



BOEM BUREAU OF OCEAN
ENERGY MANAGEMENT

Distributed Acoustic Sensing Technology for Whales Monitoring at Atlantic Offshore Wind Areas

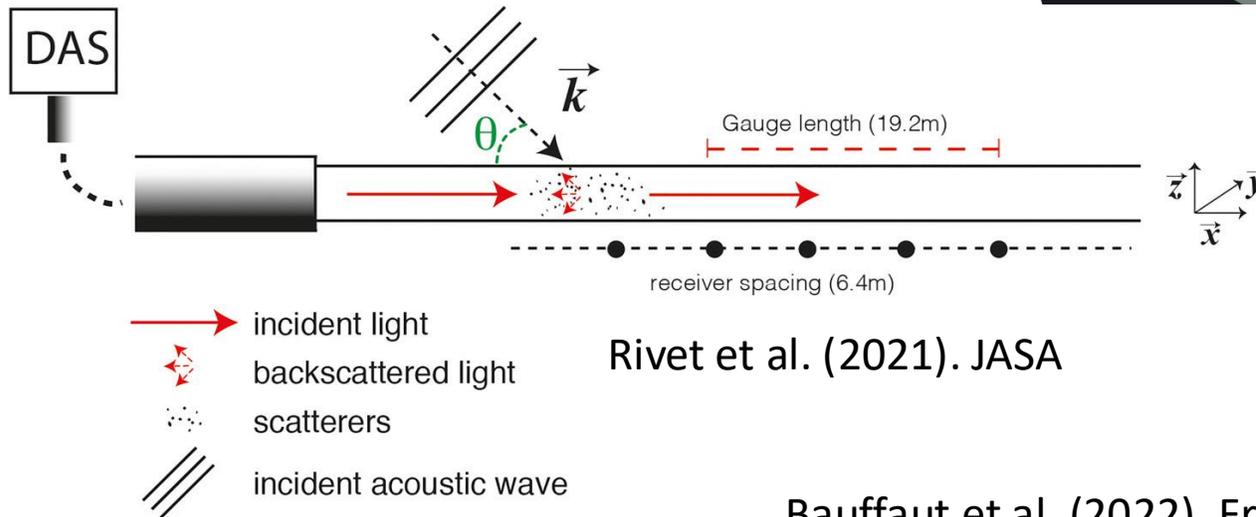
26th Meeting of the Standing
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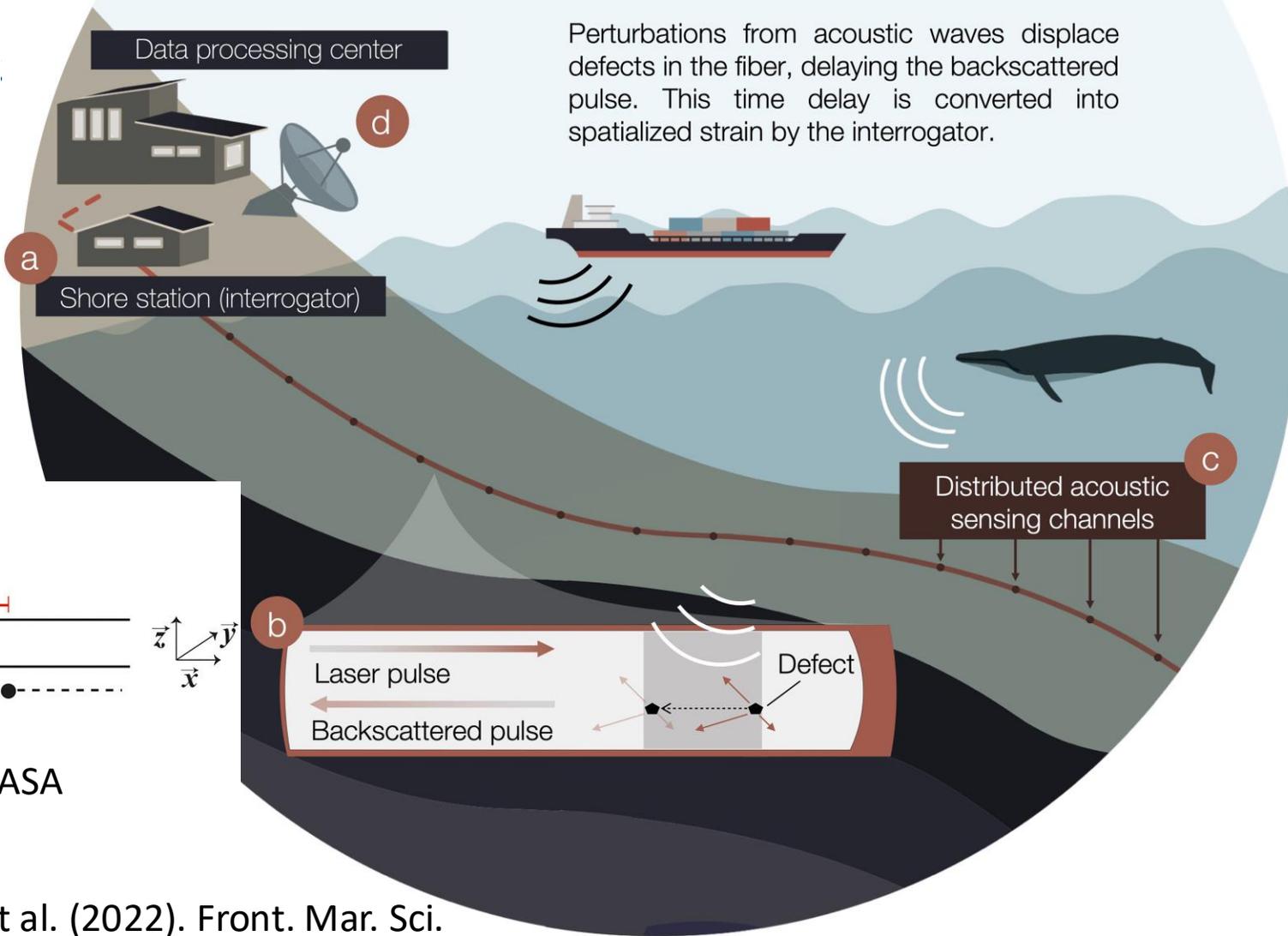
Shane Guan | Office of Environmental Studies

Background: What is Distributed Acoustic Sensing

- Terminal interrogator send laser pulse through cable
- Pulse backscattering from fiber deformation infer vibroacoustic waves.



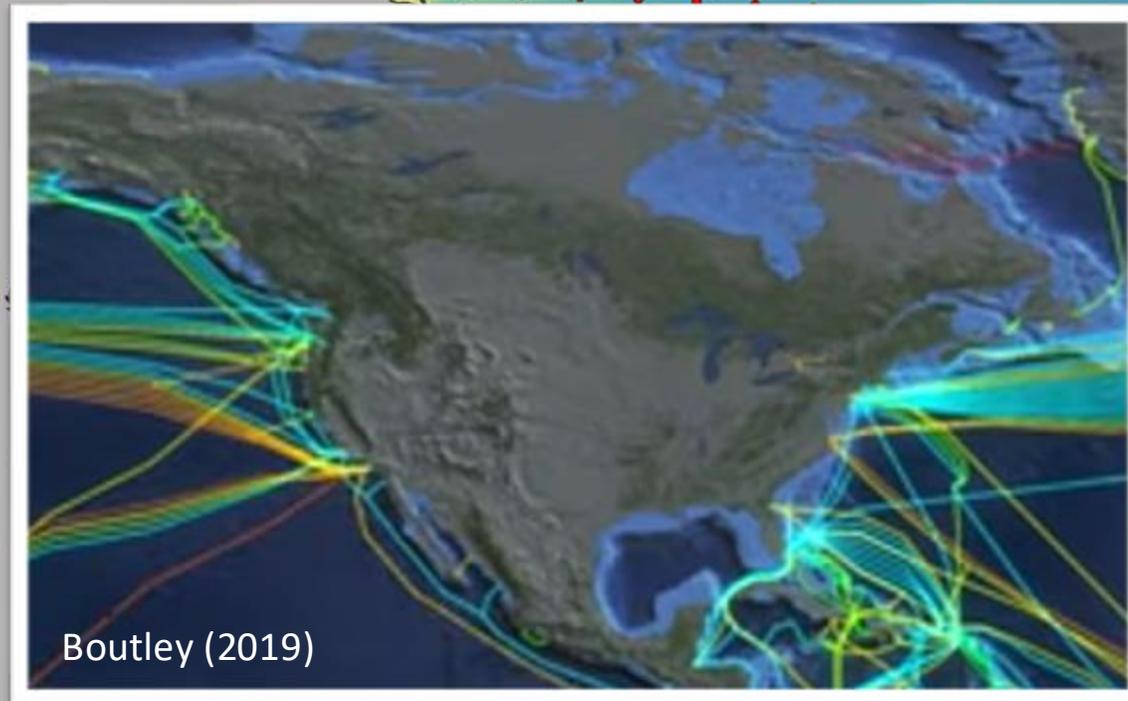
Bauffaut et al. (2022). Front. Mar. Sci.



Perturbations from acoustic waves displace defects in the fiber, delaying the backscattered pulse. This time delay is converted into spatialized strain by the interrogator.

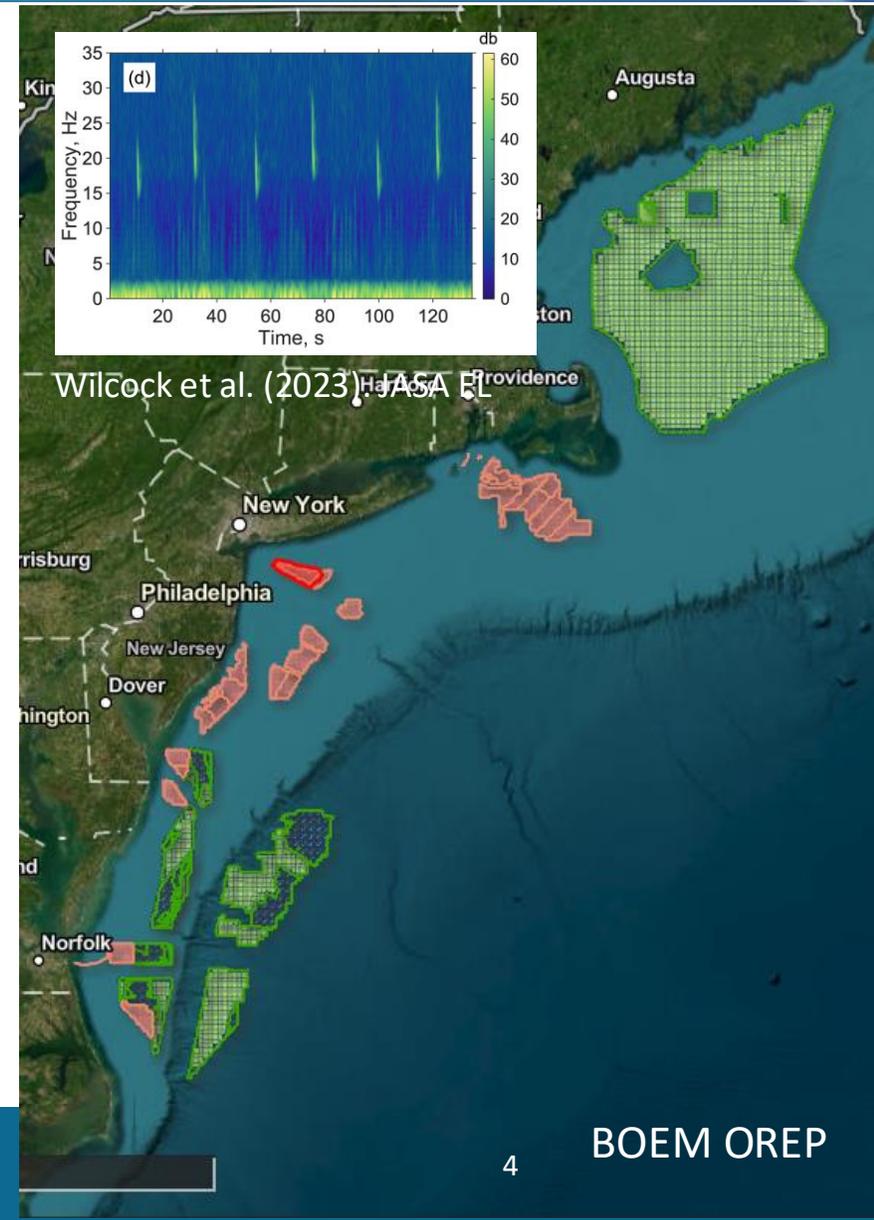
BOEM Information Need

- Information on environmental effects on marine life from large scale, long-term offshore renewable energy development
- Regional PAM Network:
 - Require investment on passive acoustic sensors (hardware)
 - Require periodic service and maintenance of equipment)
- DAS: Existing infrastructure – Potentially low-cost large spatial & temporal monitoring



Study Objectives

1. Validating DAS-based baleen whale acoustic detection with those using traditional PAM in the Atlantic offshore wind energy areas;
2. Supplementing Atlantic Regional PAM Network with DAS technology to enhance baleen whale detection and localization in the offshore WEAs; and
3. Establish an operational protocol for long-term baleen whale monitoring using DAS technologies for environmental assessments of offshore wind development.

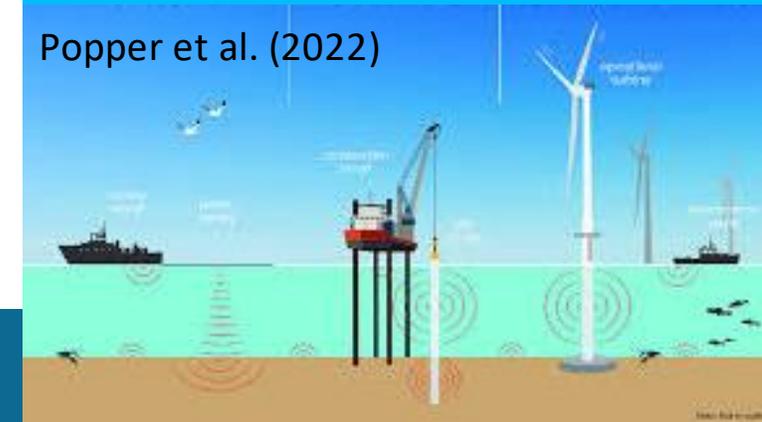
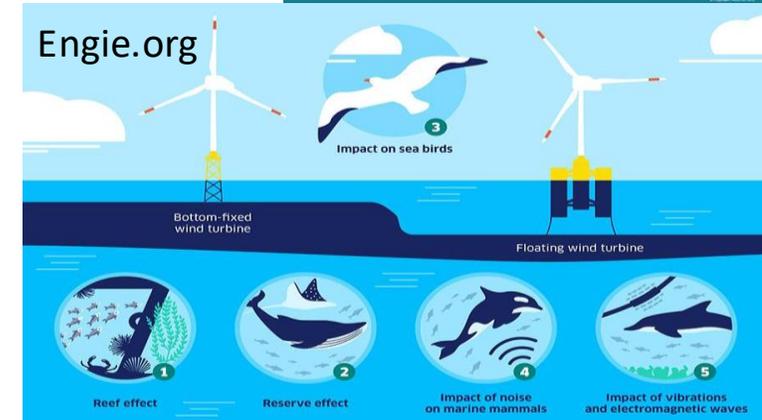
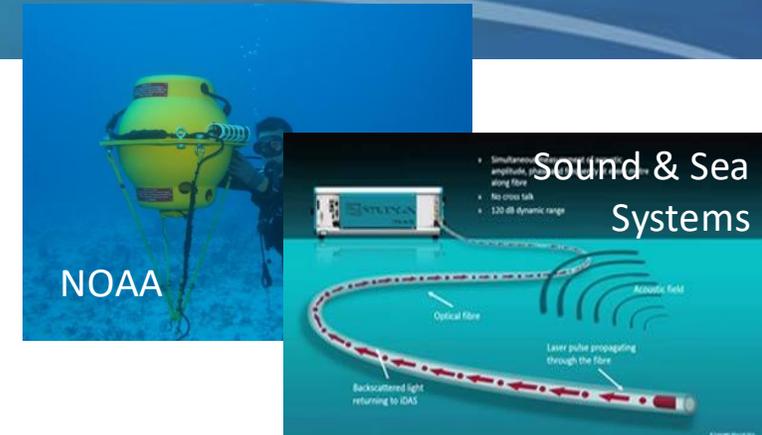


Methods

- The proposed research will first conduct a feasibility study to identify the offshore wind developers that own fiber optical cables which can be used for DAS monitoring and investigate the logistics on accessing necessary hardware and sites for the study.
- Interrogator(s) will then be installed to the shore terminal of the dark fiber(s) to measure backscattering of laser pulses that are emitted into the cable.
- DAS data collected will then be analyzed to derived information on baleen whale (in particular, NARWs) distribution, movement, and possibly behavioral status.

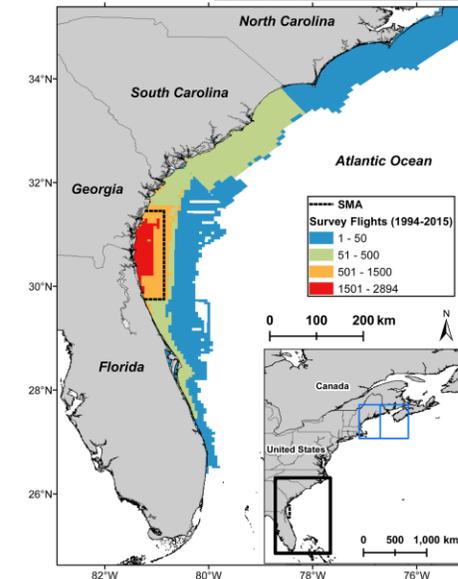
Research Questions

1. Can DAS technology be a reasonably alternative to traditional PAM to conduct baleen whale monitoring at the offshore WEAs?
2. If DAS technology proves to be a low-cost way to study baleen whale distribution, movement, and behavior in the offshore WEAs, how can it be widely applied for environmental impact assessments?
3. What are the general sources, either natural or anthropogenic, in the offshore WEA during the construction and operations of offshore wind farms?



Research Questions

4. Do baleen whales avoid windfarms construction and/or operations? Alternatively, are they attracted to these areas?
5. If there is a measurable change in baleen whale distributions across the Atlantic OCS, can we derive whether this change was due to offshore wind development or a different ongoing stressor?
6. Are there observable changes in acoustic behavior and/or behavioral ecology of baleen whales?



Gowan et al. (2019)

Matthews & Parks (2021)



Requested Input from COSA (Optional)



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