

U.S. Integrated Ocean Observing System (IOOS®)

NATIONAL ANIMAL TELEMETRY NETWORK Data Assembly Center

*Hassan Moustahfid
U.S. IOOS*

IOOS DAMC RAs Workshop, Sep.10-12 2013



Outline

- ATN Vision
- Existing ATN Data Networks
- Tagging/Telemetry Technology
- ATN Proposed DAC Why DAC?
- IOOS/ONR/TOPP Project
- IOOS/NANOOS/POST/OTN Project
- ATN DAC Prototype Development
- Fwd Looking

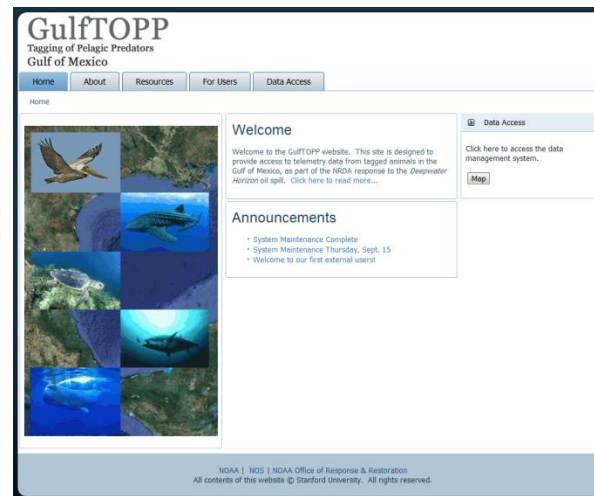
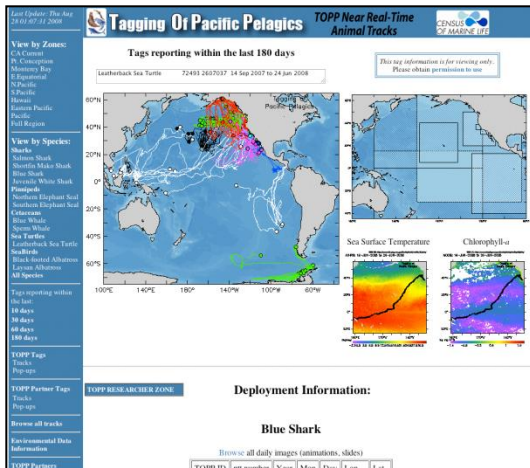
ATN Vision

“Establish a National Animal Telemetry Observing Network (ATN) under the US IOOS capable of providing observations for ocean modeling and forecasting and a science-based source of information crucial for effective Ecosystem Based Management (EBM).”

The ATN will:

- Facilitate integration of animal telemetry instrument with existing observing systems
- **Improve data standards, management, sharing capability and establish a cyber- infrastructure for archiving and displaying telemetry data**
- Serve as a focal point for the development of new sensors technology
- Bring permanence and sustainability to a national telemetry network
- Expand animal telemetry outreach and education programs.

Current ATN Data Management Scattered and Less interoperable



Navigation

- Forums
- Contact Us
- Transmitter Code Access

[Home](#) >

Sorry - Access Denied



You need to be an authorized user to have access to this page.
Please log in, register, or contact east.coast.telemetry@gmail.com for more information.

MATOS

GLATOS
Great Lakes Acoustic Telemetry Observation System
Unravelling the Mysteries of Great Lakes Fish Behavior

GLATOSWeb compiles acoustic telemetry project information and helps users learn more about ongoing acoustic telemetry projects in the Great Lakes. Scientists have been implanting Great Lakes 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 GLATOS is to help scientists and the public learn more about Great Lakes acoustic telemetry projects and their contribution to research.

What is Acoustic Telemetry?
About GLATOS
Have Data?

EXPLORE **SEARCH** **FOUND A TAG?**

Explore a map of GLATOS projects. Search the GLATOS database by keyword. Reward! Click here for instructions on what to do next.

Hydra

JOIN HYDRA LOG IN ABOUT RESEARCHERS DATA USER GUIDE

Username:

Password:

Log In

Not a member? [Join Hydra](#)

OTN Members Portal OCEAN TRACKING NETWORK

You are here: [Home](#) > visualization

visualization

'Under Development' data visualization products for eventual routine inclusion into OTN discovery

- deployment coverage
- species composition

'Under Development' deployment coverage graphs. Receiver coverage (vertical lines) and detections per week (expanding dot station number on the x axis and time on the y axis. Orange dots on vertical lines indicate a service events (e.g. deployment indicate end of a 3 month quarter. Ocean and global summary plots are also given.

'Under development' species composition graphs. Stacked bar graphs giving number of detections by common name and y ocean regions, collaboration groups and the globe as a whole.



THE USE OF AN INSTRUMENTED MARINE MAMMAL AS AN OCEANOGRAPHIC SURVEY PLATFORM

by

W. E. Evans

J. S. Leatherwood

Undersea Surveillance and Ocean Sciences Department

December 1972



Approved for public release, distribution unlimited.

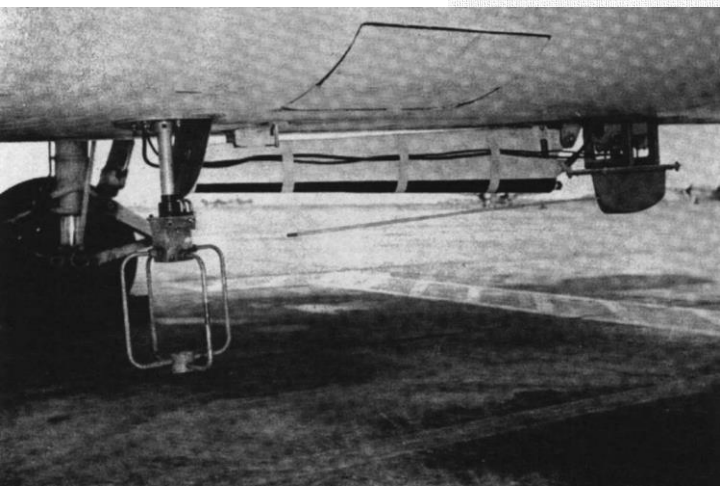


Figure 1. The tracking antennae installed on an S-2 aircraft. The antenna to the right is a motor-controlled sense antenna which can be lowered to the vertical position during flight. The directional loops are to the left.

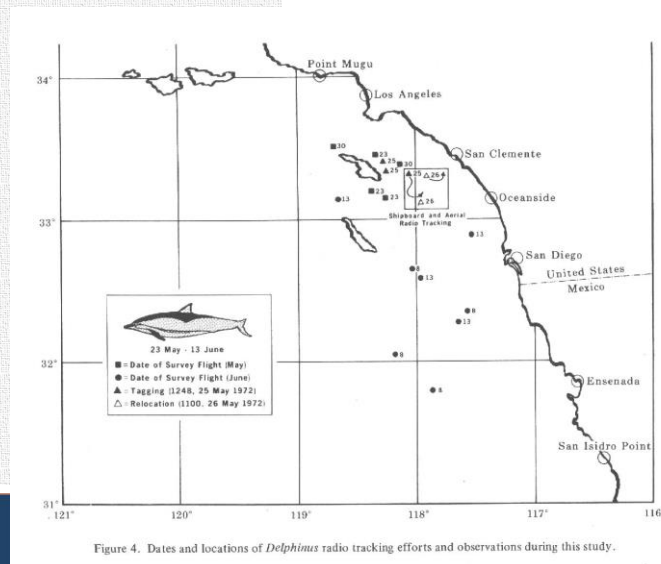
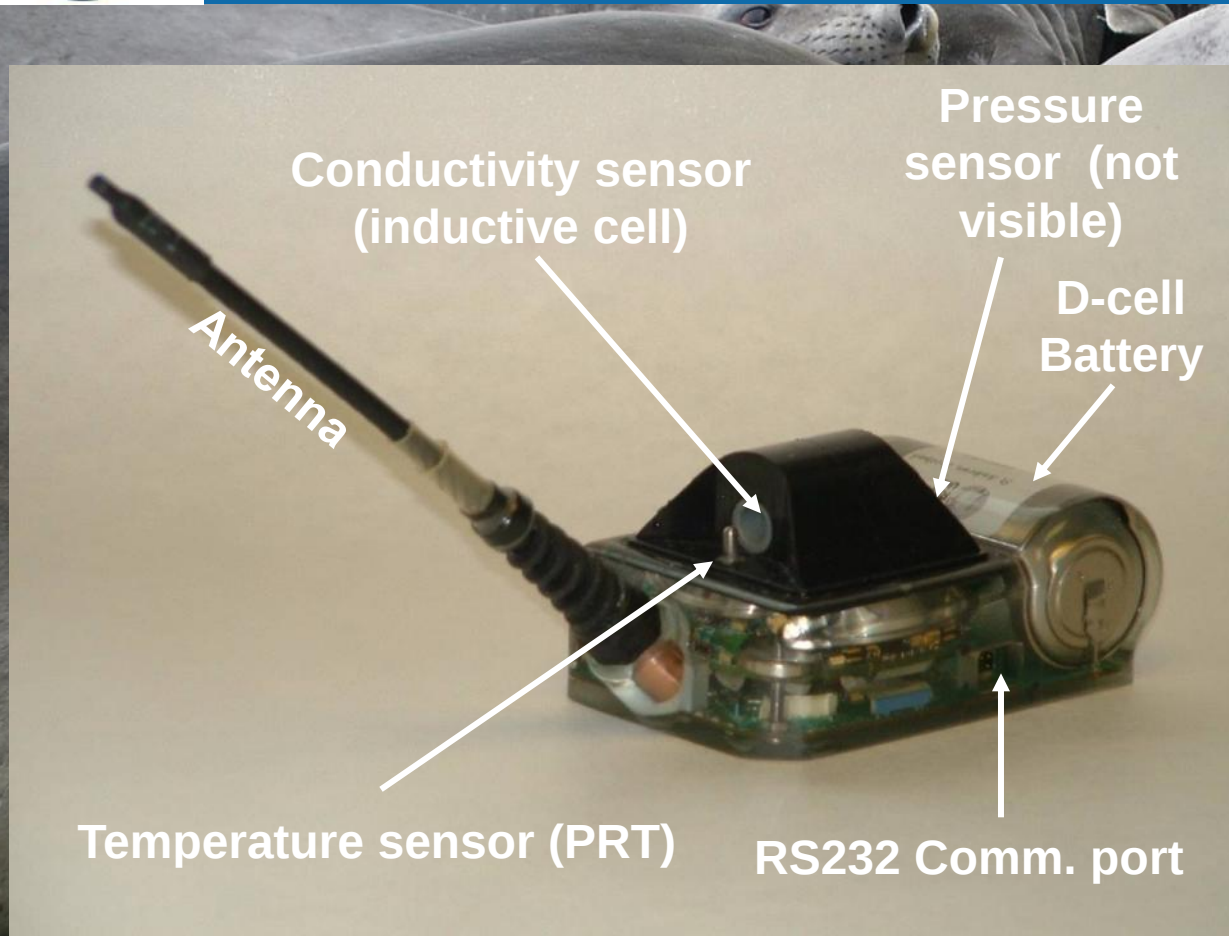


Figure 4. Dates and locations of *Delphinus* radio tracking efforts and observations during this study.



Current version of CTD tag:



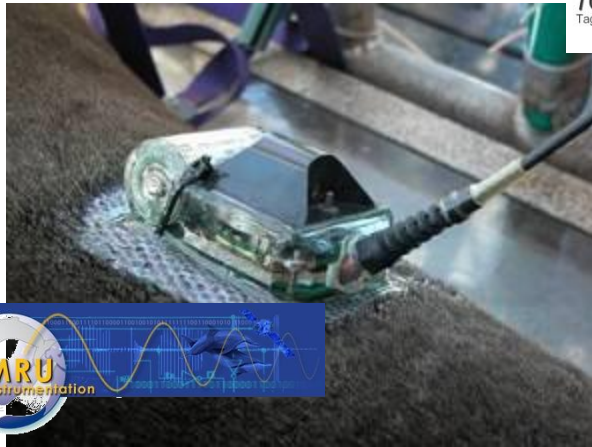
Office of Naval Research

NOPP funding

Sensor performance: Temperature: $\pm 0.01^{\circ} \text{C}$
Salinity: ± 0.01
Pressure: 1% of full scale (~2000 dBar)

A Decade of Building Next Generation Technology, Data Storage & Display

CTD Tag



Pop-Up Satellite Tags



Rapid Temperature TDR

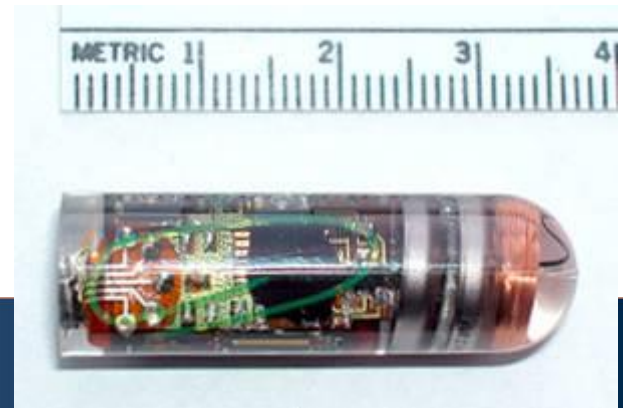


Prototype GPS Tag

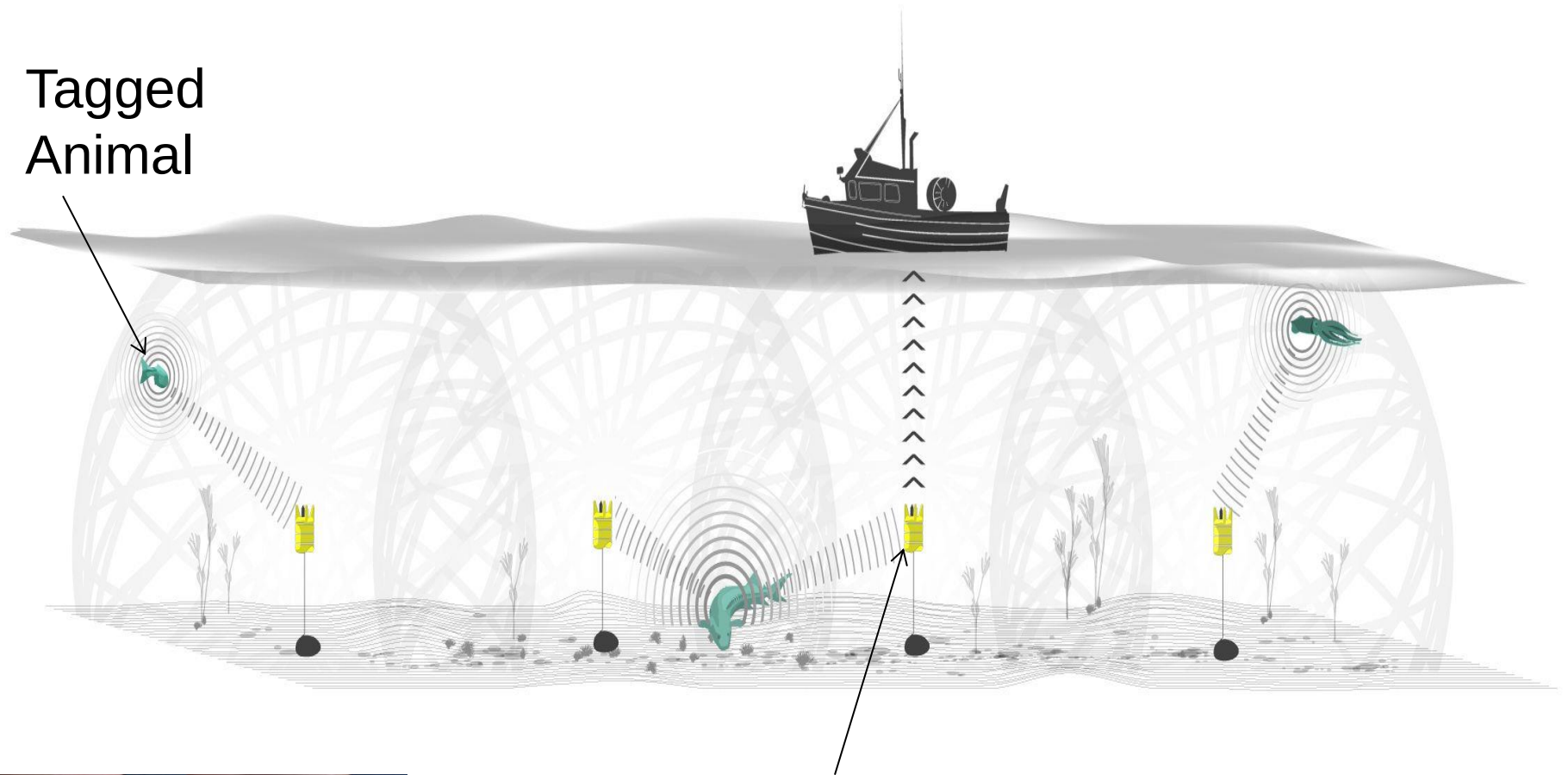


Small Acoustic Tags

Geolocation Tags (6 g)



Tagged
Animal

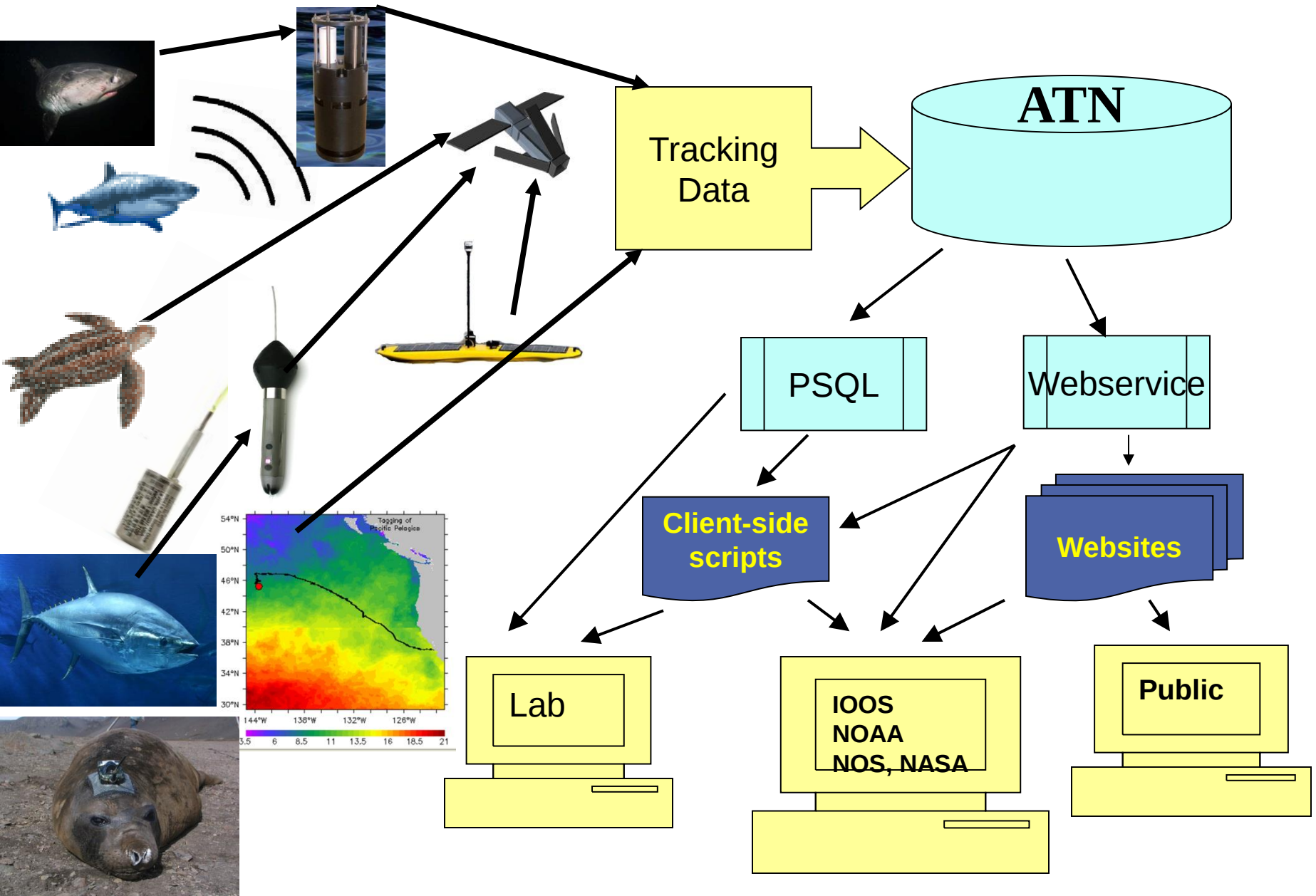


Acoustic
Receiver



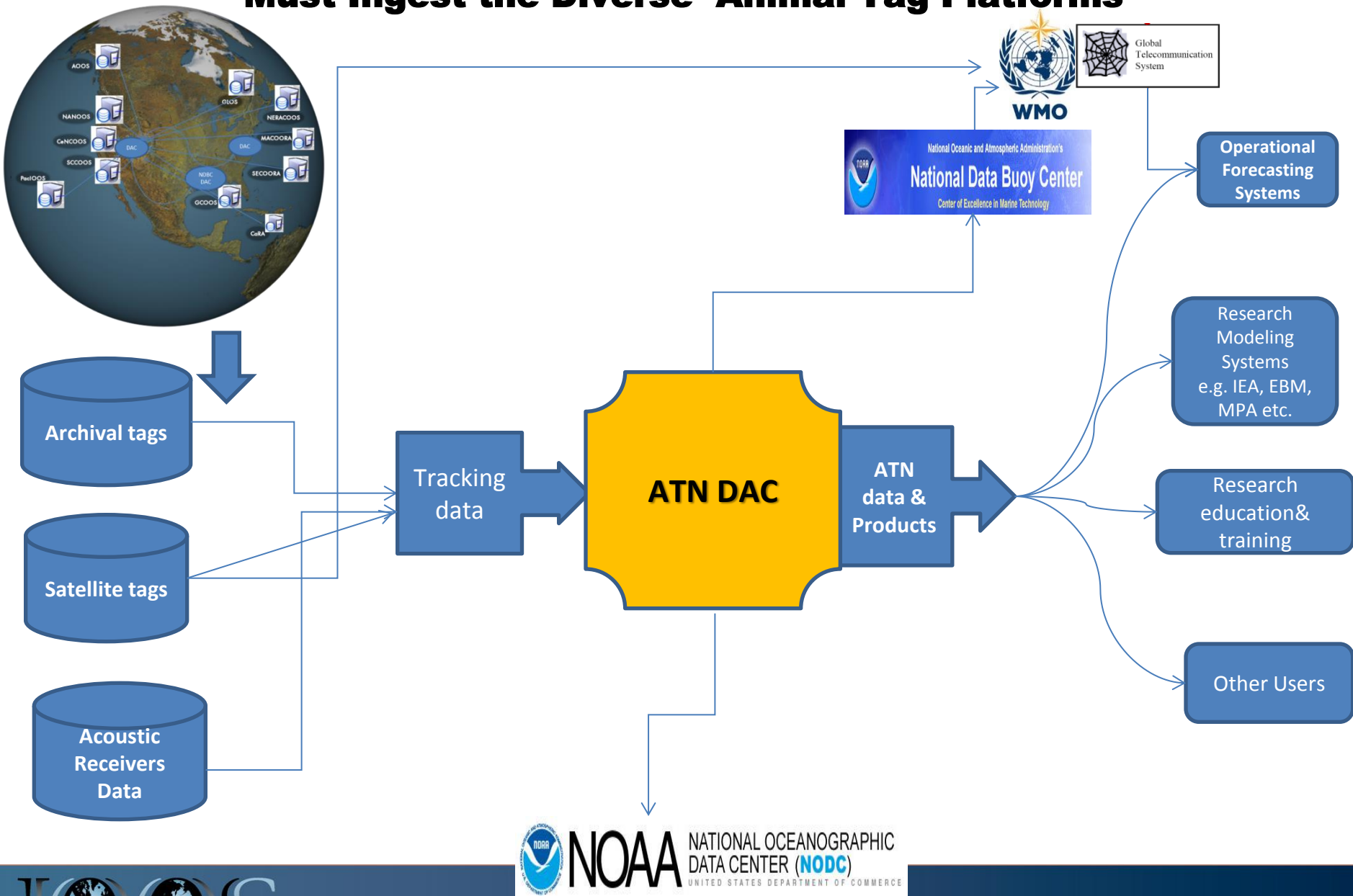
Image Credit: POST

Challenge: An IOOS ATN Data Management System: Must Ingest the Diverse Animal Tag Platforms



DATA FLOW FOR ATN.

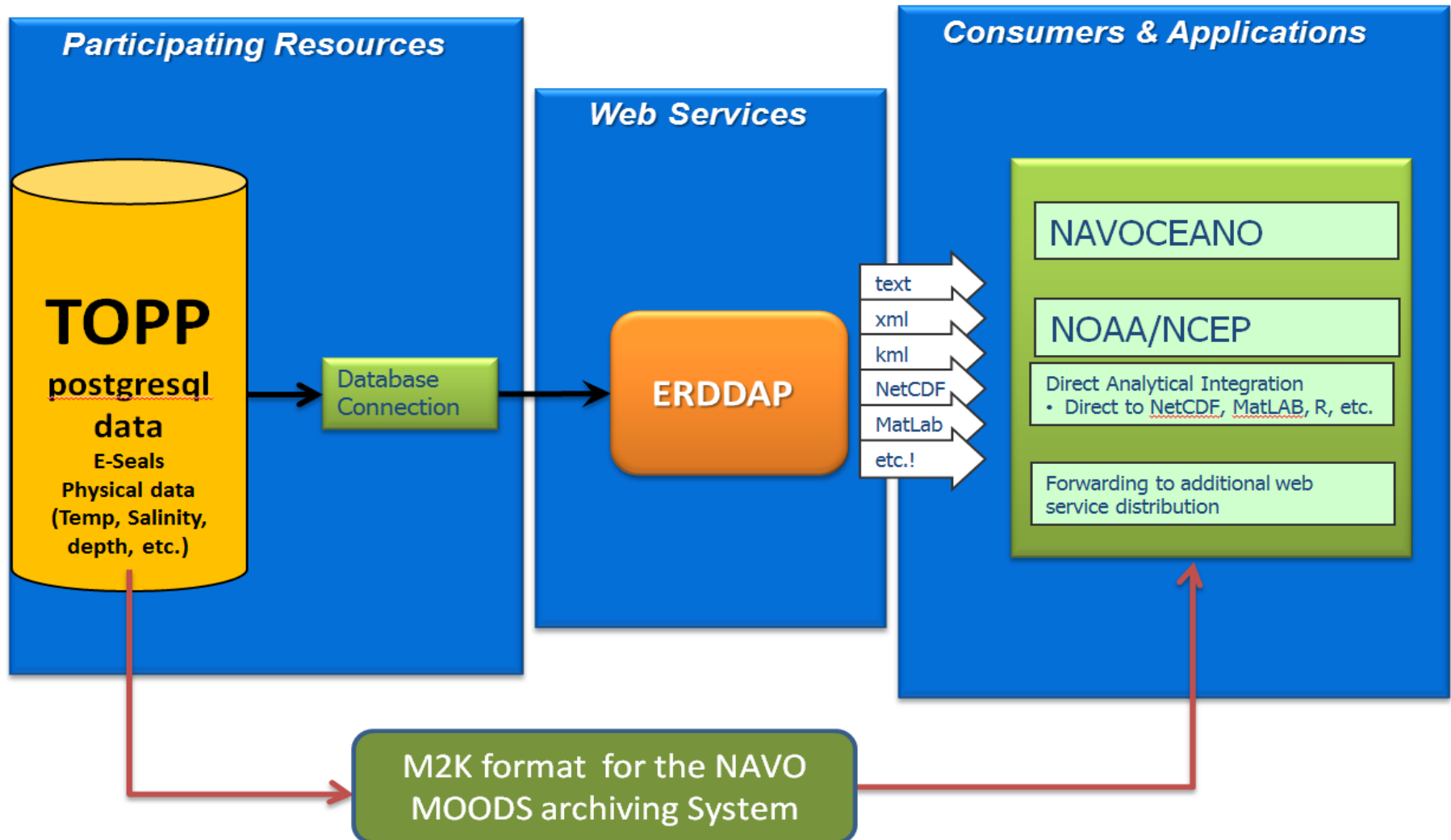
Must Ingest the Diverse Animal Tag Platforms



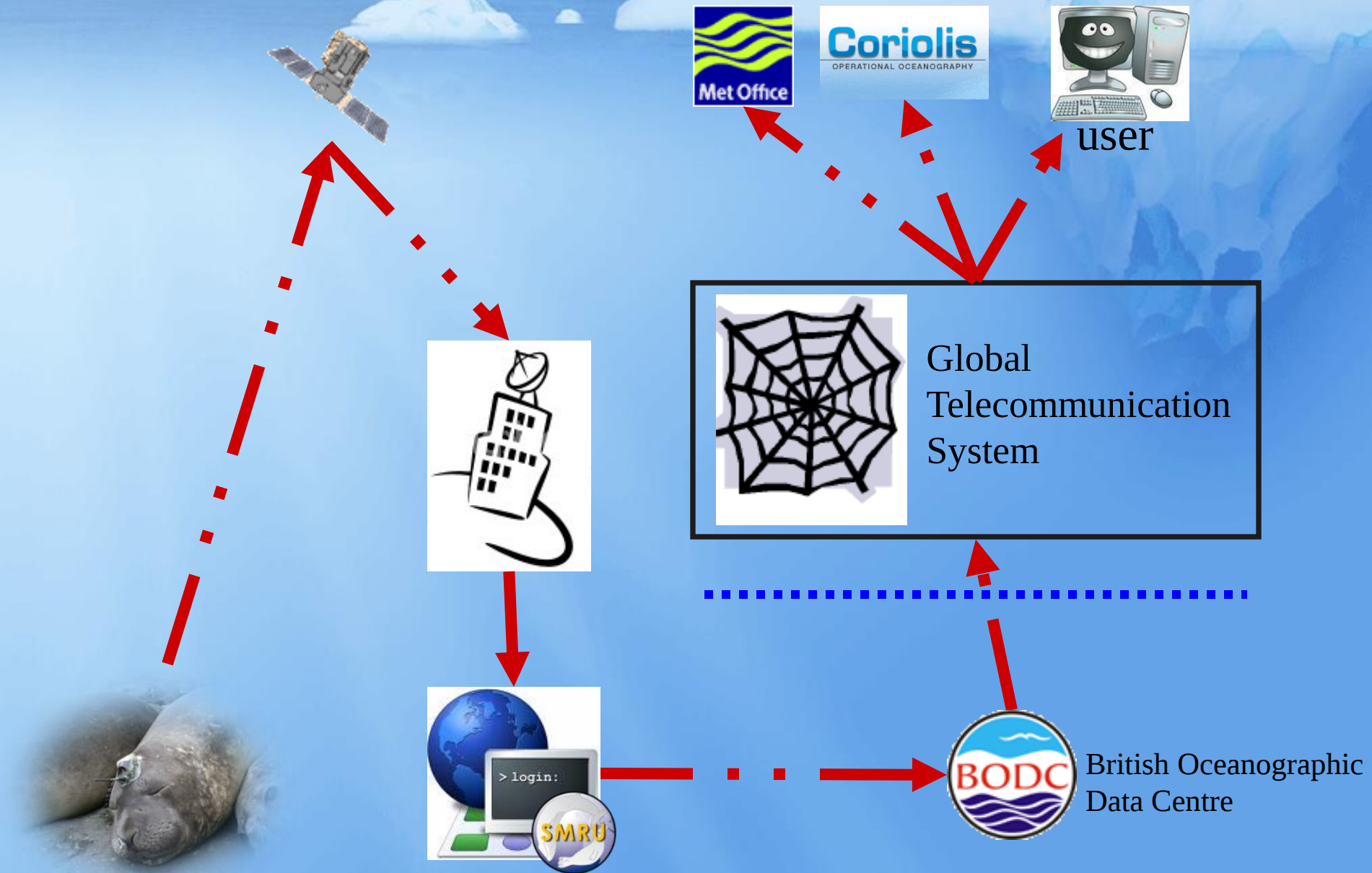
ATN Data to HYCOM models US NAVY NAVOCEANO

<http://dataxfer.stanford.edu:8080/erddap/index.html>

***System Design Diagram
to improve access to TOPP Animal Borne Sensors Physical data***



Real-time data flow



Challenges of Acoustic Telemetry Data

- Three interlocking parts (Receiver Metadata, Tag Metadata, and Detections) must be assembled to recreate an animal track
- Must keep track of Receiver Histories
- Metadata may be fairly complex:
 - Instrument attributes (e.g. tag and receiver programming)
 - Positions and position errors
 - Time (tracks)
 - Quality control
 - Attribution for objects served

Reconciled AAT Data Content Convention

A metadata convention for animal acoustic telemetry data

Version 1.1

May 29, 2013

John Payne, Hassan Moustahfid, Emilio Mayorga

Robert Branton, Marta Mihoff, Lenore Bajona

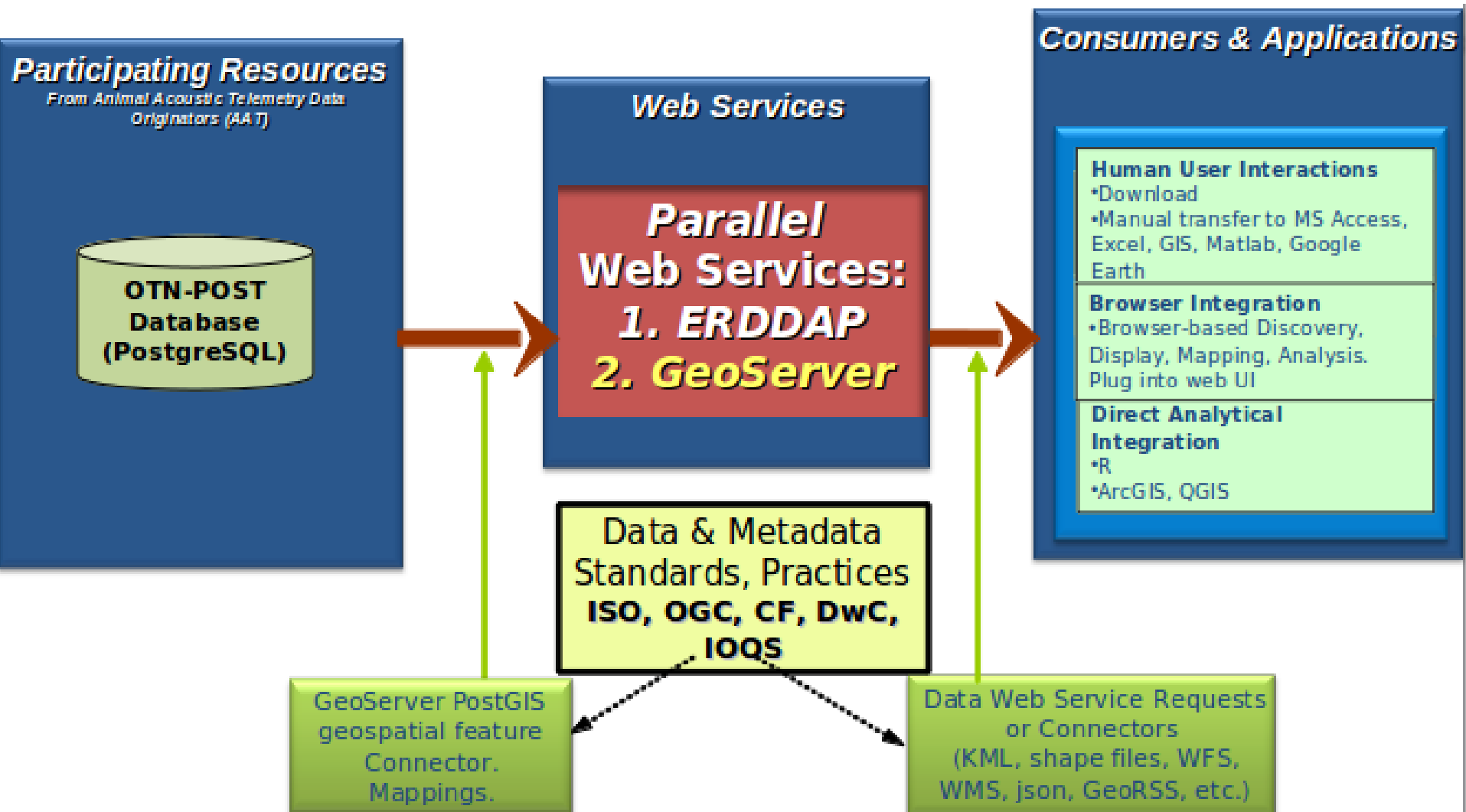
[More details AAT WIKI in IOOSTech
https://code.google.com/p/ioostech/
wiki/AnimalAcousticTelData](https://code.google.com/p/ioostech/wiki/AnimalAcousticTelData)

Table of Contents

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Project Attributes	7
Manmade Platform	10
Receiver Deployment	11



AAT Observations System Design – Service Connections. Geospatial access to data via GeoServer: RDBMS > GeoServer.



**ERDDAP > List of All Datasets**

<http://nile.apl.washington.edu/erddap/index.html>

Or, Do a Full Text Search for Datasets:

Or, Search for Datasets by Category:

[cdm_data_type](#), [institution](#), [ioos_category](#)

[long_name](#), [standard_name](#), [variable_name](#)

Or, Search for Datasets with [Advanced](#)

Pick a Dataset

14 matching datasets, listed in alphabetical order.

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Title	Summary	FGDC, ISO, Metadata	Background Info	RSS	E mail	Institution	Dataset ID
	set	data	graph		OTN NEP - Acoustic Receivers and Stations		F I M	background			OTN	otnneRecvrs
	set	data	graph		OTN NEP - Acoustic Tags and Animal Information		F I M	background			OTN	otnneAnTags
	set	data	graph		OTN NEP - Detections		F I M	background			OTN	otnneDetects
	set	data	graph		OTN NEP - Stations		F I M	background			OTN	otnneStations
	set	data	graph		OTN NEP JDF - OTN Strait of Juan de Fuca Line Acoustic Receivers and Stations		F I M	background			OTN	otnneJDFRecvrs
	set	data	graph		OTN NEP JDF - OTN Strait of Juan de Fuca Line Detections		F I M	background			OTN	otnneJDFDetects
	set	data	graph		OTN NEP LIND - Lindley Tags Acoustic Tags and Animal Information		F I M	background			NOAA-SWFSC	otnneLINDAnTags
	set	data	graph		OTN NEP MOSER - Moser Tags Acoustic Tags and Animal Information		F I M	background			NOAA-NWFSC	otnneMOSERAnTags
	set	data	graph		OTN NEP PSS2 - OTN Canada Pacific Sockeye Sal ... roject 2 Acoustic Tags and Animal Information		F I M	background			UBC	otnnePSS2AnTags
	set	data	graph		OTN NEP QCS - OTN Queen Charlotte Strait Line Acoustic Receivers and Stations		F I M	background			OTN	otnneQCSRecvrs
	set	data	graph		OTN NEP QCS - OTN Queen Charlotte Strait Line Detections		F I M	background			OTN	otnneQCSDetects
	set	data	graph		OTN NEP VOGL - Vogel Tags Acoustic Tags and Animal Information		F I M	background			NRS	otnneVOGLAnTags
	set	data	graph		OTN NEP WILL - Willapa Bay, OR Acoustic Receivers and Stations		F I M	background			KRS	otnneWILLRecvrs
	set	data	graph		OTN NEP WILL - Willapa Bay, OR Detections		F I M	background			KRS	otnneWILLDetects

Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

Results 1 to 15 (out of 15 items)

Type	Name	Title	Common Formats	All Formats
	otnnep:otnnepAllRecvrs	OTN Acoustic Receivers (All Projects)	OpenLayers KML GML	Select one v
	otnnep:otnnepStations	OTN Stations (All Projects)	OpenLayers KML GML	Select one v
	topp:states	USA Population	OpenLayers KML GML	Select one v
	nanoos_dev:temp_avg_w3m_1d	Water Temperature (oC) Daily Average -- Upper 3 meters	OpenLayers KML GML	Select one v
	nanoos_dev:map_siso_w3m_1d	map_siso_w3m_1d	OpenLayers KML GML	Select one v
	nanoos_dev:temp_avg_w3m_3h	Water Temperature (oC) 3-hour Average -- Upper 3 meters	OpenLayers KML GML	Select one v
	nanoos_dev:map_siso_as_1d	map_siso_as_1d	OpenLayers KML GML	Select one v
	nanoos_dev:barpress_avg_as_1d	Barometric Pressure Daily Average -- Near-surface	OpenLayers KML GML	Select one v
	nanoos_dev:map_siso_w3m_3h	map_siso_w3m_3h	OpenLayers KML GML	Select one v
	nanoos_dev:oxygen_min_w3m_1d	Oxygen Concentration (mg/L) Daily Minimum -- Upper 3 meters	OpenLayers KML GML	Select one v
	nanoos_dev:temp_avg_w3m_7d	Water Temperature Weekly Average -- Upper 3 meters	OpenLayers KML GML	Select one v
	nanoos_dev:map_siso_w3m_7d	map_siso_w3m_7d	OpenLayers KML GML	Select one v
	nanoos_dev:pnw_coast_mpoly	PNW coast line and land area	OpenLayers KML GML	Select one v
	nanoos_dev:pugetsnd_basins_wbd_sc3	Puget Sound Basins (from WBD)	OpenLayers KML GML	Select one v
	nanoos_dev:coastbkgr_temp_avg_w3m_1d		OpenLayers KML	Select one v

Results 1 to 15 (out of 15 items)

<http://nile.apl.washington.edu/geoserver/web/>

About & Status

 About GeoServer

Data

 Layer Preview

Demos

REAL-TIME DETECTIONS FROM CBIBS BUOY IN CHESAPEAKE

NOAA Chesapeake Bay Office (NCBO) Fish Tag Notification

Requested Fish Tag Data Found

You are receiving this email as part of the NCBO Telemetry program. To change or unsubscribe email ncbo.it

Tag Data Counts

Event Date UTC	Tag Owner	Tag VUE Id	Data Count
04/29/2013	unknown	A69-1601-9341	5
04/30/2013	unknown	A69-1601-9341	14
05/01/2013	unknown	A69-1601-9341	1
05/02/2013	unknown	A69-1601-9341	5
05/03/2013	unknown	A69-1601-9341	3
05/04/2013	unknown	A69-1601-9341	4

ATN DAC Prototype Development at NOAA/Stanford US IOOS/US NAVY

- 12 months project with NOAA and Stanford CoML Tagging of Pacific Predators Program TOPP
- Archival, Satellite and Acoustic Telemetry
- Leverage existing capabilities

[GTOPP](#) and [Gulf TOPP](#)

[IMOS AATAMS](#) and [OTN](#)

GulfTOPP

Tagging of Pelagic
Predators
Gulf of Mexico

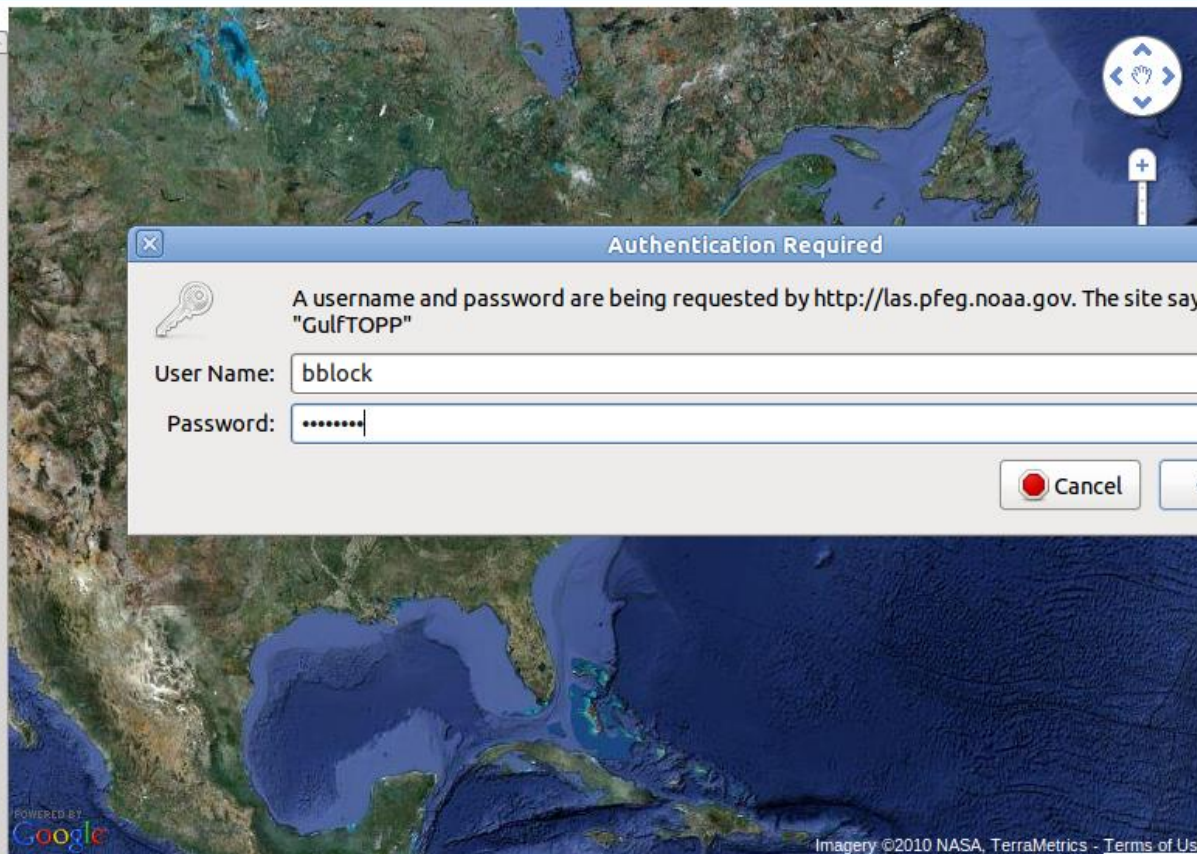
You are not logged in

Log In

Log Out

Home

Please log in to view GulfTOPP data



Show Latest Satellite Data:

Choose a time range then click 'Replot', use: ☐ deployment time ☒ last heard from
Time: to days:

GulfTOPP

Tagging of Pelagic
Predators
Gulf of Mexico

Logged in as Barbara Block (The Chief
Scientist)

[Log In](#)

[Log Out](#)

[Home](#)

Browse GulfTOPP tags with the tree OR extract tags in a region by species and time range with the menu below the map.

[Help](#)

☒ Cetaceans

☒ Sperm Whale

☒ 2011

☒ Fish

☒ Atlantic Bluefin Tuna

☐ 2007

☐ 2008

☐ 2009

☒ 2010

☐ Gulf Sturgeon

☐ 2010

☐ 2011

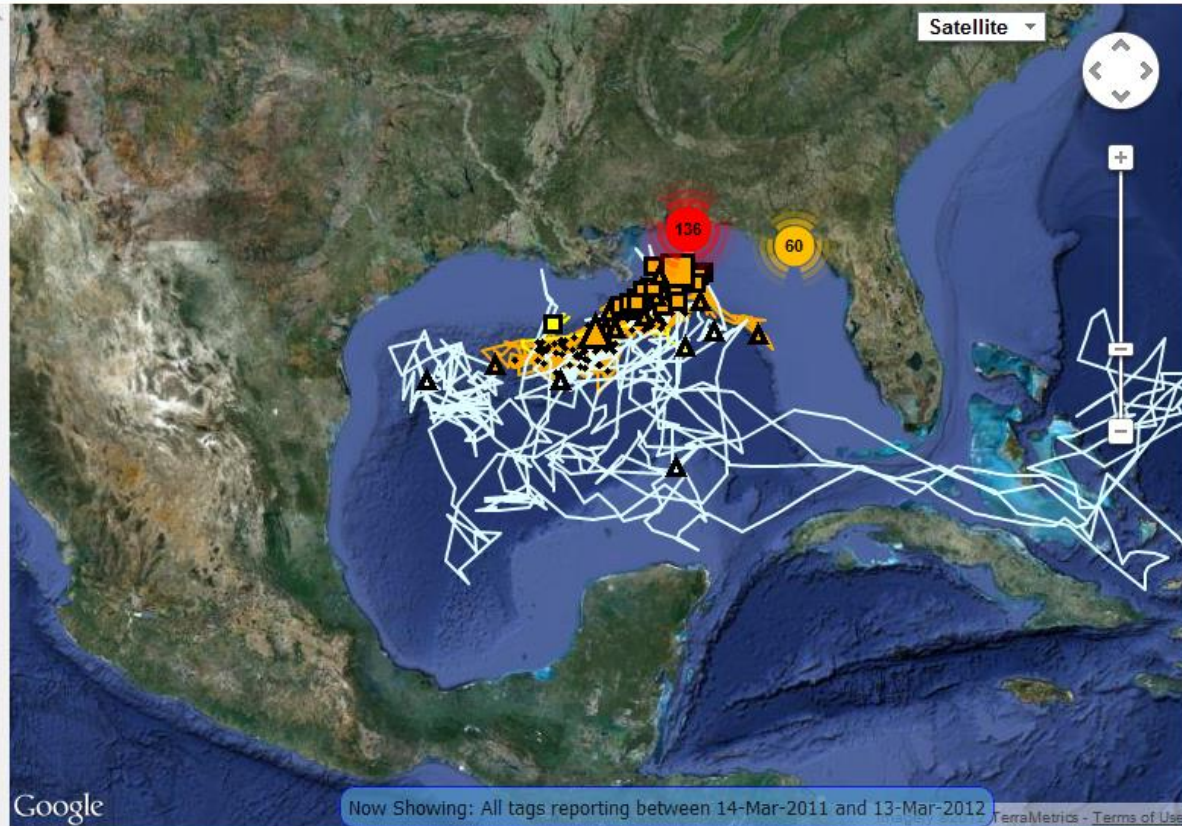
☒ Sharks

☒ Whale Shark

☐ 2010

☒ 2011

☒ 3811001--SSM



Extract tags in selected region by species and time range.

Choose species

Time: Sep 25, 2010

to Oct 14, 2011

days: 384

Show tracks
in region

Remove
region

30 tags crossed
selected region in
chosen 365 days

SW: 19.99,-98.514
NE: 30.77,-81.486

[Remove satellite overlay](#)

GulfTOPP

Tagging of Pelagic
Predators
Gulf of Mexico

Logged in as Barbara Block (The Chief

Scientist)

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[Log Out](#)

[Home](#)

Browse GulfTOPP tags with the tree OR extract tags in a region by species and time range with the menu below the map.

[Help](#)

☐ Cetaceans

☐ Sperm Whale

☐ Fish

☒ Atlantic Bluefin Tuna

☐ 2007

☐ 2008

☐ 2009

☒ 2010

☐ 5110056-MA0110A0662-SS

☒ 5110058-MA0110A0674-SS

☐ 5110059-MA0110A0675-SS

☐ 5110060-MA0110A0677-SS

☐ 5110061-MA0110A0678-SS

☐ 5110062-MA0110A0679-SS

☐ 5110063-MA0110A0680-SS

☐ 5110064-MA0110A0681-SS

☐ 5110067-MA0110A0726-SS

☐ 5110068-MA0110A0727-SS

☐ 5110070-MA0110A0729-SS

☐ 5110072-MA0110A0732-SS

☐ 5110073-MA0110A0733-SS

☐ 5110074-MA0110A0734-SS

☐ 5110075-MA0110A0685-SS

☐ 5110076-MA0110A0687-SS

☐ 5110077-MA0110A0690-SS

☐ 5110078-MA0108A0623-SS

☐ 5110080-MA0110A0731-SS

☐ 5110083-MA0110A0632-SS

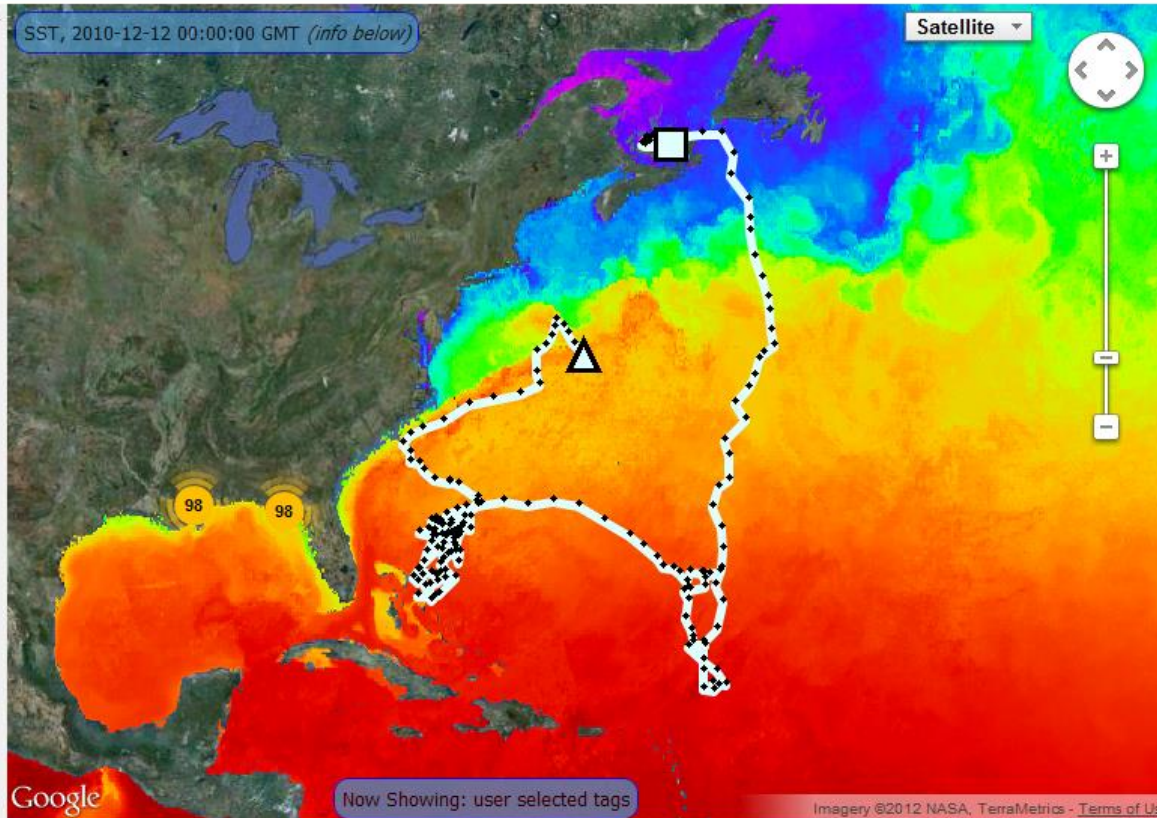
☐ 5110085-MA0110A0802-SS

☐ 5110087-PAM110P0237-SS

☐ 5110088-MA0110A0763-SS

☐ 5110089-MA0110A0801-SS

☐ Gulf Sturgeon



Extract tags in selected region by species and time range.

Choose species

Time: Sep 20, 2010

to Mar 26, 2011

days: 187

Show tracks
in region

Remove
region

1 user selected
tags on the map

SW: 19.99,-98.514
NE: 30.77,-81.486

Environmental Data Information:

SST, Blended, Global, EXPERIMENTAL (8 Day Composite)

Provided by: CoastWatch West Coast Regional Node

[Data Information](#)

[Download this data](#)

[Remove satellite overlay](#)

GulfTOPP

Tagging of Pelagic
Predators
Gulf of Mexico

Logged in as Barbara Block (The Chief

Scientist)

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[Home](#)

Browse GulfTOPP tags with the tree OR extract tags in a region by species and time range with the menu below the map.

[Help](#)

Cetaceans

☐ Sperm Whale

Fish

Atlantic Bluefin Tuna

☐ 2007

☐ 2008

☐ 2009

☒ 2010

☐ S110056-MA0110A0662-SS

☒ S110058-MA0110A0674-SS

☐ S110059-MA0110A0675-SS

☐ S110060-MA0110A0677-SS

☐ S110061-MA0110A0678-SS

☐ S110062-MA0110A0679-SS

☐ S110063-MA0110A0680-SS

☐ S110064-MA0110A0681-SS

☐ S110067-MA0110A0726-SS

☐ S110068-MA0110A0727-SS

☐ S110070-MA0110A0729-SS

☐ S110072-MA0110A0732-SS

☐ S110073-MA0110A0733-SS

☐ S110074-MA0110A0734-SS

☐ S110075-MA0110A0685-SS

☐ S110076-MA0110A0687-SS

☐ S110077-MA0110A0690-SS

☐ S110078-MA0108A0623-SS

☐ S110080-MA0110A0731-SS

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☐ S110087-PAM110P0237-SS

☐ S110088-MA0110A0763-SS

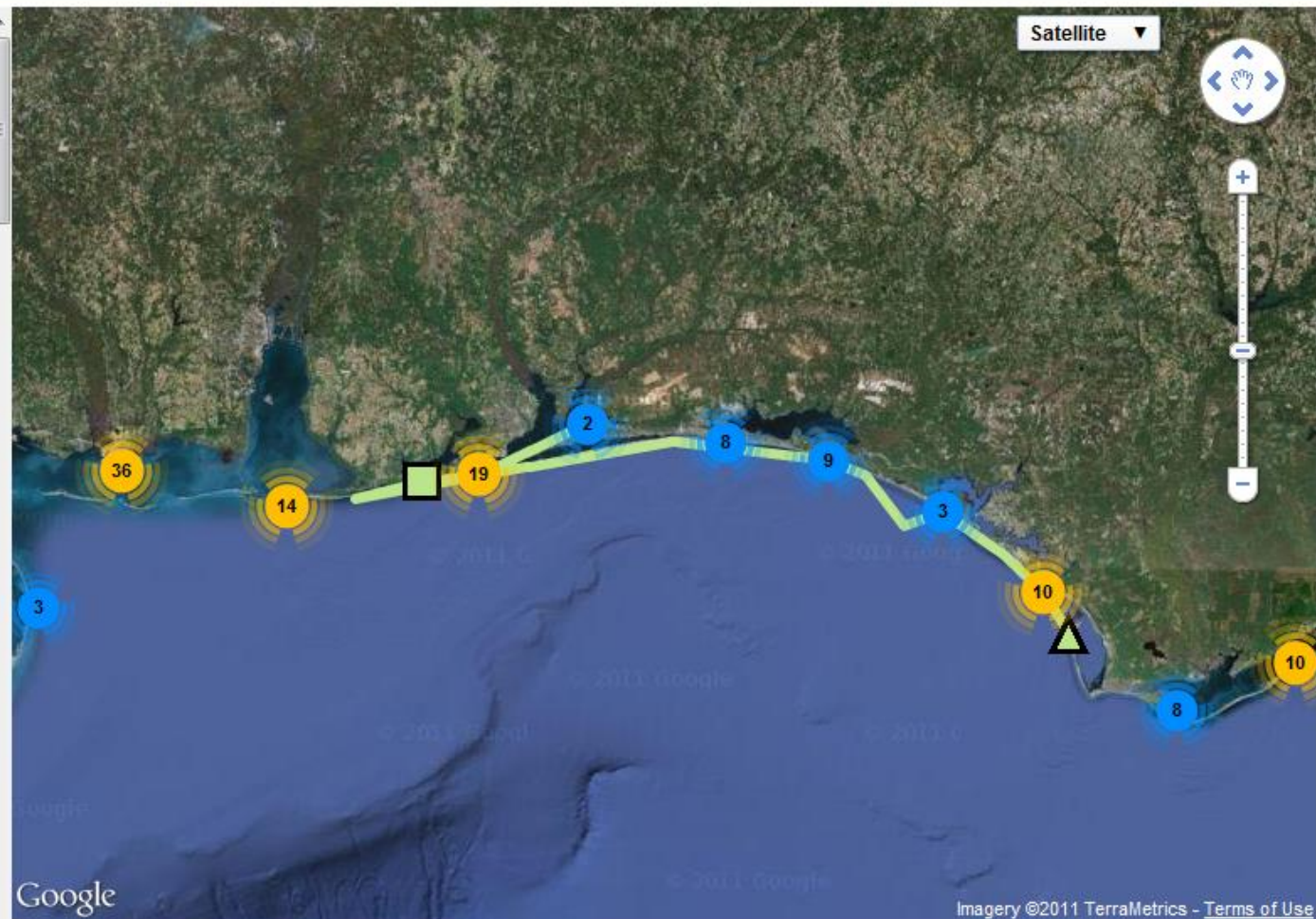
☐ S110089-MA0110A0801-SS



Browse GulfTOPP tags with the tree OR extract tags in a region by species and time range with the menu below the map.

Help

Fish

☐ Atlantic Bluefin Tuna☐ 2007☐ 2008☐ 2009☐ 2010☒ Gulf Sturgeon☒ 2010☐ GS10000-46789-ACOU☒ GS10001-10270-ACOU☐ GS10002-10143-ACOU☐ GS10003-10160-ACOU☐ GS10004-10175-ACOU☐ GS10005-10140-ACOU☐ GS10006-10271-ACOU☐ GS10007-10150-ACOU☐ GS10008-46573-ACOU☐ GS10009-10152-ACOU☐ GS10010-10277-ACOU☐ GS10011-10263-ACOU☐ GS10012-10166-ACOU☐ GS10013-10141-ACOU☐ GS10014-45719-ACOU☐ GS10015-46161-ACOU☐ GS10016-46147-ACOU☐ GS10017-45717-ACOU☐ GS10018-61029-ACOU☐ GS10019-46151-ACOU☐ GS10020-46150-ACOU☐ GS10021-46160-ACOU☐ GS10022-46154-ACOU

Extract tags in selected region by species and time range.

Choose species

Time: Oct 15, 2010 to Nov 10, 2010 days: 26

**Show tracks
in region****Remove
region**1 user selected
tags on the mapSW: 19.99,-98.514
NE: 30.77,-81.486

Remove satellite overlay

GulfTOPP

Tagging of Pelagic
Predators
Gulf of Mexico

Logged in as Barbara Block (The Chief
Scientist)

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[Log Out](#)

[Home](#)

Browse GulfTOPP tags with the
tree OR extract tags in a region
by species and time range with
the menu below the map.

[Help](#)

☐ Cetaceans

☐ Sperm Whale

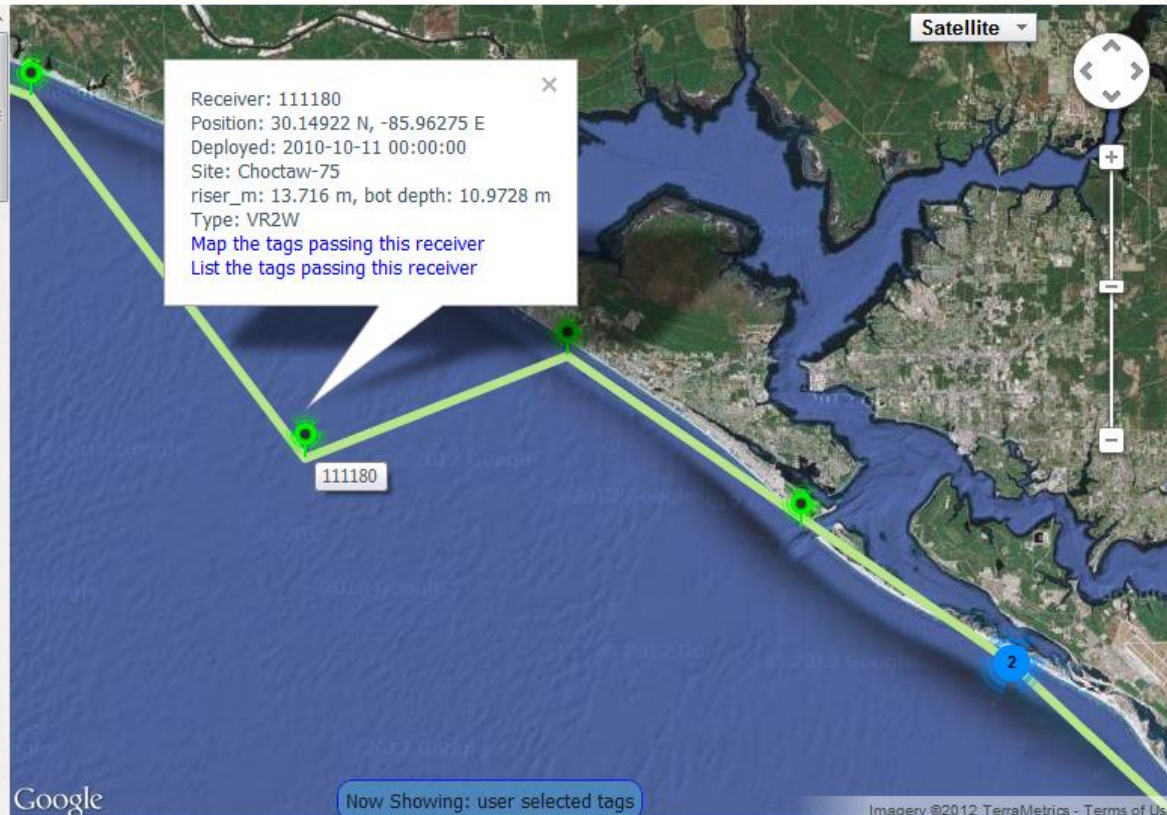
☐ Fish

☐ Atlantic Bluefin Tuna

☒ Gulf Sturgeon

☒ 2010

- ☐ GS10000-46789-ACOU
- ☒ GS10001-10270-ACOU
- ☐ GS10002-10143-ACOU
- ☐ GS10003-10160-ACOU
- ☐ GS10004-10175-ACOU
- ☐ GS10005-10140-ACOU
- ☐ GS10006-10271-ACOU
- ☐ GS10007-10150-ACOU
- ☐ GS10008-46573-ACOU
- ☐ GS10009-10152-ACOU
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- ☐ GS10011-10263-ACOU
- ☐ GS10012-10166-ACOU
- ☐ GS10013-10141-ACOU
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- ☐ GS10015-46161-ACOU
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- ☐ GS10017-45717-ACOU
- ☐ GS10018-61029-ACOU
- ☐ GS10019-46151-ACOU
- ☐ GS10020-46150-ACOU
- ☐ GS10021-46160-ACOU
- ☐ GS10022-46154-ACOU
- ☐ GS10023-46156-ACOU
- ☐ GS10024-46144-ACOU
- ☐ GS10025-46148-ACOU



Extract tags in selected region by species and time range.

Choose species

Time: Oct 15, 2010

to Nov 10, 2010

days: 26



Show tracks
in region

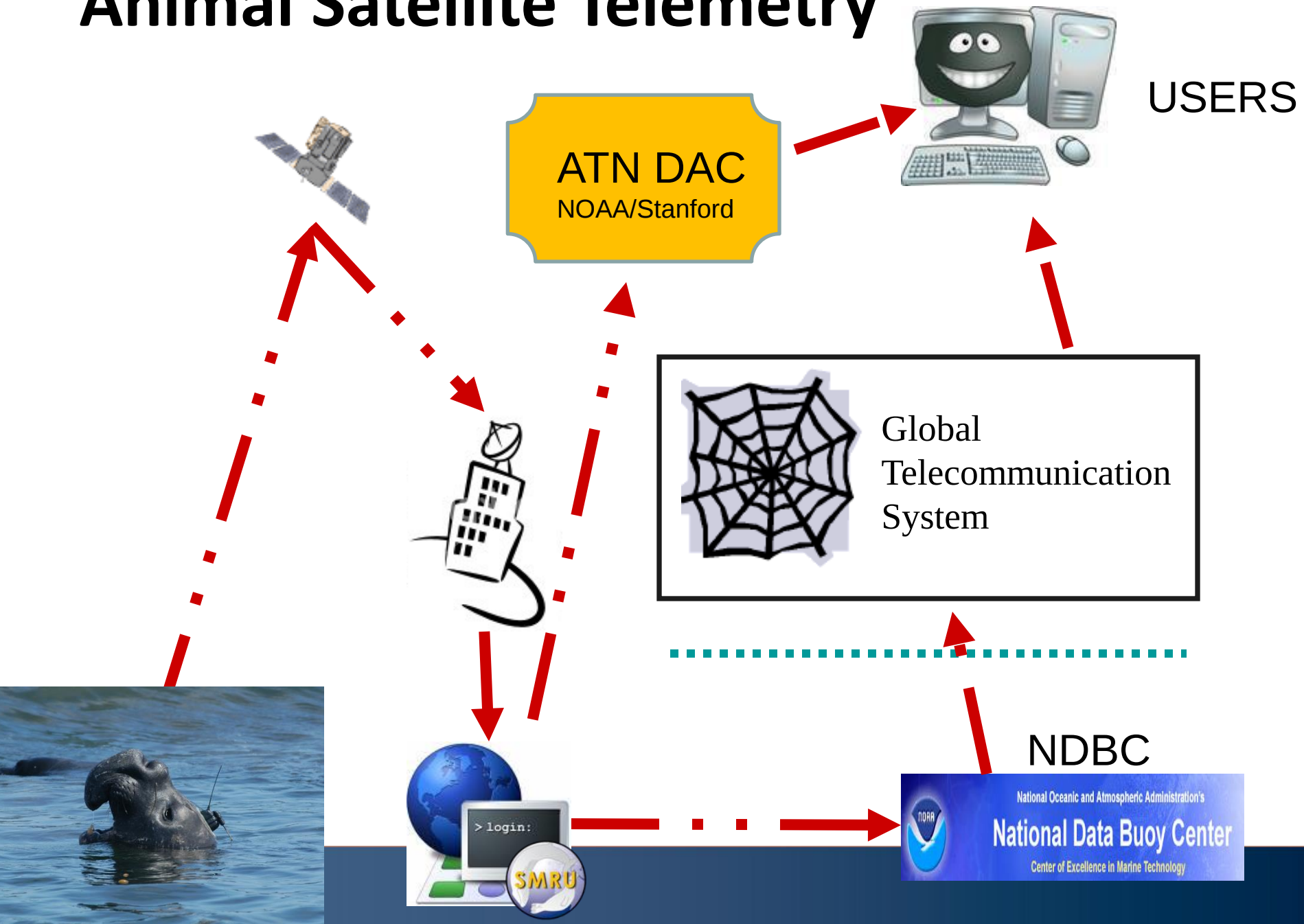
2 user selected
tags on the map

Remove
region

SW: 19.99, -98.514
NE: 30.77, -81.486

[Remove satellite overlay](#)

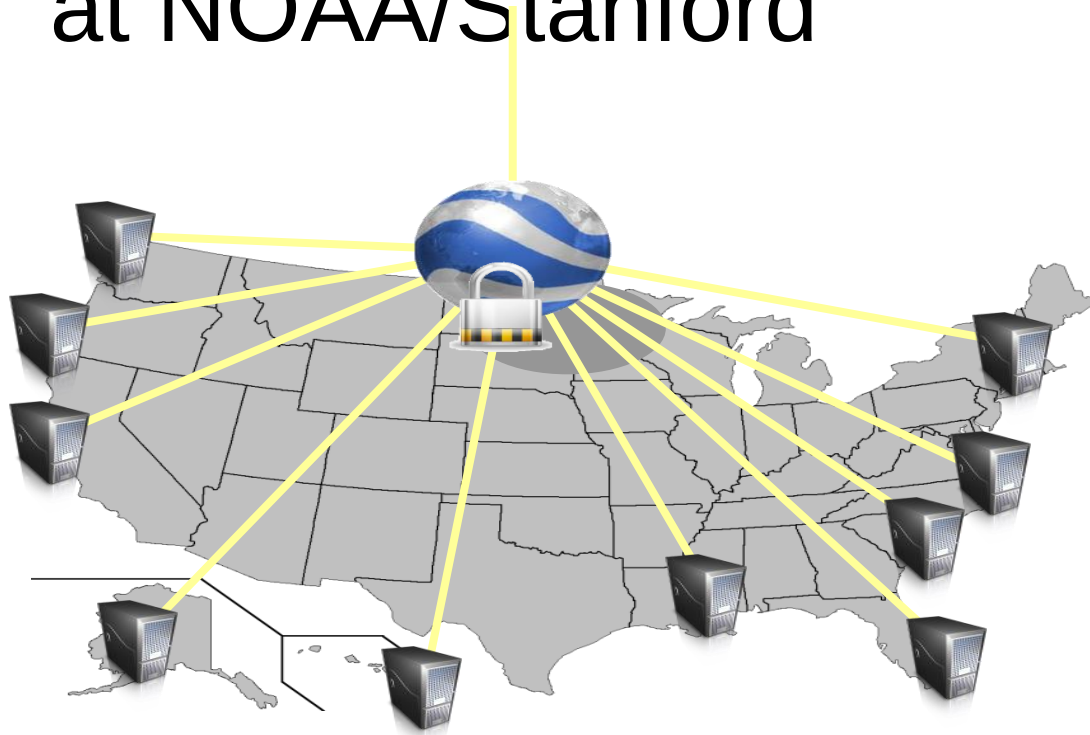
Animal Satellite Telemetry



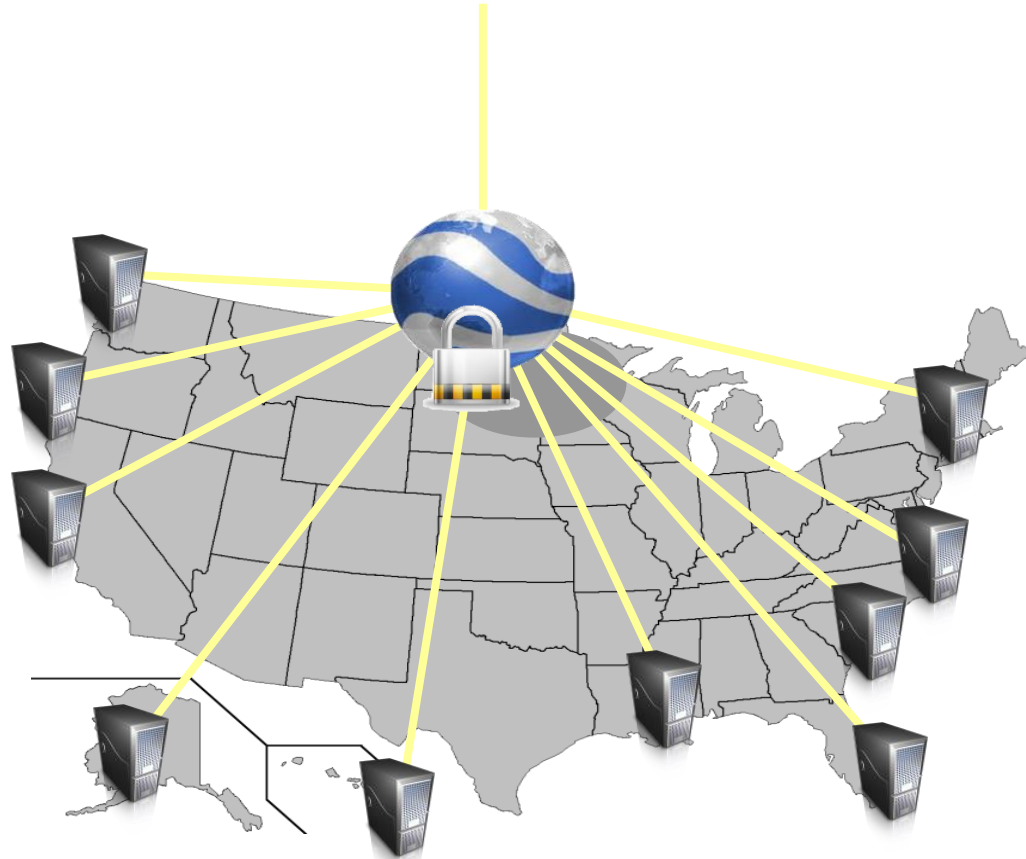
Options for AAT Data

1. Aggregate AAT Data at RAs

Duplicate NANOOS AAT capability in all RAs and Link to IOOS RCV or ATN DAC at NOAA/Stanford



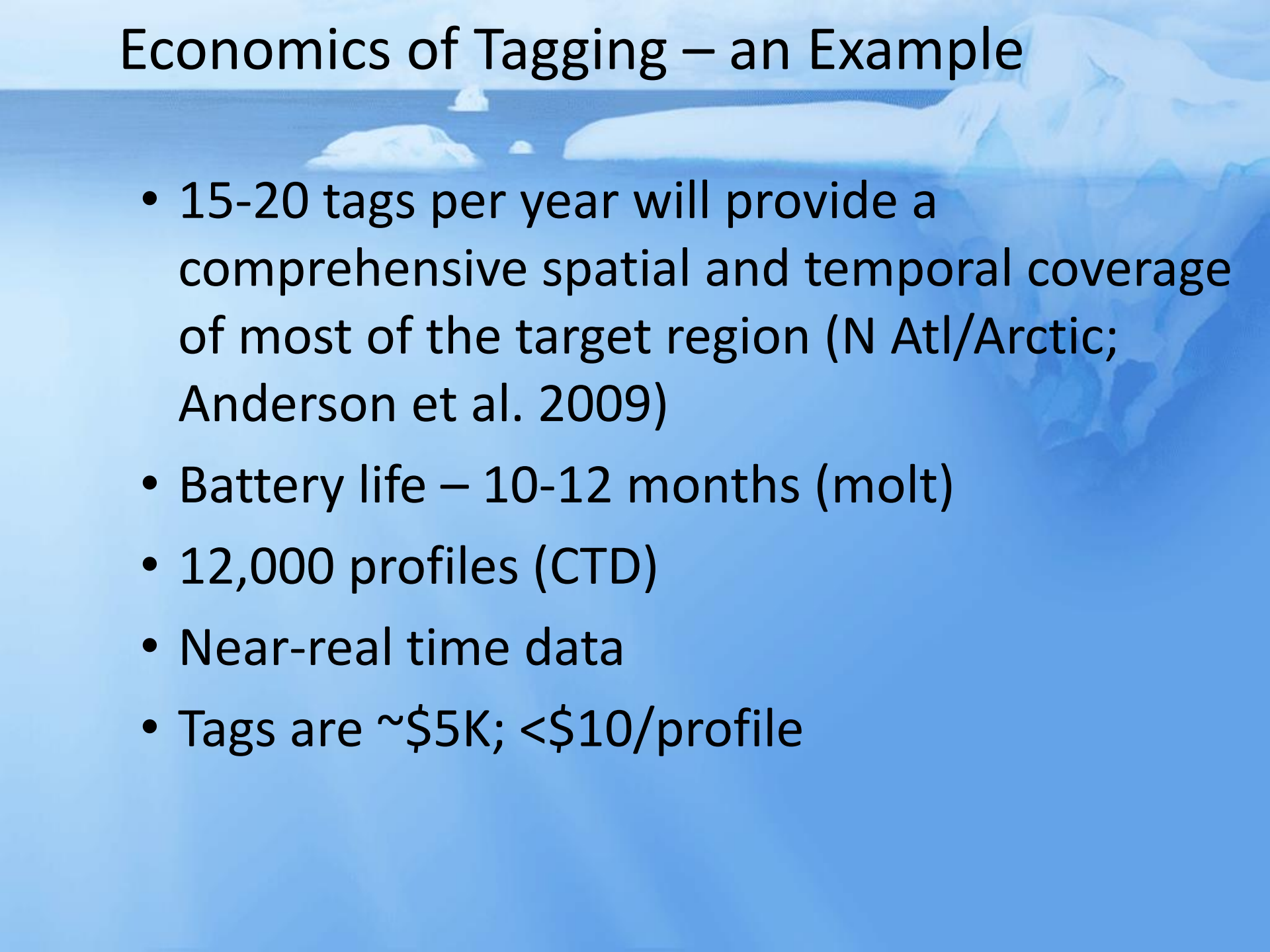
2. Aggregate AAT Data directly at the ATN DAC



Questions &
Comments?
Likes & Dislikes?



Economics of Tagging – an Example

The background of the slide is a photograph of several icebergs floating in a blue ocean. The icebergs are white and vary in size, with some showing jagged, broken edges. The sky is a pale blue, and the overall scene is serene and cold.

- 15-20 tags per year will provide a comprehensive spatial and temporal coverage of most of the target region (N Atl/Arctic; Anderson et al. 2009)
- Battery life – 10-12 months (molt)
- 12,000 profiles (CTD)
- Near-real time data
- Tags are ~\$5K; <\$10/profile