US Animal Telemetry Network
Steering Group Meeting SG-6

January 8th and 9th, 2020
Meeting Minutes

I. Voting Member Input

- B. Woodward thanked steering group members for attending in person and previewed the agenda for the two-day meeting.
- B. Woodward also thanked all members for re-enlisting for a second term and reminded members that each has a 2-year term.
- M. Weise, J. Price, & S. Hayes also thanked and welcomed all members for attending the meeting.

II. Non-Voting Member Input

- D. Snowden offered perspective from IOOS leadership:
  - A brief history of the IOOS program office: IOOS began with a community movement in 90s/early 2000s to have a focal point for ocean observation needs. The office developed, and officially became NOAA IOOS Office in 2007. The program can't own all observations but aims to promote some standardization in the observation data world. The program wants to bring this same convening power (sharing, collecting, analyzing data) to ATN. Involvement of the IOOS Regional Associations (RAs) is important.
  - IOOS wants to continue to be the host of ATN and the ATN coordinator (B. Woodward), and be able to sustain this even through budget pressures.

III. ATN Updates (B. Woodward, Chair ATN Steering Group)

Providing Unity, Stability, and Continuity to the US Marine Animal Telemetry Network

B. Woodward called for consensus on the meeting agenda and provided a brief update on ATN activities from August 2019 – January 2020. The update included the following:

- B. Woodward noted S. Simmons and Brady from MMC took the initiative and developed and completed the ATN Logo. The logo can be used in any capacity and ATN will likely be creating branded merchandise in the future.
- B. Woodward stated that an ATN Article was published on the NOAA/NOS Website on 29 October 2019 with the help of Kate Culpepper
  - Encouraged members to read the article which can be found at: https://oceanservice.noaa.gov/ocean/animal-telemetry.html
- B. Woodward noted that M. McKinzie has made excellent progress on ATN DAC with 53 projects now in the system.
- B. Woodward reported that that ATN has convened 7 ATN workshops in 2.5 years (2 of which were convened jointly with MBON and the OTN) and the ATN is currently working on writing the Workshop Reports, with 4 finished and 3 in-progress.
  - The ultimate goal is to tease out and distill common themes that are at a national level to help guide the ATN to support regional activity priorities.
- B. Woodward stated that with ONR, BOEM and NOAA funding, ATN has been able to support and fund several high-priority regional efforts (Funded Baseline Projects):
  - Four ATN Funded (2-year) Baseline Observing/Data Management are underway

- B. Woodward noted that the ATN has initiated a project to implement the dissemination of Animal-Borne ocean Profiles onto the Global Telecommunication System (GTS)
- B. Woodward stated that the Animal-Borne Sensor Network is an international effort of which the ATN is a member.
  - During a workshop in Tasmania in Nov. 2019, the international team drafted a proposal to GOOS requesting that this Animal Borne Sensor Network Be formally recognized as an emerging network within the JCOMM Observation Coordination Group. The proposal is in draft form with a planned submission in April 2020. The ATN expects to participate in the steering committee as well as contribute data management capabilities to the effort.
  - J. Price asked if we become part of this network: where will this data live? Where will it be archived? B. Woodward responded that NCEI will archives for some (such as ARGO).
  - M. Weise noted that Navy is funding some CTD profile work. There is a push to fund smaller conductivity sensors, (ex. CTD sensors on birds—eventually everything in the ocean is the goal).
- B. Woodward discussed the expanding use of encrypted ID codes for acoustic telemetry, which has become a significant issue in the global community.
  - Exclusive, proprietary codes has been developed by one of the acoustic receiver and tag manufacturers, which will potentially limit interoperability of tags/receivers among researchers using hardware from other manufacturers. Our European colleagues are affected the most and are seeking an an official position on the topic from the ATN.
- B. Woodward expressed the desire to link the value of telemetry data to high priority biological observations.
  - How can/should the ATN be active in joining forces with the larger biological community addressing these high priority challenges Focus should be on high-priority observations (e.g. HABs and OA) which are receiving global attention currently.

IV. **Review of Actions from SG-5 and On-Going Actions**
- **Create Google folder to organize in-progress projects and for SG members' reference if needed (B. Woodward)**
  - **STATUS: ON-GOING (tabling this item for now with potential follow-on action. Group needs to decide if effort is worth it.)**
- **Craft strategic plan/procedure to re-evaluate funding each fiscal year, including how to use limited funds for supporting the infrastructure (B. Woodward)**
  - **STATUS: ON-GOING**
- **Review task teams and projects to determine if they are necessary going forward (B. Woodward, M. Weise)**
  - **STATUS: COMPLETE**
  - **B. Woodward suggests previous task teams are no longer relevant**
- **Review new package (ADEPTHER) for data visualization, funded by NPS—M. McKinzie and K. Hart, USGS deciding how they want to host it.**
  - **STATUS: ON-GOING**
  - **K. Hart & M. McKinzie noted that it needs to be tested, though it's running and has been used for some of own publications. It currently lives in private GitHub but will continue to work on it.**
- **Organize and schedule 1-hour webinar to educate SG members on system tools, for example the registration app (M. McKinzie)**
  - **STATUS: ON-GOING (tabled for now)**

- o **M. McKinzie offered to host a webinar research workspace and other system tools if members are interested.**
- **Identify small group of SG members to develop effective approach for visual presentation and organization of national data (themes, gaps, needs) from regional workshops to lead to actionable tasks (B. Woodward, M. Weise)**
  - o **STATUS: ON-GOING**
- **Organize and schedule 1-hour webinar to educate SG members regarding DAC research workspace and coordinate feedback for Axiom (M. McKinzie)**
  - o **STATUS: COMPLETE (26 September 2019)**
- **Determine future funding opportunities through identification of agency needs to achieve funding goals. Develop 1-2 pager defining importance and options for ATN**
  - o **STATUS: ON-GOING (See below group discussion on how ATN is and could be meeting agency needs and garnering funding opportunities)**
- **Discuss with SG and funders about when to solicit for FY20 topics and projects using defined process. Determine if/when an open call should be used to ensure transparency and fairness (B. Woodward, M. Weise)**
  - o **STATUS: COMPLETE (canceled)**
  - o **B. Woodward proposed to remove this legacy action item as written and determine one with a clearer objective**
- **Request feedback and implement deadline for SG members. B. Woodward to gather edits into a policy document and synthesize into Google docs for final review.**
  - o **STATUS: ON-GOING**
  - o **B. Woodward proposed to keep efforts on the policy document going since the group has been working on it for a year and a half. B. Woodward recalled an eye-opening meeting in Halifax that included diverse, international perspectives on embargos and would like to have an open discussion with ATN.**
  - o **M. Weise noted that not all agencies have a data policy (per OTN in 2015) and perhaps this should be a living document.**
  - o **J. Young stated that she leans towards default being in embargo but can't officially say no to it at this time.**
  - o **B. Woodward suggested keeping this action item active to encourage discussion.**
- **ATN Logo (S. Simmons, Brady)**
  - o **STATUS: COMPLETE**
- **Generate a google spreadsheet of upcoming meetings to assess SG member attendance (K. Desai, S. Murphy)**
  - o **STATUS: ON-GOING**
  - o **M. McKinzie indicated she will send COL the list of relevant meetings and can help track proposals and relevant deadlines.**
  - o **B. Houtman suggested establishing sub-committees to tailor the objective and consider areas ATN should grow into.**
  - o **R. Wells asked if NOAA/NOS article should be sent as information about meetings becomes available. B. Woodward agreed and M. McKinzie noted it would be helpful for ATN to be an exhibitor and a list would help her plan such active engagement.**
- **Provide list for DAC folks (M. Weise)**
  - o **STATUS: ON-GOING (legacy, B. Woodward noted it could be dropped)**
- **Prepare draft text describing "What it means to submit data to the ATN DAC" (J. Young, B. Woodward)**

- o **STATUS: ON-GOING**
- o **J. Young stated she needs detailed information about what people want to know. J. Young and B. Woodward will continue efforts.**

V.   Items for Review, Feedback, Discussion, and Decision

A. Operational DAC – Research Workspace (M. McKinzie and B. Woodward)
- McKinzie provided an update on the DAC components.
- New Projects
  - o There are currently 54 projects registered with the DAC and these are projects that have data uploaded into the system from the PI.
  - o About 80% of the projects are satellite telemetry projects and there are 4 acoustic telemetry projects in the system. Only 31 projects appear currently in the portal, as M. McKinzie noted that system is waiting for key pieces of metadata to be uploaded before they can go live.
  - o Federal, academic, and non-profit groups can create projects. Federal groups have the most, followed by academic and others.
  - o The PI defines the project. The project information includes location, deployment logs, detailed dataset description (animal, caveats, etc.)
  - o 31 projects are live with 27 species and 516 tag deployments by end of this meeting. 7 datasets have been DOI minted and archived at DataONE, and these numbers are constantly evolving as new projects come in.
- Data Portal
  - o The public face of the DAC is the ATN data portal. Links available on the opening page connect you to the Map and the Catalog. .
  - o The map interface allows you to view data projects on a map. The real-time display can be sorted by 30, 60, or 90-day layers. Functionality has been implemented to eliminate high error Argos locations to clean up the default display of the real-time trajectories.
  - o Each project in the Catalog has its own individual project page with title, year range, abstract/purpose, contact info, and animals in that project. Users can click on a tag and learn details about the animal and its tracking info. If they have CTD/dive profile information, that is shown as well. The display functionality can also be manipulated
  - o Only data files that are no longer embargoed can be accessed and downloaded
  - o Can also have 2-D representations for animals that are plotted over a 3-D bathmetry map.and users can switch between different observations (e.g. salinity, temperature, etc.). Users can also change colors or units on the display as desired.
  - o J. Young asked: We have general hits type tracking on the site, but do we alert people if downloaded data has changed?
    - ▪ ACTION: M. McKinzie responded that this is not available currently, but this is
  - o Research Workspace
    - ▪ The registration app was developed by Axiom for ATN's specific needs. The Research Workspace is larger and used to manage all their projectsThis leads to some functionality issues that need to be worked around.
    - ▪ This is the primary data management tool meant to help PIs from all levels of data and research. All projects are represented under the IOOS ATN campaign.
    - ▪ PIs can upload auxiliary data (e.g. tissue or blood samples), manipulate data, and set who has access to the project and what level of access they have.

- This is also where metadata is collected for the archive. Some project-level information is stored and pushed to the RW and then the data portal.
- Automated pathway for data archiving at NCEI
  - Different archival pathway
  - DataONE currently can accept any type of raw or curated data. NCEI can only accept satellite for now but will be working with them to incorporate other types of telemetry data.
  - Per M. McKinzie, the same dataset can be archived at both sites and be discoverable at one location. If updates occur, it would have a different DOI and information indicating whether data is at NCEI or DataONE, so it would be kept separate if at both.
  - PIs present (R. Wells, G. Skomal) liked the idea of the archives because they are good for data storage and remarked that they are worth doing.
- Ingesting acoustic detection datasets into the National DAC
  - M. McKinzie noted that most of raw data gets pushed to regional nodes (FACT, ACT). Data can be exported as CSV, goes through QA/QC processes, and is cross-walked for matching. The matched data is distributed out to relevant PIs, who can be notified if their animals are detected on other receivers. This process occurs on a regional level.
  - After EMBARGO period ends, data is pushed to national DAC. When data is ready to be made public, it is sent to ATN, the PI exports it, and it is pushed through national DAC to the Research Workspace.
  - When pushed to the National DAC, there is a project page with title, contact information, abstract, purpose, a map with receiver location, etc. Depending on the type of data, it may be possible to plot certain variables, such as actuation detections.
- Dtag Status Update
  - M. McKinzie stated that high-level calls were held with various DTAG users and members of the community. The gold standard was decided to include undecimated sensor data in scientific units and maintained in the tag frame of reference.
  - Want to bring tag tools into workbook "gallery" to convert their raw data into the gold standard
  - Octave Kernel is live—so MATLAB can be used
  - Notebooks being tested by Stacey DeRuiter and Kenady Wilson, who will provide feedback. Working on creating a notebook gallery.
    - May need to modify to make sure desired metadata is captured
    - Next steps include to update a few remaining glitches and bugs, then test notebooks to ensure they are able to bring in and run the codes, modify notebooks with additional code, add ATN desired metadata, mock up a data portal project page, create Dtag SOP documents, and begin ingesting data into ATN DAC.
  - M. Weise asked that since the idea is to develop tools so that they are centrally located for community, is there something parallel for satellite tags?
    - M. McKinzie responded that this is the idea, we have list of other tools we would like for other types of telemetry, this is a good test case
- Data Training Workshops to guide PIs in the use of ATN DAC & their Research
  - M. McKinzie has held two different workshops in the past couple months on data. These were hands-on data workshop for PIs.
  - ATN Data Team includes M. McKinzie, Ian Gill (liaison between ATN & Axiom), and Chris Turner (Axiom's data librarian).
  - Next workshops? Want to target NE region, hopefully spring. M. McKinzie & S. Hayes to come up with a plan. Will be open to larger community, potentially targeting the Southeast and Southwest later in the year. Workshops have been focused on satellite telemetry users; will get broader over time.

- Asset Inventory Project
  - B. Woodward noted that it is important to know where existing assets are located and who is working with them. Approach was to create a Google questionnaire and send it to PIs who can submit the information.
    - M. Treml sent the questionnaire to 200-300 acoustic PIs and about 200 satellite PIs in the community.
  - Acoustic inventory a little easier to collect and display the data, but satellite is more difficult. With the data, it is possible to look at specific assets and view specific information about the projects.
  - Next steps:
    - QC of data on google sheet as compared to the inventory map.
    - QC info to make sure it is correct and accurate.
    - Fill in blanks where we know there are assets, but they aren't showing in database (determine if this is a mistake or from lack of response).
- Year 3 Plan/Priorities - Tag types / data types, etc. Promote our vision as a "Telemetry Community Resource"
  - Per B. Woodward, ATN is now in 2nd year of DAC with Axiom. For the rest of this year, the plan is to continue to provide focused technical assistance to ATN Researchers submitting their data to the DAC and to the broader community seeking to make use of datasets in the DAC
  - .
  - Develop/implement capability to insert R/T ocean profiles from animal-borne tags onto the GTS
  - Develop technical strategy for multi-sensor and Dtag data access and dissemination through the ATN data portal
  - In partnership with OTN and US acoustic network to develop capability and serve as national aggregation point for publicly available US acoustic telemetry datasets and assist acoustic researchers with permanent archival, DOI minting, and release of data to a national data repository. Bring idea of open source to data management process
  - Develop, expand, and enhance the ATN DAC system tools and packages and integrate them into Research Workspace Python & R Notebook kernels to support data analysis and product development by ATN Researchers.
  - Work plan for Year 3 with Axiom starts in June
  - ACTION: Get contact info from David Smith contacts Reach out to California (state) folks
- J. Young commented that it is important to start with satellite telemetry because it is a low-hanging fruit and can continue working on acoustics, lay groundwork, and become successful with it.
- D. Smith noted that it has been valuable to be able to interact with data collectors when working with data in California and over much finer spatial scales. Also noted that there have been efforts to try archiving data for years, but issues often arise with different PIs, programming, funding opportunities, etc.
- Per J. Young, the Kennedy Space Center maintains arrays and sends out gliders. An issue has arisen with gliders in that people would like to have a way to keep oceanographic data associated with it so that it is possible to analyze detection satellite tag with oceanographic profile.

B. FY-20 ATN Funding Profile
B. Woodward developed diagram to understand flow of ATN funds.

- B. Woodward noted that ATN has had an annual budget of $1.46M, though budget cuts for FY20 have dropped this amount to $1.06M.
- The immediate impact on this is somewhat mitigated because there is an overlap among the funding coming from multiple sources so CY-2020 will not be significantly impacted However, additional funds for FY-2021 will be needed to maintain the current ATN funding profile beyond CY-2020

C. Workshops & Reports (B. Woodward)
B. Woodward discussed workshops and reports that have been created with help from IOOS to create graphics.

- Workshops were stakeholder-driven, and the overall goal is to distill information gathered at the workshops into actionable items in the reports.
- B. Woodward outlined the workshop objectives:
  o Convene different types of groups to prioritize their observational needs
  o Identify existing observing assets and capabilities in region
  o Document specific uses of telemetry data
  o Identify infrastructure and data management challenges/opportunities in each region
- B. Woodward summarized common themes that emerged from the workshop discussions:
  o How are we assessing the effectiveness of conservation measures in MPAs, National Parks, monuments, sanctuaries? This is necessary to guide management decisions
  o Understand habitat use and how animals use the ecosystem
  o Support conservation management and habitat protection of threatened/endangered species and economically important/conflicted species; enable co-management of subsistence species
    ▪ S. Hayes remarked that it would be better to focus the phrasing to highlight animals that intersect with economic/food interests in order to garner more interest. People are much more interested where species conflict with these other interests.
    ▪ B. Woodward also discussed interactions with indigenous communities and stressed importance of working with them and learning from traditional knowledge to learn more about each species.
  o D. Smith asked about the possibility of pulling environmental data? The concept is well-supported in the community. While Axiom has some capability, making it accessible to public is the difficult part
  o D. Snowden pointed out while there is lots of data and capability, the challenge is the amount of effort required to distinguish individual needs
  o D. Snowden asked what the funding priority should be? B. Woodward and M. Weise responded that's up to the scientists, but essentially, the priority is expanding tools to make it easier for the scientists to do their jobs
- B. Woodward summarized high-level takeaways from the workshops
  o The East Coast: Highly organized animal telemetry efforts and lots of independent efforts
  o Gul Of Mexico: Lots of acoustic efforts, including from federal and state governments and academia. The data is challenging in the Gulf because of complex environmental factors there. There is a need to define products that can maximize the utility of telemetry data and how they could be made available. Multi-year monitoring is necessary to detect changes in trends of habitat use/productivity.
  o Alaska: A unique region, fewer acoustic efforts and important subsistence community.

- Discussed the possibility of a formal acoustic node in NW, as OTN is ready to establish a formal node. M. McKinzie remarked that it is ready to be created, it just needs a spark. It may be extended down to Northern/central CA.
- S. Hayes pointed out the desire to keep a NW node separate from Southern California telemetry networks because the ecosystems have different drivers different, for example Southern California is driven by upwelling, whereas the North is impacted by Columbia River Basin outlet
- J. Young discussed that information has been obtained about different species in AOOS site, which has resulted in production of risk maps using multiple data sources. B. Woodward confirmed this and stated that a tremendous amount of work has been done, but still unsure of how telemetry data can and should be represented.
  - Pacific Islands: B. Woodward noted that this is an enormous geographical area and the community here believes in the commitment to long-term sustainability, but they don't have resources necessary.
    - B. Woodward discussed desire to equip a few Hawaiian Islands with Motes to support the research.
    - K. Holland has been applying Mote stations (locally situated receivers that get a direct transmission from Satellite).
    - Pacific research community uses fish aggregating devices of commercial industry to do research—but they want their own FADs
    - M. McKinzie noted that PIs at workshops kept emphasizing the need to link data to other biological information coming in from the assets.
  - West Coast: This region includes a world class telemetry network and plenty of industry, although among other things it is missing baseline acoustic data. While it is not data deficient, itIS information deficient.
    - B. Woodward discussed that workshop participants had expressed a strong desire to maintain momentum after the workshop and created another group called the West Coast Biological Observations Group. This informal observation group is working with ATN, MBON amd OTN to determine what a biological observing network might look like in the region.

D. **Implementing State-Space Models in the DAC (I. Jonsen)**
- I. Jonsen (part of a consortium funded by ONR) has developed an R-package for displaying animal trackswhich he has named, "Foie Gras."
- The state-space model is a statistical quantum series model that allows data to be taken, smoothed over, and used to estimate where in space and time animals are
  - This is basically equivalent to QCing data
  - Advantages: Flexible, simple to use, fast (orders of magnitude faster), continuous-time SSMs
- I. Jonsen noted that the model will be implemented inthe ATN DAC and has been in communication with Axiom to make it happen.
  - Currently, it just does "trajectories" (locations)
- M. Weise noted that the Foie Gras package will also be broadly available to researchers so that they can tailor it to their specific needs for analysis and publishing
- B. Woodward pointed out that Foie Gras will enable real time QC of animal trajectories in the DAC

E. **Report on Funding of Baseline Projects (J. Young, M. Ogburn)**
- J. Young provided an update of the Data-Wrangler activities within the FACT Network:

- o As of 2017, the network consisted of:
  - 45 organizations
  - Over 900 receivers
  - A website and online data sharing were used early on
- J. Young summarized Year 1 Accomplishments:
  - o Have seen input of data really take off when they have a data wrangler dedicated to processing.
  - o 5 data-push events in which researchers provide their data, FACT takes in the data and pushes it back out. These events have been going on about every 2 months and lead to about a 10% increase each time.
  - o They have also used the Research Workspace (how PIs upload & pull out data from Axiom) and Jupyter Notebooks for 6800 deployments from 40 projects and 34 institutions.
  - o Just shy of 2000 stations have been registered and 6000 tags have been registered.
  - o USCAN was assimilated in the FACT node (St. Croix)
  - o The FACT Network published a paper. Also, a Munson grant to support student in FACT network (joint FACT/SECOORA effort) was awarded
  - o Lessons Learned:
    - Takes time to adjust to new system
    - Time/effort are needed to process data
    - The system should be adapted as lessons are learned
- J. Young provided goals for Year 2 of FACT
  - o FACT will continue to grow, but we need to address funding and scaling challenges
  - o New projects will expand functionality of the network
- M. Ogburn discussed implementing a new vision for telemetry in the Mid-Atlantic stimulated by ATN funding for an ACT-Mid Atlantic Data Wrangler
  - o Funding for Mid-Atlantic Data Wrangler was secured a year ago
  - o Funding for managing the ACT network out of Delaware State University (Dewayne Fox) currently runs out in March 2020
  - o The web-based MATOS tool allows acoustic telemetry researchers to share data
  - o A workshop funded by ATN was held in the spring of 2019 to provide a regional database node that works for the research community. Had 35 people in attendance from across the mid-Atlantic and discussions revolved around policies, what kinds of data can be shared, what should happen with it, how it's protected, etc.
    - Workshop also identified a steering group that includes key players representing SERC, MARACOOS, RPS, OTN, ATN, NCBO, ACT, MA DMF, NC DENR, and CBL.
  - o Currently, MATOS web portal maintains the project database, tag database, detection database, and receiver deployment database.
    - Data sharing occurs across FACT, ACT, MATOS, and OTN
    - Long-term data archive in ATN DAC
  - o Completed first OTN data push in Dec 019
    - 18 projects, 18 registered users
    - 270 tagged animals
    - 10 species
    - 85 receiver deployments
    - 500,000 tag detects
  - o M. Ogburn discussed next steps. The desire was expressed to be able to connect ACT to ATN DAC using link to be able to share data across the nodes. Transitioning to the cloud will be last step.

- o Potential collaboration with MARACOOS is in the works
- o M. Ogburn considered March 24th an 25th as dates for a second workshop.
- o B. Woodward remarked that that ACT network had been losing energy. These efforts have helped reinvigorate the program.
- Regarding the Georgia DNR Coastal Receiver Array, B. Woodward described that it is a strategically located set of receivers near St. Simon Sound, about 24 receivers managed by Dr, Chris Kalinowsky . ATN is supporting it now because it is strategically located and has been essentially continuously maintained since 2014. Data from the receiver array have been shared with 46 different research groups from 10 different state, federal, and non-governmental organizations. Thse data represent 41 different species (670 different individuals) including threatened and endangered species. The continuous operation and strategic location of the array have proven valuable for many studies that track animal movements between over wintering habitat in Florida and critical habitats to the north.

F. **Open Session Presentation**
- K. Hart (USGS) discussed her new Navy-funded turtle telemetry in the lower Florida Keys.
  - o In total, 15 turtles were tagged and are currently being tracked. They have spot tags andacoustic tags, and the study was focused where Naval activity is typically concentrated.
  - o Bulk of all receiver work is being done with the State of Florida and various partners, including Bonefish and Tarpon Trust.
  - o Hope is that this study will lead to additional funding. Other on-going turtle projects are funded by BOEM. 50 turtles have been tagged in the Gulf of Mexico and a new project is working on acceleration data logging.
  - o Models have been created from data to show rate of turtle beating its flippers. Researchers can also see the type of information that is concurrent with location.
  - o Recently they have also put together an acoustic tag retention rate

G. **Argos Fees Program: Argos Satellite Data Fees Payment Program for ATN Researchers**
- B. Woodward reviewed the rules for PIs
  - o Be engaged in satellite telemetry and using Argos
  - o Agree to submit R/T tracks to ATN DAC for website display
  - o Agree to submit complete raw tag data to DAC in real-time for duration of project. ATN will continue to manage the process behind-the-scenes.
    - ▪ B. Woodward noted that data can be protected from download by others for a time period specified by sponsoring agency.
    - ▪ Also noted that displaying data does not make it available for download;there is a legitimate concern for some threatened/endangered species that may be vulnerable if data were to be accessible right away.
- STATUS: 28 Projects, 918 tags are committed for funding
  - o J. Young asked if there were harassment concerns regarding satellite data. R. Wells confirmed that even though data is real-time, harassment of animals is not an issue as it would take too long to reach their location
  - o K. Hart expressed interest in setting an example by joining the Argos Fees Program and showing her data and sharing her Argos information, which also helps promote the portal
    - ▪ M. McKinzie will send K. Hart form to apply to the Fees Program
  - o M. McKinzie indicated data has already been collected from 161 tags
  - o B. Woodward indicated the importance of satisfying agency needs

- M. McKinzie asked at what point do we cut off PIs who are using this program but are not supplying their data to the ATN DAC?
  - It was determined that M. McKinzie and B. Woodward will email them and possibly cc ATN members to apply some pressure
- M. Weise asked if it would be possible to use the Steering Group to reach out to other USGS groups for example and to different regions so that we can get the word out to them (e.g. could be good to get the word out to NMFS Regions because not all Science Centers know about it).
- K. Hart discussed that some internal proposals in NOAA have occurred and 3 had satellite tracking. If awarded in the Pacific, these would be great to have some of the remote areas/Hawaiian Islands involved
- B. Woodward asked if it would be possible to find a larger list of PIs? Emphasized importance of doing everything we can to satisfy agency needs. K. Hart indicated she would try to backtrack and determine who is culminating that information from email blasts.
- M. McKinzie noted that she has experienced some issues with PIs not communicating with her regarding making their data available to the DAC, PIs include Goldbogen (not responded at all); Ari Friedlander (has released some data but has not provided metadata; David Wiley has not responded at all. ATN is paying the bill for them, but the PIs have not yet allowed computer access or provided metadata.
- J. Young asked if data is generally distributed for mammals and fish or mainly mammals. B. Woodward answered that it heavily trends towards mammals for Navy funding, but overall is pretty diverse.
- M. Weise asked given that some people are slow to upload data, is there a way we can essentially halt the payout until tags are actually out? Perhaps the policy could require completion of a certain number of steps before they get paid.
  - M. McKinzie noted that PIs are sent to a registration app and they must fill out metadata before they can start to be paid. It is harder to keep track of flipping that switch when a batch of ID's needs to be flipped over. M. McKinzie must be able to communicate with wildlife computers and PIs need to agree before that can be done.
- J. Young asked if there is a way to note that animals have double tags (acoustic)
  - M. McKinzie will consider how to note this, but believes it is possible.
- M. McKinzie discussed that it is useful to think of taxon-specific requirements for filtering data rather than a one-size-fits-all model. M. Ogburn noted that tracking might cause issues, such as if white sharks are thought to be in rivers near major cities.
- K. Hart asked how are we handling requests from other data users? Will PIs make this decision?
  - M. McKinzie responded that yes, decision is punted to PIs for protected data. And PIs can give them access (with limits if wanted) through the DAC research workspace.
  - B. Woodward emphasized that for real-time data from tags, it is only displayed and is not accessible.
- B. Woodward noted the program is currently limited to US researchers, although the data doesn't have to be US based. There are some big users, such as James Sulikowski from ASU with 185 tags.

H. Telemetry Tag Discussion - Making Telemetry Tags Available to ATN Researchers
- B. Woodward noted that the ATN had some money in 2019 to buy some satellite tags (about $65K) and posed questions to the group about which tags should be bought, how they should be

distributed, and who should receive them. Other tools that could be of assistance (for example receivers) also count.

- o M. Weise suggested collaborating with ATN researchers to determine what tags would be most useful.
- o K. Hart suggested considering if there is a way to prioritize active and funded projects, and projects on the DAC (that way it incentivizes being on DAC)
- o G. Skomal noted that normally the process would include a call for proposals and ranking system, but this is time consuming. An option could be to preemptively narrow the field by setting specific criteria
  - ▪ W. Turner suggested it might be it feasible have people write brief proposals and have a small group review
  - ▪ A financial limit could be set at $5K or $10K. Other criteria could be set such as management implications, in part to avoid applications from every graduate student.
  - ▪ R. Carini offered to share MMC grant criteria as they have a similar process
- o B. Woodward suggested deciding on a narrow set of criteria based on input from ATN group
  - ▪ R. Wells recommended incorporating a possible consultation process
- o M. McKinzie will investigate any blatant gaps in DAC network that we could narrow down the criteria to address.
- o K. Holland suggested to consider purchasing something loanable to have in inventory to increase infrastructure capacity.
- o K. Hart suggested it might be worth asking BOEM what the process is for putting something on a rig.
- o K. Hart also discussed an idea that there might be to prioritize needs of active projects that are currently funded. The projects would have to be on the DAC. B. Woodward noted that this could be a good mechanism, especially to only consider PIs with metadata on the DAC.
- o J. Young asked if only research that focuses on larger-scale questions should be considered?
- o B. Woodward asked if the focus should be narrowed to particular research topics?
- o K. Holland noted that the process seems like it would be complicated and might be beneficial to have tags available for moments of opportunity.
  - ▪ B. Woodward indicated that this is not always practical, as it becomes difficult to distinguish from regularly funded proposals. Perhaps best choice is to decide on a very narrow scope depending on member discussions.
- o J. Young mentioned that tags would likely need to be registered for an incentive program. B. Woodward confirmed that they would only be loaned to PIs.
- M. Ogburn recalled that ROSA is an industry-funded study on the impacts of industry. The group is looking for an executive director (Rosa is fish and commercial focused). M. Ogburn noted that it would be beneficial to support industry partnerships and help study impacts of development on the east coast.
  - o S. Hayes noted that ROSA was created to be fisheries-focused and it might be good to keep fishing stakeholders separate from conservation/ESA/MMC stakeholders due to perpetually unreconcilable differences.
  - o B. Woodward suggested it seems like a good opportunity for telemetry and other science to connect with Eastern seaboard development. No immediate steps are needed for interaction, but it's a topic to keep eye on.
  - o S. Hayes stated that Shell has funded $150k for ropeless fishing and the DOE is budgeting things up to $10M. Still unsure if this would be beneficial for ecosystem

impact or devastating. While there is no direct mechanical impact that is obvious, there would still be a system changes as a result of the scale of such work.

I. **Meeting IOOC agency needs; Funding for ATN from other IOOC Agencies**
- B. Woodward reminded the group that ATN agencies were selected because telemetry has implications for agencies. Having the Steering Group made up of representatives from those agencies would bring their needs to the table and guide the direction in which ATN goes in terms of satisfying those needs.
    - o Considering this, it's time to revisit the specific needs of agencies and to what extent are we currently able to satisfy them. If we're not, what can we do to fix that?
- B. Woodward called on several members to provide their agency's perspective:
    - o M. Weise (ONR perspective): ONR focus is basic research and initiating and early development of technologies d capabilities like the ATN. The Navy wants to enable access to tag data for their EIS assessments, for example gathering data on where animals are relative to Navy activity. ONR's recommended priorities include:
        - ▪ Making sure everyone knows about ATN/DAC and PIs are adding data where appropriate
        - ▪ Foster next steps development by bringing in other programs for support/finance.
        - ▪ Navy wants long-term data access, so it's important to get in current data AND pull in historic data that they have funded for last decade. Navy may be able to contribute money to have PIs to put historic data together.
        - ▪ B. Woodward commented that a critical piece of vision going forward is the transition to operations.
    - o B. Houtman (NSF perspective): NSF solicits and funds proposals but does not conduct science in-house. NSF's higher-level interest is that there is a place that NSF researchers can go and be of value to the larger community, not just PIs. They fund some databases and activities and are interested in funding the best available data for EIS for marine seismic work. Another priority is long-term investment in infrastructure, although there is a balance between how much goes to infrastructure (which is costly) vs. funding research.
        - ▪ B. Woodward asked about database maintenance. B. Houtman responds that the science community expresses that they need databases, even though they are a very high initial investment and are usually only funded for 3-5 years. Evaluations are made based on how a database is being used and how it is serving the community.
        - ▪ NSF is NOT doing "monitoring" and "operations" and cannot easily fund a database like the DAC directly. However, if database like the DAC is of value to NSF it would be feasible to include 'user fees' or some other way to support database in proposals and projects funded by NSF . Woody chimed in that NASA is the same way in that direct funding a DAC would be difficult, but it would be feasible to include 'user fees' or some other way to support database in proposals and projects funded by NASA.
        - ▪ B. Houtman suggests it may be valuable to reach out to Heidi for input on if NSF would be willing to fund her type of project (using ATN data). Heidi would need to request to use her funding from NSF to pay ATN
        - ▪ M. Weise asked if there is any interaction with Antarctica program? B. Houtman confirmed that direct contact has not been made with them.
    - o W. Turner (NASA perspective): Animal movement is exploding right now and lends itself to the top-down view that NASA prides itself on. This is area for growth as higher resolution data is valuable, with nods to climate and other anthropogenic influences.

NASA is looking for one place to tell people to put their data and NASA can go for information. "Monitoring" is also a turn-off word for NASA. However, the agency does seek long-term time scales, and is interested in funding some long-term projects.

- For example, take the ICARUS tags project: the Germans put an antenna on the international space station on the Russian side. NASA is trying to help make tags smaller. So, NASA needs help making sure tags are as useful as possible for terrestrial and aquatic organisms. USGS and FWS ask NASA through "Satellite Needs Project." Other agencies can also help (including DOD and NOAA) to ask NASA for telemetry, which will help convince upper management. The goal is to get as sophisticated tags as possible.
- B. Woodward commented that MBON and ATN overlap but are different. The programs may not need to combine but should search for the overlap. Noted difficulties in supporting a biological program that is going in two different directions, but discussions are ongoing especially for the west coast.
- M. Weise added that it would be worth finding agency overlap as well. M. Weise also asked if something could be developed for smaller transmitters?
  - W. Turner confirmed this would most likely be the case, if funding and work is there.
  - B. Woodward noted that the plan is to launch 24 cubesats by 2022which will uilize the significant data handling infrastructure which exists forthe ARGOS system.
- W. Turner added that the goal now is to develop intelligent cube satellites with as much communications capability as possible. NASA for decades has been looking at greenness (plants on land and water). It is now time to transition to looking at animals. If we could figure out how to apply the technology to marine environments as well it would be a significant advancement
- B. Houtman suggested NSF could consider data being sent to ATN as part of awards when evaluating data management plans
o J. Price suggested that agencies need common language and shared spreadsheet for data needs and suggested a look at projects that are recently concluded and currently active.
  - ACTION: M. McKinzie will set up a spreadsheet to circulate to agencies to populate with inventory of what is being done. Would also be beneficial to have agencies agree on common language.
  - R. Wells asked if the ATN can accept money from private folks
    - B. Woodward answered yes. RAs are also non-federal and offer some funding vehicles. Smithsonian may also have opportunities. Schmidt, Packard, other Foundations may also be interested in funding this type of work. B. Woodward noted, however, that often the issue is limitation of data.
  - M. McKinzie asked if data is just going to DAC to live there or if it will be pushed to long-term archive? In other words, is it part of the requirement for funding agencies as ATN takes the next steps?
o D. Smith (Army COE perspective): Would like to see spreadsheets/shared documents describing projects and importance of ATN that he can take back to management. It may be worth reaching out to Josh at the Bureau of Reclamation as they may be interested in participating. Also, Kate Lee with "state."
  - COE has a lot of acoustic data that they paid for and could potentially be added to the DAC. Funding is not centralized in the COE, but instead distributed across all needs.

- If ATN is successful in wrangling acoustic data, the COE would find that very useful and could be informational for the environmental community. COE is mostly interested in near-shore and freshwater.
- COE has lots of data stored on the PNW. Reports have been put out, but the data is mostly just sitting on hard drive. Getting this data out may be a good argument for getting Army COE more involved.

- J. Price (BOEM perspective): BOEM has at least 15 years of animal tagging investment and has made valuable progress. BOEMs budget was cut significantly in FY20, so that's the reason their ATN contribution was decreased. However, the agency has built an appreciation for data preservation is still very committed to supporting ATN. BOEM also has regional offices that may be useful.
    - J. Price noted that data is already very valuable to environmental impact assessments. In 2010, a project looked at various aspects of tagging to do a study assessing health impacts on tagged animals, so there are now years of interest already proving itself to managers.
    - B. Woodward remarked that ATN would like a closer relationship with PIs who are supported through BOEM to satisfy their needs. What would Jim recommend is the best way for ATN to learn who those people are?
        - J. Price suggested that M. McKinzie can start a spreadsheet and send to BOEM, and he can populate it with project and names. BOEM is going to require that PIs submit a data management plan with proposal—PIs need to submit to DAC. Maybe have some kind of informational blurb to send to people (esp. people that aren't so connected to RAs)
    - J. Price agreed to starting a conversation with Gulf Offices to get them more involved
    - J. Price is also having a face-to-face chat with his division chief, and may be able to tease out if there's a way ATN funding could have not been cut (perhaps if it was put in a different category)
    - M. McKinzie asked how BOEM's funding cycle works. J. Price stated that they have an annual cycle, operating differently from NFS. They occasionally accept unsolicited proposals, but it is very rare. In general, an internal proposal process is started, and colleagues review each other's (very few external proposals considered). Stronger requests go to upper management for review.
        - J. Price also noted that regional offices are dealing with local science centers and collaborating actively with them.
- K. Hart (USGS perspective): USGS is required to release data to the public via Science Base (a USGS database), except for ESA species in National Parks (much of where she works). K. Hart is supportive of data sharing within the community and attempts to promote the idea by sharing her own data.
    - K. Hart noted that funding ultimately comes from Ecosystems and Status/Trends programs.
    - K. Hart discussed that each scientist has their own mission and funding sources (sometimes external) and that data must be shared back to those portals. Would also be beneficial to share data with broader community.
    - M. McKinzie asked how DOIs are minted and how are they accessible? K. Hart noted that it usually lands in Science Base and they mint the DOI. They have a data steward who reviews any data release and it is held until study is published and then all released at same time.
    - M. Weise asked if K. Hart could reach out to centers/programs to obtain data from them. K. Hart suggested speaking with program coordinator in Reston and would send them.

- o S. Hayes (NMFS perspective): The development of online tools for satellite telemetry is impressive, and ideally acoustic technology will catch up. The acoustic receiver network falls behind on small regional projects. Perhaps the ATN could prop up the acoustic receiver network. The West Coast especially could benefit from nationalized data management scheme, like how it functions on the East Coast. S. Hayes would like to see NCEI process stabilized and suggests DAC could be the underpinning for this process.
    - M. McKinzie chimes in that the hold up with NCEI is that it requires a systematic process that isn't often possible with acoustic data
    - One option is to think about how to break up nodes along the West Coast
    - B. Woodward noted the importance of being flexible. While it is important to be able to focus on one area, the nature of the field is that tags are always changing, and standardization is difficult.
    - A new way to use telemetry would be to better understand how animals invade new areas. Big tags for large animals, though, can be challenging logistically.
- R. Carini (MMC Perspective): Would also like to contribute to the spreadsheet tracking projects and stay up to date on what work is being done so they can take district project information to Capitol Hill. MMC also has their upcoming annual meeting and will considering sharing information about DAC. ATN is good example that may be applied to biological interests and initiatives.
    - Potential new IOOC biological task team
    - M. McKinzie has done a webinar with the entire commission. They are working closely with the Coast Guard shipping routes and communities, which use a lot of telemetry data. They are currently writing an oversight letter, which is especially important as ATN DAC grows
    - R. Carini noted that MMC will be reinstating their own survey of federally funded research on marine mammals and ATN would be a very helpful place to go for researchers. It would be beneficial to be able to report out to folks and educate government staff on what is out there as part of their mission. There is potential to publicize the ATN DAC at their annual meeting, as well.
    - R. Carini discussed the benefits of monitoring the ocean variables in association with stakeholders, especially for regional associations. MMC could also be used for positive advertisement for ATN and DAC.
    - M. Weise noted that NMFS has protected resources and engages with fisheries. Has anything come to mind to determine how to better connect fisheries across the different science centers?
        - S. Hayes answered that councils are entrenched with procedural processes that drive the agencies. Patrick Lynch is the new division director for protected species, and they are still trying to figure out funding.
- M. Ogburn (Smithsonian Perspective): The Smithsonian is not a funding agency but would like to support the ATN in other ways. The Smithsonian has convening power for researchers. While they focus on long-term research programs, they also have a broad communications reach
    - The Smithsonian may qualify as a "Forever agency" where ATN data could be archived
    - Good emphasis on ecology and working on developing some resources. On resource side, the Smithsonian has several people working on development, beta testing new tags, and a lot of interest on that side as well as integrating data and synthesizing a lot of different kinds of projects.

J. ATN Wheelhouse Newsletter

- B. Woodward asked the group to comment on whether they find the newsletter valuable and worth the investment (of Bill's time). The newsletter has now transitioned from monthly publishing to bi-monthly. It is distributed to SG members, RAs, and goes to a few ATN PIs
  - M. McKinzie noted it might be useful if it went to all ATN PIs (currently only sent to some of them).
  - R. Wells, B. Houtman, and W. Turner commented that they find the newsletter valuable, though perhaps it could go out quarterly. B. Woodward prefers to keep his memory fresh and publish it more frequently, so will continue to publish it bi-monthly
  - M. Weise and S. Hayes agreed that the letter is valuable and helps keep ATN at the front of people's minds. It may be helpful to have someone solicit updates from PIs. Pictures and field blogs could also be rotated on the site to promote engagement
  - M. McKinzie noted that updates from PIs could also be highlighted on ATN DAC splash page (would simply need to contact Axiom).

K. **ATN Policy Document**
- B. Woodward notes that he is still putting the finishing touches on it. This includes incorporating the comments from J. Young, and B. Woodward may ask her to help with this.
- No further discussion needed on the subject for the time being

L. **Linking ATN work to other observing fields (HABs, Ocean Acidification)**
- B. Woodward explored how our community might linkour telemetry work to observing efforts associated with, for example, HABs and ocean acidification. may serve to align priorities and perhaps provide to funding approaches.
- S. Hayes agreed it is beneficial to have examples of how having telemetry infrastructure is useful in these areas (for example R. Wells Red Tide work) but suggested this may be best left up to scientists. It is challenging because HABs and OA are more unpredictable (although forecasting is improving).
  - S. Hayes also remarked that there is so much technology being implemented in Sarasota Bay, that it could be used as a hook to show what has been and can be accomplished.
- B. Houtman noted that it is always worthwhile to connect a project with high societal value/impact, whether that's predictive, analytical, or post-analytical because it helps justify investment in ATN
- B. Woodward commented that no one dissented with this idea, so believes it to be beneficial.
  - B. Houtman agreed to type up explanation of benefits.
- J. Young noted it would be beneficial to have information on unusual mortality events from the previous year, as necropsies don't often provide much conclusive evidence.

M. **Global Open Code Set Issue for Acoustic Receivers/Tags**
- B. Woodward recalled that the European acoustic telemetry community has created their own open source code set that can be used with any vendor that wants it.Vemco is not interested in making their systems interoperable with this code set and insists on maintaining their proprietary code set which is not interoperable with other vendors hardware
  - Kim Aarestrup (Technical University of Denmark) is advocating the approach that all PIs, the next time they make a purchase order, request that it operates on open code set to demonstrate that the community wants open code and encourages Vemco to provide it
- B. Woodward noted that his role was to go to US practitioners and ask which ones would be willing to do that

- o D. Smith commented that researchers are probably not willing; it's just not worth it to sacrifice quality
- o S. Hayes noted that if we move to using acoustic telemetry to track everything in the ocean (eg., ropeless fishing gear), it will have to be open source code. Eventually we may even move to standard operating devices (like we have for phones).
- J. Young suggested that PIs offer to pay an extra $50 for open source products if Vemco would open another line of products with this functionality. SG members agreed this is a strong idea to explore.

N. **B. Woodward presented an update on ARGOS Kineis CubeSats**
- The French Space Agency (CNES) is launching a constellation of 25 CubeSats which will shorten the time between satellite passes down to about 15 minutes. The system is being called Kineis and is scheduledto launch in 2022, though it will likely be postponed to 2023 or later.
  - o While this is not expected to change ARGOS capabilities, the fourth generation Argos system on board these cubesats will have a higher data rate though it can not necessarily be applied to animal tracking.
  - o ARGOS also continues to be aboard the traditional weather satellites (NOAA, EUMETSAT, ISRO) enabling routine operational communications to continue to exist.

O. **5-Year Implementation Plan**
B. Woodward noted that the 5-year plan ends in 2021 and asked Steering Group members if another plan should be created to cover the next 5 years.
  - o Members agreed that it would be beneficial and will need to strategize how to do this.

P. **Organizing Satellite Telemetry Community**
- B. Woodward requested members to discuss ways in which the same community building organization for satellite telemetry community as they have for the acoustic telemetry community in the United States. Perhaps there could be an annual ATN meeting to help facilitate interactions between satellite and acoustic communities (this could even be opened globally). Another option would be to bring groups together based on common needs.
  - o B. Woodward encouraged members to brainstorm ideas to accomplish this task.
  - o B. Woodward noted that if the ATN is dedicated to building community and collaboration, unity, stability, and continuity, then it doesn't serve that purpose well to have individuals in the community working separately. Instead, it would be beneficial to bring in more collaboration and show that ATN is looking for ways to support that community.

Q. **Open Session Presentation**
- R. Wells presented his research on satellite-linked tag evolution
  - o Tags are becoming smaller, safer, and have more functions.
  - o Had opportunity to put tags on 5 stranded pilot whales in Florida and track them for 36 days. One group went to northern Gulf of Mexico and another looped around Florida to the Atlantic. They suspect that animals are doing just fine even though the tags did not last as long as they would have liked.
  - o TADpole: A project developing and refining a prototype tagging tool
    - ▪ Fixture is a satellite-linked tag that fires dart around a fin and collects a genetic sample
    - ▪ R. Wells suggested this could potentially be made available to ATN to distribute to researchers who could use it
    - ▪ R. Wells noted that they have a stock of tags and are planning to deploy/provide them when an opportunity presents itself.

- o Passive acoustic listening stations have been set up
    - Include an automated system for identifying dolphin whistles in under 2 minutes.
    - Result: researched showed a dramatic decrease in acoustic activity soon after arrival of a Red Tide that lasted for a significant amount of time, showing that Red Tide has a long-lasting impact on the ecosystem.
    - Citizen science can also contribute to measurements
    - This would be a tool to not only be able to track dolphins, but also to look at the recovery of the ecosystem over time.
- o M. Weise asked about organisms dying from harmful events and if it would be beneficial to look at the spectrogram through time to learn how much is actually getting off the beach.

Meeting Attendees

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Action Items

#	Action Item	Point	Due Date
1	Create Google spreadsheet to organize in-progress projects and for SG members' reference if needed. Send to SG member to help populate.	B. Woodward, M. McKinzie	
2	Incorporate J. Young's comments into policy document and send out for final review.	B. Woodward & J. Young	
3	Look into possibility of alerts for DAC users when downloaded data has been altered	M. McKinzie	
4	Initiate conversations with Gulf Coast PIs to facilitate more engagement.	J. Price	
5	Begin strategizing the next 5-year ATN plan, given that the current plan ends in 2021.	B. Woodward	
5	Craft strategic plan/procedure to re-evaluate funding each fiscal year, including how to use limited funds for supporting the infrastructure.	B. Woodward	
7	Review new package (ADEPTHER) for data visualization, funded by NPS	K. Hart, M. McKinzie	
8	Organize and schedule 1-hour webinar to educate SG members on system tools (e.g. registration app, etc.)	M. McKinzie	
9	Identify small group of SG members to develop effective approach for visual presentation and organization of national data (themes, gaps, needs) from regional workshops to lead to actionable tasks.	B. Woodward, M. Weise, TBD	
10	Organize and schedule 1-hour webinar to educate SG members regarding DAC research workspace and coordinate feedback for Axiom.	M. McKinzie	Within 4 weeks

| 11 | Determine future funding opportunities through identification of agency needs to achieve funding goals. Develop 1-2 pager defining importance and options for funding, including 1) baseline operations, and 2) ATN project/topic support | M. Weise | Ongoing |

On-Going Action Items

#	Action Item	Point	Due Date
1	Generate a google spreadsheet of upcoming meetings to assess SG member attendance.	S. Murphy, S. Rahman	Ongoing