# SECOORA-CARICOOS ANIMAL TELEMETRY NETWORK WORKSHOP SUMMARY REPORT

Identifying Regional Needs and Priorities for Animal Telemetry Observations of Aquatic Species MARCH 28-29. 2017 HILTON TAMPA AIRPORT WESTSHORE TAMPA, FLORIDA

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### WORKSHOP SPONSORS



Thanks to our planning committee, sponsors, and all who helped make this workshop a success. Special thanks to Kayla Witeck and Abbey Wakely for their valuable assistance recording and distilling the notes that serve as the basis for this report. We also thank Vemco for hosting the evening reception.

#### **Report Contents**

Overview
Workshop Highlights4
Workshop Conclusions5
Objective I 5
Objective II6
Objective III7
Objective IV9
Speakers
Breakout Sessions14

Cover photo: An adult black drum tagged with a long life acoustic transmitter in the Banana River Lagoon, Florida. Tracking studies have revealed that black drum in Florida estuaries often inhabit the same site for several years but undertake extensive coastal migrations once moving to open Atlantic waters.

Image Credit: Eric Reyier, Kennedy Space Center Ecological Program

# OVERVIEW

As called for in the U.S. Animal Telemetry Network (ATN) Implementation Plan 1, SECOORA (Southeast Coastal Ocean Observing Regional Association), CARICOOS (Caribbean Coastal Ocean Observing System), and U.S. IOOS (Integrated Ocean Observing System) convened a southeast and Caribbean regional ATN workshop on March 28–29, 2017. Workshop participants from multiple agencies and organizations, including NOAA, the National Park Service, the Bureau of Ocean Energy Management (BOEM), Florida Fish and Wildlife Conservation Commission, International Game Fish Association, Chicago Zoological Society, and more worked together over the two days to address four objectives:

**Objective I.** Identify and prioritize regional telemetry research and potential keystone monitoring and observational needs.

**Objective II.** Review the existing regional telemetry observing assets and scientific capabilities and provide a state-of-the-region analysis.

**Objective III.** Document existing examples of stakeholder use of telemetry data (e. g., understanding fish distribution, mortality, migration, design of protected areas, definition of essential habitat for species protected by the Endangered Species Act [ESA] and Marine Mammal Protection Act [MMPA], socioeconomics, fisheries management, and others).

**Objective IV.** Identify data management challenges and showcase the SECOORA-FACT Acoustic Node as a regional tool with global linkages for data management, sharing, and collaboration. Consider needs common to other regions and discuss strategies for applied, collaborative research across geographies and disciplines.

Twenty-one speakers covered topics that provided perspectives from the commercial, resource management, and research communities.

Breakout sessions were held to address the following tasks: 1) Create a matrix of observational needs within SECOORA and CARICOOS versus the assets currently in place to collect them and decide how should it be organized, 2) If money was no issue (or if the ATN was given \$1 million a year for ten years), what would a baseline network look like? and 3) What are the effective telemetry data-sharing pathways outside and within the regions and how should they be implemented?

https://ioos.noaa.gov/project/atn/

Large aggregation of blacktip sharks Image Credit: Anonymous

# WORKSHOP HIGHLIGHTS

### I. STAKEHOLDER MONITORING/OBSERVATIONAL NEEDS

- Occurrence, distribution, abundance and abundance distribution, spatial use, foraging ecology, movement, habitat use, long-term residency times and patterns, connectivity shoals as a fish habitat, residency on dredge sites
- Correlation of fish migration patterns with chemical and physical oceanographic properties, arrival and departure time, mortality estimates, population structure and fish aggregation locations
- Life history recordings that do not involve animal mortality and are not stratified by the time of year or movement by month and age class
- Soniferous fish, cobia, pompano, gulf kingcroaker, red drum, white/scalloped hammerhead and lemon/bull/blacktip sharks, spotted eagle rays, devil rays, snook, goliath grouper, manatees, sea turtles, tarpon
- North Atlantic right whales, sperm whales, Bryde's whales, bottlenose dolphins

### II. EXISTING OBSERVING ASSETS

- FACT: 900 receivers, 3,180 tags, 83 species, 45 member organizations
- USCAN: 130 receiver, 900 tags
- U.S. Geological Survey (with BOEM): 272 satellite tags and 259 acoustic tags (2006-2016)
- iTAG: >1,000 receivers, 2,000 tags, 85 members
- Sarasota Dolphin Research Program: Extensive tag development/deployment—satellite and acoustic
- Duke University Marine Lab: Broad Navy telemetry support—satellite, DTAG, passive acoustic

### III. STAKEHOLDER USE OF TELEMETRY DATA

- Inform Outer Continental Shelf development policy decisions.
- Support conservation management/habitat protection of economically important species.
- Guide management efforts and assess effectiveness of conservation measures and boundaries for marine protected areas (MPAs), sanctuaries, monuments, and national parks.
- Ensure compliance of military training activities with federal environmental laws and regulations.
- Evaluate site fidelity and connectivity between MPAs and establish critical habitats for selected species.

### IV. IDENTIFY DATA MANAGEMENT CHALLENGES

- Be cognizant of state rules versus community governance of data availability (e.g., FACT, iTAG).
- Be aware that federally funded work must be PARR (Public Accessibility to Research Results) compliant; details are funding-agency dependent.
- Increase the emphasis on data-sharing for regional intramural and extramural collaborative relationships.
- Highlight the distinction between data being available only to view versus data being available to download and use.
- Consider making regional level information sharing a requirement in order to obtain a tagging permit.
- Integrate and standardize telemetry data in an accessible portal for managers to use so that NMFS can effectively implement Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) regulations.

# WORKSHOP CONCLUSIONS

# **OBJECTIVE I: Identify and Prioritize Regional Telemetry Research and Potential Keystone Monitoring/Observational Needs.**

THEME A: Continue telemetry and tagging to understand the environmental impacts on migratory patterns of species.

**THEME B:** Sustain the system while increasing and supporting collaborations to help long-term monitoring and ecosystem-based management efforts.

THEME C: Incorporate new technology into future monitoring efforts.

THEME D: Increase data accessibility and discoverability.

#### **FEDERAL AGENCIES**

**The Bureau of Ocean Energy Management (BOEM)** uses the information that is collected to work with industry (including renewable energy). The species they are interested in are soniferous fish, sea turtles (using satellite telemetry), and the North Atlantic right whale. The agency is multiplying their access to Vemco receivers, tracking 500 fish of fifteen different species, and plans to include more glider research and passive and active acoustic monitoring of soniferous fish.

**Caribbean Region National Park Service (NPS)** is working with partners to keep existing acoustic units operational while working to establish a more permanent and sustained acoustic array to evaluate patterns on the shelf.

**Kennedy Space Center Ecological Program and NASA** are investigating the effect of dunes and renourishment projects on fish and shark nurseries. Their tagging projects are focused on surf zone fish like pompano, gulf kingcroaker, red drum, scalloped hammerhead, and lemon sharks. They supported a NASA survey and extended it to examine shoals as a fish habitat and residency on dredge sites. They have been encouraged by NASA to look at the estuarine side of the acoustic arrays.

The U.S. Navy uses field monitoring methods to gather telemetry data for baseline data of cetaceans as well as movement, habitat use, and bycatch reduction measures for sea turtles. They will use DTAGs (recording depth, temperature, and three-dimensional motion) to provide short-term, fine scale behavior data, satellite tags showing medium-term movement, and photo-identification giving long-term residency patterns.

**The National Marine Fisheries Service (NMFS)** manages 26 cetacean species and 90 stocks. Their priority marine mammal stocks are the North Atlantic right whale, sperm whale, Bryde's whale, bottlenose dolphin, and small bay/estuary and coastal stocks. The agency uses dive recordings and reporting telemetry tags to improve the accuracy of abundance estimation for deep diving marine mammals and sea turtles. They continue to work on development of Low Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) tag attachment types, as well as behavioral tags, to improve on migratory models and abundance estimates. NMFS is interested in technical improvements in tags that include better ways to tag free-swimming cetaceans, longer battery life, and using tags/animals as ocean sensors.

**NOAA National Centers for Coastal and Ocean Science (NCCOS)** uses fish movement, residence times, and connectivity to enable realistic applications of marine parks and monument boundaries. NOAA would like to increase efforts to maximize data and asset sharing within the community.

**The National Park Service (NPS)** is interested in easier data accessibility and discoverability tailored for resource managers. The agency introduced software by which they can take VRL (Vemco Receiver Log) files and put them into a database to send to collaborators and is working to establish more transparency with data sharing.

The U.S. Geological Survey (USGS) priority is in-water sea turtle habitat use with a synergistic approach of combining satellite telemetry data with acoustic telemetry and habitat maps.

#### STATE AGENCIES/RESOURCE MANAGERS

**Fish and Wildlife Research Institute (FWRI) and Georgia Department of Natural Resources (GA DNR)** track cobia along the Atlantic Seaboard and into the Gulf of Mexico in order to establish management lines and stock division of the species. They encourage other groups to collaborate to deploy additional tags in their research areas.

The Florida Fish and Wildlife Conservation Commission (FWC) Manatee Program is interested in using DTAG capabilities to help determine seasonal ranges of manatees in relation to foraging sites.

**GA DNR** is investing fish tagging efforts on tripletail (a popular recreational species). Future telemetry projects include continuing the red drum habitat utilization project and data collection for cobia management. GA DNR is facing possible removal of a critical coastal acoustic receiver line that many user groups along the Atlantic use for acoustic telemetry in the region.

**Massachusetts Marine Fisheries'** highest priorities are collaborative coastal acoustic lines and deploying sufficient numbers of satellite tags. Massachusetts Marine Fisheries needs life history recordings that do not involve animal mortality and are not stratified by the time of year and movement by month and age class.

#### COMMERCIAL/NGO STAKEHOLDERS

**Chicago Zoological Society/Sarasota Dolphin Research Program** has collaborative efforts underway in Sarasota Bay on multi-taxa observations including bull sharks, blacktip sharks, juvenile sharks, spotted eagle rays, devil rays, snook, goliath grouper, manatees, and sea turtles.

**Bonefish & Tarpon Trust** is working with FWC to set up an array in Cuba to monitor scale connectivity on tarpon and bonefish genetics.

**Commercial industry** is interested products that detail the analysis, results, and connectivity of oceanographic data. This includes application of real-time observation data. Using the fishing industry as a partner in telemetry can provide less expensive observing platforms of opportunity.

# **OBJECTIVE II:** Review the existing regional telemetry observing assets and scientific capabilities and provide a state-of-the-region analysis.

FACT Network:	900 receivers, 3,180 tags, 83 species, 45 member organizations
U.S. Caribbean Acoustic Network (USCAN):	130 receivers, 900 tags
USGS (with BOEM):	272 satellite tags and 259 acoustic tags [2006-2016]
iTAG:	>1,000 receivers, 2,000 tags, 85 members
Sarasota Dolphin Research Program:	Extensive tag development/deployment—satellite and acoustic
Duke University Marine Lab:	Broad Navy telemetry support—satellite, DTAG, passive acoustic

#### STATE OF THE REGION ANALYSIS

The breakout groups recommended how to conduct a regional analysis to help the Animal Telemetry Network document a baseline network for a national plan. Summary of recommendations for doing a state-of-the-region analysis include:

- Generate a map that lists all assets currently deployed in the water.
- Perform a cost-benefit analysis for existing arrays by reviewing historical data to define optimum receiver locations.
- Create a list of metrics to help determine priority locations (example of metrics could be: number of detections, grant project longevity, etc.).
- Ask each collaborative network (FACT, iTAG, etc.) to develop a budget to maintain their regional network. The budget could include estimation of costs for acoustic/satellite hardware, receivers, operations/maintenance, data management, deployments, and a full-time network coordinator.
- Identify known marine animal migrations to decide where collaborations are necessary.
- Include existing and new infrastructure as potential array hosts (e.g., buoys).
- Incorporate future technology into the plan (such as gliders).

# **OBJECTIVE III:** Document existing examples of stakeholder use of telemetry data.

**THEME A:** Inform policy decisions on the development of energy and mineral resources on the Outer Continental Shelf (OCS) that are compliant with federally mandated legislation.

**THEME B:** Support science needs assessments, guide management efforts, and assess effectiveness of conservation measures for MPAs/sanctuaries/monuments/national parks. Assess the efficacy of monument boundaries, quantify habitat usage and home range patterns, determine migration timing and spawning aggregation sites, and evaluate site fidelity and connectivity between MPAs.

**THEME C:** Establish critical habitats for selected species; inform Take Reduction Teams (TRT), Marine Mammal Protection Act (MMPA) permit applications, ESA Section 7 consultations, release decisions, and animal health; better understand the impacts of long-line fishing; determine which areas are important to migratory marine species; perform post-intervention follow-up monitoring to evaluate the need for animal rehabilitation; research to support conservation management/habitat protection of economically important species.

#### **FEDERAL AGENCIES**

**BOEM** supports conservation and the use of applied data to make informed decisions about the environment and the ocean that comply with ESA, Magnuson-Stevens Fishery Conservation and Management Act, and the National Environmental Policy Act (NEPA). BOEM has also funded many renewable energy telemetry studies in the Atlantic to determine which areas are important to migratory marine species and has worked with industry to ensure environmentally compliant development.

**U.S. Navy/NAVFAC/Atlantic Marine Species Monitoring Program** is responsible for compliance of their training activities with a suite of federal environmental laws and regulations that apply to marine mammals and other marine protected species, including the ESA and the MMPA. Complex training range monitoring plans, including short- and long-term marine animal tagging telemetry, have been developed to address the monitoring requirements of the ESA and MMPA across the various geographic regions where the U.S. Navy operates.

**NOAA/NMFS** uses telemetry data for marine mammal stock assessment in the U.S. Atlantic, from Florida to North Carolina, the Gulf of Mexico, and the U.S. Caribbean, including Puerto Rico and the Virgin Islands. Telemetry data are used to establish critical habitats, inform TRTs, MMPA permit applications, ESA Section 7 consultations, release decisions, and animal health, as well as to better understand the impacts of long-line fishing on pilot whales by identifying their seasonal movements and interactions with the fishery.

**USGS** uses satellite and acoustic tags as well as standard mark-recapture studies to collect data on survival, population growth rates, habitat use, and stock identification of sea turtles, all of which are vital for understanding whether conservation measures are effective. Many projects (Everglades, Buck Island, and Dry Tortugas) are implemented involving modeling of marine turtle movement and habitat use, which describe how important connectivity is to their research.

**NOAA/NPS/USVI** collected acoustic tracking data at the Coral Reef National Monument and examined fine-to-broad scale fish movements within and between the park/monument, and surrounding waters, establishing an ecological connectivity between the two. A continuing study in St. John at Coral Bay is examining fish movements and residence times to evaluate the efficacy of monument boundaries.

**NPS' Southeast Region** uses telemetry data to assess the effectiveness of specially managed zones, such as Marine Reserves and MPAs, and to better understand habitat use, climate change, and impacts of human use, invasive species, stranding research, and gulf restoration. In the Caribbean Region, the NPS is using telemetry data from threatened and endangered species, as well as ecologically and commercially important fish to quantify habitat usage and home range patterns, to determine migration timing and spawning aggregation sites, and to evaluate site fidelity and connectivity between individual MPAs.

#### STATE AGENCIES/RESOURCE MANAGERS

**Florida Fish and Wildlife Conservation Commission (FWC)** uses satellite telemetry to determine seasonal ranges of manatees in relation to foraging sites, to measure how manatees respond to approaching watercraft, and to infer what will happen to these animals when there is a loss of habitat. Telemetry data also support their manatee protection and conservation program through scientific research and education.

**South Carolina Department of Natural Resources** implemented a three-year, multistate sturgeon study with the following objectives: i) better address the distribution and migration range, ii) identify critical habitats, and iii) document the degree of inter-basin transfer occurring for both species of sturgeon. Through the FACT network, they obtained and shared detection data that verified that there was a north/south migration, which is also used to determine how dredging impacts the presence of animals off the coast.

**Massachusetts Marine Fisheries** tracked the distribution of white sharks in the western North Atlantic that goes from the Gulf of Mexico to Canada; satellite telemetry tracking data provide great connectivity between north and south organizations involved. The data are used to examine fine- and broad-scale movements, habitat use, site fidelity, residency, and feeding behavior. Results illustrate both ecological and human recreational points applications and have inspired interest in researching both local movement as well as effects of abiotic and biotic parameters.

**The FACT Network** is a partnership of 45 marine research organizations using acoustic telemetry to reveal the movement and behavior of fishes and sea turtles in U.S. South Atlantic, Bahamas, and Caribbean Sea. The members collectively maintain 900 underwater acoustic receivers. The telemetry data provide information about a species' habitat preferences, migration patterns, stock mixing, and survival. In addition to advancing basic knowledge of these species, these results help guide management strategies for species of economic value to the region or those requiring special conservation attention.

**iTAG/FWC** is an active, informal regional animal tracking consortium created to demonstrate how the added value of collaboration among many can result in better science and conservation. The group uses telemetry data to support iTAG/FWC research interests, including spawning site selection and rebirth rate, integrating telemetry and genetic tracking to understand spawning population abundance over time, and the influence of temporal and spatial scales, plus group behavior and predator/prey dynamics.

#### COMMERCIAL/NGO STAKEHOLDERS

**The Chicago Zoological Society/Sarasota Dolphin Research Program** has collected forty years of telemetry data in combination with evolving telemetry techniques in Sarasota Bay, a natural laboratory setting for bottlenose dolphins. VHF and satellite tags have helped define the bottlenose dolphin stock in St. Joseph Bay, Florida and near Brunswick and Sapelo Island, Georgia. Satellite-linked tags were deployed in 2013 near Mississippi Sound to define dolphin ranging patterns relative to the Deepwater Horizon oil spill. These studies can be very helpful for the post-intervention follow-up monitoring to evaluate the need for animal rehabilitation.

The commercial and recreational fishing industries have used telemetry data to answer baseline questions about where the fish are going and what they are doing and to correlate fish activities with physical and chemical ocean conditions; telemetry data help to establish migration patterns, identify outliers, find fish hotspots, determine population structure and estimates of fish mortality, and identify unit stock plus fish aggregation around topographic features.

**IGFA** – **International Great Marlin Race (IGMR)** is the largest citizen-science billfish conservation project in the world and contributes to knowledge about the diversity of migratory patterns and the factors that influence them, resulting in better management strategies.

**Bonefish & Tarpon Trust** focuses, among other things, on flats fisheries, including bonefish, tarpon, and permit. They fund and conduct research that is directly applicable to conservation management/habitat protection of those economically important species.

**OBJECTIVE IV.** Identify data management challenges and showcase the **SECOORA-FACT** Acoustic Data Node as a regional tool with global linkages for data management, sharing, and collaboration. Consider needs common to other regions and discuss strategies for applied, collaborative research across geographies and disciplines.

#### DATA MANAGEMENT CHALLENGES RECOMMENDATIONS FOR COLLABORATIVE ANIMAL TELEMETRY

- Be aware of state rules versus community governance of data availability (e.g., FACT and iTAG). Some states (e.g., North Carolina) require data to be publicly available immediately after collection and to be stored in a state repository.
- Be aware that federally funded work must be PARR (Public Accessibility to Research Results) compliant; details are agency dependent.
- Ocean Tracking Network- (OTN) compliant nodes enable easy sharing of acoustic telemetry data among collaborating regions as well as mystery/orphan tag identification.
- Formal data-sharing agreements may be needed in some cases among states, institutions, and community-based organizations.
- Regional intramural and extramural collaborative relationships do exist, but the data-sharing part has not yet caught up.
- Consider making regional level information sharing a requirement in order to obtain a permit for tagging, which will minimize data collection overlap.
- Regular meetings, webinars, etc., are very helpful to promote collaboration/data sharing.
- Identifying how much of the data being collected is actually being used is essential.
- Implementing trust among collaborators is essential to successful data sharing; it requires both in-reach and outreach and encourages communication resulting in fair and ethical use of data.
- Highlight the distinction between data being available only to view versus data being available to download and use.
- Some data ARE sensitive and should be kept from immediate public access—e.g., endangered/threatened species, spawning aggregation areas.
- Sharing/exchange agreements should include codes of conduct for collaborators.



Marine biologist Chris Kalinowsky (GADNR) and wife Sarah Lynn Kalinowsky collecting cobia from the nearshore waters of the South Atlantic for age/growth and genetic samples. Image Credit: Chris Kalinowsky

## **SPEAKERS**

#### COMMERCIAL, RESOURCE MANAGEMENT, AND RESEARCH PERSPECTIVES

Over the two-day workshop, representatives from the commercial sectors, resource management agencies, and the research communities discussed regional telemetry applications and stakeholder needs.

#### **U.S. Animal Telemetry Network**

#### Bill Woodward, NOAA-IOOS Animal Telemetry Network Coordinator

The U.S. Animal Telemetry Network (ATN) is a multi-agency program hosted within the NOAA IOOS Program Office and is funded by the Bureau of Ocean Energy Management (BOEM), the National Oceanic and Atmospheric Administration (NOAA), and the Office of Naval Research (ONR). The ATN provides a mechanism to create alliances among federal and nonfederal, state, regional, tribal, and academic partners to maximize collaborations, maximize access to telemetry data, improve data standards and sharing capability, and to bring permanence to a U.S. national baseline telemetry network.

Guided by the ATN Implementation Plan 2016-2021<sup>1</sup>, the ATN began a phased approach to implementation in 2016. Phase I includes convening regional workshops to identify and prioritize regional stakeholder observational needs and uses of telemetry data and to identify existing telemetry assets and capabilities in the region.

1 https://ioos.noaa.gov/project/atn/

#### Roffer's Ocean Fishing Forecasting Service, Inc. Mitchell Roffer, ROFFS<sup>™</sup>

The commercial and recreational fishing industry can benefit substantially from collaborative science-based fisheries management using animal telemetry data to understand fish migrating patterns and their correlation with chemical and physical oceanographic properties, arrival and departure time, mortality estimates, population structure, and fish aggregation locations.

#### **International Game Fish Association**

#### Leah Baumwell, Conservation Coordinator, IGFA Great Marlin Race: A Citizen-Science, Billfish Conservation Project

The IGFA Great Marlin Race, created in 2009 by Barbara Block to encourage recreational fishing as a way of collecting scientific data, has tracked hundreds of fish globally and directly supports the IGFA goal of understanding the ocean ecosystem better so the fishing community can interact with it in a sustainable way.

### NOAA/NPS/USVI Reef Fish Telemetry Studies in St. John and St. Croix

Mark Monaco, NOAA/National Centers for Coastal Ocean Science

Collaborative acoustic tagging/tracking efforts at three locations in the U.S. Virgin Islands have provided information on movement patterns across different habitats and management units to establish ecological connectivity and on residence times and species distribution to evaluate the efficacy of monument boundaries.

#### **NPS Oceans Program**

#### Anna Toline, National Park Service

The Southeast region of the NPS is responsible for the protected coastal areas from Cape Hatteras through Florida to the U.S. Virgin Islands and the Dry Tortugas with multiple regional goals, including to advance the understanding of coastal ecosystems' features, processes, and resources, encourage public awareness and education, and promote research to expand knowledge and make science-based decisions. The NPS resource managers need easily accessible telemetry data to better understand habitat use, climate change, impacts of human use, stranding research, and gulf restoration.

#### **Tracking Manatees for Conservation**

Margie Barlas, FWC/Florida Fish and Wildlife Research Institute

The FWC Manatee Program is dedicated to protecting and conserving the Florida manatee through scientific research and education. While traditional satellite tags with two-year lifetimes have been used regularly to track manatee movements, FWC has recently incorporated acoustic DTAG and TDR technology, which records movement in three dimensions and can help measure how manatees respond to approaching watercraft and help to determine seasonal ranges in relation to foraging sites.

#### Animal Telemetry at the Bureau of Ocean Energy Management—BOEM Atlantic Programs

Mary Boatman, Bureau of Ocean Energy Management

In support of their mission to manage ocean energy and mineral resources on the Outer Continental Shelf in a safe and environmentally sound manner, BOEM applies tagging and telemetry data to understand environmental impacts on migratory patterns of animals and hereby make informed decisions about the environment and the ocean that comply with ESA, Magnuson-Stevens Fishery Conservation and Management Act, and NEPA. BOEM sees a demand for telemetry work for highly endangered species, such as the North Atlantic right whale, with a future vision towards fine-scale movement studies and real-time data monitoring.

#### Using Animal Telemetry in Marine Mammal Management

*Erin Fougères, NOAA/National Marine Fisheries Service (NMFS)/ Southeast Regional Office (SERO)* 

The presentation focused on a review of U.S. laws governing marine mammals and how to use telemetry to address them, as well as to inform marine mammal management and meet MMPA and ESA mandates. Desired future technical improvements to tags and their applications include: better ways to tag free swimming cetaceans, longer battery life, and the use of tags as oceanographic sensors. If data derived from telemetry networks are integrated and standardized in an accessible portal for managers to use, NMFS can effectively implement MMPA and ESA regulations.



Beth Bowers instrumenting a blacktip shark with an acoustic transmitter. Image Credit: Stephen Kajiura

#### Tag Telemetry Data and Marine Mammal Stock Assessment in the Southeast U.S.

Keith Mullin, NOAA/NMFS/Southeast Fisheries Science Center

NMFS uses telemetry data for understanding marine mammal, seasonal movement, risk exposure, and abundance estimates in the U.S. Atlantic—from Florida to North Carolina, the Gulf of Mexico, and the U.S. Caribbean, including Puerto Rico and the Virgin Islands. Their priority marine mammal stocks are the North Atlantic right whale, sperm whale, Bryde's whale, bottlenose dolphin, and small bay/estuary and coastal stocks. Through collaboration with community partners, they are exploring less invasive tags, particularly for assessing right whale migration, and behavioral tags to improve the migratory models and abundance estimates.

#### Sarasota Dolphin Research Program Involvement in Small Cetacean Telemetry in the SE U.S.

#### Randall Wells, Chicago Zoological Society

Research on bottlenose dolphins started in 1970 in Sarasota Bay, Florida, where they have a natural laboratory setting, continue testing new telemetry techniques and gear and have gathered forty years of data. Within the Sarasota Dolphin Research Program, electronic tags have evolved dramatically, allowing researchers to define the bottlenose dolphin stock in St. Joseph Bay, Florida, as well as a similar study near Brunswick and Sapelo Island, Georgia, which led to more NOAA telemetry work off the Georgia coast in 2015. Beyond the SECOORA region, satellite-linked tags were deployed in 2013 near Mississippi Sound to define dolphin ranging patterns relative to the Deepwater Horizon oil spill. These studies can help with the post-intervention follow-up monitoring that determines whether rehabilitation is necessary.

#### The FACT Network: A Community for Collaboration

#### Joy Young, FWRI/The FACT Network

Building the grass-roots FACT community network has dramatically improved the ability of the regional telemetry researchers to conduct their research via intra- and inter-regional collaborative tagging efforts among FACT, iTAG, Atlantic Cooperative Telemetry (ACT) Network, U.S. Carribean Acoustic Network (USCAN), and the Ocean Tracking Network (OTN). These collaborations promote the much needed trust among the researchers to reduce the vulnerability introduced when sharing data. Regular avenues of communication keep everyone accountable to each other and establishes rules for data sharing and publishing among the authors, acoustic receiver array managers, and tag owners.

#### Acoustic Telemetry Research at Cape Canaveral: Projects and Perspectives

Eric Reyier, Kennedy Space Center Ecological Program

The Kennedy Space Center Ecological Program collaborates with other agencies and organizations, such as BOEM, NASA, U.S. Fish and Wildlife Service, NPS, U.S. Navy, and U.S. Air Force, on their ESA and Essential Fish Habitat concerns. New projects on the estuarine side of acoustic arrays are encouraged, e.g., dunes and re-nourishment projects, coastal and estuarine habitats studies, and how sportfish utilize no-take zones. Their focus is primarily on red drum, black drum, and green and loggerhead sea turtles, and they have tagged 250 individuals of nine species. Collaboration with ACT and FACT provide great value with access now to 326 receivers from Tampa Bay to New Jersey.

#### **Georgia's Coastal Telemetry Project**

Chris Kalinowsky, Georgia Department of Natural Resources, Coastal Resources Division

The Georgia DNR/CRD program focuses on acoustic tagging of tripletail, a popular recreational species. A unique aggregation off Jekyll Island occurs every year from April through June, with a rapid development of their recreational use but a lack of biological information on the species. A small array was established to address this issue, but without funding, there is concern that the array could be broken up and distributed among smaller projects. Joining the FACT network has enabled the efficient coordination of acoustic tagging efforts between Georgia and Florida.

#### An Overview of Acoustic Receiver Arrays

#### Bill Post, South Carolina Department of Natural Resources

A significant multistate sturgeon study was implemented in 2010 with multistate universities and organizations to better address the distribution and migration range, identify critical habitats, and document the degree of inter-basin transfer occurring for sturgeon. By affiliation with the FACT network, they obtained and shared detection data that verified that there was a north/ south migration. Attendees were encouraged to participate in community organizations' call for others with coastal receivers to tap into existing data from tag detections.

#### Movement Ecology of the White Shark in the North Atlantic Derived from Multiple Technologies

Greg Skomal, Massachusetts Marine Fisheries

White shark movements detected from satellite and acoustic tags deployed in the western North Atlantic by the Massachusetts Marine Fisheries demonstrate the broad distribution of these animals from the Gulf of Mexico to Canada and that the East Coast population has rebounded since the 1960s through the 1980s. Thanks to the data sharing among the networks, they have also received detections from Canada all along the Eastern seaboard and the Gulf of Mexico. The results from the acoustic detections showed that the white sharks exhibit fidelity with areas of high seal density. The fisheries-dependent sightings and acoustic data have indicated a general seasonal migratory pattern along the continental shelf off the East Coast. Satellite tagging data have indicated that white sharks were shifting to offshore areas in the Atlantic as they age.

#### **MPA Effectiveness Through Collaboration**

#### Clayton Pollock, National Park Service

NPS research objectives in the St. Croix region are to quantify habitat usage and home range patterns, determine migration timing and spawning aggregation sites, and evaluate site fidelity and connectivity between MPAs. NPS now has over 130 receivers and is collaborating directly with the U.S. Virgin Islands with a focus on reef fish like snappers and grunts and are looking forward to including large pelagic species. They have over 600 active tags in two different studies of queen triggerfish and tiger sharks; they found animals traveling from the monument area out to Lang Bank, demonstrating the type of connectivity that they were looking for.



Marine biologist Chris Kalinowsky (GADNR) and junior marine biologist Finn Kalinowsky collecting genetic samples on tripletail in Ossabaw Sound, Georgia. Image Credit: Chris Kalinowsky

#### Duke University Marine Lab Telemetry Program Overview

*Heather Foley, Duke University* 

Some of the first telemetry work at the Duke Marine Lab was a survey funded by the Navy Marine Species Monitoring Program. The study was done at Cape Hatteras and Onslow Bay, North Carolina and Jacksonville, Florida using line-transects, photo IDs, biopsy sampling, passive acoustic monitoring, DTAGing, and satellite tagging to gather data on occurrence, distribution, abundance, density, spatial use, foraging ecology, and baseline behavior of cetaceans. They used acoustic tags for dive behavior tracking but are now switching to more fine-scaled satellite tags. They have successfully used satellite tags on bottlenose dolphin, Cuvier's beaked whale, and short-finned pilot whale research and suggested that combining multiple tagging methodologies could provide more well-rounded, informative data.

#### Tracking Marine Turtles Across the Seascape

Kristen Hart, USGS Wetland and Aquatic Research Center

The USGS has multiple projects involving modeling of marine turtle movement and habitat use; connectivity is important to their research. One project is in the Everglades and Buck Island, where they partnered with BOEM to collect data from 2006 to 2016 with 272 satellite tags and 259 acoustic tags on abundance, density, survival, population growth rates, habitat use, and stock identification. Another project involves satellite and acoustic tagging in the Dry Tortugas, where the receivers collected 28,065 detections of different animals including sharks, fish, and turtles. They have received over seven million detections from their in-water tags. The migration patterns of these animals direct the researchers to where they should be seeking collaboration efforts.

# Integrated Tracking of Aquatic Animals in the Gulf of Mexico (iTAG)

Sue Lowerre-Barbieri, FWC, iTAG

FWC has built an outstanding and very active regional tracking community called iTAG, where their research interests include spawning site selection and rebirth rate, integrating telemetry and genetic tracking to understand spawning population abundance over time, influence of temporal and spatial scales, and group behavior and predator/prey dynamics. The added value of building collaboration within the regional tracking community was further emphasized with the goal of having a detection universe that helps to assess whether the animal left the system.

#### SECOORA – FACT Acoustic Data Node

Joy Young, FWRI/The FACT Network

FACT has a new VEMBU database created in honor and memory of Vembu Subramanian. VEMBU stands for Vemco Biotelemetry User Database, used for storing and sharing acoustic telemetry metadata. The VEMBU database organizes deployment and receiver information, standardizes data collection, uses built-in QA/QC rules to minimize errors, and stores the history of receiver and station maintenance and queries for current receiver and station information. The output is formatted for the FACT node but will also work for other OTN structured nodes.

#### **FACT Database Node**

#### *Jon Pye, Ocean Tracking Network*

OTN is a global research initiative headquartered at Dalhousie University in Halifax, Nova Scotia. The initiative covers in-water operations for all four coasts, the glider program, acoustic telemetry program, buoy or opportunity program, and data shop. OTN has long-term partnerships with Integrated Marine Observing System (IMOS) Animal Tracking Facility in Australia and the South African Institute of Aquatic Biology, as well as those in the U.S. with the Great Lakes Acoustic Telemetry Observing System, and Bill Woodward at the ATN.

# The Cuba Connection: Connectivity with Cuba:Multiple Spatial Scales, Multiple ApproachesAaron Adams, Bonefish & Tarpon Trust, FAU

The Bonefish & Tarpon Trust focuses on flats fisheries, including bonefish, tarpon, and permit. The trust funds and conducts research that is directly applicable to conservation management due to the annual economic impacts. Studies in the Florida Keys, Belize, and the Bahamas have been conducted, but Cuba remains the perfect location for research comparative to the Florida and Caribbean areas so that Cuba does not repeat south Florida's development mistakes on the environment.



Never heard of them? Blacknose sharks are among the most common shark species in the southeastern U.S. Image Credit: Eric Reyier

### BREAKOUT SESSIONS

#### The breakout groups were given three tasks regarding the future actions of the ATN:

- Create a matrix of observational needs within SECOORA and CariCOOS versus the assets currently in place to collect them and decide how should it be organized.
- If money was no issue (or if the ATN was given \$1 million a year for ten years) what would a baseline network look like?
- What are the effective telemetry data-sharing pathways outside and within the regions and how should they be implemented?

#### **GROUP 1**

#### Facilitated by Debra Hernandez, SECOORA

- The group did not generate a matrix but agreed that the observational needs should be driven by the high priority stakeholder management requirements (stock assessment, essential fish habitat, and marine protected areas) and spatial ecology. Any matrix must consider technical observation capabilities (acoustic, satellite, archival) and species of interest.
- Defining a long-term baseline network must: i) examine what currently exists regionally, especially regarding hardware, deployment/operations, maintenance, data management costs plus the locations of existing acoustic receiver arrays and satellite tag deployments, ii) consider observing priorities and how they will evolve, and iii) evaluate existing receiver detection data to identify hotspots and satellite tag data to assess broader scale movements.
- FACT has spent a considerable amount of time developing workable data-sharing policies both within their region as well as outside with iTAG and ACT, and the OTN has provided significant technical support to the data nodes to facilitate data-sharing capabilities. It is critical to recognize that several states require the researchers they fund to store their data in state repositories and to make it immediately available to the public.



Joy Young addresses findings for breakout group. Image Credit: Abbey Wakely

#### **GROUP 2**

#### Facilitated by Joy Young, FWRI/The FACT Network

- The group prepared an initial draft matrix and reinforced the importance of having this information to cost-effectively organize and manage the deployment of acoustic and satellite telemetry assets in the region and to minimize duplication of efforts.
- While the best way to define a dense backbone acoustic array might be by proposing an assortment of smaller scale arrays and lines, the ultimate conclusion was that even \$1 million/year would not go very far when paying for equipment, operations, maintenance, researchers' and managers' salaries. Despite this, the group did recommend that analysis of historical animal migration data could enable useful collaborative efforts towards cost-benefit analyses of existing arrays leading to annual measures of success to aid in long-term baseline continuity decisions.
- Intra-regional and inter-regional collaborative relationships exist, but the data sharing part has not yet caught up. Requiring individuals applying for tagging permits to agree to share their data on a regional level was proposed as a way to minimize data collection overlap. The group also stressed how much excess data is being collected but not actually used and suggested that the ATN could do a formal assessment of the existing quantities of unused data.

#### **GROUP 3**

#### Facilitated by Mitchell Roffer, ROFFS<sup>™</sup>

- Responding to how an asset versus needs matrix could be produced, the group concluded that the first step should be to establish a community agreed-upon baseline of what data should be collected from river mouths to open ocean over a range of depths and to create a management council to oversee the definition of all science and management needs to stack up the needs versus the data being collected.
- A complete knowledge of every existing observational asset and infrastructure in the region and whether it is actually being used is an essential starting point for defining a baseline network. A review and decision process would then be implemented to determine what to keep and what to enhance. A group analysis of the expected cost of a likely baseline array concluded that \$1 million would be spent very quickly.
- Regarding collaborative data-sharing pathways, the group concluded that unethical use of data is not a current issue, and that collaboration can lead to personal relationships being formed that will encourage communication and fair use of data. There are, however, some sensitive data (animal behavior, spawning aggregation data, etc.) that possibly should be kept from the public. Preparing a possible code of conduct for existing and new data users was proposed.

### WORKSHOP PARTICIPANTS

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