BOEM

Bureau of Ocean Energy Management

Sound Sources Used in Offshore Wind Site Characterization

Whale Educational Forum

April 4,, 2023

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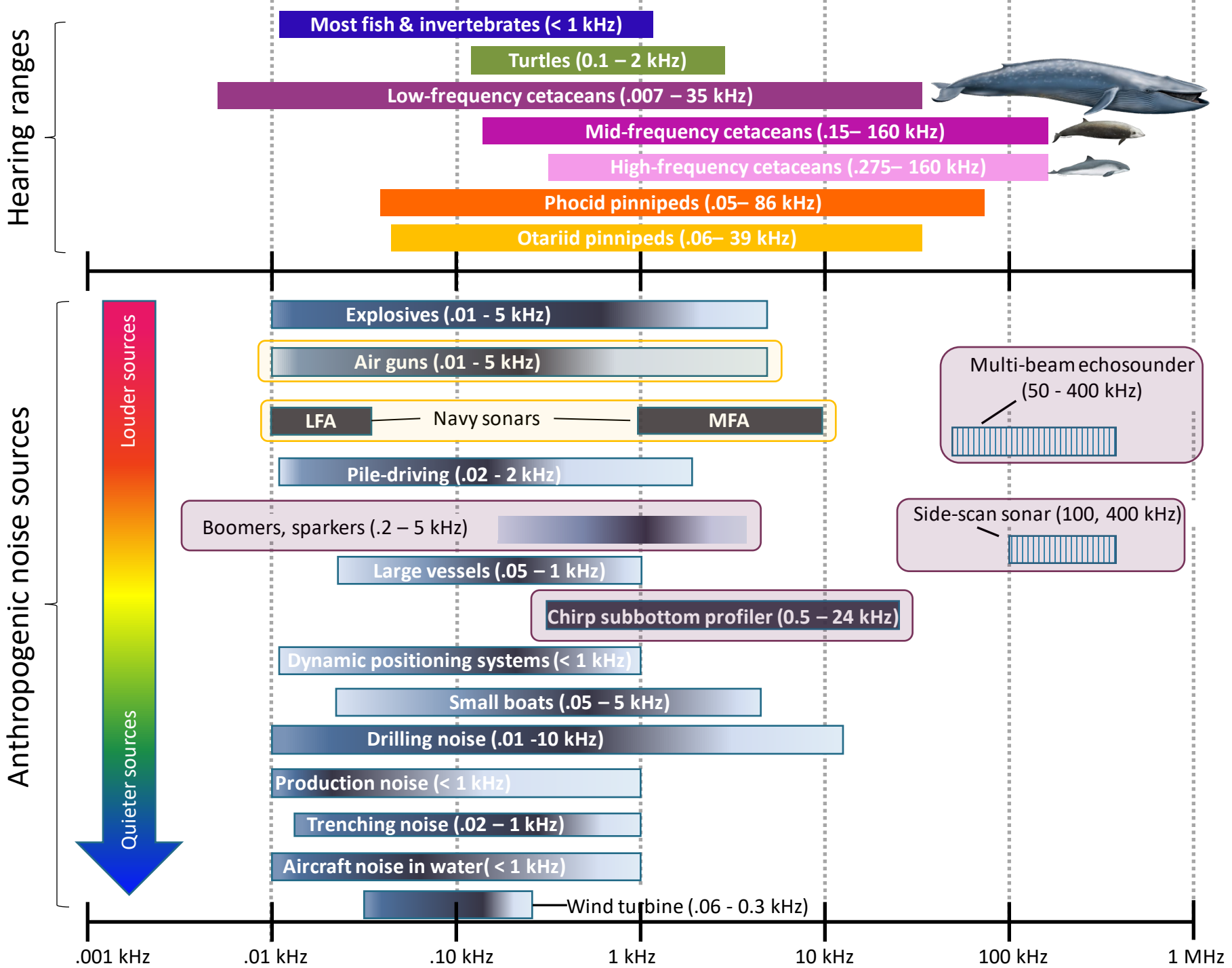
“Take” under the Marine Mammal Protection Act

“Take” ≠ kill !

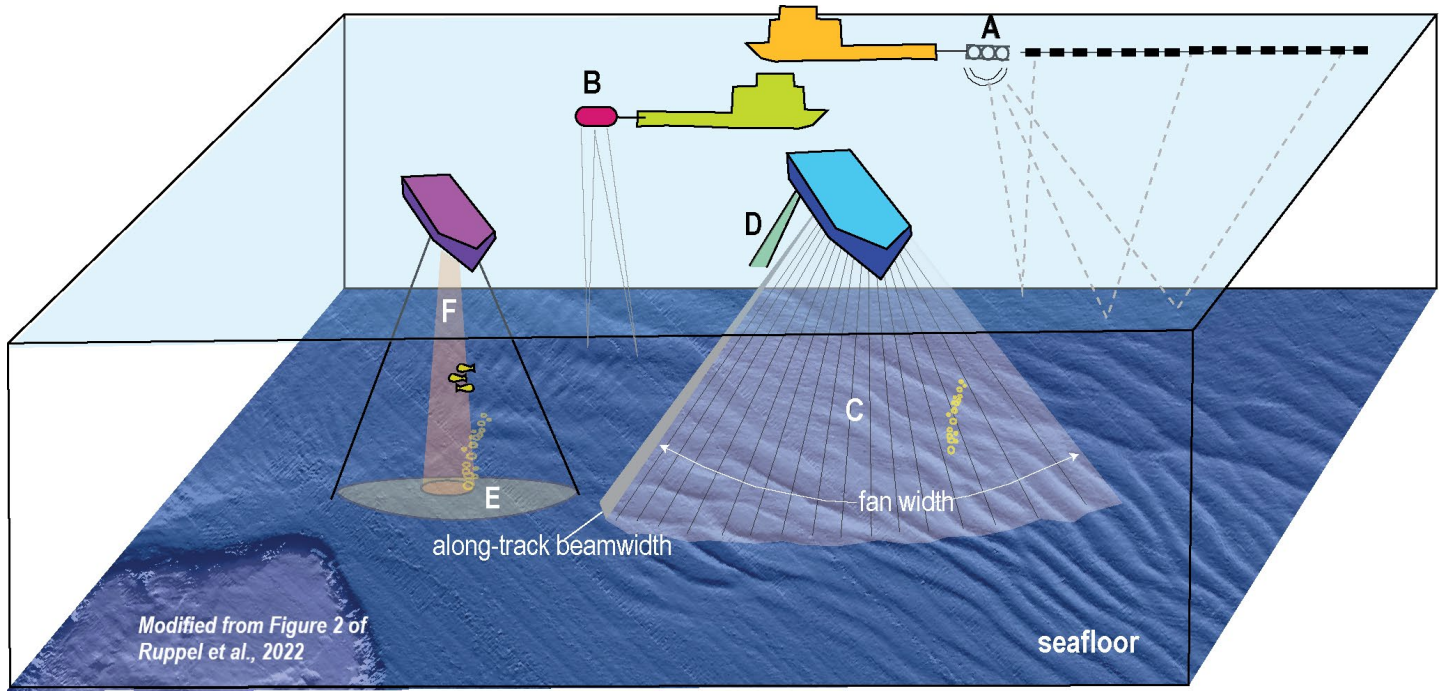
- “The term ***take*** means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” – MMPA
- In general for BOEM activities, very little lethal take is ever authorized by NOAA. NOAA is not authorizing ***any lethal take*** for offshore wind activities.
- NOAA fisheries can authorize incidental (unintentional) take of small numbers of marine mammals for certain activities, like offshore wind development.
- Two types of incidental take:
  - “Level A” = injury. For acoustics, this is auditory injury, i.e. permanent hearing loss. Acoustic thresholds are established by NMFS and differ by species group.
  - “Level B” = behavioral disturbance. For acoustics, this includes behavioral disturbance from a sound source and possibly temporary (i.e. recoverable) hearing loss. Threshold is 160 dB re 1 µPa for all species.



- Airguns and Navy sonars are some of the most powerful man-made sources.
- High-resolution geophysical (HRG) sources used in seafloor mapping are lower in energy and have key characteristics that set them apart.
- There is no evidence that HRG sources used by offshore wind companies could cause mortality of whales, nor any evidence that they are responsible for the recent whale strandings.

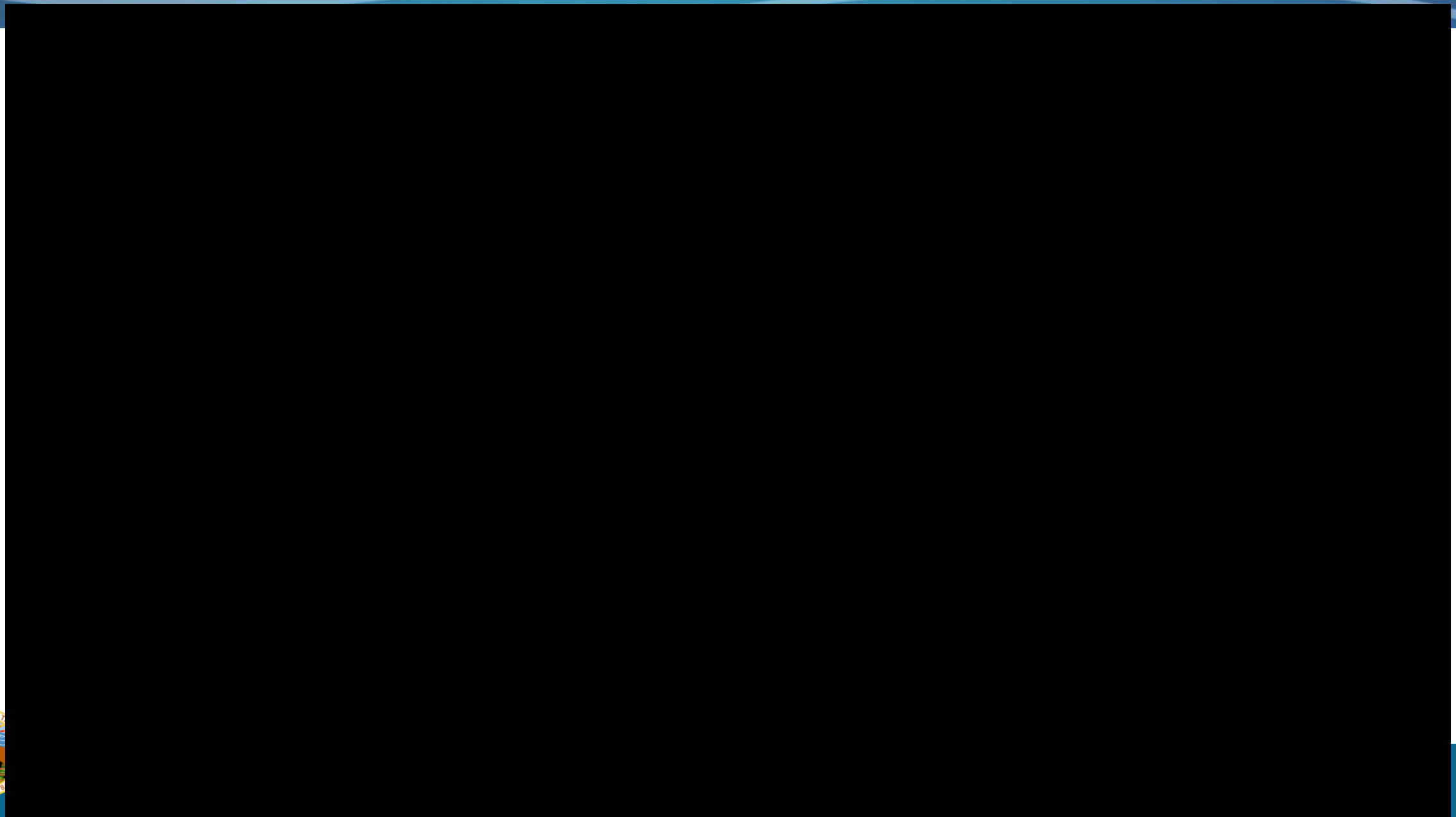
Site characterization for offshore wind

- "High-resolution geophysical" sources
  - Have source levels lower than airguns (most are < 210 dB re 1 µPa)
  - Are non-impulsive (except for boomers and sparkers)
  - Are intermittent
  - Have very low duty cycles (short pulses of sound with relatively long periods of silence)
  - Are directional



Ruppel et al. **(J. Marine Science & Engineering, 2022) evaluated key factors of the sound sources while considering the current behavioral harassment threshold of 160 dB re 1 µPa**

https://www.youtube.com/watch?v=hdlOkQOtgMk&t=37s



Tiering Framework proposed by Ruppel et al 2022

Tier 1: take possible, mitigation required

- Airguns >1500 in^3

Tier 2: take possible, mitigation required

- Airguns < 1500 in^3

Tier 3: No take with mitigations applied

- High-powered sparkers
- 1 and 2-plate boomers
- Some new sources may remain here until vetted

✓ 100m EZ except for NARW
✓ Shutdowns required
✓ PAM not required
✓ Nighttime ops allowed

Tier 4: *de minimis*
No take; no mitigation required

- Low-powered sparkers
- 3-plate boomers
- Bubble guns (most likely)
- Hull-mounted and towed SBP
- Split beam echosounders
- Multibeam echosounders
- Acoustic releases
- Fathometers
- Pingers
- ADCP
- USBL
- Instruments on AOVs, ROVs, etc.
- Any source operating above 180 kHz

This framework was proposed in the paper, but BOEM currently requires mitigation mitigation for Tiers 3 and 4.

Marine mammal observers on survey vessels are required to report *any* encounter with a whale.

Conclusions

- The current mitigations that are used for site characterization should be more than adequate.
- No evidence that site characterization could be the cause of whale strandings.
- None of the OSW site characterization surveys have sought level A harassment authorization, and relatively little Level B. NOAA is not authorizing mortality for *any* offshore wind activity.

- Current areas of focus for BOEM:
  - Multi-year regional monitoring of baleen whales using PAM and other methods
    - If change in distributions does occur, is it caused by offshore wind development *or other existing stressors*?
  - Received sound level limit for impact pile-driving
  - Acoustic exposure tradeoffs of impact vs. vibratory pile-driving
  - Impacts of substrate vibration/particle motion on fishes and invertebrates
  - Auditory recovery time for impulsive sounds

Journal of Marine Science and Engineering

MDPI

Article

Categorizing Active Marine Acoustic Sources Based on Their Potential to Affect Marine Animals

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Abstract: Marine acoustic sources are widely used for geophysical imaging, oceanographic sensing, and communicating with and tracking objects or robotic vehicles in the water column. Under the U.S. Marine Mammal Protection Act and similar regulations in several other countries, the impact of controlled acoustic sources is assessed based on whether the sound levels received by marine mammals meet the criteria for harassment that causes certain behavioral responses. This study describes quantitative factors beyond received sound levels that could be used to assess how marine species are affected by many commonly deployed marine acoustic sources, including airguns, high-resolution geophysical sources (e.g., multibeam echosounders, sidescan sonars, subbottom profilers, boomers, and sparkers), oceanographic instrumentation (e.g., acoustic doppler current profilers, split-beam fisheries sonars), and communication/tracking sources (e.g., acoustic releases and locators, navigational transponders). Using physical criteria about the sources, such as source level, transmission frequency, directionality, beamwidth, and pulse repetition rate, we divide marine acoustic sources into four tiers that could inform regulatory evaluation. Tier 1 refers to high-energy airgun surveys with a total volume larger than 1500 in^3 (24.5 L) or arrays with more than 12 airguns, while Tier 2 covers the remaining low/intermediate energy airgun surveys. Tier 4 includes most high-resolution geophysical, oceanographic, and communication/tracking sources, which are considered unlikely to result in incidental take of marine mammals and therefore termed *de minimis*. Tier 3 covers most non-airgun seismic sources, which either have characteristics that do not meet the *de minimis* category (e.g., some sparkers) or could not be fully evaluated here (e.g., bubble guns, some boomers). We also consider the simultaneous use of multiple acoustic sources, discuss marine mammal field observations that are consistent with the *de minimis* designation for some acoustic sources, and suggest how to evaluate acoustic sources that are not explicitly considered here.

Keywords: active acoustics; marine noise; sonar; airguns; marine seismic; high-resolution geophysics; pingers; echosounder; multibeam; marine mammals; endangered species; cetaceans; delphinids; sea turtles

check for updates

Citation: Ruppel, C.D.; Weber, T.C.; Staaterman, E.R.; Labak, S.J.; Hart, P.E. Categorizing Active Marine Acoustic Sources Based on Their Potential to Affect Marine Animals. *J. Mar. Sci. Eng.* **2022**, *10*, 1278. https://doi.org/10.3390/jmse10091278

Academic Editor: Giuseppa Buscaino

Received: 29 June 2022
Accepted: 2 September 2022
Published: 9 September 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

A wide range of controlled sound sources is deployed in the marine environment to map, explore, and characterize the seafloor, the subbottom, and the water column and to communicate with or track remote devices (e.g., remotely operated vehicles, seafloor sensors) that are also used to accomplish these tasks. For controlled sound sources, physical factors such as the power level, transmission frequency, duration of sound pulses, and deployment depth, as well as characteristics of the seafloor and seawater, influence sound propagation in the marine environment. An animal's response to a sound source depends on the biological characteristics (e.g., hearing range and sensitivity, behavioral activity) and the environmental context (e.g., depth in the water column, distance from the source) of the marine species receiving the sound. The combination of the physics of the sound sources

Ruppel et al. (2022): Characterizing active acoustic sources based on their potential to affect marine mammals. *Journal of Marine Science and Engineering* (10: 1278). **Open Access https://www.mdpi.com/2077-1312/10/9/1278**

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