



ANIMAL TELEMETRY NETWORK



REGIONAL WORKSHOPS



National & Regional Themes, Needs, Findings, & Recommendations



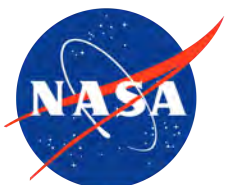
Between 2017 & 2019, the Animal Telemetry Network (ATN) convened a series of workshops around the U.S to bring together scientists, practitioners, and stakeholders to determine regional telemetry and biodiversity observation needs. The workshops sought to assess existing needs, capabilities, applications, challenges, and opportunities to better address stakeholder priorities.



A report was prepared for each workshop which detailed findings and recommended strategies that IOOS and partners may employ with their stakeholders to expand and strengthen observations and improve data management coordination and capabilities. The key findings and recommendations published in the Regional Workshop Reports have been analyzed to identify commonalities across regions, and priorities for expanding national and regional capacities and coordination.



The highlights are synthesized at both the national and regional levels in the following document. With sufficient support and resources, this information will assist the ATN, MBON, and OTN to execute their vision of an expanded and sustained U.S. Marine Life observation and data management capacity for the benefit of all stakeholders.



WORKSHOPS OUTCOMES

National Synopsis

PRIORITY THEMES



Data Accessibility



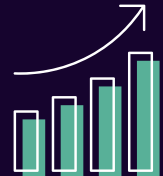
Funding



Long-term Observation Strategies

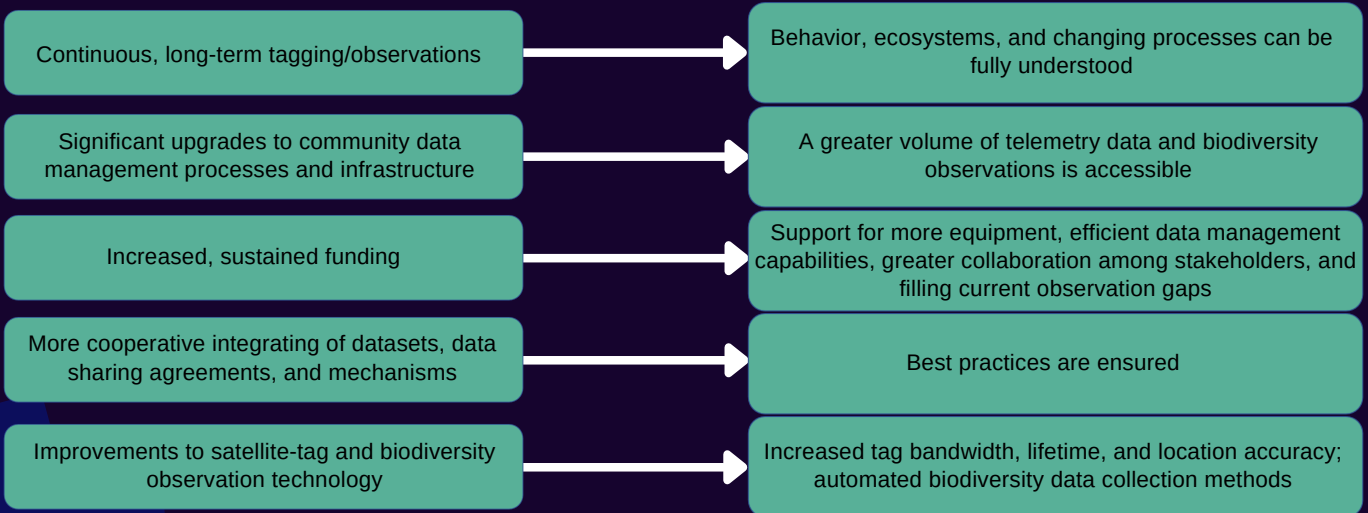


Stakeholder Collaboration



Data Management

CROSS-CUTTING NEEDS & THE OUTCOMES IF MET



RECOMMENDATIONS



Encourage funders to require researchers to budget specifically for data management costs



Promote collaboration and data sharing with regular meetings, webinars, etc



Coordinate with industry/suppliers more closely to influence the focus of the technical development efforts



Include codes of conduct for collaborators within sharing and exchange agreements



Collaborate with oil/gas companies and federal agencies to utilize existing infrastructure



Improve organization and standardization of data (formats, analysis, etc)



Leverage and expand existing partnerships among researchers, tech suppliers, and all data users



Implement trust among collaborators to increase successful data sharing; it requires both in-reach and outreach and encourages communication resulting in fair and ethical use of data



Implement national standards for managing and archiving federal telemetry data



Create a central data repository for storing, managing, accessing and displaying marine animal telemetry and biodiversity data


PacIOOS
ANIMAL TELEMETRY NETWORK
WORKSHOP SUMMARY REPORT
 Identifying Regional Needs and Priorities for Animal Telemetry Observations of Aquatic Species

APRIL 23-24, 2018
 INFORMATION TECHNOLOGY CENTER,
 UNIVERSITY OF HAWAII MANOA,
 HONOLULU, HAWAII



U.S. WEST COAST
SCCOOS • CeNCOOS • NANOOS
ATN • MBON • OTN
BIOLOGICAL OBSERVATIONS
WORKSHOP SUMMARY REPORT
 Identifying Regional Needs and Priorities for Animal Telemetry and Biodiversity Observations of Aquatic Species

NOVEMBER 7-9, 2018
 HOTEL PARADOX
 SANTA CRUZ, CALIFORNIA



GCOOS
ANIMAL TELEMETRY NETWORK
WORKSHOP SUMMARY REPORT
 Identifying Regional Needs and Priorities for Animal Telemetry Observations of Aquatic Species


JANUARY 23-24, 2018
 DOUBLETREE BY HILTON
 NEW ORLEANS,
 LOUISIANA



Animal Telemetry Network & Marine Biodiversity Observation Network Regional Workshops Findings and Recommendations


AOOS
ANIMAL TELEMETRY NETWORK
WORKSHOP SUMMARY REPORT
 Identifying Regional Needs and Priorities for Animal Telemetry Observations of Aquatic Species

DECEMBER 5-6, 2017
 ANCHORAGE MARRIOTT
 DOWNTOWN HOTEL
 ANCHORAGE, ALASKA



NERACOOS
ATN • MBON • OTN
U.S. NORTHEAST ATLANTIC BIOLOGICAL OBSERVATIONS WORKSHOP SUMMARY REPORT
 Identifying Regional Needs and Priorities for Animal Telemetry and Biodiversity Observations of Aquatic Species

MAY 6-7, 2019
 UNIVERSITY OF NEW HAMPSHIRE
 DURHAM, NEW HAMPSHIRE



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



Gulf of Mexico Coastal Ocean Observing System (GCOOS)

FINDINGS

- Data from various sources is not adequately integrated or made available.
- Real-time data is difficult to use and is not easily available.
- Little or no investment in new technology exists, limiting the flexibility and maintenance of existing infrastructure.
- Multi-year projects are not adequately funded, creating time gaps, which limit the ability to detect ecosystem patterns and changes.
- Managing the volumes of data created by real-time telemetry, and maximizing its use, is challenging.
- There is only limited focus on how to best help ports with their information needs.
- Lack of code-sharing between acoustic telemetry suppliers, Vemco and Lotek, significantly limits data collection efficiency.

RECOMMENDATIONS

EXISTING PROJECTS AND INFRASTRUCTURE

- Leverage oil and gas activities that could provide useful sites for multi-year monitoring, including acoustic data collection.
- Integrate BOEM's work, which is expected to provide information about the use of the Gulf of Mexico Large Marine Ecosystem.
- Leverage sentinel sites where and when species aggregate to help define starting points for longer-term monitoring and tracking.

PROJECTS AND TOOLS

- Develop seabird movements as a focus area.
- Initiate "tags of opportunity" projects that could be highly beneficial to the community for rescue and rehabilitation work.
- Develop use of mobile sensors on AUVs to help position assets and increase probability of detection.
- Leverage exploration tools and products that can help streamline and organize real-time data.

COLLABORATION ACROSS SECTORS AND DISCIPLINES

- Establish an acoustic tag code space agreement to help make acoustic telemetry systems compatible and broaden the network infrastructure.
- Standardize networks and best practices for an avian system and expand upon the MoveBank Data Repository.
- Use telemetry data to help identify areas for port expansions.
- Advocate for multi-taxa, large-scale proposals that can improve integration of data collection and enhance coordination across taxa groups in the Gulf of Mexico.

Pacific Islands Ocean Observing System (PacIOOS)

FINDINGS

- Long-term tags and commitments for sustained funding for telemetry observations are necessary to support multi-year monitoring opportunities.
- We do not have the fullest and most effective understanding of community technology needs.
- Knowledge of fish behavior that influences their catchability is limited. Need information on preferential depth of species with daily/seasonal spatial variability and behavior relative to fishing gear.
- Integrated, long-term, and interdisciplinary Ecosystem monitoring activities are needed to successfully observe abundance, distribution, diversity, and condition of reef fishes, corals, invertebrates, algae, microbes, and meroplankton.
- Mote receiving stations are not well-leveraged or coordinated across research groups in Hawaii and within the tagging community.
- Improved tags are needed with larger data bandwidth, improved location accuracy, and longer lifetimes.
- Standards are needed for collecting, managing, and archiving tag data.
- Tag data and equipment lack standardization, limiting the potential for successful, integrated monitoring.

RECOMMENDATIONS

TAG INNOVATION

- Pair medium/long-term telemetry attachments with other sensors, such as calibrated acoustics or accelerometer.
- Fill the many spatial and temporal gaps in measuring environmental conditions with larger numbers of animal-borne sensor tags.
- Add acoustic or other environmental sensors to the tags. Hybrid acoustic/satellite technologies hold promise.

DATA ARCHIVING CHALLENGES

- Increase the use of data warehousing, public accessibility, and data exploration tools.

INTEGRATION OF THE PACIFIC ISLANDS TAGGING COMMUNITY

- Find ways to leverage Mote stations across multiple research groups in the Pacific Islands.
- Track large numbers of all tropical tuna species with an integrated large-scale acoustic telemetry network.
- Provide the Pacific community with their own FADs so they are not dependent on purse seine fisheries for research.
- Use telemetry data to answer questions, such as: Are whales going to different feeding/breeding habitats, or are they skipping/shortening their breeding migrations?

Alaska Ocean Observing System (AOOS)

FINDINGS

- Little or no investment exists in accessible statistical analysis tools, models, tags, and cyber infrastructure.
- There is no central data repository from which others can access and use ALL telemetry data.
- Coordination with industry is lacking for development efforts.
- Interpreted data and data products, processed data layers, and stored tracking data are insufficient.
- Telemetry data are big and messy (although not really "big data").
- Data are often not available, unless tags/receivers are retrieved.
- Raw data without analysis are not helpful to managers because they do not have the time to synthesize.
- Invasive tag technology cannot be used on certain species.
- Subsistence communities have traditionally viewed tagging studies as being disrespectful to animals and endangering their welfare.
- Cross (geopolitical)-boundary animals can present issues with datasharing. E.g. fur seal adults stay on the U.S. side, but pups go into international waters.

RECOMMENDATIONS

DATA ACCESS AND CYBER STRUCTURE

- Improve coordination between animal taggers and data users.
- Improve availability of acoustic telemetry data without requiring manual retrieval.
- Improve data sharing/discovery, standardize tag metadata, and link archival data with products.

COMMUNITY INVOLVEMENT

- Involve community at the proposal stage of a tagging project.
- Identify specific project objectives that will address community needs.
- Integrate Traditional/Local Knowledge into the science objectives.

DATA USABILITY/INTEGRATION

- Integrate Automatic Identification System (AIS) data to assess how ships may be affecting habitat use.
- Eliminate duplication of efforts with ADF&G work through expanded cooperative efforts.
- Develop methods to translate telemetry data into usable information and share it with the Arctic Waterways Safety Committee.

Southeast Coastal Ocean Observing (SECOORA) & Caribbean Coastal Ocean Observing System (CariCOOS)

FINDINGS

- The essential communications among researchers, data users, and stakeholders is currently too limited.
- Although data is collected by multiple institutions, it is not integrated into a system that provides access to all of it.
- Available data sharing and archiving methods, and their capabilities, are inadequate.
- Rules for governing data availability and sharing can be different among state and federal funding agencies, and should be considered by community-based acoustic networks like FACT and iTAG.
- There is limited awareness that federally funded results must be PARR (Public Accessibility to Research Results) compliant; details are funding agency-dependent.
- Ocean Tracking Network (OTN)-compliant nodes enable easy sharing of acoustic telemetry data and mystery/orphan tag identification among collaborating regions.
- Although regional intramural and extramural collaborative relationships do exist, the data-sharing part has not yet caught up.

RECOMMENDATIONS

COLLABORATION AND DATA SHARING

- Conduct regular meetings, webinars, etc.
- Minimize data collection overlap by making the sharing of regional data/information a requirement for obtaining a permit for tagging.
- Develop formal data accessibility and sharing agreements for states, institutions, and community-based organizations that are funding/conducting animal telemetry activities.
- Actively develop trust among collaborators to improve successful data sharing; it requires both in-reach and outreach and encourages communication that results in fair and ethical use of data.
- Include codes of conduct for collaborators in data accessibility and sharing agreements.

DATA CHARACTERIZATION AND ACCESSIBILITY

- Identify how much of the data being collected is actually being used and by whom.
- Highlight the distinction between data that is "available only to view" versus data that is "available to download and use."
- Maintain security of sensitive data including endangered/threatened species and spawning aggregation areas to protect them from immediate public access.



West Coast (CENCOOS, SCCOOS, & NANOOS)

FINDINGS

- Observational capabilities from animal-borne sensor tags (biologging) could be developed to provide detailed information on marine species, while simultaneously sampling the ocean environment.
- Adding observatory data on critical parameters from all four environments of Monterey Bay National Marine Sanctuary will significantly improve their IEA-supported condition reports.
- Stakeholder partnerships are limited, but could be leveraged to fulfill science missions.
- While individual animal tag tracks are very useful, bigger datasets and derivation of species-specific home ranges or core areas for groups are needed.
- Ocean processes change, thus requiring long-term sustained observations to keep models and modelers in check.
- Funding to analyze and publish current data sets to balance out the continued collection of new data is needed.
- Long-term sustained telemetry/biodiversity observations are required to address and understand the functional and context-dependent responses of marine mammals to disturbances and change.
- Telemetry tags are very expensive and limit researcher's potential.

RECOMMENDATIONS

NATIONAL COORDINATION

- Leverage existing opportunities for MBON-IOOS leadership in biological assessments.
- Implement large-scale tagging projects like TOPP with required data sharing (ATN) to make tag data useful for monitoring biodiversity and informing management.
- Develop data management standards for acoustic telemetry data and provide data archiving capability for small-scale acoustic telemetry users.
- Link federal enforcement of data sharing requirements to the approval of permits/grants for tagging.
- Leverage consumer electronic and economies of scale to obtain cheaper tags.

DATA IMPROVEMENTS

- Connect California fisheries with accessible researcher data.
- Convince funders to encourage researchers to budget specifically for data management costs.
- Develop opportunities for biologging to play a significant role in studying marine biodiversity observations by providing animal distribution data and observations useful to biomass modeling.
- Leverage fishing boats as "observation platforms of opportunity," as fishermen are both data users and data generators.

Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS)

FINDINGS

- Stellwagen Bank is a microcosm of changes happening in the GoM; it is a national resource and a natural opportunity.
- ATN-MBON observations deliver information to answer “So What” questions from potential funders.
- The GoM is warming faster than 90% of the world’s waters and the Estuarine Research Reserves are at the forefront of measuring impacts of climate change.
- The Atlantic White Shark Conservancy is responding to the public perception of the safety risk from sharks close to shore with educational programs and community outreach.
- The NERACOOS Data Management System applies the state-of-the-art tools THREDDS and ERDDAP to ensure both human-readable and machine-to-machine accessibility of all the available data.
- Incorporating telemetry into longer-term monitoring is challenging due to the associated costs.
- Acoustic telemetry is a research tool that is vital to furthering our knowledge about species that are commercially and recreationally important to the Commonwealth.
- An acoustic monitoring capability for real-time detection of whales in “dynamic shipping lanes” would be an essential component for a whale strike dynamic management mitigation strategy to be effective.
- The Casco Bay Aquatic Systems Survey (CBASS) has the greatest potential for telemetry to add value to their regional monitoring efforts.
- The ISMN fills a sampling gap and facilitates integration of multiple datasets aimed at predictions, for example, of future NARW foraging distributions.

RECOMMENDATIONS

EXPANDED APPLICATIONS

- Develop innovative partnerships aimed at long term solutions.
- Apply real time state-of-the-art monitoring and mitigation solutions to reduce vessel strike risk plus minimize harassment during geological and geophysical surveys.
- Fund expanded telemetry studies with at least 1% of the \$250B recreational fishing industry income.
- Implement eDNA measurements, which are powerful, relatively low cost, becoming more accessible, and can be archived and reanalyzed for more/different species.

DATA USABILITY/INTEGRATION/ACCESSIBILITY/MANAGEMENT

- Compound the power of telemetry by combining it with other techniques, perspectives and integrated networks to facilitate/drive higher-impact science by leveraging resources, asking bigger questions (spatial and temporal scales) and implementing novel observations/analyses.
- Update ocean models by incorporating both turtle-derived and glider data.
- Link the NE Real-time acoustic network (Robots 4 Whales/ digital acoustic monitoring instrument Buoy, Stellwagen Bank NARW Listening Network, CAB Buoys) to existing Ocean Observing Systems.
- Implement a sustained Biological Observation Network in the northeast to ensure efficient sharing and retrieval of data and information and reducing workload for researchers while improving data quality.



Mid-Atlantic Regional Association Coastal Ocean Observing System

FINDINGS

- The Atlantic Cooperative Telemetry (ACT) Network is a grassroots regional effort to facilitate data sharing among researchers using acoustic telemetry.
- In 2016, ACT included 14 organizations with 35 researchers tagging 40 species with 1,800 new tags.
- The Mid-Atlantic Acoustic Telemetry Observation System (MATOS) is a web-based tool under development to help ACT members manage, store, and share data in a searchable, secure database.
- MATOS is compatible with the Ocean Tracking Network (OTN) and is a catalyst for user engagement.
- Data sharing obstacles include a sense of competition, lack of communication/awareness of existing work, and reluctance to track down data owners.
- Determining migratory patterns of fishes, birds, turtles, and marine mammals will improve understanding of development/construction activity impacts and provide real-time alerts for shipping.
- Challenges in aquatic movement ecology include limited coverage of the space animals use; insufficient data archiving, access, and sharing; and barriers to incorporating movement data into decision-making.
- Because some researchers continue to reinvent the wheel, improvements in electronic tagging require greater coordination of efforts and better engagement of stakeholder funding mechanisms.
- A principal goal of seascape ecology is to make efficient use of oceanographic data and ecological process models to predict the distributions and migrations of marine organisms.

RECOMMENDATIONS

DATA MANAGEMENT/ACCESSIBILITY/INTEGRATION

- Implement whatever actions are needed to develop MATOS into an operational data management tool that supports the ACT Network community.
- Support the maritime community with improvements in modeling, coordinated planning, and better data that can lead to real-time decision-making, e.g., real-time marine mammal alerts for shipping.
- Seek agreement on data sharing rules of the road: Use and Access Expectations, Publications and Cost Sharing and, Data Ownership.

EXPANDED APPLICATIONS

- Explore blending ACT into regional/national efforts.
- Integrate environmental data into MATOS and explore the role telemetry data can play in a dynamic seascape ecology framework.
- Expand telemetry capacity to support fisheries management, coastal resources conservation, and planning processes.
- Increase the application of telemetry data to improve the validation/tuning of traditional models for future stock assessments and habitat decision making.
- Combine satellite and DTAG telemetry to estimate availability, describe habitat usage and vocalization patterns, to estimate broad scale abundance and to develop fine scale seasonal, spatially explicit density estimates within the ecosystem context to be used for management purposes.