# Tracking fish with passive acoustic telemetry

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https://www.andersoncabotcenterforoceanlife.org/our-work/programs/fset/

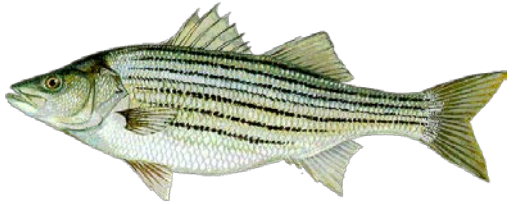
New England Aquarium
Protecting the blue planet

# What is fish acoustic telemetry?

- Tagging system to monitor the movements and activity of fishes
- Transmitters emit unique coded ultrasonic ‘pings’ (69 – 180 kHz) at defined time interval
- Transmitters come in many sizes and functionalities (depth, temperature, acceleration)
- Listen for ‘pings’ with acoustic receivers


Images: https://www.innovasea.com/fish-tracking/

American shad (*Alosa sapidissima*)

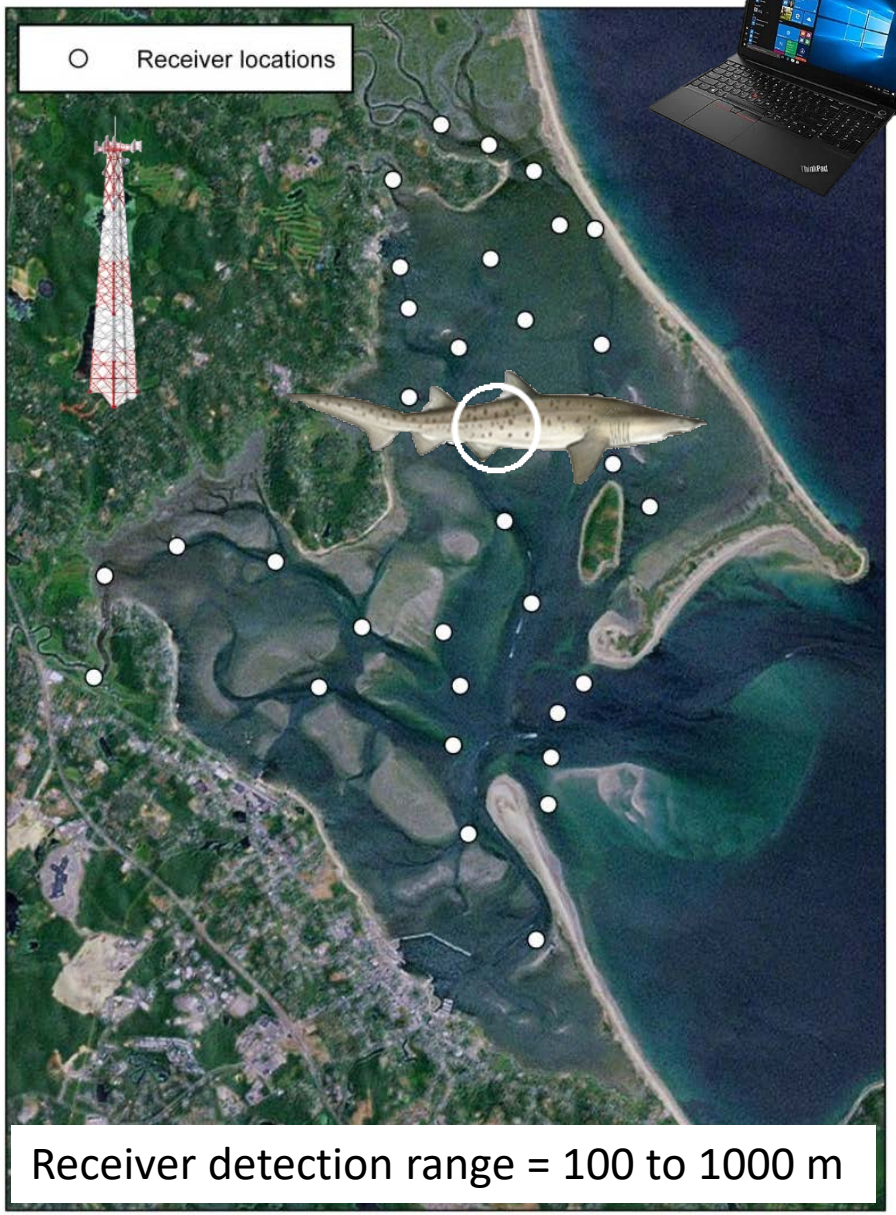


Striped bass (*Morone saxatilis*)

Bluefin tuna (*Thunnus thynnus*)

Shortfin mako (*Isurus oxyrinchus*)

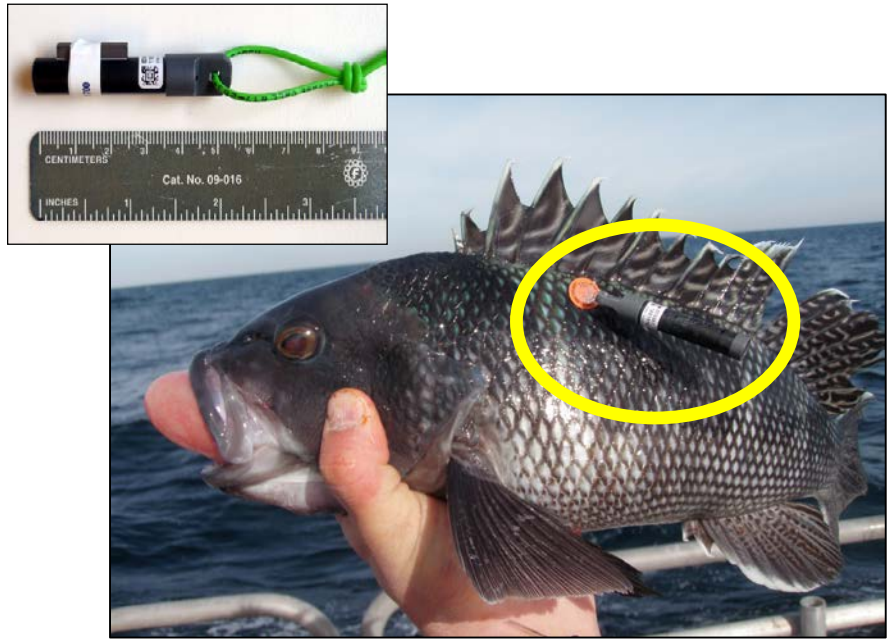
# How do we track fish movements with acoustic transmitters?

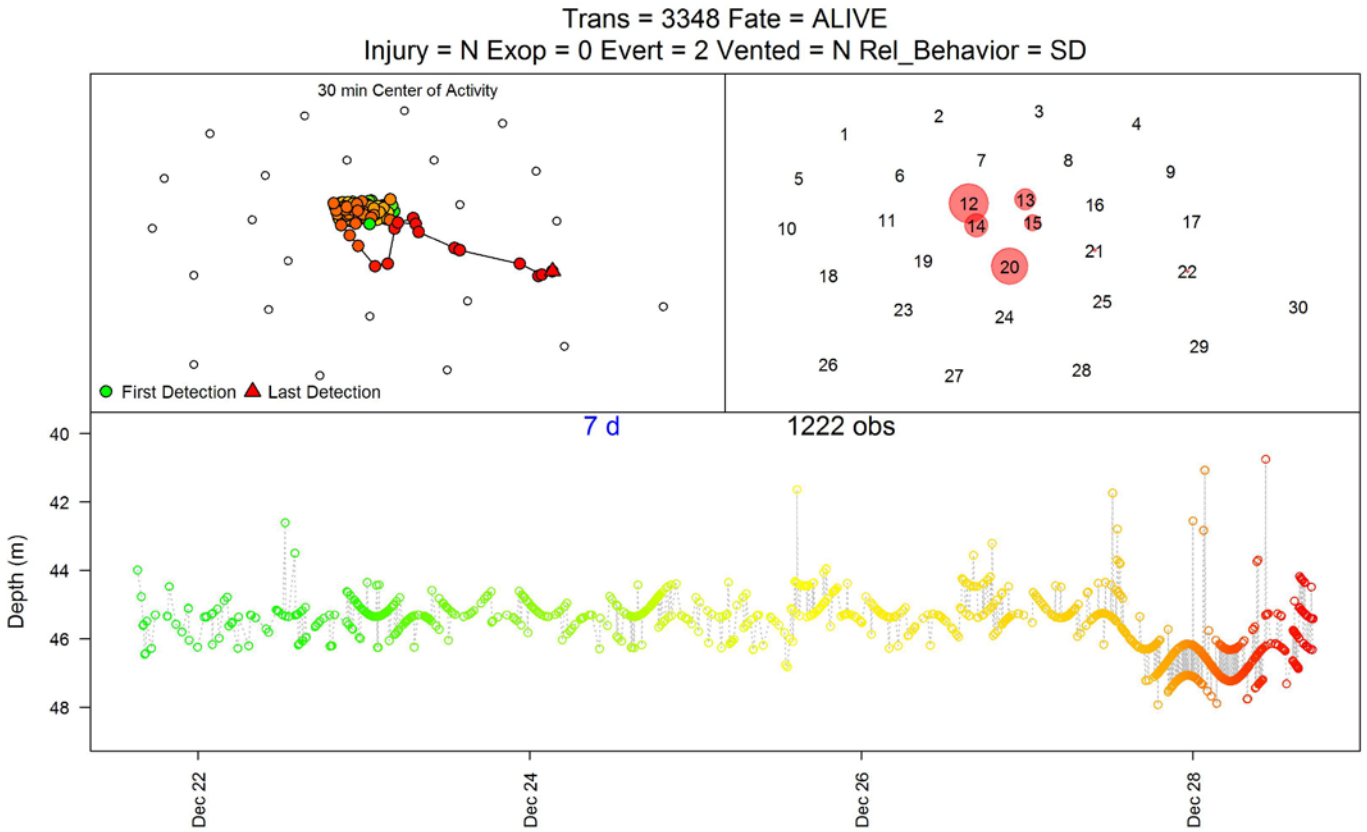
# What does it help scientists do?

- Understand how, why, for how long species use specific areas
- Monitor environmental or anthropogenic impacts in areas
- Understand how fish are impacted by catch and release

Essential bits of knowledge for effective fishery management and species conservation




Black sea bass (*Centropristis striata*)
Zemeckis et al. (2020) *Fishery Bulletin*



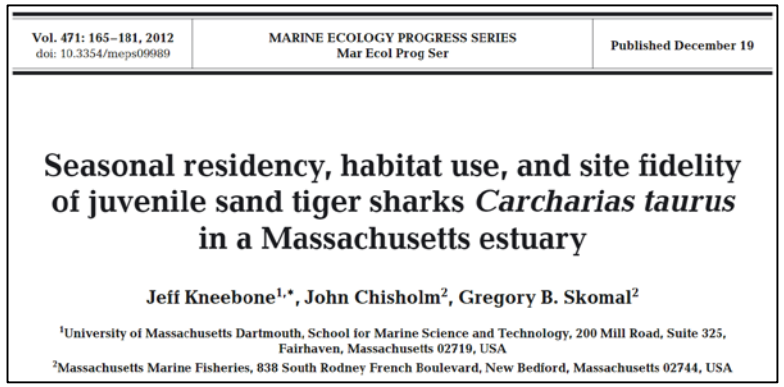
# A bit of extra sound does a lot of good for many fishes

- Acoustic telemetry has led to….
  - Hundreds of scientific papers on fish ecology, behavior, habitat preferences, population structure, and survival
  - New fishing regulations that promote more responsible catch and release practices
  - Spawning area closures
  - Identification of Essential Fish Habitat
  - Endangered Species Research and Conservation
  - Improved understand of the need for and effectiveness of Marine Protected Areas


Identifying the distribution of Atlantic cod spawning using multiple fixed and glider-mounted acoustic technologies

Douglas R Zemeckis, Micah J Dean, Annamaria I DeAngelis, Sofie M Van Parijs, William S Hoffman, Mark F Baumgartner, Leila T Hatch, Steven X Cadrin, Christopher H McGuire

*ICES Journal of Marine Science*, Volume 76, Issue 6, November-December 2019, Pages 1610–1625, https://doi.org/10.1093/icesjms/fsz064


Vol. 471: 165–181, 2012 | MARINE ECOLOGY PROGRESS SERIES Mar Ecol Prog Ser | Published December 19

doi: 10.3354/meps09989

Seasonal residency, habitat use, and site fidelity of juvenile sand tiger sharks *Carcharias taurus* in a Massachusetts estuary

Jeff Kneebone[1,*], John Chisholm[2], Gregory B. Skomal[2]

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[2]Massachusetts Marine Fisheries, 838 South Rodney French Boulevard, New Bedford, Massachusetts 02744, USA

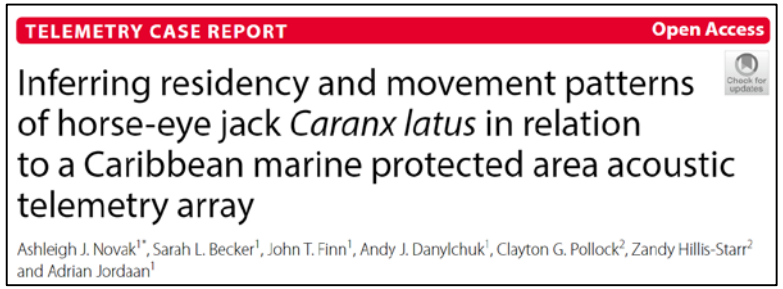

Using Advanced Acoustic Telemetry to Test the Conservation Benefit of Circle Hooks in the Recreational Striped Bass Fishery

The waters off Massachusetts are regarded by recreational anglers to have some of the best striped bass fishing in the world.


Multiple spawning run contingents and population consequences in migratory striped bass *Morone saxatilis*

David H. Secor, Michael H. P. O'Brien, Benjamin I. Gahagan, Dewayne A. Fox, Amanda L. Higgs, Jessica E. Best

Published: November 25, 2020 • https://doi.org/10.1371/journal.pone.0242797


TELEMETRY CASE REPORT Open Access

Inferring residency and movement patterns of horse-eye jack *Caranx latus* in relation to a Caribbean marine protected area acoustic telemetry array

Ashleigh J. Novak[1*], Sarah L. Becker[1], John T. Finn[1], Andy J. Danylchuk[1], Clayton G. Pollock[2], Zandy Hillis-Starr[2] and Adrian Jordaan[1]


Potential detection of illegal fishing by passive acoustic telemetry

David M. Tickler, Aaron B. Carlisle, Taylor K. Chapple, David J. Curnick, Jonathan J. Dale, Robert J. Schallert & Barbara A. Block

*Animal Biotelemetry* 7, Article number: 1 (2019) | Cite this article


UD-DEVELOPED TEXT ALERT SYSTEM HELPS FISHERMEN AVOID STURGEON

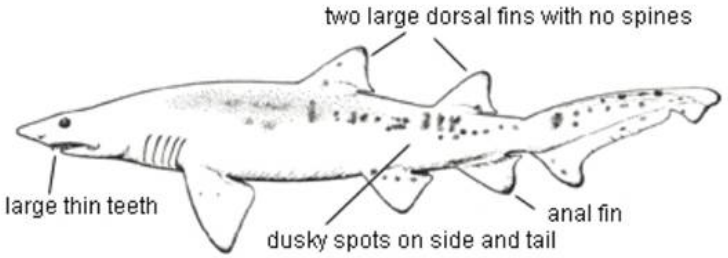
Article by Karen B. Roberts | Photos by Michael Graw and Delaware State University | Video by Michael Graw | April 12, 2018

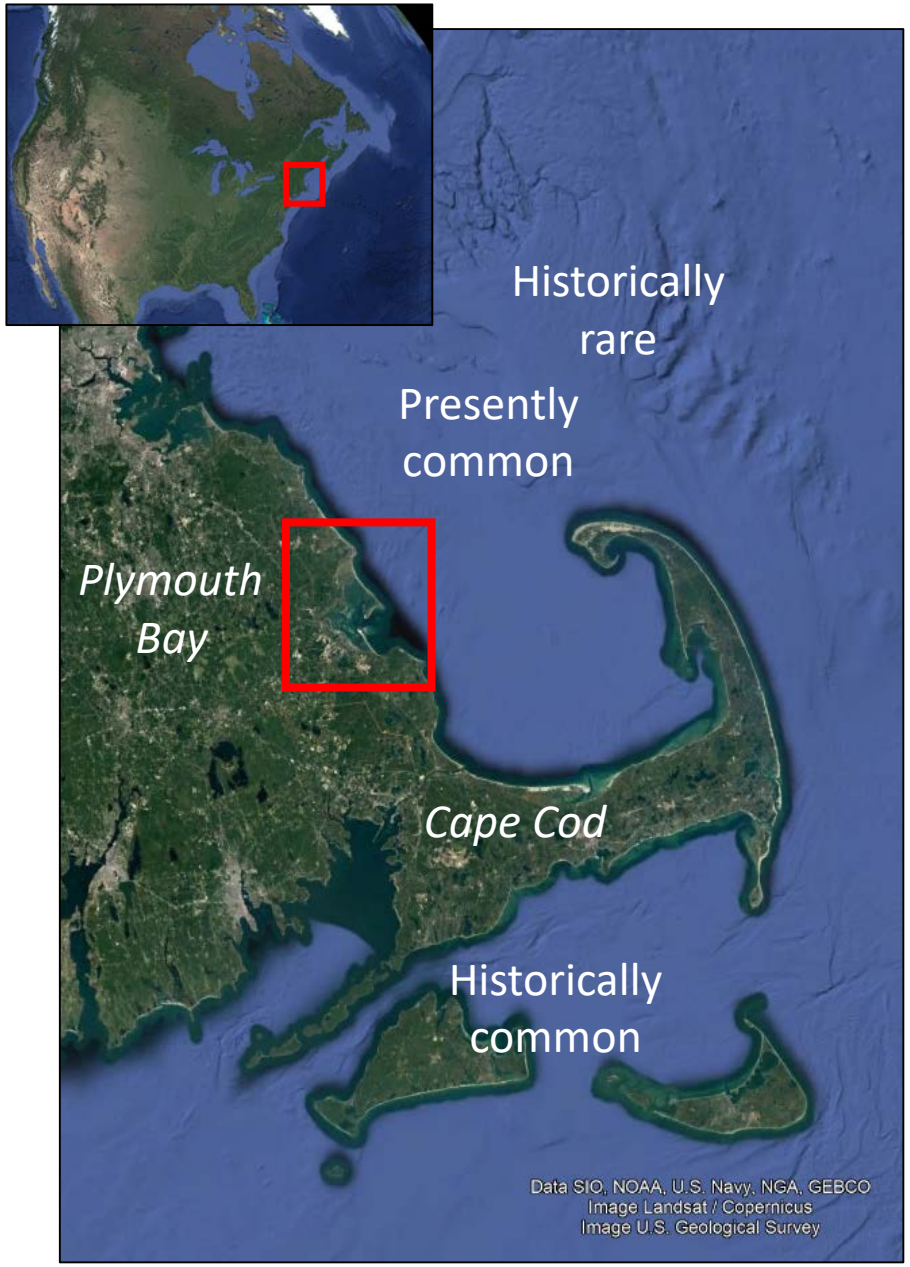
New system predicts presence of Atlantic sturgeon with 88 percent accuracy

# Objective: Monitor juvenile sand tiger shark presence in Massachusetts (USA)


- 70 – 90% decline in U.S. Atlantic population since 1970's
  (Source: Musick et al., 1993; 2000)
- Prohibited in U.S. federal (1997) and east coast state (2009) waters
- Must be released if caught by a fisherman

**Prohibited!!**



# Juvenile sand tiger shark tracking Plymouth Bay (2008 to 2011)


Key findings….

1) Juvenile sand tigers stayed in the bay June to October
2) Sharks inhabited the bay every year
3) Numerous individuals returned for up to 3 years

Kneebone et al. (2012) *Marine Ecological Progress Series*

# Plymouth Bay = sand tiger nursery habitat

## The facts:

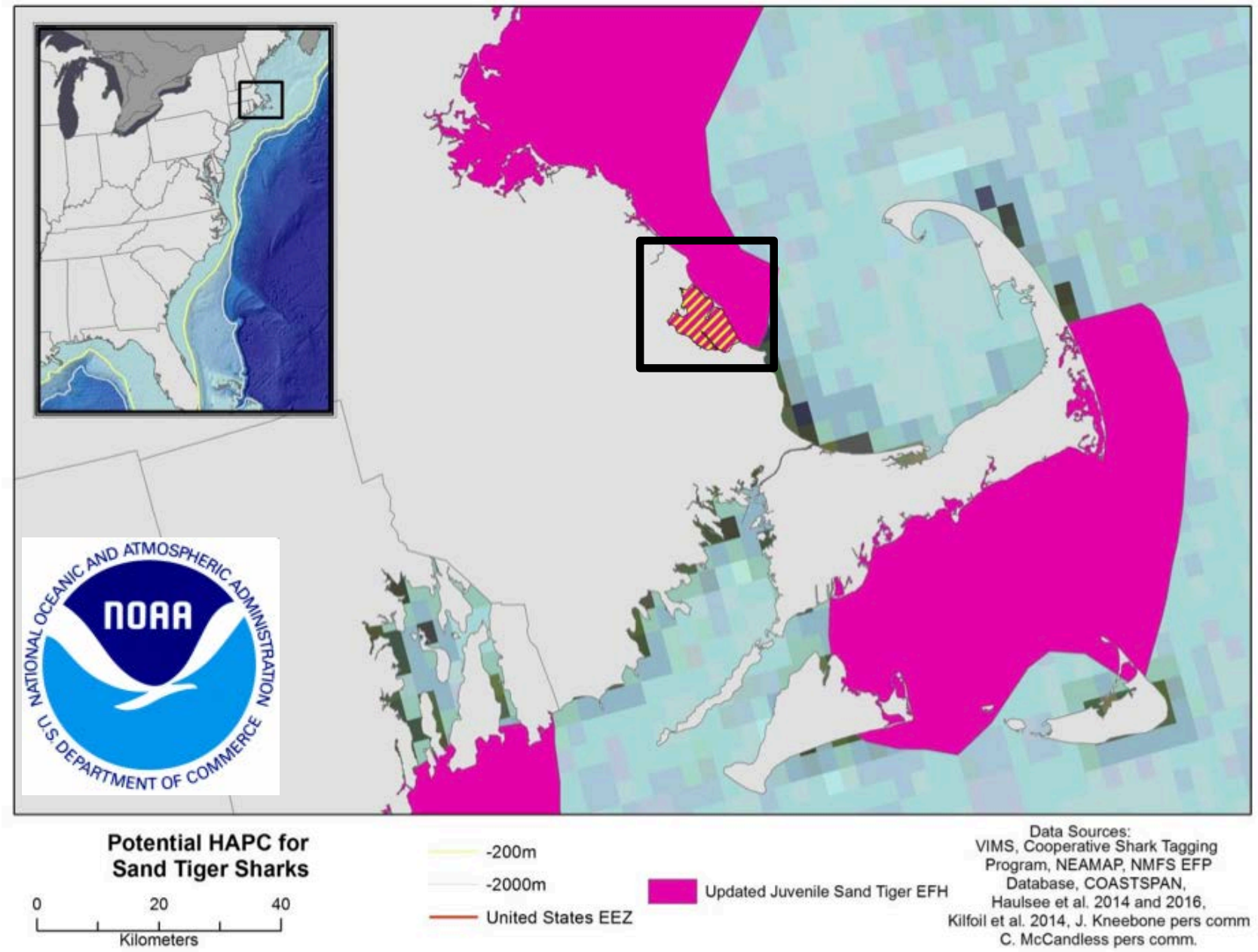
Only juveniles present

Present each year

Same sharks coming back

Using same areas each year

Stay in those areas indefinitely



# Sharing is caring: We can learn A LOT more by sharing telemetry data

The Atlantic Cooperative Telemetry Network

MATOS
Mid-Atlantic Acoustic Telemetry Observation System

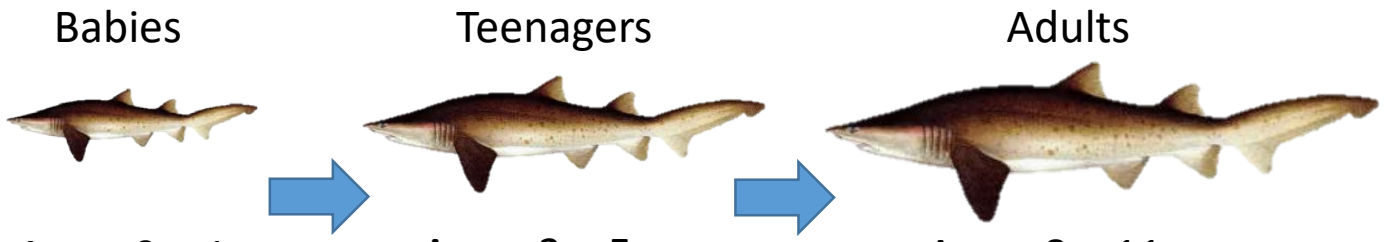
https://sites.google.com/site/cooperativetelemetry/
https://matos.asascience.com/

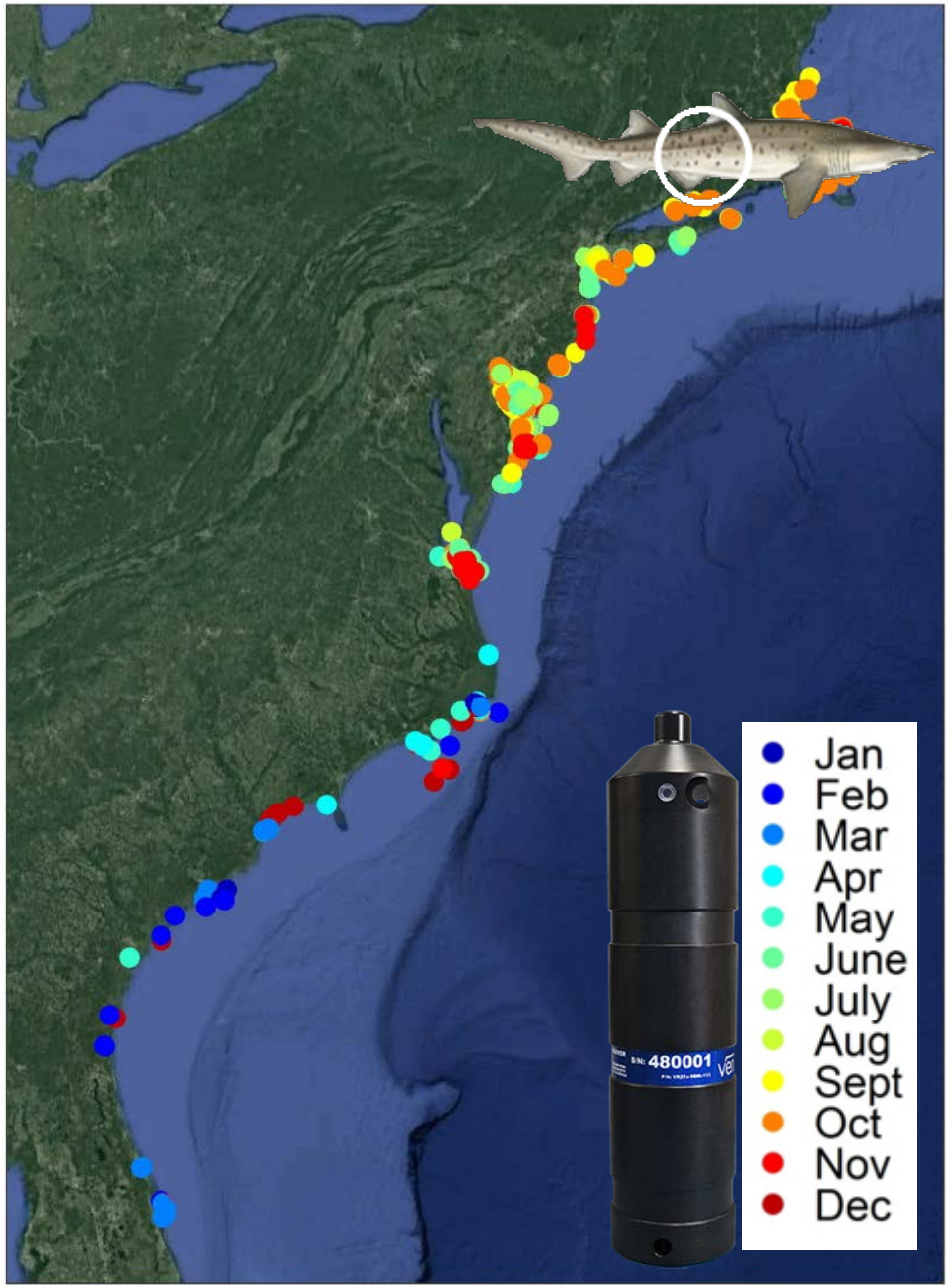
*Since the sand tiger project started in 2008….*

>200,000 receiver detections

>700 locations (receivers)

Individuals tracked for up to 3,650 days (10 yrs)!



# Coming Soon to Southern New England…Offshore Wind

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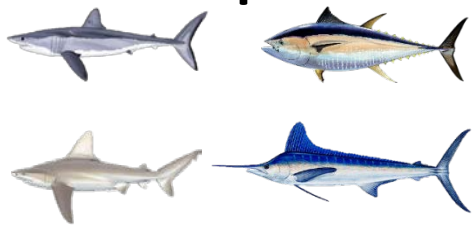

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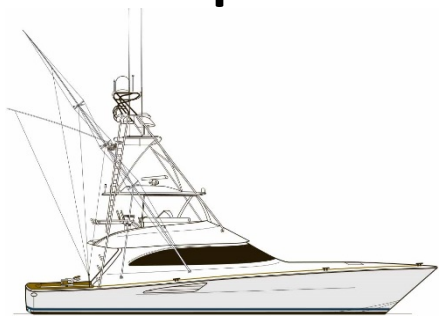
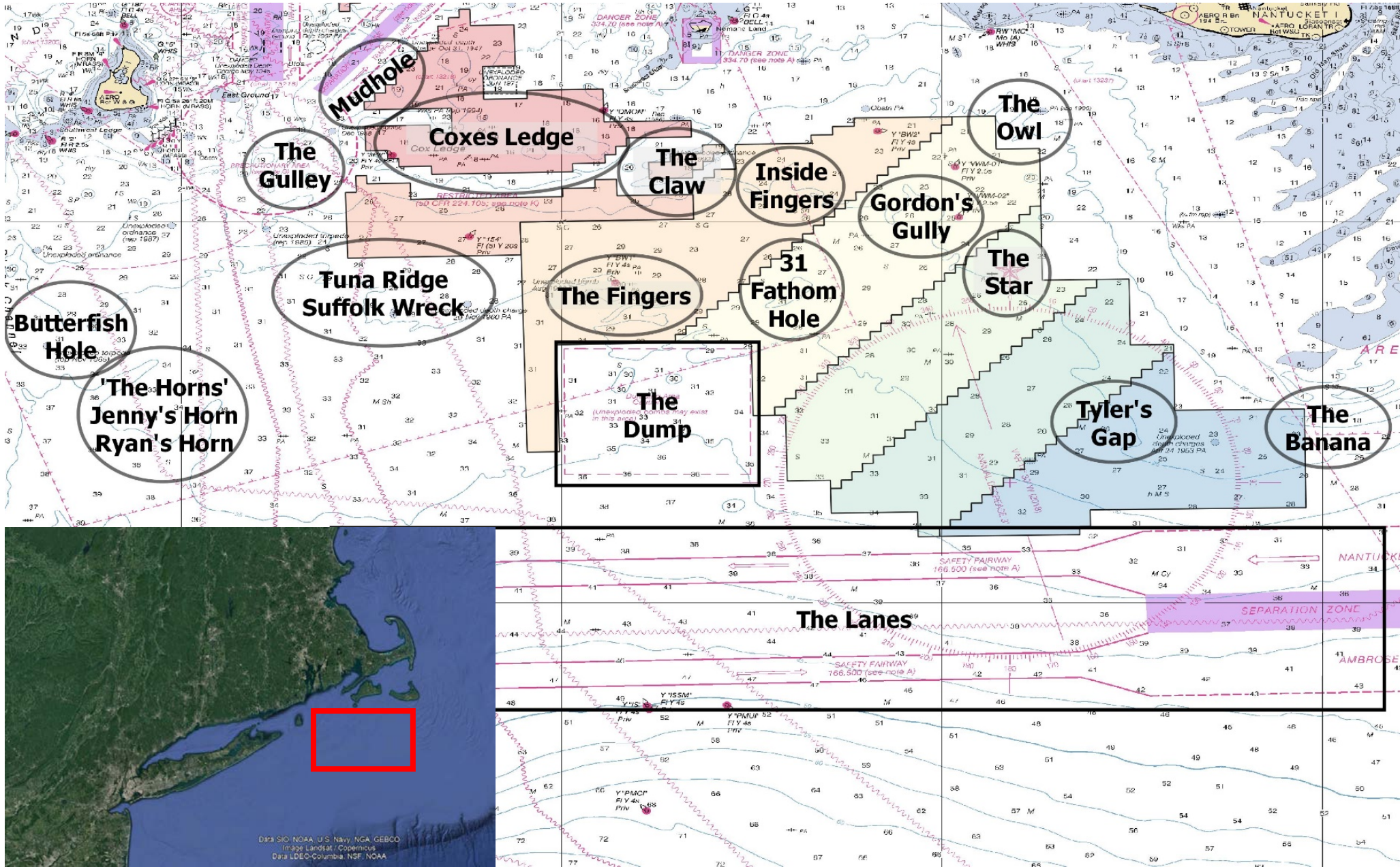
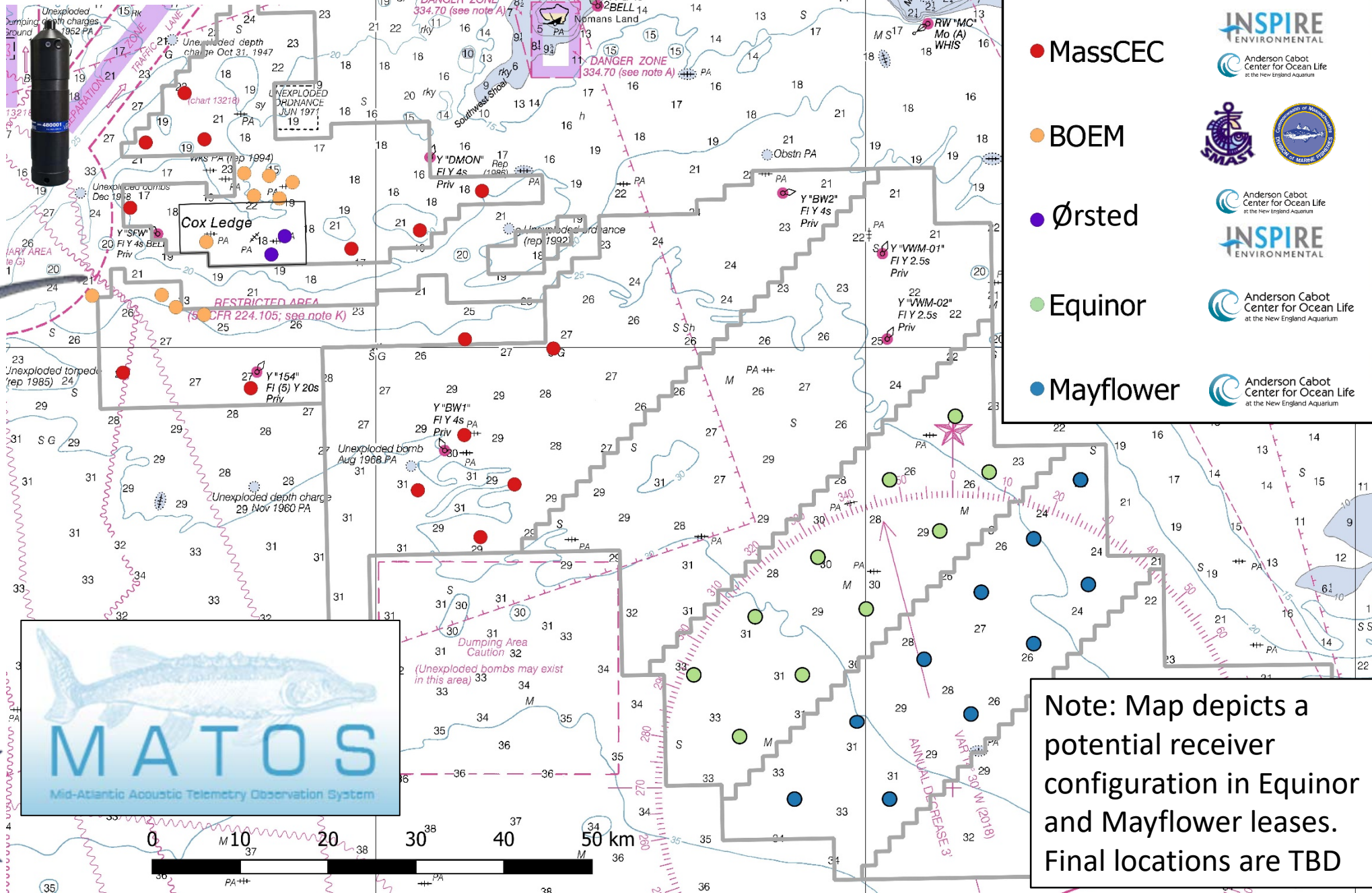




# 2021 Acoustic receiver array



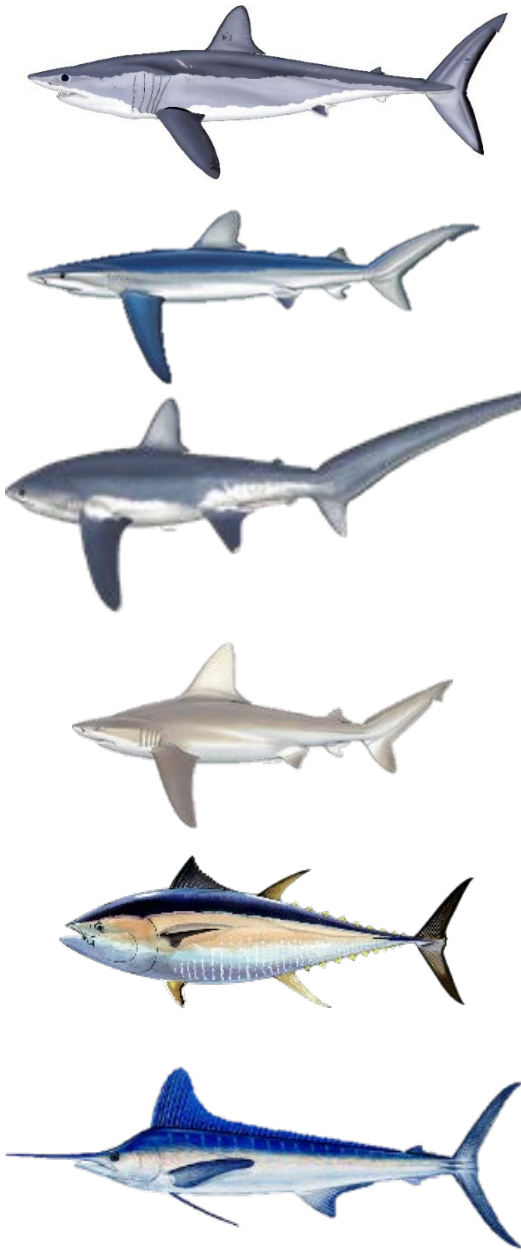




| Supporter | PI |
|---|---|
| MassCEC | INSPIRE ENVIRONMENTAL; Anderson Cabot Center for Ocean Life at the New England Aquarium |
| BOEM | SMAST; Commonwealth of Massachusetts Division of Marine Fisheries |
| Ørsted | Anderson Cabot Center for Ocean Life at the New England Aquarium; INSPIRE ENVIRONMENTAL |
| Equinor | Anderson Cabot Center for Ocean Life at the New England Aquarium |
| Mayflower | Anderson Cabot Center for Ocean Life at the New England Aquarium |

Note: Map depicts a potential receiver configuration in Equinor and Mayflower leases. Final locations are TBD

# Glider missions to support monitoring efforts in some areas?



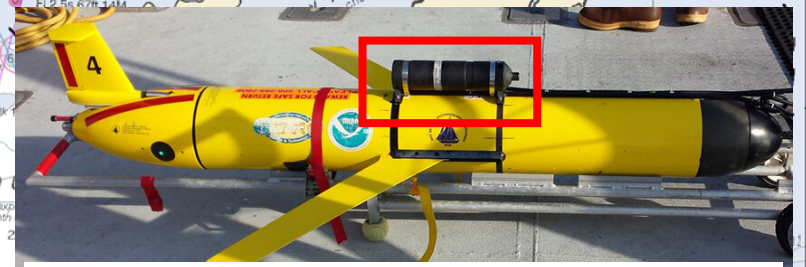


Photo: Chris McGuire, The Nature Conservancy

SFWF Work Area
Lease 0CS-A 0500
Lease OCS-A 0486
Lease OCS-A 0517
Sunrise Wind Farm Area
Submerged Lands Act Boundary

Potential Export Cables
Sunrise
Revolution
South Fork

Acoustic Receivers
Glider Track

Nautical Miles
0 1 2 3 4 5

Data: NOAA NOS Chart 12300
Document Name: SFWF_2020_Cod
Date: 9/28/2020

South Fork Wind | Powered by Ørsted & Eversource

# Thank you, and…

Study collaborators

Dr. Greg Skomal
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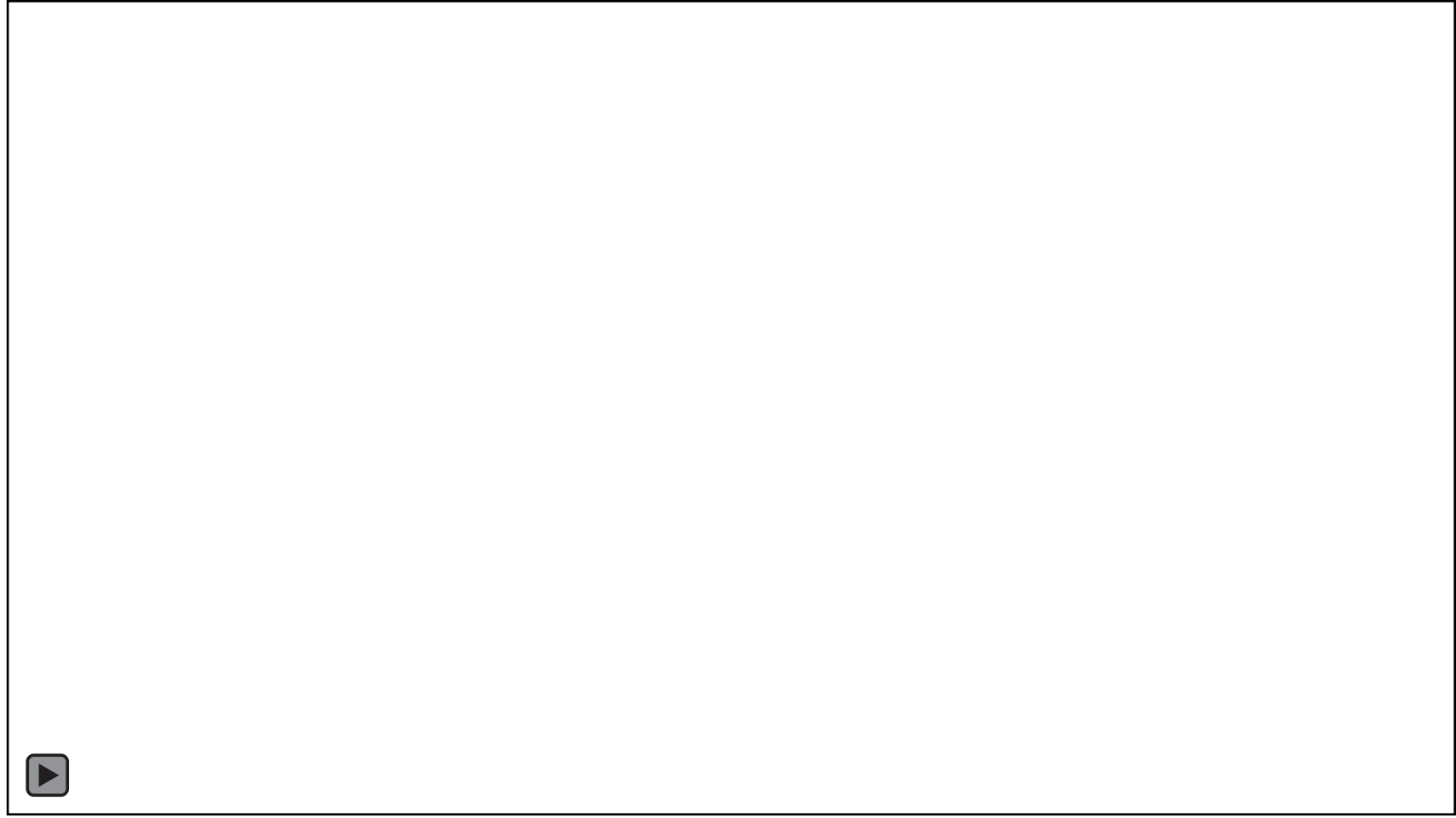
Harry Graff
Rob Taylor (F/V Reel EZ)
Willy Hatch (F/V Machaca)
Greg Mataronas (F/V Cailyn and Maren)



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