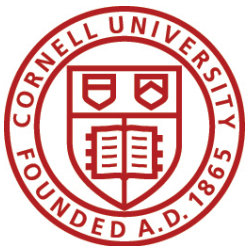
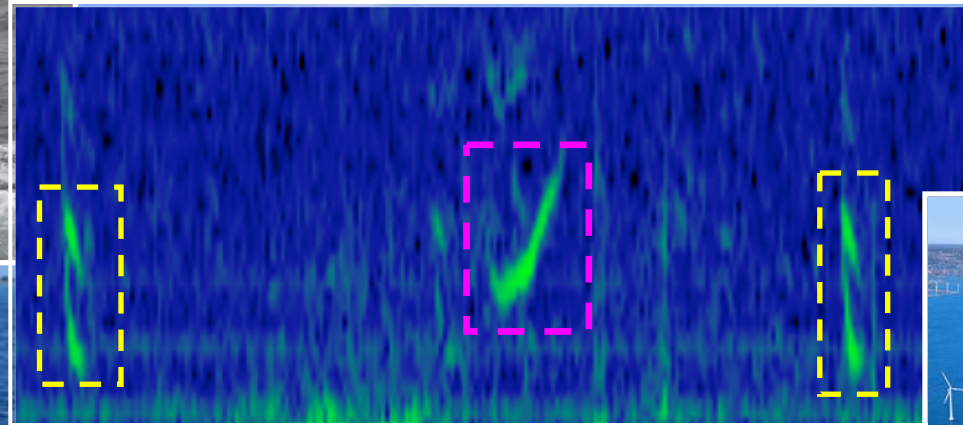


Whales Acoustic Surveys Along the U.S. Atlantic Coast: Understanding multi-species population dynamics over broad spatial and temporal scales



Aaron N. Rice, Ph.D.
Bioacoustics Research Program
Cornell Lab of Ornithology
Cornell University
Ithaca, NY 14850, USA

The **Cornell** Lab
of Ornithology 



What We Need to Know About Biological Risk

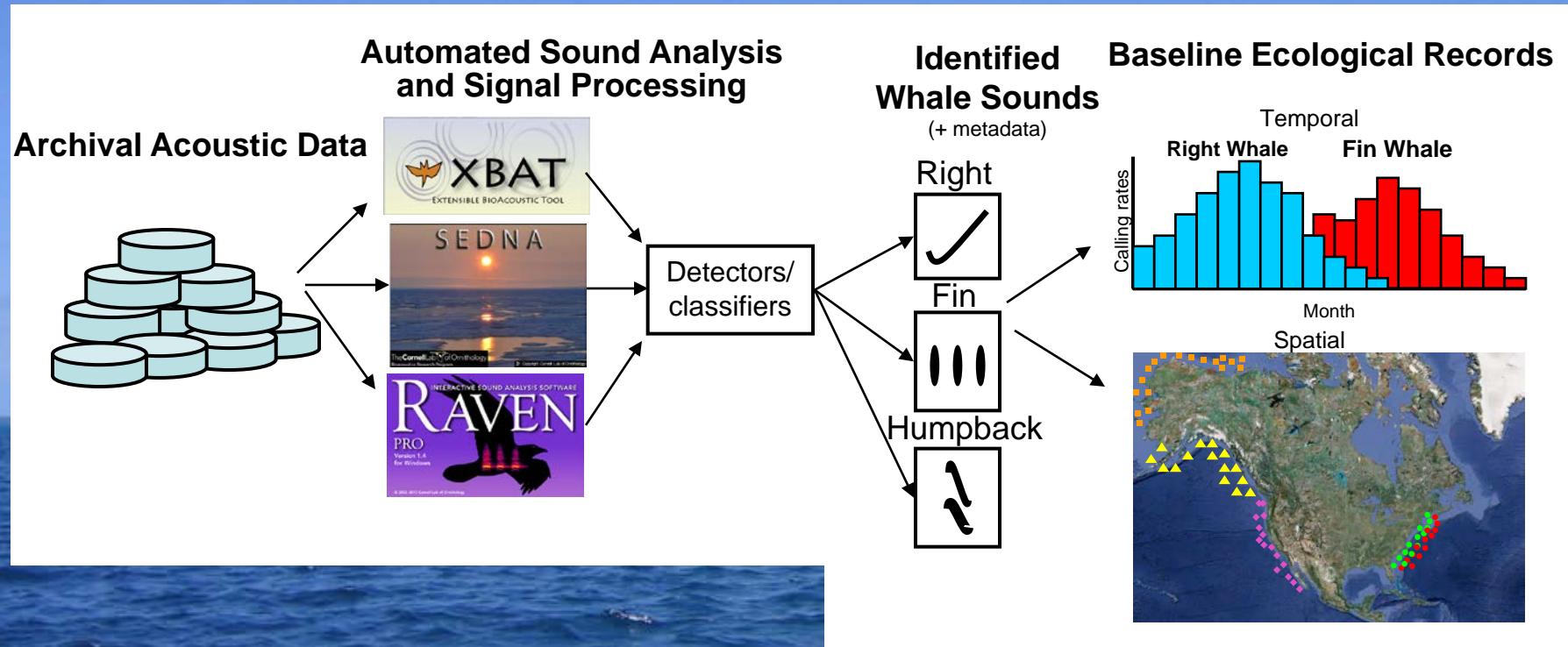


- What's there?
- How many are there?
- How are they distributed in time & space?
- Why are they there?
- What is the mechanism that leads to risk?

Importance of Understanding Bioacoustics

- Sound is an essential component to many (if not all) species of marine vertebrates
 - Used for communication, foraging, navigation, predator avoidance
 - Biological sounds travel across scales up to 1000s of km
- Anthropogenic activities have raised ambient noise levels 1000x in only 40 years
 - What is the impact of current activities on the acoustic ecosystem?
 - How does this effect organisms' habitat?
 - What are the consequences of expanded development?

Acoustic Monitoring to Understand Ecology and Biodiversity



Time-stamp and sensor location of sounds of interest becomes the foundation for understanding spatial and temporal occurrence patterns

Marine Autonomous Recording Unit (MARU)



- Archival recorder
- Records for up to ~ 4 months
- Sampling rates up to 64 kHz, typically 2 kHz
- Can be used for presence/absence or deployed in arrays for localization

Acoustic Monitoring Along the Atlantic Coast

- I. Monitoring for whales in New York
- II. Monitoring for whales in the Massachusetts Wind Area
- III. Whale monitoring in wind sites along the U.S. Atlantic Coast



Acoustic Monitoring Along the Atlantic Coast

- I. Monitoring for whales in New York
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I. Whale Acoustic Surveys in the New York Bight

Project Goal:

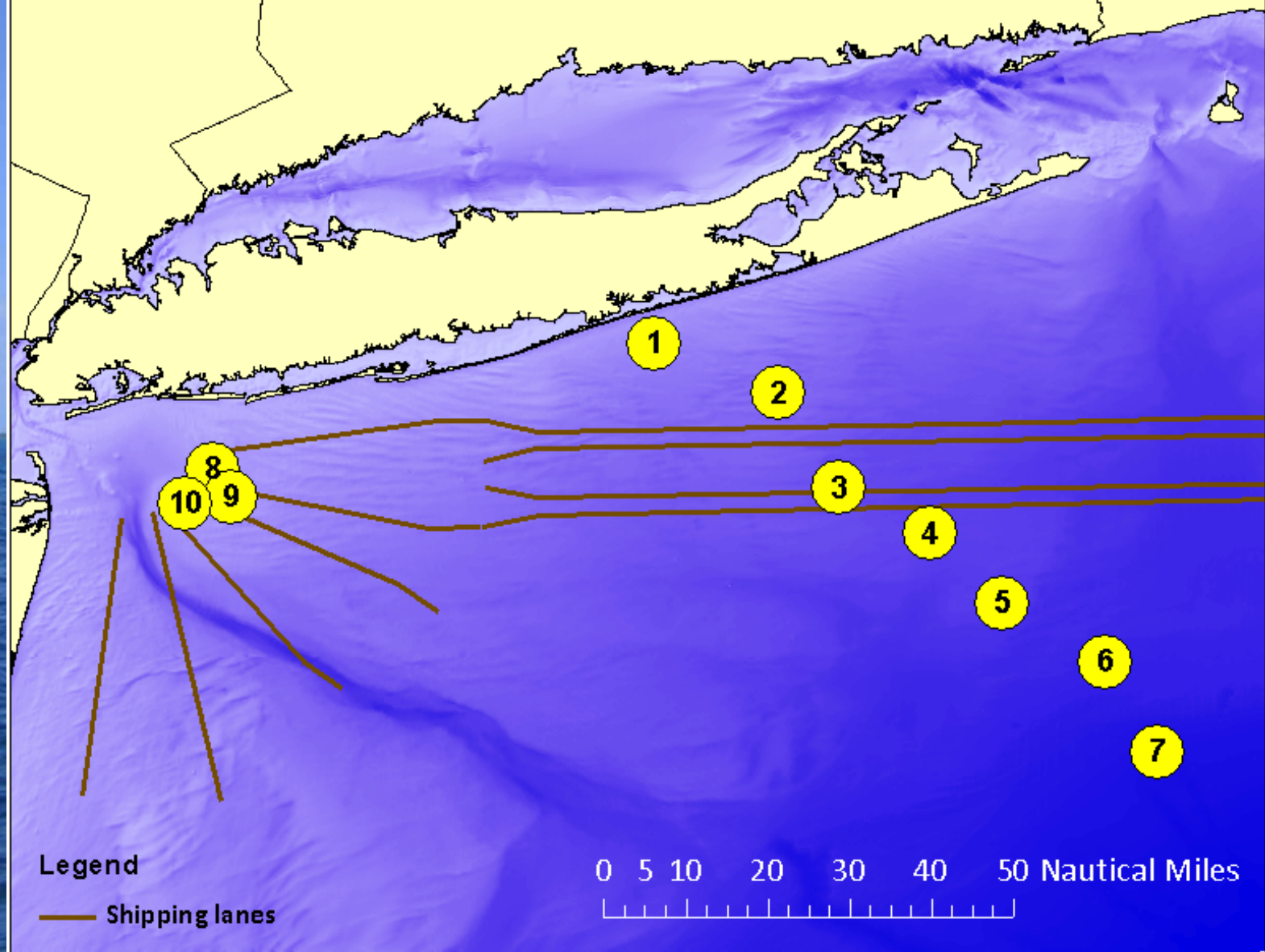
Determine occurrence of Species of Greatest Conservation Need (SGCN):

- North Atlantic right whales
- Blue whales
- Fin whales

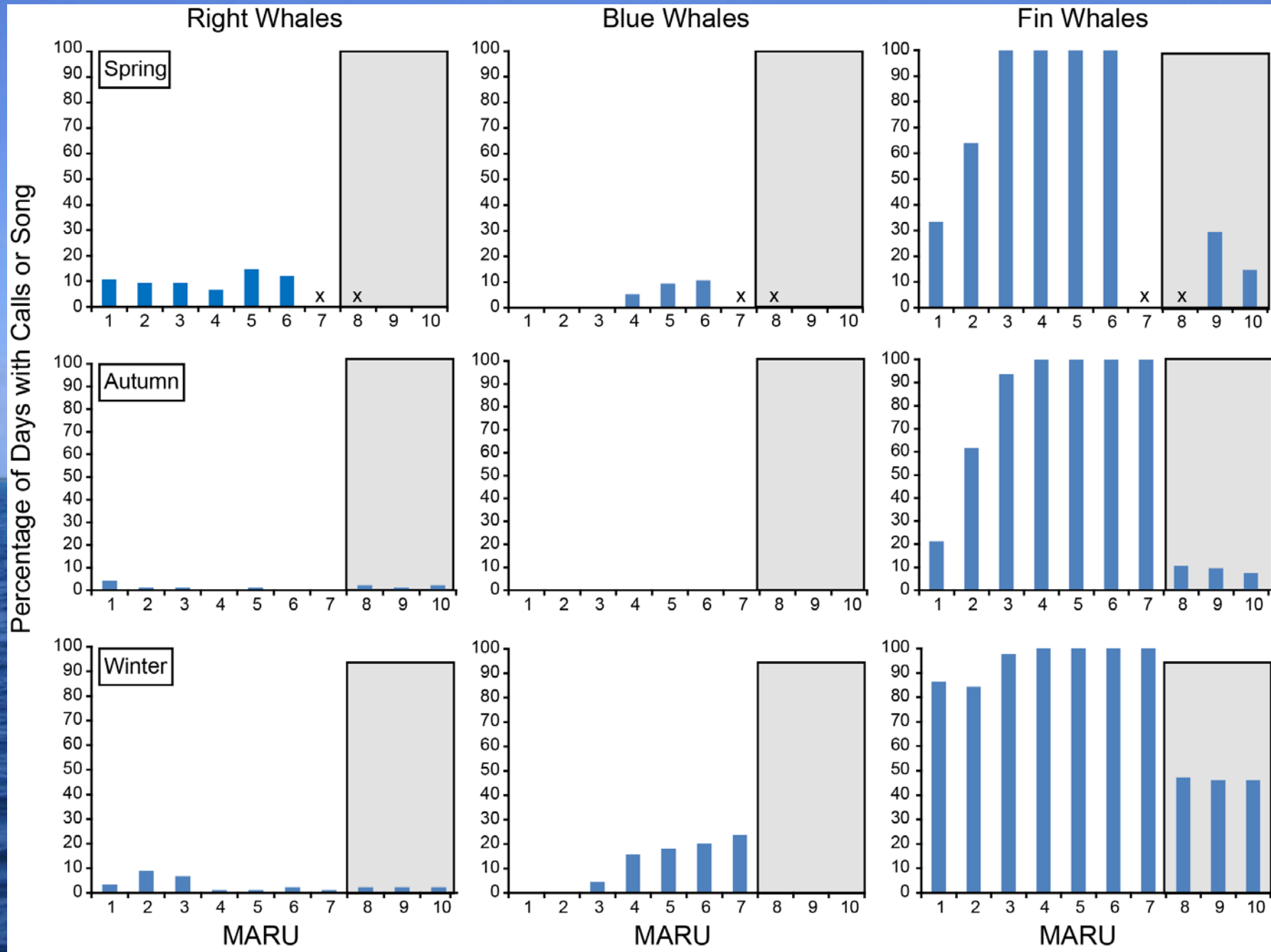
Timeline (3 deployments):

- 29 February – 16 May 2008 (“Spring 2008”)
- 29 August 2008 – 5 March 2009 (“Autumn 2008”, “Winter 2008-9”)

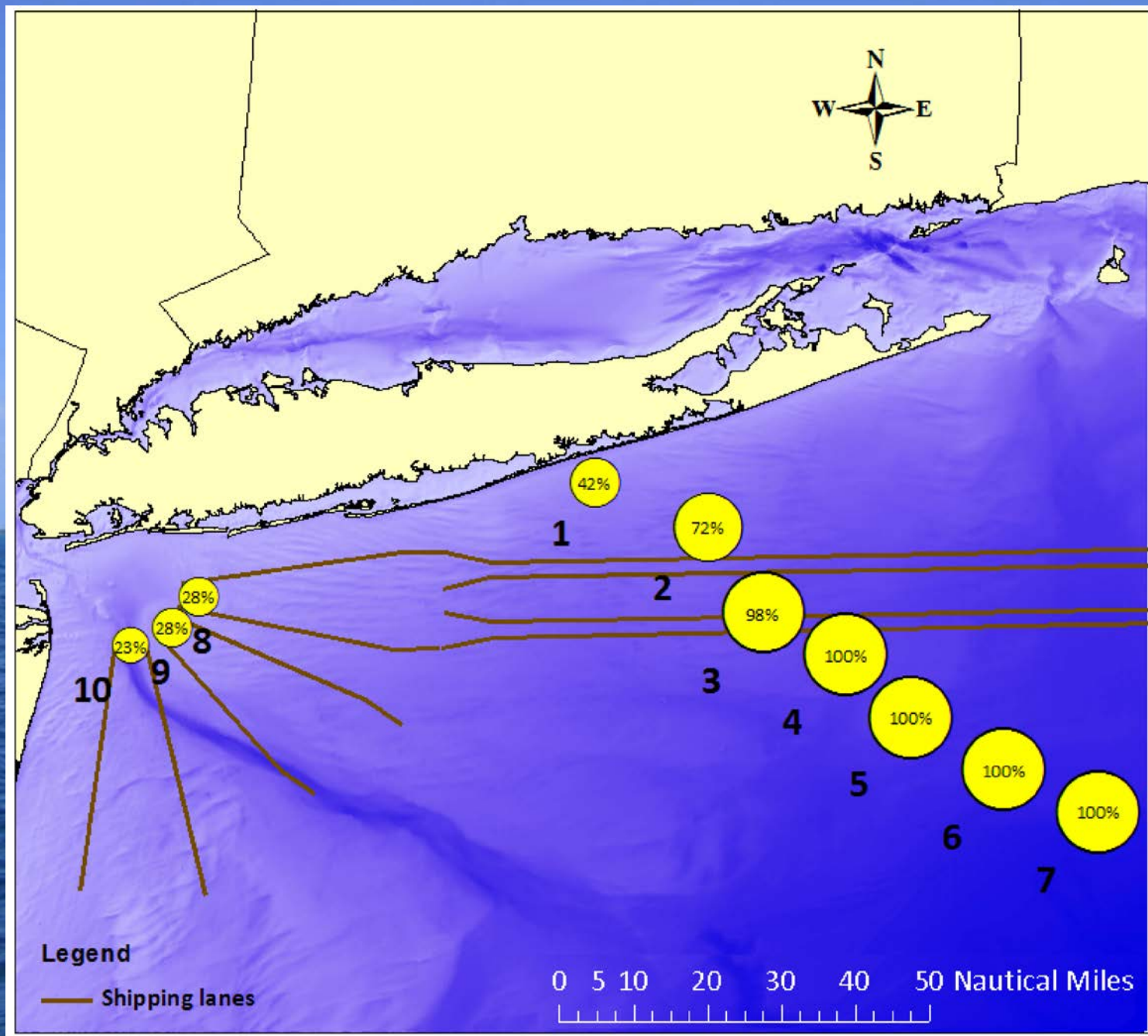
Autumn 2008/Winter 2009



Whale SGCN in NY Bight

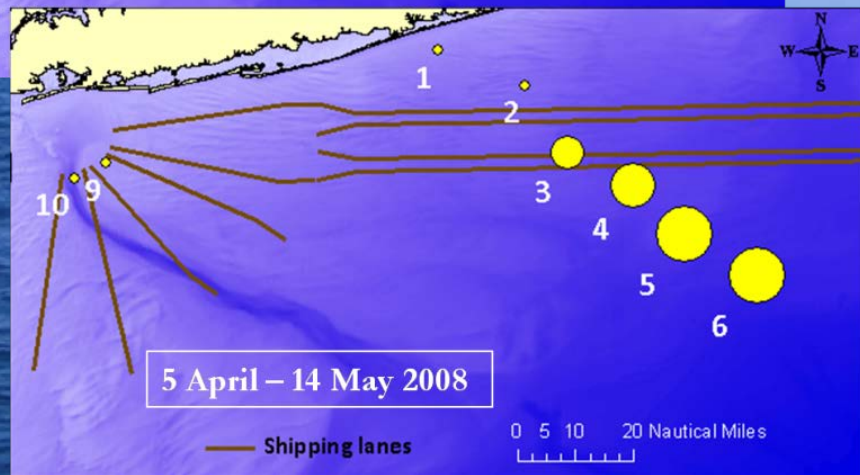
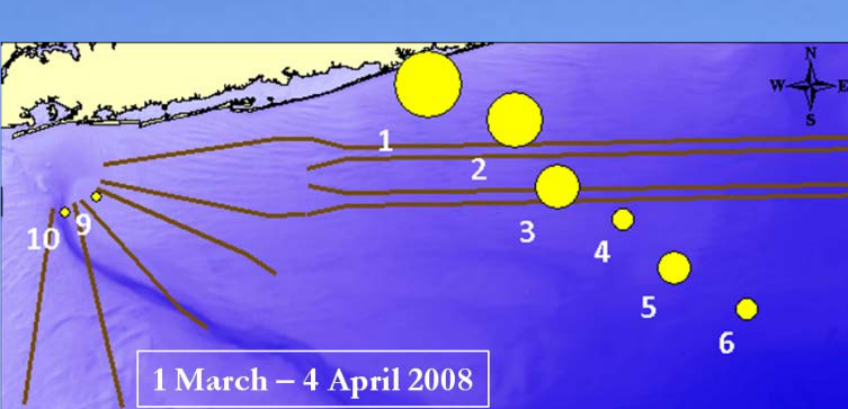


Cumulative Whale SGCN Occurrence in NY Bight

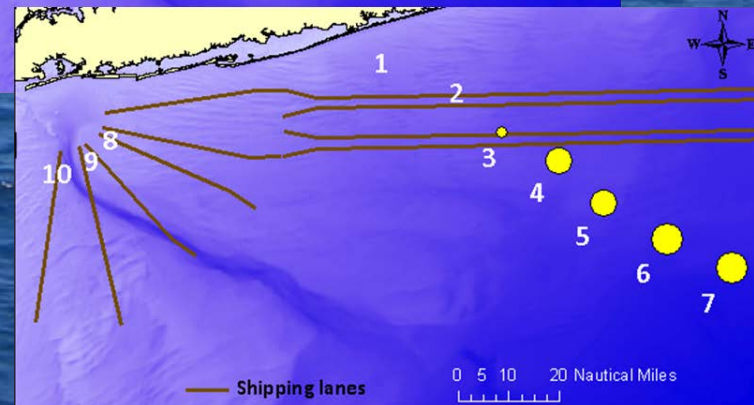
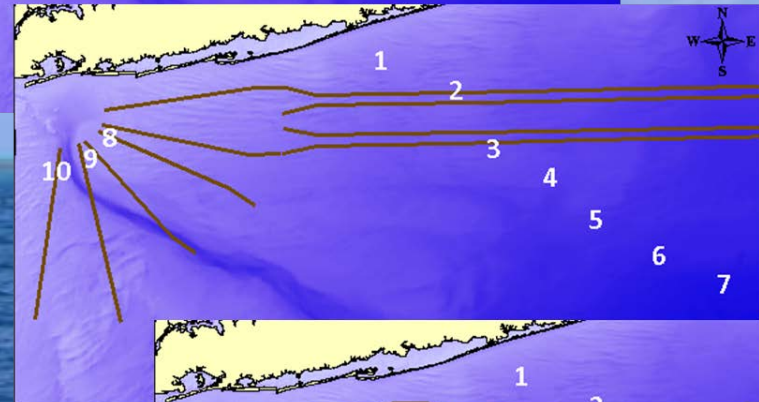
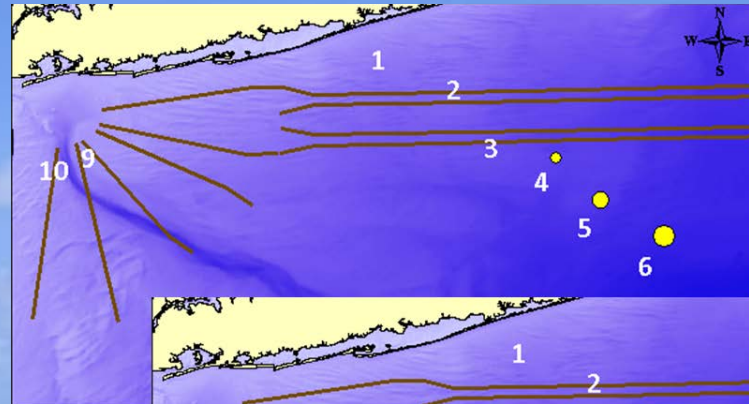


Geographical Distribution of Whale SGCN in NY Bight

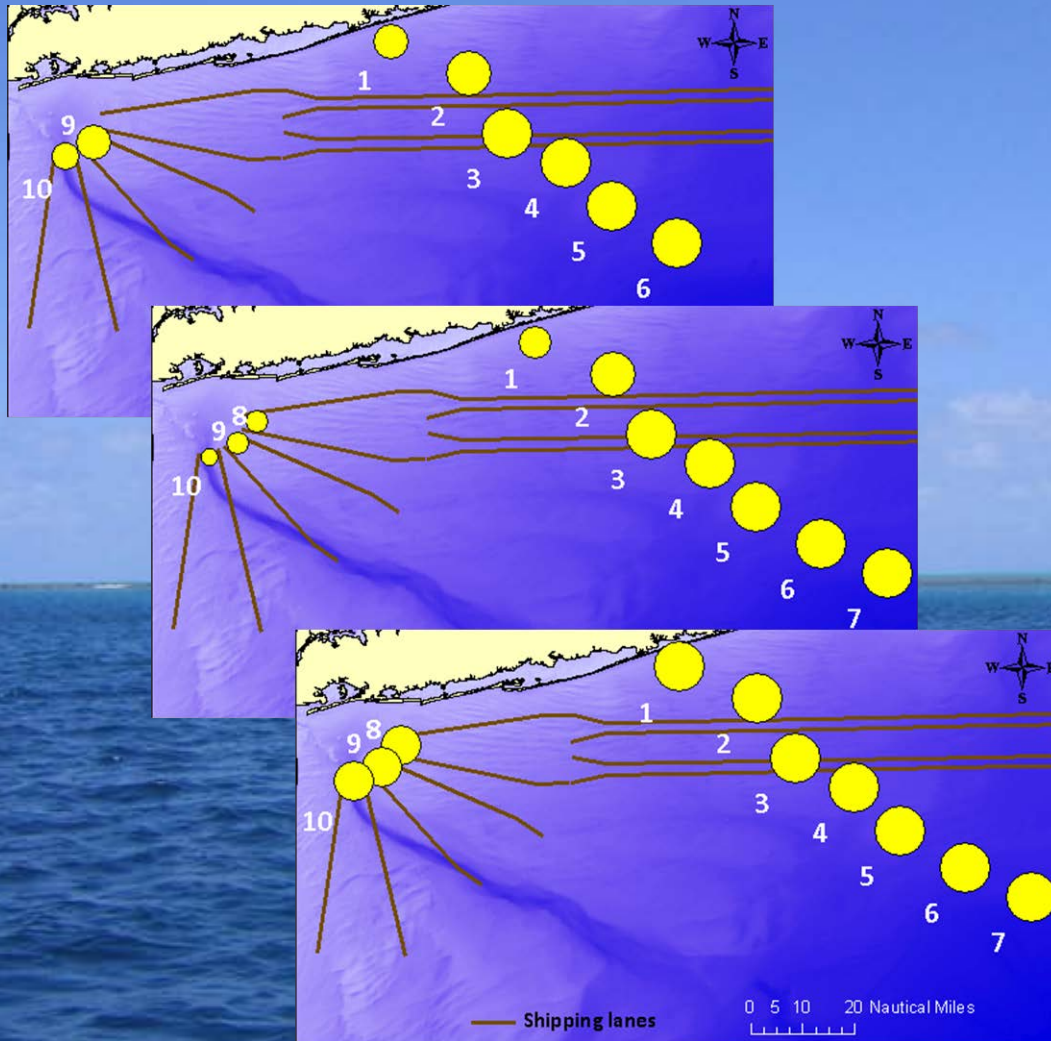
Right Whales



Blue Whale



Fin Whales



Acoustic Monitoring Along the Atlantic Coast

- I. Monitoring for whales in New York
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II. Whale Acoustic Surveys in the Massachusetts Wind Area

Project Goals:

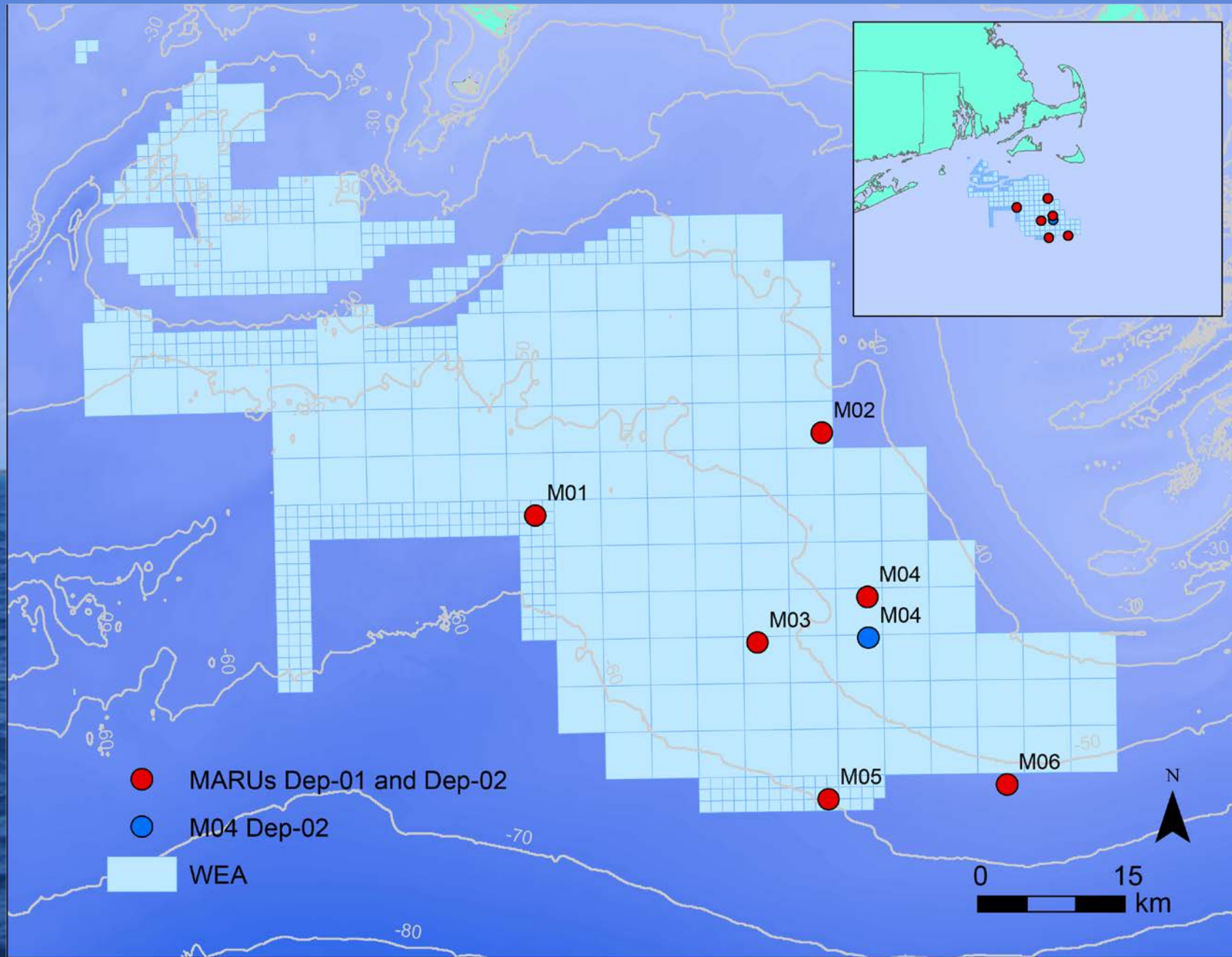
1) Determine occurrence of:

- North Atlantic right whales
- Blue whales
- Fin whales
- Humpback whales
- Minke whales

2) Compare acoustic survey data to visual survey data (NEAq)

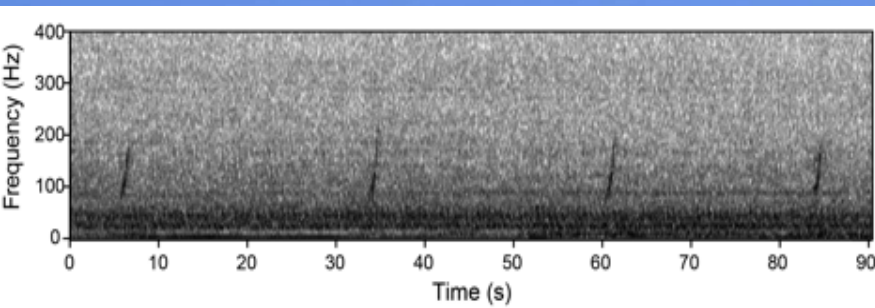
Timeline (2 deployments): November 2011 – October 2012

Massachusetts Wind Energy Survey Locations

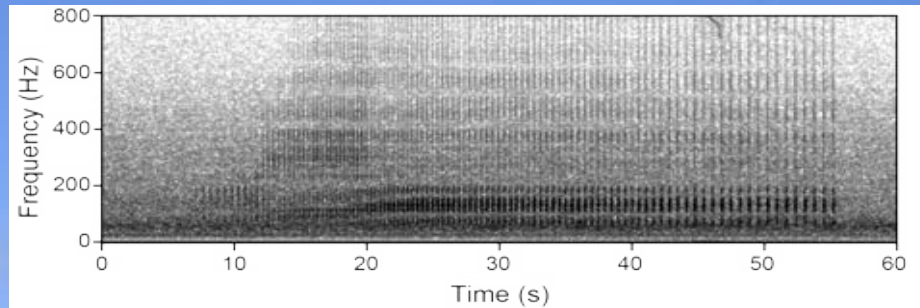


Species of Interest

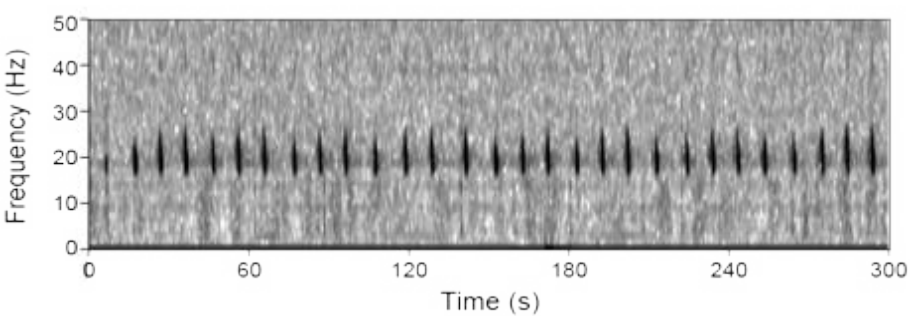
North Atlantic right whale



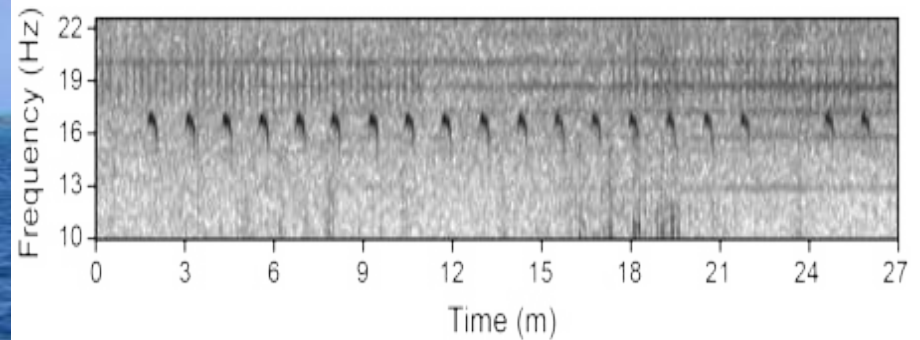
Minke whale



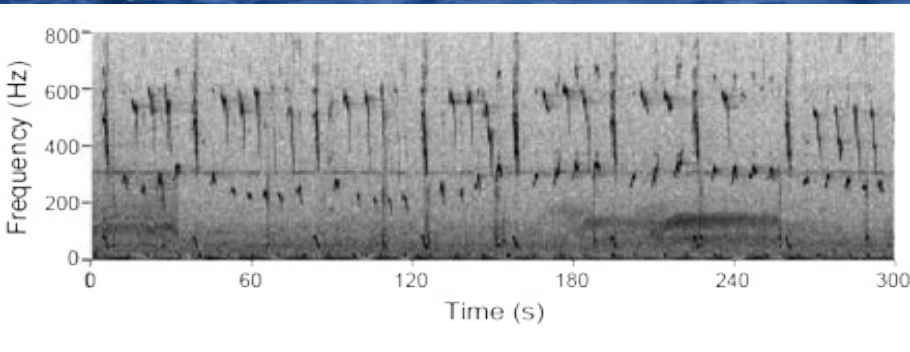
Fin whale



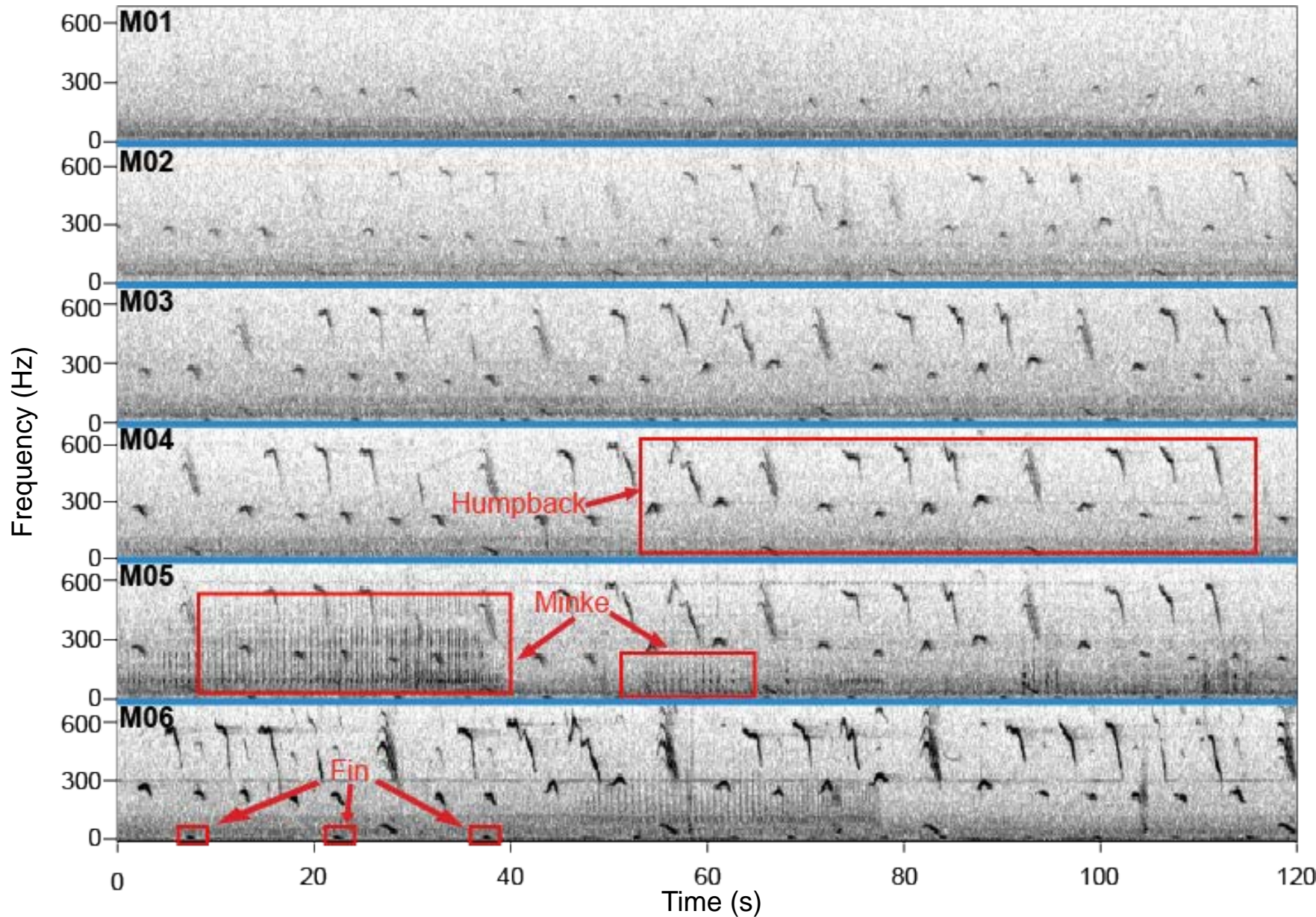
Blue whale



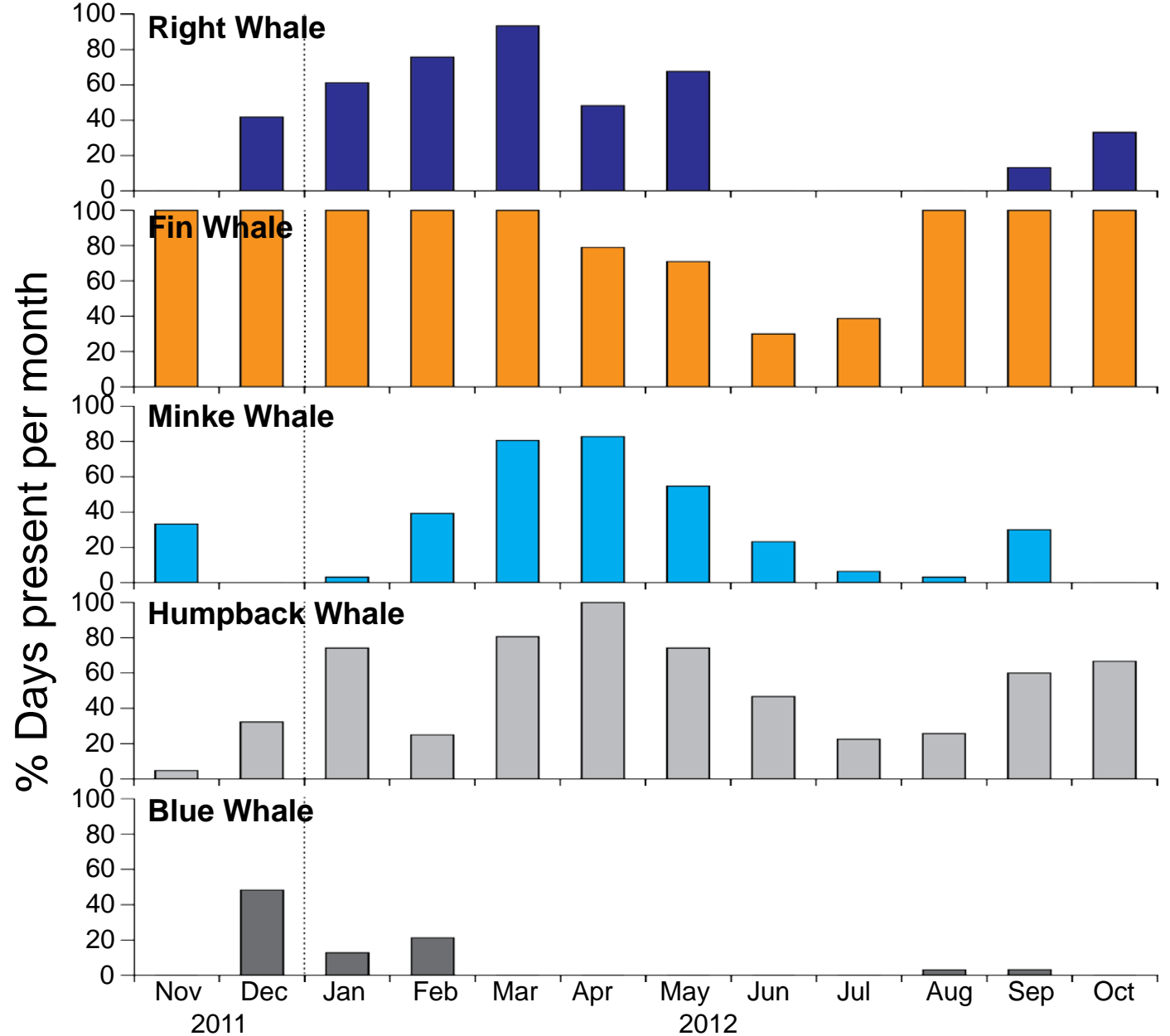
Humpback whale



Simultaneous Presence of Multiple Species in MA Wind Area (16 March 2012)



Massachusetts Wind Area



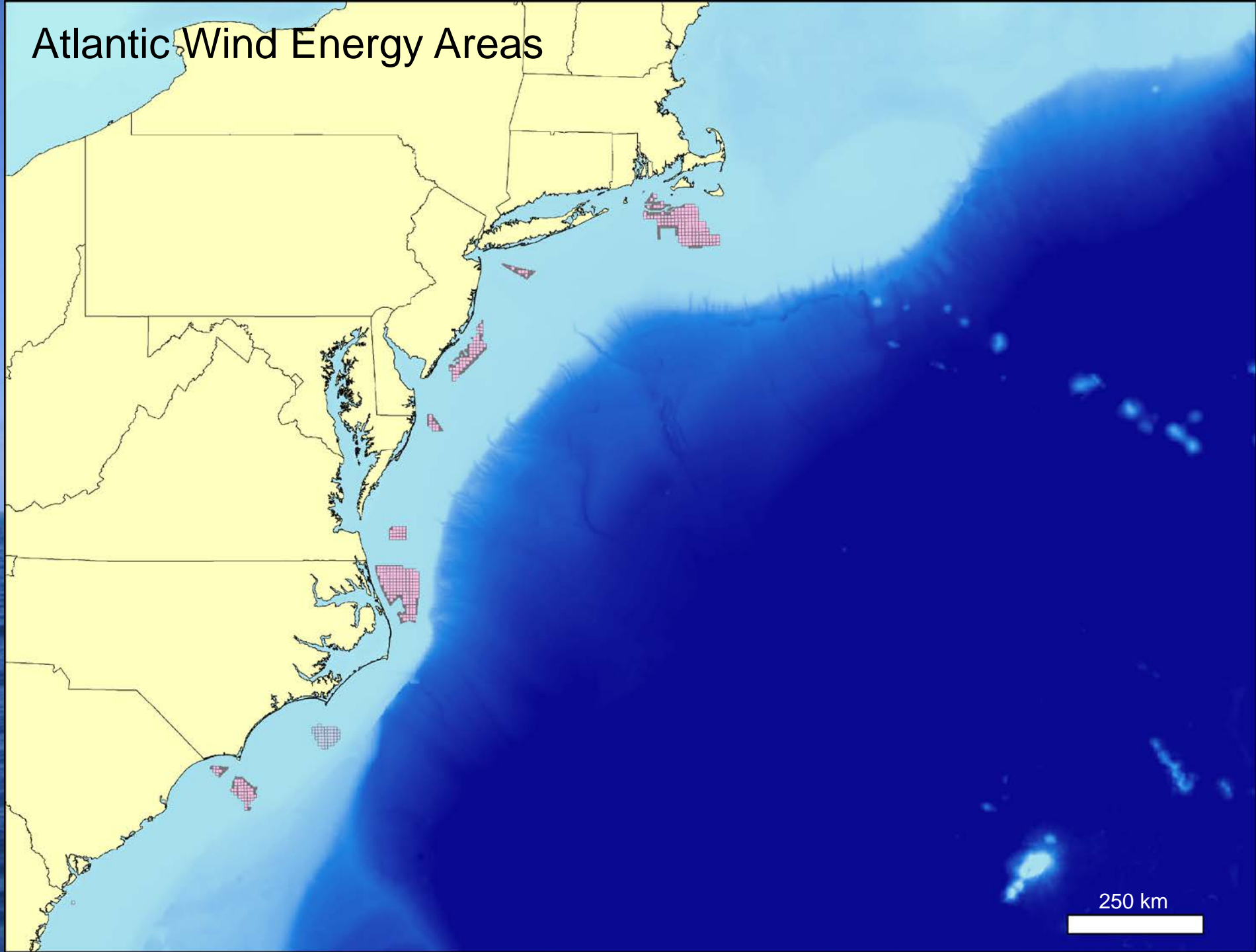
- Five focal baleen whale species acoustically detectable
- This area may serve as an ecologically important area for whales

Acoustic Monitoring Along the Atlantic Coast

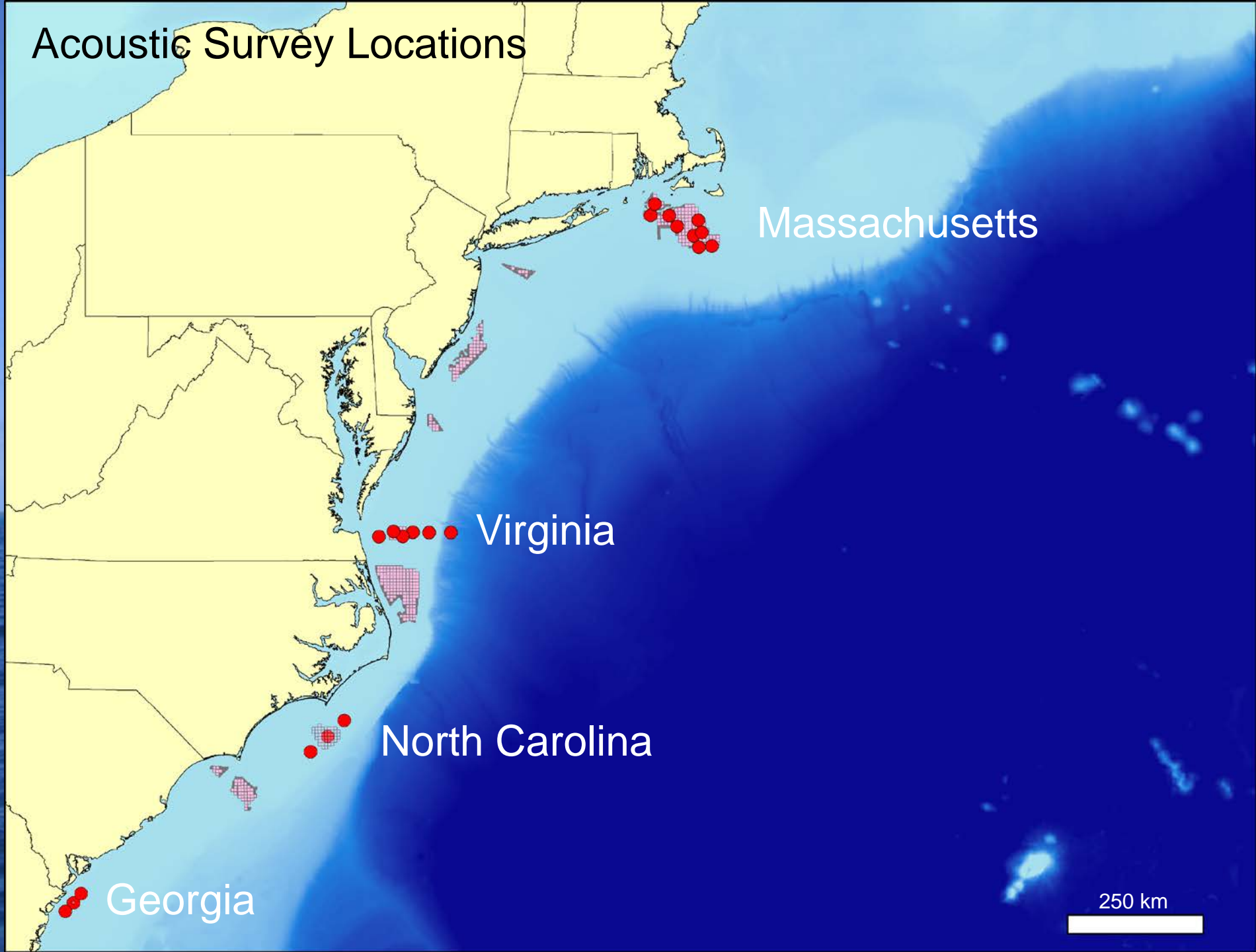
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Atlantic Wind Energy Areas



Acoustic Survey Locations



Massachusetts

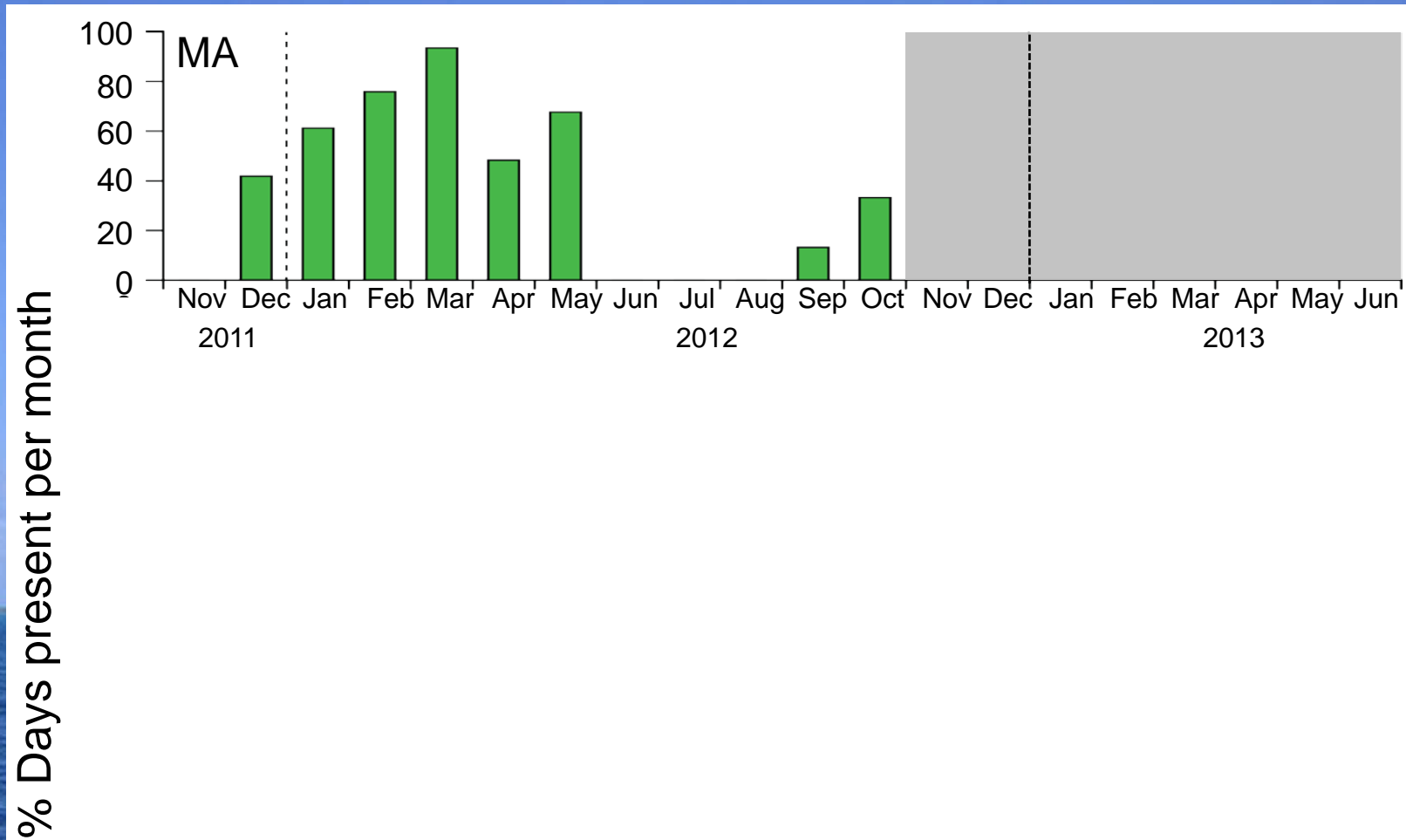
Virginia

North Carolina

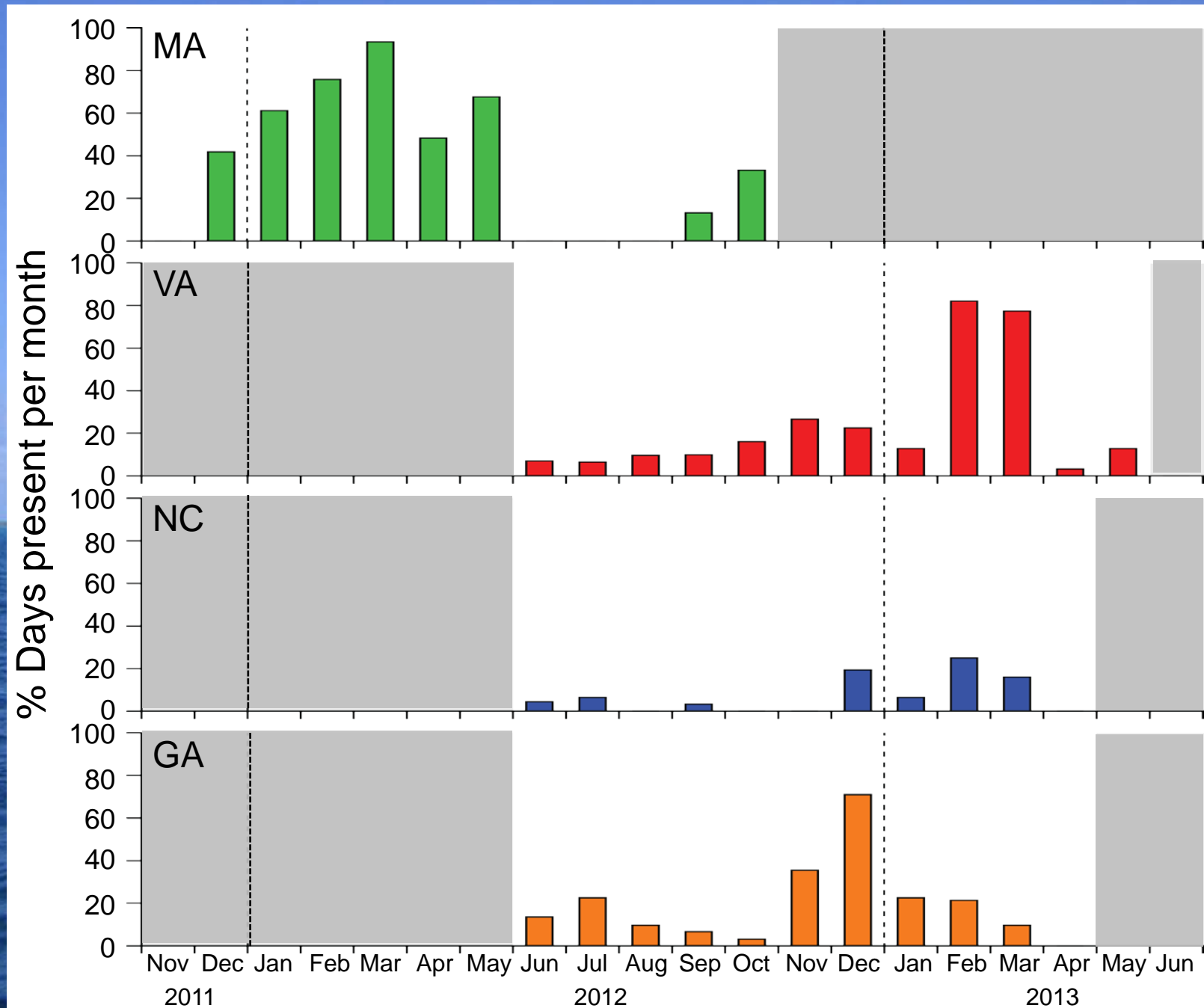
Georgia

250 km

Atlantic Coast Right Whale Occurrence



Atlantic Coast Right Whale Occurrence



Conclusions from All Three Projects

New understandings of seasonal occurrence of different species

- Changes previous understanding of right whale migration
- New insights on whale occurrence
- Both scientific and regulatory implications
- Influence timing of different construction activities
- Whales occurring in unexpected places at unexpected times

Cornell work ongoing:

- 1 year of Rhode Island data being processed
- 2nd year of Massachusetts being processed
- More VA, NC, GA data being analyzed

Long-term surveys in focal areas can:

- Reduce data gaps
- Further reduce risk to developers
- Help minimize environmental impacts

BRP Staff

Fred Channell
Russ Charif
Harold Cheyne, Ph.D.
Christopher Clark, Ph.D.
Deborah Cipolla-Dennis
Brian Cusimano
Stan DeForest
Christi Diamond
Peter Dugan, Ph.D.
Bobbi Estabrook
Sam Fladung
Linda Harris
Dean Hawthorne, Ph.D.
Kristin Hodge
Amanda Kempf
Tish Klein
Rob Koch
Tim Krein
Ray Mack
Pete Marchetto
Jason Michalec
Janelle Morano – NC. GA
Ed Moore
Charles Muirhead

Chris Pelkie
Mike Pitzrick
Dimitri Ponirakis
Marian Popescu
Ashik Rahaman
Matt Robbins
Liz Rowland
Dan Salisbury - VA
Yu Shiu, Ph.D.
Chris Tessaglia-Hymes
Jamey Tielens - MA
Ildar Urazghildiiev, Ph.D.
Ann Warde - NY
Peter Wrege, Ph.D.

Collaborators

New England Aquarium
Virginia Aquarium

Funding

Bureau of Ocean Energy
Management

IFAW

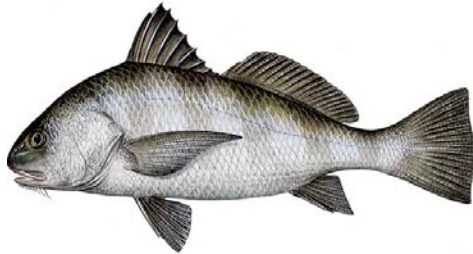
Massachusetts Clean Energy
Center

NY DEC

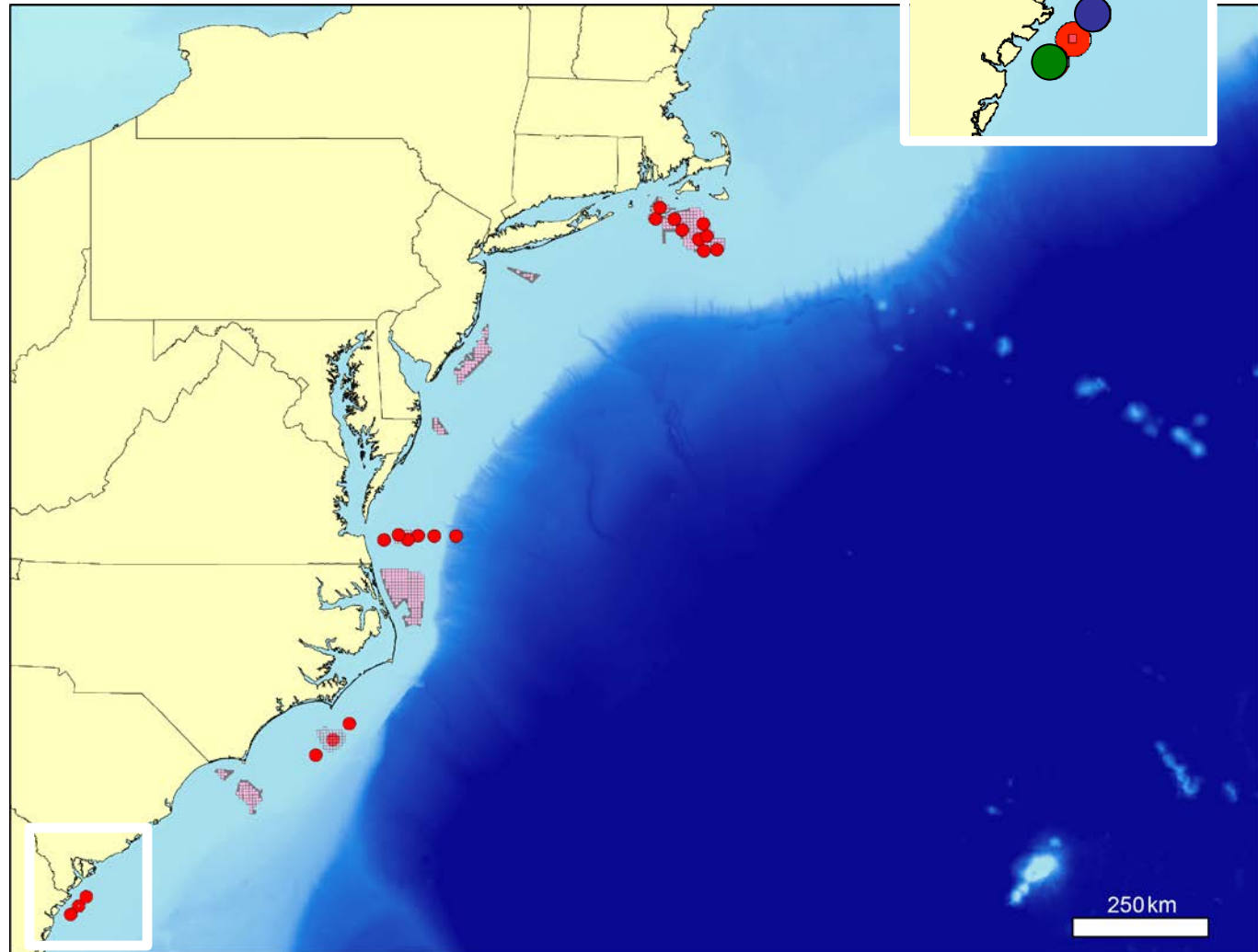
Oceana

Georgia Fish Acoustic Occurrence

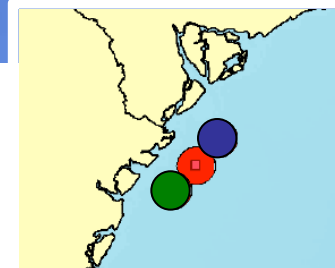
Black drum
(*Pogonias cromis*)



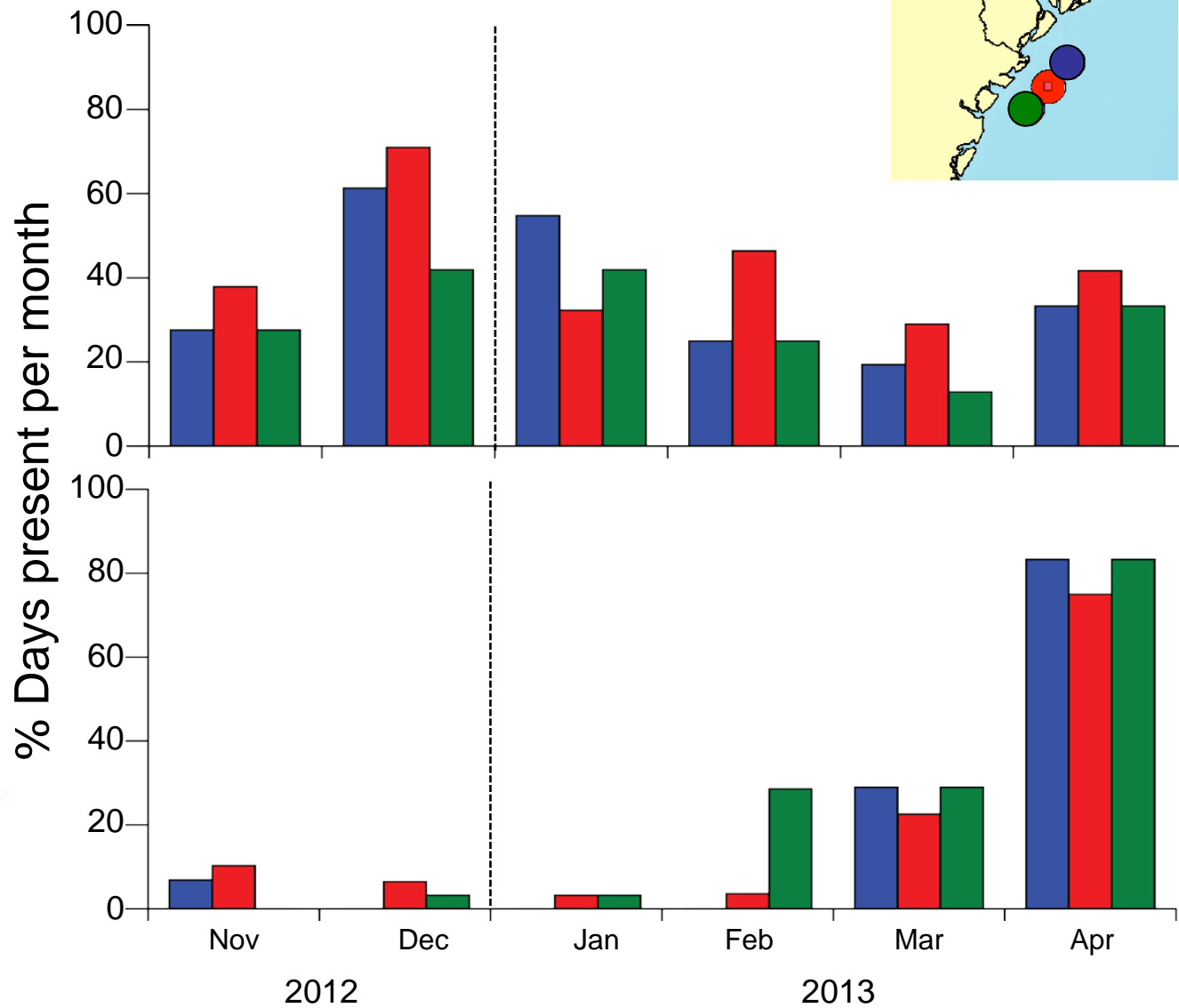
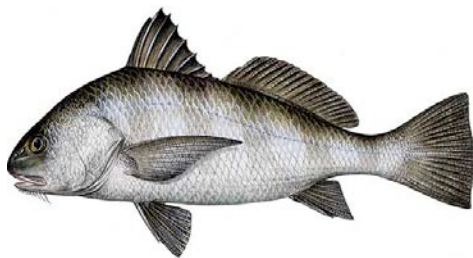
Oyster toadfish
(*Opsanus tau*)



Georgia Fish Acoustic Occurrence



Black drum
(*Pogonias cromis*)



Oyster toadfish
(*Opsanus tau*)



Right Whale Migration

