

# Endangered Species Act Information

## Needs for Aquaculture Projects in the U.S. Atlantic

**This document is designed to aid federal action agencies developing Biological Assessments (BA) to analyze the potential effects of proposed aquaculture activities on listed species and designated critical habitat, as required by section 7 of the Endangered Species Act (ESA), in NMFS' Greater Atlantic Region (GAR). The Greater Atlantic Regional Fisheries Office consults on aquaculture projects occurring from Maine through Virginia. While the federal agency is responsible for developing and submitting the BA to NMFS PRD for section 7 consultation, this document will also inform aquaculture proponents about the information needs related to their action in regards to avoidance and minimization of effects on ESA listed species.**

General guidance on carrying out ESA Section 7 consultation in the **GAR** is available at:

<https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-aquaculture-greater-atlantic-region>.

The statutory requirements for Biological Assessments and requests for consultation are described at 84 FR 44976 (August 27, 2019) and [50 CFR 402.12](#).

This document outlines the information necessary to support a robust analysis of the effects of a proposed aquaculture activity on ESA-listed species and designated critical habitat. This list is not project specific and may not capture all information needs for all projects, but is intended as a guide. In addition, the information needed to produce an adequate and complete BA will vary due to a number of factors such as project scope and size, location (e.g., estuary/bay, inshore, offshore), type of operation, etc. For each project, we expect that any description of baseline information or analysis of the potential effects of any action will be comprehensive and based on the best available scientific information. We understand that gear- and site-specific information may sometimes be limited; in those instances, the best reasonable proxy should be provided with an explanation for why any necessary assumptions are reasonable. We also recognize that quantitative analyses are not always possible; in those cases, qualitative assessments should be provided with a robust explanation of any underlying assumptions or data gaps. For all activity descriptions, include as much detail as possible including relevant measures to reduce impacts and monitoring and reporting requirements that are part of the proposed action.

For technical assistance<sup>1</sup> on NMFS trust resources, contact your [regional PRD contact](#). If you do not know your contact is, please contact [nmfs.gar.esa.section7@noaa.gov](mailto:nmfs.gar.esa.section7@noaa.gov).

For each specific information need/stressor listed, we have included sub-topics with specific aspects to include/consider/analyze.

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<sup>1</sup> Technical assistance includes information on protected species present in the action area and potential stressors the species may encounter as a result of the project.

## Information Needs

### 1. Identification of Action Area

The action area is defined as: “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” [50 CFR Section 402.02].

- a. Include aquaculture site and all adjacent areas that will be affected by the action (e.g., due to changes in water quality through effluent, receiving environment for escapes of animals/gametes)
- b. For a new land based facility, this includes effects of activities that extend into the water (e.g., effluent discharge of land-based systems)
- c. Include all vessel transit routes during all phases of the project, including international ports.
- d. Describe the hatchery facilities supporting marine farms, this should include location and stocks (gametes, fish or seedstock) proposed for stocking site or net pens.

### 2. Description of the Proposed Action

Describe all activities related to the action that may affect ESA-listed species/designated critical habitat, and provide sufficient detail to allow for identification of consequences to individuals of all species that may be affected (including direct consequences and those that may occur indirectly (e.g. effects to habitat or prey)). This detailed description should include activity levels, frequency, duration, location, and intensity and should reflect the best available information on the activities and how the activities are likely to be carried out.

- a. List all expected federal (e.g., USACE EPA, USCG) and state permits required for the action.
- b. Anticipated start date, duration of project, seasonality (if any), end date
- c. If seasonal, describe whether gear remains deployed in the off-season, is partially removed, or is removed completely. Describe the reasons the activities are planned as seasonal. For example, are there growing season restrictions or an initial phase with plans to move toward full year activity at a later time, etc.
- d. Description of the natural and anthropogenic characteristics (oceanographic environment, habitat features, shipping lanes, fishing grounds, etc.) of the action area
  - i. Include relevant seasonal, geographic, etc. information for each characteristic
  - ii. Include information about currents, depths, tidal influence, etc.

- e. Describe any geophysical and geotechnical surveys that may occur prior to construction (e.g., site selection) and continuing through all operations. Provide information on equipment to be used, sound source levels, distances to isopleths of interest, etc. (if applicable, see noise section below).
- f. Describe species to be grown/raised. Indicate the source of the gametes, fish or seedstock (e.g., North American Atlantic salmon, American oysters, European oysters,) and any certification of origin and disease status. Describe species size, dimensions, weight when harvested. If species are clustered together, such as a mussel drop line, describe estimated dimensions and weight of individuals and of the overall cluster.
- g. Describe the location and size of project area, and portion of area in which gear will be deployed
- h. Describe the gear design. Gear descriptions should be detailed, include figures/photos/engineering diagrams wherever possible, and include:
  - i. Type of gear deployed
  - ii. Number of vertical/horizontal lines (rope length, diameter, material, breaking strength), including any marker buoys
  - iii. Buoyancy compensation to maintain structure and floatation.
  - iv. Anchoring systems, including foundations type.
  - v. Any anti-predator gear that may be used
  - vi. Any deterrents that may be used
  - vii. Gear spacing/distance between gear components/zone of passage
- i. Describe the process used to install the gear
  - i. If rip-rap or other material such as oyster shells are being placed on shoreline or bottom, provide a description of type of material and how it will be placed (e.g., small rocks by hand, dredge, etc.)
  - ii. Large vessels and equipment needed to set anchors etc. (include potential size and estimated max number of vessels).
- j. Describe the harvesting systems to be used
- k. Describe the gear maintenance plan
- l. Describe how the gear will be removed after the permit is expired or the permitted activity otherwise ceases(i.e., decommissioning plan)

- m. Identify all proposed conservation measures<sup>2</sup> (e.g., best management practices, measures to reduce entanglement) and permit conditions for avoidance or minimization of effects that are to be considered part of the proposed action, including specific information about when and how these would apply and the anticipated reduction in take (e.g., capture, vessel strike) or severity of take. This should include any proposed monitoring or reporting measures.

**3. Abundance and distribution of [ESA-listed species in the action area](#)**

- a. Use the best available information to describe listed species distribution and abundance in the entire action area:
  - i. Describe how listed species habitat use varies across the action area (e.g., some species may occur in the area transited by project vessels but not at the proposed site, behavior (foraging, migrating, etc.), duration of presence (occasional, intermittent, frequent), seasonality of use, if any).
  - ii. Examples of data sources or relevant research that may be used to identify ESA-listed species and critical habitat presence in the action area include, but are not limited to the following:
    1. Atlantic Marine Assessment Program for Protected Species (AMAPPS), <https://www.fisheries.noaa.gov/new-england-mid-atlantic/population-assessments/atlantic-marine-assessment-program-protected>
    2. Site characterization surveys
    3. NOAA NEFSC Northeast Acoustic Marine Mammal Surveys, <https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-acoustic-projects>
    4. NOAA Northeast Fisheries Science Center Right Whale Aerial Survey, <https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html>
    5. Provincetown Center for Coastal Studies Right Whale Aerial Survey, <https://coastalstudies.org/right-whale-research/>
    6. OBIS-SEAMAP, <http://seamap.env.duke.edu/>
    7. The Nature Conservancy Marine Mapping Tool, <https://maps.tnc.org/marinemap/#7/42.8/-68>
    8. Southern New England Sea Turtle Sightings Hotline, <https://seaturtlesightings.org/>

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<sup>2</sup> Please note that developing gear specifications is outside of GARFO PRD's expertise. While we can provide information on protected species in the action area and work with the action agency on certain specifics, we recommend that gear engineers, GARFO's Regional Aquaculture Coordinators, or others with similar expertise be consulted on gear design.

9. DOE Mid-Atlantic Baseline Studies, <http://www.briloon.org/mabs>
10. New York State Dept. of Conservation NY Bight Passive Acoustic Monitoring, Aerial, Shipboard Surveys, <https://www.dec.ny.gov/lands/113647.html>
11. Habitat-based marine mammal density models <https://seamap.env.duke.edu/models/mdat/mammal.html>
12. NMFS GARFO Section 7 Mapper, including tables with species temporal distribution, <https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater>
13. Northeast Regional Ocean Council Data Portal, <https://www.northeastoceancouncil.org/quick-links/>
14. Mid-Atlantic Ocean Data Portal, <https://portal.midatlanticocean.org/data-catalog/conservation/>

**4. Description of [critical habitat in the action area](#) (if any)**

**5. Information Needed to Support Evaluation of Project Effects and Anticipated Affects to ESA-Listed Species and designated Critical Habitat. For each potential stressor listed in Appendix A, the following should be analyzed:**

- a. Determine which ESA –listed species may be exposed to the stressors of the action, including a description of the life-stage exposed, and identify the effects that may occur (i.e, avoidance, entanglement, etc.).
- b. When possible, include a quantitative assessment of the number of individuals likely to be exposed to a particular stressor (e.g., estimated number of animals that may become entangled in lines, estimated number of animals that may be struck by vessels transiting to and from the site). When a quantitative assessment is not possible, a qualitative approach may be substituted (e.g., identification of the species and life stages likely to be exposed and the duration and intensity of that exposure).
- c. Establish if the stressor may result in any impacts to designated critical habitat in the action area, if present, and include which Physical and Biological Features<sup>3</sup> may be affected by each stressor and what those effects may be.
- d. Evaluate the effects of the current project when added to environmental baseline conditions. Environmental baseline conditions include the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area.

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<sup>3</sup> Physical and biological features essential to the conservation of the species are defined as: The features that occur in specific areas and that are essential to support the life-history needs of the species. A feature may be a single habitat characteristic or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity. These features are described in the critical habitat designation.

- e. Make an determination regarding the effects of the action on each listed species and/or critical habitat<sup>4</sup>:
  - i. For each stressor/activity, determine if effects are expected to be: (a) discountable (extremely unlikely to occur), (b) insignificant (unable to meaningfully measure, detect or evaluate), (c) wholly beneficial (positive effects without *any* negative effects), or (d) adverse (the appropriate conclusion if the effects are not discountable, insignificant or wholly beneficial). If the effects to a species are likely to be adverse, identify the type of take that you anticipate will occur (e.g., harm, harass, capture, kill, injure, collect);
  - ii. At the project level, for each species and critical habitat in the action area, the federal action agency determines if the action:
    - 1. May Affect, Not Likely to Adversely Affect (NLAA), if effects are: (a) discountable (extremely unlikely to occur), (b) insignificant (unable to meaningfully measure, detect or evaluate), and/or (c) wholly beneficial (positive effects without *any* negative effects); or
    - 2. May affect, Likely to Adversely Affect (LAA), if effects are likely to adversely affect the listed species and/or critical habitat.

## **6. Description of monitoring plan**

- a. Describe how the site will be monitored including monitoring methods (e.g, methods for determining gear movement, gear maintenance needed, interactions with ESA-listed species), frequency of site visits
- b. Describe if there will be active on-site monitoring (e.g., acoustic monitoring, video monitoring, notification systems for gear failures)
- c. If active monitoring is conducted, describe how the data will be analyzed and assessed.
- d. If the operations are seasonal, monitoring should be described when the farm is operating and, if gear remains in the water, during the off-season.

## **7. Description of response plan**

- a. Describe any response plans and containment management plans that will be in place (e.g., responses to gear failures, contaminant spills, storm damage, entanglement event, escapes of farmed fish, low oxygen, disease outbreaks).

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<sup>4</sup> Note that you may reach different effects conclusions for the same activity/stressor for different species or species groups.

## **Appendix A**

This appendix describes the stressors that may be associated with aquaculture projects. As noted above, this document is not project or site specific. Therefore, this provides an overview of the potential stressors (in bold) which may apply to aquaculture operations and list the information needed for a thorough evaluation of impacts associated with the potential stressor for the Biological Assessment.

### **Physical Presence of Farm**

1. Evaluate the potential for any ESA-listed species to be present in the action area and potential effects of the physical presence of the gear to entangle, entrap, impinge, or otherwise interact with ESA-listed species and how that will impact the species. This should include potential non-lethal, serious injury, and lethal interactions with the individual's exposed.
2. Evaluate the potential for displacement/disruption of listed species use of the action area and the consequences of any such displacement or disruption of use of the area.
3. Evaluate the habitat conversion (e.g. scour, reef effect, soft bottom to hard bottom) and loss or addition of benthic resources.
4. Evaluate changes to abundance and distribution of primary prey species for listed species and how these changes will impact the listed species.
5. Describe attraction of ESA-listed species to the site (e.g., attraction to prey species being farmed or light).
6. Describe potential for farm to attract any predators of ESA-listed species to the site.
7. Evaluate the effects of the physical presence of farm to regional and local oceanographic and atmospheric conditions and how that will impact listed species, including impacts on prey species.
8. For installation and operation including dismantling/removal of aquaculture gear, evaluate impacts to benthic resources, water quality, turbidity, effects on primary forage, and amount of habitat disturbed or altered.

### **Vessels**

1. For each phase (planning, installation/removal, operation), describe baseline vessel traffic in the area where project vessels will occur (i.e., vessel traffic in the area is absent but for the proposed action).
2. Include unique transits for all vessels transiting the entire action area for each phase and the extent of the project. Unique transits are considered an individual entry-exit of a vessel that overlaps the action area.
3. Description should include vessel types, activity, size (e.g., length, beam, draft, deadweight tons), and operational speed (minimum operating headway speed, anticipated working speed, anticipated transiting speed, maximum speed).
4. Include details on ports planned for use and number of expected trips by vessel type to each port per month during each phase of the project.

5. Evaluate risk of vessel strike to listed species from project vessels during each project phase.

## **Noise**

1. Include sound source levels and distance to isopleths of concern for all noise sources (e.g., vessels, site assessment (i.e., sonar) or other benthic surveys, use of deterrents) for all phases of the project including planning, construction, operation, and dismantling. Quantify the size of the area where noise will be above thresholds of concern (see below).
2. Describe the addition of noise due to construction, operational, and dismantling of the farm on the oceanic soundscape.
3. If source levels exceed the thresholds of concern, describe the species anticipated to be exposed to noise sources and anticipated responses (e.g., behavioral disturbance)/consequences (e.g., physiological damage, shift in foraging grounds).
4. Clearly address how any minimization and monitoring measures included as part of the proposed action are anticipated to reduce exposure (either the number of individuals or the duration of exposure) or reduce the response/consequences (e.g., physiological damage, shift in foraging grounds) to the exposed individuals.
5. Where possible, a quantitative assessment of the number of individuals likely to be exposed to underwater noise that could result in mortality, injury, and/or behavioral disturbance/response should be provided. However, when that is not possible, a qualitative approach is acceptable. This is the action agency's best estimate of the extent of the action's effects; it is not an incidental take statement.
6. Include a complete description of any acoustic thresholds to be used in the analysis (see below for NMFS requirements).
7. Evaluate impacts to listed species that are displaced from an impacted area due to project noise (e.g., how displacement may affect foraging, spawning, increase/decrease the likelihood of interactions with fisheries, vessels, or other threats).

## **Displacement/Shifts and Changes in Use of other Activities**

1. Describe potential changes in use of the action by non-project related activities/users (e.g., commercial recreational fisheries, scientific research surveys, ferry services), and how those changes may affect listed species (i.e., assess interaction risk due to displacement/shifts of vessel traffic and fishing activity) through all phases of the project.
2. Describe potential impacts to listed species resulting from this displacement.

## **Disease transmission**

1. Describe risk of disease/parasite transmission to wild populations, and evaluate the risk to listed species.

2. Clearly address how any minimization and monitoring measures included as part of the proposed action are anticipated to reduce exposure (either the number of individuals or the amount of pathogens released into the receiving waters) or reduce the response/consequences (e.g., physiological damage, infection, stress) to the exposed individuals.

### **Escapement**

1. Describe the risk of escapement, and the risk to listed species should escapement occur.
2. Describe any potential for genetic and ecological effects to occur on natural populations due to escapement.
3. Describe any measures that would minimize the potential for genetic and ecological effects to occur such as reproductive sterility, triploidy, and single sex populations.
4. Clearly address how any minimization and monitoring measures included as part of a containment management plan for the proposed action are anticipated to reduce escapes (i.e., the number of individuals) or reduce the response/consequences (e.g., genetic effects, stress) to the exposed individuals.

### **Pollutant discharge**

1. Describe risk of oil spills and/or contamination from antifoulants, fuel, lubricants etc. and evaluate risk to listed species.
2. Describe risk of authorized chemical releases (e.g., therapeutants, sea lice treatments) and evaluate risk to listed species.
3. Describe risk of discharge of excess feed and fecal material, and evaluate risk to listed species.
4. Describe changes to turbidity and water quality, and evaluate risk to listed species.
5. Describe risk of damaged or lost gear (due to expected and unexpected events), and evaluate risk to listed species (e.g., escapes of farmed fish).

### **Project Lighting**

1. Evaluate project lighting as a potential attractant for ESA-listed species, prey for ESA-listed species, or predators of ESA-listed species.
2. Evaluate the potential for lighting to attract smaller prey species that could aggregate larger predators and ESA-listed species such as marine mammals.

### **Unexpected/unanticipated events, and evaluate any risk to listed species**

1. Describe risks of vessel collision/allision, and evaluate the impacts to listed species.
2. Describe any risks due to failure of farm gear due to weather, and evaluate the impacts to listed species.

## Appendix B

This appendix describes the acoustic hearing thresholds for ESA-listed species of fish, sea turtles, and large whales in the Northwest Atlantic. Specifically, it identifies the received levels, or thresholds, at which individual animals are predicted to experience behavioral disturbance and/or physiological changes in their hearing sensitivity (either temporary or permanent) due to exposure to underwater anthropogenic sound sources. For aquaculture projects that will result in the introduction of underwater sound (i.e., through construction, operation, and/or decommissioning), these acoustic hearing thresholds will need to be considered in assessing the impacts of any anthropogenic sound sources introduced by proposed aquaculture project.

### Acoustic Thresholds

#### *ESA-listed fish*

Acoustic thresholds identifying the onset of behavioral disturbance and interim injury for ESA-listed fish.

Hearing Group	Behavioral Disturbance	FHWG (2008) interim injury criteria
ESA-listed fish greater than or equal to 2 grams (0.07 ounces)	150 dB re 1 $\mu$ Pa (rms)	Peak SPL: 206 dB re 1 $\mu$ Pa SELcum: 187 dB re 1 $\mu$ Pa <sup>2</sup> -s
ESA-listed fish less than 2 grams (0.07 ounces)	150 dB re 1 $\mu$ Pa (rms)	Peak SPL: 206 dB re 1 $\mu$ Pa SELcum: 183 dB re 1 $\mu$ Pa <sup>2</sup> -s

#### *Sea Turtles*

Acoustic thresholds identifying the onset of permanent threshold shift and temporary threshold shift for sea turtles exposed to impulsive sounds (U.S. Navy 2017) (McCauley et al. 2000a; McCauley et al. 2000b)

Hearing Group	Generalized Hearing Range	Permanent Threshold Shift Onset	Temporary Threshold Shift Onset	Behavioral Response
Sea Turtles	30 Hz to 2 kHz	204 dB re 1 $\mu$ Pa <sup>2</sup> -s (SEL <sub>cum</sub> ) 232 dB re 1 $\mu$ Pa SPL (0-pk)	189 dB re 1 $\mu$ Pa <sup>2</sup> -s (SEL <sub>cum</sub> ) 226 dB re 1 $\mu$ Pa SPL (0-pk)	Response: 166 dB re 1 $\mu$ Pa (rms) Significant Disruption/Avoidance: 175 dB re 1 $\mu$ Pa (rms)

*ESA-listed whales*

Level A (injury/onset of PTS) and level B (behavioral disturbance) acoustic thresholds for the marine mammal species groups (NMFS 2018).

Hearing Group	Generalized Hearing Range <sup>[1]</sup>	Level A Harassment <sup>[2]</sup> : PTS Onset: Impulsive (weighted)	Level A Harassment <sup>[2]</sup> : PTS Onset: Non- Impulsive (weighted)	Level B Harassment <sup>[3]</sup> : Impulsive (weighted)	Level B Harassment <sup>[3]</sup> : Non- Impulsive (weighted)
Low-Frequency Cetacean	7 Hz to 35 kHz	L <sub>pk,flat</sub> : 219 dB; LE,LF,24h: 183 dB	LE,LF,24h: 199 dB	160 dB re 1 μPa (rms)	120 dB re 1 μPa (rms)
Mid-Frequency Cetacean	150 Hz to 160 kHz	L <sub>pk,flat</sub> : 230 dB; LE,MF,24h: 185 dB	LE,MF,24h: 198 dB	160 dB re 1 μPa (rms)	120 dB re 1 μPa (rms)

<sup>[1]</sup> Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on approximately 65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007).

<sup>[2]</sup> L<sub>pk,flat</sub>: unweighted (<sub>flat</sub>) peak sound pressure level (L<sub>pk</sub>) with a reference value of 1 μPa; LE,<sub>XF</sub>,24h: weighted (by species group; LF: Low Frequency, or MF: Mid-Frequency) cumulative sound exposure level (L<sub>E</sub>) with a reference value of 1 μPa<sup>2</sup>-s and a recommended accumulation period of 24 hours (<sub>24h</sub>)

<sup>[3]</sup> Level B harassment levels are expected to capture any qualifying changes in behavioral patterns that may result from Temporary Threshold Shifts (86 FR 33827; June 25, 2021).

## References

FHWG 2008, <https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/ser/bio-fhwg-criteria-agree-a11y.pdf>

McCauley, R. D., J. Fewtrell, A. J. Duncan, C. Jenner, M-N. Jenner, J. D. Penrose, R. I. T. Prince, A. Adhitya, J. Murdoch, and K. McCabe (2000a). Marine seismic surveys - a study of environmental implications. *Apnea Journal*. 40:692-708.

McCauley, R.D., J. Fewtrell, A. J. Duncan, C. Jenner, M-N. Jenner, J. D. Penrose, R. I. T. Prince, A. Adhitya, J. Murdoch, K. McCabe (2000b). Marine seismic surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid. Curtin University of Technology.

Department of the Navy 2017, [https://www.nwtteis.com/portals/nwtteis/files/technical\\_reports/Criteria\\_and\\_Thresholds\\_for\\_U.S.\\_Navy\\_Acoustic\\_and\\_Explosive\\_Effects\\_Analysis\\_June2017.pdf](https://www.nwtteis.com/portals/nwtteis/files/technical_reports/Criteria_and_Thresholds_for_U.S._Navy_Acoustic_and_Explosive_Effects_Analysis_June2017.pdf)

National Marine Fisheries Service. 2018. 2018 [Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing \(Version 2.0\)](#): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. Bartol, T. J. Carlson and S. Løkkeborg, (2014). Sound exposure guidelines. In ASA S3/SC1. 4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI (pp. 33-51). Springer, Cham.

Southall, B., A. Bowles, W. Ellison, J. Finneran, R. Gentry, C. Greene Jr., D. Kastak, D. Ketten, J. Miller, P. Nachtigall, W. Richardson, J. Thomas, P. Tyack, P. (2007). Marine Mammal Noise Exposure Criteria. *Aquatic Mammals*, 33(4), 273-275.