



Listening (and looking) at finer scales: Existing knowledge and data gaps for whales and dolphins in the NY Bight



Dr. Melinda Rekdahl

Ocean Giants Program, WCS

State of the Science Workshop, Nov 13th, 2018

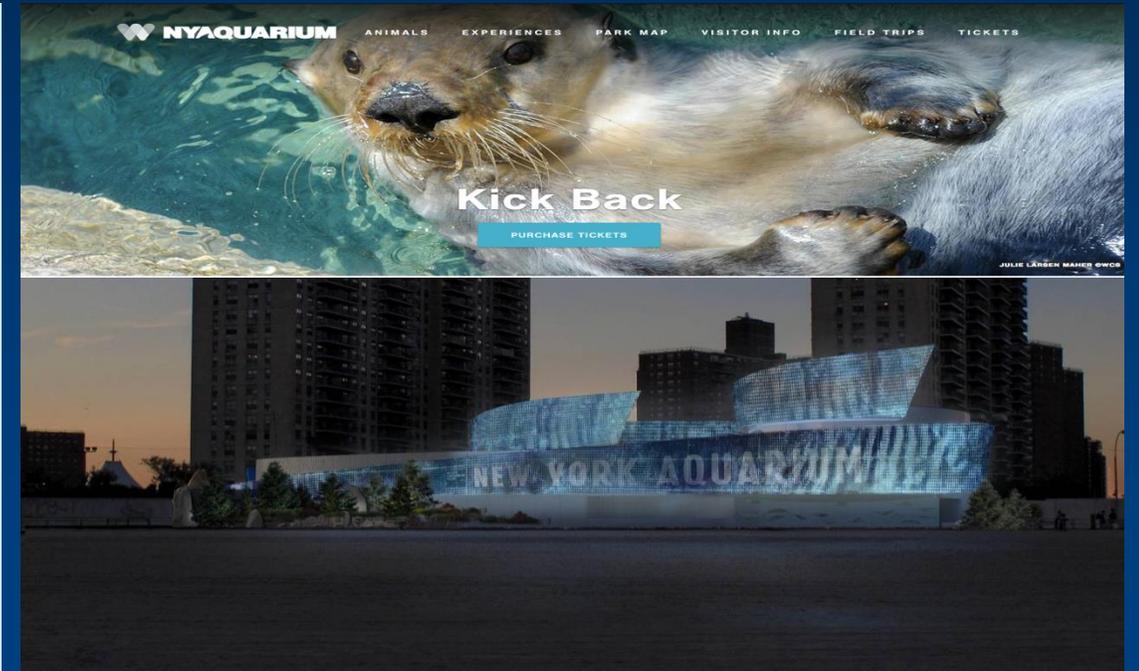
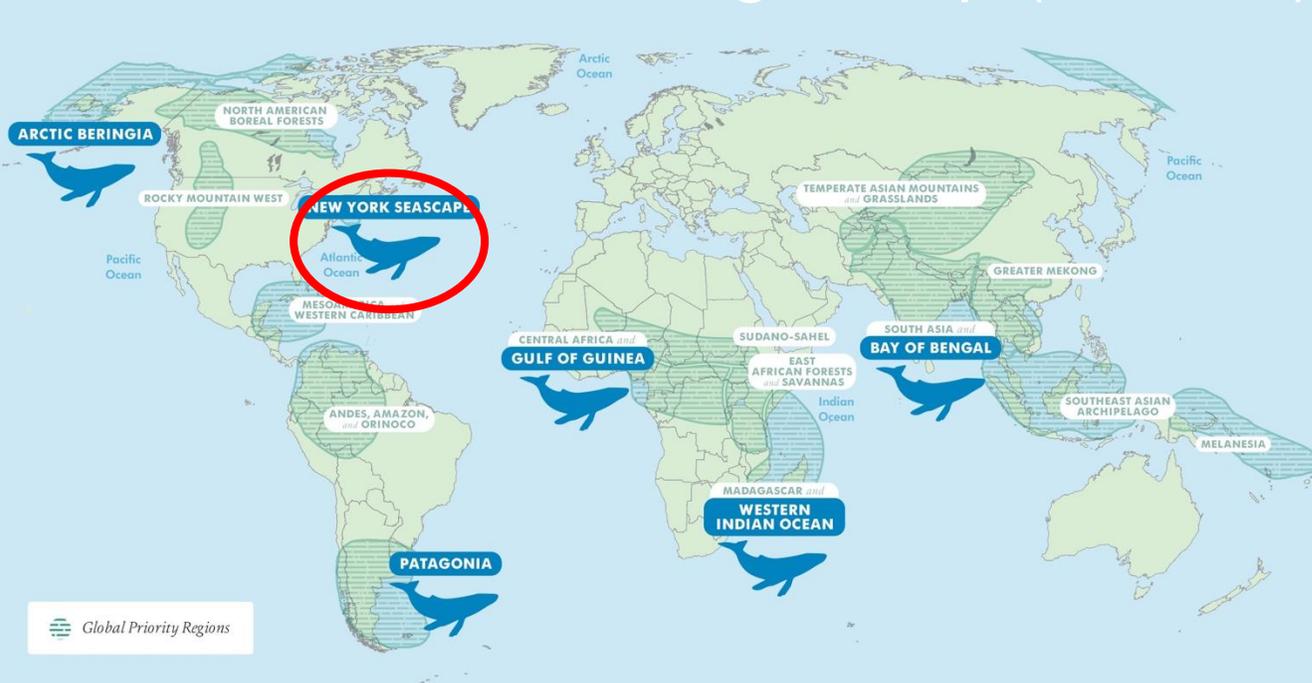
W/ Dr. Howard Rosenbaum, Dr. Aaron Rice, Dr. Brandon Southall



Ocean Giants Program Objectives



- Work to address threats to marine mammals globally
 - Bycatch
 - Ocean noise
- Engaged locally in NY waters on ocean noise and marine issues
- WCS (Howard Rosenbaum) member of NYSERDA Environmental Technical Working Group (E-TWG)



Outline

- Anthropogenic ocean noise concerns broadly and for NY waters/Mid-Atlantic
- Threats and data gaps for cetaceans in NY waters
- Ongoing and future research efforts to fill some of these gaps in NY waters
- Take home messages and future directions



Ocean Noise

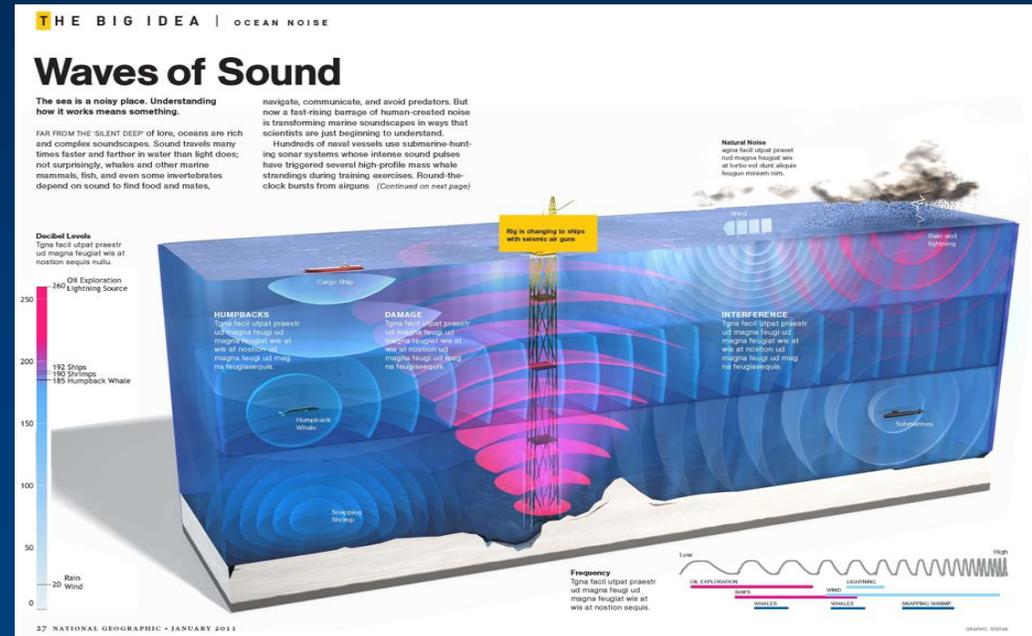


Marine animals produce sound and listen for environmental acoustic cues. Underwater sound is critical in life history

Oceans have always been 'noisy' but baseline noise levels have risen dramatically due to intentional or incidental production of noise by humans

See: www.dosits.org

<https://dosits.org/decision-makers/webinar-series/webinars-2018/potential-effects-mammals2018/>



See: National Geographic (Jan 2011 issue)

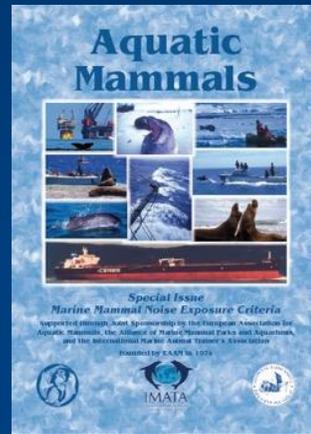
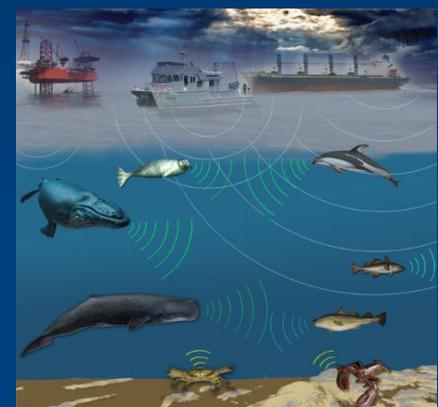
Effects of Noise on Cetaceans

Generally
Increasing
Severity

But

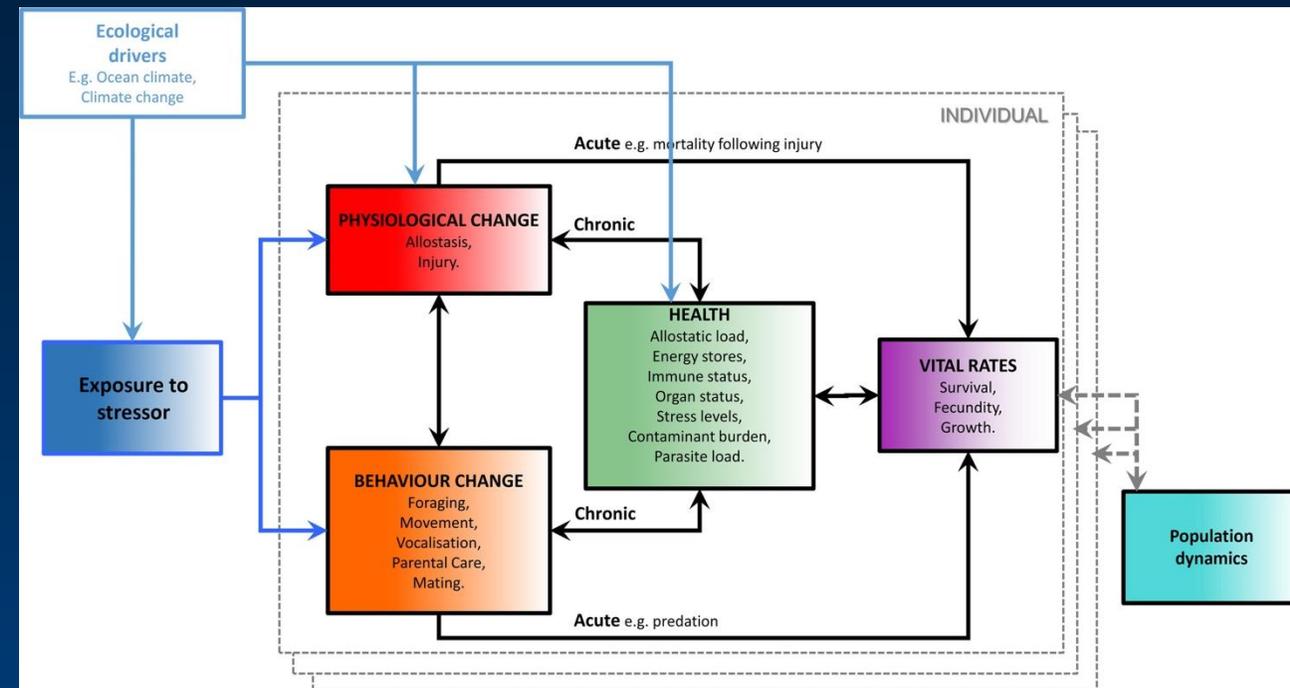
Generally
Decreasing
Occurrence

- None observable
- Interference with Communication
 - Auditory masking (loss of acoustic “habitat”)
 - Temporary or permanent hearing damage
- Behavioral Responses
 - Orientation, increased alertness, vocal changes
 - Effects on feeding, social activity, risk of predation
 - Habitat abandonment: temporary or permanent
- Physiological Effects (stress, DCS)
- Stranding causing injury or death



Individual or population level consequences

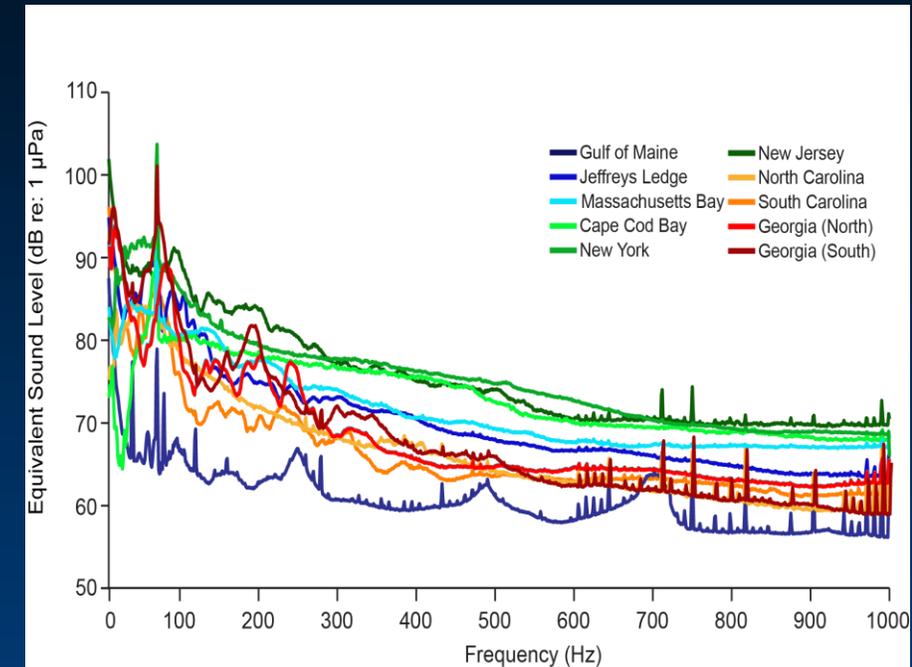
- PCOD/PCAD Conceptual models for population consequence of disturbance
- Considered to be a useful framework for guiding research prioritization and mitigation concepts
- Moving towards considering multiple stressors



Effects of Noise in the Mid Atlantic & NE



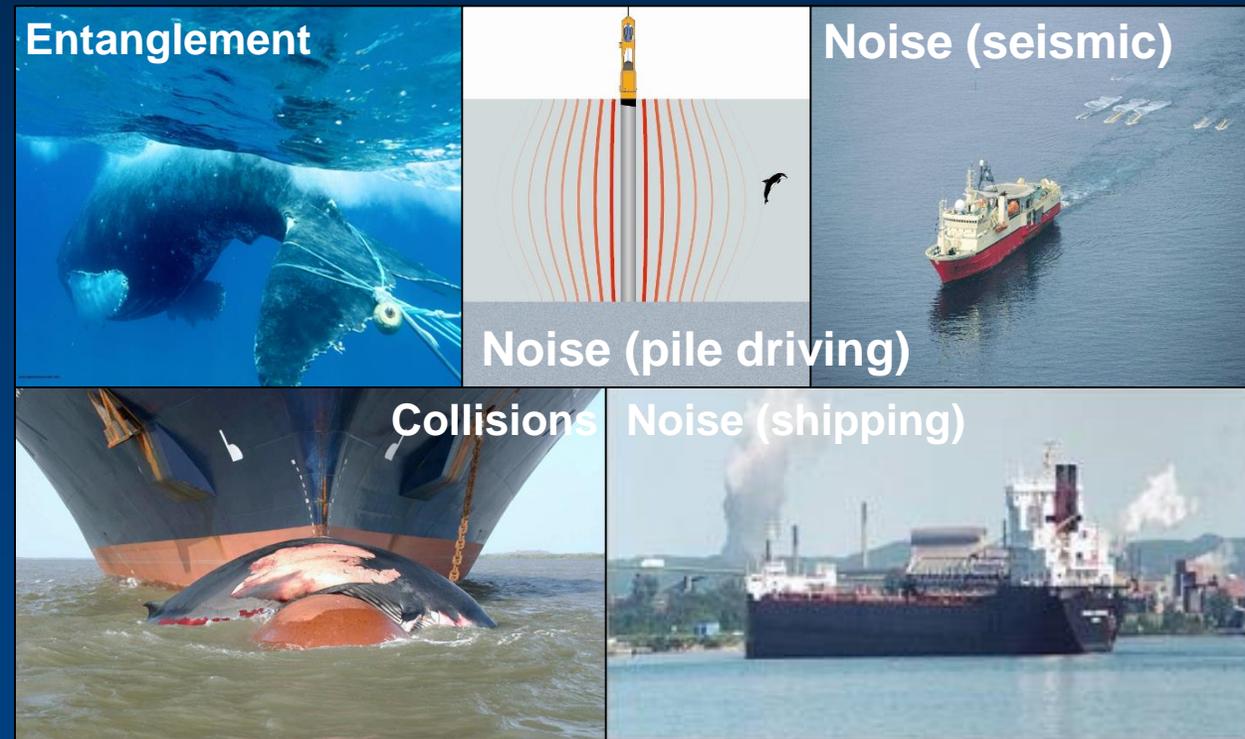
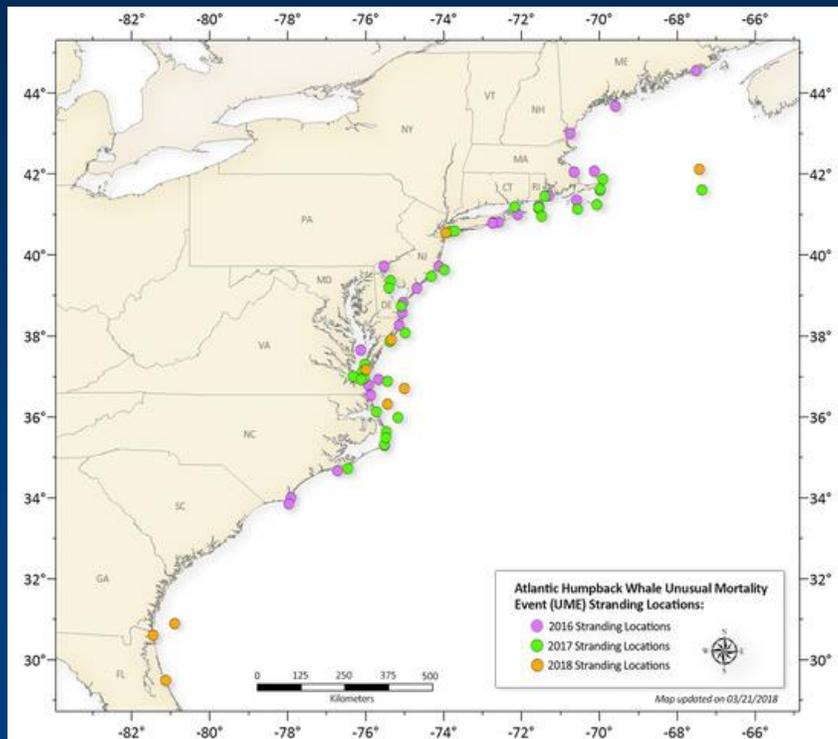
- Broad scale ocean noise characterization
 - Ocean noise conditions along the North Atlantic coastline (Rice et al. 2014)
- Some targeted studies on noise impacts MA/RI
 - Ambient and vessel noise on the communication space of baleen whales (Cholewiak et al. 2018)
- Need more focused studies NY/Mid-Atlantic to better understand noise impacts on cetacean populations specific to these habitats and particular suite of stressors



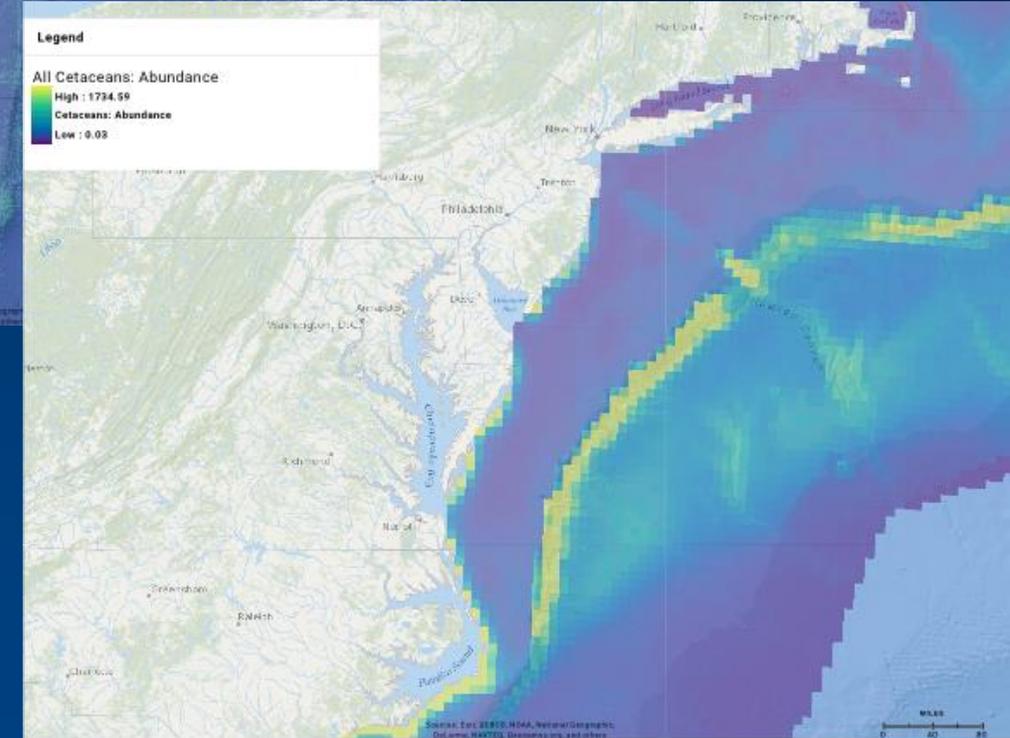
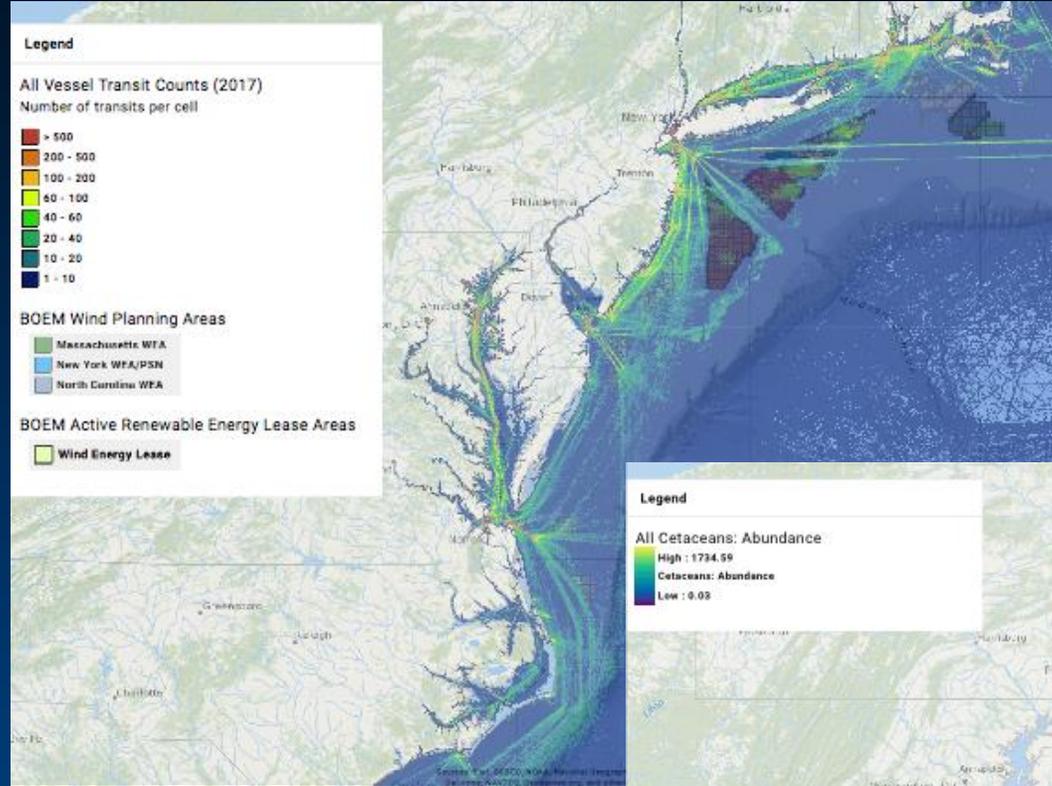
Mid Atlantic/NY Bight Conservation Concerns



- NOAA declared humpback whale, minke whale and North Atlantic right whale Unusual Mortality Event (UME) for Atlantic coast 2016-2018
 - Most due to human interactions (entanglement, ship strikes)
- Consider cumulative stressors within a given area and across the migratory corridor



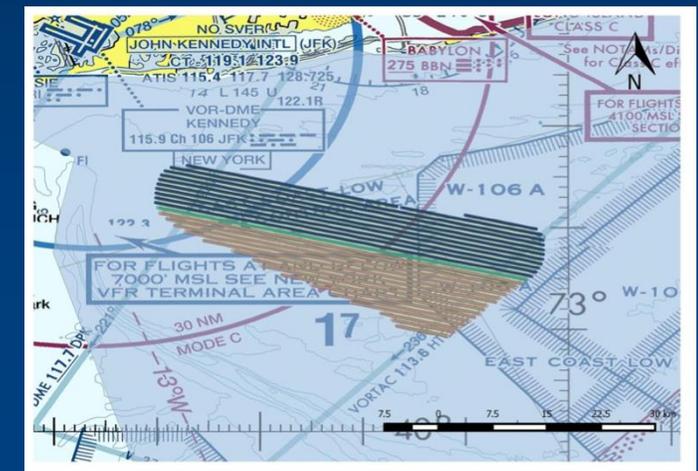
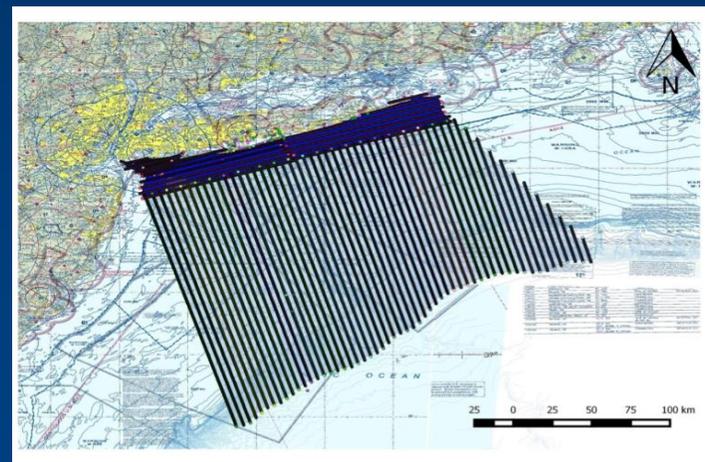
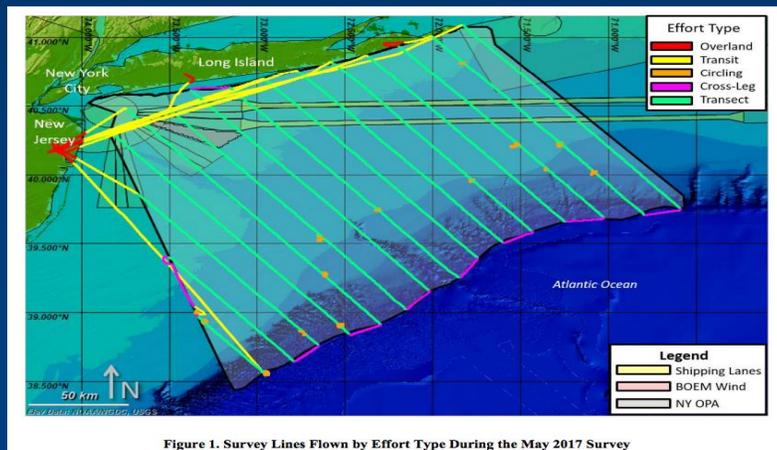
Cetaceans in NY waters



Cetaceans in NY waters



- Considerable efforts now underway
 - Distribution and abundance of marine mammals (DEC/Tetra Tech, NYSERDA)
 - Characterization of ocean noise (DEC/Cornell/WCS/JASCO/Syracuse)
- Data gaps still exist
 - Fine-scale habitat use, drivers of movement patterns and change over time
 - Individuals and population level impacts from human activities
 - Cumulative stressors – both locally and regionally



May 2017 flight path. Credit: Tetra Tech and DEC

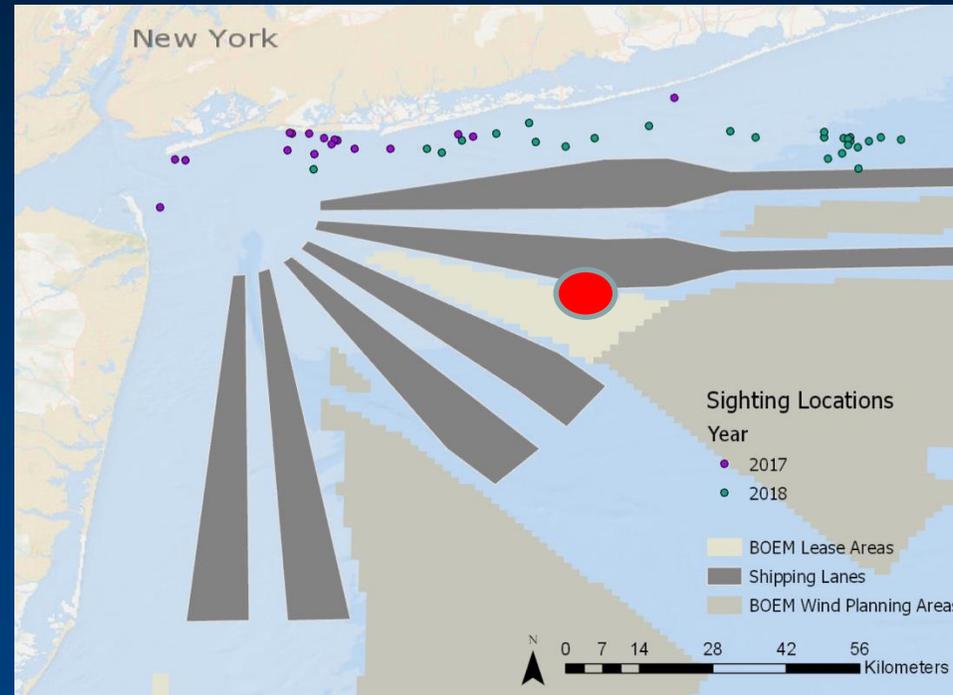
NYSERDA OPA flight path

NYSERDA WEA flight path



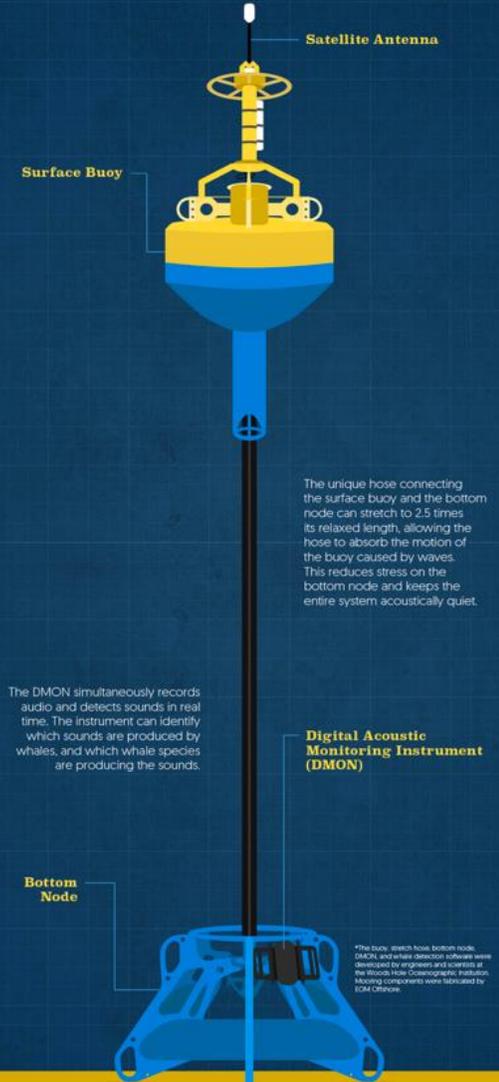
New York whale research

- Data synthesis
 - Distribution and occurrence of large whales in the New York Bight prior to 2017 (Chou et al.)
- Small vessel surveys
 - Genetics, photo ID
 - Sat tagging, eDNA
- Acoustic surveys
 - WCS/WHOI buoy
 - NY Harbor archival
- Targeting data poor areas

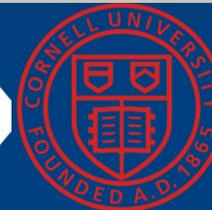


MEET THE BUOY

The whale-detection system consists of a surface buoy, stretch hose, and an anchored bottom node. Whale sounds are detected by the digital acoustic monitoring instrument (DMON) attached to the bottom node, and information about those sounds is transmitted through the stretch hoses to the buoy, from the buoy to a shore-side computer via satellite, and to a publicly accessible website in near real time.



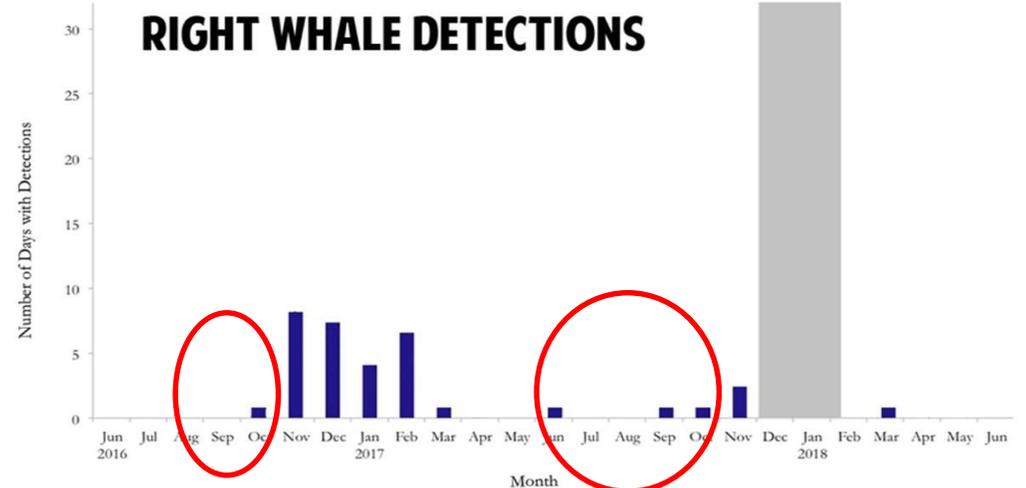
BLUEYORK™
A WCS CAMPAIGN BASED OUT OF
THE NEW YORK AQUARIUM



Protecting North Atlantic Right Whales in NY



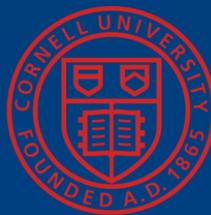
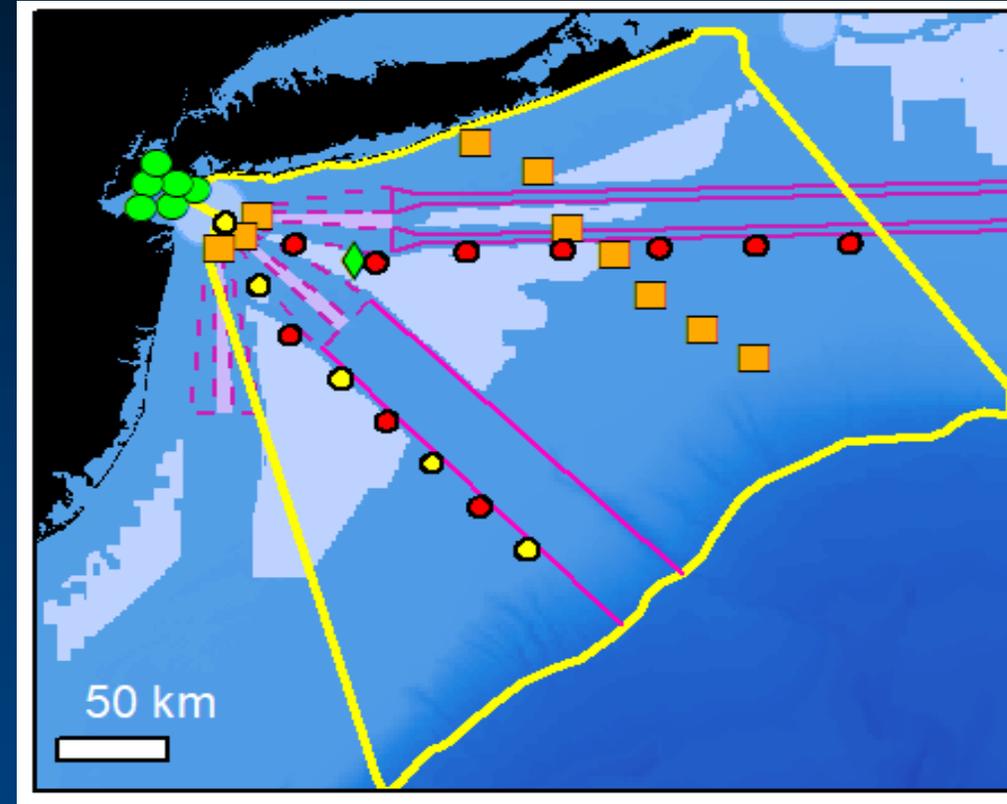
- Endangered North Atlantic right whales (NARWs) detected year-round
 - Most detections in late fall and winter, but as early as June
 - Ship speeds are only reduced between November-April.
 - Buoy lies beyond the boundaries of the Seasonal Management Area.
- Need to consider how to mitigate risk from ship-strike, entanglement and wind energy development and operation.



New York Acoustic Monitoring



- Opportunity to synthesize all available acoustic data collected in the last 10 years and currently being collected
 - NYSDEC funded NYB 2008/2009/2018-2020 (Cornell)
 - WCS/WHOI 2016-2020 datasets
- Temporal and spatial variability in noise of the NYB
- Masking potential of noise sources of concern
- Changes in acoustic behavior as function of noise?
- Soundscape maps and masking metrics into a spatial framework.



Take home messages

- Establish robust baselines at scales that enable identification of biologically important habitats and drivers of change
 - Prey interactions/oceanographic conditions
 - Understanding impacts and population level consequences
 - Aggregate noise/Cumulative impacts
 - Changing climate
- Opportunity for multi-disciplinary collaborative effort with industry, government, academic/research community and IGOs/NGOs to start to address some of these data gaps for target populations.
 - Data integration and synthesis



Take home messages

- Focus on sub-lethal behavioral and physiological effects rather than the lethal effects
 - Consider opportunities to integrate physiological, observational monitoring and/or behavioral response studies (BRS) in NY waters
- Until data gaps are filled..
 - Develop and implement best practices that include appropriate mitigation and precautionary measures when needed; these include application of methods and technologies that reduce acoustic impacts
 - Area- and species-specific measures in order to minimize ocean noise and associated impacts



THANK YOU!

Special thanks to NYSERDA and workshop organizers



Effects of Noise on Cetaceans



Species	Location	Response/ Effect	Received Level	Reference
Bowhead whale	Arctic	Change surface-respiration; Avoidance	120-130 dB re 1 μPa RMS	Richardson et al. 1999; Robertson et al. 2013
Sperm whale	Gulf of Mexico	Buzz (feeding) rate decline	135-147 dB re 1 μPa RMS	Miller et al. 2009
Harbor porpoise	North Sea	Temporary displacement	145–151 dB re 1 $\mu\text{Pa}^2 \text{ s}^{-1}$	Thompson et al. 2013
Humpback whale	Angola	Singing and singers declined	120-150 dB re 1 μPa peak	Cerchio et al. 2014
Fin whale	Mediterranean	Altered singing and abandon habitat	ca. 15 dB 1 μPa above background	Castellote et al. 2012

- Response differs by species and by context within species
- Noise criteria thresholds based on best available information – recently updated (Southall et al. 2007; in press)
- Provides broadly applicable guidance to decision-makers for predicting and mitigating impacts
 - Insufficient data for many species and populations