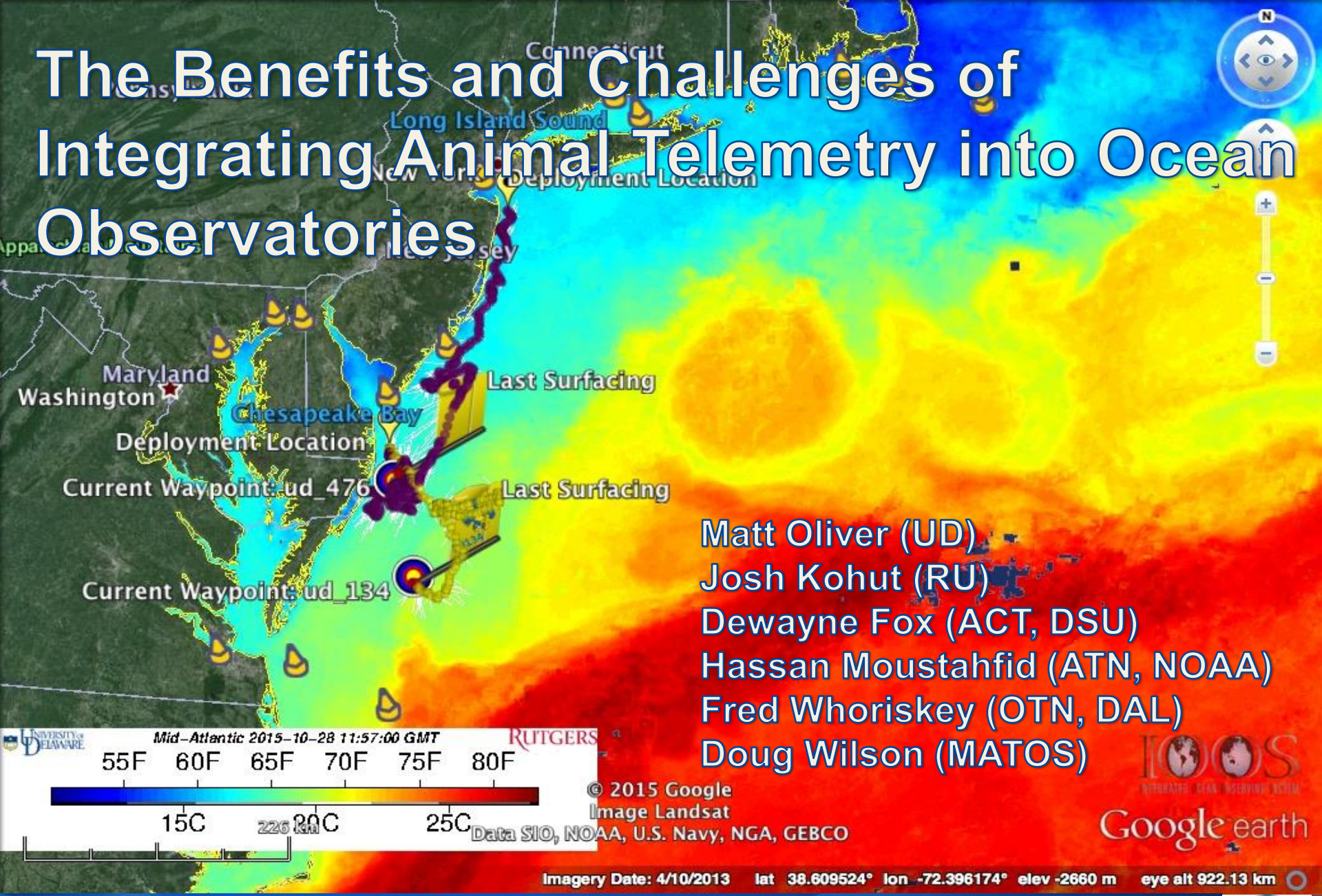
The Benefits and Challenges of Integrating Animal Telemetry into Ocean Observatories



Matt Oliver (UD)
Josh Kohut (RU)
Dewayne Fox (ACT, DSU)
Hassan Moustahfid (ATN, NOAA)
Fred Whoriskey (OTN, DAL)
Doug Wilson (MATOS)

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Ocean Information for a Changing World

East Coast Observatories Circa 2000

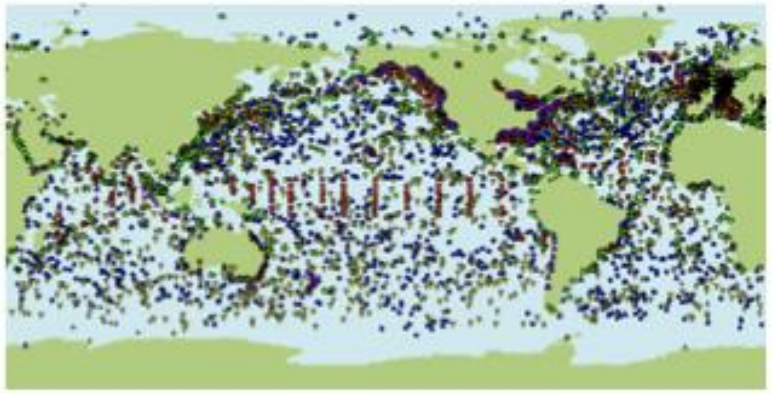
The Challenge -

Form this growing list into a linked federation of pre-operational observatories

U.S. Integrated Ocean Observing System

IOOS
INTEGRATED OCEAN OBSERVING SYSTEM

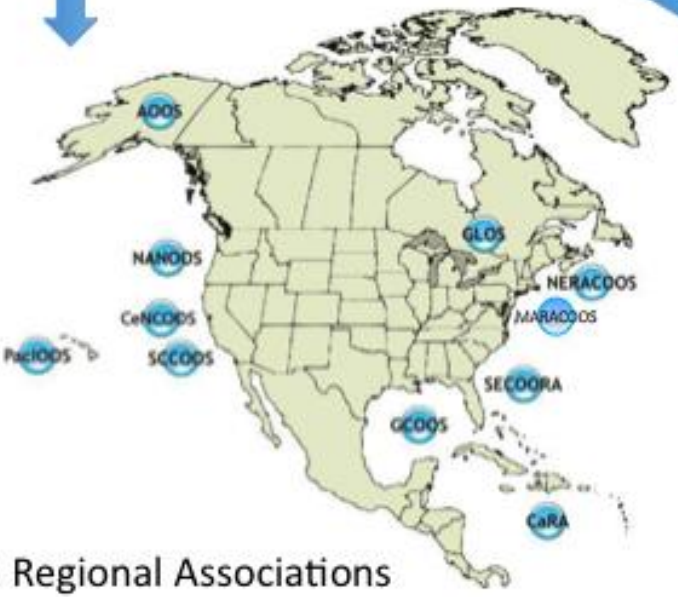
Global Component



Global Ocean Observing System

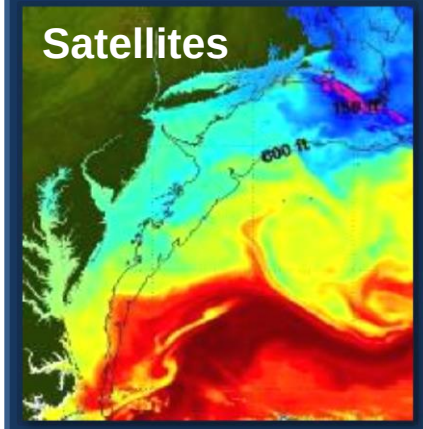
Regional Component

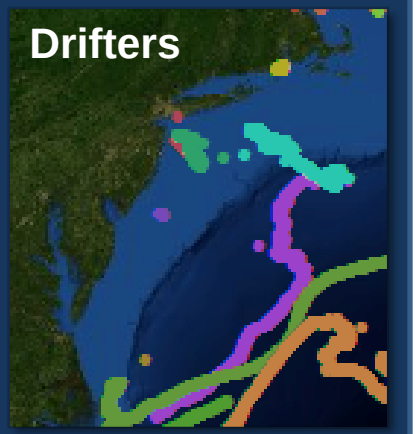
National Component



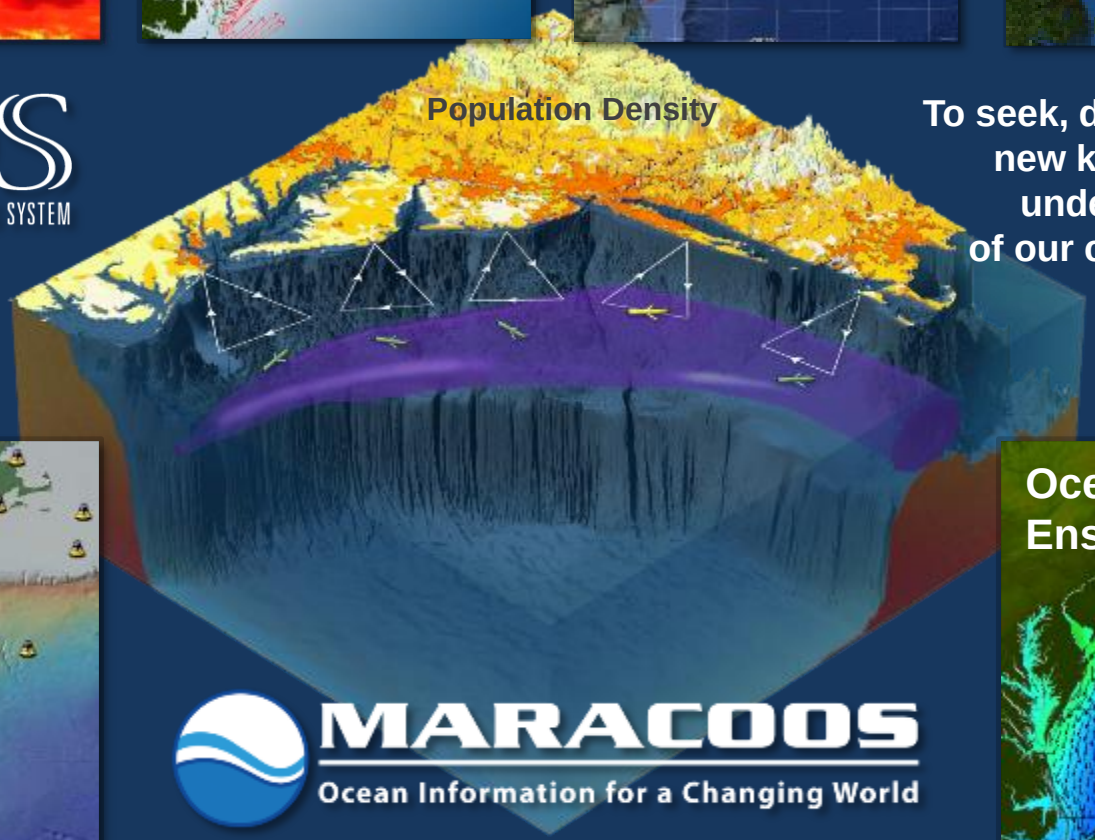
11 Regional Associations

17 U.S. Federal Agencies

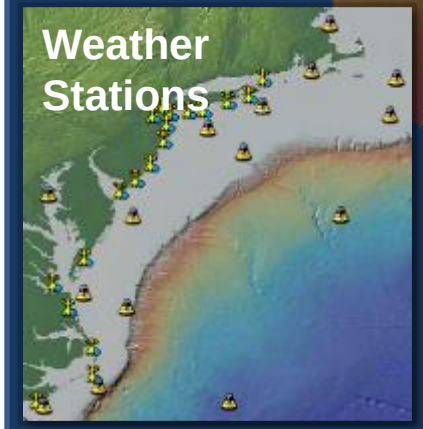


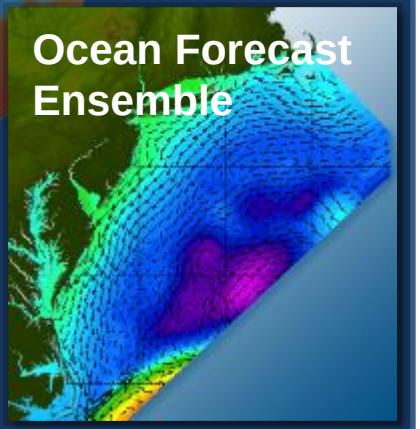


IOOS
INTEGRATED OCEAN OBSERVING SYSTEM



To seek, discover & apply new knowledge & understanding of our coastal ocean





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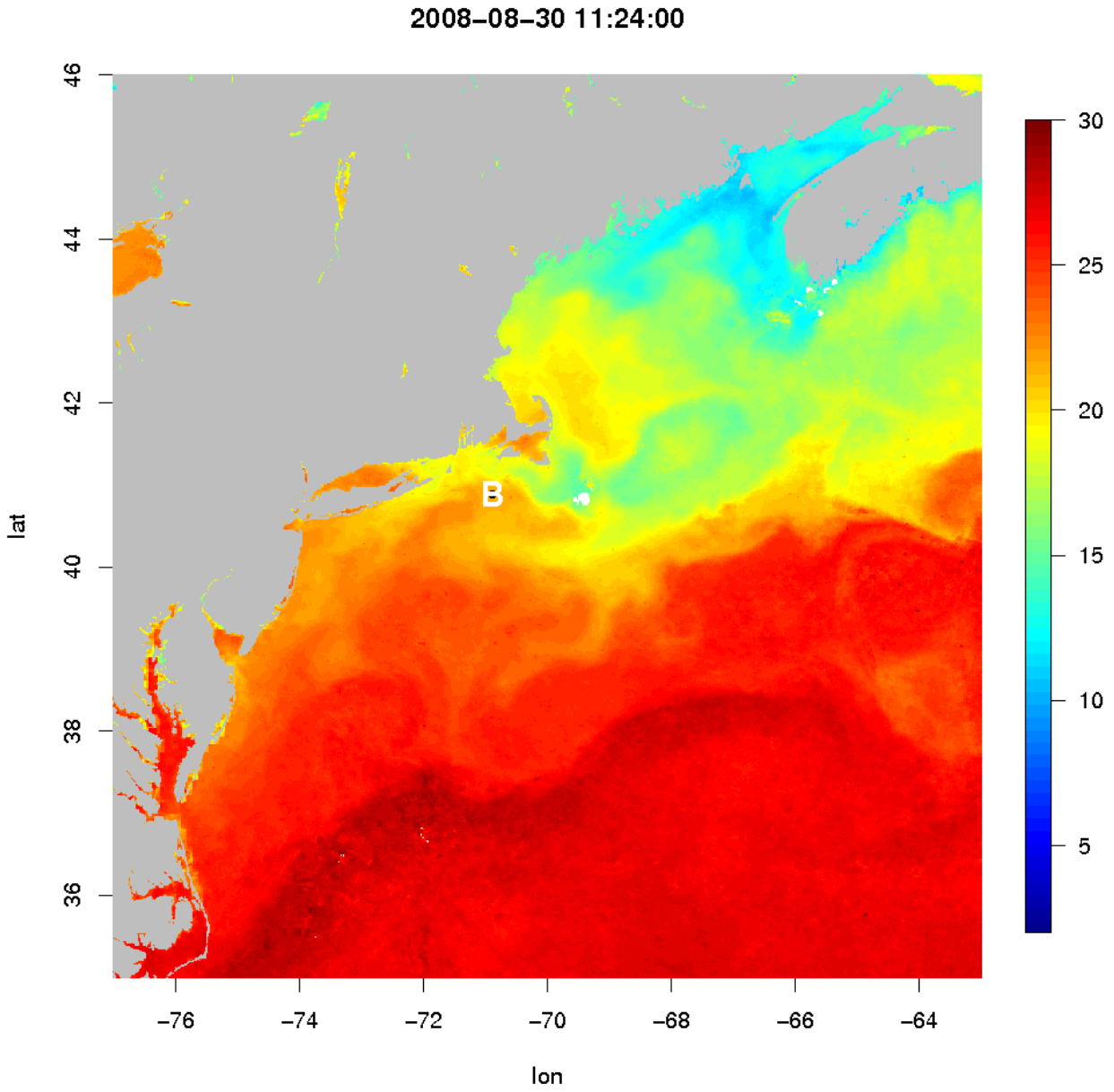
Personal Example (2009)

Was contacted by a shark researcher in the mid-Atlantic who asked if I could annotate the track of a Blue shark and a Mako shark.

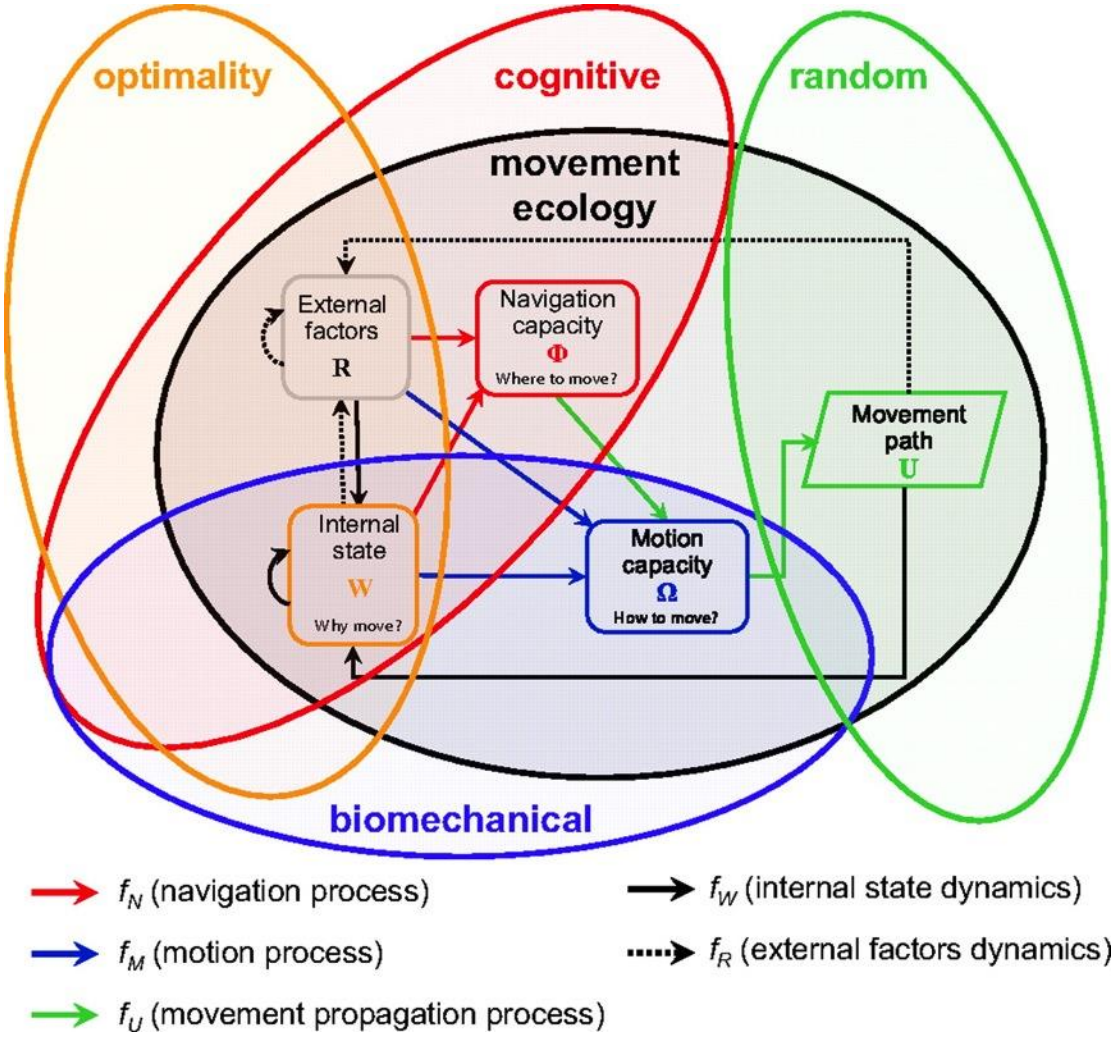
This was intriguing.



Analyzing long-lived individuals to try and understand migration and population dynamics

Usually bigger than a butterfish

Nathan R et al. PNAS 2008;105:19052-19059



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REVIEW

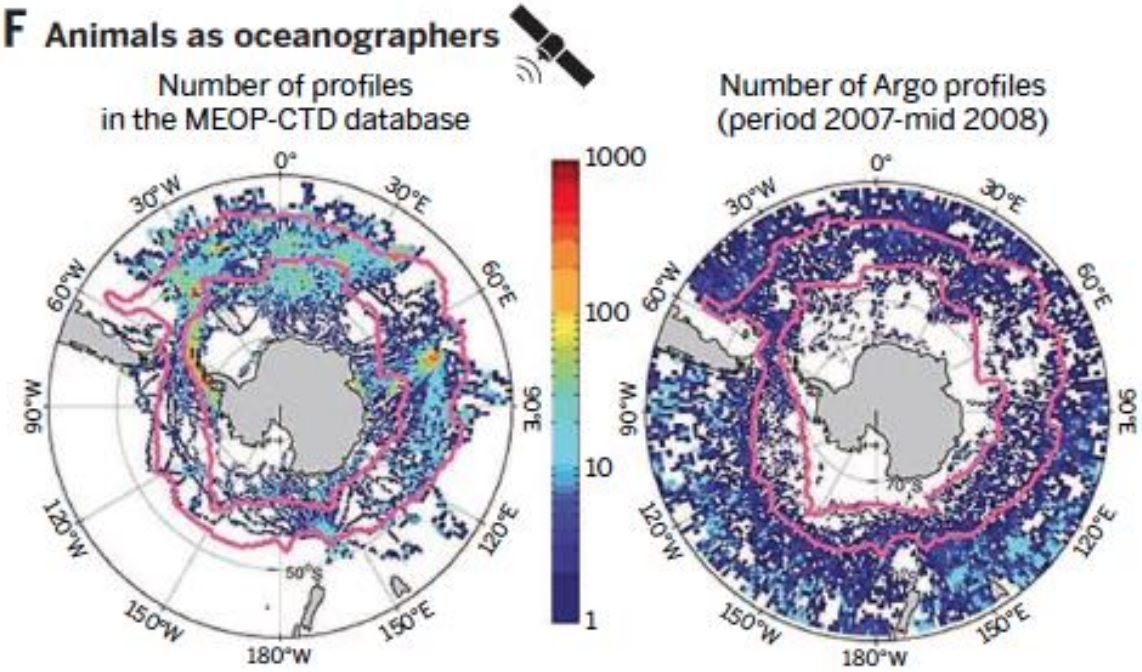
SCIENCE sciencemag.org

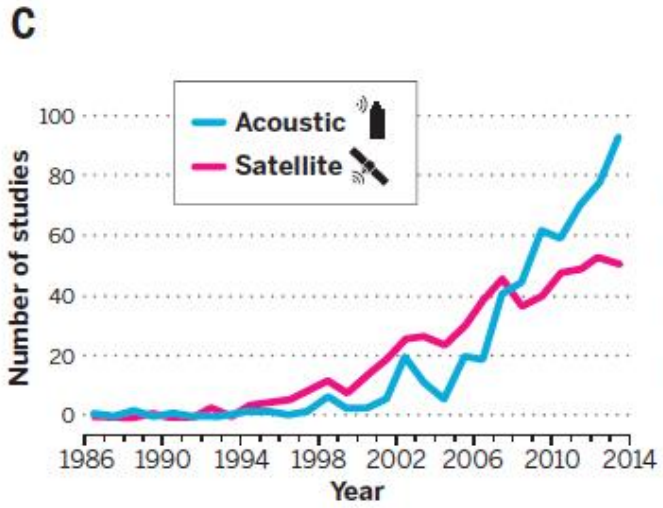
12 JUNE 2015 • VOL 348 ISSUE 6240

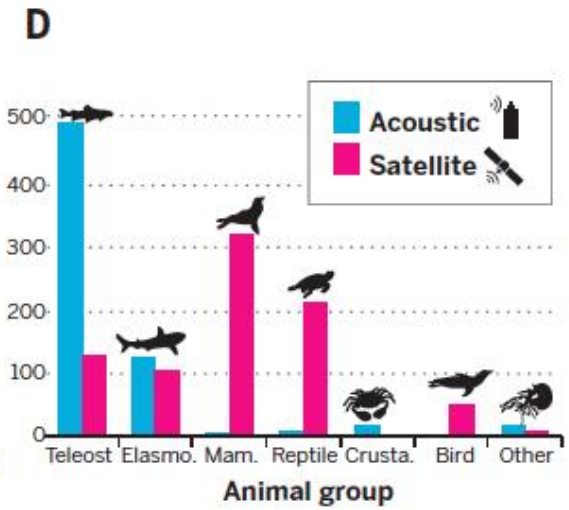
ECOLOGY

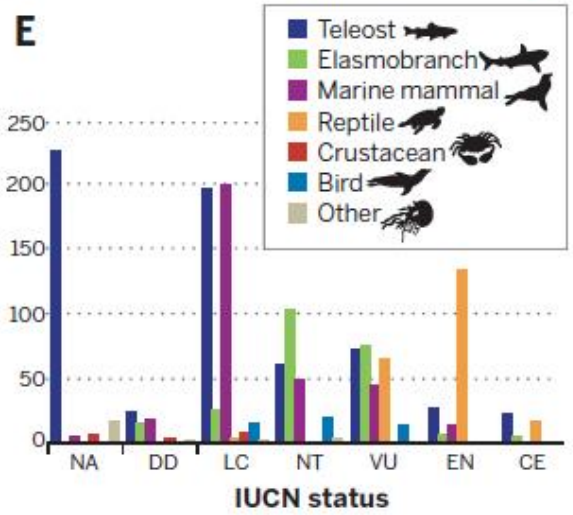
Aquatic animal telemetry A panoramic window into underwater world

Nigel E. Hussey,[1] Steven T. Kessel,[1] Kim Aarestrup,[2] Steven Aaron T. Fisk,[1] Robert G. Harcourt,[5] Kim N. Holland,[6] Sara J Joanna E. Mills Flemming,[9] Fred G. Whoriskey[7]

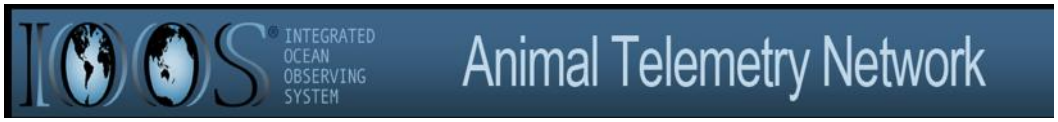








Major Telemetry Groups in the Mid-Atlantic

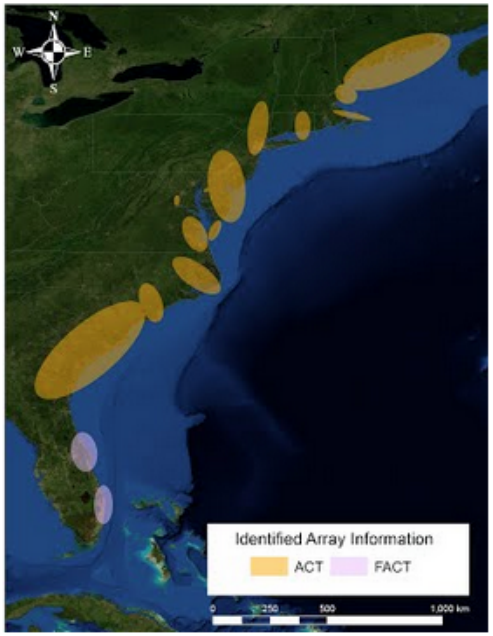


The Atlantic Cooperative Telemetry Network

Search this site

Home | Background and Development | Species Being Studied | Datasharing Format

Welcome to the ACT Network



The ACT Network is a grassroots effort to facilitate datasharing between researchers utilizing acoustic telemetry to gain a greater understanding of a wide variety of aquatic species.

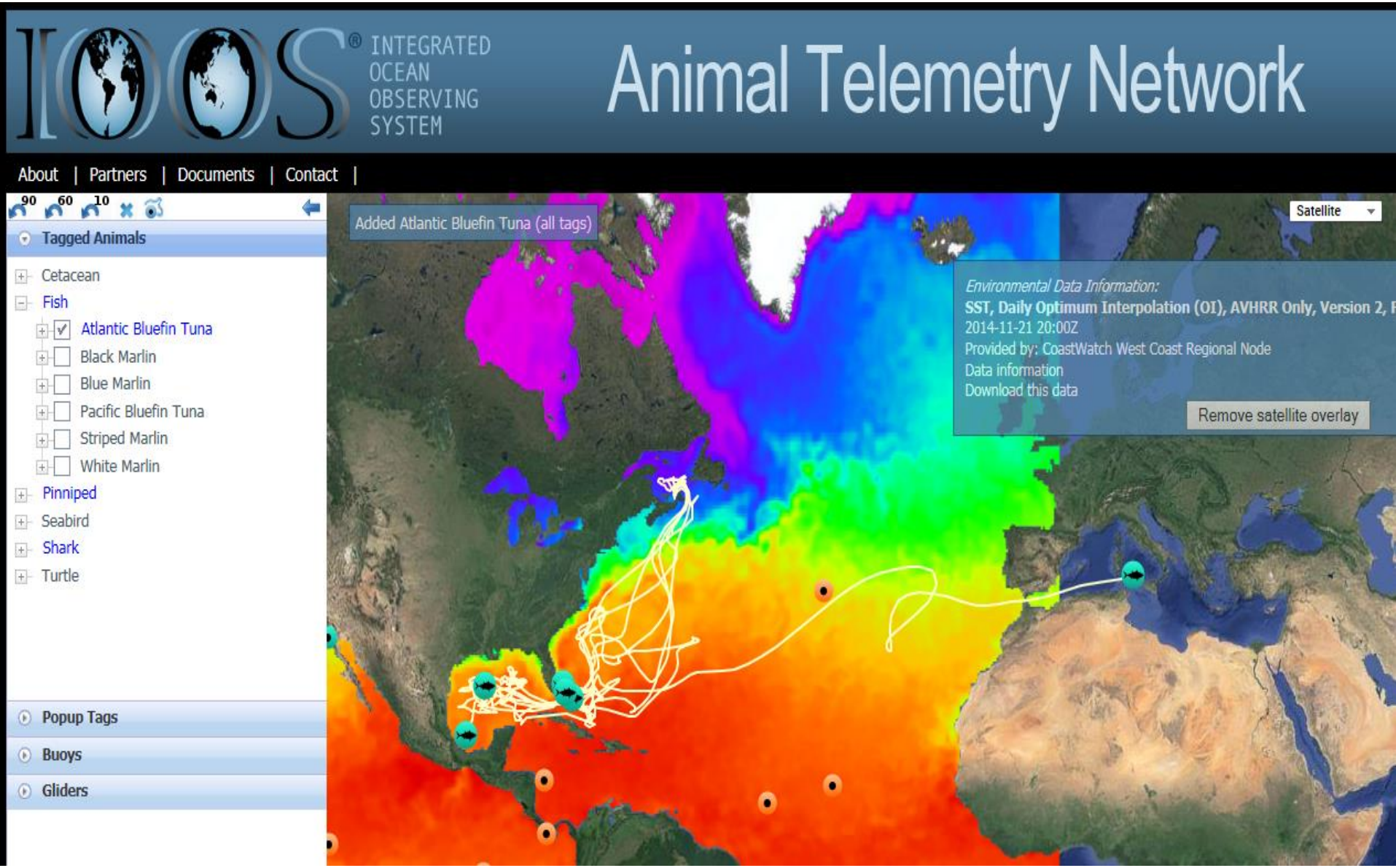
ACT began to take shape in 2006 during an Atlantic States Marine Fisheries Commission - Atlantic Sturgeon Technical Committee Meeting. As researchers began utilizing acoustic telemetry technology more extensively along the eastern coast of the United States, the potential benefits of collaborating in order to share telemetry data from existing arrays beyond those in their own system became apparent. What started with 15 researchers working on Atlantic and Shortnose Sturgeon that year has expanded to over 100 from Maine to Florida working with over 80 different species. We are also collaborating with researchers from the Canadian Maritimes as well as individuals of the Florida Acoustic Cooperative Telemetry (FACT) group. To date, there are over 11,000 known transmitters deployed since 2004, with more being deployed annually.

Researchers maintain their own arrays, so transmitters deployed and array sizes are dependent on seasonal conditions, research needs, and available funding. It is up to the individual researchers to provide information regarding transmitters and arrays. Researches can maintain a level of involvement in the network that is appropriate for their needs and abilities; from just sharing general tag code information to collaborating with other researcher and leveraging other arrays to gain additional funding.

We hope to make exchanging information about "unknown" transmitter codes simpler and more straightforward, further strengthen collaboration. One of the main challenges ACT faces as we continue to expand is developing and maintaining standards in data collecting and sharing, so as we grow, we will be able to incorporate our telemetry data with other physical/environmental

The Ocean Tracking Network: A contribution to global biological ocean observation

To create a global partnership to construct and sustain a scientific platform and the associated trained personnel to collect, store, share, analyze, and use aquatic tracking and environmental data to support sustainable management of valued aquatic species.



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MATOS

Mid-Atlantic Acoustic Telemetry Observation System

Login | Request MATOS Account | Help

EXPLORE
Explore a map of MATOS projects

SEARCH
Search the MATOS database by keyword

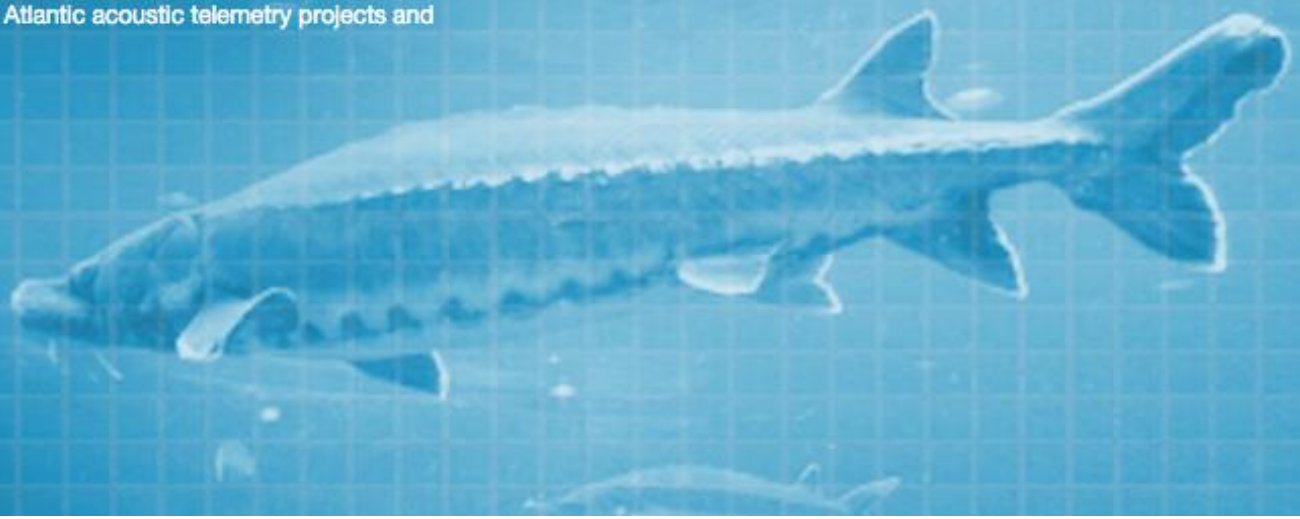
REWARD
Click here for instructions to claim a reward

MATOS Web compiles acoustic telemetry project information and helps users learn more about ongoing acoustic telemetry projects in the Mid Atlantic. Scientists have been implanting Mid Atlantic fish with transmitters and, like the GPS on a car, have been tracking fish movement through a network of receivers placed on the bottom of the lakes. The purpose of MATOS is to help scientists and the public learn more about Mid Atlantic acoustic telemetry projects and their contribution to research.

What is Acoustic Telemetry?

About MATOS

Have Data?



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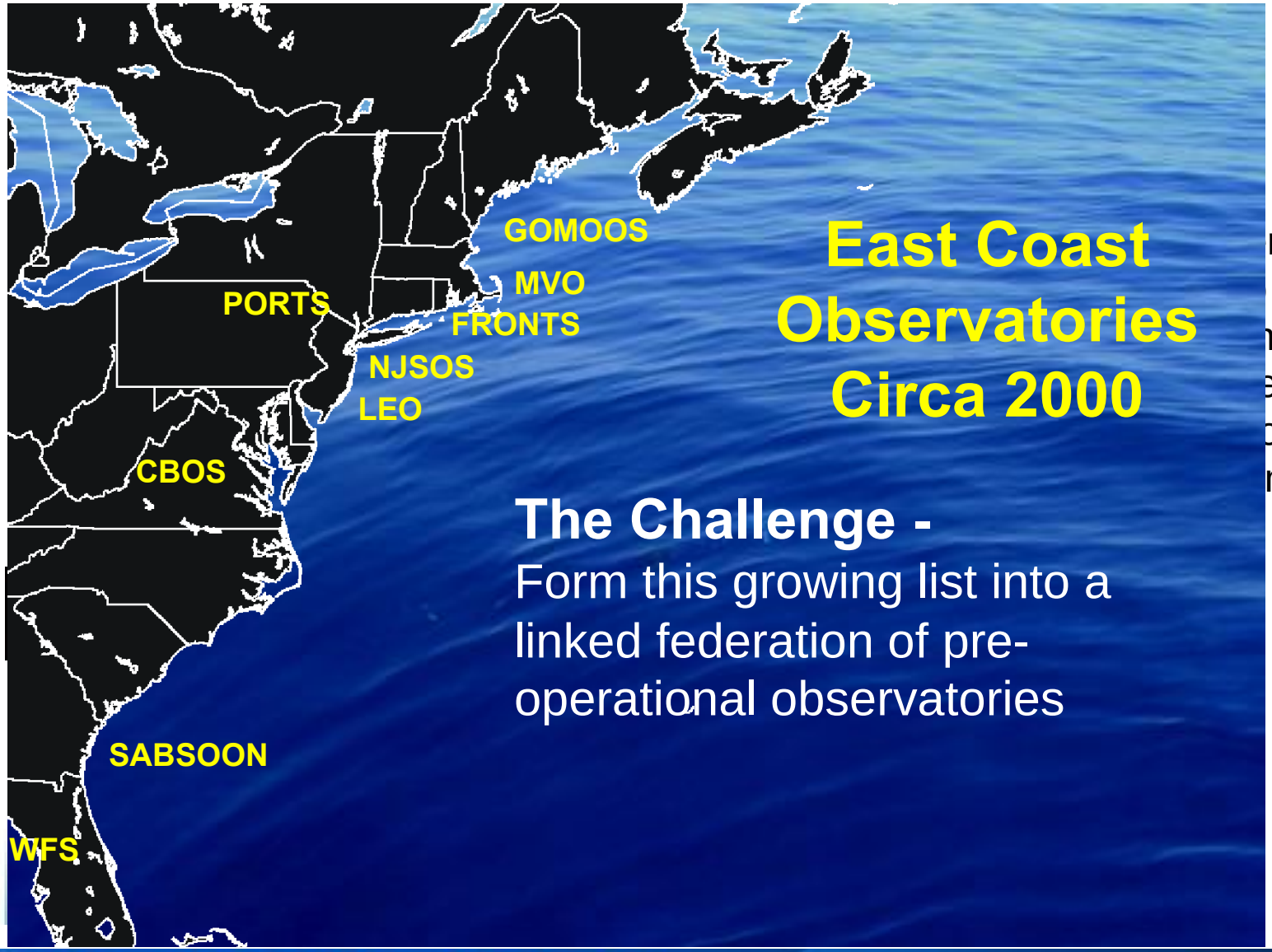
Major Telemetry Groups in the Mid-Atlantic



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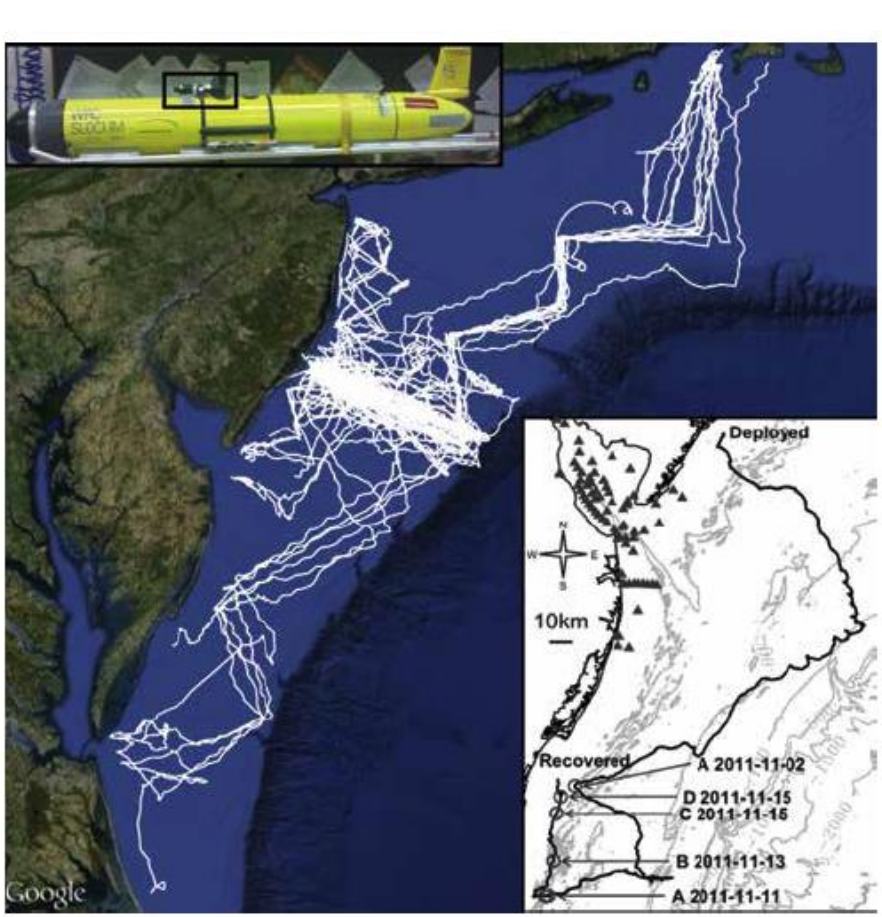
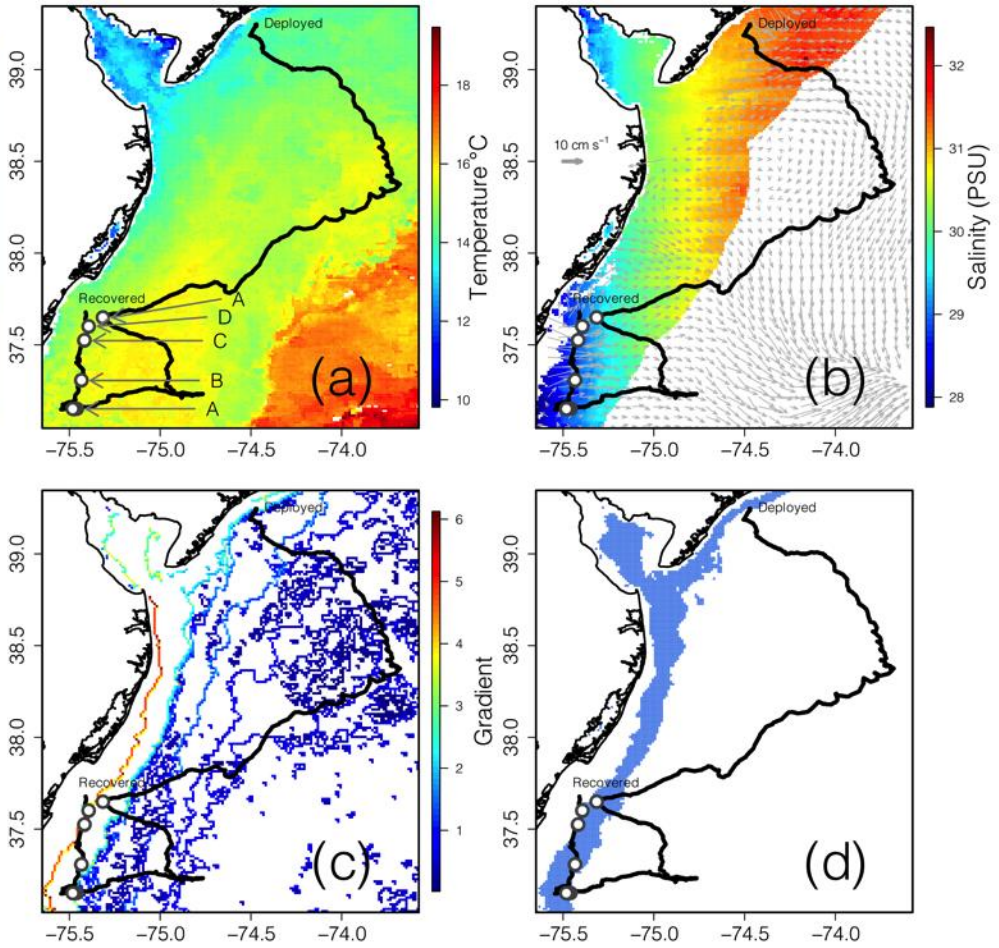
Shrinking the Haystack: Using an AUV in an Integrated Ocean Observatory to Map Atlantic Sturgeon in the Coastal Ocean

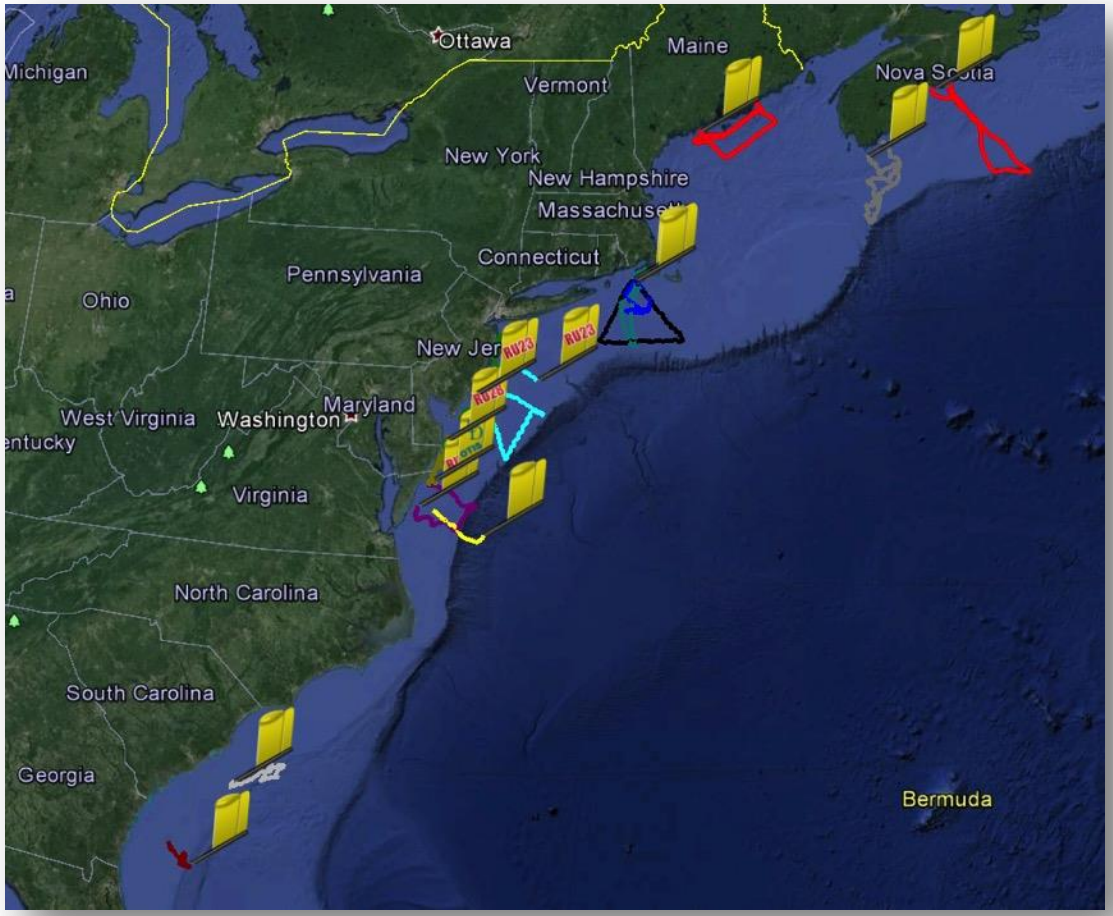
Fisheries • Vol 38 No 5 • May 2013 • www.fisheries.org

Telemetry data made avail through ACT

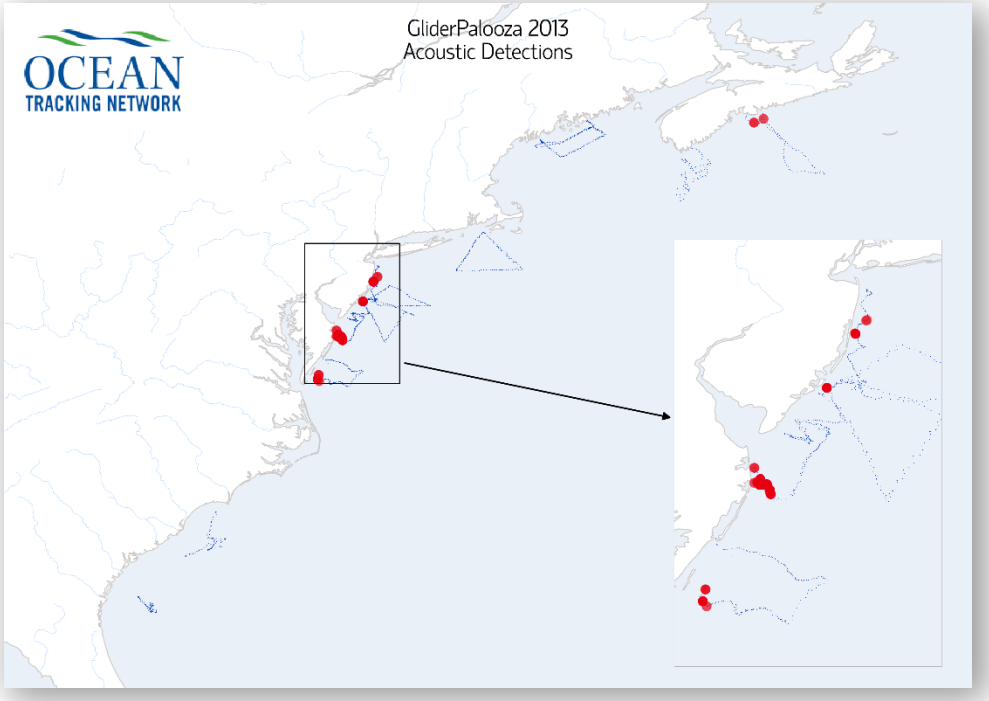




Gliderpalooza 2013



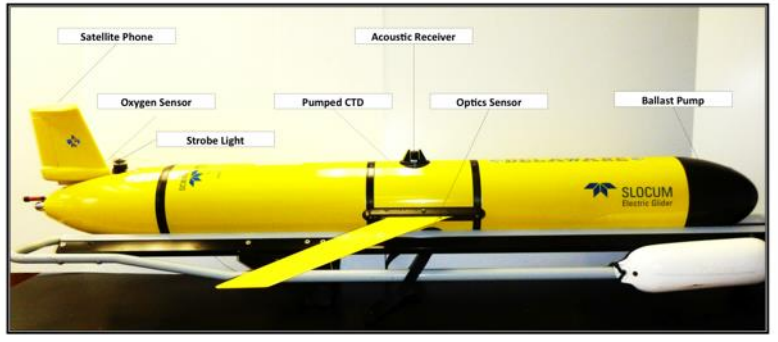
- Vemco VMT receivers deployed on 9 of 16 gliders
- Key Species: Right Whales, tiger sharks, Atlantic sturgeon, Atlantic Salmon
- Data organized by OTN

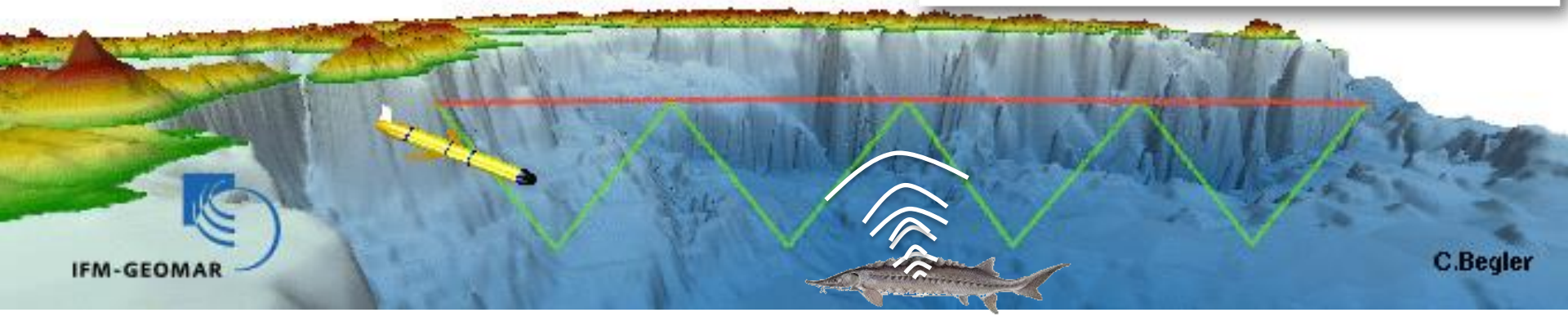


- Vemco receivers detected 16 animals
- Species: Blue Shark and Atlantic Sturgeon.

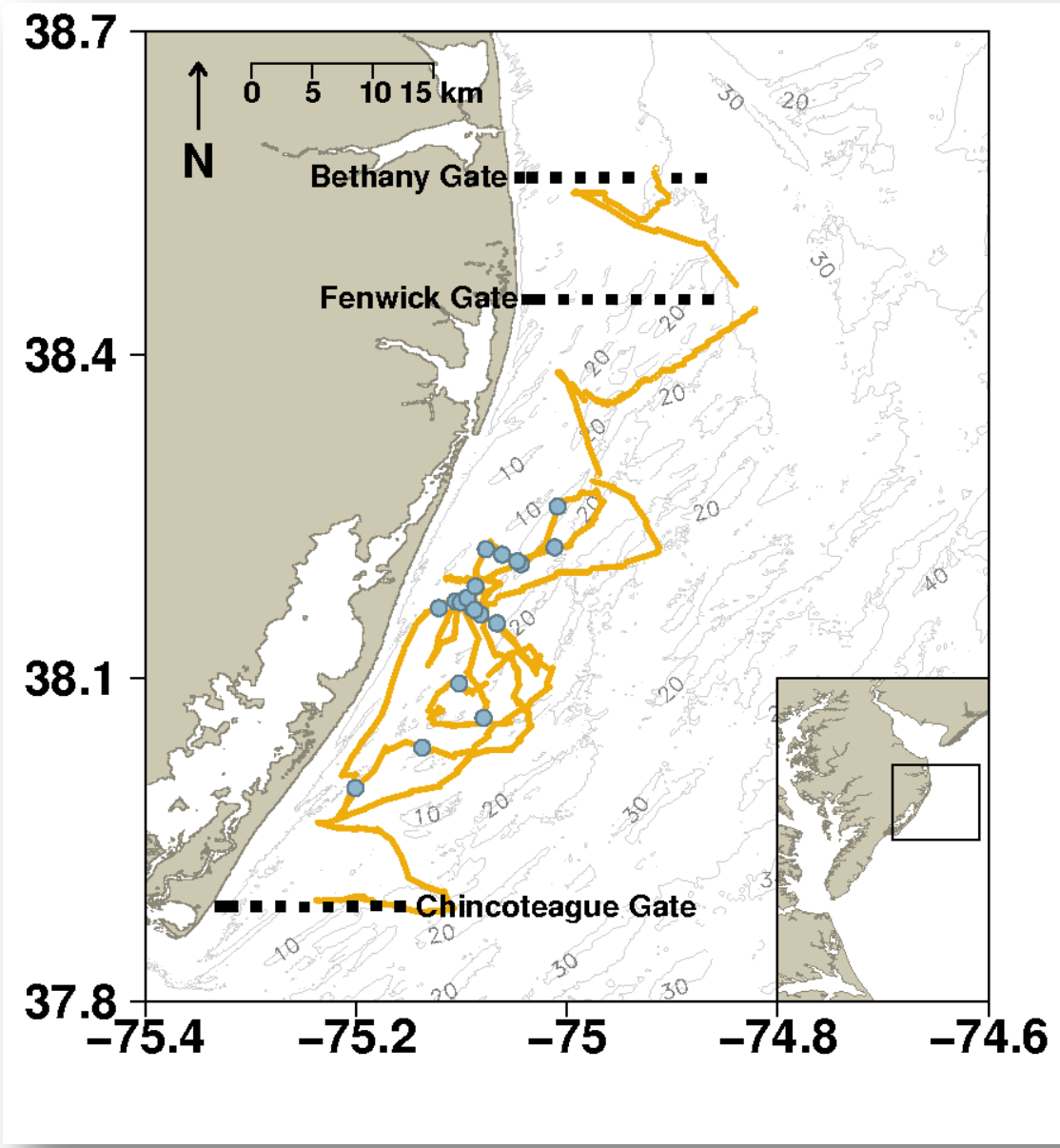
Group	Glider Name	Species	#
Dalhousie	OTN200	No detections	0
	OTN201	Blue shark	2
U Maine	Penobscot	Not reported yet	0
U Mass	Blue	No detections	0
Rutgers	RU28	Atlantic sturgeon	10
	RU22	Atlantic sturgeon	3
	RU23	Atlantic sturgeon	1
U Delaware	Otis	Glider lost at sea	--
NC State	Salacia	No detections	0
U Georgia	Modena	No detections	0

Glider Acoustic Telemetry

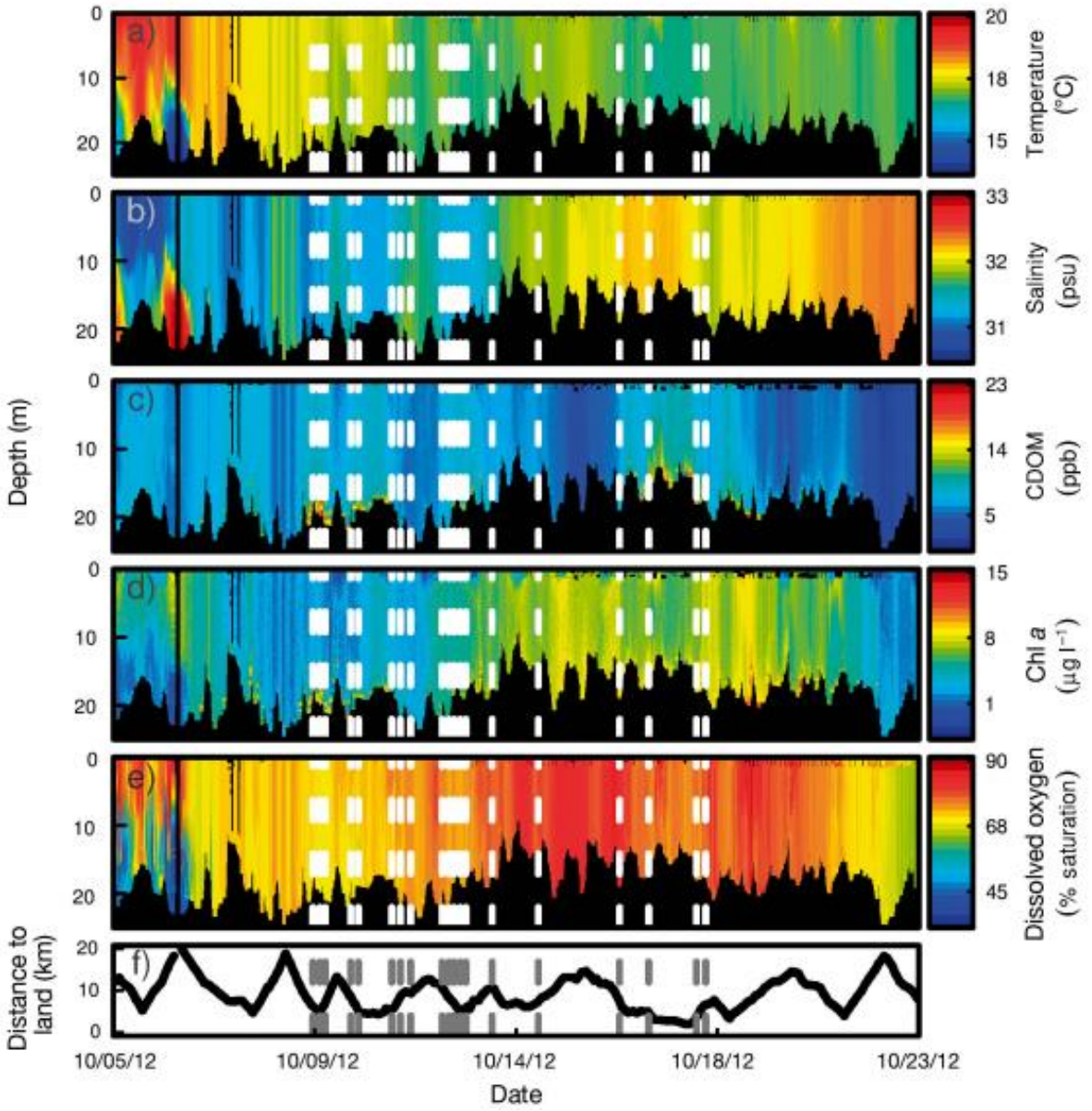




- Mission
  - October 5th – 23rd 2012
  - 337km traveled
  - Detected 23 different Sand Tiger sharks
  - Glider just as efficient as a single receiver
  - Working on uploading full glider and telemetry data to OTN



- What is the appropriate scale for matching environmental data?

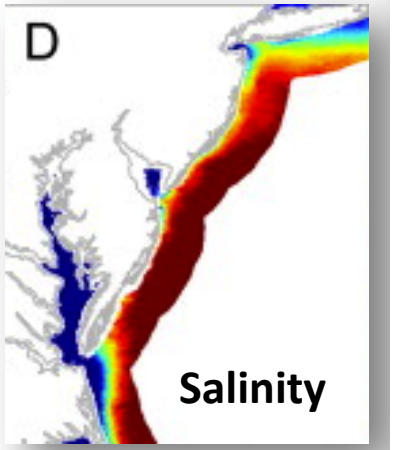


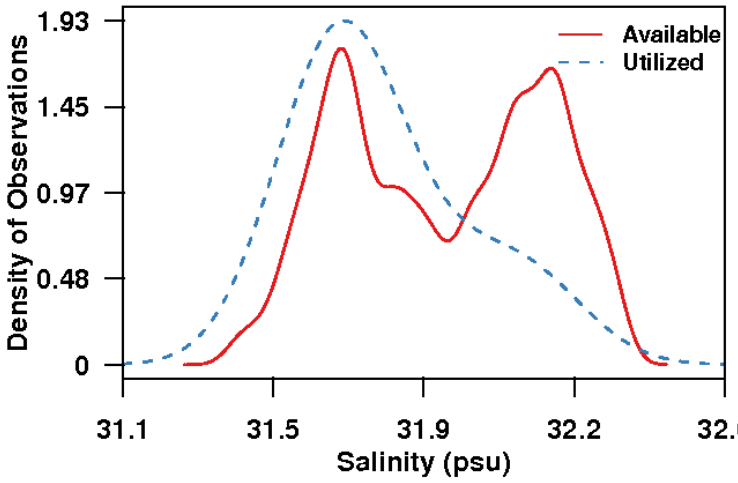
Vol. 528: 277–288, 2015 | MARINE ECOLOGY PROGRESS SERIES Mar Ecol Prog Ser | Published May 28
doi: 10.3354/meps11259

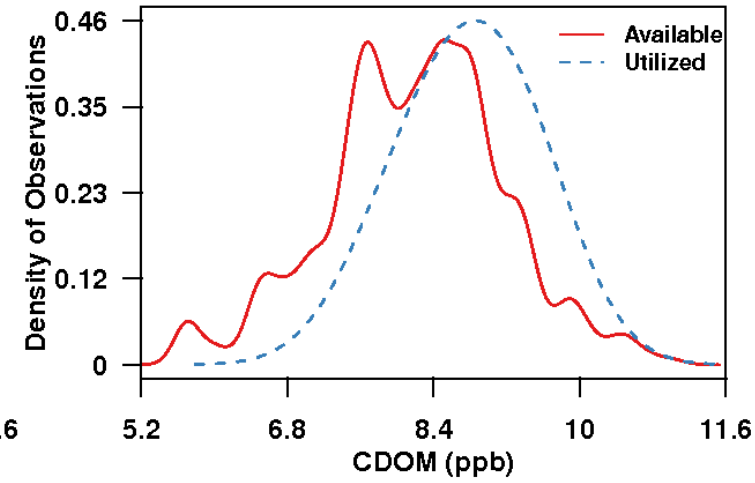
OPEN ACCESS

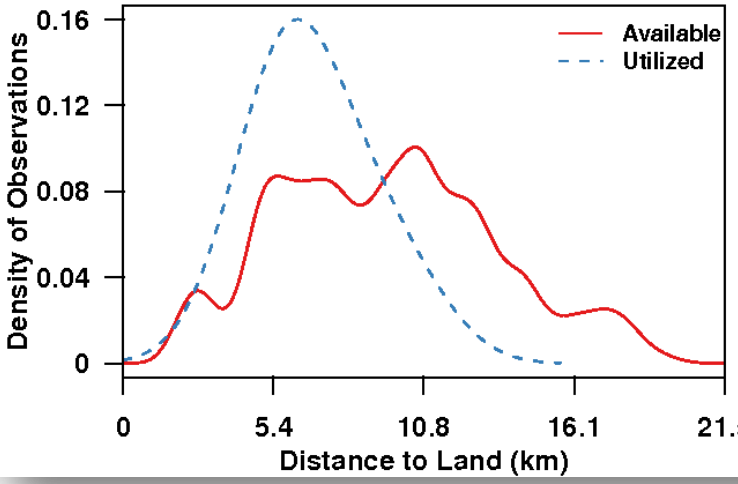
Habitat selection of a coastal shark species estimated from an autonomous underwater vehicle

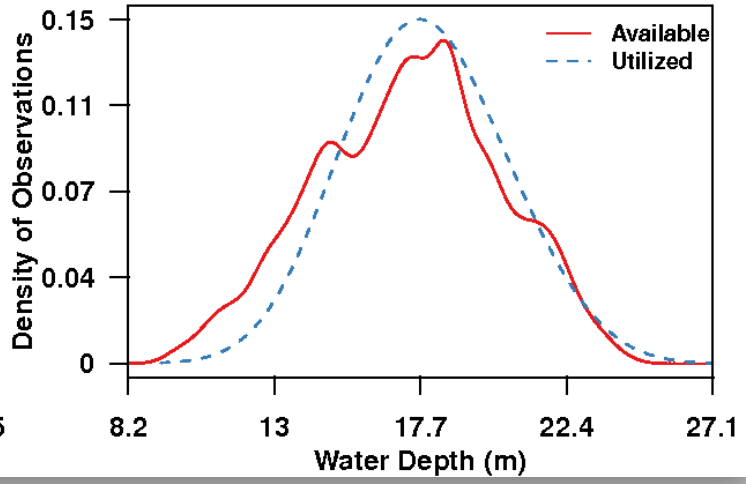
D. E. Haulsee[1,*], M. W. Breece[1], D. C. Miller[1], B. M. Wetherbee[2], D. A. Fox[3], M. J. Oliver[1]





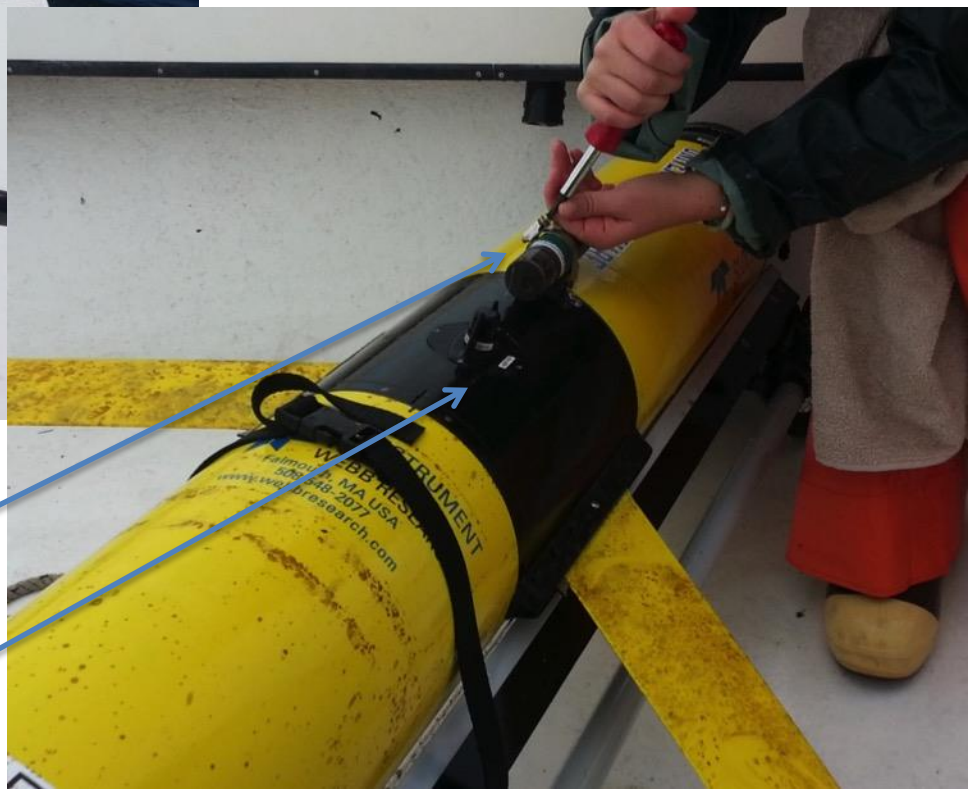






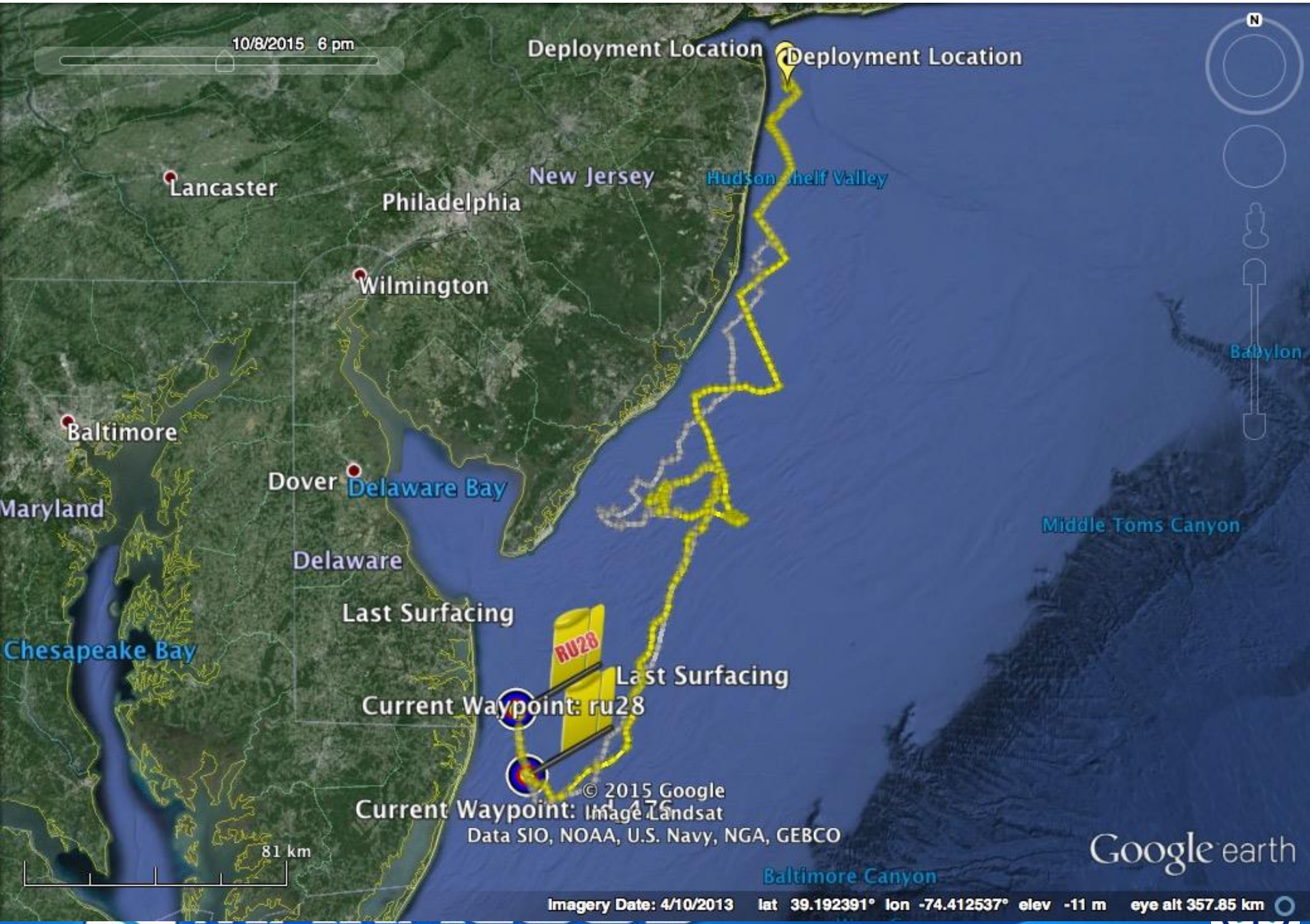
Leveraging observatory assets help estimate detectability questions

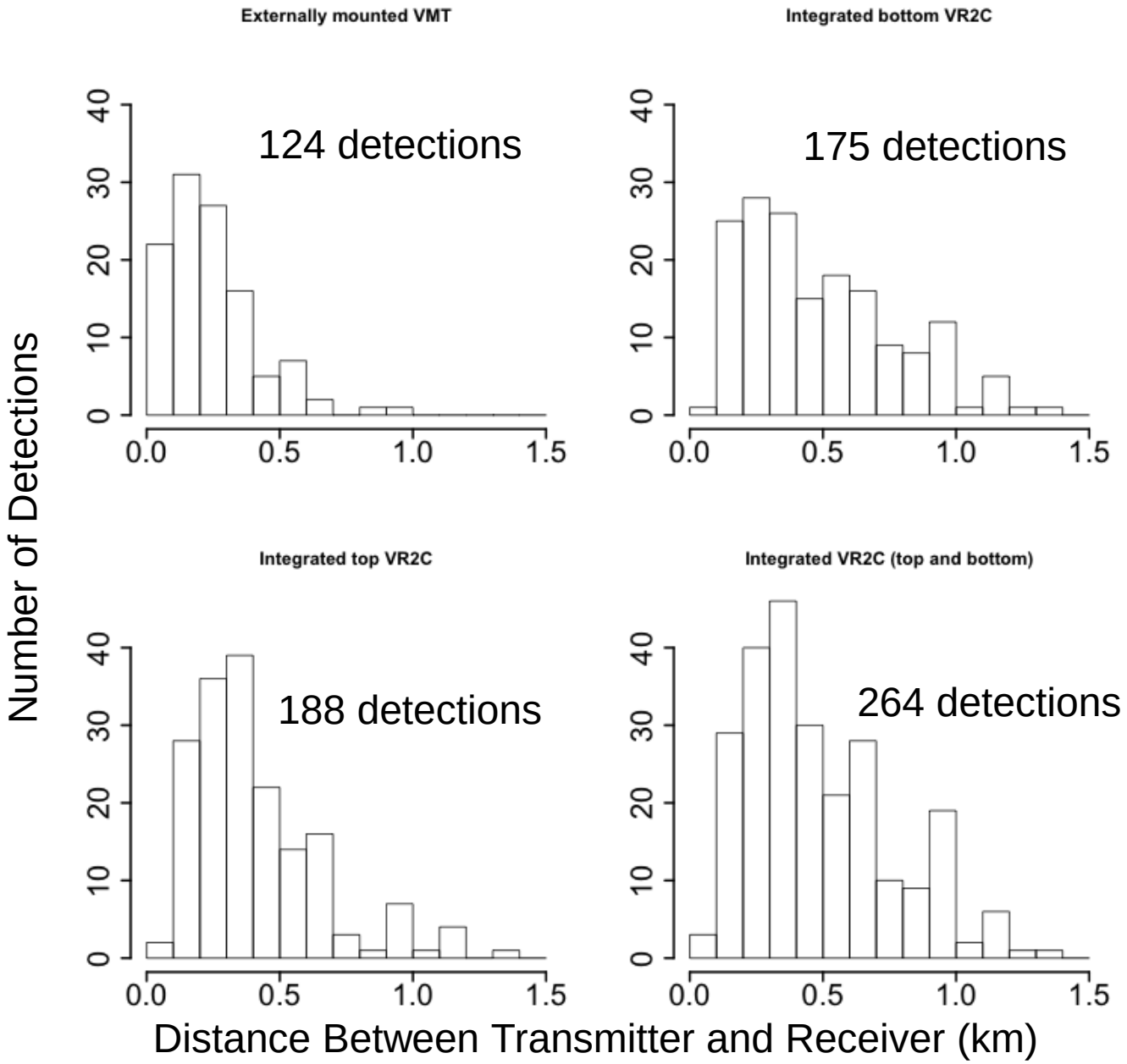
VMT

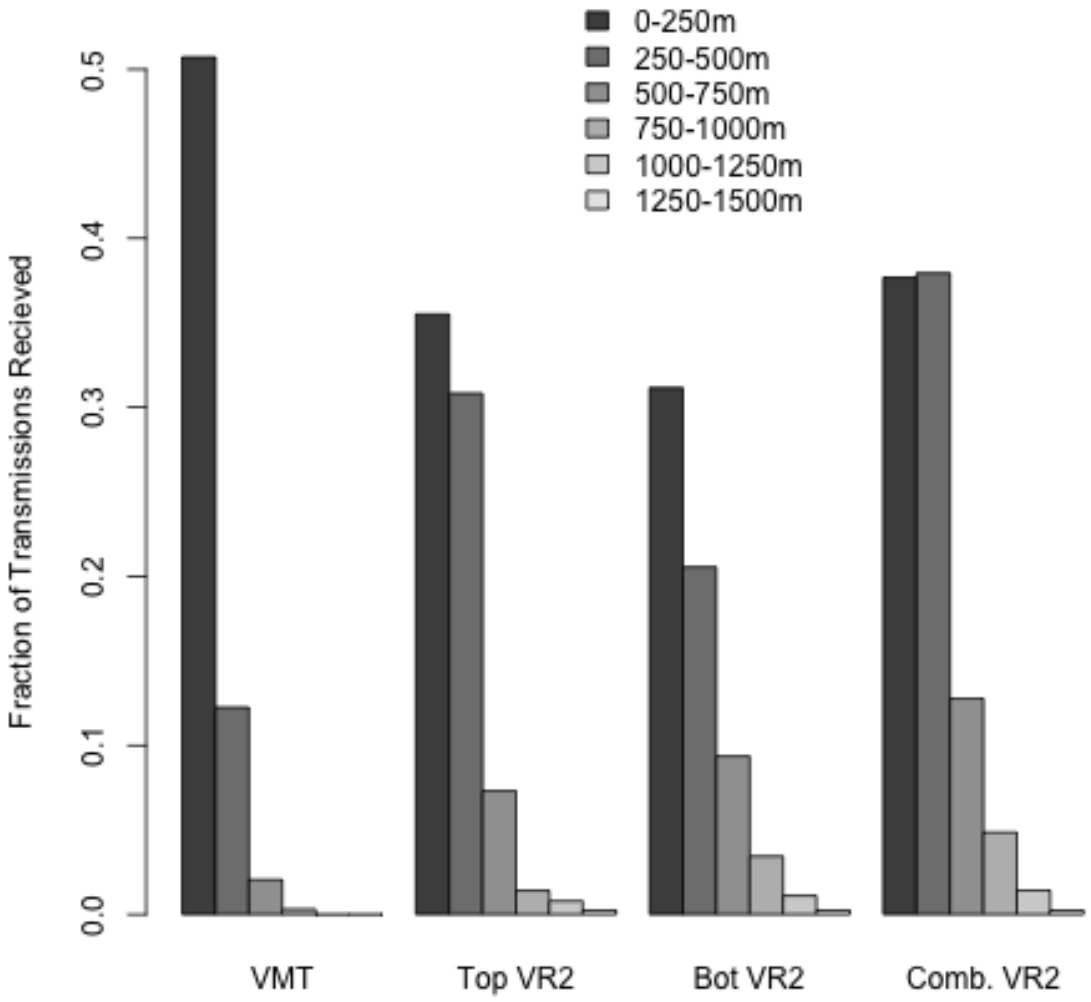


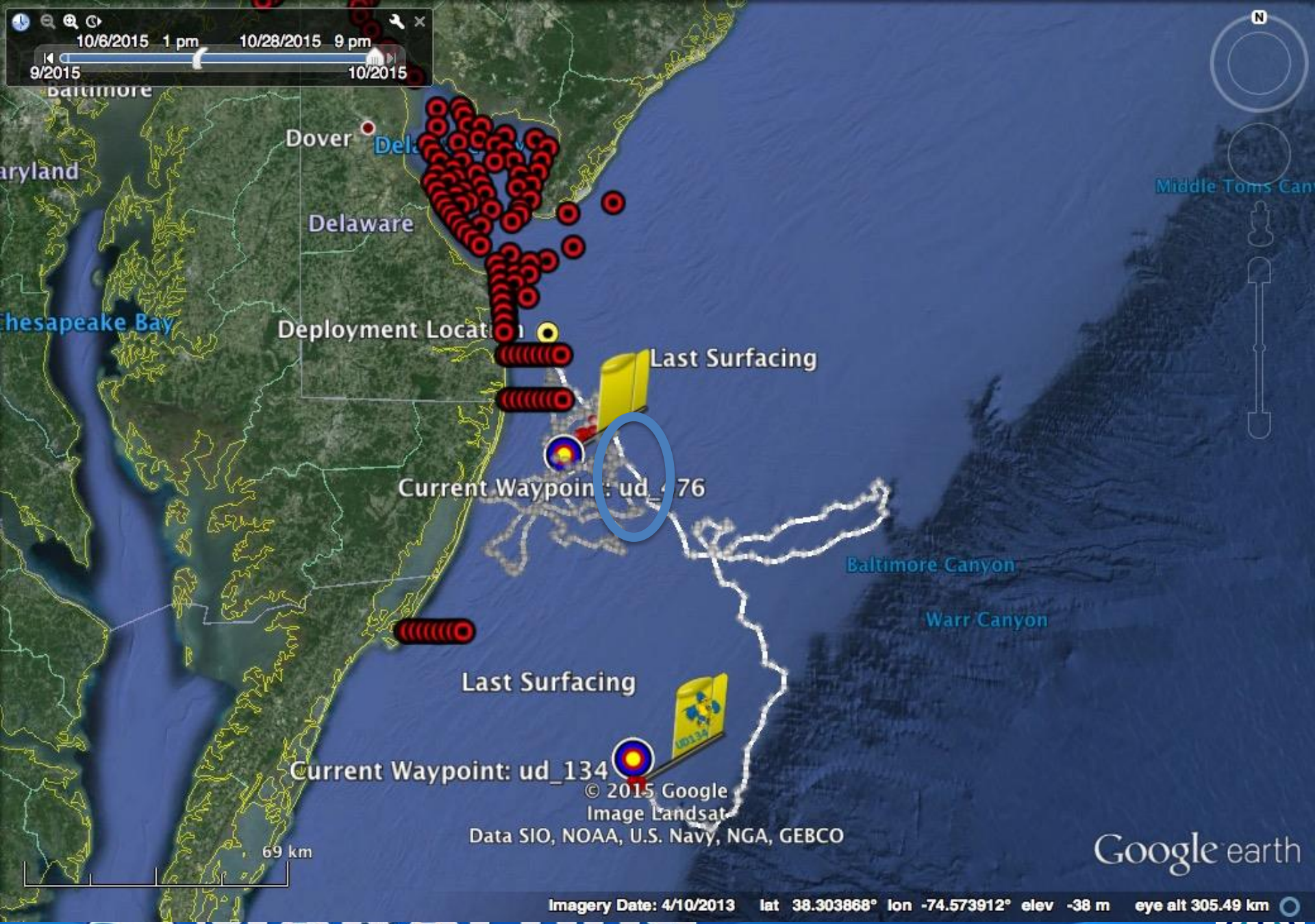
VMT

Integrated VR2


10/8/2015 6 pm
Deployment Location
Deployment Location
Lancaster
Philadelphia
New Jersey
Hudson Shelf Valley
Wilmington
Baltimore
Dover
Delaware Bay
Maryland
Delaware
Last Surfacing
Chesapeake Bay
RU28
Last Surfacing
Current Waypoint: ru28
Current Waypoint:
© 2015 Google
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
81 km
Middle Toms Canyon
Baltimore Canyon
Babylon
Google earth
Imagery Date: 4/10/2013 lat 39.192391° lon -74.412537° elev -11 m eye alt 357.85 km


Externally mounted VMT
124 detections
Integrated bottom VR2C
175 detections
Integrated top VR2C
188 detections
Integrated VR2C (top and bottom)
264 detections
Number of Detections
Distance Between Transmitter and Receiver (km)
0
10
20
30
40
0.0
0.5
1.0
1.5


0-250m
250-500m
500-750m
750-1000m
1000-1250m
1250-1500m
Fraction of Transmissions Recieved
0.0
0.1
0.2
0.3
0.4
0.5
VMT
Top VR2
Bot VR2
Comb. VR2


10/6/2015 1 pm
10/28/2015 9 pm
9/2015
10/2015
Dover
Delaware
Deployment Location
Last Surfacing
Current Waypoint: ud_176
Baltimore Canyon
Warr Canyon
Last Surfacing
Current Waypoint: ud_134
© 2015 Google
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
69 km
Google earth
Imagery Date: 4/10/2013 lat 38.303868° lon -74.573912° elev -38 m eye alt 305.49 km

Conclusions

Telemetry observation networks are rapidly developing

A lot of potential for collaboration with existing ocean observing networks that benefit fisheries and oceanography communities

Potential to significantly increase fisheries independent observations

Coupled species locations/environmental data

Platforms of opportunity lead to new discoveries

Adaptability of missions with integration observatory integration

Opportunity to act on real-time data with telemetry integrated into ocean observatories