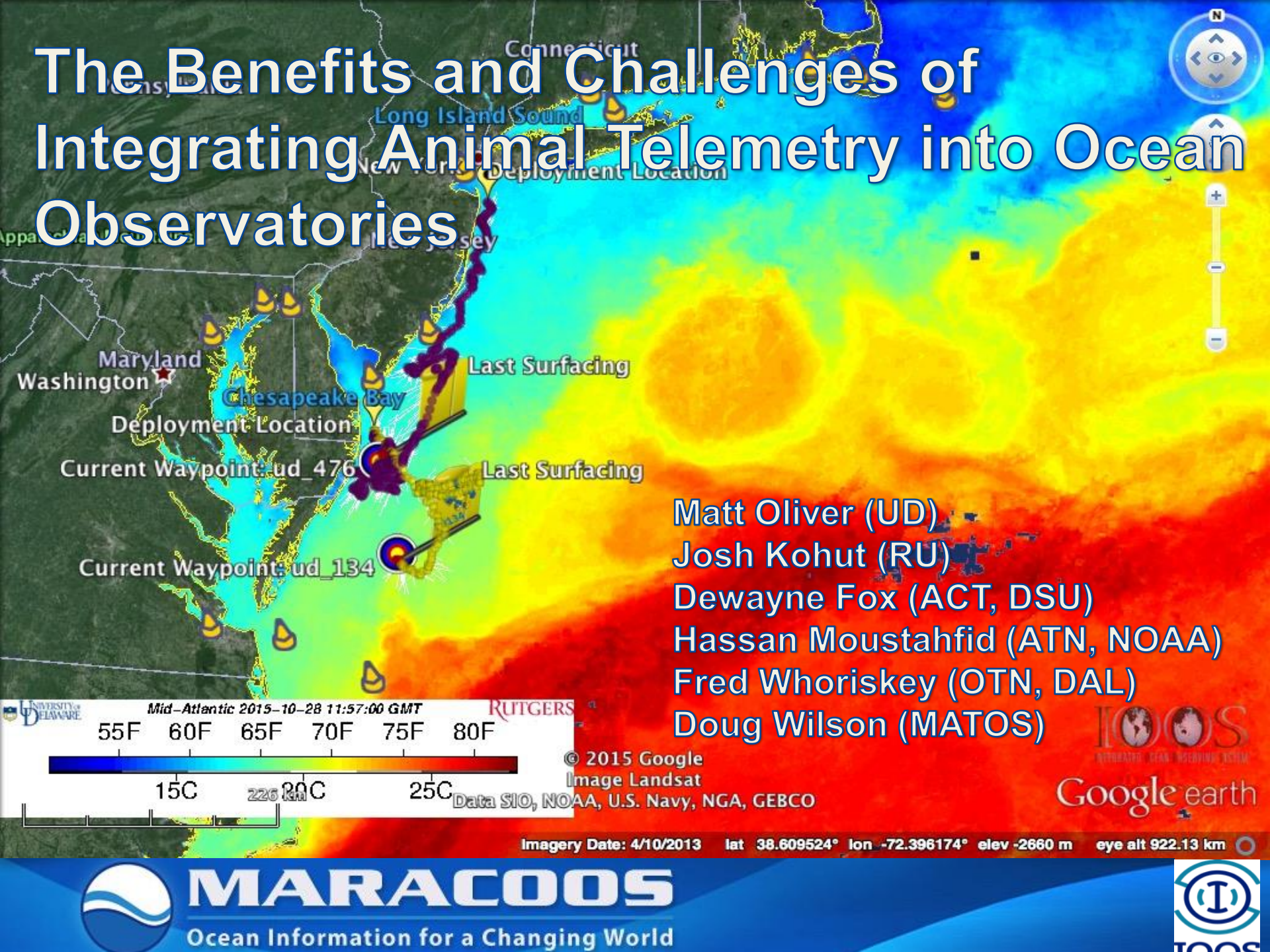
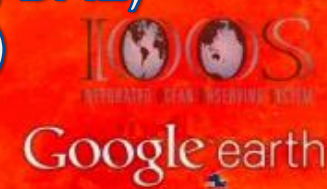
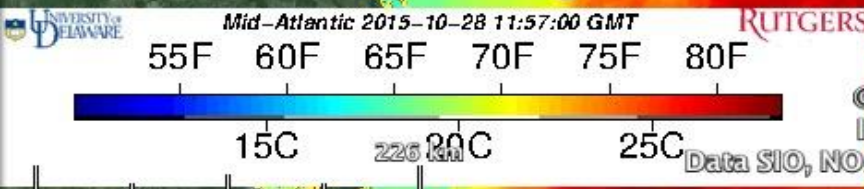


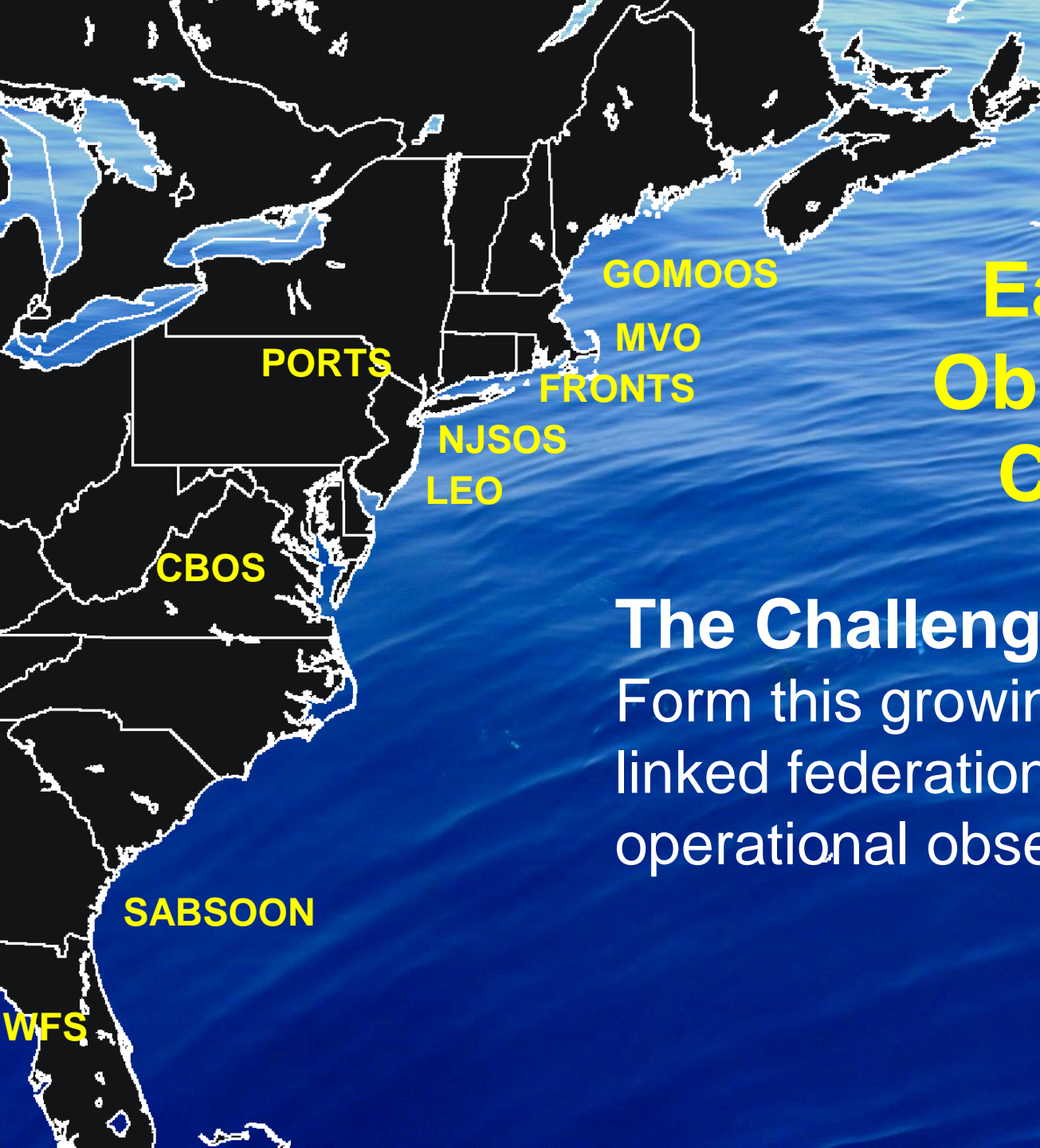
The Benefits and Challenges of Integrating Animal Telemetry into Ocean Observatories



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



Imagery Date: 4/10/2013 lat 38.609524° lon -72.396174° elev -2660 m eye alt 922.13 km



East Coast Observatories Circa 2000

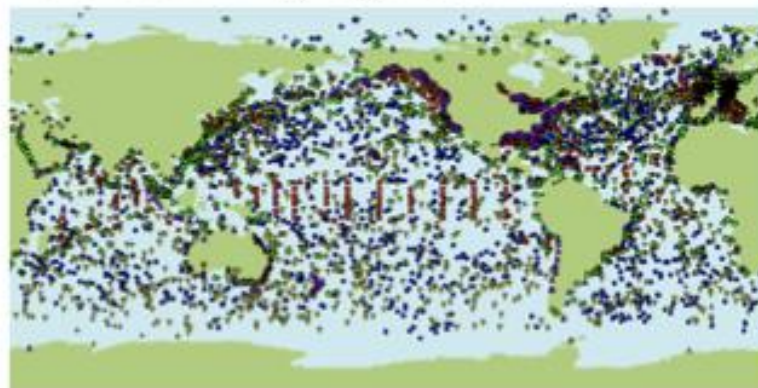
The Challenge -

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

U.S. Integrated Ocean Observing System



Global Component



Global Ocean Observing System

Regional Component



National Component



11 Regional Associations



17 U.S. Federal Agencies

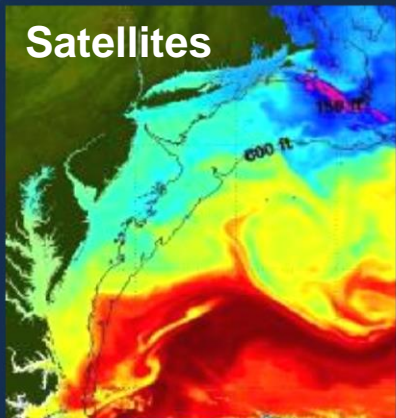


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Satellites



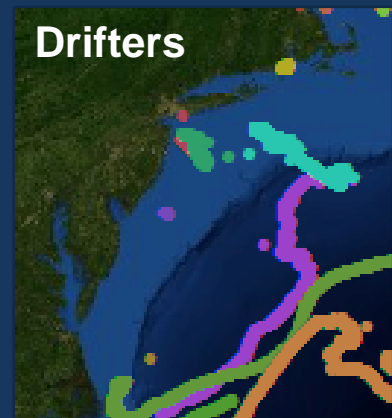
HF-Radar



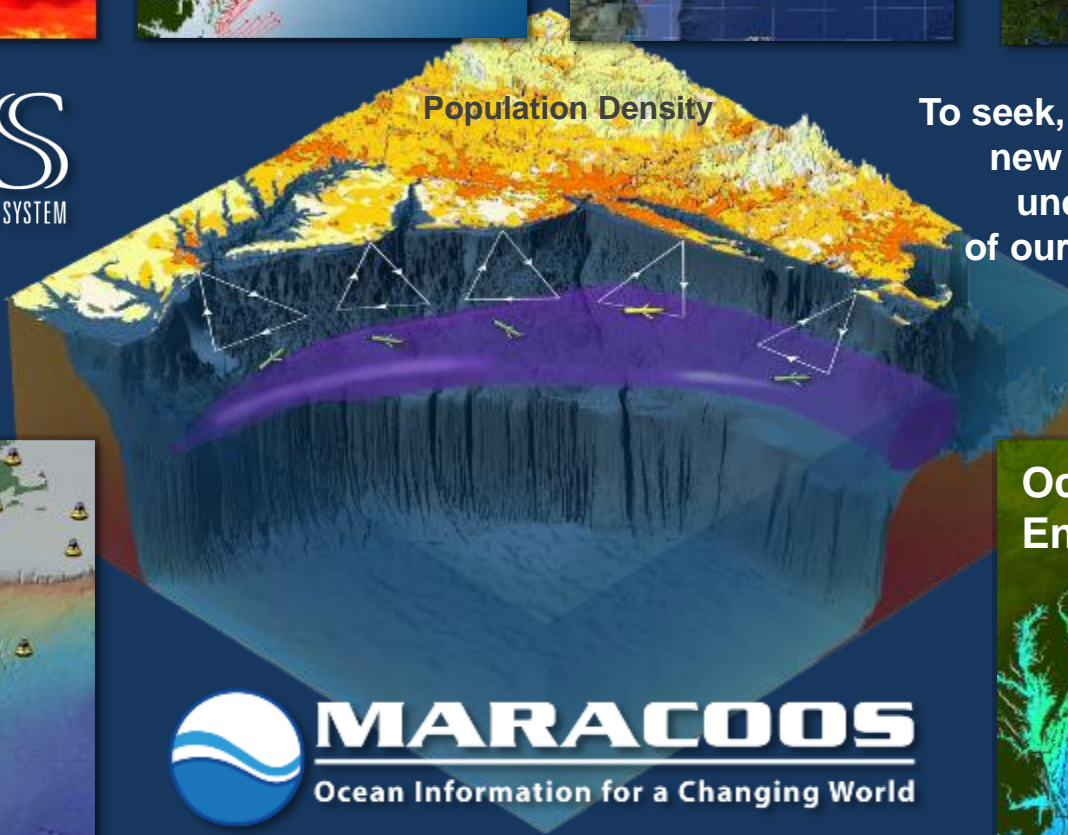
Gliders



Drifters

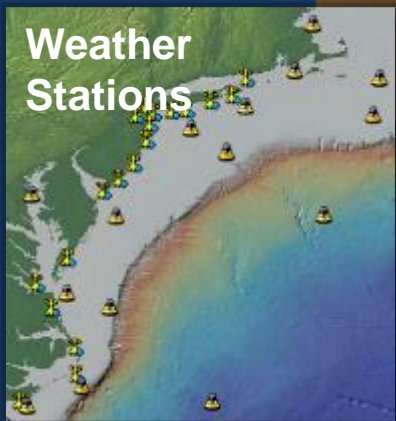


Population Density

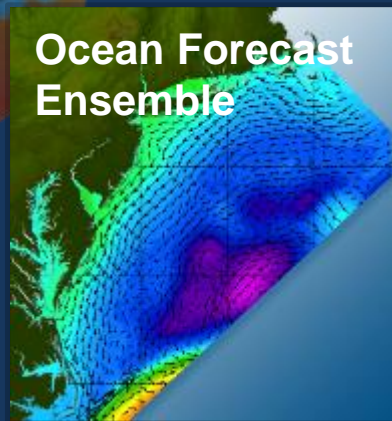


To seek, discover & apply
new knowledge &
understanding
of our coastal ocean

Weather Stations



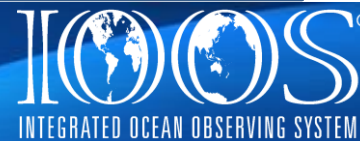
Ocean Forecast Ensemble



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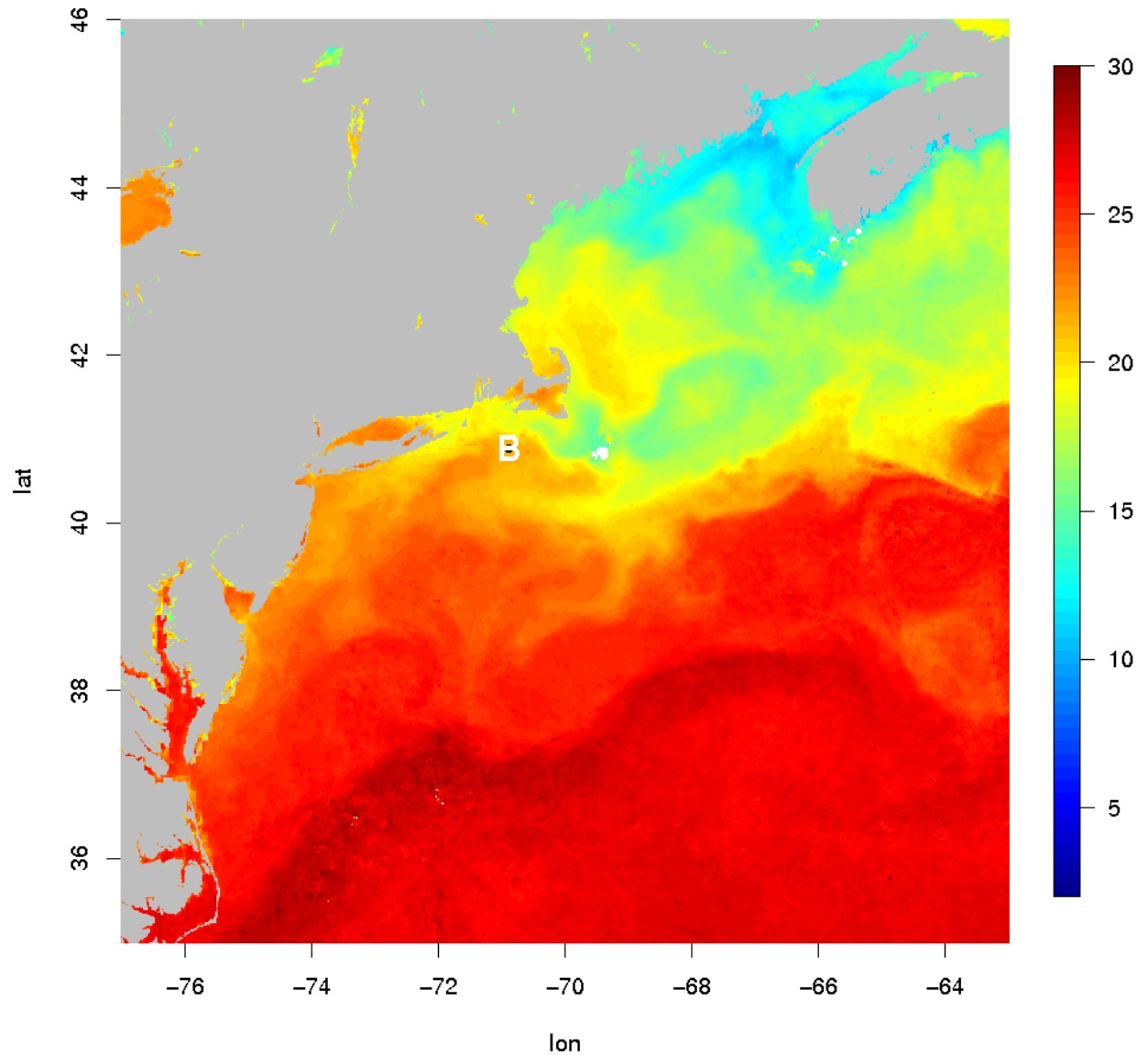


2008-08-30 11:24:00

Personal Example (2009)

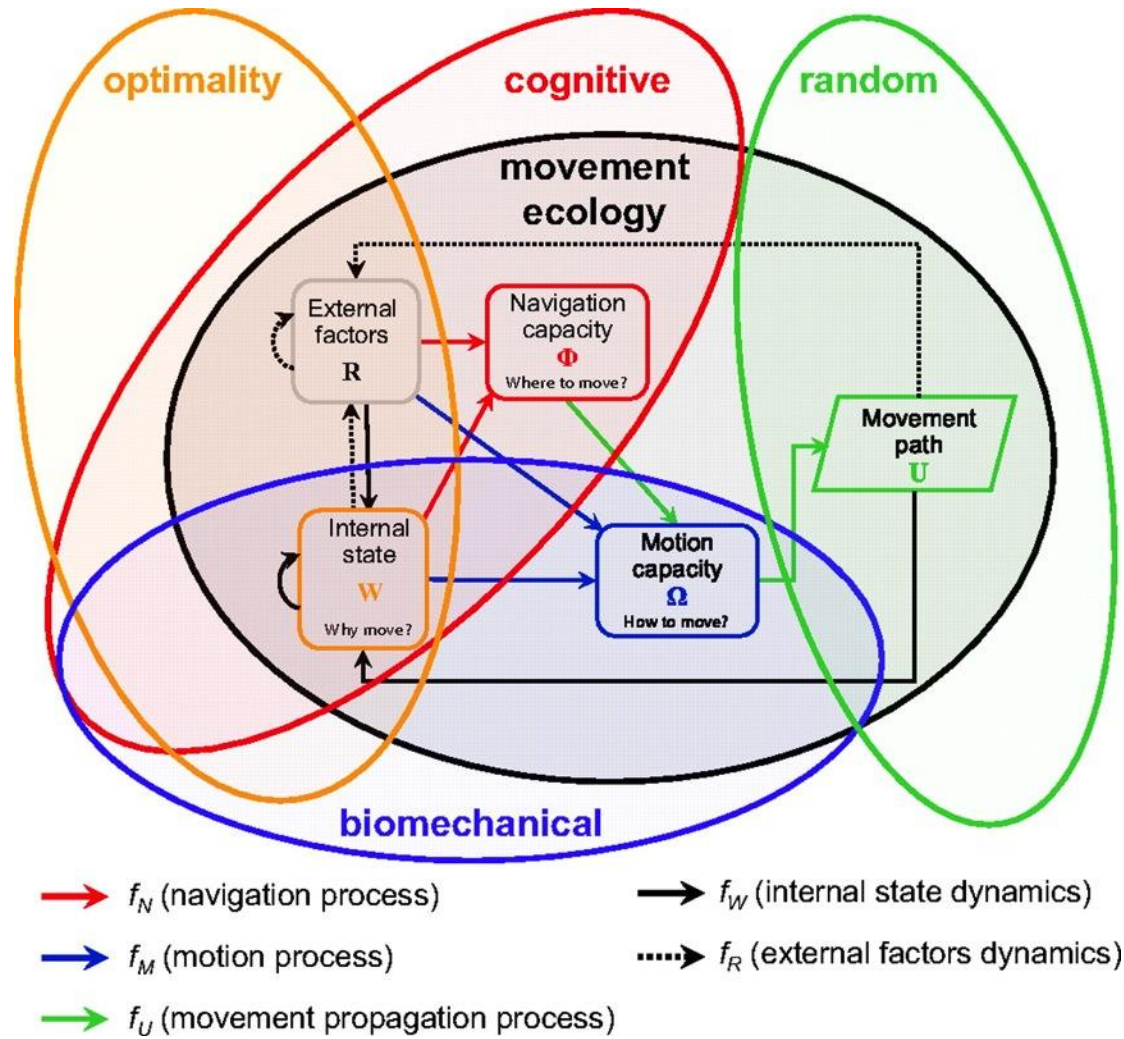
Was contacted by a shark researcher in the mid-Atlantic who asked if I could annotate the track of a Blue shark and a Mako shark.

This was intriguing.



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

Usually bigger than a butterflyfish





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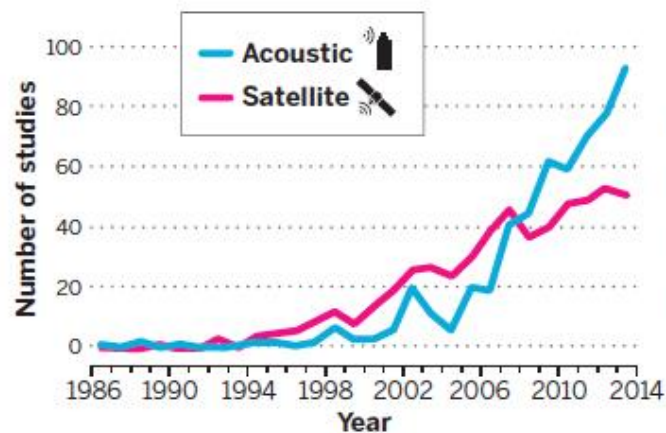


Aquatic animal telemetry A panoramic window into underwater world

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. Whoriskey⁷

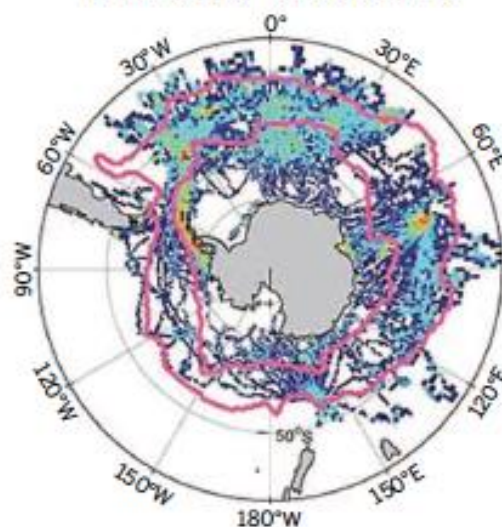


C

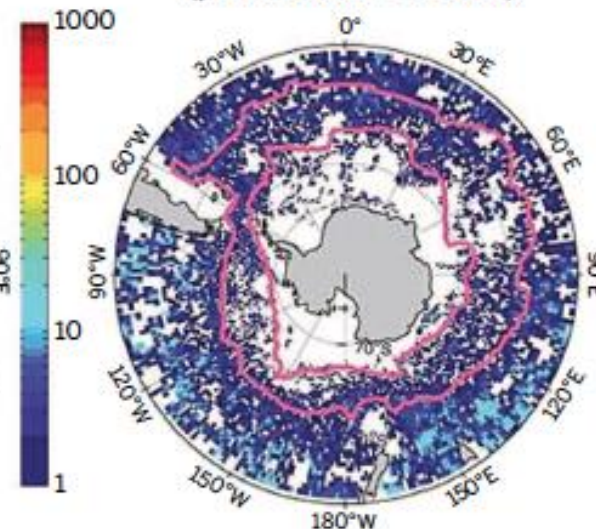


F Animals as oceanographers

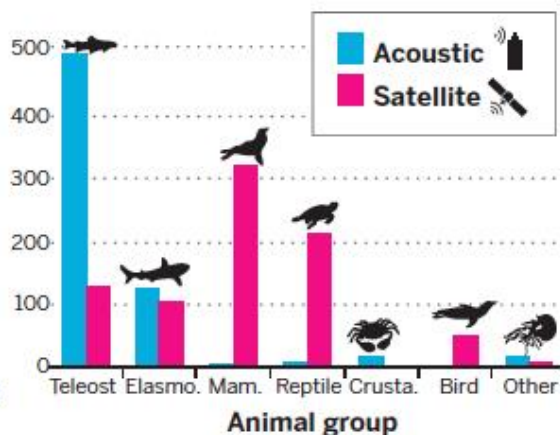
Number of profiles
in the MEOP-CTD database



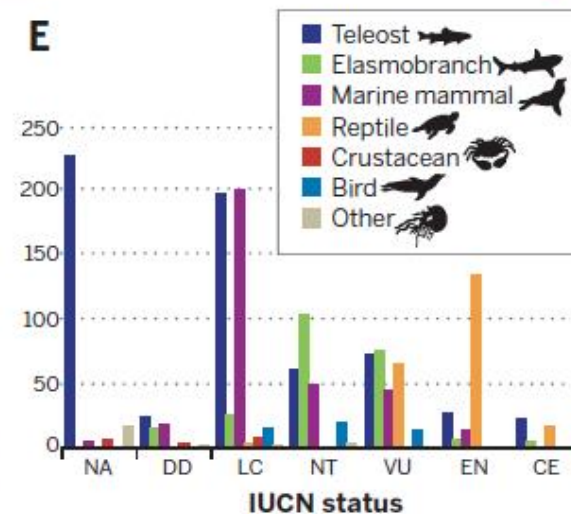
Number of Argo profiles
(period 2007-mid 2008)



D



E



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Major Telemetry Groups in the Mid-Atlantic



The Atlantic Cooperative

Telemetry Network

OCEAN
TRACKING NETWORK



Animal Telemetry Network



Mid-Atlantic Acoustic Telemetry Observation System



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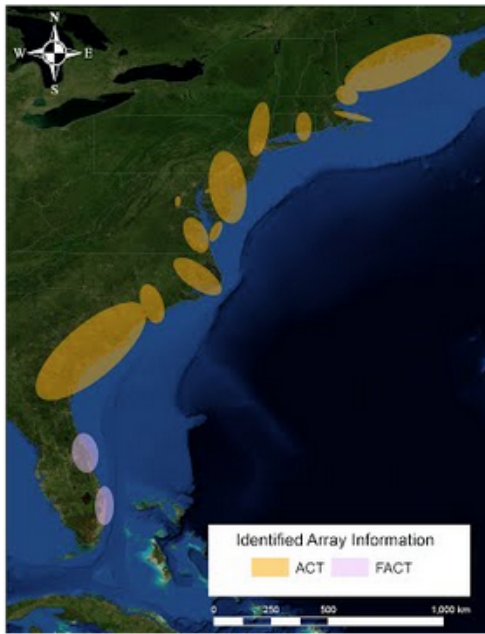
The Atlantic Cooperative

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. Researchers 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



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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.

CTD



VMT

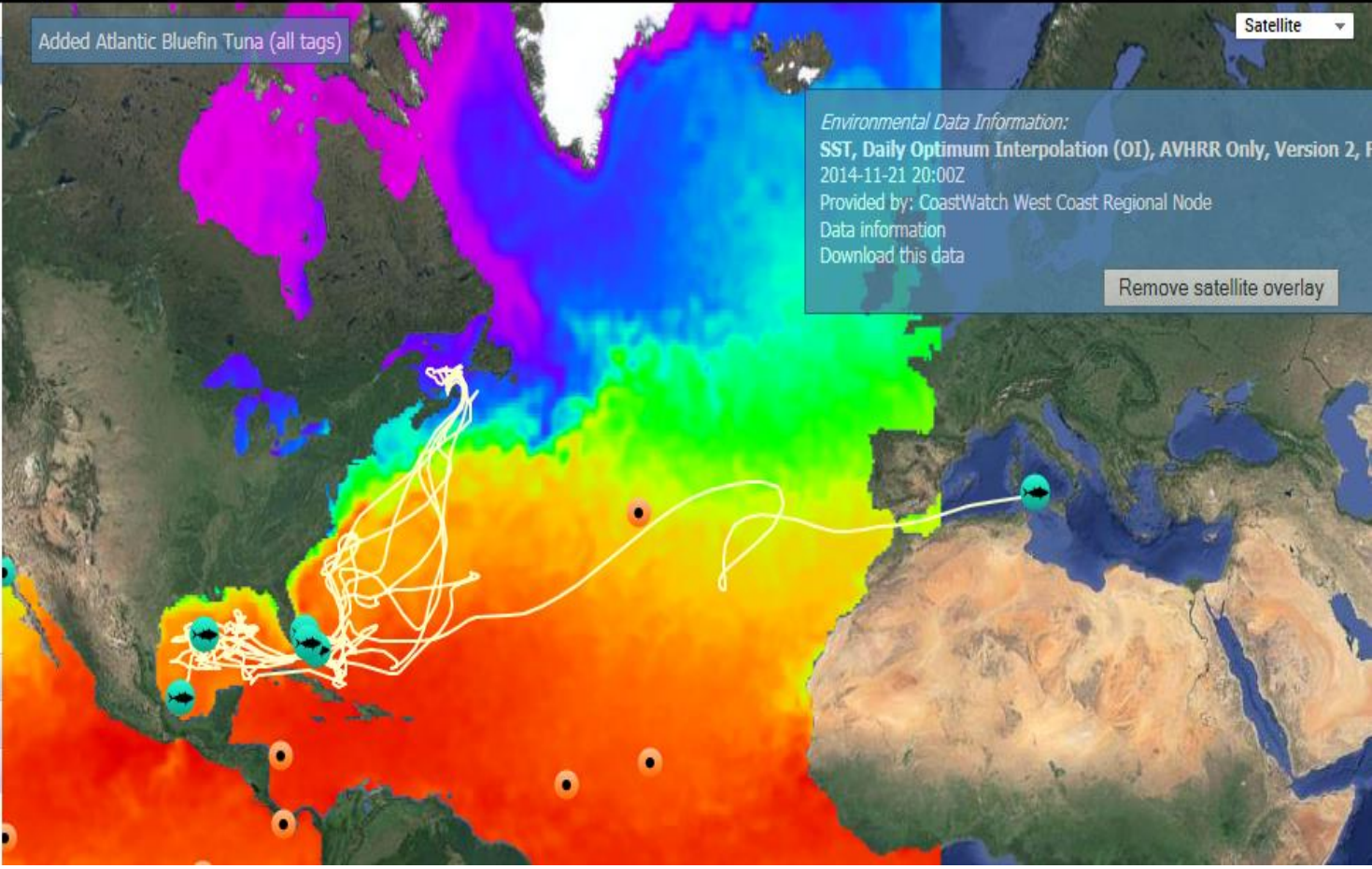
90 60 10

Tagged Animals

- Cetacean
- Fish
 - Atlantic Bluefin Tuna
 - Black Marlin
 - Blue Marlin
 - Pacific Bluefin Tuna
 - Striped Marlin
 - White Marlin
- Pinniped
- Seabird
- Shark
- Turtle

Popup Tags

- Buoys
- Gliders





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

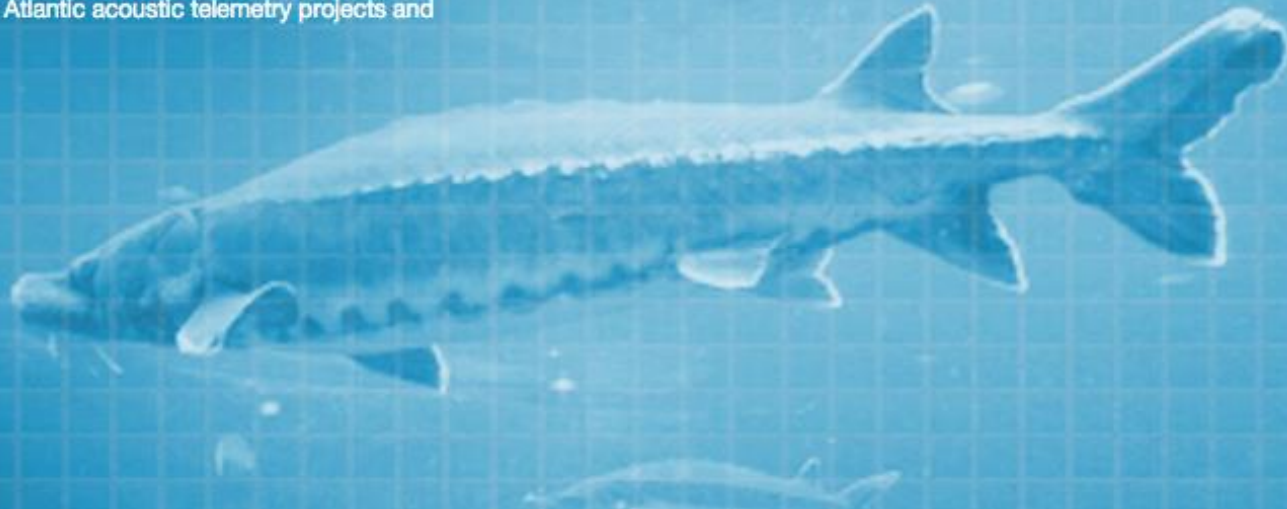
Click here for instructions to claim a reward

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

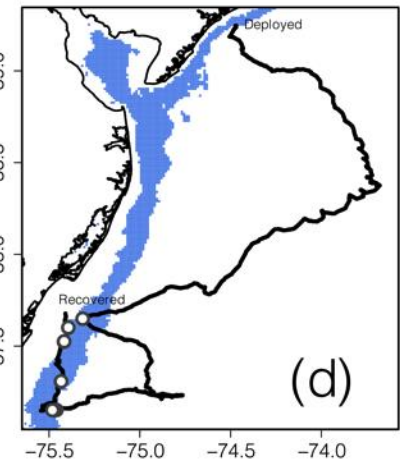
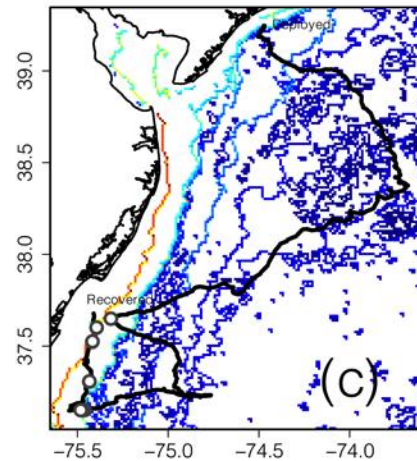
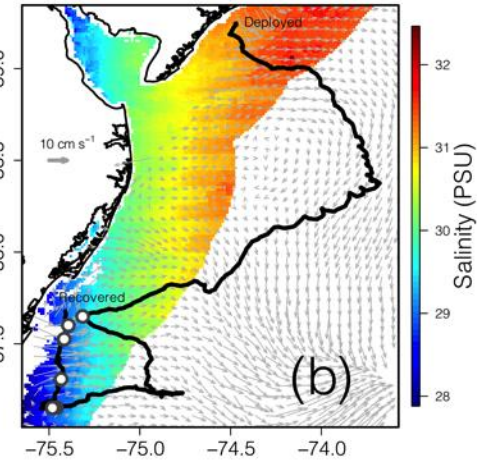
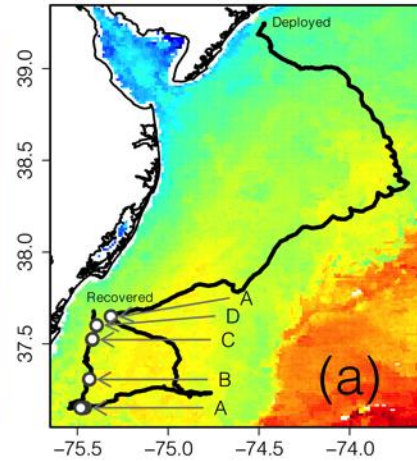
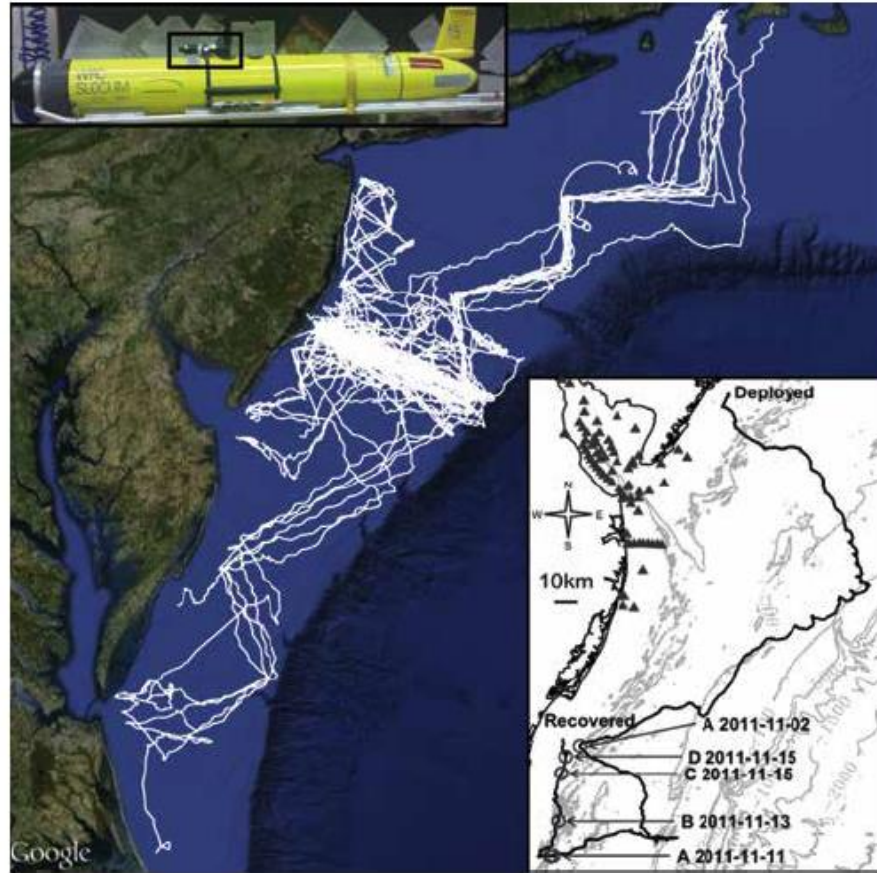


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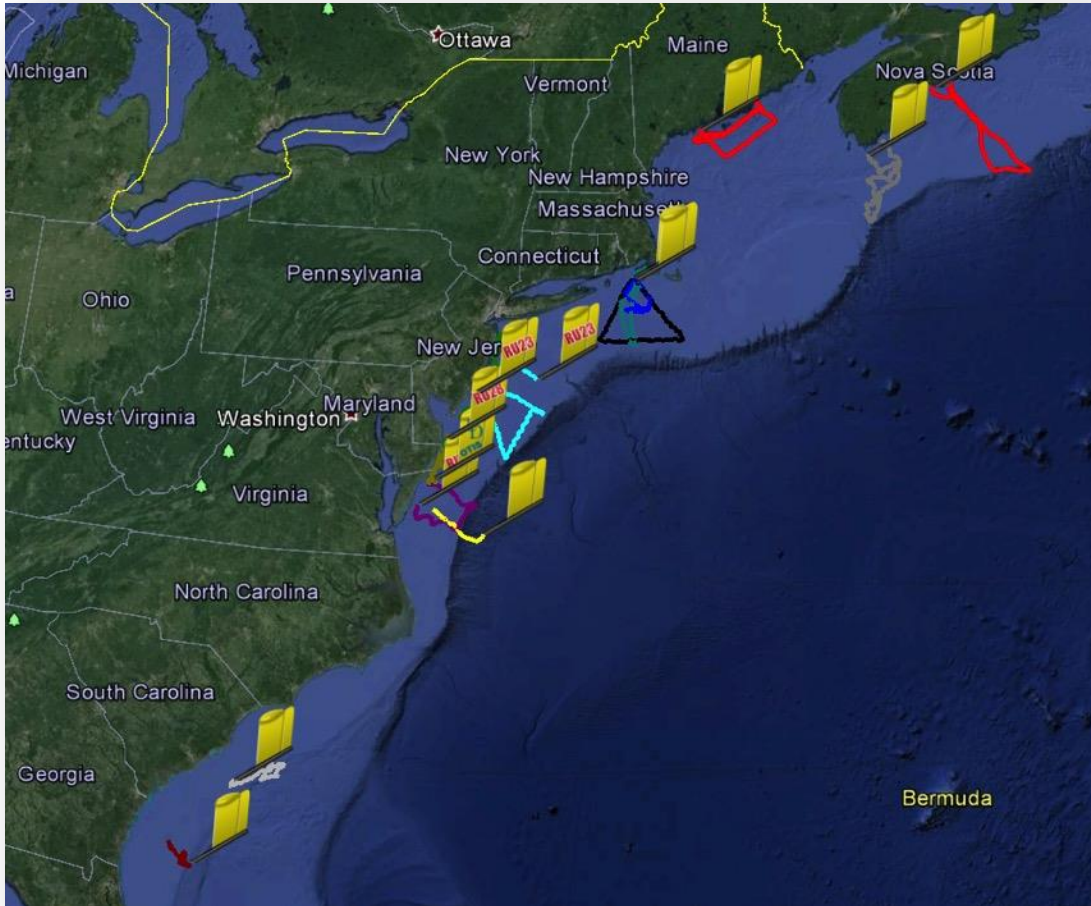
Shrinking the Haystack: Using an AUV in an Integrated Ocean Observatory to Man Atlantic Sturgeon in the Coastal Ocean

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

Telemetry data made available through ACT

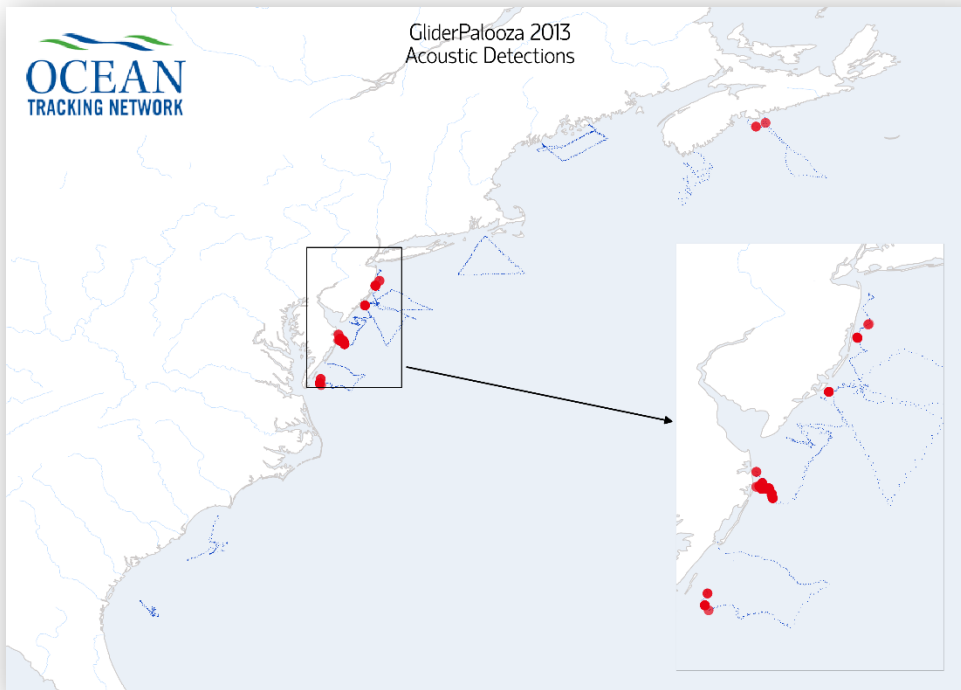


Gliderpalooza 2013



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



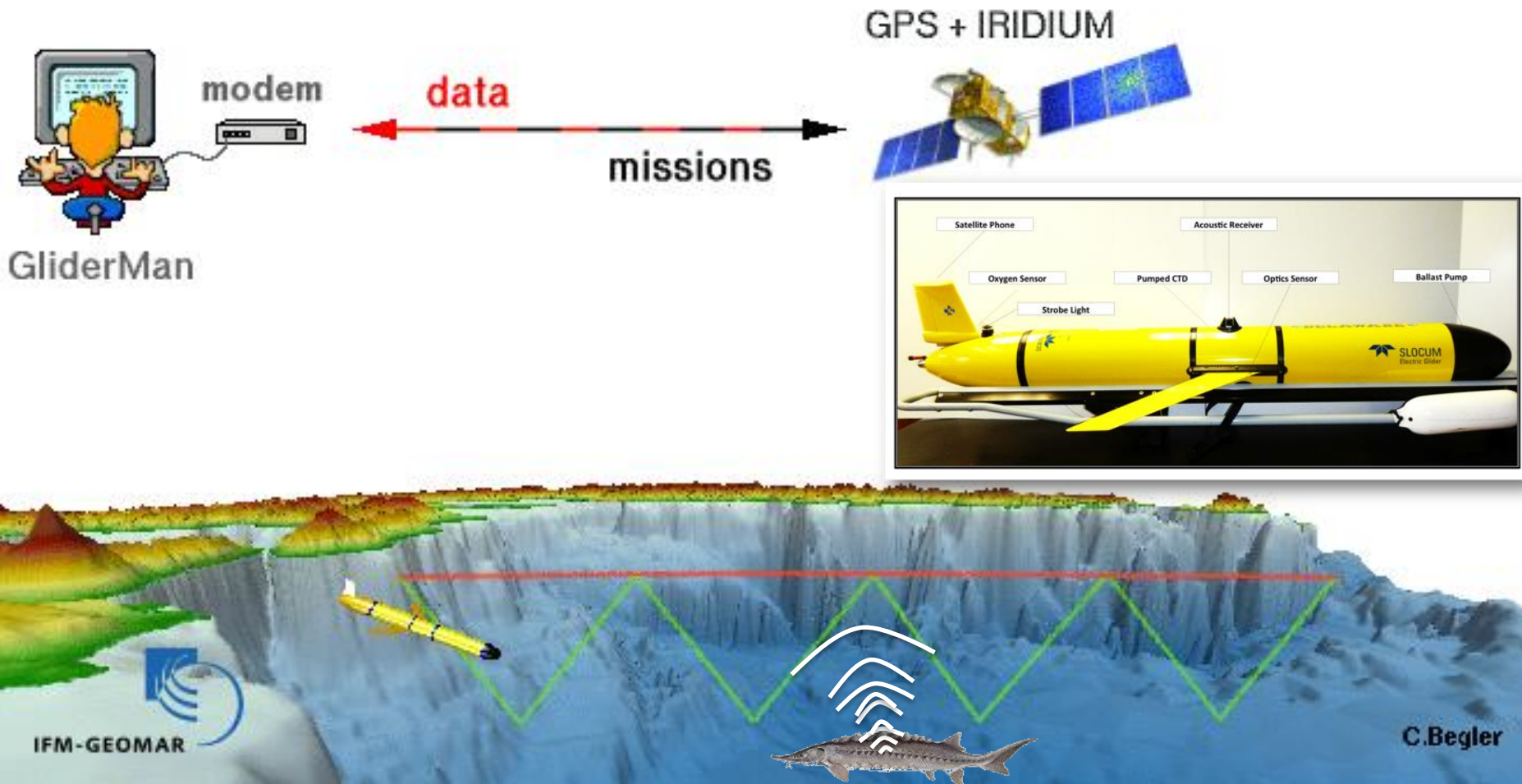


- Vemco receivers detected 16 animals
- Species: Blue Shark and Atlantic Sturgeon.



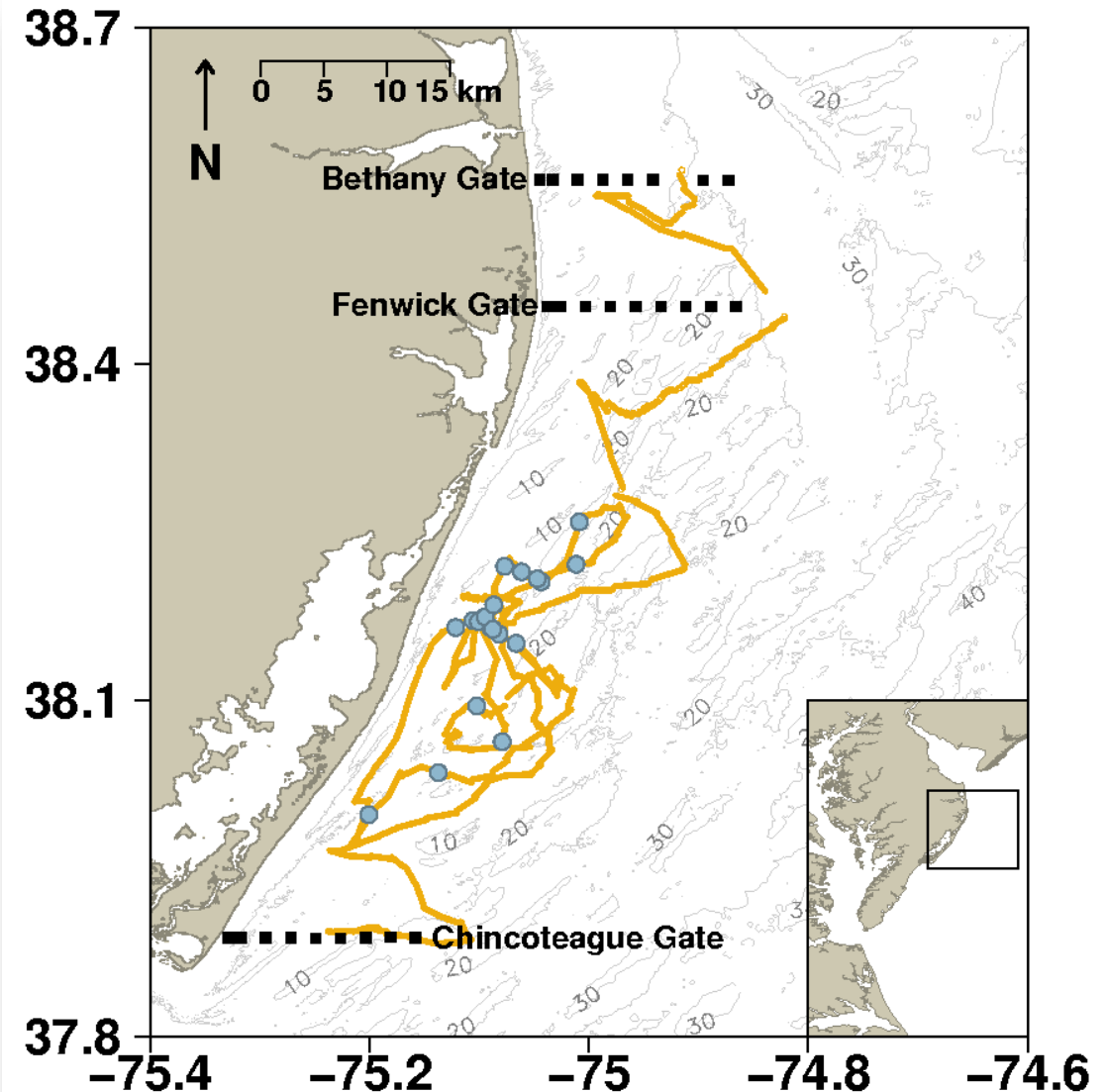
Group	Glider Name	Species	#
Dalhousie	OTN200	No detections	0
	OTN201	Blue shark	2
U Maine	Penobscot	Not reported yet	0
U Mass	Blue	No detections	0
Rutgers	RU28	Atlantic sturgeon	10
	RU22	Atlantic sturgeon	3
	RU23	Atlantic sturgeon	1
U Delaware	Otis	Glider lost at sea	--
NC State	Salacia	No detections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

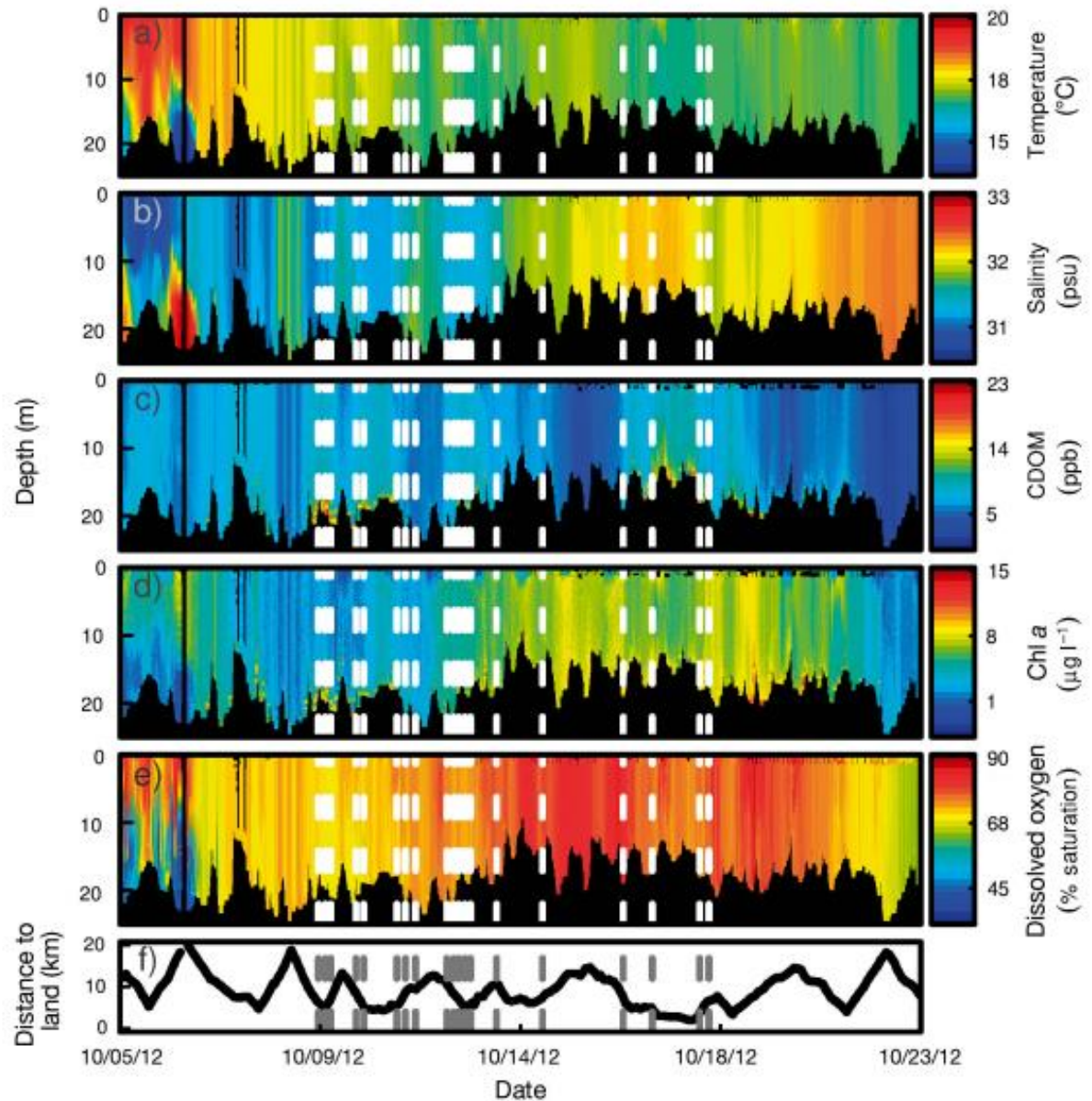


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- What is the appropriate scale for matching environmental data?



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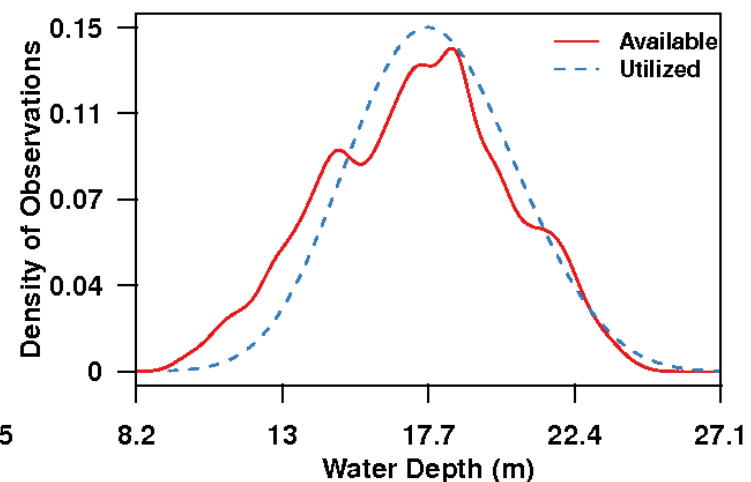
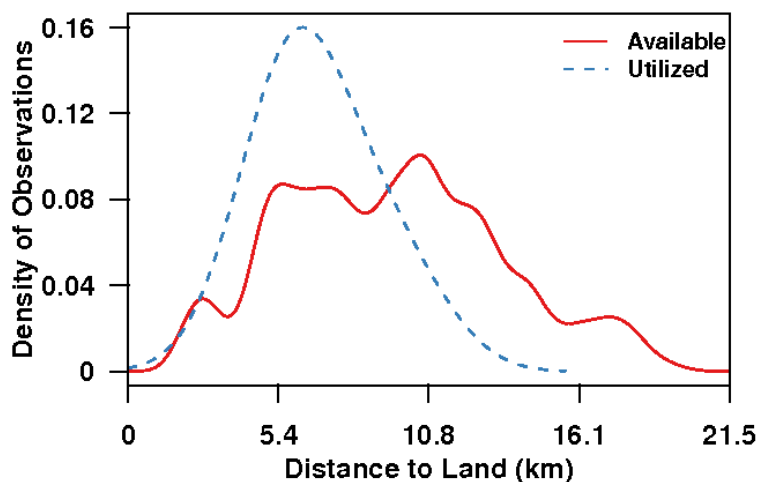
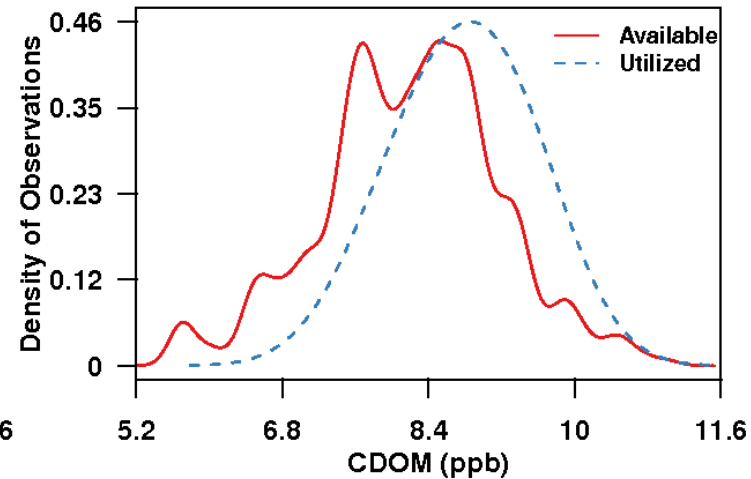
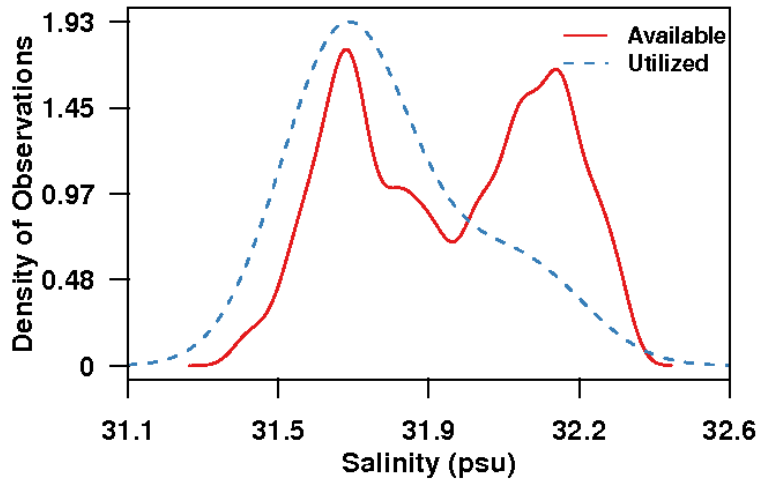
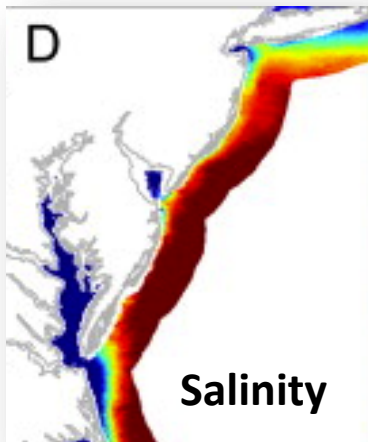
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Habitat selection of a coastal shark species estimated from an autonomous underwater vehicle

D. E. Haulsee^{1*}, M. W. Breece¹, D. C. Miller¹, B. M. Wetherbee², D. A. Fox²,
M. J. Oliver¹



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Leveraging observatory assets help estimate detectability questions



VMT

VMT

Integrated VR2



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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

Last Surfacing

Current Waypoint: ru28



Current Waypoint: 1476

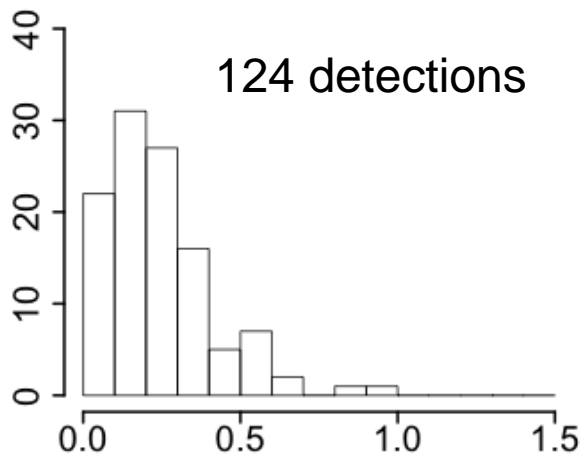
© 2015 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

81 km

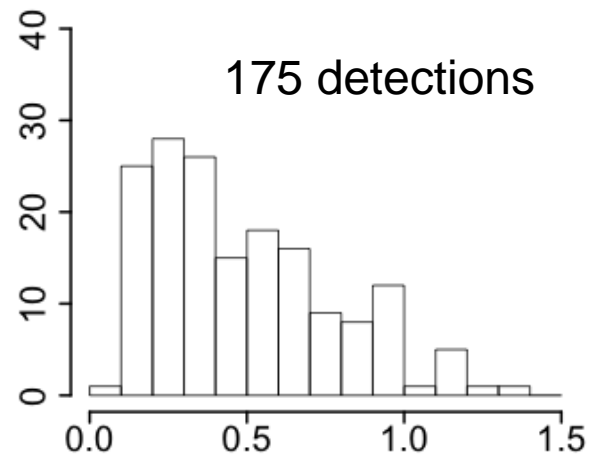
Baltimore Canyon

Imagery Date: 4/10/2013 lat 39.192391° lon -74.412537° elev -11 m eye alt 357.85 km

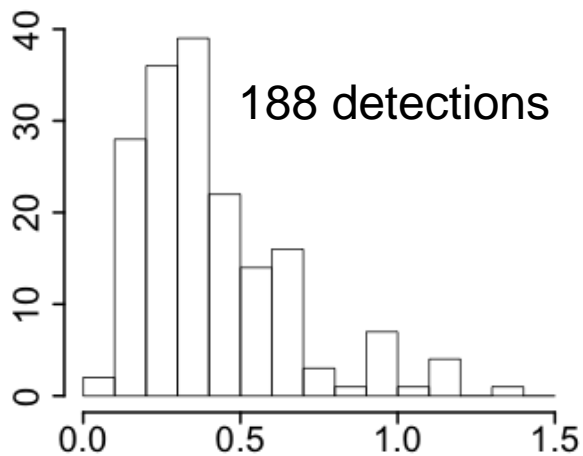
Externally mounted VMT



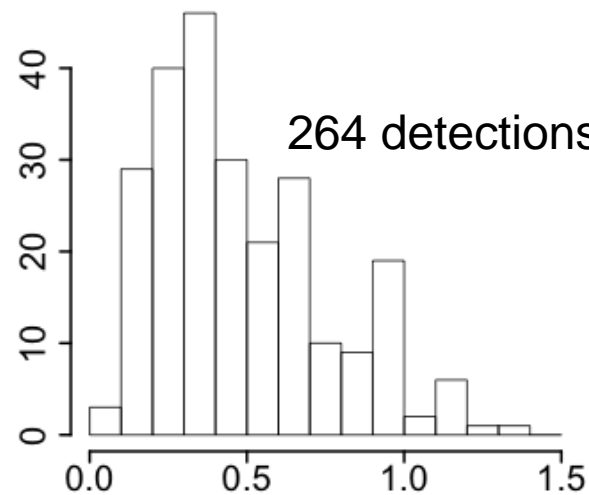
Integrated bottom VR2C



Integrated top VR2C



Integrated VR2C (top and bottom)



Number of Detections

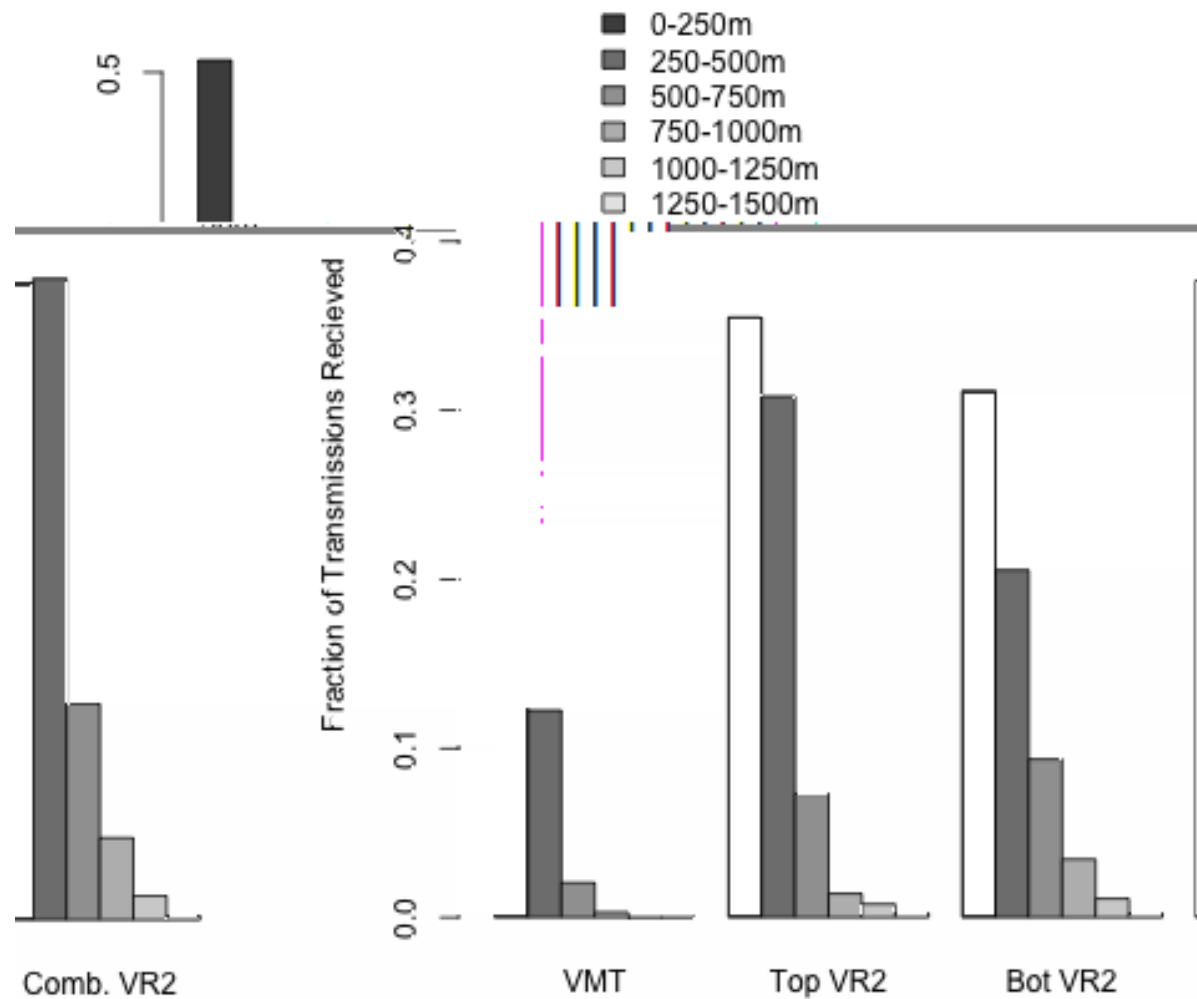
Distance Between Transmitter and Receiver (km)



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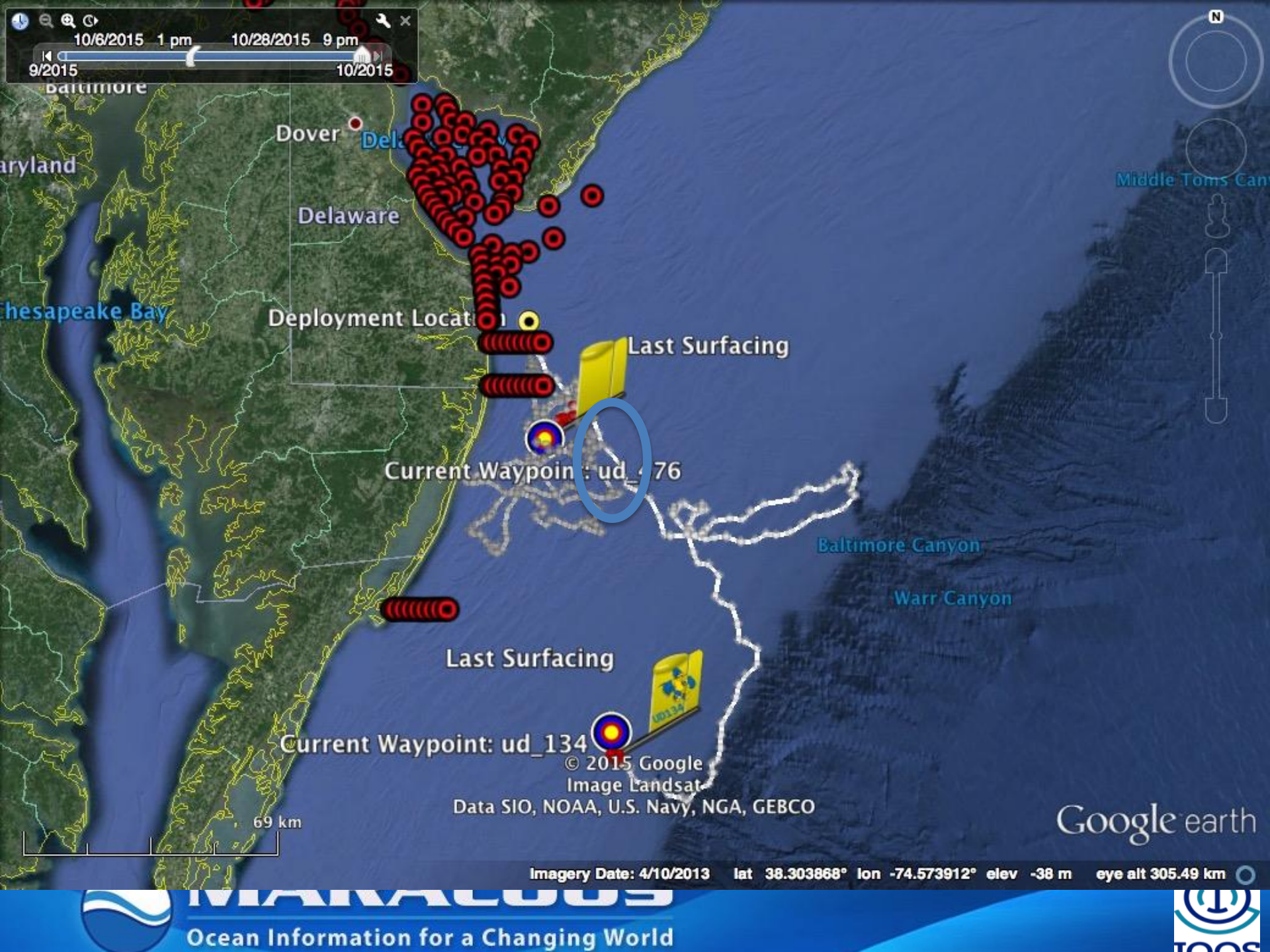




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Conclusions

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



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IOOS