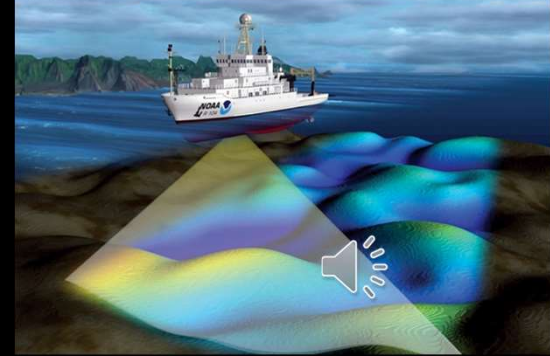
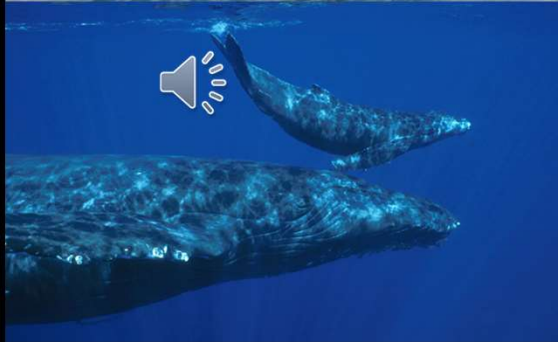
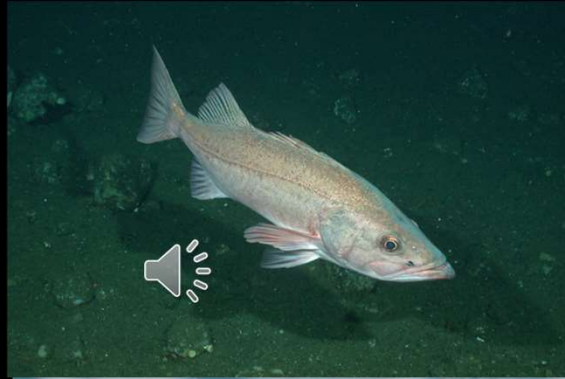
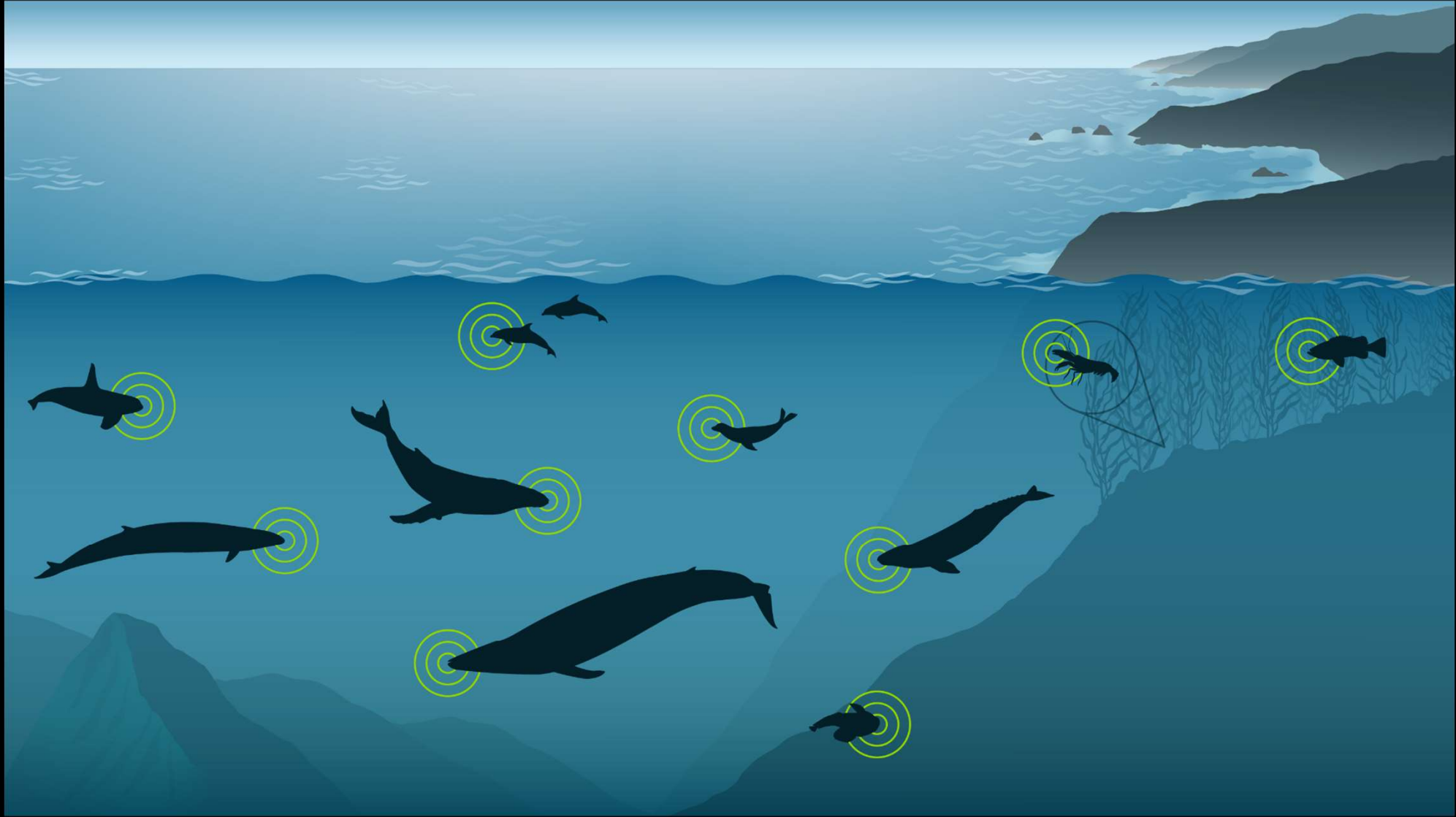


# **Underwater Noise: Understanding Impacts, Guiding Solutions**

Leila Hatch  
US National Oceanic and Atmospheric  
Administration

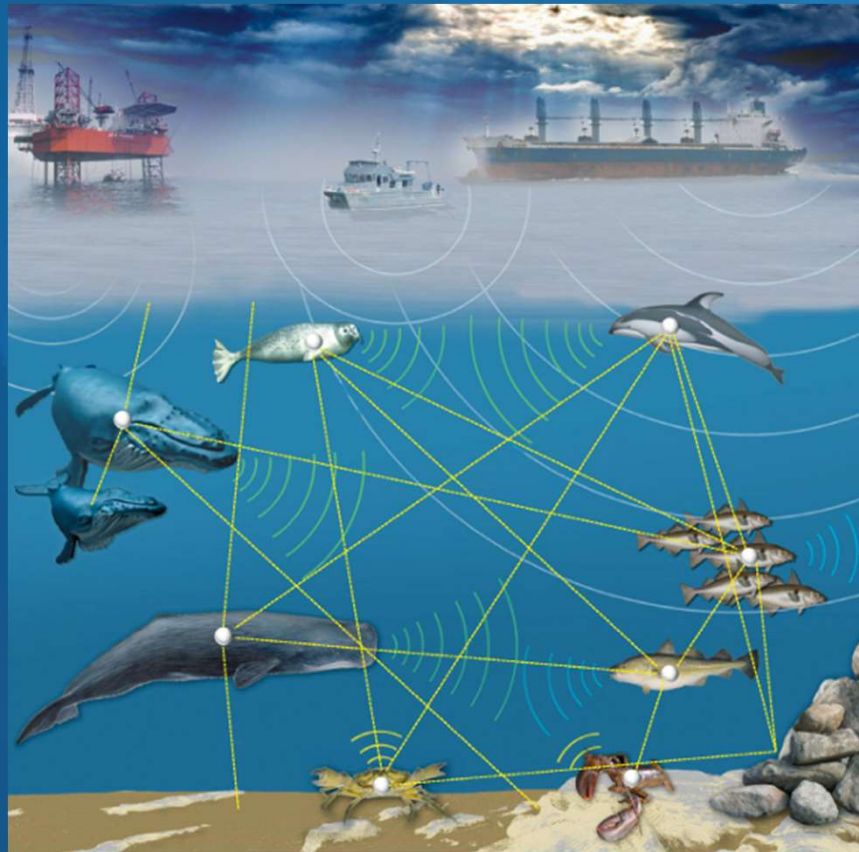




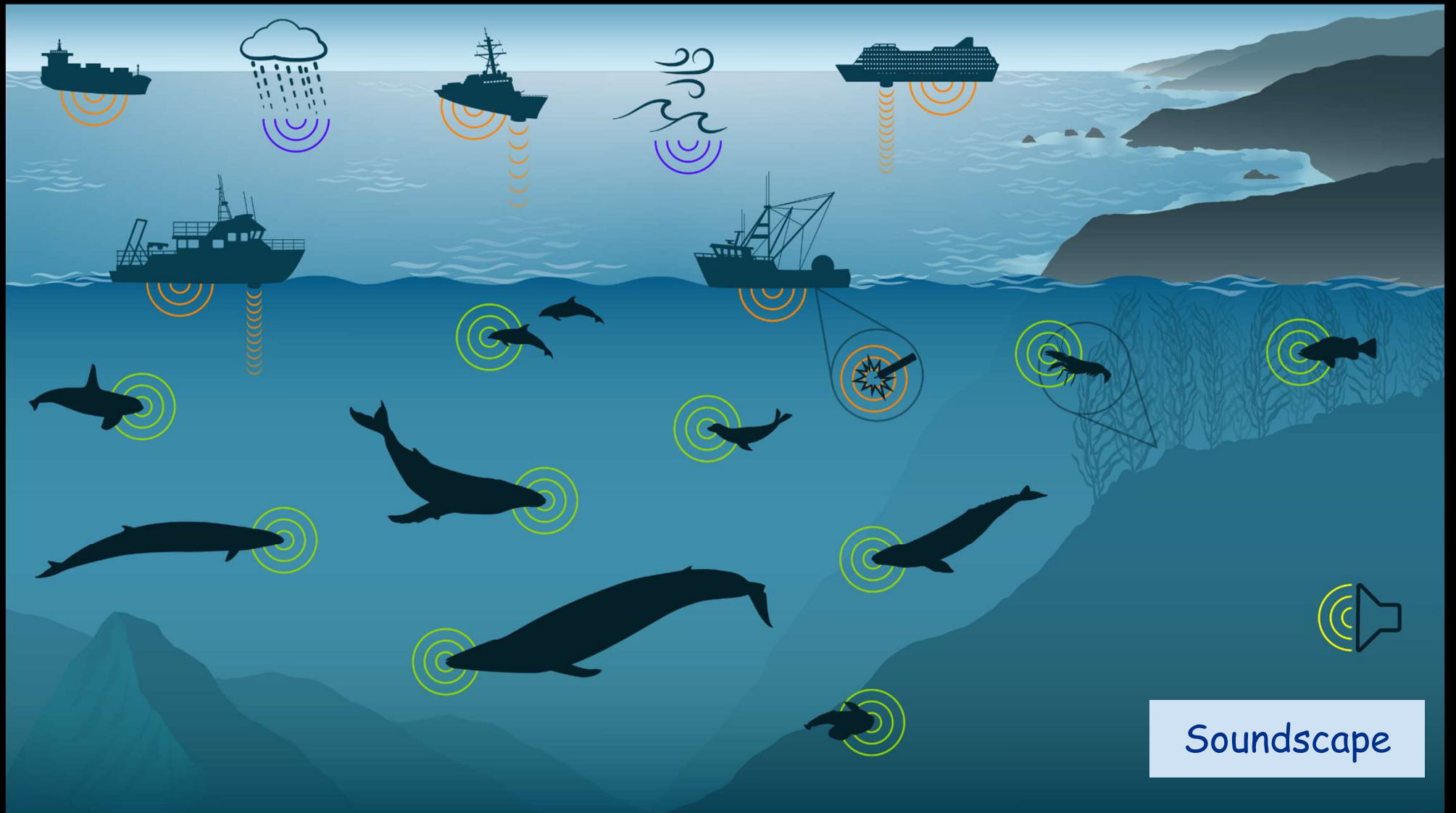




# USE OF SOUND BY AQUATIC ANIMALS



- Making sounds to communicate with your own species (calls, song, grunts, trills, clicks, tail slaps, crunches, scraping, snapping)
- Making sounds that bounce off targets (imaging prey, but also canyons, continental shelves)
- Eavesdropping on sounds made by other marine animals and geophysical processes (prey, predators, preferred habitat, storms, ice)
- And more (to stun prey, to trigger prey to form tighter schools, to maintain physical orientation in the water, etc.)



Soundscape



# WHAT FEATURES OF NOISE DETERMINE IMPACT?

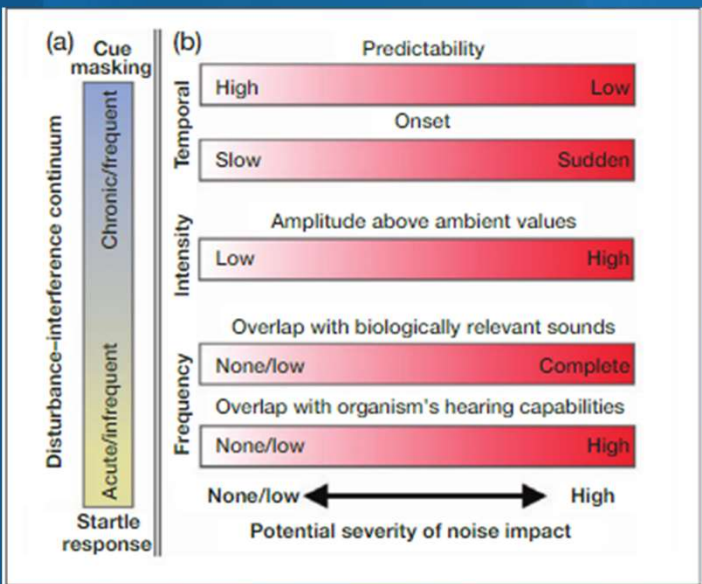


Figure: Francis and Barber 2013

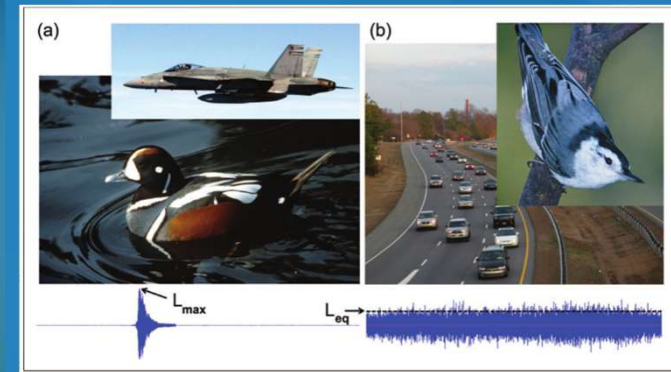
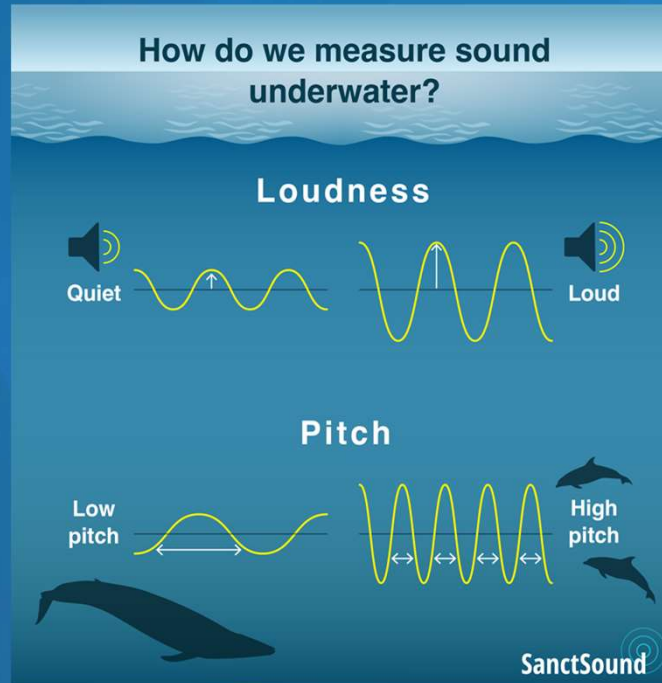


Figure: Francis and Barber 2013



# WHY IS VESSEL NOISE A CONCERN?

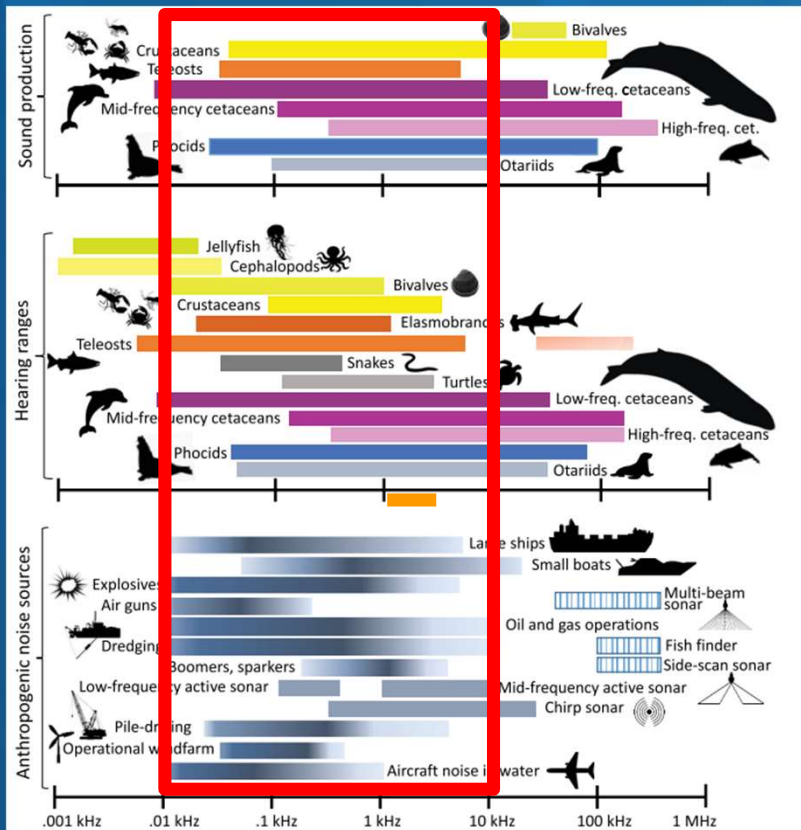


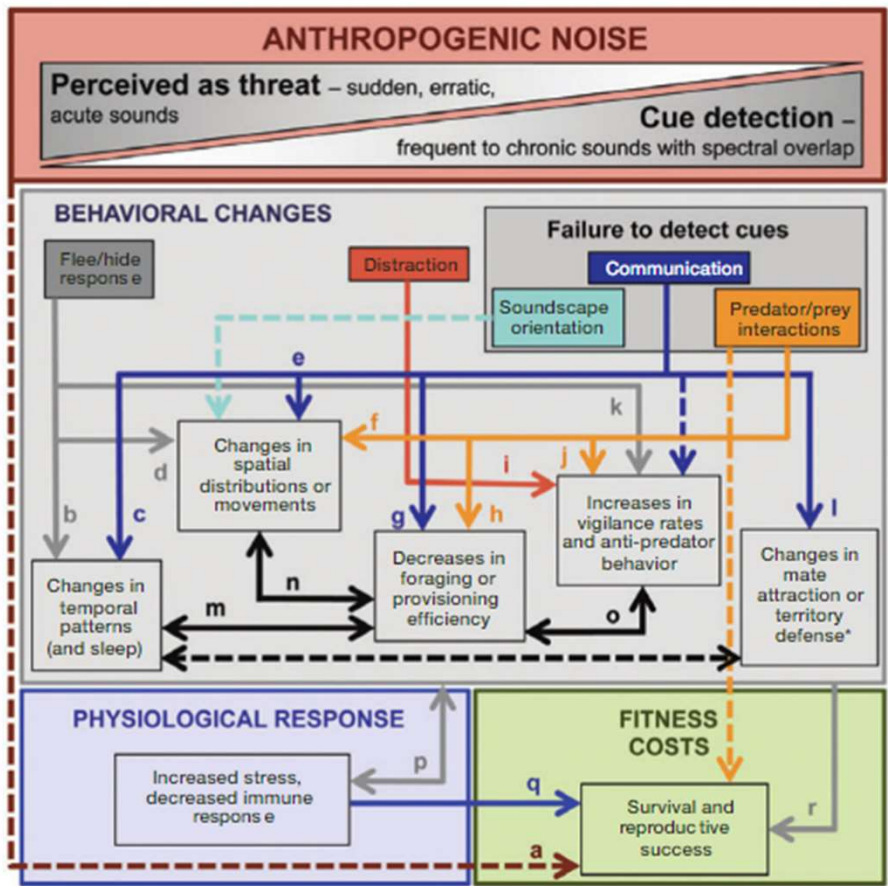
Figure: Duarte et al 2021



Figure: European Maritime Safety Agency 2021



# WHEN DOES NOISE MATTER TO ANIMALS?



## VESSEL NOISE IMPACT STUDIES: EXAMPLES

### Higher Stress Hormones:

- [Effects of vessel traffic and ocean noise on gray whale stress hormones](#)
- [Evidence that ship noise increases stress in right whales](#)

### Lost Foraging Efficiency:

- [Evidence for ship noise impacts on humpback whale foraging behaviour](#)
- [Vessels and their sounds reduce prey capture effort by endangered killer whales \(\*Orcinus orca\*\)](#)
- [Reducing vessel noise increases foraging in endangered killer whales](#)
- [High rates of vessel noise disrupt foraging in wild harbour porpoises \(\*Phocoena phocoena\*\)](#)

### Changes in Communication Signaling:

- [Long-term and seasonal changes of large whale call frequency in the southern Indian Ocean](#)
- [Whale songs' changing pitch may be response to population, climate changes](#)
- [Individual right whales call louder in increased environmental noise](#)

### Predation and Loss of Evasion

- [Anthropogenic noise increases fish mortality by predation](#)
- [Effects of boat noise on fish fast-start escape response depend on engine type](#)
- [Vessel noise affects routine swimming and escape response of a coral reef fish](#)

### Effects on Reef Habitats:

- [Boat noise impacts risk assessment in a coral reef fish but effects depend on engine type](#)
- [Boat noise prevents soundscape-based habitat selection by coral planulae](#)
- [School is out on noisy reefs: the effect of boat noise on predator learning and survival of juvenile coral reef fishes](#)

Figure: Francis and Barber 2013

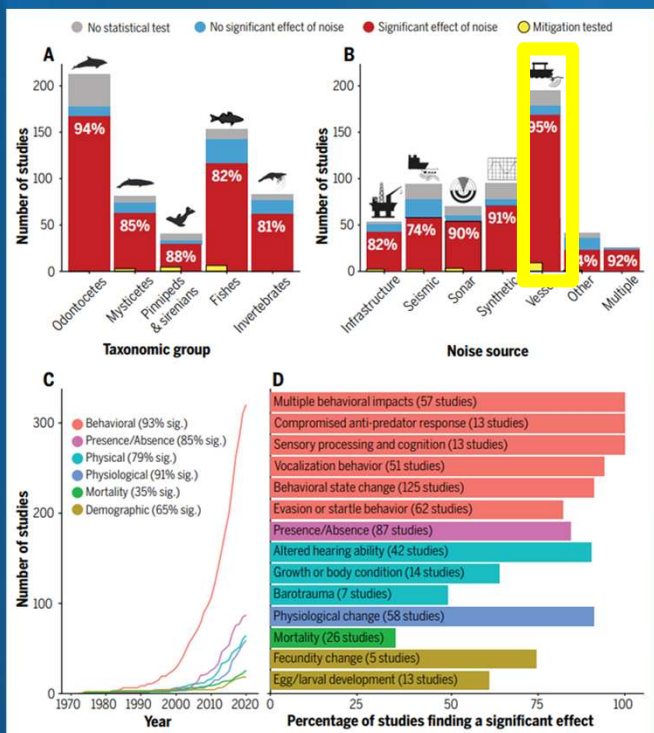




# GROWING DOCUMENTATION OF VESSEL NOISE IMPACTS



FOR MORE EFFECTS  
FOR MORE TYPES OF ANIMALS



FROM MORE PLACES AROUND THE WORLD

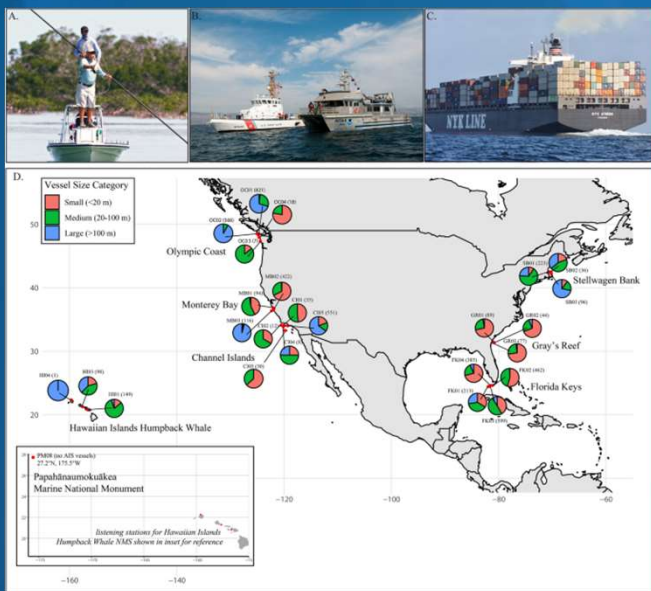


Figure: Erbe et al 2021

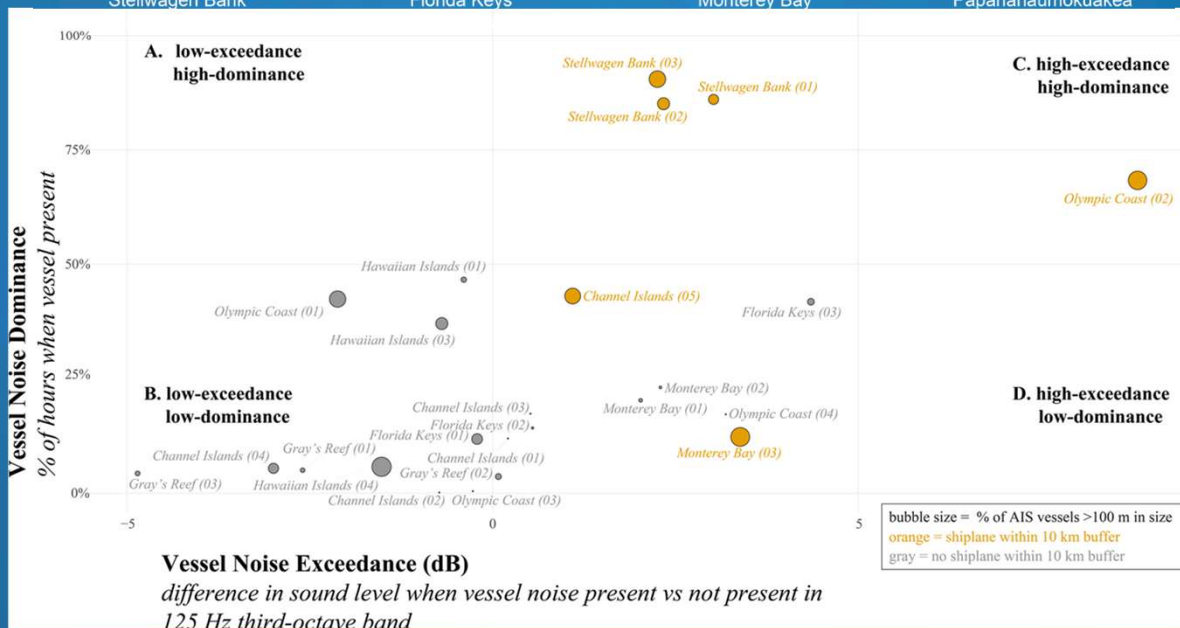
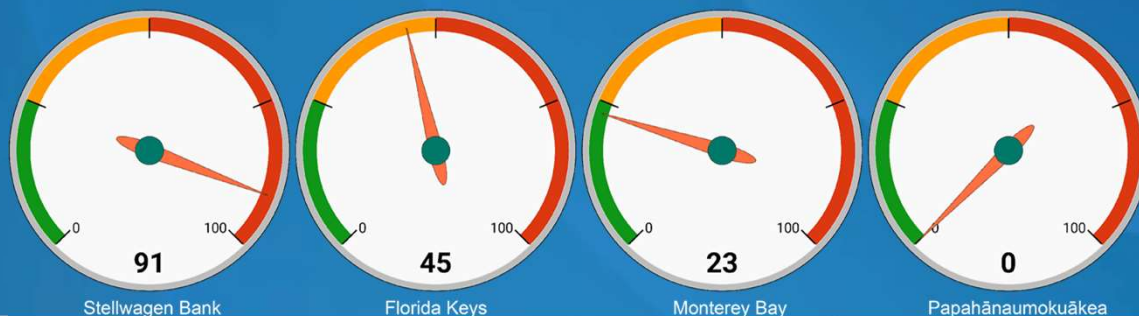
Figure: Duarte et al 2021



# SOUND SCIENCE TO SUPPORT POLICY



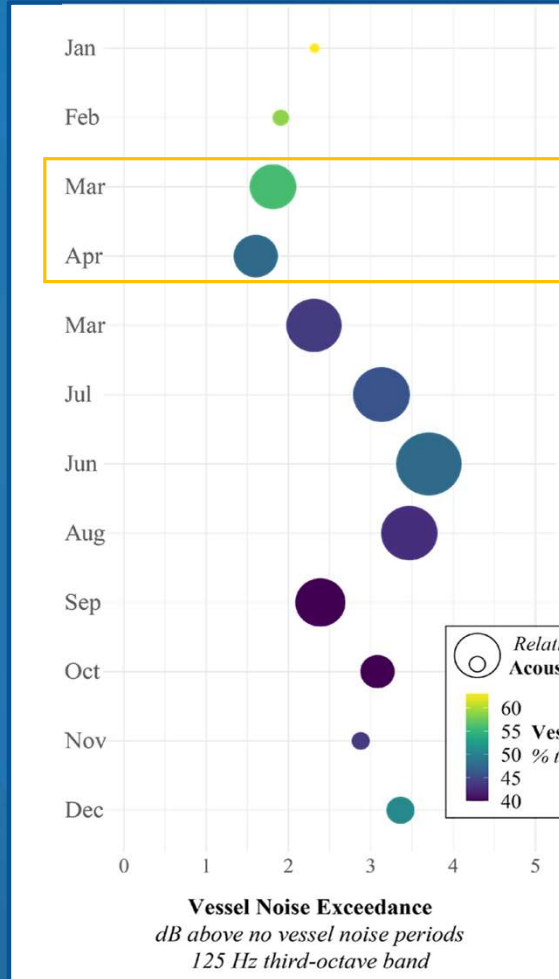
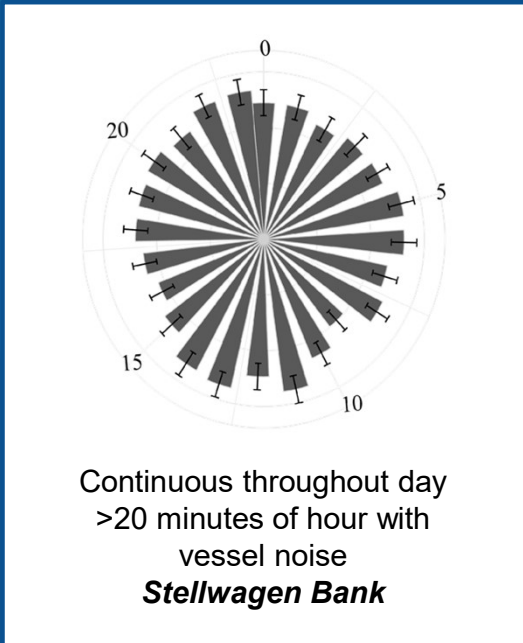
Percent of hours with vessel noise



Figures: McKenna et al 2024



# SOUND SCIENCE TO SUPPORT POLICY



**Mandatory Vessel Speed Reduction Period**

Figures: McKenna et al 2024



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