). We will take 1 - 4 samples from each animal.
17				30			Photo-id; Photograph/Video; Sample, fecal ; Sample, skin and blubber biopsy	Up to 30 animals will be approached up to 3 times each for biopsy sampling.
18			All	20	3		Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	Up to 20 animals will be approached up to 3 times each for the purpose of photo-identification for inclusion in regional data bases.
19	Whale, minke	Canadian East Coastal Stock	All	250	1	Harass	Incidental harassment	Up to 250 animals that might be in groups being tagged, sampled for exhaled gas, biopsied or photographically identified could be incidentally harassed.
20	Whale, sei	Nova Scotia Stock (NMFS	Adult/ Juvenile	10	3	Harass/ Sampling	Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF,	Up to 10 adult/juveniles and up to 2 calves, will be approached up to 3 times each for the

Table 1: Authorized annual takes by harassment of marine mammals during aerial and vessel surveys in the Gulf of Maine. Animals may be taken more than once per year during surveys.								
Line	Species	Stock/ Listing Unit	Lifestage	Number of Takes	Takes Per Animal	Take Action	Procedures	Details
21		Endangered)	Calf	2		Harass/	TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, exhaled air; Sample, fecal	purpose of suction cup tag placement. Some animals might receive two tags. Up to 10 adult/juvenile and 2 calves, that have already been suction cup tagged, will be approached up to 3 times to obtain blow. We will take 1 - 4 samples from each animal. Calves will not be tagged prior to June and will be >~7.5m in length.
22				1			Acoustic, passive recording; Acoustic, sonar for prey mapping; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	Up to one calf, on the feeding but not breeding grounds, could be approached up to 3 times for the purpose of suction cup tag placement. Calves will not be tagged prior to June and will be >~7.5m in length.
23			Adult/ Juvenile	30			Photograph/Video; Sample, fecal ; Sample, skin and blubber biopsy	Up to 30 animals will be approached up to 3 times each for biopsy sampling.
24			All	30			Observations, behavioral; Photo-id; Photograph/Video; Sample, fecal	Up to 30 animals will be approached up to 3 times each for the purpose of photo-identification for inclusion in regional data bases.

Table 1: Authorized annual takes by harassment of marine mammals during aerial and vessel surveys in the Gulf of Maine. Animals may be taken more than once per year during surveys.								
Line	Species	Stock/ Listing Unit	Lifestage	Number of Takes	Takes Per Animal	Take Action	Procedures	Details
25	Whale, sei	Nova Scotia Stock (NMFS Endangered)	All	370	1	Harass	Incidental harassment	Up to 370 animals that might be in groups being tagged, sampled for exhaled gas, biopsied or photographically identified could be incidentally harassed.

*Takes = the maximum number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

NMFS-Approved Personnel for Permit No. 18059.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name of Co-Investigator	Activities
Alessandro Bocconcelli	Tagging activities and photo-ID in support of tag operations
Ari Friedlaender	All research activities
Susan Parks	Tagging activities and photo-ID in support of tag operations