# NATIONAL MARINE FISHERIES SERVICE
# ENDANGERED SPECIES ACT SECTION 7
# BIOLOGICAL OPINION

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| **Title:** | Biological and Conference Opinion on the Issuance of Permit No. 20556 and its Subsequent Modification (Permit No. 20556-01) to the Georgia Department of Natural Resources, Responsible party Jonathan P. Ambrose, for Research on North Atlantic Right 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 Agencies:** | Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service |
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# 1 INTRODUCTION

The Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 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 or endangered species (ESA-listed), or designated critical habitat that may be affected by the action that are under NMFS jurisdiction (50 C.F.R. §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 species under NMFS jurisdiction, consultation concludes informally (50 C.F.R. §402.14(b)).

The Federal action agency shall confer with the NMFS for species under NMFS jurisdiction on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 C.F.R. §402.10). If requested by the Federal agency and deemed appropriate, the conference may be conducted in accordance with the procedures for formal consultation in §402.14.

Section 7(b)(3) of the ESA requires that at the conclusion of consultation and conference, NMFS provides an opinion stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. If NMFS determines that the action is likely to jeopardize ESA-listed species or destroy or adversely modify 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 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 NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter the Permits Division). The Permits Division proposes to issue a scientific research permit (Permit No. 20556, Appendix A) and then modify this permit (to become Permit No. 20556-01) pursuant to section 10(a)(1)(A) of the ESA and section 104 of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 USC 1361 et seq.) to the Georgia Department of Natural Resources (GA DNR), Responsible party Jonathan P. Ambrose, 2070 U.S. Highway 278 SE, Social Circle, Georgia 30025-4711. 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 applicant to conduct scientific research on North Atlantic right whales (*Eubalaena glacialis*) in the Atlantic Ocean and Gulf of Mexico. The purpose of the proposed modification to the permit is to authorize the use of a new tag technology, fully-piercing tags, pending results of testing.

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 defined by regulation (50 C.F.R. §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." NMFS does not have a regulatory definition of "harass." We rely on our interim guidance, which interprets harass as to "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 C.F.R. §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"

For purposes of this action, harassment is 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 (Level B Harassment). Under NMFS regulation, Level B harassment does not include an act that has the potential to injure a marine mammal or marine mammal stock in the wild.

NMFS' interim ESA harass definition does not perfectly 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 the MMPA and ESA, our and the Permit Division's ESA analysis may result in slightly different outcomes compared to the Permit Division's MMPA analysis, depending on the action. Given that the MMPA definition of harass involves two different levels, neither of which is completely synonymous with our interpretation of harass under the ESA, there may be circumstances in which an act is considered harassment, and thus take, under one statute but not the other. NMFS intends to further explore the similarities and differences between harassment under the MMPA and ESA to determine whether additional steps should be taken relative to the interpretation of the two statutes when taking actions regarding ESA-listed marine mammals.

This consultation, biological and conference opinion (opinion), and incidental take statement, were completed by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division (hereafter referred to as “we”) in accordance with section 7(a)(2) and 7(b) of the statute (16 U.S.C. 1536 (a)(2)), associated implementing regulations (50 C.F.R. §402), and agency policy and guidance.

This document represents NMFS opinion on the effects of the proposed issuance of Permit No. 20556 on blue whales (*Balaena musculus*), bowhead whales (*Balaena mysticetus*), fin whales (*Balaena physalus*), Gulf of Mexico Bryde’s whales (*Balaenoptera edeni*, unnamed subspecies), North Atlantic right whales, sei whales (*Balaena borealis*), sperm whales (*Physeter macrocephalus*), green turtles (*Chelonia mydas*, North Atlantic Distinct Population Segment [DPS]), hawksbill turtles (*Eretmochelys imbricata*), Kemp’s ridley turtles (*Lepidochelys kempii*), leatherback turtles (*Dermochelys coriacea*), and loggerhead turtles (*Caretta caretta*, Northwest Atlantic Ocean DPS). A complete record of this consultation is on file at NMFS Office of Protected Resources in Silver Spring, Maryland.

## 1.1 Background

GA DNR has been conducting research on North Atlantic right whales since at least 1998 and has previously held at least three NMFS scientific research permits authorizing research on North Atlantic right whales in the Atlantic Ocean and Gulf of Mexico (Permit Nos. 0594-1467 [1998-2004], 594-1759 [2005-2011], and 15488 [2011-2017]). These past permits issued to GA DNR authorized a variety of research activities including most the activities proposed under Permit No. 20556 such as aerial surveys, vessel surveys, close approaches, documentation, and biological sampling. Previous consultations considering the issuance of permit to GA DNR all resulted in biological opinions concluding that their issuance was not likely to jeopardize the continued existence of ESA-listed species, nor adversely modify designated critical habitat (NMFS 1998; NMFS 2005a; NMFS 2011a). The only research activity that GA DNR has not been authorized to conduct under previous permits is tagging. However, we have previously consulted on numerous research permits involving tagging of large whales, all resulting biological opinions that concluded this activity was not likely to jeopardize the continued existence of ESA-listed species, nor adversely modify designated critical habitat (e.g., NMFS 2017a; NMFS 2017b; NMFS 2017c). In this consultation, we build upon on our long-term evaluation of GA DNR’s research activities from previous consultations, consider their previous permits as part of the environmental baseline (Section 7), and evaluate the effects of authorizing GA DNR to conduct the proposed research under Permit No. 20556.

## 1.2 Consultation History

This opinion is based on information provided in the permit application (GA DNR 2017), correspondence and discussions with the Permits Division and the applicant, previous biological opinions for research permits issued to GA DNR and other researchers for similar activities (NMFS 1998; NMFS 2005a; NMFS 2011a; NMFS 2016a; NMFS 2017b; NMFS 2017c; NMFS 2017e), annual reports from GA DNR's previous research (NMFS 2011b; NMFS 2017g), 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 July 27, 2016, the Permits Division provided us a copy of the initial permit application and informed us that they may seek consultation on the proposed Permit No. 20556, likely as part of a batch consultation with another permit (Permit No. 20527)
- On September 13, 2016, the Permits Division provided us with their comments for the applicant on the initial permit application and asked for our review.
- On September 28, 2016, we provided our review of the initial permit application and requested additional information and clarification from the applicant and the Permits Division.
- On November 16, 2016, we met with the Permits Division to discuss our concerns with the use of invasive tags on North Atlantic right whales given the 2016 death of a Southern Resident DPS Killer whale (*Orcinus orca*) that may have been related to invasive tagging (Haulena 2016; NMFS 2016c).
- On November 29, 2016, the Permits Division informed us that they no longer wished to batch Permit No. 20556 with Permit No. 20527 given that the two permits differed in their timeline and several aspects of the proposed research activities.
- On January 3, 2017, the Permits Division sent us an updated permit application and requested additional review.
- On January 31, 2017, we provided the Permits Division our review of the updated application, which included minimal comments and requests for clarification and additional information. At this time, we also notified the Permits Division that the applicant addressed the majority of our concerns with invasive tagging of North Atlantic right whales.
- On March 14, 2017, the Permits Division sent us an updated application and requested additional review and a species list based on the research area for Permit No. 20556. We reviewed the updated application this same day and notified the Permits Division that we had no additional comments.
- On March 20, 2017, we provided the Permits Division a list of ESA-listed species and designated critical habitat (and proposed species and critical habitat) based on the applicant's research area.

- On March 23, 2017, the Permits Division provided us an updated application that included an expansion of the study area. We reviewed the updated application and had no comments or questions.
- On June 1, 2017, the Permits Division provided additional information on the expanded study area and requested a revised species list. On the following day, we provided the Permits Division with a revised species and critical habitat list based on the applicant's expanded research area.
- On June 6, 2017, the Permits Division informed us that they received substantial comments from the U.S. Marine Mammal Commission regarding the proposed, new, fully-piercing tags that would be used under Permit No. 20556, and as a result the applicant was working to update the application to address these concerns. At this time, the Permits Division also notified us that they may not initially authorize the use of fully-piercing tags. Instead, they may modify the permit soon after its initial issuance in order to authorize fully-piercing tags (which would result in Permit No. 20556-01). Modification would occur once the applicant has completed additional testing and addressed the concerns of the U.S. Marine Mammal Commission and any additional comments and concerns received during public comment.
- On June 14, 2017, the Permits Division sent us an initiation package and memorandum requesting initiation of formal consultation on the issuance of Permit No. 20556.
- On June 22, 2017, we provided the Permits Division our review of the initiation package, detailing that we were unclear on some aspects of the proposed action and that additional information was needed prior to initiation formal consultation.
- On June 29, 2017, we met with the Permits Division to discuss our review of the initiation package. During this meeting, the Permits Division provided clarification on the proposed action, notably that the permit would initially be issued not including fully-piercing tags, but would be modified soon after to include them, and that they wished to consult on both the issuance of the original Permit No. 20556 and its subsequent modification to Permit No. 20556-01 simultaneously. As the result of the additional information and clarification provided at this meeting, we determined the initiation package to be complete.
- On July 10, 2017, we sent the Permits Division a memorandum informing them that we initiated formal consultation on the issuance of Permit No. 20556 on June 29, 2017. In this memorandum, we acknowledged the Permit Division's request to have consultation completed on or before November 1, 2017, which we would try meet, but noted that by statute, we have until November 10, 2017, to complete consultation.
- On July 12, 2017, the Permits Division provided the applicant's responses to several questions we raised concerning fully-piercing tags in our June 29, 2017, meeting.
- On August 1, 2017, the Permits Division provided us a final annual report for GA DNR's previous permit (Permit No. 15488).

- On August 4, 2017, we reviewed the applicant's response to our questions concerning fully-piercing tags and had no further questions. At this time, we requested and updated draft permit from the Permits Division and requested clarification on when the applicant would be authorized to conduct aerial surveys.
- On August 7, 2017, the Permits Division provided us an updated draft Permit No. 20556 that removed the fully-piercing tags.
- On October 5, 2017, we expressed concern to the Permits Division regarding their proposal to allow researchers to tag North Atlantic right whales within invasive tags up to 20 centimeters away from sensitive areas (e.g., blowhole, eyes, etc.), and requested they seek additional information on researchers' tagging accuracy.
- On October 6, 2017, the Permits Division provided us information from experienced researchers on their tagging accuracy. On this day also we provided the Permits Division a draft of the proposed action for their review, and in this document, suggested a 30 centimeter distance, which we felt was more practical (e.g., it approximates one foot, a standard U.S. unit of measure, and was informed by the response on researchers' accuracy) and provided better protection for North Atlantic right whales.
- On October 12, 2017, the Permits Division provided their review of the proposed action and agreed to our suggested 30 centimeter distance restriction away from sensitive areas. Consequently, they provided an updated application to reflect new permit conditions regarding this new distance restriction.
- On October 20, 2017, we provided the Permits Division a draft of our conservation recommendations regarding the issuance of Permit No. 20556 for their review and consideration.

# 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 C.F.R. §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 C.F.R. §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 spatial extent of the action area.

*Status of Endangered Species Act Protected Resources* (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 any species and designated critical habitat not likely to be adversely affected (Section 6.1).

*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, and impacts of state or private actions that are contemporaneous with the consultation in process.

*Effects of the Action* (Section 8): We identify the stressors that are likely to result from the proposed action, any measures that will be taken to mitigate or minimize exposure of ESA-listed resources to the stressors, the number (and age or life stage, and gender, if possible) 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 C.F.R. §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 preceding analyses 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 a 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 (Section 12) 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 C.F.R. §402.14 (i). We also provide discretionary conservation recommendations (Section 13) that may be implemented by the action agency. 50 C.F.R. §402.14 (j). Finally, we identify the circumstances in which reinitiation of consultation is required (Section 14). 50 C.F.R. §402.16.

To comply with our obligation to use the best scientific and commercial data available, we collected information 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)
- National Oceanic and Atmospheric Administration (NOAA) technical memoranda
- 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. The research permit would allow an exception to the moratoria and prohibition on takes established under the ESA and MMPA in order to allow GA DNR to conduct scientific research on North Atlantic right whales and in doing so, incidentally harass sei whales and several non-ESA listed cetaceans. The purpose of GA DNR's research is to contribute to North Atlantic right whale population monitoring, identify and reduce human causes of mortality and serious injury, monitor and protect North Atlantic right whale habitat, and cooperate with NMFS to implement the North Atlantic Right Whale Recovery Plan (NMFS 2005b). Permit No. 20556 would authorize GA DNR to take ESA-listed North Atlantic right and sei whales and several non-ESA-listed cetacean species. Table 1 below displays the annual takes of ESA-listed species that would be authorized under Permit No. 20556. For research permits, the Permits Division counts one take per cetacean per day including all approaches[1] and procedure attempts, regardless of whether a behavioral response to the permitted activity is observed.

[1] An "approach" is defined as a continuous sequence of maneuvers involving a vessel, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for sperm and baleen whales (excluding minke whales) and 50 yards for all other cetaceans.

**Table 1:** Proposed annual takes of Endangered Species Act listed species that would be authorized under Permit No. 20556.

| Species | Stock/ Listing Unit | Life stage | No. of Takes[2] | Take Action | Procedures | Details |
|---|---|---|---|---|---|---|
| Whale, right, North Atlantic | Western Atlantic Stock (NMFS Endangered) | All | 100 | Harass | Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-identification; Photogrammetry; Photograph/Video; Tracking | Aerial surveys. Most aerial surveys will occur at 1000 feet and will not result in takes; aircraft may descend to 500 feet altitude for photogrammetry and other imaging. |
| | | | 500 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial; Sample, exhaled air; Sample, fecal; Tracking | Level B boat activities including Photo-identification, unmanned aerial system overflights, and post-tag monitoring. Most whales will be taken one to three times per year, a few may be taken up to 10 times per year. |
| | | Non-neonate/ Juvenile/ Adult | 95 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-identification; Photogrammetry; Photograph/Video; Remote vehicle, aerial; Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking | Biopsy sampling and associated activities on yearlings[3], juveniles[4], and adults. Individual whales will only be sampled successfully once per year (Nov-Oct). Animals may be approached on a second day if biopsy sampling is not successful on the first day. |

[2]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.
[3]Yearling North Atlantic right whales were born in the previous calving season (November 1- October 31) and are estimated to be approximately one year old; however, depending on the actual birthdate and month of resighting, "yearlings" could be 8-14 months in age. Definitive identification of individuals and actual age determination may not occur until after field work is completed.
[4]North Atlantic right whales are defined as juveniles if: (1) they are known to have been born the previous calving year (November 1- October 31 of the following year); (2) they are alone and have well defined callosities, or (3) they have well-defined callosities, and if associated with another whale, are greater than one-half the associated whale's body length.

| Species | Stock/ Listing Unit | Life stage | No. of Takes[2] | Take Action | Procedures | Details |
|---|---|---|---|---|---|---|
| Whale, right, North Atlantic | Range-wide (NMFS Endangered) | Non-neonate calf | 60 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-identification; Photogrammetry; Photograph/Video; Remote vehicle, aerial; Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking | Biopsy sampling and associated activities on non-neonate[5] calves (approximately three weeks to seven months). Calves will only be sampled successfully once per year (Nov-Oct) among all permit holders. Animals may be approached on a second day if biopsy sampling is not successful on the first day. |
| | | Non-neonate/ Juvenile/ Adult | 20 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup; Observation, monitoring; Observations, behavioral; Photo-identification; Photogrammetry; Photograph/Video; Remote vehicle, aerial; Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking | Tagging and associated activities on yearlings, juveniles, and adults including moms without neonate calves. A maximum of 15 animals successfully tagged per year (including all tag types). Up to five animals may receive one suction-cup and one dart tag per year. Animals may be approached on a second day if both tagging and biopsy cannot be completed on the same day. |
| | | Non-neonate | 200 | Import/ export/ receive only | Import/export/receive, parts | Export right whale skin and blubber samples for genetics analysis. |
| Whale, sei | Range-wide (NMFS Endangered) | All | 50 | | Incidental harassment | Incidental harassment of whales that are closely associated with North Atlantic right whales during boat and aerial surveys and unmanned aerial system approaches. |

[5]North Atlantic right whale neonates are defined by: (1) fetal folds present on body; (2) few cyamids on head or lip and smooth rostrum; (3) flaccid flukes; (4) raised or "periscoped" blowholes relative to nuchal region; (5) thin or "tubular" body shape; (6) movements appear clumsy and uncoordinated; and (7) activity that stays near surface or surfaces frequently to breath.

The proposed research would encompass a variety of activities including aerial surveys (manned and unmanned), vessel surveys, close approaches, documentation (e.g., photography, videography, observation, etc.), biological sampling (fecal, sloughed skin, exhaled breath, and biopsy), and tagging. The proposed permit amendment would authorize the use of an additional tag type, termed a fully-piercing tag, to be used in accordance with the take depicted in Table 1. Thus, the amendment would not authorize additional take, just an additional tag type. During research activities non-target cetaceans that are in association with North Atlantic right whales, including ESA-listed sei whales, may be incidentally harassed. These research activities are individually described in more detail below. Further information can be found in the permit application (GA DNR 2017).

GA DNR would also be authorized to import and export North Atlantic right whale parts, samples, and specimens collected under Permit No. 20556, as further described below, or from legal sample collection performed by other researchers. However, since these activities would have no effects on ESA-listed species outside of the sample collection, the act of exporting and importing is not discussed further in this opinion.

### 3.1 Manned Aerial Surveys

Manned aerial surveys have long been used by researchers to collect important information on the occurrence, abundance, and habitat use of cetaceans. The Permits Division proposes to authorize GA DNR to take North Atlantic right and sei whales as detailed in Table 1 by means of harassment (incidental for sei whales) during manned aerial surveys. The objectives of manned aerial surveys are to collect photo-identification data, reduce vessel strikes by submitting near-real-time North Atlantic right whale sighting data to commercial and military vessels via the Early Warning System (https://www.nefsc.noaa.gov/psb/surveys/SAS.html), monitor southeastern U.S. North Atlantic right whale habitat, document dead, injured and entangled North Atlantic right whales, and provide real-time whale sighting data to vessel teams conducting work under Permit No. 20556 and the Marine Mammal Health and Stranding Response Program.

For manned aerial surveys, GA DNR proposes to use De Havilland Twin Otters, Cessna Skymasters or other manned fixed-wing aircraft flown at speeds of 185 to 204 kilometers per hour and altitudes of approximately 305 meters. During standard manned aerial surveys two or more experience marine mammal observers would search for cetaceans using the naked eye as the aircraft traverses a pre-determined transect line. Once a North Atlantic right whale is sighted, the aircraft would break off the transect line and circle over the whale for 15 to 30 minutes in order to collect photographic, videographic, and behavioral data before returning to the transect line to complete the survey. Occasionally, aircraft would descend lower than 305 meters (minimum altitude 152 meters) in order to collect additional photographs or video if necessary.

In addition to conducting standard manned aerial surveys on pre-determined transect lines, GA DNR would conduct opportunistic and special purposes manned aerial surveys. These may be in response to possible North Atlantic right whale sightings made by other platforms, including injured, sick, dead, entangled, tagged, out-of-habitat and out-of-season whales, or in an effort to assist vessel based researchers under Permit No. 20556 in sighting and tracking North Atlantic right whales. Flight parameters would generally be the same as described above for standard manned aerial surveys except that additional fixed-wing aircraft and turbine-powered helicopters (e.g., Bell 206 and 407) may be used if standard survey aircraft are unavailable. Opportunistic and special purpose manned aerial surveys may also require longer circling above whales. GA DNR estimates that circling times for sick and injured whales would be between 30 and 60 minutes and for out of habitat or entangled whales, circling may last anywhere from two to eight hours. As with standard manned aerial surveys, altitudes would be 305 meters or greater, unless additional photographs or video are needed, resulting in descents to no less than 152 meters. If helicopters are used, circling above whales would typically not last longer than 30 minutes (unless assisting in entanglement response) and altitudes would be 152 to 229 meters.

### 3.2 Vessel Surveys, Close Approaches, and Documentation

Vessel surveys are the primary means by which cetacean researchers collect data as they provide a platform to collect a wealth of information on cetacean biology. The Permits Division proposes to authorize GA DNR to take North Atlantic right and sei whales as detailed in Table 1 by means of harassment (incidental for sei whales) as the result of close approaches and documentation during vessel surveys. As mentioned previously in section 3.1, vessel surveys would often be conducted in conjunction with manned aerial surveys. Here we describe the proposed vessel surveys and associated close approaches and documentation (e.g., photography, observation, etc.) more generally and then detail additional research activities (unmanned aerial surveys, biologically sampling, and tagging) that would sometimes occur during vessel surveys in separate sections below.

GA DNR proposes to conduct two types of vessel surveys: “on effort” vessel surveys, when effort (i.e., vessel track lines) data are collected, and “off effort” vessel surveys, when effort data are not collected. Both types of surveys would utilize a small vessel (six to eight meters in length) powered by one to two outboard engines. During on effort surveys, the vessel would traverse pre-determined or haphazard track lines within the action area at speeds of approximately 16 to 22 knots while three or more experience marine mammal researchers (one being the driver) search for North Atlantic right whales. These surveys would only be conducted during daylight hours and in good weather conditions (e.g., visibility greater than three kilometer and a Beaufort sea state of less than five). During off effort vessel surveys, researchers would typically be responding to North Atlantic right whale sightings reported by the aerial survey team or other platforms, and as such, they would not occur along any pre-determined track lines. However, vessel operations would be the same as described above with the exception that fewer researchers may be on board (minimum of two, a driver and an observer) since the focus is to investigate specific whale sightings, not to search widely for whales.

Regardless of survey type, once a whale is spotted within one kilometer, the vessel would reduce its speed to 10 knots or less and approach alongside the animal(s) (i.e., not directly from behind or head on) to within 10 to 15 meters in order to obtain photographs and video of both sides of the animal for photo-identification and to assess health (Pettis et al. 2004). Occasionally, the vessel may approach the whale to within one vessel length to obtain higher resolution photographs if the whale’s behavior is amenable. If a whale approaches the vessel on its own, the driver would slowly move the vessel away or place the vessel in neutral and allow the whale to leave on its own.

In addition to photographic and videographic documentation during the close approach associated with vessel surveys, researchers would collect behavioral and environmental data through focal follows. During focal follows, researchers would follow an individual whale or group of whales at a distance of approximately 100 meters to minimize potential harassment from the research vessel. Vessel speed would vary depending on whale behavior but would range from floating adrift to 10 knots or less. Researchers would collect photographs, video, and data on environmental conditions, group size, association types, time at surface, respirations and behaviors defined in the North Atlantic right whale Consortium photo-identification database (Kenney 2014). Environmental data would be collected using onboard or hand-held electronics (e.g., EcoSense EC300A conductivity meter, YSI, Yellow Springs, OH; GPSMAP 7612xsv chart plotter and GT51M-TM transducer, Garmin, Olathe, Kansas). In addition, researchers would collect passive acoustic data using small towed arrays (e.g., GeoSpectrum Technologies, Dartmouth, NS) or corded single-element hydrophones (e.g., HTI-96-MIN hydrophone, High Tech Inc., Long Beach, Mississippi) deployed over the side of the boat. While passive acoustic recordings would typically be conducting during typical focal follow vessel operations as described above (i.e., 10 knots or less and at 100 meters or more), occasionally recordings may be conducted at distances as close as 20 meters if the whale's behavior is amenable. Nonetheless, if a whale approaches the vessel during passive acoustic recording, the hydrophone(s) would be removed from the water immediately and the vessel would slowly maneuver away from the whale or go into neutral to let the whale pass. Focal follows would typically last for 30 to 60 minutes but may be longer if the whale’s behavior is amenable to additional data collection.

In addition to the documentation and data collection described above, during vessel surveys researchers may attempt additional research activities such as unmanned aerial surveys, biological sampling, and tagging, depending on the whale’s behavior, environmental conditions, and data needs. Each of these activities is further described below.

### 3.3 Unmanned Aerial Surveys

With recent advances in unmanned aircraft systems (UAS), researchers are now conducting unmanned aerial surveys to provide information similar to that obtained with manned aerial surveys, as well as novel datasets. The Permits Division also proposes to authorize GA DNR to take North Atlantic right and sei whales as detailed in Table 1 by means of harassment (incidental for sei whales) during unmanned aerial surveys. The primary goal of unmanned aerial surveys is to collect photo-identification and photogrammetry images, video, behavioral and health assessment data, and exhaled breath samples (further detailed in Section 3.4.2). Given the rapidly evolving field of UAS, the exact models and flight parameters that would be used during unmanned aerial surveys may change over the course of the permit. As such, here we describe the methods that are currently proposed, and recognize that variations of these methods would be authorized under Permit No. 20556, as long as they are expected to cause similar or lower levels of harassment and disturbance to cetaceans.

The UASs that would be used during unmanned aerial surveys would be short endurance platforms such as a hexacopter equipped with a camera system and exhaled breath sampling equipment (e.g., sterile well plates). Currently, GA DNR anticipates using APH-22 hexacopters [Aerial Imaging Solutions, Old Lyme, Connecticut;(Durban et al. 2015)] or DJI-S1000 octocopters (DJI Ltd., Shenzhen, China). UASs would be deployed from research vessels by hand by a crew of at least three (a vessel driver, UAS pilot, and observer). Unmanned aerial surveys would only be conducted during daylight hours, in winds less than 37 kilometers per hour, visibility greater than 5.6 kilometers, and within line of sight of the pilot. In addition, on board video equipment would provide the pilot with a real time video feed from the UAS. The pilot would be licensed by the U.S. Federal Aviation Administration and all UAS operations would comply with all certification and operating requirements specified in the U.S. Federal Aviation Administration's Small Unmanned Aircraft Rule (14 CFR Part 107). UAS would be flown at a maximum altitude of 122 meters, with descents to approximately 15 to 30 meters to collect images and video, and to approximately 1.5 to three meters to collect breath samples depending on animal behavior (lower altitudes may be used if a whale is resting at the surface). Flight durations would generally not exceed 15 minutes, as limited by battery capacity, whale behavior, and environmental conditions.

## 3.4 Biological Sampling

Biological samples from free ranging cetaceans allow researchers to address numerous important questions regarding animals' ecology, physiology, health, and relatedness and population structure. The Permits Division proposes to authorize GA DNR to collect a variety of different biological samples from North Atlantic right whales as specified in Table 1 including feces, sloughed skin, and skin and blubber through biopsy sampling. Methods for obtaining each of these types of samples are described below.

### 3.4.1 Fecal and Sloughed Skin

Fecal and sloughed skin sampling are well-established noninvasive sample collection methods that can be used to assess reproductive hormones, stress, parasites, red tide effects, diet composition, energetics, nutrition, and genetics (Amos et al. 1992; Hunt et al. 2013). The collection of feces and sloughed skin does not usually require approaching animals directly. However, fecal and sloughed skin sampling could take place in the vicinity of whales, and due to this potential for close proximity, the Permits Division proposes to authorize GA DNR to collect these samples in the vicinity of North Atlantic right whales during vessel surveys as specified in Table 1. When feces or sloughed skin are observed in the water, researchers would approach the sample (not the whale) and collect it with a hand held net from the vessel. In addition, sloughed skin that is attached to tags (see Section 3.5 below) may also be collected. As no particular whale is expected to be "taken" during fecal and sloughed skin, there is no limit on the number of samples that can be taken, but the researcher would only be authorized to take the number of North Atlantic right whales listed in Table 1 as a result of the close approaches that may occur during fecal and sloughed skin sampling.

### 3.4.2 Exhaled Breath Sampling

A relatively new noninvasive methodology that GA DNR would be authorized to conduct under Permit No. 20556 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). To collect exhaled breath samples from whales, researchers would use a UAS. UAS operations would follow those previously described for unmanned aerial surveys, with the addition that during exhaled breath sampling, the pilot would attempt to position the UAS as close as five feet above the blowhole of a North Atlantic right whale prior to it taking a breath. At no time is the UAS expected to make contact with the animal. The sampling material would consist of sterile well plates affixed to the UAS with hook and loop fasteners. Researchers would be authorized to attempt to collect an exhaled breath sample from an individual up to three times per day, but must discontinue efforts if an animal exhibits repetitive, strong, adverse reactions.

### 3.4.3 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. 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). The Permits Division proposes to authorize GA DNR to biopsy sample North Atlantic right whales as detailed in Table 1. Biopsy sampling would be authorized for both sexes and for all non-neonate age classes (i.e., three weeks and older). Biopsy sampling of calves is necessary because after calves leave the breeding grounds in the southeastern U.S., it can be exceedingly difficult track them and establish parentage with photographic and genetic data collected on the foraging grounds or in subsequent years on the breeding grounds if no initial genetic data are available. No intentional repeat (within a year) biopsy sampling of any age class would be authorized. However, researchers would be authorized to attempt to biopsy sample an individual up to three times per day, and on more than one day if initial attempts are unsuccessful. Nonetheless, researchers must discontinue efforts to biopsy sample an animal if it exhibits repetitive, strong, adverse reactions. Researchers would be authorized to resample individuals across years.

Biopsy sampling would always follow photographic identification as described above in order to ensure that the targeted individual has not already been sampled that year and to provide photographs of the sampled individual to later be associate with the genetic data.

When high quality, identifiable photographs of the target individual have been obtained and researchers have confirmed the animal has not previously been sample and is of appropriate age, the vessel would approach the whale in a similar fashion as described above with the exception that the vessel may get slightly closer, to within approximately 10 meters (seven to 20 meters) of the target animal(s). Once the whale is within range, a projectile biopsy dart would be deployed from a crossbow, compressed air gun, or modified 0.22 caliber rifle (see Noren and Mocklin 2012 for review of various projectile methods). Biopsy samples would typically be taken from the dorsal or lateral surface of the animal, and no biopsy sampling forward of the pectoral fins would be authorized. Once the biopsy dart hits the animal, it would recoil, fall into the water, and float for retrieval by boat.

Biopsy dart tips would be made of stainless steel and collect a sample of skin and blubber (i.e., would not penetrate into the muscle layer) no larger than 10 millimeters in diameter and 40 millimeters deep. Penetration depth would be controlled by a cushioned stopper that does not allow the dart to penetrate greater than 40 millimeters. Prior to field work, biopsy tips would be disinfected[6] according to an Institutional Animal Care and Use Committee (IACUC) approved procedure. GA DNR's current protocol involves cleaning biopsy tips with detergent, bleach and water, disinfecting them with 90 percent ethyl alcohol, and then flaming the tips. After sterilization, tips would be stored in sterile whirl-pacs until use. If a biopsy tip becomes contaminated in the field (e.g., missed attempt) and a new biopsy tip is not available, researchers would re-clean biopsy tips following the above methods before they are used again.

### 3.5 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). The Permits Division proposes to authorize GA DNR to tag North Atlantic right whales under Permit No. 20556 with suction-cup and/or dart/barb tags as specified in Table 1. In addition, the Permits Division proposes to modify Permit No. 20556, resulting in Permit No. 20556-01, to authorize the use of an additional, fully-piercing tag that is currently under development. Researchers would be authorize to tag both males and females (including pregnant females and females with dependent calves, but not neonates), and all animals estimated to be eight months of age and older. Up to five animals per year would be authorized to receive both a suction-cup and a dart/barb tag simultaneously. Researchers would be authorized to attempt to tag an individual up to three times per day and on subsequent days if the initial attempt is unsuccessful. However, if an animal exhibits repetitive, strong, adverse reactions to tagging attempts, researchers must discontinue tagging efforts. No within year repeat tagging would be

[6] Disinfection = eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects usually by liquid chemicals (Rutala and Weber 2008).

authorized, but researchers would be authorized to re-tag an individual in subsequent years. Researchers would not be authorized to attempt to tag an individual that appears to be compromised (e.g., appears to be in poor health, exhibiting unusual behavior) based on a pre-tagging health assessment. Below we describe the specifications of each proposed tag type according to the attachment mechanism, followed by a description of the methods used to deploy tags, which are similar across tag types, and GA DNR's phase in plan for the new, fully-piercing tag.

### 3.5.1 Tag Types

Tagging technologies for cetaceans are rapidly advancing (Nowacek et al. 2016; Szesciorka et al. 2016). As such, the exact specifications of the tags that GA DNR would use over the five-year duration of its permits are not known at this time. However, below we describe the tags that are currently available and thus, would be authorized under Permit No. 20556, and those that are under development and would authorized under the modified Permit No. 20556-01. Any modifications to these tags would only be authorized if they are expected to have the same or lesser impacts to animals (i.e., smaller, lighter, reduced risk of injury, etc.). GA DNR proposes to use two different types of currently available tags, as distinguished by their attachment mechanism. These include partially penetrating tags called Type II tags (referred to as dart/barb tags in Table 1), and non-penetrating tags called Type III tags (referred to as suction-cup tags in Table 1) (ONR 2009). In addition, GA DNR proposes to use a novel, fully-piercing tag that is currently under development. While fully-piercing tags are partially penetrating, and thus could be considered Type II tags, we describe them separately given their novel attachment mechanism and that they would only be authorized for use following a modification to the original permit. In their application, GA DNR notes that they will select tag models based on their ability to allow researchers achieve their research goals while having the least impact on whales. Furthermore, regardless of the tag used, GA DNR will ensure that the frontal area of the tag is not greater than one percent of the frontal area of the animal and that the total weight of the tag in water is no more than 0.1 percent of the animal's total body weight.

*Type II*

Type II tags consist of tags in which a portion of the tag such as metal darts, barbs, or pins penetrate the animal's tissue for attachment, while the electronic package of the tag remains outside of the animal's body. These tags are designed for medium durations, lasting from a week to several months, and for use on both small and large cetaceans. Type II tags can be archival meaning researchers must recover the tag to download data, or non-recoverable with all data being transmitted via satellite. A variety of Type II tags currently exist including Low Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) tags, Whale Lander tags, Dermally Attached Short-term (DASH) tags, suction-cup style tags modified to include darts to increase duration, and a variety of modified versions of these tags (Figure 1) (NMFS 2017b).

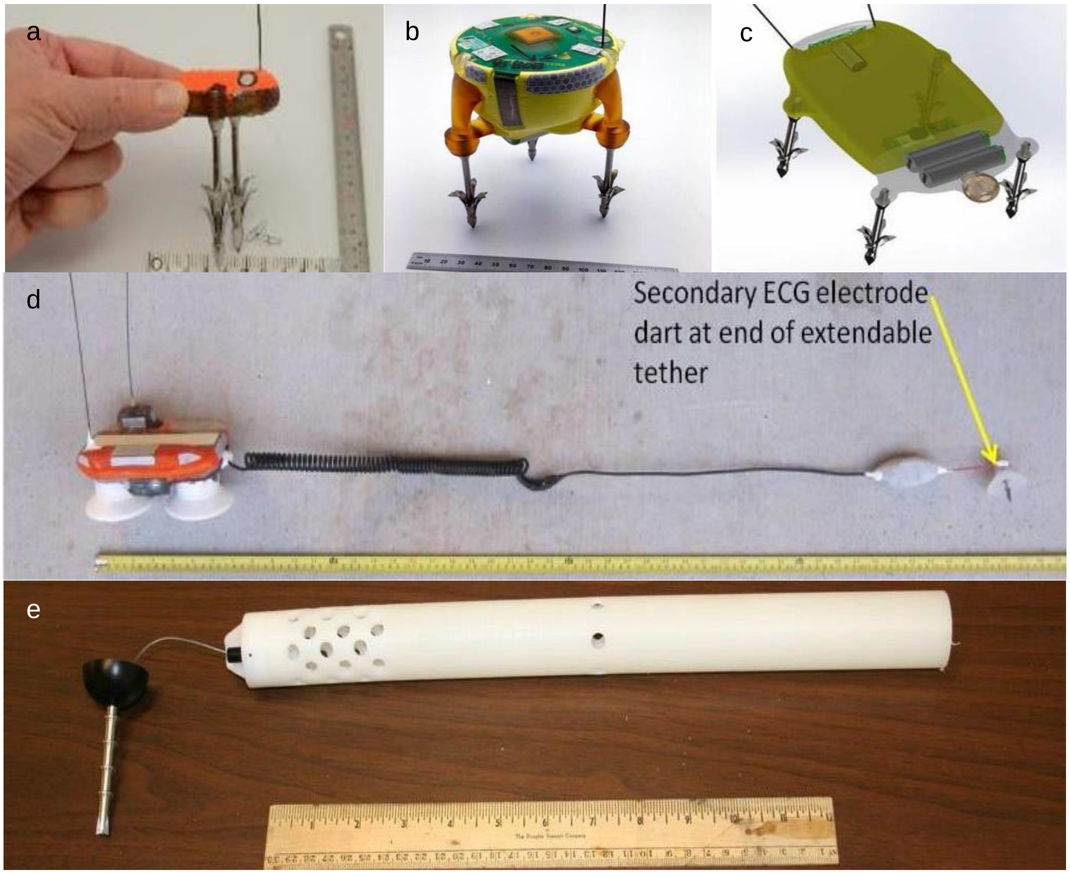


**Figure 1:** Example Type II tags. a) Low Impact Minimally Percutaneous External-electronics Transmitter tag, b) Whale Lander tag, c) alternate design of a Multi-sensor, Multi-dart tag with four darts, d) Multi-sensor behavioral and physiological recording tag with primary electrodes in darts of main tag body (under suction cups) and secondary electrode in dart at end of tether, e) Dermally Attached Short-term tag (NMFS 2017b).

The penetrating portions of Type II tags are typically made of surgical grade stainless steel or high-grade titanium, which are attached to the electronic portion of the tag encased in an epoxy and urethane housing. However, in the future (if approved by an IACUC and the Permits Division) they may be constructed from a biocompatible polymer, such as silicone, nylon or Delrin or other biocompatible, or bioabsorbable materials, including polyglycolic acid, polylactic acid, or hydrogels. Type II tags are designed to remain solely within the blubber layer when deployed on the dorsal surface of large cetaceans such as North Atlantic right whales. Given the variety of currently available Type II tags and the constant advances in tag technology, the exact size, weight, and depth and number of penetration points of Type II tags that would be used under Permit No. 20556 is not known. Thus, all current models represent examples of tag specifications that could be used.

Current location-only LIMPET tags (SPOT6, Figure 1a) measure 55 millimeters by 48 millimeters by 21 millimeters and weigh 49 grams without darts (Andrews et al. 2015). They are typically attached with two or three darts measuring 65 to 100 millimeters in length, with retention barbs between five and 30 millimeters long, making for a maximum tag weight of 90 grams. Current Whale Lander tags (Figure 1b), which are archival, utilize the same dart attachment system as LIMPET tags and measure 8.9 centimeters in diameter and 6.5 centimeters tall (NMFS 2017b). An alternate design multi-sensor, multi-dart tag currently under development (Figure 1c) would be similar in size to LIMPET and Whale Lander tags, and attach with four LIMPET style darts. Modified Type III suction-cup style tags also exist in which LIMPET style darts (e.g., Figure 1d) are added to suction-cups to increase attachment, and or add additional physiological sensors. DASH tags (Figure 1e) differ from most other Type II tags in that they use a short needle for anchoring, which is then attached to a free-floating tag (approximately 35 millimeter in diameter and 350 grams) via a corrosive tether (Baumgartner et al. 2015). Despite having two components when attached, DASH tags are designed to be a contiguous projectile when fired at the whale, and only after attachment would the tag housing separate from the needle and float alongside the whale. Current DASH models use needles less than 10 centimeters in length and 6.4 millimeters in diameter, with raised rings or pins to prevent early detachment, and a stopper to control penetration depth. Regardless of the specific tag used, GA DNR propose a maximum penetration depth of 10 centimeters, which would almost always be above the muscle-blubber interface for North Atlantic right whales (mean ± standard deviation = 12.23 ± 2.16 centimeters, n = 172, Miller et al. 2011).

Type II tags contain a variety of sensors depending on the tag model and research objective. These include but are not limited to satellite transmitters, time-depth-recorders, acoustic time-depth-recorders, video cameras, accelerometers, other 3-dimensional movement sensors, and physiological sensors such as a thermistor or electrocardiogram sensors that may be contained within darts attached to a tether. Given that archival tags must be located after detaching from the whale, these tags always have a Global Positioning System unit and/or a very high frequency radio transmitter to aid in tag recovery. While some archival Type II tags may contain remote release functions or corrosive links that can be used to detach the electronic package of the tag, the penetrating portion of the tag always detaches via natural outward foreign body migration. Type II tags typically remain within whales for only a few days or up to several months (Andrews et al. 2015; Baumgartner et al. 2015; Citta et al. 2012; Szesciorka et al. 2016).

*Type III*

Type III tags consist of tags that use a non-invasive, non-penetrating attachment systems. These tags are designed for short durations, only lasting hours up to several days, and can be used on all cetacean species. Most Type III tags are archival and attach to cetaceans using either rigid or non-rigid rubber or silicon suction-cups. A variety of current Type III tags exist including National Geographic Crittercams, Digital Acoustic Recording tags (e.g., Figure 2), Acousonde tags, Customized Animal Tracking Solutions tags, among others.

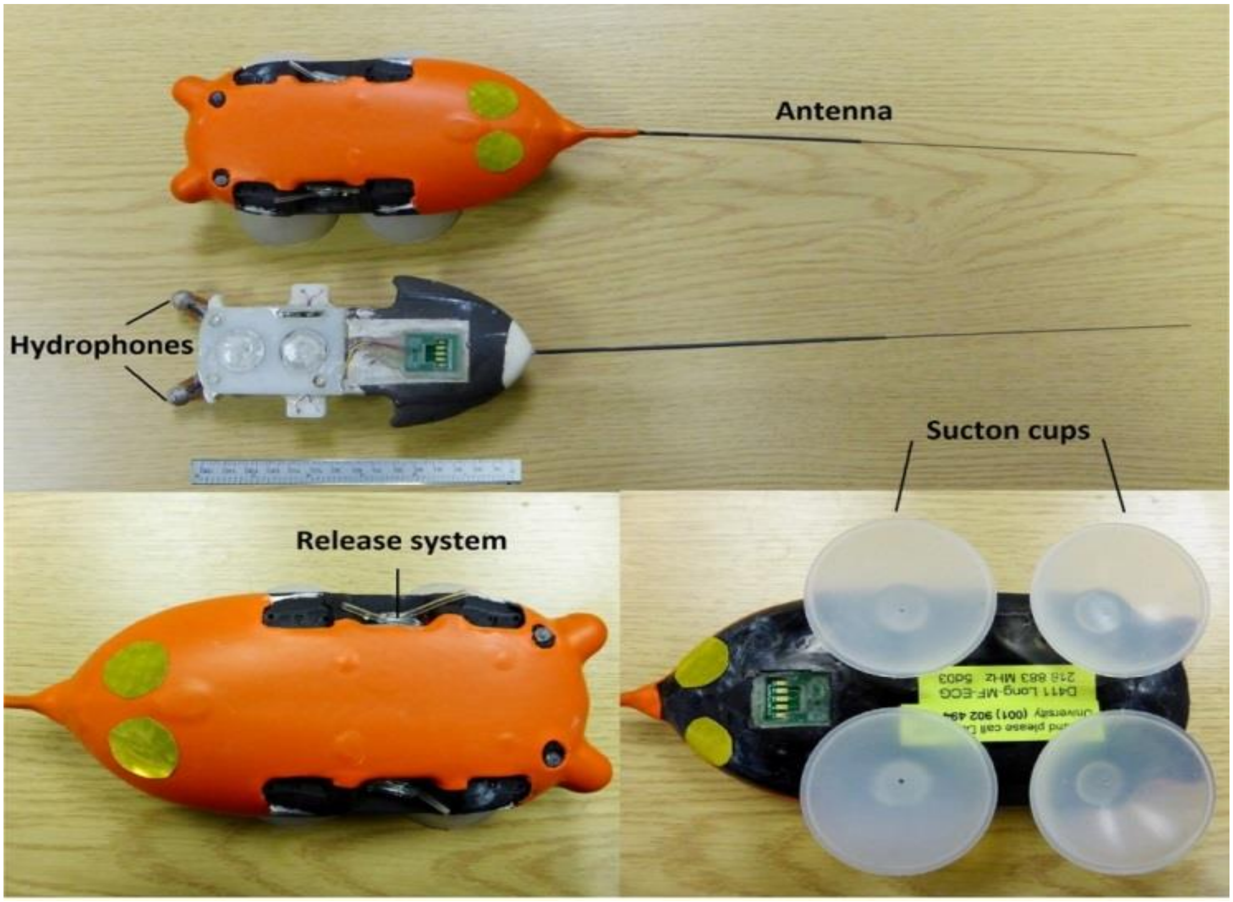


**Figure 2:** Example Digital Acoustic Recording Tag, Version 3. http://soundtags.st-andrews.ac.uk/dtags/

Type III tags are typically small measuring approximately 30 centimeters by 12 centimeters by 4 centimeters or less and weighing 500 grams or less, but heavier video camera tags such as Crittercam tags weighing approximately 1100 grams exist. Type III tags usually consist of an electronic package housed in a mixture of glass microspheres and polyethylene resin encased within or attached to a non-compressible foam or plastic floatation system to aid in recovery. Depending on the specific tag model, one or several suction-cups may be used ranging in size from three to 30 centimeters in diameter, which may be lubricated with silicon grease or other non-reactive substances to improve the seal between the cup and skin. Suction-cup tags can be attach passively when the cup contacts the whale or actively with a vacuum, Venturi device, or one-way valves that create suction as the whale dives.

As with Type II tags, Type III tags contain a variety of sensors including time-depth-recorders, acoustic recorders, video cameras, temperature sensors, accelerometers, pressure sensors, accelerometers, light sensors, gyroscopes, among others. Given that Type III tags are almost always archival, they typically have a very high frequency radio transmitter, Global Positioning System unit, and/or strobe light to aide in tag recovery. Suction-cup tags mostly rely on passive release that occurs when the suction-cup seal breaks contact with the skin, but some tag models are equipped with release mechanism. Regardless, suction-cup tags only remain attached to animals for minutes up to several days before falling off (Szesciorka et al. 2016).

*Fully-piercing*

Recently, GA DNR has begun development of a novel tag technology, termed a fully-piercing tag. This tag utilizes the same tag packages previously described for Type II tags but relies on a unique attachment mechanism of pins that fully penetrate (i.e., enter and exit) the animal's tissue. This fully-piercing attachment method is based on tags that have long been deployed on beluga whales (Martin and Smith 1992; Orr et al. 1998) and is aimed at improving tag longevity while further minimizing tag impacts. As the tag is currently under development, the exact specifications are not known at this time. As such, below we describe the range of specifications that GA DNR plans to test. Any modifications to these specifications would only be authorized in the permit modification if the expected impacts are the same or lesser than those that would result from the original specifications in the permit application.

Instead of attaching to whales via vertically penetrating darts as most Type II tags do, often with associated barbs and petals, fully-piercing tags would attach via one to two smooth (i.e., no barbs/petals) pins inserted horizontally through the animals surface (Figure 3). Pins would be constructed of a biocompatible material (stainless steel, titanium, polymers) approved for use in long-term human implantation and that have not been shown to cause adverse tissue reactions in cetaceans (Geraci et al. 1985; Geraci and Smith 1990). To spread out the force, pins may be oblong in shape rather than cylindrical. Regardless, they would not exceed 30 centimeters in length and three centimeters in thickness, and would not penetrate deeper (i.e., perpendicular to the animals body surface) greater than 10 centimeters. Once passed fully through the animal's tissue, each end of the pin(s) would be attached to the tag's electronic package. The exact means by which pins would attach to the tag package is currently unknown but once fully attached, the tag is expected to show some, but minimal movement as the whale swims (i.e., the attachment will not be fully rigid, but the tag will also not continuously move around).

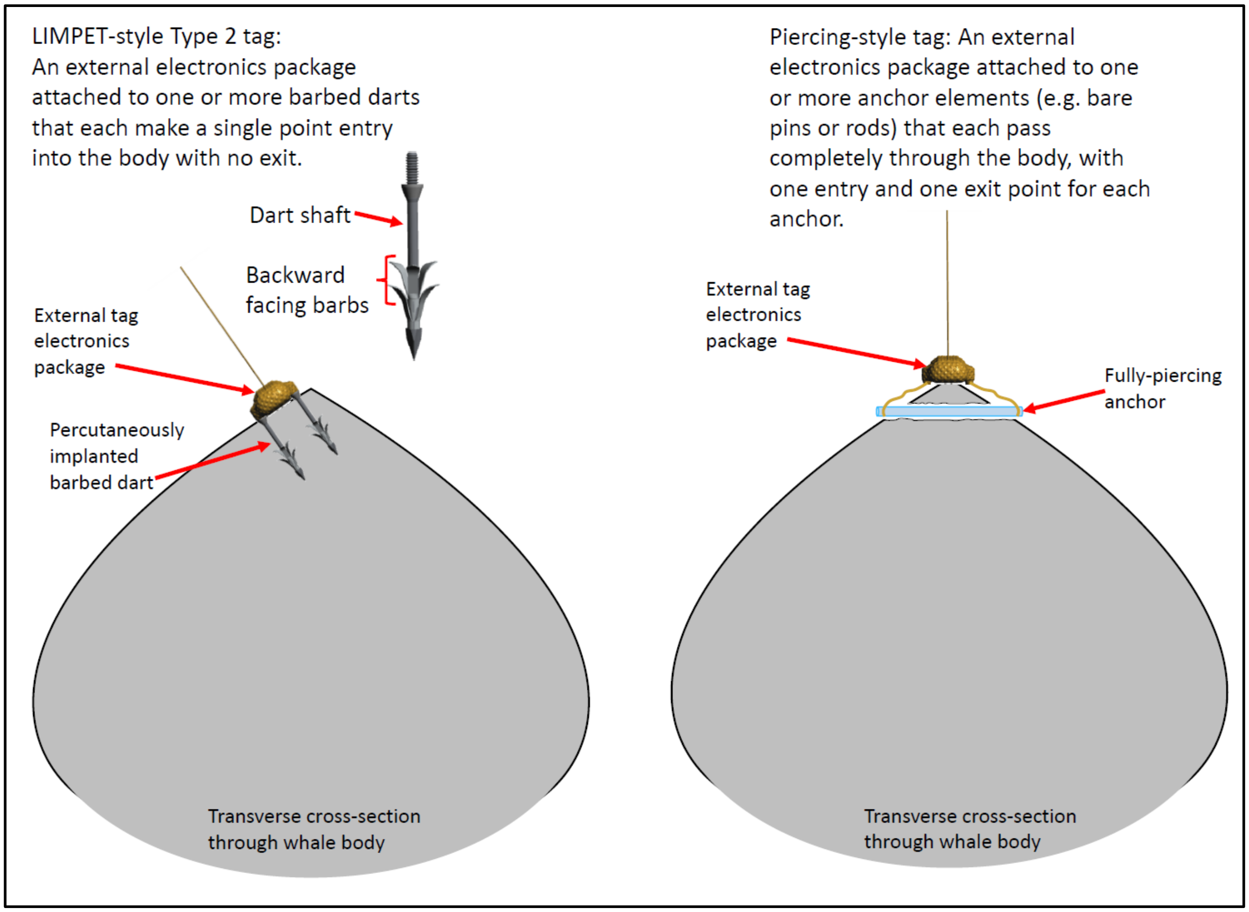


**Figure 3. Typical dart/barb attachment method of a Low Impact Minimally Percutaneous External-electronics Transmitter tag (LIMPET) style tag (left) vs. the proposed fully-piercing attachment method.**

Since fully-piercing tags would rely on the same electronic packages described previously for Type II tags (including any new and updated electronic packages that may become available during the life of the permit), they may contain any number of the previously described sensors and may be archival or non-recoverable. In addition, we anticipate that fully-piercing tags would be designed to either release passively [i.e., through natural migration of the pins as seen in beluga whales (*Delphinapterus leucas*) (Martin and Smith 1992; Orr et al. 1998)] or be equipped with a release mechanism such as corrosive links. While the duration of these tags is currently unknown, we anticipate that if they are not equipped with a release mechanisms, they will remain attached to whales anywhere from several days, up to a maximum of a year based on similar tag deployments in beluga whales (Hauser et al. 2017; Hobbs et al. 2005; Richard et al. 2001; Smith et al. 2017; Suydam et al. 2001).

### 3.5.2 Tag Sterilization

All tags parts that penetrate the skin (i.e., darts/barbs/pins) would be sterilized[7] prior to deployment. GA DNR's current method of sterilization consists of first scrubbing the tag parts with detergent, then rinsing them with distilled water, followed by sterilization via ethylene oxide gas or another IACUC approved method. It is important to note that GA DNR does not currently have an approved IACUC protocol, but are in the process of establishing one. Accordingly, even though Permit No. 20556 may be authorized prior to GA DNR's IACUC approval, no biopsying or tagging would be authorized until GA DNR's biopsy and tagging sterilization protocols have been approved by an IACUC. After sterilization, the tag parts would be kept in individual sterilization packages until use. Manipulation of penetrating parts during and after sterilization, immediately before deployment, would be carried out with surgical gloves or other sterilized equipment. If a tags become contaminated in the field (e.g., missed attempt), GA DNR would not be authorized to use them again until they are re-sterilized using gas sterilization or another method approved by their IACUC. To further reduce the possibility of infection from penetrating tags, topical or integrated slow-release antibiotics may be integrated into or coat the penetrating portions of the tags. The method of antibiotic coating would similar to the method used by Mate et al. (2007), which utilizes 2.5 grams of gentamicin sulfate mixed into a delayed release polymethacrylate-based copolymer, spread over a surface are of 80 square centimeters. Other more effective methods may be used when they become available as long as they are approved by an IACUC and the Permits Division.

### 3.5.3 Tag Deployment

Prior to tag deployment, researchers would perform a pre-tagging health assessment to ensure that any whales targeted for tagging are not compromised, which may increase the chances of adverse effects from tagging. Health of whales would be assessed based on visual observation and photography of physical characteristics as described in Pettis et al. (2004) and further detailed in the application (GA DNR 2017). Briefly, health would be assessed based on post-nuchal fat, skin condition, blowhole rake marks, and cyamids. Whales would not be tagged if any of these features indicates the animal is in poor health. In addition, whales would not be tagged if they exhibit wounds estimated to be greater than eight centimeters in depth or have other injuries that appear to correspond with poor health (Knowlton and Kraus 2001).

Tag deployments would take place either when whales approach the research vessel on their own or during directed vessel approaches as described in Section 3.1, but in some cases with closer proximity to whales (as close as three meters). In addition, a second research vessel, which would follow the same operating procedures as described above, may be used to assist in tagging efforts. Both boats would only approach animals within 100 meters if their behavior is amenable. Photographs and video of the targeted individual will be captured before tagging in order to

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[7] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (Rutala and Weber 2008)

identify the individual to be sure it has not been previously tagged. A variety of deployment methods would be used to attach tags to North Atlantic right whales. The exact method of deployment would depend on the tag type and available equipment but possibly deployment methods include the use of pneumatic rifles, crossbows, black-powder guns, hand-held poles, or jab sticks (e.g., Figure 4). With projectile methods, the tag would be placed in a tag holder at the tip of an arrow/bolt, which slides into the flight groove of the crossbow or the barrel of the rifle prior to firing (e.g. Figure 4). On contact with an animal, the arrow/bolt would fall away and be retrieved, leaving only the tag attached to the animal. When hand-held poles (three to seven meters in length) are used, researchers would extend the pole over the side of the research vessels during close approaches and manually place the tag on the whale (e.g., Figure 4).

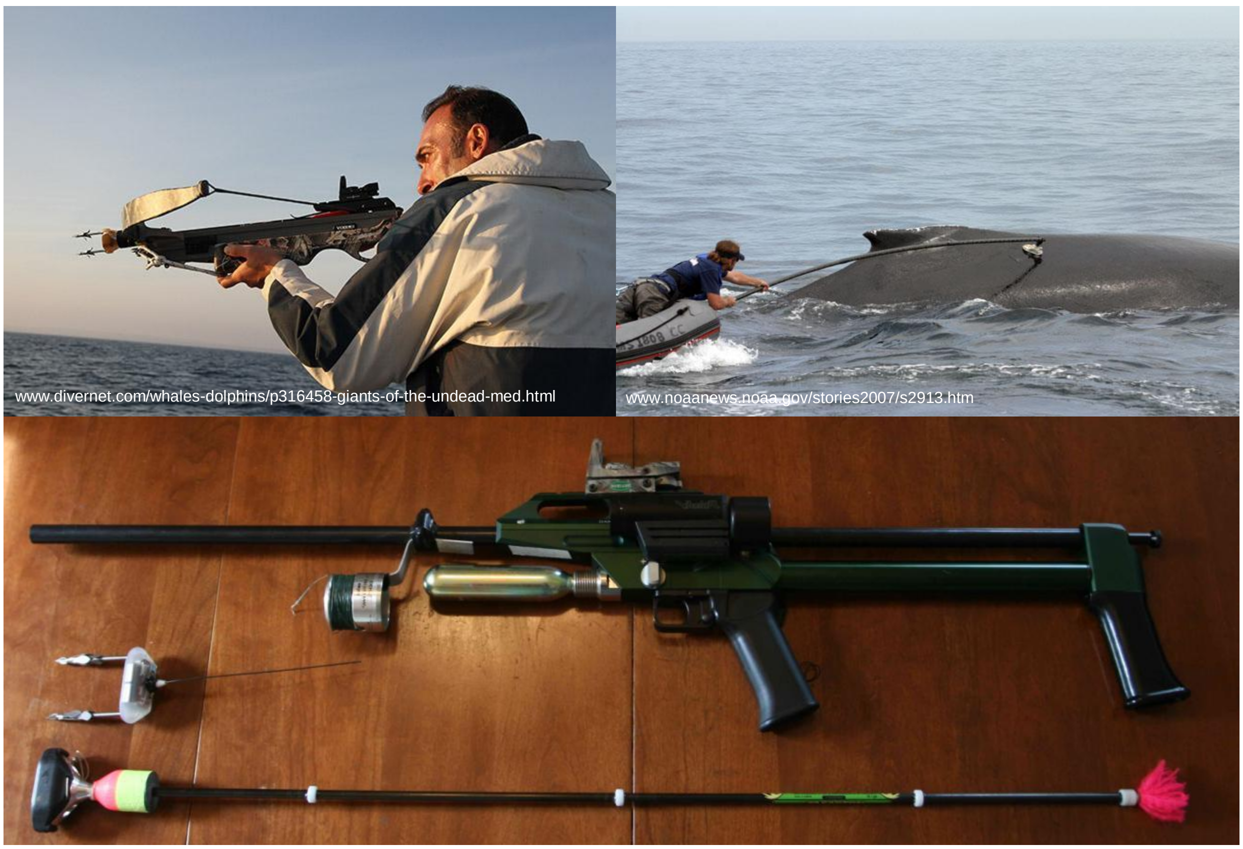


**Figure 4:** Example of crossbow equipped with Low Impact Minimally Percutaneous External-electronics Transmitter tag (left), example of suction-cup tag deployment with hand-held pole (right), example of a pneumatic rifle with bolt, tag holder, and Low Impact Minimally Percutaneous External-electronics Transmitter tag (bottom) (CRC 2017).

Given their novel attachment mechanism, a unique pole system would be used to deploy full-piercing tags (Figure 5). The current vision for the fully-piercing tag deployment system makes use of a long pole equipped with a pneumatic device that would fire a pin (or two if two pins are being used) through the animals tissue on contact with the whale at two points (both sides of deployment arm as seen in Figure 5). Unlike projectile methods, this system would allow researchers to dictate the exact placement of the tag and carefully control the amount of force used (using the minimum force needed) to penetrate the animal's tissue. If the device fails to make contact with the whale on both sides of the deployment arm, the device would not fire and thus there is no way for the system to "miss". The penetration depth (vertical, from above the tag) would be dictated by the dimensions of the deployment arms, which as currently proposed would allow for a penetration depth of 10 centimeters, the maximum penetration depth GA DNR propose to use for any type of tag. The horizontal (i.e., along the axis of the pneumatic barrel and pin) penetration distance would be no more than the length of the pin itself, currently proposed to be 30 centimeters. If for some reason the pin does not fully penetrate the animal's tissue (e.g., not enough force is used), and thus does not exit and make contact with the opposite side of the deployment arm, it would easily fall or be pulled out (as the research pulls the pole away) through the original entry point since the pin is not equipped with any barbs or petals. GA DNR has already begun testing this fully-piercing tag deployment system on carcasses to determine various system parameters including tissue compliance, tensile and shear strength, and ballistic penetration resistance. With additional testing (on carcass, tissue surrogates, and live mysticetes in other countries under other permits, see Section 3.5.5 below), the specifics of the system will likely become further adjusted and solidified. Nonetheless, the above description provides the general deployment system that would be authorized for use with fully-piercing tags under the proposed permit modification.

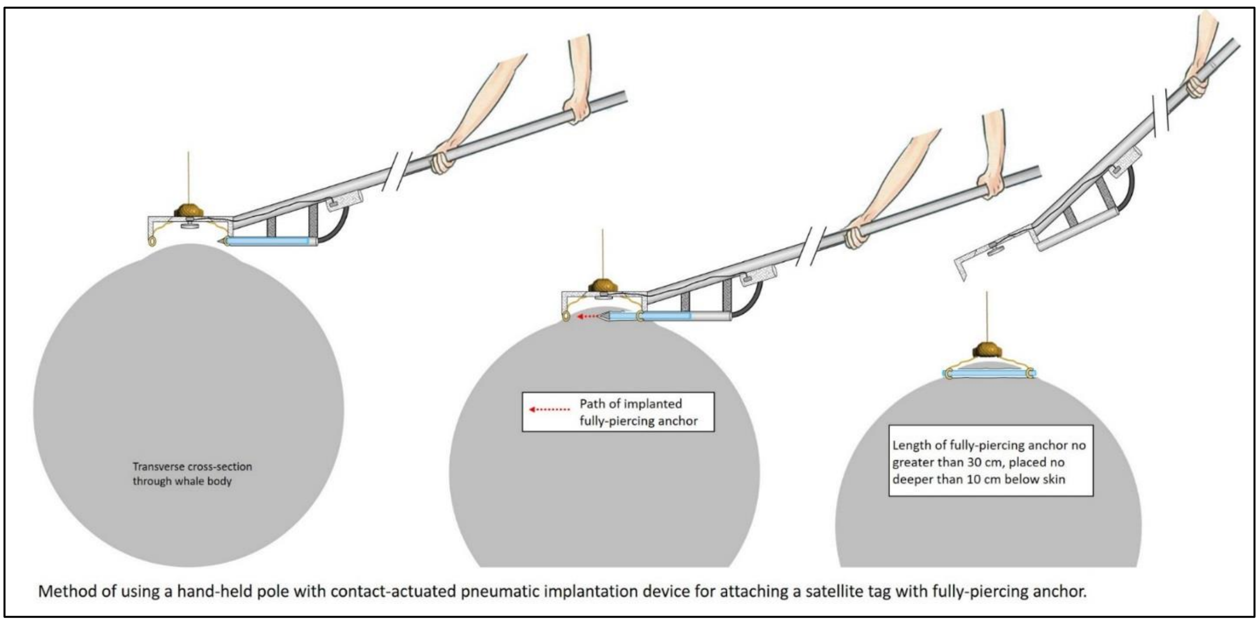


**Figure 5.** Schematic of pneumatic device for applying tags with fully-piercing anchors using a pole.

GA DNR would be authorize to simultaneously deploy more than one tag on any given individual as specified in Table 1 using a combination of the methods described above. Deploying multiple tag types is necessary in order to address research objectives that span multiple time periods (e.g., short-term, day to week studies, to long-term month to year studies). When using multiple tags on whales, GA DNR would be authorized to deploy one invasive tag and one non-invasive tag (e.g., one Type II tag and one Type III tag). The deployment of multiple tags on a single whale may be accomplished on a single surfacing, when possible, or may occur on multiple surfacings typically with the non-invasive tag being deployed first.

The location tags would be placed on North Atlantic right whales would vary according to the tag type. Tags that utilize transmitters (very high frequency, GPS, Argos) would be placed on the whale's dorsal surface, typically near the animal's mid-line in order to maximize time above water during surfacing bouts and minimize impacts on behavior. Non-transmitter tags such as acoustic tags or Crittercam tags would also be placed on the animal's dorsal surface, but also other parts of an animal as long as the location of the tag would not be expected to impair the animal's ability to carry out species typical behaviors. In particular, the area near the blowhole, eyes, mouth, genitals, flippers, and flukes would be avoided. Typically, the Permits Division also does not authorize tagging of cetaceans forward of the pectoral fin (e.g., NMFS 2017c). However, in their original permit application, GA DNR requested permission to tag North Atlantic right whales forward of the pectoral fin in order to position tags as high as possible, to increase chances of successful satellite transmission. In doing so, they noted that they would avoid tagging within 20 centimeters of sensitive areas (e.g., blowhole, eyes, etc.). In the original draft permit, the Permits Division proposed to authorize such tagging, having reviewed it with NMFS Marine Mammal and Sea Turtle Conservation Division's Veterinary Medical Officer.

During consultation we expressed concern regarding this distance from sensitive locations for two reasons. First, 20 centimeters appeared arbitrary and, to our knowledge, was not based any estimate of researchers' tagging accuracy. For example, if researchers are only accurate to within 10 centimeters (i.e., researchers can successful place tags to within 10 centimeters or less of the desired location), than this 20 centimeter restriction may very well result in tags being placed only 10 centimeters away from sensitive areas, a distance we felt drastically increases the chances of adverse effects. Second, 20 centimeters is not a common measurement used in the U.S. (i.e., 20 centimeters does not approximate any standard unit in the imperial system, which is likely more familiar to U.S. based researchers), and so we questioned researchers ability to estimate 20 centimeters accurately when tagging whales in the field.

As a result, we requested the Permits Division seek information on tagging accuracy from several highly experienced large whale tagging researchers. Four researchers responded to the Permits Divisions inquiry, and their responses, which the Permits Division shared with us, indicated that accuracy is variable and highly dependent on both the individual's experience and the environmental conditions (e.g., wind, waves, swell, whale and vessel movement, etc.). Some noted accuracy to within 10 centimeters is often achievable, while others indicated accuracy can be as poor as 100 centimeters. Based on this new information, and the need to establish a practical distance that could be easily estimated in the field, we suggested that the Permits Division require GA DNR avoid sensitive areas by at least 30 centimeter. This distance approximates one foot, a measurement U.S. researchers should be very familiar with, and provides an addition 10 centimeter buffer (the best accuracy noted in responses from experienced taggers) to protect whales' sensitive areas from the potential injury that tags my cause. The

Permits Division again seeked the Veterinary Medical Officer's review, who agreed with 30 centimeter restriction, and subsequently notified us that they also now agreed to our suggested distance restriction. As a result, the permit would be conditioned to require researchers to avoid sensitive areas within 30 centimeters.

In addition, if any North Atlantic right whales are tagged forward of the pectoral fin, the permit holder would be required to describe the location of the tag and any adverse reactions in their annual reports so that any additional impacts can be monitored, since this is the first time the Permits Division is authorizing tagging forward of the pectoral fin. Finally, if researchers tag a North Atlantic right whale within 30 centimeters of sensitive areas, the permit holder would be required to submit an incident report to the Permits Division, which would be shared with us, for further evaluation.

### 3.5.4 Tag Monitoring

GA DNR proposes extensive post-tag deployment monitoring. Immediately after tag deployment, researchers would photograph the initial placement and condition of the tag site. If possible, researchers would then conduct a focal follow as described above in Section 3.2 in order to assess the whale's response to tagging. Through these post-tagging focal follows and the various pre-tagging research activities, researchers would be with any given individual for up to three hours in a single day for mother-calf pairs, and for up to six hours in a single day for other whales.

In addition to this same-day tag monitoring, researchers would monitor the whale's movements via the Argos satellite system and attempt to resight, photograph, and conduct follow-up observations on all tagged whales by vessel every five days. Researchers would also attempt to collect photographs of previously tagged whales during aerial surveys whenever tagged individuals are in the area. The methods that would be used for both aerial and vessel tag monitoring are the same as those described above for each of these activities more generally. In monitoring tagged whales, GA DNR and any collaborators helping to monitor tagged whales under their permits would follow an explicit protocol further detailed in the permit application (GA DNR 2017). Finally, to coordinate tag monitoring across researchers and the range of North Atlantic right whales, GA DNR would share photographs of all tagged individuals with other researchers working within the action area or other areas where tagged whales may be found in order to increase the chances that tagged individuals are resighted and monitored and to ensure that previously tagged whales are not subject to additional invasive procedures (e.g., biopsy sampling, additional tagging).

The key tagging co-investigator on the permit (Dr. Russel Andrews) would review all tag monitoring data as soon as it is received, and if at any point there are indications of unexpected tissue (e.g., unusually large swellings or depressions, excessive purulent discharge, etc.) or behavioral responses, the data would be reviewed by an additional tagging team member and three qualified veterinarians to decide deciding if adjustments need to be made or tagging stopped. Regardless of if there are unexpected responses, Dr. Andrews would collate tag monitoring data annually for review by the veterinarians in order to further tag development that minimizes adverse effects and maximizes the amount of data that is collected.

### 3.5.5 Fully-piercing Tag Phase In Plan

Given the novelty of the fully-piercing tag design, the Permits Division and GA DNR proposes a phased approach for the use of fully-piercing tags on North Atlantic right whales. The current plan consists of six phases as detailed in (Table 2). It is important to note that the proposed modification would not authorize any additional takes. That is, GA DNR would still only be able to deploy the total number of tags detailed in Table 1. Any deployments of a fully-piercing tag described below would count towards the maximum 15 annual tag takes that would be authorized, meaning the use of fully-piercing tags would result in fewer deployments of other Type II and Type III tags.

**Table 2. Phase in plan for fully-piercing tags**

| Phase | Description | Time Frame | Status |
|---|---|---|---|
| 1 | Demonstrate attachment mechanisms works on tissue surrogates | Prior to permit modification | In Progress |
| 2 | Conduct testing on whale carcasses | Prior to permit modification | Not yet initiated |
| 3 | Deploy on at least three lives whales of a surrogate species, outside of U.S. jurisdiction and under other permits | Prior to permit modification | Not yet initiated |
| 4 | North Atlantic right whale deployments: 3 tags on juvenile or adult males or non-reproductive females | Year 1 of Permit Modification | Not yet initiated |
| 5 | North Atlantic right whale deployments: 10 tags on juvenile or adult males or non-reproductive females | Year 2 of Permit Modification | Not yet initiated |
| 6 | North Atlantic right whale deployments: 15 tags on juvenile or adult males or females (including suspected pregnant females and females with non-neonate calves) | Years 3-5 of Permit Modification | Not yet initiated |

During Phase 1, GA DNR proposes to test fully-piercing tags, including both the deployment system and the attachment mechanism, on tissue surrogates such as composite rubber or woven fiber blocks. Once the system is fully tested and optimized on the surrogate tissue, during Phase 2, similar testing would be conducted on tissue blocks from actual cetacean carcasses, including North Atlantic right whales, obtained by GA DNR through legal sample collection under other permits. In order to proceed to the next phase, 90 percent of carcass tissue block trails would need to result in successful deployment and the tag would need to pass extensive impact testing. At this point, Phase 3 would be initiated in which GA DNR would work with researchers outside U.S. jurisdiction and under other permits to deploy at least three fully-piercing tags on surrogate species (e.g., southern right whales, *Eubalaena australis*). If the system is successful, shows no impacts beyond those that result from currently available Type II tags (see Section 8.4.5), and the

Permit's Division has reviewed all testing results (Phase 1-3) and confirmed with us that the effects of fully-piercing tags are consistent with those described in Section 8.4.5 of this opinion, then Permit No. 20556 would be modified to authorize limited use of fully-piercing tags on North Atlantic right whales and Phase 4 would commence.

During the first year of tag deployments on North Atlantic right whales (Phase 4), GA DNR would only be authorized to deploy up to three tags on yearlings and juveniles (at least eight months of age) of either sex, non-reproductive adult females, or adult males. Age will be based on a combination of size and sighting histories (e.g., when researchers are able to identify individuals and track their life history). Yearlings are defined as animals that were born in the previous calving season (November 1- October 31) and are estimated to be approximately one year old, but may be between eight 14 months old depending on when they were born and then resighted in the calving grounds. Juveniles are defined as animals that are known to have been born the previous calving year or earlier, are alone and have well defined callosities, or have well-defined callosities, and if associated with another whale, are greater than one-half the associated whale's body length. Juveniles are expected to be less than nine years old, and thus presumed to be non-reproductive (Hamilton et al. 1998). Adult males are any male estimated to be nine years or older based on body length as described above. Non-reproductive adult females are females that have never been sighted with a calf and are estimated to be 20 years or older. No tagging of potentially reproductive females, considered to be any female estimated to be between nine and 20 years of age, or females older than 20 that have previously calved, would be authorized. If Phase 4 is successful, and after review of the results the Permits Division confirms with us that the observed effects are consistent with our analysis in Section 8.4.5 of this opinion, Phase 5 would commence. During this phase, researchers would be authorized to deploy a maximum of 10 fully-piercing tags on the same age classes authorized for Phase 4. If Phase 5 is successful, and review by the Permits Division and us indicates the effects are still within the scope of those considered in this opinion, in the final phase, Phase 6, GA DNR would be authorized to deploy up to 15 fully-piercing tags on any animal considered to be a yearling, juvenile, or adult, regardless of reproductive status. Following Phase 6, GA DNR would provide the Permits Division all tagging results for review, which the Permits Division would share with us for confirmation that the effects of fully-piercing tags fall within the scope of effects considered in this opinion.

# 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 utility apart from the action under consideration. For this consultation, we consider all vessel transit associated with research activities as interdependent. Thus, we evaluate the effects this vessel transit on ESA-listed species and so include all waters traversed during such transits as part of the action area.

# 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 C.F.R. 402.02).

The action area for Permit No. 20556 can be seen below in Figure 6. It includes all Atlantic Ocean, Gulf of Mexico and estuarine waters within the U.S. Exclusive Economic Zone from the United States-Canadian border in the northeast to 87 degrees 30 minutes West longitude in the southwest. Within this the southeastern United States, research activities would primarily occur between December 1 and March 31 annually, but here, and elsewhere research may also occur at other times during the year during the duration of the five-year permit.

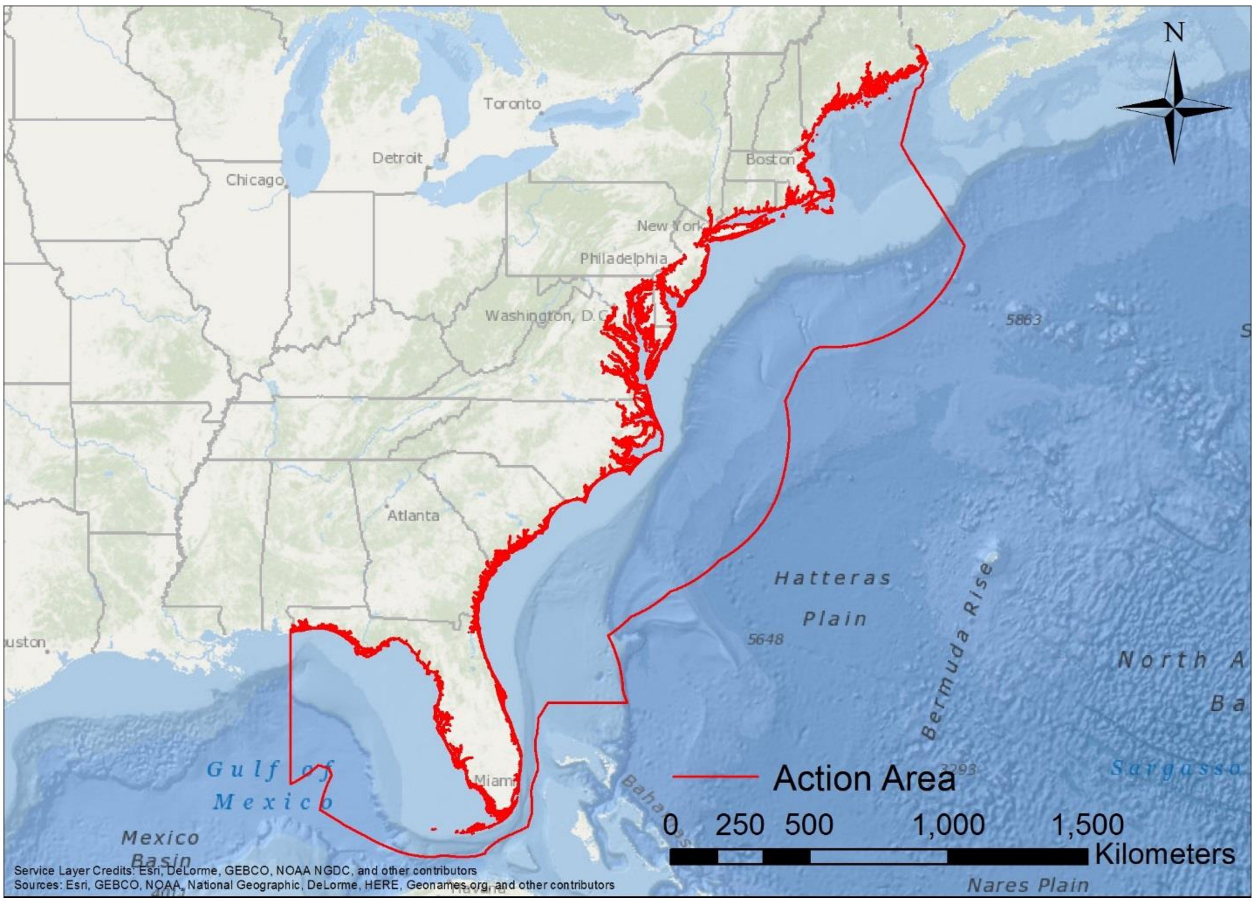


**Figure 6:** Action Area for Permit No. 20556 off the east coast of the United States and in the eastern Gulf of Mexico.

# 6 STATUS OF ENDANGERED SPECIES ACT PROTECTED RESOURCES

This section identifies the ESA-listed species that potentially occur within the action area (Figure 6) that may be affected by the issuance of Permit No. 20556. It then identifies those species not likely to be adversely affected by the proposed action because the effects of the proposed action are deemed insignificant, discountable, or fully beneficial. Finally, summarizes the biology and ecology of those species that may be adversely affected by the proposed action and details information on their life histories in the action area if known. The ESA-listed species potentially occurring within the action area that may be affected by the proposed action are given in Table 3, along with their regulatory status.

**Table 3:** Endangered Species Act-listed species that may be affected by the proposed action.

| Species | ESA Status | Recovery Plan |
|---|---|---|
| Blue Whale (*Balaenoptera musculus)* | E – 35 FR 18319 | 07/1998 |
| Bowhead Whale (*Balaena mysticetus*) | E – 35 FR 18319 | -- -- |
| Fin Whale (*Balaenoptera physalus)* | E – 35 FR 18319 | 75 FR 47538 |
| Gulf of Mexico Bryde's Whale (*Balaenoptera edeni*) | E – 81 FR 88639 (Proposed) | -- -- |
| North Atlantic Right Whale (*Eubalaena glacialis*) | E – 73 FR 12024 | 70 FR 32293 |
| Sei Whale (*Balaenoptera borealis*) | E – 35 FR 18319 | 12/2011 |
| Sperm Whale (*Physeter macrocephalus*) | E – 35 FR 18319 | 75 FR 81584 |
| Green Turtle (*Chelonia mydas*) – North Atlantic DPS | T – 81 FR 20057 | 10/1991 |
| Hawksbill Turtle (*Eretmochelys imbricata)* | E – 35 FR 8491 | 63 FR 28359 and 57 FR 38818 |
| Kemp's Ridley Turtle (*Lepidochelys kempii*) | E – 35 FR 18319 | 9/2011 |
| Leatherback Turtle (*Dermochelys coriacea*) | E – 35 FR 8491 | 63 FR 28359 and 10/1991 |
| Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS | T – 76 FR 58868 | 74 FR 2995 |

## 6.1 Species Not Likely to be Adversely Affected

NMFS uses two criteria to identify the ESA-listed or critical habitat that are not likely to be adversely affected by the proposed action, including 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 habitat that is exposed to a potential stressor but is likely to be unaffected by the exposure is also not likely to be adversely affected by the proposed action. We applied these criteria to the species ESA-listed in Table 3 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.

### 6.1.1 Cetaceans

The proposed action spatially overlaps with and may affect blue, bowhead, fin, Gulf of Mexico Bryde's, sei, and sperm whales. The Permits Division has determined that the issuance of Permit No. 20556 is not likely to adversely affect these species. While these species may be incidentally exposed to aerial and vessel surveys, they would not be targeted for research activities, and no take of these species would be authorized under the ESA. However, since researchers anticipate that sei whales may be found in close association with North Atlantic right whales, the Permits Division proposes to authorize take of sei whales under the MMPA in the form of incidental harassment.

Aerial (manned and unmanned) and vessel surveys may cause visual or auditory disturbances to whales and more generally disrupt their behavior. Whales's responses to these activities are discussed in greater detail in Section 8.4 but summarized here. Whales are known to exhibit a variety of behavioral responses to the presence of research vessel ranging from no response to short-term changes in activity state (e.g., ceasing resting or foraging), diving, surface behavior, respiration, swimming speed, orientation, and vocalizations (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). Response to manned aerial surveys include similar short-term behavioral responses, and when aerial surveys are conducted at higher altitudes, whales often show no response (Luksenburg and Parsons 2009; NMFS 2017b; NMFS 2017f; Patenaude et al. 2002; Smultea et al. 2008; Wursig et al. 1998). Similarly, most whales exhibit no response to unmanned aerial surveys (Marine Mammal Commission 2016; Smith et al. 2016), and those that have, thus far only exhibited short-term, mild behavioral responses (NMFS 2017h). Regardless of the response, individuals appear to resume species' typical behavior within minutes of researchers leaving the area (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).

Under Permit No. 20556, researchers would not be authorized to approach blue, bowhead, fin, Gulf of Mexico Bryde's, and sperm whales. Given the substantial field experience the researchers have, and that all these species, except bowhead whales, differ markedly in their morphology compared to North Atlantic right whales, we anticipate that researchers would be able to easily identify most whales to species well before they would approach at a distance that would cause any disturbance (Nowacek et al. 2004). Furthermore, even if researchers were to unintentionally approach an individual of these species, based on the above review, we anticipate that whales would only exhibit short-term behavioral responses that would not would significantly disrupt normal behavioral patterns to an extent that it would create the likelihood of injury or impact fitness. Thus, we find that the effects of disturbance on blue, fin, Gulf of Mexico Bryde’s, and sperm whales that may result from aerial and vessel surveys are insignificant.

Bowhead whales, being one of the few other extant Balaenidae, are closely related to North Atlantic right whales and have similar morphology. Therefore, it may be more difficult for researchers to distinguish between bowhead and North Atlantic right whales in the field. However, bowhead whales are only rarely found within the action area (Rugh et al. 2003), and the majority of research under Permit No. 20556 would occur in the southern portion of the action area, where bowhead whales have never been observed. Given this, we find it highly unlikely that researchers under Permit No. 20556 would encounter a bowhead whale, and we find the effects of disturbance on bowhead that may result from aerial and vessel surveys are discountable.

During aerial and vessel surveys, GA DNR would be authorized under the MMPA to incidentally harass sei whales that are in close association with North Atlantic right whales. However, as reviewed above, behavioral responses to such incidental harassment are likely to be mild and short-term in nature. We do not anticipate that any disturbance of sei whales resulting from incidental harassment would significantly disrupt normal behavioral patterns to an extent that it would create the likelihood of injury or impact fitness. Thus, even though the Permits Division proposes to authorize take of sei whales under the MMPA, we have determined that the effects of disturbance on sei whales that may result from aerial and vessel surveys are insignificant and do not constitute harassment under the ESA.

In addition to potentially disturbing blue, bowhead, fin, Gulf of Mexico Bryde’s, sei, and sperm whales, vessel surveys entail a risk vessel strike. Responses to a vessel 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 vessel strikes of large whales occur when vessels are traveling at speeds greater than approximately 10 knots, with faster vessels, 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). While vessel strikes are possible during all research vessel transits, we are aware of only two instances of any research vessel ever striking a whale in thousands of hours at sea. Both events involved vessels striking North Atlantic right whales in the Gulf of Maine, which is part of the action area for Permit No. 20556. Full details of these events can be found in Wiley et al. (2016), but below we provide a brief summary of each.

The first event occurred on April 9, 2009, in Massachusetts Bay when the NOAA research vessel the *Auk* struck a North Atlantic right whale (Wiley et al. 2016). A captain and mate, each of whom had logged many hours at sea during marine mammal research activities, were operating 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 to 23 knots 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 after 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, and appears to be healthy with the injury being fully healed by day 719 after the strike.

The second event occurred on April 9, 2014, in Cape Cod Bay when the Center for Coastal Studies' research vessel the *Shearwater* struck a North Atlantic right whale (Wiley et al. 2016). Researchers aboard the vessel were performing North Atlantic right whale prey mapping and sampling along pre-determined track lines. The vessel was traveling at nine knots, below regulatory limits within the area even though these limits don't apply to the *Shearwater* given its size. While aerial observers in the area had spotted sub-surface feeding groups of whales, the two dedicated vessel observers saw no indication of whales in the immediate vicinity of the vessel until the whale was struck. All observations of the event indicate the whale was struck on the left mid or lower flank. Despite significant aerial and vessel effort to photograph, relocate, and follow animal immediately after the strike, researchers were unable to confirm the individual's identity. However, since the injury appeared to be non-lethal based on its location, depth, width, size, and the number of cuts, and no carcass with wounds consistent with the strike was found, the individual is assumed to have survived (Wiley et al. 2016).

The two events described above represent extremely rare occurrences, being the only two researched-related cetacean vessel strikes that we are aware of in over 40 years of permitted cetacean research activities. Given this, the small size of the vessels that would be used (six to eight meters in length), the extensive experience GA DNR has in spotting cetaceans at sea, and the slow speeds at which GA DNR would operate vessels when near whales (10 knots or less), we believe the likelihood of a vessel strike of a blue, bowhead, fin, Gulf of Mexico Bryde's, sei, or sperm whale resulting from research vessel transit is extremely unlikely, and thus discountable.

Finally, the use of vessels in areas inhabited by blue, bowhead, fin, Gulf of Mexico Bryde's, sei, and sperm whales may result in discharge (i.e., leakages of fuel or oil) that could affect these species. However, we anticipate that the effects of any such discharge would have minimal, if any, effect on ESA-listed cetaceans. Given the size of the proposed research vessels and the amount of fuel, oil, and other chemicals likely to be on board, if any discharge were to occur the amount would be small and likely dissipate quickly. We do not anticipate that such discharge would have a measurable impact on whales directly, nor pose measurable hazards to their food sources. Therefore, we find that effects of vessel discharge on blue, bowhead, fin, Gulf of Mexico Bryde's, sei, and sperm whales are insignificant.

In summary, we concur with the Permits Division that the issuance of Permit No. 20556 is not likely to adversely affect blue, bowhead, fin, Gulf of Mexico Bryde's, sei, and sperm whales, and we will not discuss these species further.

### 6.1.2 Sea Turtles

The proposed action spatially overlaps with several ESA-listed sea turtle species and/or DPSs including green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, and loggerhead turtles (Northwest Atlantic DPS). The Permits Division has determined that the issuance of Permit No. 20556 may affect, but is not likely to adversely affect these ESA-listed sea turtles. As no research activities would directed at sea turtles, the only stressors that ESA-listed sea turtles may be exposed to are those associated with aerial and vessel surveys.

If occurring within the vicinity of sea turtles, general aircraft and vessel operations have the potential to disturb sea turtles. However, researchers would constantly be on the lookout for cetaceans and thus be able to spot sea turtles at a distance (approximately 100 to 200 meters from a vessel, Epperly et al. 2002), well before the animals would be expected to respond (approximiately 10 meters from a vessel, Hazel et al. 2007). In addition, sea turtles appear to exhibit no response to UAS (Bevan et al. 2015). If a sea turtle were spotted, researchers would not approach the sea turtle, and would change course in order to avoid coming into close proximity. Because researchers would reasonably be expected to spot sea turtles, and thus avoid approaching and disturbing them, we find that the effects of disturbance on sea turtles that may result from aerial and vessel surveys are extremely unlikely to occur, and thus discountable.

As for blue, bowhead, fin, Gulf of Mexico Bryde's, sei, and sperm whales mentioned above, vessel strikes of sea turtles resulting from research vessel transit are expected to be extremely unlikely. Research vessels would have numerous observers on lookout, which would allow researchers to spot and avoid sea turtles well in advance of any potential collision. In addition, we are not aware of any case of a cetacean research vessel striking a sea turtle in over 40 years of research activities permitted by the Permits Division. For these reasons, we find it is extremely unlikely that a research vessel will strike a sea turtle, and thus such effects are discountable.

Finally, as noted above vessel operations may result in discharge. However, given the amount of discharge that is possible, we do not anticipate measurable impacts on ESA-listed sea turtles or their food sources. Consequently, we find that effects of vessel discharge on ESA-listed sea turtles are insignificant.

In summary, we concur with the Permits Division that the issuance of Permit No. 20556 is not likely to adversely affect green (North Atlantic DPS), hawksbill, Kemp's ridley, leatherback, and loggerhead turtles (Northwest Atlantic DPS), and we will not discuss these species further.

## 6.2 Species Likely to be Adversely Affected

This opinion examines the status of each species that would be 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 C.F.R. 402.02. More detailed information on the status and trends of these ESA-listed species, and their biology and ecology can be found in the listing regulations and critical habitat designations published in the Federal Register, status reviews, recovery plans, and on NMFS Web site: http://www.nmfs.noaa.gov/pr/species/esa/listed.htm.

Below we describe the status of the species that are likely to be adversely affected by the proposed action.

### 6.2.1 North Atlantic Right Whale

The North Atlantic right whale is a narrowly distributed baleen whale found in temperate and sub-polar latitudes in the North Atlantic Ocean (Figure 7).

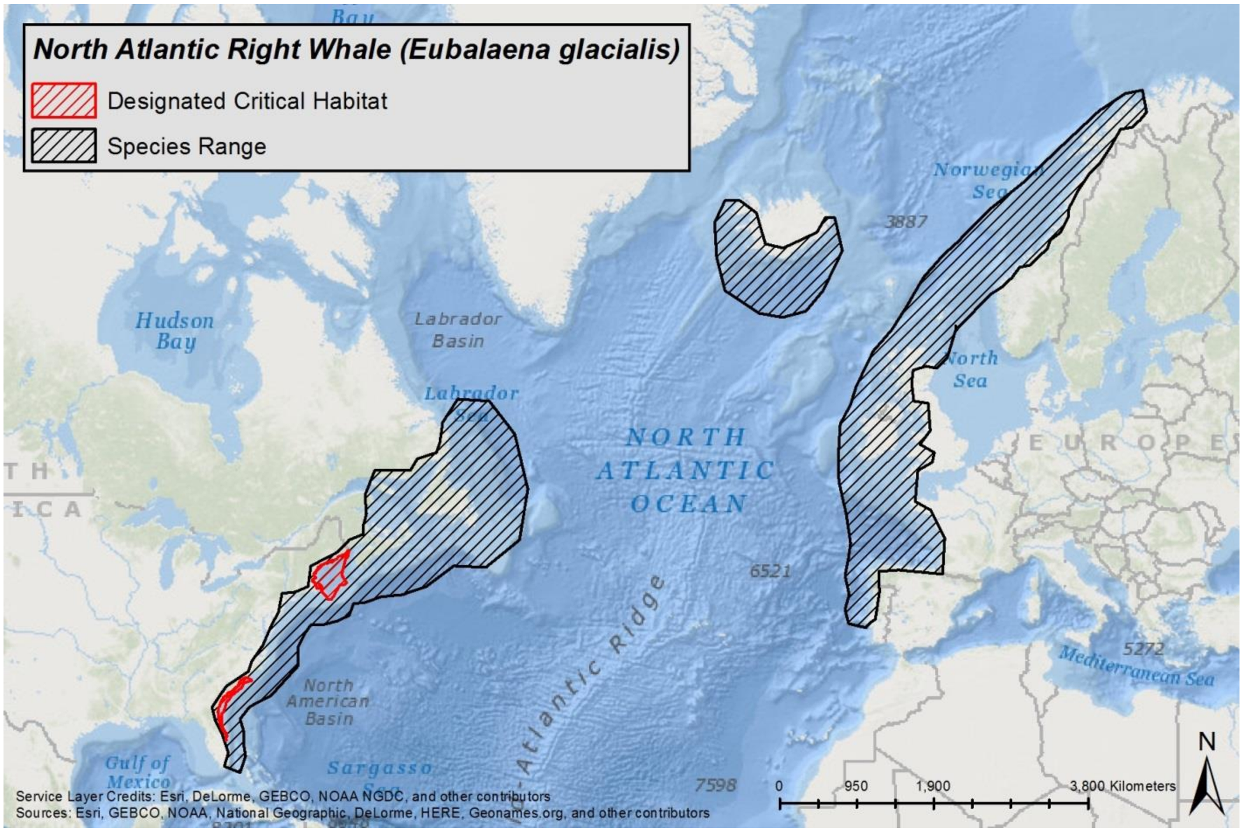


**Figure 7:** Map identifying range and critical habitat of the North Atlantic right whale.

The North Atlantic right whale is a narrowly distributed baleen whale, distinguished by its stocky body and lack of a dorsal fin (Figure 8). The species was originally listed as endangered on December 2, 1970 (Table 4).

**Figure 8:** North Atlantic right whale. Photo: National Oceanic and Atmospheric Administration.

**Table 4.** North Atlantic right whale status summary and information links.

| Species | Common Name | Distinct Population Segment | ESA Status | Recent Review Year | Listing | Recovery Plan | Critical Habitat |
|---|---|---|---|---|---|---|---|
| *Eubalaena glacialis* | North Atlantic right whale | None | Endangered | 2012 | 73 FR 12024 | 2005 | 81 FR 4837 |

We used information available in the five-year review (Colligan et al. 2012), the most recent stock assessment report (Hayes et al. 2017), and the scientific literature to summarize the life history, population dynamics and status of the species, as follows.

### 6.2.1.1 Life history

The lifespan of North Atlantic right whales is unknown, but some individuals appear to live to be at least 50 years old (Kenney 2009). Their gestation is 12 to 13 months, and calves are nursed for eight to 17 months. The average calving interval is three to five years and they are thought to reach sexual maturity at approximately nine years of age. They typically migrate to low latitudes during the winter to give birth in shallow, coastal waters, and to high latitudes in the summer to feed on large concentrations of copepods (Colligan et al. 2012). That said, some individuals appear not to migrate south, and remain in the northern feeding grounds year round (Bort et al. 2015; Morano et al. 2012). Furthermore, little is known about North Atlantic right whale habitat use in the mid-Atlantic, and recent acoustic data indicate year round presence off the coasts of New Jersey, Virginia, and North Carolina (Hodge et al. 2015; Salisbury et al. 2016; Whitt et al. 2013).

#### 6.2.1.2 Population dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the North Atlantic right whale.

There are currently two recognized populations of North Atlantic right whales, a western and an eastern population. In 2012, there were estimated to be a minimum of 440 individuals in the western North Atlantic population. This minimum estimate is based on a review of a photo-identification data, which NMFS has typically used for estimating abundance of North Atlantic right whales (Hayes et al. 2017). More recent estimates derived from Bayesian mark–recapture open population modelling that accounts for individual capture heterogeneity (i.e., individual differences the probability being photographed), give a population size of 458 individuals as of November 2015 (95 percent credible intervals 444–471, Pace et al. 2017). Less than 20 individuals are thought to exist in the eastern North Atlantic, and as such, this population may be functionally extinct (Colligan et al. 2012)**.** Pre-exploitation abundance is not available for the species. The western population may have numbered fewer than one hundred individuals by 1935 when international protection for right whales came into effect (Kenney et al. 1995). Little is known about the population dynamics of right whales in the intervening years.

The western North Atlantic population demonstrated overall growth of 2.8 percent per year between 1990 to 2010, despite a decline in 1993 and no growth between 1997 and 2000 (Pace et al. 2017). However, since 2010 the population has been in decline, with a 99.99 percent probability of a decline just under one percent per year (Pace et al. 2017). Between 1990 and 2015, survival rates appeared to be relatively stable, but differed between the sexes with males having higher survivorship than females (males: $0.985 \pm 0.0038$; females: $0.968 + 0.0073$), leading to a male biased sex ratio (approximately 1.46 males per female as of 2015, Pace et al. 2017). During this same time period, calving rates varied substantially, with low calving rates coinciding with all three periods of decline or no growth. On average, North Atlantic right whale calving rates are estimated to be roughly half of that of Southern right whales (Pace et al. 2017), which appear to be increasing in abundance (NMFS 2015).

While data are not yet available to statistically estimate the population's trend and vital rates beyond 2015, two lines of evidence indicate the population is still in decline. First, calving rates in 2016 and 2017 appear to be below that which is needed to compensate for expected mortalities (Pace et al. 2017). Long-term photographic identification data indicate that new caves rarely go undetected, so these years likely represents a continuation of the low calving rates that began in 2012 (Kraus et al. 2007; Pace et al. 2017). Second, since June 2017, at least 14 North Atlantic right whales have died in what has been declared an Unusual Mortality Event[8] (UME), and at least one calf died prior to this in April 2017. Twelve whales died in Canada in the Gulf of St. Lawrence area and two in the United States near Cape Cod. One was the result of entanglement

[8] http://www.nmfs.noaa.gov/pr/health/mmume/2017northatlanticrightwhaleume.html

in fishing gear and four showed signs of acute trauma consistent with vessel strikes (Daoust et al. 2017). The remaining causes of death could not be, are yet to be, determined. These increased mortalities, combined with low calving in 2016 and 2017, strongly suggest the population is still in decline.

Analysis of mtDNA from North Atlantic right whales has identified seven mtDNA haplotypes in the western North Atlantic. This is significantly less diverse than southern right whales and may indicate inbreeding. While analysis of historic DNA taken from museum specimens indicates that the eastern and western populations were likely not genetically distinct, the lack of recovery of the eastern North Atlantic population indicates at least some level of population segregation. Overall, the species has low genetic diversity as would be expected based on its low abundance (Hayes et al. 2017).

Today, North Atlantic right whales are primarily found in the western North Atlantic, from their breeding grounds in lower latitudes off the coast of the southeastern U.S. to their feeding grounds in higher latitudes off the coast of Nova Scotia (Hayes et al. 2017). In recent years, there has been a shift in distribution in their feeding grounds, with fewer animals being seen in the Great South Channel and the Bay of Fundy and perhaps more animals being observed in the mid-Atlantic region (Davis et al. 2017; Hayes et al. 2017; Pace et al. 2017). Very few, if any, individuals are thought to make up the population in the eastern Atlantic (Hayes et al. 2017). However, in recent years a few known individuals from the western population have been seen in the eastern Atlantic, suggesting some individuals may have wider ranges than previously thought (Kenney 2009).

#### 6.2.1.3 Status

The North Atlantic right whale is listed under the ESA as endangered. With whaling now prohibited, the two major known threats to survival are vessel strikes and entanglement in fishing gear. Substantial progress has been made in mitigating vessel strikes by regulating vessel speeds (78 FR 73726) (Conn and Silber 2013; Waring et al. 2016), but entanglement in fishing gear remains a major threat (Kraus et al. 2016). Furthermore, the population is currently experiencing a UME that appears to be related to both vessel strikes and entanglement in fishing gear (Daoust et al. 2017). On top of this, recent modeling efforts indicate that low female survival, a male biased sex ratio, and low calving success are contributing to the population’s current decline (Pace et al. 2017). While there are likely a multitude of factors involved, low calving has been linked to poor female health (Rolland et al. 2016) and reduced prey availability (Meyer-Gutbrod and Greene 2014), and entanglement in fishing gear appears to have substantial energetic costs that could affect both survival and reproduction (van der Hoop et al. 2017a). Given their current decline and small population size, the species resilience to future perturbations is considered low.

#### 6.2.1.4 Critical Habitat

Critical habitat for North Atlantic right whales was designated in 1994 and expanded in 2016. It includes two major units: Unit 1 located in the Gulf of Maine and Georges Bank Region and

Unit 2 located off the coast of North Carolina, South Carolina, Georgia, and Florida (Figure 7). Unit 1 consists of important foraging area and contains the following physical and biological features essential to the conservation of the species: the physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate the zooplankton species *Calanus 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. Unit 2 consists of an important calving area and contains the following physical and biological features essential to the conservation of the species: sea surface conditions associated with Force 4 or less on the Beaufort Scale, sea surface temperatures of 7 to 17 °Celsius, and water depths of 6 to 28 meters, where these features simultaneously co-occur over contiguous areas of at least 231 nautical square-miles of ocean waters during the months of November through April.

#### 6.2.1.5 Recovery Goals

See the 2005 updated Recovery Plan for the North Atlantic right whale for complete down listing criteria for the following recovery goals:

1. The population ecology (range, distribution, age structure, and gender ratios, etc.) and vital rates (age-specific survival, age-specific reproduction, and lifetime reproductive success) of right whales are indicative of an increasing population;
2. The population has increased for a period of thirty-five years at an average rate of increase equal to or greater than two percent per year;
3. None of the known threats to Northern right whales are known to limit the population's growth rate; and
4. Given current and projected threats and environmental conditions, the right whale population has no more than a one percent chance of quasi-extinction in one hundred years.

# 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 C.F.R. §402.02). In this section, we discuss the environmental baseline within the action area as it applies to species that are likely to be adversely affected by the proposed action.

## 7.1 Climate Change

There is mounting evidence that our climate is changing. The global-average combined land and ocean surface temperature, as calculated by a linear trend, show a warming of approximately 0.85 ºCelsius 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 0.11º Celsius per decade over the period 1971 to 2010 (IPCC 2014). In fact, a recent analysis utilizing improved methods for assessing ocean heat content indicates that the ocean has been steadily warming since the 1980s, and warming is increasingly being seen at greater depths (Cheng et al. 2017). 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).

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). Furthermore, species most threatened by climate change appear to face a greater number of other, non-climatic anthropogenic threats compared to species less threatened by climate change (Fortini and Dye 2017). As such, we expect the extinction risk of North Atlantic right whales species to rise with climate change. 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 prey, 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. North Atlantic right whales are predicted to experience unfavorable conditions, with a range contraction likely (Macleod 2009). Moreover, even if North Atlantic right whales don't shift their range, there may still be changes in other aspects of their ecology such as the arrival at and departure from feeding grounds (Ramp et al. 2015).

The Atlantic Ocean appears to be warming faster than all other ocean basins except perhaps the southern oceans (Cheng et al. 2017). 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 *C. finmarchicus*, the principal prey of North Atlantic right whales (Conversi et al. 2001). As a result, during these years North Atlantic right whale calving rates generally increase, although there may be some lag in timing (Greene et al. 2003). In years when the index is negative, sea surface temperatures are generally lower, and as a result, so is the abundance of *C. finmarchicus* and consequently, North Atlantic right whale calving rates in subsequent years decrease (Drinkwater et al. 2003; Greene et al. 2003; Pershing et al. 2010). In recent years, the oscillation has been mostly positive[9], leading to increases in copepod abundance and North Atlantic right whale calving rates (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 rate of North Atlantic right whales (Drinkwater et al. 2003; Greene et al. 2003). Furthermore, evaluation of changes in *C. finmarchicus* abundance under multiple climate change scenarios indicate *C. finmarchicus* density is likely to decrease in the North Atlantic, in some cases by as much as 50 percent by 2081-2100 (Grieve et al. 2017). Thus, regardless of the North Atlantic Oscillation, North Atlantic right whales are likely to experience a significant decline in their primary prey in the near future.

## 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 to begin 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

[9] http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/month_nao_index.shtml

to the moratorium (Iceland and Norway). 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. Finally, whales in a few areas of the world are also still killed for subsistence purposes. While there is currently no known whaling of North Atlantic right whales, prior exploitation is likely to have altered their population structure and social cohesion such that the effects of historical whaling are still being felt on their abundance and recruitment.

### 7.3 Vessel Strikes

Vessel 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 from which they were previously extirpated (Swingle et al. 1993; Wiley et al. 1995). As vessels continue to become faster and more widespread, an increase in vessel interactions with cetaceans is to be expected. The vast majority of commercial vessel strike mortalities of cetaceans are likely undocumented, as most probably go unreported and most whales killed by vessel strike probably sink rather than washing up on shore. Kraus et al. (2005) estimated that 17 percent of vessel strikes are actually detected. Of the 11 cetacean species known to be threatened by vessel strikes, fin whales are the mostly commonly struck species (Laist et al. 2001; Vanderlaan and Taggart 2007). However, North Atlantic right whales do not appear to avoid vessel traffic (Nowacek et al. 2004), and their near surface foraging behavior places them in close proximity to transiting vessels (Baumgartner et al. 2017). In fact, North Atlantic right whales show the highest vessel strike rate per capita than any other large whale species (Vanderlaan and Taggart 2007). While any vessel has the potential to strike whales, in most cases, lethal or severe injuries are caused by vessels 80 meters or longer, travelling 14 knots or faster (Laist et al. 2001).

The North Atlantic is one of the most traveled areas in the world for marine shipping. Vessel traffic within the action area can come from both private (e.g., commercial, recreational) and federal vessels (e.g., military, research), but traffic that is most likely to result in serious injuries or mortalities to North Atlantic right whales comes from commercial shipping. To help reduce vessel strikes to North Atlantic right whales, in 2008 NMFS established regulations requiring all vessels 65 feet (19.8 meters) 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). 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. Finally, in collaboration with the U.S. Coast Guard, NMFS established several recommended shipping routes aimed at reducing large whale strikes from commercial vessels (see http://www.fisheries.noaa.gov/pr/shipstrike/#routes for more information). A map of the action area, with commercial shipping density and NMFS' Seasonal Management Areas overlaid can be seen in Figure 9 (Halpern et al. 2015).

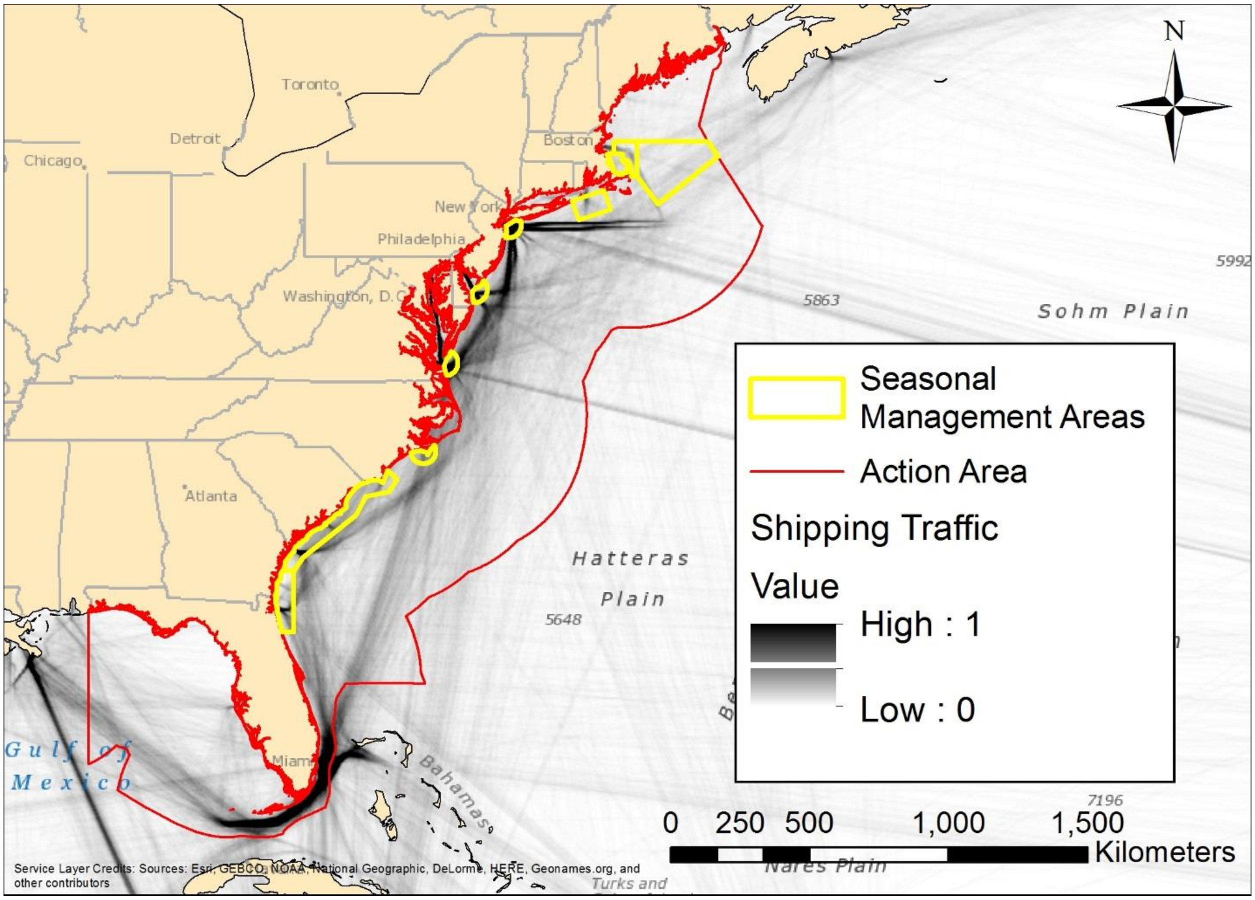


**Figure 9:** Map of action area, seasonal management areas, and relative shipping traffic. Shipping traffic data from (Halpern et al. 2015).

The potential population consequences of lethal vessel strikes are particularly profound on species with low abundance such as North Atlantic right whales. From 2010 to 2014, six North Atlantic right whales are known to have been seriously injured or killed as the result of vessel strikes, resulting in an average of 1.2 vessel strike related mortalities or serious injuries per year (Henry et al. 2016). These represent only known mortalities and serious injuries, and do not include the additional four whales suspected to have died from vessel strikes as part of the ongoing UME (Daoust et al. 2017). More, undocumented mortalities and serious injuries of North Atlantic right whales resulting from vessel strikes within the action area have likely occurred.

## 7.4 Whale Watching

There are numerous whale watching operations within the action area (O’Connor et al. 2009). 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 (García-Cegarra and Pacheco 2017), whale watching has the potential to impact whales in a variety of ways (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 (Lesage et al. 2017; Parsons 2012; Senigaglia et al. 2016). 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 (*Megaptera novaeangliae*) 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, in the future we will have a better understanding of the population-level, long-term impacts of whale watching (New et al. 2015; Senigaglia et al. 2016).

With the high density of whales found in the action area, there are numerous whale watching operations that may impact North Atlantic right whales (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, making whales in this region 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. These activities occur to varying degrees throughout the year and may lead to behavioral disturbance or even physical injury, both of which have the potential to negatively impact individual 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 globally (NRC 2003). Large vessels emit predominantly low frequency sound which overlaps with North Atlantic right whale's predicted hearing range [seven hertz (Hz) to 35 kilohertz (kHz), (NOAA 2016)] and may mask their vocalizations and cause stress (Parks et al. 2011; Rolland et al. 2012). In particular, low frequency sounds from commercial shipping may interfere with mother-calf communication, although some data suggest whales are able to modify their calls to reduce masking (Parks and Clark 2007; Parks et al. 2007; Parks et al. 2011; Tennessen and Parks 2016).

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 depths of 100 to 200 meters, less but still substantial vessel traffic sound can be heard. Modelled anthropogenic noise from commercial vessel traffic within the action area can be seen in Figure 10 below.

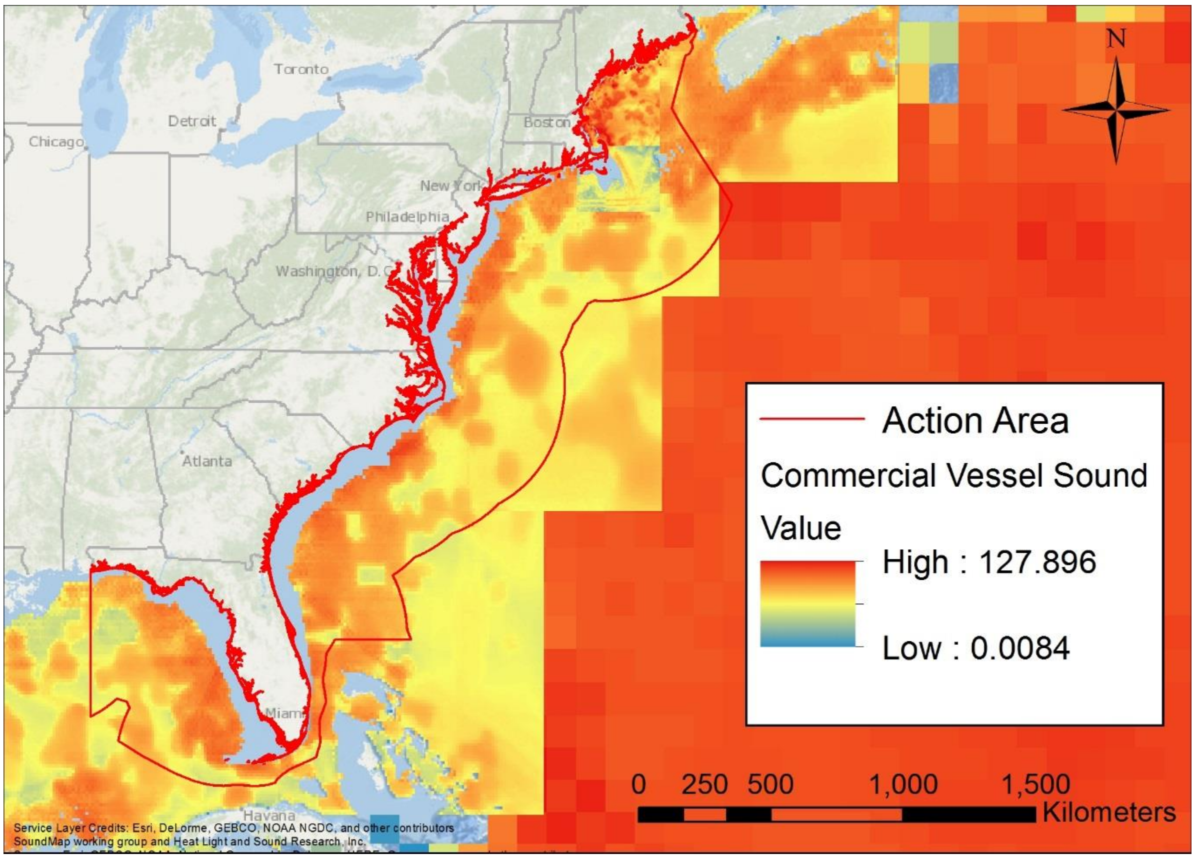


**Figure 10:** Commercial vessel traffic sound in decibels, one-third-octave centered at 100 hertz at 30 meters, within the action area. Data from http://cetsound.noaa.gov/.

Sonar systems are used on recreational, commercial, and military vessels and may also affect North Atlantic right whales (NRC 2003). Although little information is available on potential effects of multiple commercial and recreational sonars to cetaceans, 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). For further discussion of military sound on North Atlantic right whales, see Section 7.6.

Aircraft within the action area may consist of small commercial or recreational airplanes or helicopters, or large commercial airliners. These aircraft produce a variety of sounds that could potentially enter the water and impact North Atlantic right whales. 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 for oil and gas in the past, there are currently no planned or active lease sales in the North Atlantic (BOEM 2017b). However, seismic surveys involving airguns for oil and gas exploration, as well as for scientific research and/or geological purposes, have and may occur in the action area (82 FR 26244). Seismic 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 decibels 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 North Atlantic right whales (NOAA 2016; 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. The Bureau of Ocean Energy Management authorizes oil and gas activities in U.S. waters and in doing so, consults with NMFS to ensure their actions do not jeopardize the continued existence of ESA-listed species or adversely modify or destroy designated critical habitat. More information on the effects of oil and gas activities on ESA-listed species can be found in recent biological opinions on the Bureau of Ocean Energy Management activities (e.g., NMFS 2013b)

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 which is within the action are, and more are likely to become operational in the near future (DOE and DOI 2016). In addition, within the action area there are several planned commercial wind farms, numerous active leases, and several areas where future leasing may occur (BOEM 2017a). Construction on these projects has not begun, but it may during the five-year extent of Permit No. 20556. While the full extent of impacts from wind farms to whales 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 conducts military readiness activities within the action area (Atlantic Fleet Training and Testing [AFTT], Figure 11). Military readiness 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. In addition to these testing and training activities, the Navy operates Surveillance Towed Array Sensor System Low Frequency Active sonar (SURTASS LFA) within the action area. SURTASS LFA utilizes low frequency sounds to detect and monitor submarines.

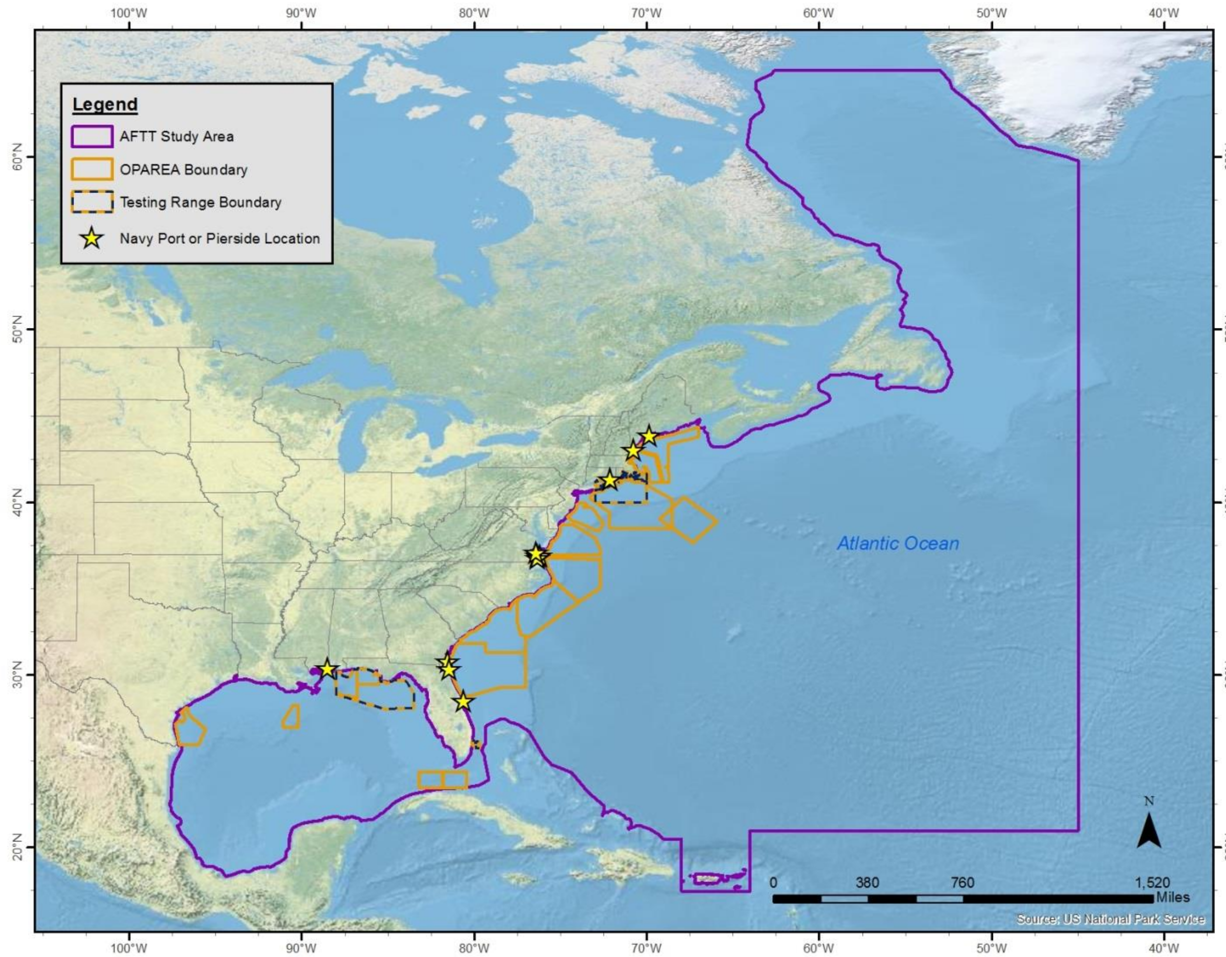


**Figure 11:** Navy Atlantic fleet training and testing area. OPAREA stands for at-sea Operating Area and is where training exercise and system qualification tests are routinely conducted.

U.S. Navy activities are likely to produce sound and visual disturbance and may result in vessel strikes and/or other physical injury. Effects of Navy's activities on North Atlantic right whales may include behavioral disturbance, temporary or permanent hearing threshold shifts, injury, and mortality. Take of North Atlantic right whales within the action area for Navy activities has been authorized and previously consulted on (NMFS 2013a; NMFS 2017d). Our previous biological opinions considering the effects of Navy activities within the action area resulted in incidental take statements because we concluded that the Navy's actions were not likely to jeopardize the continued existence of ESA-listed species, nor adversely modify designated critical habitat (NMFS 2013a). In our most recent opinion considering Navy activities in the AFTT study area, only takes in the form of behavioral harassment were authorized. More details regarding the effects of Navy activities on ESA-listed cetaceans can be found in recent biological opinions considering the U.S. Navy's actions (NMFS 2013a; NMFS 2017d).

## 7.7 Fisheries

Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in cetaceans (see Dietrich et al. 2007), and appears to be a particularly important threat to North Atlantic right whales (Baumgartner et al. 2017; Kraus et al. 2016). 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 vessel strikes) by restricting agility and swimming speed, which may have significant sub-lethal energetic impacts and subsequent effects on reproduction, as was recently suggested for North Atlantic right whales (van der Hoop et al. 2017a; van der Hoop et al. 2017b). 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 fishing-related mortalities. Cetaceans also 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 vessel strikes, entanglement or entrapment in fishing gear likely has the greatest impact on populations of ESA-listed species with the lowest abundance like North Atlantic right whales (Kraus et al. 2016). From 2010 to 2014, six North Atlantic right whales are known to have been seriously injured or killed as the result of entanglement in fishing gear, for an average of 1.2 entanglement related mortalities or serious injuries per year (Henry et al. 2016). These represent only known mortalities and serious injuries, and do not include the additional whale suspected to have died from entanglement as part of the ongoing UME (Daoust et al. 2017). More, undocumented mortalities and serious injuries of North Atlantic right whales resulting from entanglement within the action area have likely occurred. For example, at least five other North Atlantic right whales were observed to be entangled in fishing gear in 2017, and while three of these animals were either disentangled or shed the gear on their own, the fate of the remaining two is currently unknown (Daoust et al. 2017).

In addition to these direct impacts, cetaceans may also be subject to indirect impacts from fisheries. Many cetacean species are known to feed on species of fish that are harvested by humans (Ruzicka et al. 2013). 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. While North Atlantic right whales feed exclusively zooplankton, primarily *C. finmarchicus*, even species that do not directly compete with human fisheries could be indirectly affected by fishing activities through changes in ecosystem dynamics (DeMaster et al. 2001; Gavrilchuk et al. 2014). In general, the effects of fisheries on whales via altered prey abundance and/or ecosystem dynamics remain unknown.

### 7.8 Pollution

Contaminants can 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 cetaceans, 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 in waters have declined, although the more persistent chemicals are still detected and are expected to endure for years (Law 2014) with the potential for health consequences in marine mammal populations. While North Atlantic right whales' relatively lower trophic position may buffer them from the accumulation of lipid soluble contaminants, their close proximity to coastal sources of pollution still places them at risk to the detrimental impacts of contaminants (Reeves et al. 2001)

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). For North Atlantic right whale, entanglement in fishing gear, much of which may be abandoned and no longer in use, appears to be a major source of serious injury and mortality(Hayes et al. 2017; Kraus 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. 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).

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) and are likely a leading cause of animal extinctions (Clavero and Garcia-Berthou 2005). In the marine environment, invasive species are widespread primarily as a result of international shipping and aquaculture with only 16 percent or less of marine ecoregions having no reported marine invasives (Molnar et al. 2008). While invasive species are not considered a major threat to North Atlantic right whales, they are likely to alter the ecosystem dynamics upon which cetaceans depend and may act as vectors for disease (Bax et al. 2003).

### 7.9 Scientific Research

Scientific research similar to that which would be conducted under Permit No. 20556 has and will continue to impact North Atlantic right whales that may be found in action area. Currently, there are 12 active research permits that may adversely affect North Atlantic right whales within the action area (Permit Nos. 13927, 14450, 16239, 16388, 17355, 18786, 19315, 19674, 20294, 20527, 20605, and 20951). The primary objectives of these permitted studies are to monitor the North Atlantic right whale population or gather data for behavioral and ecological studies. These currently permitted activities may directly or incidentally result in harassment, stress, and injury. No mortalities are authorized for any North Atlantic right whale of any age under these existing permits and no mortalities have been reported as a result of activities carried out under these permits. It is important to note that the research activities that would be conducted under Permit No. 20557 would be in addition to those conducted under these other research permits. Twelve active research permits, with Permit No. 20556 representing the $13^{th}$, represent substantial research on North Atlantic right whales given their relatively small population size. As such, many individuals would be subject to more than one activity within a given year, and in some cases could be subject to the same activity multiple times within a single year.

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 and associated impacts to North Atlantic right whales. In addition, research activities under many of the existing permits occur over smaller portions of the range of North Atlantic right whales (e.g., only in the northern foraging grounds) rather than being conducted across the entire action area of Permit No. 20556. All current permits have undergone ESA section 7 consultation and for each permit, we concluded that the research activities were not likely to jeopardize the continued existence of ESA-listed species, nor adversely modify designated critical habitat.

As detailed further below in our response analysis (Section 8.4), North Atlantic right whales may respond to research activities in a variety of ways including no obvious response, minor behavioral disturbances, avoidance and stress-related 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 invasive tags are used (NMFS 2017a; NMFS 2017b). The fact that multiple permitted "takes" of North Atlantic right whales is already permitted in the action area and is expected to continue to be permitted in the future means that research has the ability to contribute to or even exacerbate the response of North Atlantic right whales to other threats occurring in the action area.

# 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 C.F.R. §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.

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 C.F.R. §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 action, 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. 20556 would authorize several research activities that may expose North Atlantic right whales within the action area to a variety of stressors. Each research activity presents a unique set of stressors, as further detailed below.

Manned aerial surveys would expose North Atlantic right whales to aircraft noise and visual disturbance depending on the aircraft altitude. Vessel surveys and close approaches would present a range of stressors including vessel traffic, discharge, and visual and auditory disturbances. Unmanned aerial surveys would present similar stressors to manned aerial surveys, although given their much smaller size and quieter engines, the magnitude of these stressors is expected to be much smaller. Given their non-invasive nature, fecal sampling, sloughed skin sampling, exhaled breath sampling, and documentation are not expected to produce any stressors aside from those associated with vessel surveys, close approaches, and unmanned aerial surveys. Biopsy sampling carries the stressor of a closer vessel approach than is typical for other vessel survey activities (except tagging), a minor puncture wound, and tissue collection. Tagging presents the additional stressors of a very close approach to apply tags, direct physical contact in the case of suction-cup tags or puncture wounds in the case of Type II tags.

### 8.2 Mitigation to Minimize or Avoid Adverse Effects

Several aspects of the proposed action are designed to minimize adverse effects (i.e., exposure and response) to ESA-listed species that may result from exposure to the stressors associated with the research activities. These include the experience and measures taken by the researchers and conditions specified in the permit, as proposed by the Permits Division.

GA DNR researchers have extensive experience conducting research on North Atlantic right whales. As noted in Section 1.1, all previous permits for GA DNR underwent section 7 consultation and resulted 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 addition, in their permit application, GA DNR outlines the following mitigation measures designed to minimize exposure to North Atlantic right whales:

> "Aerial surveys will be flown at 1000 feet to avoid harassing and taking whales. Duration of lower altitude overflights (500 to 800 feet) will be minimized (average = 15 minutes, max = 30 minutes) to reduce duration of harassment and ensure there is sufficient time to complete surveys. Overflights will be discontinued if whales react strongly to approaches or if there is any evidence that activities are interfering with cow/calf pair bonding or vital functions.
>
> Boats will be operated at slow-to-idle speed (five to 10 knots) when approaching North Atlantic right whales. Success of research activities is enhanced when whales' behavior is compliant, so it is in our interest to operate boats in a way that minimizes reaction from whales. Boats may be operated at 10 to 15 knots for the initial portion of biopsy and tagging approaches if whales are traveling and if their location relative to the boat is known precisely. When close to animals, efforts will be made to minimize sudden changes in speed or direction in order to minimize disturbance. The vessel driver will

have substantial experience working with cetaceans or will be driving under the direction of the Principal Investigator or a Co- Investigator. Approach distance will vary according to activity (e.g., focal follows, photo-identification, biopsy, tagging), but will be conducted at the greatest distance required to successfully complete that activity. If whales show signs of boat avoidance, approach distance may be increased or approaches may be temporarily suspended until the whale's behavior changes. If a whale approaches a boat, or surfaces nearby unexpectedly, the driver will boat away slowly or shift the engines to idle and wait for the whale to depart, whichever is safest for the whale and crew. Activities will cease altogether if whales react strongly to approaches or if there is any evidence that activities are interfering with cow/calf bonding or vital functions. Mothers with neonate calves will not be approached for biopsy sampling or tagging. Close boat approaches, biopsy sampling and tagging activities will be suspended temporarily when calves appear to be nursing, and will resume only when nursing appears to be complete. Activities requiring approaching within 100 yards will be limited to three hours for mother/calf pairs and six hours for other whales.

Drones [UAS] will be used to collect images from whales remotely, thereby reducing the frequency of close boat approaches and associated harassment. A maximum of one successful close drone approach (greater than 15 meters altitude) to collect blow samples will be conducted per whale per day.

Individual whales will only be biopsy sampled and tagged successfully a maximum of one time per year (November to October; including double-tagging with Type II and Type III tag concurrently). Whales will only be taken for the purpose of biopsy sampling or tagging a second time during that year if activities on the first day were unsuccessful. If biopsy sampling or tagging are not successful on the second day, that whale will not be taken again for biopsy or tagging for the remainder of the year. A maximum of three biopsy or tagging attempts will be conducted on an individual whale on the same day.

Biopsy tips will not penetrate deeper than four centimeters below the surface of the skin. Biopsy tips will be cleaned and sterilized between uses. Tips will be cleaned with detergent and bleach (to damage any remaining DNA from previous whale sample), rinsed with water, disinfected with 90 percent ethyl alcohol, flamed, and stored in sterile whirl-pacs until use.

The implanted parts of tag attachment systems will not penetrate deeper than 10 centimeters, a depth that is almost always above the muscle-blubber interface. The mean blubber thickness for North Atlantic right whales is approximately 12 centimeters, and the vast majority of measurements were in excess of 10 centimeters (Miller et al. 2011). We will conduct health assessments before tagging whales to further reduce the potential of tagging whales with below average blubber thickness. Parts of tags that are implanted into whales and are in contact with whale tissue will be constructed of medical grade stainless steel, titanium, or other materials (such as medical-grade synthetic polymers)

> proven to be biocompatible. Implanted parts of tags will be sterilized. The preferred method of sterilization is with ethylene oxide gas, but other methods approved by the IACUC may be used.
>
> Aerial survey teams will provide boat teams with whale sighting and identification information in real-time to enhance the efficiency of boat-based activities, thereby reducing the number of whales that are approached needlessly because they have already been sampled. Aerial and boat teams will keep track of whales that have been taken for biopsy sampling and tagging, and communicate that information with one another and with other researchers, thereby minimizing the potential that individual whales will be inadvertently exposed to Level A harassment [biopsy sampling, tagging] repeatedly during the same year. All reactions to research activities will be recorded, tabulated and reported to NMFS annually."

In addition to these mitigation measures taken by GA DNR, the Permits Division proposed to include terms and conditions in the proposed permit, which include several mitigation measures designed to minimize exposure and impacts to ESA-listed species (see Appendix A, Section III of Draft Permit). As part of these terms and conditions, 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 Clay George, listed Co-Investigators, and research assistants. We anticipate that requiring research be conducted by experienced personnel would further minimize impacts to North Atlantic right whales 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 3). Table 1 specifies the applicant's and the Permits Division's proposed exposure of ESA-listed species to research activities associated with manned aerial surveys, vessel surveys, close approaches, documentation, unmanned aerial surveys, biological sampling, and tagging. In accordance with our regulations (50 C.F.R. §402), here we evaluate whether or not these proposed levels of exposure are reasonably certain to occur.

In their application, GA DNR gives the following justification for the proposed exposure in Table 1, broken down by research activity:

*Manned Aerial Surveys*

> "We are requesting 100 aerial survey takes per year for all North Atlantic right whale age classes. Takes will be used when aircraft need to descend below 305 meters altitude to obtain high resolution still images and video, and in the rare case of helicopter overflights. All approaches conducted by an aircraft over an individual whale at an altitude less than 305 meters during a single day will be recorded as one take. The

minimum altitude for any overflights in fixed- or rotary wing aircraft will be 152 meters (500 feet). Overflights below 305 meters will be limited to 30 minutes unless circumstances require longer durations (e.g., disentanglement response, river incursions). Individual whales will be taken a maximum of five times per year (November to October). Overflights will cease immediately if: 1) whales show signs of strong avoidance in response to the approaching aircraft (e.g., breaching, slapping flippers or flukes in apparent response to aircraft) or 2) there is any evidence that activities may be interfering with North Atlantic right whale cow/calf pair bonding, nursing or other vital functions. All reactions to overflights will be recorded and reported in annual permit reports. Most aerial overflights will occur at approximately 305 meters (1,000 feet) altitude and whales will not be taken accordingly."

*Vessel surveys, Close Approaches, Documentation, Unmanned Aerial Surveys, Fecal Sampling, Sloughed Skin Sampling, and Exhaled Breath Sampling*

"We are requesting 500 vessel survey takes of all age classes of North Atlantic right whales for photo-identification, behavioral observations, drone [UAS] overflights and other Level B activities conducted from boats [close approaches, documentation, fecal sampling, sloughed skin sampling, and exhaled breath sampling]. This number of takes is required to ensure that photo-identification and other monitoring data are collected from all North Atlantic right whales observed in the southeastern United States during vessel surveys. Individual whales may be taken a maximum of 10 times per year, although most whales will be taken only one to three times per year. All boat-based Level B activities conducted on an individual whale during a single day will be recorded as one vessel take, including boat and drone approaches. Boat approaches within 100 meter of whales will average 30 to 60 minutes per individual whale per day. Mother/calf pairs will be approached for a cumulative maximum duration of three hours in one day; other North Atlantic right whales will be approached for a maximum of six hours in a day. Close drone approaches to collect blow samples will be limited to one successful sample per whale per day. An average of two close approaches (max five [but limited by the proposed permit to three]) will be required to obtain a blow sample. Duration of close approaches will average 30 seconds (max five minutes). Mother and calves will be approached concurrently during close drone approaches because mother and calf pairs are usually closely associated. Calves will only be sampled for blow if they are large enough to produce a discernable blow and their behavior is amenable. We anticipate that noise created by close drone approaches may cause mild harassment in some situations (e.g., calm seas, whale resting). Goebel et al. (2015) found that sound levels recorded from APH-22 hexacopters through air were approximately 25 dB above ambient background sound level on a quiet, calm day at zero meters distance/altitude. Levels were only approximately five to 10 dB above ambient at 15 to 30 meters altitude. As such, we do not anticipate harassing whales during drone imagery overflights. Close boat approaches (less than 100 meters) and drone approaches (less than 50 meters) will cease immediately if: 1) whales react strongly (e.g., breaching, slapping flippers or flukes in apparent response to aircraft) or 2) there is any evidence that activities may be interfering with North Atlantic right whale cow/calf pair bonding, nursing or other vital functions. All reactions to boat and drones will be recorded and reported in annual permit reports."

*Biopsy Sampling*

"We are requesting 60 biopsy takes per year for non-neonate North Atlantic right whale calves approximately three weeks to seven months old. Sixty takes will be required to ensure that all calves sighted in the southeastern United States each year (November to October) can be sampled. A biopsy attempt will be recorded any time a biopsy sampling projectile is shot toward a North Atlantic right whale, regardless of whether the projectile touches the whale or not. We estimated 60 calf takes as follows: 1) the most recent Stock Assessment Report estimated that the North Atlantic right whales population was growing at 2.8 percent per year as of 2011 (Waring et al. 2016), 2) if the population continues to grow at 2.8 percent per year, there will be a minimum of 600 North Atlantic right whales by 2021, and 3) calf production has been estimated as high as one percent of the minimum population size during good calving years (Waring et al. 2016). Therefore, up to 60 calves could be produced during a good calving year by 2021.

We are requesting 95 biopsy takes for adults, juveniles and non-neonate North Atlantic right whales eight months and older in order to: 1) resample all whales that survive their calving year and return to the southeastern United States during a subsequent year, and 2) sample all cataloged whales that are not known to have been sampled previously. We estimated 95 adult/juvenile takes as follows: Browning et al. (2010) found that up to 92 percent of calves can survive their calving year, so as many as 55 calves may survive to be juveniles after a good calving year. These whales will need to be resampled in order to confirm their age and parentage. In addition, there are currently over 40 whales in the photo-identification catalog that are likely alive and are not known to have been sampled previously (North Atlantic Right Whale Consortium, unpublished data), which sums to a total of 95 takes. This number is conservative and could increase in coming years due to recent shifts in North Atlantic right whale distribution in the northeastern United States and Canada, and concomitant decreases in resighting rates (P. Hamilton, pers. comm.; R. Pace, pers. comm.). Because fewer calves and young juveniles have been seen on the summer foraging grounds in recent summers, there will likely be an increase in the number of unknown age whales being added to the catalog in coming years. These whales will need to be sampled/resampled so that their genetic profiles can be linked to their calf profiles.

Individual whales will only be biopsy sampled successfully one time per year (November to October of the following year). Individual whales may be taken a second time during the same year for biopsy sampling only if biopsy sampling was unsuccessful on the first day (e.g., a sample was too small for genetics analysis, or a whale reacted strongly to an unsuccessful sampling attempt). A maximum of three biopsy attempts will be conducted on any given whale on a single day. Whales that are closely associated with a whale that is approached for biopsy sampling (e.g., mother with a calf when the calf is sampled only) will be recorded as Level B harassment takes. Biopsy activities will cease immediately if a whale reacts strongly to the approaching vessel or to a biopsy shot (e.g., breaching, thrashing its flukes strongly). All biopsy and associated support activities (e.g., photo-identification, drone overflights) conducted on an individual whale during a single day will be recorded as one biopsy take, including missed shots and shots that hit the whale but fail to collect a sample. Approaches will average 45 to 60 minutes. Mother/calf pairs and suspected pregnant females will be approached for a cumulative maximum duration of three hours in one day. Other North Atlantic right whales will be approached for a maximum of six hours in a day. Mother/calf pairs will not be sampled when they appear to be nursing."

*Tagging*

"We are requesting 20 tagging takes per year with the goal of successfully tagging a maximum of 15 whales per year (November to October of the following year). Tags will be deployed on a combination of non-neonate calves 8 months old or older, juveniles and adults, including suspected pregnant females and females with non-neonate calves [but see Section 3.5.5 for age classes for fully-piercing tags]. Tagging takes would be used for a combination of barb-dart tags, fully-piercing tags and/or suction cup tags. In Year 1 [following the permit modification], a maximum of three fully-piercing tags would be deployed, and in Year 2 a maximum of 10 fully-piercing tag deployments would be deployed. No more than 15 whales would be tagged in any given year regardless of tag types used. This number of takes will be needed to obtain sufficient sample sizes, given the high rate of premature detachments that are expected to occur when using minimally invasive tags. All tagging and associated activities (e.g., photo-identification, pre-tagging health assessment, drone photography, tagging, post-tagging photography, focal follows, biopsy sampling) conducted on an individual whale on a day that tagging is attempted will be recorded as one tagging take, including unsuccessful tagging attempts and deployments of Type II and Type III tags concurrently. Tagging attempts will be defined as any time: 1) a tag or deployment device touches a whale, 2) a tag is shot from a remote deployment device toward a whale but does not touch the whale or 3) a tagging pole or other handheld deployment device hits the water near a whale. A maximum of three tagging attempts will be conducted on a whale in the same day. A maximum of five whales will be double-tagged with Type II and Type III tags per year. Whales will only be double-tagged if their behavior is amenable. Type II tags will have no more than four barbed darts or two fully-piercing anchors. Type III tags will have no more than six suction cups. Whales may be biopsy sampled on the same day they are tagged if they are not known to have been biopsy sampled previously and their behavior is amenable. Individual whales will be tagged successfully a maximum of one time per year, and a maximum of three times during the five years of the permit. Individual whales may only be taken for the purpose of tagging on a second day during the same year if activities on the first tagging day were unsuccessful (e.g.; tag, pole or instrument touched the whale but did not attach; activities were aborted due to a strong reaction).

Tag deployment attempts and other approaches within 100 meters of whales will cease immediately if whales react strongly (e.g., breaching, thrashing flukes strongly) to vessel approaches, tag deployment or related activities. If whales show significant avoidance to boat approaches prior to being touched by a tag, pole or other instrument, activities may cease and the event will be recorded as a Level B harassment take. Likewise, whales that are closely associated with whales that are approached for tagging, but are not tagged themselves, will be recorded as Level B boat harassment takes. If a whale is touched with a tag, pole or instrument on a given day, it will be recorded as a tagging take regardless of whether the tagging attempt was successful or not.

For fully-piercing tags, we will tag only males and non-reproductive females in Years 1 and 2 as described in the phase-in procedure above [see Section 3.5.5 of this opinion]. If the phase-in procedure is successful, we will tag juveniles and adult whales of either sex with fully-piercing tags during Years 3 to 5, including pregnant females and females with non-neonate calves.

Mothers with neonate calves will not be approached for tagging activities. Suspected pregnant females and females with non-neonate calves may only be tagged if their behavior is amenable and their calves appear healthy and robust (see Biopsy Sampling for proposed methods to distinguish neonate and non-neonate calves [within application]). Mother/calf pairs will not be approached closely for tagging when they appear to be nursing. Tagging activities that involve boating within 100 meters of mother/calf pairs will be limited to a total of three hours in a single day. Other North Atlantic right whales will be approached for a maximum of six hours in a day.

Calves will not be tagged. We will classify North Atlantic right whales as calves if: 1) they are known to have been born during that calving year or 2) they are closely associated with another whale and are less than one-half the body length of the associated whale (Browning et al. 2010). Whales will be classified as adults or juveniles, and permissible to tag, if: 1) they are known to have been born the previous calving year, 2) they are alone and have well defined callosities, or 3) they have well-defined callosities, are closely associated with another whale, and are greater than one-half the associated whale's body length. If there is any uncertainty whether a whale is a calf or a juvenile, it will not be tagged. Calving years will be defined as the periods from November 1 to October 31 of the following year. For example, a calf that was first observed with its mother in the southeastern United States in December 2015 would be considered a 2016 calf and would not be permissible to tag during the period of November 1, 2015 to October 31, 2016. If the same whale was resighted in the southeastern United States in

> November 2016, it would be classified as a juvenile, and therefore permissible to tag. Whales that are socializing actively (i.e., surface active groups) will not be tagged in order to reduce the likelihood of tags being knocked off prematurely."

With this explanation of the requested take number estimates, our own evaluation of these take numbers in comparison to GA DNR's previous annual reports (NMFS 2011b; NMFS 2017g), and the conservative assumption that all take that the Permits Division authorized under Permit 20556 *could* occur, we adopt the exposure of ESA-listed species specified in Table 1. This exposure could occur year-round, with the duration of each exposure ranging from several minutes to six hours as described in Section 3.

Having estimated or adopted the applicant's and Permit Division's exposure of North Atlantic right whales to research activities that would be authorized under Permit No. 20556, we now further consider the meaning of the numbers specified in Table 1. Despite its name, the column titled *No. Takes* in Table 1 does not necessarily reflect the number of animals that would be exposed. Instead, *No. Takes* represent the maximum number of *takes* that would be authorized and would include any repeat takes of the same individual, as further detailed below.

Given the Permits Division's issuance and counting of takes[10] and the fact that researchers may not always be able to identify individual animals in the field, the number specified in *No. Takes* in Table 1 does not necessarily reflect the number of animals that would be exposed to the research activities under Permit No. 20556. For example, if researchers take an animal on one day it would count as one individual taken. If the same individual were taken on another day that same year without researchers realizing it had already been sampled, it would be counted as a different individual taken. This would result in the total annual number of individuals taken being less than in Table 1. This scenario also illustrates that researchers may unintentionally take the same individual more than once in a single year. However, given the nature of fieldwork (unpredictability, reliance on equipment and personnel availability, and good weather for operations, etc.), the large ranges of North Atlantic right whales, and that North Atlantic right whales are extremely well catalogued and most individuals are known and identifiable in the field, it is unlikely that many, if any, animals would be exposed to the same research activity more than once in a single year other than perhaps manned aerial surveys and vessel surveys since these are required to identify individuals. Give this, the *No. Takes* presented in Table 1 represents the maximum number of individuals that could be exposed annually, and if animals are taken by the same means more than once per year, fewer individuals would be exposed.

Based on Table 1, the entire population of North Atlantic right whales could be exposed to directed research each year. In fact, to account for potential population growth, more annual takes are authorized than there are thought to be individuals in the population (e.g., 500 whales

[10] 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.

could be exposed to vessel surveys each year, and in 2015 the population was estimated at 458 individuals). Such high exposure is purposeful as GA DNR aims to monitor the entire population of North Atlantic right whales within the action area. Nevertheless, most of this exposure would be to aerial and vessel surveys (and associated close approaches, documentation, and non-invasive sampling), with a smaller number of individuals being exposed to biopsy sampling (155 whales annually), and even less to tagging (15 whales annually).

### 8.4 Response Analysis

Given the exposure detailed above, in this section we describe the range of responses among North Atlantic right whales that may result from the stressors associated with the research activities that would be authorized under Permit No. 20556. These include stressors associated with manned aerial surveys, vessel surveys, close approaches, unmanned aerial surveys, biopsy sampling, and tagging. As discussed in Section 8.1, documentation, fecal sampling, sloughed skin sampling, and exhaled breath sampling are not expected to produce any stressors themselves, and as such, no response to these activities is expected beyond the response to the associated vessel surveys and close approaches. For the remaining activities, 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 cases where data specific to North Atlantic right whales are unavailable, we rely on data from other species, including cetaceans, particularly large whales (i.e., mysticetes and sperm whales). We recognize that there can be species specific responses, and even within species all individual animals do not respond to each stressor in the same way (e.g., Noren and Mocklin 2012). Examining the range of responses large whales exhibit to research activities allows us to incorporate the uncertainty that stems from intra- and inter-species response heterogeneity, and makes use of the best available science.

In general, all the research activities described in Section 3 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 hormonal 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 human disturbance caused by the research activities that would occur under Permit No. 20556 may lead to a variety of different stress-related responses. In addition to possibly causing a stress-related response, each research activity is likely to produce unique responses as detailed further below.

### 8.4.1 Manned Aerial Surveys

The Permits Division has determined that manned aerial surveys may result in harassment under the MMPA, and consequently proposes to authorize associated take of North Atlantic right whales. Manned aerial surveys would expose North Atlantic right whales to visual or auditory disturbance that may elicit a behavioral response.

Cetacean responses to aircraft depend on the animals' behavioral state at the time of exposure (e.g., resting, socializing, foraging or traveling) as well as the altitude and lateral distance of the aircraft to the animals (Luksenburg and Parsons 2009). The underwater sound intensity from aircraft is less than produced by boats; and visually, aircraft are more difficult for whales to locate since they aren't in the water and move rapidly (Richter et al. 2006). However, when aircraft fly below certain altitudes (about 500 meters), they have caused cetaceans to exhibit behavioral responses that might constitute a significant disruption of their normal behavioral patterns (Patenaude et al. 2002). Thus, aircraft flying at low altitude, at close lateral distances and above shallow water elicit stronger responses than aircraft flying higher, at greater lateral distances and over deep water (Patenaude et al. 2002; Smultea et al. 2008). The sensitivity to disturbance by aircraft may also differ among species (Wursig et al. 1998). Sperm whales have been observed to respond to a fixed-wing aircraft circling at altitudes of 245 to 335 meters by ceasing forward movement and moving closer together in a parallel flank-to-flank formation, a behavioral response interpreted as an agitation, distress, and/or defense reaction to the circling aircraft (Smultea et al. 2008). Bowhead whales, an appropriate surrogate for North Atlantic right whales, approached during aerial surveys only occasionally exhibited short-term behavioral reactions to helicopters (14 percent of groups), and most of these reactions occurred at altitudes lower than would be flown under Permit No. 20556 (below or equal to 150 meters, compared to a standard altitude of 305 meters and minimum of 152 meters here) (Patenaude et al. 2002). In response to fixed-wing aircraft, only 2.2 percent of bowhead whales exhibited a response, and similarly, most of these responses occurred at altitudes below that which would be typically used under Permit No. 20556 (below or equal to 182 meters) (Patenaude et al. 2002).

Based on these data, it is possible that North Atlantic right whales exposed to manned aerial surveys would exhibit short-term behavioral reactions, but data from GA DNR's past permit reports do not report any behavioral reactions to date (NMFS 2011b; NMFS 2017g). Therefore, it is expected that the proposed manned aerial surveys are not likely to elicit a behavioral response from North Atlantic right whales, but if they do, would only result mild short-term behavioral responses, and not any long-term behavioral changes or reduction in fitness. Thus, we find that the effects of disturbance on North Atlantic right whales that may result from manned aerial surveys are insignificant and do not constitute harassment under the ESA. As such, we will not discuss effects associated with manned aerial surveys further.

### 8.4.2 Vessel Surveys and Close Approaches, and Documentation

The Permits Division has determined that vessel surveys and close approaches may result in harassment under the MMPA, and consequently proposes to authorize associated take of North Atlantic right whales. Vessel surveys and close approaches would expose North Atlantic right whales to vessel traffic, discharge, and visual and auditory disturbances. Responses to each of these stressors are described below.

Vessel surveys necessarily involve transit within the marine environment, and the transit of any vessel in waters inhabited by whales carries the risk of a vessel strike. As noted in Section 6.1.1, responses to vessel strike include death, serious injury, and/or minor, non-lethal injuries, with the associated response depending on the size and speed of the vessel, among other factor. Vessels traveling at speeds greater than approximately 10 knots, especially large vessels (80 meters or greater), are more likely to cause serious injury or death (Conn and Silber 2013; Jensen and Silber 2004; Laist et al. 2001; Vanderlaan and Taggart 2007). As previously detailed in Section 6.1.1, to our knowledge there have only been two instances of a cetacean research vessel striking a whale in over 40 years of NMFS permitting cetacean research activities (Wiley et al. 2016). Thus, while vessel strikes of cetaceans by researcher vessels are certainly possible, current data suggest the likelihood of this occur is extremely low. Furthermore, as noted in Section 6.1.1, GA DNR would use small vessels (six to eight meters) that would travel at slow speeds when near whales (10 knots or less) and would be easily maneuvered away from oncoming whales. In addition, GA DNR has extensive experience spotting cetaceans at sea. For these reasons, we believe the likelihood of a research vessel striking a North Atlantic right whale is extremely low. As such, we find effects from this stressor to be discountable, and we will not discuss it further.

As noted in Section 6.1.1, 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 cetaceans, including North Atlantic right whales. Given the researchers experience operating and maintaining small vessels, it is unlikely that spills or discharges would occur, but if they do, the amounts of leakage would be small given the proposed vessel sizes and the related amounts of fuel, oil, and other chemicals likely to be onboard. We would not be expected such small quantities of discharge to affect North Atlantic right whales directly, or pose measurable hazards to their food sources. Therefore, we conclude that effects from this stressor are insignificant, and we will not discuss it further.

Close approaches by research vessels may cause visual or auditory disturbances to North Atlantic right whales, which could 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). Changes in cetacean behavior can correspond to vessel speed, size, and distance from the whale, as well as the number and frequency of vessel approaches (Baker et al. 1988; Beale and Monaghan 2004). Characteristics of the individual 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. 2001; 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 more 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 and gray whales (*Eschrichtius robustus*) 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 effects from close vessel approaches that would be authorized under Permit No. 20556 to North Atlantic right whales to be minimal for several reasons. First, GA DNR has years of experience approaching cetaceans in a way designed to minimize disturbance and associated responses. Furthermore, in their application GA DNR notes that they will terminate close approaches if they observes any strong reactions to vessels (e.g., breaching, slapping flippers or flukes) or if there is any evidence that activities may be interfering with North Atlantic right whale cow/calf pair bonding, nursing or other vital functions. Second, the source levels of sounds that would be generated by research vessels are below that which could cause physical injury or temporary hearing threshold shifts, and they are unlikely to mask cetaceans' ability to hear mates and other conspecifics for any significant amount of time (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 by GA DNR or more generally in the literature. In their application, GA DNR notes that of the 308 North Atlantic right whales they approached under their most recent permit (Permit No. 15488), 24 percent exhibited avoidance behavior (e.g., swimming away from the vessel or changing course) (GA DNR 2017). They have not observed any severe behavioral reactions, such as breaching, repeated tail slapping, and fluke thrashing. Thus, based on accounts from GA DNR’s past research, responses documented in the literature, and the proposed method for closely approaching North Atlantic right whales by vessel, we expect North Atlantic right whales may respond to the proposed close approaches by exhibiting short-term (several minutes) behavioral responses, but we do not expect these responses would significantly disrupt the normal behavioral patterns of whales to an extent that would create the likelihood of injury or impact fitness. Thus, similar to our findings in Section 6.1.1, we find that the effects of vessel surveys and close approaches to North Atlantic right whales are insignificant and do not constitute harassment under the ESA.

In summary, we find the effects of vessel strikes discountable since they are extremely unlikely to occur, and those discharge insignificant since only small quantities of discharge are possible. While we anticipate some North Atlantic right whales will exhibit mild, short-term behavioral responses to the presence of the research vessel and close approaches, we have determined that these responses would be insignificant. As such, we will not discuss the effect of vessel surveys and close approaches further.

### 8.4.3 Unmanned Aerial Surveys

The Permits Division has determined that unmanned aerial surveys may result in harassment under the MMPA, and consequently proposes to authorize associated take of North Atlantic right whales. Unmanned aerial surveys may cause visual or auditory disturbances to North Atlantic right whales. While the use of UAS to study cetaceans is in its infancy, current data indicate that cetaceans exhibit no behavioral response to UAS. For example Acevedo-Whitehouse et al. (2010) used a UAS at an elevation of 13 meters over blue, gray, humpback, and sperm whales and observed no avoidance behaviors. Koski et al. (2015) used UAS over bowhead whales at a flying elevation of 120 meters with no behavioral responses noted. NMFS’ Southwest Fisheries

Science Center used UAS over killer whales (*Orcinus orca*) and found that at 35 meters flying elevation, there were no behavioral reactions (Durban et al. 2015). Three recent reviews covering the potential impacts of UAS use on marine mammals for research purposes found no data to indicate that cetaceans behaviorally respond to UAS (Christie et al. 2016; Marine Mammal Commission 2016; Smith et al. 2016). However, in a recent report submitted to NMFS for Permit No. 18636, researchers documented behavioral responses by southern right and humpback whales when UAS were flown at a height of approximately 12 feet (NMFS 2017h) above the animals. These responses consisted of mild, short-term change in behavior such as whales rolling over to view the UAS, or "bucking" before returning to pre-exposure behavior.

Based on the available information, we anticipate that in most cases, there would be no response to unmanned aerial surveys, but in some cases, mild short-term behavioral responses could occur. Given the nature of these responses, we do not expect they would significantly disrupt the normal behavioral patterns of North Atlantic right whales to an extent that they would create the likelihood of injury or impact fitness. Thus, similar to our findings in Section 6.1.1, we find that the effects of unmanned aerial surveys to North Atlantic right whales are insignificant and do not constitute harassment under the ESA. As such, we will not discuss the effects of unmanned aerial surveys further.

### 8.4.4 Biopsy Sampling

Under Permit No. 20556, GA DNR would be authorized to biopsy sample North Atlantic right whales. Biopsy sampling presents the stressors of a minor puncture wound and tissue collection, as well as the stressor of a very close approach (as close as seven meters). In general, it is difficult to distinguish between animals' reactions to these different stressors without explicit studies designed to isolate the response to individual stressors, which to our knowledge have not be conducted. As such, below we describe the range of responses, both physiological and behavioral, to the overall procedure of biopsy sampling and where data are available indicate possible responses to specific stressors.

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) 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 trauma such as 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 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 level, and muscle damage. However, given the small size of wounds created by biopsy sampling and the short duration over which the sampling occurs, stress responses to remote biopsy sampling are likely to be 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 mortality: 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 anticipated as a result of biopsy sampling that would be conducted under Permit No. 20556. This is because all biopsy dart tips that GA DNR would use would 1) be thoroughly disinfected before sampling, thus minimizing any chances of infection, 2) sample the animal's dorsal or lateral surface, away from vital organs and sensitive areas, and 3) only penetrate the animal's blubber layer, not muscle, and thus result in no serious injury, death, or impacts to fitness.

Cetaceans also exhibit a wide range of behavioral responses to biopsy sampling (reviewed in Noren and Mocklin 2012), and in some cases these are indistinguishable from those described below for invasive tags (Reisinger et al. 2014). 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).

In their application, GA DNR notes that of the 63 North Atlantic right whales they have biopsy sampled since 2012, 38 percent of exhibited a behavioral response (GA DNR 2017). Most responses were mild, with only two whales exhibiting what might be considered a strong response (e.g., head lifting and swimming away, fluke slapping). Brown et al. (1991) found that a slightly smaller proportion (19.4 percent) of biopsied North Atlantic right whales (N=206) exhibited and observable behavioral response, with most responses being mild (e.g., twitching, swimming away, arching the back, flicking the tail, lobtailing). Why GA DNR observed a greater percentage of responses is unknown, but may be due to the fact that GA DNR's dataset included a greater number of younger individuals, which may be more likely to exhibit a behavioral response to biopsy sampling (Best et al. 2005).

For all of these behavioral 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 normal behavior quickly, usually within 30 seconds to three minutes following biopsy/close approach (Brown et al. 1991; 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 to the second biopsying event (Noren and Mocklin 2012, although see Best et al. 2005).

A variety of factors influence how cetaceans respond behaviorally 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 to biopsy sampling compared to mysticetes (Noren and Mocklin 2012). In some cases (Best et al. 2005, and see above), 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 their 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 the applicants (Section 8.2), we expect North Atlantic right whales to behaviorally respond to biopsy sampling by exhibiting short-term, minor to moderate changes in behavior. However, we do not expect these responses would significantly disrupt their normal behavioral patterns to an extent that it would create the likelihood of injury or impact 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 of a common dolphin (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) particularly given that researchers often resample the same individuals within one week or over a number of years during permitted activities. 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.

### 8.4.5 Tagging

Under Permit No. 20556, GA DNR would be authorized to tag North Atlantic right whales with either dart/barb Type II tags or suction-cup Type III tags. Following the permit modification (Permit No. 30556-01), GA DNR would also be authorized to use fully-piercing tags, though there would be no change in the total number of tag deployments authorized. Tagging presents a variety of stressors including a very close approach (to within a three meters) and physical contact if suction-cup, Type III tags are used or puncture wounds if Type II tags are used. Responses to these stressors may be physiological and/or behavioral in nature and likely differ depending on the tag attachment type. Given that the proposed fully-piercing tags are still under development, no data exist on whale's responses to these tags directly. Therefore, in this opinion was assume these tags will produce responses similar to those exhibited in response to currently available tag types. As part of the phase in plan for fully-piercing tags (see Section 3.5.5), if at any point during tag development evidence suggests otherwise, the permit would not be modified and the effects of fully-piercing tags would be re-evaluated (both by us and the Permits Division). Below we detail the range of physiological and behavioral responses cetaceans exhibit to Type II and Type III tags based the timing of the response, from the initial tag deployment until the tag detaches. As with other stressors above, we discuss data from a multitude of species since data are not always available specifically to North Atlantic right whales, and in many cases we assume responses across large whales will be similar.

#### 8.4.5.1 Tag Deployment

Cetaceans are likely to respond behaviorally to very close approaches for tag attachment in a similar way as previously described above for other close approaches. However, given the closer proximity of these approaches, we anticipate these responses would 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 physical application of the suction-cup tag, or in the case of dart/barb tags or fully-piercing tags, puncture wounds. However, current research examining how cetaceans respond to tag attachments, regardless of type, does not usually distinguish between a whale's response to a very close approach and the 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 cetaceans themselves may not differentiate between the two stressors. As such, below we describe what is known about how cetaceans respond behaviorally to the initial tag deployment, which includes the response to both the very close approach and the attachment of tags.

Previous studies have found that cetaceans respond to suction-cup tag deployment (and missed 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 deployments. 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 deployments. Baumgartner and Mate (2003) reported that strong reactions of North Atlantic right whales to suction-cup tag deployments 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). 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 deployments including changes in frequency of leaps and group speed, flinching, tail slapping, rapid swimming, and rapid surfacing attempts, but no long term fitness consequences. To our knowledge, there are no studies indicating a physiological response to the attachment of suction-cup tags, but we believe a short-term, minor stress response as described at the beginning of Section 8.4 is possible.

The behavioral responses cetaceans exhibit to the application of invasive tags, such as dart/barb, are similar to those described for suction-cup tags and very close vessel approaches (Walker et al. 2012). Furthermore, behavioral responses to dart/barb tags do not appear to drastically differ from those noted for deeper penetrating implantable tags, which are not proposed as part of Permit No. 20556 (Mate et al. 2007; Mate et al. 2016; Robbins et al. 2016; Szesciorka et al. 2016; Walker et al. 2012). These responses include head lifts, fluke lifts, exaggerated fluke beats on diving, quick dives, or increased swimming speeds. Less frequent behavioral responses include fluke slaps, head lunges, fluke swishes, defecation, decreased surfacing rates, disaffiliation with a group of whales, evasive swimming behavior, cessation of singing, breaching, bubble blowing, or rapid acceleration (Mate et al. 2007; Mate et al. 2016; Szesciorka et al. 2016; Walker et al. 2012).

Given that Type II tags penetrate the animal’s tissue, a physiological response is expected. Anticipated reactions to these puncture wounds include minor pain, cell damage, and possibly local inflammation, swelling, bleeding, blood clotting, hemorrhage, and bruising (Mate et al. 2016; NMFS 2017b; Robbins et al. 2016; Szesciorka et al. 2016; Walker et al. 2012; Weller 2008). However, since the penetrating parts of Type II tags would be designed to not penetrate beyond the blubber layer of North Atlantic right whales, and the size of the puncture wounds would be small, very little bleeding, and no hemorrhage, blood clotting, or bruising is expected to occur from these types of tags. Furthermore, current evidence suggest such responses are rare, even for deeper penetrating implantable tags (Mate et al. 2016; NMFS 2017b; Robbins et al. 2016; Szesciorka et al. 2016; Walker et al. 2012; Weller 2008). In addition, a stress response to the deployment of invasive tags is possible, but the available data indicates such a response would be short-term and minimal (Eskesen et al. 2009). If the penetrating parts of tags were contaminated, a viral, fungal, or bacterial infection is possible (Haulena 2016; NMFS 2016c; Weller 2008). However, given that GA DNR would thoroughly sterilize all tags prior to deployment, infection is unlikely. That said, tag sterilization does not preclude the possibility that a pathogen on the whales skin enters the body upon tag insertion (Weller 2008).

There is also a possibility that some Type II tags may break upon impact or soon after, leaving parts of these tags (e.g., petals) in the animal with no tag attached. This is more likely for dart/barb styles tags than the fully-piercing tags under development, as the former relies on barbs and petals to remain within the animal's tissue while the later does now. In their application, GA DNR states that out of approximately 500 dart/barb tag deployments, there have been approximately 8 instances of dart/barb tag breakage (GA DNR 2017). Furthermore, future tag breakage is even less likely given that recent tag modifications made by researchers have greatly reduced or eliminated tag breakage (Robbins et al. 2016; Szesciorka et al. 2016). In fact, the need to reduce tag breakage and minimize the likelihood that tag parts remain in animals is one reason GA DNR's is developing the fully-piercing tags. With these tags, even if there is tag breakage the tag pins can easily slide out of the animal's tissue with no tag parts remaining behind. For dart/barb tags, even if tag breakage were to occur, we do not anticipate the response to this initial tag breakage to be any different from that described above. However, as discussed below, when tag breakage results in tag parts remaining in whales, there may be adverse impacts beyond the initial tagging event.

Based on the information presented above, we expect North Atlantic right whale behavioral responses to initial tag deployments (including unsuccessful attempts) to consist of brief, low-level to moderate behavioral responses. We do not anticipate any physiological responses to the initial attachment of suction-cup, Type III tags other than those associated with a minor stress response. For dart/barb Type II tags, a range of physiological responses is possible, but the initial deployment of tags is not expected to result in serious injury. The deployment mechanism for fully-piercing tags as proposed here is not yet fully developed, and so data are not available on how North Atlantic right whales will respond (behavioral and physiologically). While tags somewhat similar to the fully-piercing tags proposed here have been deployed on beluga whales and narwhals (*Monodon monoceros*) (e.g., Heide-Jørgensen et al. 2015; Smith et al. 2017), these tags were deployed on captured animals, not on free swimming whales as is proposed here. Given the lack of data on responses to the proposed fully-piercing tags, we assume responses to fully-piercing tags would be similar to those described above for other currently available Type II tags. Based on the reviewed responses to the deployment of both Type III and Type II tags, we do not anticipate that the initial tag deployment would affect the fitness of individual whales.

#### 8.4.5.2 Continued Tag Attachment

Once tagged, whales may respond both behavioral and physiologically to the continued attachment of tags. For all types of tags, current studies suggest little to no 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. For implantable tags, which penetrate deep and stay on longer than the dart/barb and fully-piercing tags being proposed here, researchers also note that whales appear to return to baseline behavior within minutes of the initial tagging event. For example, blue and humpback whales tagged with implantable tags appear to resume feeding soon after being tagged (Mate et al. 2007; Robbins et al. 2016). Robbins et al. (2016) reported that the median time it took humpback whales in the Gulf of Maine to recover behaviorally from being tagged with implantable tags was nine minutes. However, recovery times for some individuals were longer, lasting at least 4.5 hours for one individual, which appeared to be related to tag design flaws and the placement of the tag lower on the animal's body than is desired (Robbins et al. 2016). This suggests that under some circumstances, at least some individuals (and/or species) exhibit more extended behavioral responses to tagging. However, all but one whale in this study observed on subsequent days appeared to resume species typical behavioral (Robbins et al. 2016). Based on the above information, North Atlantic right whale behavioral responses to continued attachment of tags is expected to be mild and short-term.

While similar long-term behavioral responses are expected for the different tag types, they differ in the long-term physiological responses they are likely to elicit. For suction-cup tags, almost no physiological response is expected. While the continued attachment of suction-cup tags could cause inflammation and hyperemia at the attachment site, such responses would be short term and minimal (NMFS 2017b). In contrast, dart/barb and fully-piercing tags are designed to maintain long-term (months) penetration within the animal, which may lead to a variety of short-term or chronic responses including pain, tissue damage, inflammation, swelling, and/or depression, change in skin pigmentation and/or skin loss, tissue extrusion, exudate, serious injury, infection, changes in reproduction, or even death.

The available data on the physiological responses of cetaceans to the continued attachment of invasive tags are primarily limited to short-term effects, as few studies have attempted to follow up on tagged individuals weeks, months, or years after tagging. In general, wounds from invasive tags heal with only minor scaring and indentation (Best et al. 2015; Calambokidis 2015; Hanson et al. 2008; NMFS 2016b; Norman et al. 2017; Robbins et al. 2016; Szesciorka et al. 2016). Consistent with this, in their application GA DNR notes that all seven of the North Atlantic right whales previously tagged with LIMPET tags (under Permit No. 14450 to NMFS Southeast Fisheries Center), were observed alive and healthy after tag detachment, and visually, tag wounds appeared to heal normally (GA DNR 2017). While there are currently no data available on the physiological responses of cetaceans to the continued attachment of fully-piercing tag, data from a similar tag design that as long been deployed on beluga whales and narwhals indicates infection and healing complications are unlikely (Citta et al. 2016; Citta et al. 2013; Dietz et al. 2008; Dietz et al. 2001; Hauser et al. 2017; Heide-Jørgensen et al. 2003; Heide-

Jørgensen et al. 2015; Hobbs et al. 2005; Laidre et al. 2003; Orr et al. 1998; Richard et al. 2001; Smith et al. 2017; Suydam 2009; Suydam et al. 2001).

Long-term impacts of the continued attachment of invasive tags, however, remain difficult to gauge (Mate et al. 2007). Several studies have examined long-term impacts of invasive tags and have not found any. In a study on false killer and pilot whales, researchers found no significant difference in survival (Baird et al. 2013). One recent study investigating long-term impacts from dart/barb tags on cetaceans in Hawaii found little evidence of any impacts on survival or reproduction (Andrews et al. 2015), although the power to detect significant differences was very low. In studying the effects of implantable tags, which are more invasive than the dart/barb and fully-piercing tags proposed here, on southern right whales, Best et al. (2015) found similar calving rates between tagged and un-tagged females. Thus, in most instances where researchers have attempted to document long-term impacts of invasive tagging on fitness, they have failed to detect any negative effects. However, we are aware of three recent studies that suggests at least older tag designs may result in negative long-term fitness consequences.

Gendron et al. (2014) monitored the wound site of a broken subdermal attachment from an invasive satellite tag somewhat similar to the dart/barb tags being proposed here, on an adult female blue whale over a period of 16 years (1995-2011). In 2005, 10 years after tag deployment, the tag attachment remained embedded in the whale, with swelling less than 60 centimeters in diameter observed at the site of the attachment. In 2006, 11 years after tag deployment, the sub-dermal attachment had been expelled, leaving an open wound with blubber tissue apparently visible at the center of the swelling, which appeared to have decreased in size compared to two years before. The whale was last seen in 2011 with a scar (closed wound) present at the tag site. The whale’s calving history included three calves; two were observed prior to, and one after, the swelling period (1999-2007). Though there was not definitive evidence of the tag attachment’s effect on reproduction, the authors suggested that it may have affected the female’s reproductive success during this period (Gendron et al. 2014).

In a study on humpback whales in the Gulf of Maine, Robbins et al. (2016) examined the effects of implantable tags on vital rates of both males and females. For both sexes, there did not appear to be any effect on survival and many tagged females continued to successfully reproduce. However, tagging did appear to increase females’ inter-birth intervals, with non-tagged females being nearly twice as likely to produce a calf compared to tagged females in the year following the initial tagging (or relevant year for non-tagged females). This suggest that implantable tagging may have an effect on pregnancy. Following this first year after tagging, tagged and non-tagged females appeared to be similarly likely to reproduce. Additional analyses investigating the effects of different tag models indicated that this impact on reproduction may have been due to a tag design flaw that lead to tag breakage and parts of the tag being left inside the whale after the tag detached. This flaw was recently addressed with a fully integrated implantable, and more recent data using these tags does not currently show the same negative effect on reproduction (NMFS 2017b; Robbins et al. 2016).

In examining the health effects and long-term impacts of implantable tags on large whales in the Pacific, Calambokidis (2015) used photographs and sightings records to evaluate tag-site wound healing and tagging effects on survival. Data came from a variety of long-term studies on blue and gray whales, which were tagged with implantable tags between 1993 and 2008 for blue whales, and in 2011 and 2013 for gray whales. While no effect on re-sighting rate was found for blue whales, tagged gray whales appeared to be less likely to be seen in subsequent years as compared to a control group. When sighting data were used in Cormack-Jolly-Seber capture recapture models to examine the effects of tagging on survival, there was no unequivocal evidence to support a tagging effect on survival, but several of the top models included a negative effect of tagging. Given this and the small sample size, caution should be used when interpreting these results, and effects of tagging on gray whale survival appear to be possible.

Importantly, two of these studies involved implantable tags, which are not being proposed here, and all involved much older tag technologies than would be used by GA DNR under Permit No. 20556. In recent years, many advances in tag technology have been made both to improve data collection and to minimize and avoid adverse impacts to tagged animals and the key tagging co-investigator on the permit Dr. Russel Andrews has been a part of these efforts (GA DNR 2017). These include smaller tag designs, stronger materials, fully-integrated designs, improved sterilization techniques, and better tag application methods, all of which are incorporated in tags that would be used under Permit No. 20556 and the modified Permit No. 20556-01. With these improvements, the chances of long-term adverse effects are greatly reduced (Mate et al. 2007; NMFS 2016b; Robbins et al. 2016; Szesciorka et al. 2016). However, even with these advances impacts to fitness can still occur, as exemplified by the recent death of a Southern Resident DPS killer whale.

In 2016, the death of a Southern resident killer whale, L95, was reported following attachment of a dart/barb tag under Permit No. 16163. An expert veterinary panel concluded that a fungal infection developed at the tag site, as determined by gross dissection, radiographs, magnetic resonance imaging and histopathology, though the killer whale presented in moderate to advanced decomposition at the time of necropsy (Haulena 2016; NMFS 2016c). This fungal infection contributed to illness in the whale and most likely contributed to its death. There were several factors in this case that may have predisposed this whale to a fungal infection at the tagging site including: incomplete disinfection of the tag after seawater contamination, retention of the tag petals which may have allowed for formation of a biofilm or direct pathogen implantation, placement of the tag lower on the body and near large bore vessels which increased the chance of fungal dissemination through the blood system, poor body condition, and possible immunosuppression.

The case of L95 is an important reminder that all invasive tags carry some risk of death, even if minimal. However, the circumstances that lead to L95’s death are extremely unlikely to occur under Permit No. 20556 for several reasons. First, GA DNR would not attempt to tag any individual that appears to be in poor health based on their pre-tagging health assessment protocol. Second, GA DNR would follow stringent sterilization methods as described in his application and the permit terms and conditions. Third, GA DNR would use the latest tag technologies to minimize chances of tag breakage. Finally, GA DNR would only be authorized to use invasive tags on North Atlantic right whales and to date, there have been no records of tag-related mortalities to large whales (although see Calambokidis (2015) study on gray whales discussed above). Given these measures, we find it highly unlikely that the use of invasive tags would result in the death of any individual cetacean.

In summary, we expect North Atlantic right whales to show minor to no behavioral response to the continued attachment of tags. For suction-cup tags, we also anticipate little to no physiological response to the continued attachment of the tag. For dart/barb and fully-piercing tags, we anticipate most wounds would heal with little to no complication and minimal scaring, with only a few animals exhibiting pro-longed healing and scaring. Given recent advances in tagging technologies and the mitigation measures proposed by the Permits Division and GA DNR, we find it unlikely that mortality or a reduction in fitness would result from invasive tagging. However, as indicated by the above review, mortality and fitness impacts have been documented in the literature for older tag designs or under extenuating circumstances (e.g., L95).

### 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 long-term fitness of any individual North Atlantic right whale. As such, the issuance of Permit No. 20556 is not expected to present any risk to the species as 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 C.F.R. §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, vessel 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 North Atlantic right whales; 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 cetacean 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 Endangered Species Act Protected Resources* (Section 6).

The following discussions summarize the probable risks the proposed action poses to North Atlantic right whales. This summary integrates the exposure profile presented previously with the results of our response analysis for the proposed action considered in this opinion.

As discussed in Section 6.1, several ESA-listed species occur within the action area and may be affected by the issuance of Permit No. 20556, but are not likely to be adversely affected because the effects of the proposed action are insignificant or discountable. These include blue whales, bowhead whales, fin whales, Gulf of Mexico Bryde's whales, sei whales, sperm whales, green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, and loggerhead turtles (Northwest Atlantic DPS).

North Atlantic right whales may be affected and are likely to be adversely affected by the proposed action. On an annual basis over the five-year life of Permit No. 20556, 155 North Atlantic right whales would be exposed to biopsy sampling and 15 to tagging, the only two research activities for which the effects were not determined to be discountable or insignificant. This represents approximately 34 and three percent of the population respectively, using the 2015 estimate of 458 individuals. Based on the best available data, behavioral responses to biopsy sampling and tagging range from no response, to mild behavioral responses that are not expected to create the likelihood of injury or impact fitness. Biopsy sampling and tagging may also result in minor wounds and low-level stress responses, but it is not expected to result in infection, long-term adverse health impacts, or effects on fitness.

The status of North Atlantic right whales, as described in Section 6, indicates a small declining population. A variety of current and past anthropogenic threats impact North Atlantic right whales within the action area including climate change, whaling, vessel strikes, whale watching, sound, military activities, fisheries, pollution, and scientific research. Perhaps the most significant direct anthropogenic threats North Atlantic right whales are currently face are vessel strikes and entanglement in fishing gear. In fact, the population is currently experience an UME and early indications indicate these two threats may be contributing factors. Although other factors remain significant threats, their direct impact on North Atlantic right whales is more difficult to assess. All of these threats are expected to continue into the future, but the magnitude at which, and their future impacts on the survival and recovery of North Atlantic right whales, is not reliably predictable.

Considering the activities to which North Atlantic right whales within the action area are likely to be exposed, their potential responses to these activities, the status of the species, and the baseline anthropogenic threats they face, we expect that the issuance of research Permit No. 20556 would result in minor behavioral and physiological responses, including minor puncture wounds, but we do not expect negative consequences to the fitness of any individual North Atlantic right whale.

# 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 North Atlantic right whales. In addition, we find that the proposed action is not likely to adversely affect blue whales, bowhead whales, fin whales, Gulf of Mexico Bryde's whales, sei whales, sperm whales, green turtles (North Atlantic DPS), hawksbill turtles, Kemp's ridley turtles, leatherback turtles, and loggerhead turtles (Northwest Atlantic DPS).

# 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. 20556 involve directed take for the purpose of scientific research. Therefore, NMFS does not expect the proposed action would incidentally take threatened or endangered species. However, we request that the Permits Division report to us the take as specified in Table 1 that actually occurs at the expiration of the permit, as well as any information on the response animals exhibited to those takes. Such information will be used to inform the *Environmental Baseline* and *Effects of the Action* sections in future consultations for similar research activities to be performed by GA DNR or other researchers. In addition, as identified in the proposed action, specifically Section 3.5.5, we request the Permits Division share all data and reports related to the development of fully-piercing tags so that we may confirm that the observed effects of fully-piercing are consistent with those assumed in this opinion.

# 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 C.F.R. §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 cetaceans as well as reduce harassment related to the authorized activities:

1. **Invasive Tag Health Assessment and Monitoring**

   We recommend that the permits division work with researchers to establish standardized pre-tagging health assessment and post-tagging monitoring protocols for all permits that involve invasive tagging of cetaceans. In previous consultations with the Permits Division, we have evaluated numerous protocols for invasive tagging of cetaceans, all varying in the degree to which they assess health prior to tagging and conduct monitoring post-tagging. In their application, GA DNR provides some of the best examples of these two components of an invasive tagging plan that we have reviewed. They clearly articulate the criteria that must be observed during the pre-health assessment in order for tagging to take place, and provide a detailed post-tagging monitoring plan that will be shared and standardized across collaborators. Using this as an example, the Permits Division should consider working with researchers to develop similar protocols that all researchers would follow when using invasive tags on cetaceans. Of particular importance is the collection of consistent post-tagging monitoring data so that the effects of invasive tagging on cetaceans can be evaluated across permits. Such data will greatly improve our and the Permits Division’s understanding of the adverse effects of invasive tags, and should eventually lead to improved tag technologies to minimize these adverse effects.

2. **Individual-Level and Aggregate Take Tracking**

   We recommend that the Permits Division improve their system for tracking the amount of take allowed under issued permits and realized for any given population of ESA-listed species during permitted activities. The Permits Division’s current permit tracking system allows tracking of take (not necessarily number of individual animals) for an individual permit, and for understanding the extent of research at broad scales (e.g., number of research permits in a particular region). However, it remains difficult to quantify the number of animals taken and the extent of take each individual population of ESA-listed species may be subject to across permits. For example, the structure of Table 1 means that when reporting their actual take, researchers are not able to distinguish individuals that were subject to all of the procedures listed in the column “Procedures” from those that only received some of the procedures. Furthermore, there is currently no simple way to summarize the number of takes issued across permits for a given species within a given area, which is necessary for fully understanding the current level of authorized research in the environmental baseline for new research permits. In general, individual-level and aggregate take tracking would better enable the Permits Division and us to evaluate the impacts of multiple, simultaneous research efforts on ESA-listed individuals, populations, and species.

3. **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 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 become available in the peer-reviewed literature. The Permits Division may consider discussing what data gaps exist with designated recovery coordinators and consultation biologists, working on specific reporting requirements that aid those managers in obtaining the necessary data, and making an annual report of these data available to managers and the public.

4. **Data Sharing**

   We recommend the Permits Division work to establish protocols for data sharing among all permit holders, especially monitoring data on invasive tagging as noted above. While many researchers in the community collaborate, especially those studying North Atlantic right whales, having a national standard for data sharing applicable to all researchers permitted by NMFS will reduce impacts to trusted resources by minimizing duplicated research efforts. We recommend basic information reporting be required from each researcher at the expiration of each permit, including the species, location, number of individuals, and age, sex, and identity if known. This information could be further refined based on our third conservation recommendation above and then be made available to all other permit holders and/or applicants, and preferably the public. To help meet this need, data could be uploaded to one of several already established online repositories. For example, OBIS-SEAMAP allows researchers to upload spatial data regarding marine mega-vertebrate sightings (http://seamap.env.duke.edu/). Similarly, the IWC has a portal system (https://portal.iwc.int/) where researchers can contribute basic information on species sightings. In our experience, direct submission by researchers to the IWC portal is required by other countries (e.g., Australia) as a condition of research permits.

5. **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 and with the resource managers. Such meetings may be a venue to discuss the details outlined in our first and third conservation recommendation.

In order for us 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 us of any conservation recommendations they implement in their final action.

# 14 Reinitiation Notice

This concludes formal consultation for the Permits Division's proposal to issuance Permit No. 20556. As 50 C.F.R. §402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) The amount or extent of taking specified in the incidental take statement 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 previously considered.
(3) The identified action is subsequently modified in a manner that causes an effect to ESA-listed species or designated critical habitat that was not considered in this opinion.
(4) A new species is listed or critical habitat designated under the ESA that may be affected by the action.

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# 16 Appendices

## Appendix A: Draft Permit No. 20556 (October 10, 2017)

*Final permit may have minor changes that would not affect this opinion. Permit No. 20556

Permit No. 20556

Expiration Date: October 31, 2022

Reports Due: January 31st, annually

PERMIT TO TAKE PROTECTED SPECIES[11] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to the Georgia Department of Natural Resources, 2070 U.S. Highway 278 SE, Social Circle, GA 30025-4711., (hereinafter "Permit Holder"), [Responsible Party: Jonathan P. Ambrose) pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq*.); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.); and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

II. Abstract

The objectives of the permitted activity, as described in the application, are to: 1) contribute to ongoing North Atlantic right whale (NARW) population monitoring efforts; 2) identify and reduce human causes of mortality and serious injury; 3) monitor and protect NARW habitat; and 4) cooperate with NMFS to implement the NARW Recovery Plan.

III. Terms and Conditions

[11] "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 October 31, 2022. This permit expires on the date indicated and is non-renewable. This permit may be extended by the Director, National Marine Fisheries Service (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[12] of protected species occurs.

   b. If authorized take[13] is exceeded in any of the following ways:

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

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

[12] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers listed in Table 1 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; or deaths resulting from infections related to sampling procedures or invasive tagging. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[13] 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.

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[14] acquired[15] under this permit after permit expiration without additional written authorization, provided the samples are maintained as specified in this permit.

B. <u>Number and Kind(s) of Protected Species, Location(s) and Manner of Taking</u>

1. The table in Appendix 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 Appendix 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 of Appendix 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. 20556. 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:

[14] 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.
[15] Authorized methods of sample acquisition are specified in Appendix 1.

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. For all approaches[16] in water and attempts to remotely biopsy and tag, count and report 1 take per cetacean per day.

   i. If <u>all</u> of your Level A biopsy or tagging attempts on a single day are unsuccessful but <u>do not make contact</u> with the animal, count the take against your Level B harassment take row.

   ii. If any of your Level A attempts on a single day are unsuccessful but <u>make contact</u> with the animal, count the take for the day against your sampling or tagging take row.

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[16] 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 for sperm and baleen whales (excluding minke whales) and 50 yards for all other cetaceans.

c. During manned aerial surveys flown at an altitude lower than 1,000 feet, count and report 1 take per cetacean observed per day, regardless of the number of passes.

d. During Unmanned Aircraft System (UAS) surveys, count 1 take per cetacean approached per day, regardless of the number of passes.

General

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

f. The cumulative maximum time spent with a NARW in a single day must not exceed:

   i. For mother/calf pairs: 3 hours; and

   ii. For all other NARWs: 6 hours.

g. 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.

Aerial Surveys

h. Aerial flights must not be conducted over pinnipeds on land.

*Manned Aerial Surveys*

i. Manned aerial surveys must be flown at an altitude of 1,000 feet (305 m). Descents for photo-identification must be no lower than 500 feet (152 m).

j. To comply with regulations (50 CFR 224.103) prohibiting approaches within 500 yards of North Atlantic right whales without a permit, this permit authorizes right whale aerial surveys flown at 1,000 feet (333 yards). Take numbers are not required for these surveys at or above 1,000 feet. Takes are required for surveys below 1,000 feet and circling at 500 feet.

*Unmanned Aircraft Systems (UAS)*

k. Researchers are authorized to use a vertical take-off and landing UAS.

l. UAS must be flown at an altitude of 50 feet (15 m) or higher. Brief descents for breath sampling must be no lower than 5 feet (1.5 m).

Remote Biopsy, Breath Collection, and Tagging

m. Researchers must submit Institutional Animal Care and Use Committee (IACUC) approval and approved protocols to the Permits Division prior to biopsy sampling or tagging any cetaceans.

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

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

p. Researchers must use sterile[17] biopsy tips and invasive tag anchors (darts, pins, bolts, etc.). Sterilization procedures must follow the protocol

[17] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (CDC 2008). These methods should follow the IACUC-approved protocol for sterilization (e.g., gas).

described in the application and be approved by the IACUC. If the IACUC approves different protocols, these must be submitted to the Permits Division.

i. If the biopsy tip or tag anchor becomes contaminated and is no longer sterile (e.g., missed attempt, contacts seawater, physical contact) prior to use, a new sterile biopsy tip or tag anchor must be used.

ii. If a new, sterile biopsy tip is not available, the contaminated tip must be completely cleaned and disinfected[18] following the protocol described in the application.

iii. However, if new sterile tag anchors are not available, the researcher must cease tagging efforts until sterile alternatives are available.

q. Before attempting to biopsy sample or tag an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid repeated sampling of any individual.

Biopsy Sampling

r. Researchers must not attempt to biopsy a cetacean anywhere forward of the pectoral fin.

s. Researchers may biopsy sample non-neonate calves and females accompanied by these calves. A calf must only be successfully sampled (yielding a sample) once.

t. Neonates or females accompanied by neonate calves may not be sampled. Neonates are defined, as described in the application, to have:

i. fetal folds present on body,

ii. few cyamids on head or lip and a smooth rostrum,

[18] Disinfection = eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects usually by liquid chemicals (CDC 2008).

iii. flaccid flukes,

iv. raised or “periscoped” blowholes relative to nuchal region,

v. thin or “tubular” body shape,

vi. movements appear clumsy and uncoordinated, and

vii. activity that stays near surface or surfaces frequently to breath.

<u>Tagging</u>

u. Researchers must not attempt to tag a cetacean anywhere forward of the blowhole. The area within ~ 30 cm of sensitive sites such as the blowhole, eyes, mouth, flippers, and flukes must be avoided. See Condition E.4 for additional report requirements.

v. Researchers may suction-cup or dart/barb tag animals at least 8 months old including yearlings[19], juveniles, and adults. Whales are defined as <u>juveniles</u>, as described in the application, if:

  i. they are known to have been born the previous calving year (November 1- October 31 of the following year),

  ii. they are alone and have well defined callosities, or

  iii. they have well defined callosities, and if associated with another whale, are greater than one-half the associated whale's body length.

w. Females accompanied by non-neonate calves may be tagged.

x. Researchers may not tag whales that are unhealthy, entangled, or seriously injured following the pre-tag health assessment described in the application.

<u>Non-target Species</u>

y. This permit does not authorize takes of any protected species not identified in Table 1, including those species under the jurisdiction of the United States Fish and Wildlife Service (USFWS) (e.g., manatees). Should other protected species be encountered during the research

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[19] Yearling NARWs present in the southeastern United States were born in the previous calving season (November 1- October 31 of the following year) and are estimated to be approximately one year old; however, depending on the actual birthdate and month of resighting, “yearlings” could be 8-14 months in age. Definitive identification of individuals and actual age determination may not occur until after field work is completed.

activities authorized under this permit, researchers must exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

z. For activities in areas where manatees may be encountered, the Permit Holder or Principal Investigator must follow these conditions to prevent interactions with manatees:

i. Obey all speed zones and manatee no entry zones. Boat strikes are a leading cause of death for manatees.

ii. If manatees are observed prior to an encounter, care should be taken to slowly maneuver away from the direction of the animals. If a manatee is encountered while on the water, a minimum distance of 50 feet should be maintained at all times.

iii. If manatees approach, place boat engines in neutral and allow the animals to pass.

iv. If the manatees are located during aerial surveys, altitudes should be increased to 1,000 feet and surveys should cease if the manatees appear to be affected by the over flight.

v. If a manatee is injured or killed while conducting the activities authorized under this permit:

a. Such activity must be suspended, unless it would result in the death of the animal(s) being studied or rescued.

b. Immediately contact:

- USFWS Jacksonville office at 904-731-3079 (weekdays) or 904-655-0730 (weekends);
- USFWS Georgia Ecological Services Office at 912-832-8739; and
- Brad Winn with the Georgia Department of Natural Resources' Non-Game Program at 912-264-7218.

c. For any activities which result in the injury or death of a manatee, a written report must be submitted to USFWS Division of Management Authority and the appropriate regional or field office within 30 days detailing the circumstances that led to the injury or mortality and suggesting measures to prevent or minimize the chances of future injuries or mortalities. A necropsy (if applicable) should be performed by a qualified veterinarian and details of the cause of death included in the written report.

d. The USFWS may subsequently recommend continuation of the suspended activities with any necessary modifications/conditions.

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., skin, blubber);

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 identified in Appendix 2 without additional written authorization, 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 additional 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. <u>Qualifications, Responsibilities, and Designation of Personnel</u>

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 – R. Clay George.

b. Co-Investigators – See Appendix 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. This includes coordination of field activities of all personnel working 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 (e.g., pilots – including UAS operators) 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 or PI 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. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI 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.

9. 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. <u>Reporting</u>

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 Reporting

   a. If a serious injury or mortality occurs or authorized takes have been exceeded as specified in Conditions A.2 the Permit Holder must:

      i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;

ii. Submit a written report within 2 weeks of the incident as specified below; and

iii. Receive approval from the Permits Division before resuming work. 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.

b. Any time a serious injury or mortality of a protected species occurs, a written report must be submitted within two weeks.

c. Any time a tag is inadvertently attached to a North Atlantic right whale within ~ 30 cm of sensitive areas including the blowhole, eyes, or mouth, a written incident report must be submitted within two weeks.

d. The incident report must include: 1) a complete description of the events and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

3. Annual reports describing activities conducted during the previous permit year (from November 1st to October 31st) must:

   a. be submitted by January 31st 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. For any North Atlantic right whale tagged forward of the pectoral fin, please provide in your annual report a description of these activities, including tag location, any adverse behavioral reactions to the tagging, and any adverse reactions at the tagging site.

5. A final report summarizing activities over the life of the permit must be submitted by (April 30, 2022), or, if the research concludes prior to permit expiration, within 180 days of completion of the research.

6. 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. NMFS Regional Offices are responsible for ensuring coordination of the timing and location of all research activities in their areas to minimize unnecessary duplication, harassment, or other adverse impacts from multiple researchers.

2. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Offices listed below at least two weeks prior to initiation of each field trip/season.

   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, boat driver, UAS pilot, Research Assistant "in training").

   Notification must be sent to the following Assistant Regional Administrators for Protected Resources as applicable to the location of your activity:

   For activities in NC, SC, GA, and FL:

   Southeast Region, NMFS, 263 13th Ave South, St. Petersburg, FL 33701; phone (727)824-5312; fax (727)824-5309

   Email (*preferred*): nmfs.ser.research.notification@noaa.gov; and

   For activities in ME, 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. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the applicable Regional Offices 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[20] from the Permit Holder;

[20] 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.

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 or 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.

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.

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  Date Issued

Director, Office of Protected Resources

National Marine Fisheries Service

______________________________ ________________

Jonathan Ambrose  Date Effective

Director, Wildlife Resources Division

Georgia Department of Natural Resources

Responsible Party

Appendix 1: Tables specifying the Kinds of Protected Species, Locations, and Manner of Taking.

Table 1. Annual takes of male and female marine mammals in the Atlantic Ocean and Gulf of Mexico during vessel and aerial surveys. Includes direct takes and incidental harassment to non-target animals during any directed research. Maximum of 15 animals tagged per year for all tag types combined.

| Line | Species (Stock/DPS) | Life stage | No. Takes [21] | Take Action | Procedures | Details |
|---|---|---|---|---|---|---|
| 1 | Dolphin, Atlantic spotted (Range-wide) | All | 500 | Harass | Incidental harassment | Incidental harassment of dolphins that are closely associated with whales during aerial and boat surveys and UAS approaches. |
| 2 | Dolphin, bottlenose (Range-wide) | | 500 | | | |
| 3 | Dolphin, Atlantic white sided (Range-wide) | | 100 | | | |
| 4 | Whale, humpback (West Indies DPS) | All | 50 | Harass | Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL) | Boat approaches for photo-ID. UAS overflights and other Level B harassment on humpback whales that are associated with right whales and/or sighted opportunistically during right whale vessel and aerial surveys. |

[21] 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.

Table 1. Annual takes of male and female marine mammals in the Atlantic Ocean and Gulf of Mexico during vessel and aerial surveys. Includes direct takes and incidental harassment to non-target animals during any directed research. Maximum of 15 animals tagged per year for all tag types combined.

| Line | Species (Stock/DPS) | Life stage | No. Takes [21] | Take Action | Procedures | Details |
|---|---|---|---|---|---|---|
| 5 | Whale, pilot, long-finned (Western Atlantic Stock) | All | 50 | Harass | Incidental harassment | Incidental harassment of whales that are closely associated with NARWs during boat and aerial surveys and UAS approaches. |
| 6 | Whale, right, North Atlantic (Western Atlantic Stock NMFS Endangered) | All | 100 | Harass | Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Tracking | Aerial surveys. Most aerial surveys will occur at 1,000 ft and will not result in takes; aircraft may descend to 500 ft for photogrammetry and other imaging. |
| 7 | | All | 500 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking | Vessel surveys. Level B harassment vessel activities including photo-ID, UAS overflights, and post-tag monitoring. Most whales will be taken 1-3 times per year, a few may be taken up to 10 times per year. |

| Table 1. Annual takes of male and female marine mammals in the Atlantic Ocean and Gulf of Mexico during vessel and aerial surveys. Includes direct takes and incidental harassment to non-target animals during any directed research. Maximum of 15 animals tagged per year for all tag types combined. | | | | | | |
|---|---|---|---|---|---|---|
| Line | Species (Stock/DPS) | Life stage | No. Takes [21] | Take Action | Procedures | Details |
| 8 | Whale, right, North Atlantic (Western Atlantic Stock, NMFS Endangered) | Non-neonate/ Juvenile/ Adult | 95 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking | Biopsy sampling and associated activities on yearlings,[22] juveniles,[23] and adults. Individual whales will only be sampled successfully once per year (Nov-Oct). Animals may be approached on a second day if biopsy sampling is not successful on the first day. |
| 9 | | Non-neonate calf | 60 | Harass/ Sampling | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking | Biopsy sampling and associated activities on non-neonate[24] calves (~3 weeks to ~7 months) calves will only be sampled successfully once per year (Nov-Oct) among all permit holders. Animals may be approached on a second day if biopsy sampling is not successful on the first day. |

[22] Yearling NARWs were born in the previous calving season (November 1- October 31) and are estimated to be approximately one year old; however, depending on the actual birthdate and month of resighting, "yearlings" could be 8-14 months in age. Definitive identification of individuals and actual age determination may not occur until after field work is completed.

[23] NARW are defined as juveniles if: (1) they are known to have been born the previous calving year (November 1- October 31 of the following year); (2) they are alone and have well defined callosities, or (3) they have well-defined callosities, and if associated with another whale, are greater than one-half the associated whale's body length.

[24] NARW neonates are defined by: (1) fetal folds present on body; (2) few cyamids on head or lip and smooth rostrum; (3) flaccid flukes; (4) raised or "periscoped" blowholes relative to nuchal region; (5) thin or "tubular" body shape; (6) movements appear clumsy and uncoordinated; and (7) activity that stays near surface or surfaces frequently to breath.

Table 1. Annual takes of male and female marine mammals in the Atlantic Ocean and Gulf of Mexico during vessel and aerial surveys. Includes direct takes and incidental harassment to non-target animals during any directed research. Maximum of 15 animals tagged per year for all tag types combined.

| Line | Species (Stock/DPS) | Life stage | No. Takes [21] | Take Action | Procedures | Details |
|---|---|---|---|---|---|---|
| 10 | | Non-neonate/ Juvenile/ Adult | 20 | | Acoustic, passive recording; Collect, sloughed skin; Count/survey; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking | Tagging and associated activities on yearlings,[12] juveniles,[13] and adults including moms w/o neonate calves. A maximum of 15 animals successfully tagged per year (including all tag types). Up to 5 animals may receive one suction-cup and one dart tag per year. Animals may be approached on a second day if both tagging and biopsy cannot be completed on the same day. |
| 11 | | Non-neonate | 200 | Import/ export/ receive only | Import/export/receive, parts | Export of right whale skin and blubber samples for genetics analysis. |
| 12 | Whale, sei (Nova Scotia Stock NMFS Endangered) | All | 50 | | Incidental harassment | Incidental harassment of whales that are closely associated with NARWs during boat and aerial surveys and UAS approaches. |

## Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 20556.

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



| Name | Agency | Role | Aerial Survey | Boat Surveys[25] | UAS | | Ship/ Receive Samples | Biopsy Sampling | Tagging | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Oversee | Pilot | | | Suction-cup | Dart |
| Clay George | GDNR | PI | X | X | X | | X | X | X | |
| William Kolkmeyer III | GDNR | CI | X | X | X | | X | X | | |
| Mark Dodd | GDNR | CI | X | X | | | X | X | | |
| Ashley Raybould | GDNR | CI | X | X | | | X | | | |
| Cynthia Taylor | S2S | CI | X | | | | | | | |
| Tom Pitchford | FWC | CI | X | X | | | X | X | X | |
| Katharine Jackson | FWC | CI | X | X | | | X | X | | |
| Jenifer Jakush | FWC | CI | X | X | | | X | X | | |
| Andrew Garrett | FWC | CI | X | X | | | X | | | |
| Barbara Zoodsma | NMFS SERO | CI | X | X | | | X | | | |
| Russel Andrews | UAF | CI | | X | | | X | X | X | X |

[25] Level B Harassment Only

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Michael Moore | WHOI | CI | | X | | X | X | | | |
| Lisa Conger | NMFS NEFSC | CI | X | X | | X | X | X | | |
| Bradley White | Trent University | CI | | | | | X | | | |

Biological samples authorized for collection or acquisition in Table 1 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

| Authorized Recipient | Sample Type | Disposition |
|---|---|---|
| Georgia Department of Natural Resources, Clay George and William Kolkmeyer | Skin, blubber, and feces | Curation of blubber, skin, and feces; temporary storage of skin samples prior to genetic analysis |
| Trent University, Dr. Bradley White | Skin | Genetic analysis and curation of remaining samples |
| National Marine Fisheries Service, Northeast Fisheries Science Center, Lisa Conger | Skin | Curation of duplicate skin samples |
| New England Aquarium, Dr. Rosalind Rolland | Feces | Analysis and curation of remaining samples |
| Florida Fish and Wildlife Conservation Commission, Florida Fish and Wildlife Research Institute, Tom Pitchford, Katharine Jackson, Andrew Garrett | Skin, blubber, and feces | Temporary storage of biological samples until shipped for analysis or curation |