Southeast Coastal Ocean Observing Regional Association (SECOORA): Supporting Resilient Ecosystems, Communities and Economies

Program Performance Report

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1) Progress and Accomplishments

Goal 1: Continue SECOORA's region-wide governance and communication structure to engage users and stakeholders in coastal observing science

Milestone A: Maintain governance and management for the RA and RCOOS: *On-Track*

Activities	Status
Effectively manage grants and contracts	The SECOORA Year 4 Descope proposal was submitted to the IOOS office 08/29/19. The SECOORA Year 5 Descope proposal writing is underway.
Ensure SECOORA's operational & governance structure enables us to achieve our vision	SECOORA held its annual Board of Directors election. The 11-member Board will start on July 1, 2020.
Maintain effective communication with US IOOS and the IOOS Association	Highlights this period include IOOS Association and IOOS Annual meetings in DC 3/4-5/20; and monthly IOOS Program Office, IOOS Association Executive Committee and RA Director calls.
Expand and diversify funding.	SECOORA received $15,000 in funding from the Curtis & Edith Munson Foundation in April 2019 to re-establish three FACT acoustic sensors and add 30 water temperature sensors at established acoustic receiver stations in South Florida. As a matching campaign, SECOORA raised $12,800 in donations. The donated funds support a graduate student RFP, focusing on fisheries research in South Florida. 5 students submitted proposals and the recipient will be select by late June 2020.

Activities	Status
Update and maintain SECOORA's RCOOS Plan	SECOORA has revised its Regional Coastal Ocean Observing System Strategic Operational Plan (RCOOS plan). The new plan covers the period 2020 – 2025 and will be used to guide the SECOORA proposal writing process for the 2021 – 2026 IOOS proposal.

Milestone B: Engage users and other stakeholders to prioritize investments: *On-Track*

Activities	Status
Improve web-based information system and web presence	SECOORA continues to track website usage with Google Analytics. There was a 14% decrease in website sessions on secoora.org (from 41,377 to 35,382) this period. Data portal sessions (portal.secoora.org) have decreased 3% in the reporting period (from 5,527 to 5,340). This is expected as webpage and data portal usage is event driven (i.e. hurricane season).
Identify and promote opportunities for non-members to engage in SECOORA activities and initiatives	SECOORA hosted 4 webinars as part of the *Coastal Ocean Observing in Your Community* webinar series and over 370 participants tuned in. Click here for recorded webinars. - Peter Hamilton, NCSU, presented "What do we know about the Loop Current in the Gulf of Mexico from recent observations?"68 attendees. - Dr. Joy Young, FACT Network, presented a webinar "Where did my fish go? How scientists are working together to track fish over vast ocean space" as part of SECOORA's webinar series on March 24. 104 attendees. - Catherine Edwards (UGA SkIO and SECOORA PI) and Travis Miles (Rutgers University) presented the webinar "Hurricane Gliders: Improving Tropical Storm Intensity Forecasts with Real Time Data" 105 attendees. - Steve Pfaff, Mark Willis, and Victoria Oliva, forecasters from National Weather Service Forecast Office Wilmington, NC presented "The Rip Current Challenge: A coastal hazards with far inland implications" on May 26. 94 attendees.
Implement an effective outreach strategy	SECOORA's outreach strategy is based on goals in the Strategic Plan and Fundraising Strategy. Primary marketing and outreach mechanisms are e-newsletters, e-mails, social-media, and the website. During this period subscription to the newsletter increased by 11% (from 1022 to 1136); Facebook "likes" have grown 3% (from 471 to 485); and, Twitter "followers" have grown 6% (from 698 to 741). SECOORA shared approximately 51 Facebook posts and 62 Twitter "tweets", referring a combined 802 sessions to the SECOORA website (decreasing 24% from 1055 to 802) and 19 stories were published on the website (www.secoora.org/news).
Support citizen science opportunities	REEF, the South Atlantic Fishery Management Council (SAFMC), and SECOORA submitted a NFWF proposal, *A Citizen Science Pilot Project to Develop Size Matters: Innovative Length Estimate (SMILE)*. The proposal, though not funded, would have worked with recreational scuba divers to take photos of fish. The photos would be analyzed for size, habitat, and location.
Engage students in problem solving using ocean observing data	In February, two USF undergraduate classes participated in field trips to the SECOORA/USF COMPS Clam Bayou station. The students learned how data from the station are important to environmental monitoring. The Clam Bayou station is a partnership between YSI Xylem, SECOORA, and USF COMPS. Over 300 students have been taught through this partnership since it began in 2014. SECOORA announced over $22,000 in student opportunities during the reporting period. There were three opportunities and all proposals were due May 15, 2020. Winners will be announced in June 2020. See list: Vembu Subramanian Ocean Scholars Award (3 submissions)

Activities	Status
	• [2020 Data Challenge](#)- High Frequency Radar (1 submission) • [Graduate Student Fisheries Opportunity](#) (Munson matching funds): Examine How Temperature Affects Fish Movement Patterns in South Florida (5 submissions) Due to the COVID-19 pandemic, there is increased demand for high-quality online science education resources. SECOORA is soliciting [proposals](#) to develop online or online accessible K-12 marine science curricula and/or activities that can be implemented by parents, teachers, and other educators. Proposals are due June 18, 2020. The Coastal Studies Institute, in partnership with SECOORA, is hosting a NOAA Hollings scholar, Natalie Murphy. **See page 13 of this report for details**.
Coordination of SOCAN activities (Treml)	Leslie Wickes stepped down as the SOCAN Coordinator and Megan Treml assumed the duties of the Coordinator. SOCAN continued monthly Science Working group calls, with Emily Hall, Mote Marine Laboratory, leading the calls. SOCAN/SECOORA led a NOAA OA proposal with collaborators from GCOOS, the University of Delaware, Woods Hole Oceanographic Institute, Florida Sea Grant, and the US Geological Survey. The proposal, "Integrated Human-Ecological Approach to Assess Coastal and Ocean Acidification in the US Southeast", seeks to develop environmental and economic models to assess OA impacts in the Southeast and Gulf of Mexico. A new SOCAN webpage focused on South Carolina has also been added to the [website](#).

Milestone C: Provide DMAC infrastructure to enable collaboration and decision-making (SECOORA and Axiom Data Science, LLC): *On-track*

Activities	Status

IOOS DMAC standards compliance and implementation of Data Management, Products, and Services	Responsible contractor: Axiom Data Science, LLC. SECOORA follows the IOOS recommended standards-based services and requirements to ingest, manage, and provide access to all our funded data streams (in-situ, remotely sensed and numerical models). See [portal.secoora.org](#). Progress during this period is as follows:
	• Maintain IOOS compliant services and applications for integration with national products:
	    ○ THREDDS - 4.6.14 - [https://thredds.secoora.org](#)
	    ○ ERDDAP 1.82 - [https://erddap.secoora.org](#)
	    ○ SECOORA ISO WAF - [https://thredds.secoora.org/iso](#)
	    ○ NCEI Archive - [https://ncei.axiomdatascience.com/secoora/](#)
	• Expanded SECOORA data portal holdings to include:
	    ○ Ingested and visualized 24 estuary water quality monitoring stations from the UNC Institute for Marine Science [ModMon program](#) (PI Paerl).
	    ○ Ingested and backfilled data for 13 [FL DEP stations](#) (7 real-time and 5 historic). Applied QARTOD tests to data streams.
	    ○ Updating the [USF COMPS](#) C10, C11, and C15 station pages with historical, post-processed data with quality checks provided by data provider.
	    ○ Added delayed mode bottom temperature data from UNCW Center for Marine Science (PI Freshwater) for the [5-mile](#) and [23-mile](#) stations.
	• Maintained submission of 66 sensor feeds to NCEI for long-term preservation. Submitted 2 new glider missions to the IOOS Glider DAC ([angus-20200319T0000](#), [bass-20200203T0000](#)).

Activities	Status

	• Maintained the SECOORA glider system for the management of SECOORA glider assets. The SECOORA glider data is available for visualization in the SECOORA portal.
	• Created an HF Radar Surface Currents data product to allow end users to access HFR data in a more user-friendly way. The page provides access to and display of end products, including a visual summary of data availability in the region. Implemented an automated pathway for SECOORA to ingest real-time HF Radar radials from data providers, including development of a Python-based library to convert the RUV/LLUV format available from both data providers and archived with NCEI into a netCDF file, including daily radar statistics and static images. See: https://hfradar.secoora.org/files/
	• Developing a Sensor-SMS service for SECOORA users to access the last observation data through a text message. Testing and feedback on the services is providing information for improvements, including feedback on naming the service (Text-a-Buoy or Dial-a-Buoy are the top choices).
	• Enhanced the hurricane tracking tool, Eyes on the Storm, by updating the landing page, normalizing the ingestion of National Hurricane Center active storm tracks for optimal display on the SECOORA portal, and integrated real-time sensor data from across the SECOORA region.
	• Supported the WebCAT application (http://secoora.org/webcat). Managed the ongoing 10-minute clip downloads from Surfline for the original WebCAT cameras and hosting the video data through SECOORA so it is discoverable and downloadable via the SECOORA website.
	• Supported the FACT Network:
	  o Maintained the OTN FACT Node at SECOORA, including progress towards making the FACT data discoverable through the IOOS Animal Telemetry Network data portal.
	  o Updated the FACT database to PostGIS 9.5 version to maintain consistency between FACT's Node install and OTN's standard.
	  o Through funding from an award to SECOORA from the Munson Foundation, created an interactive FACT map to display receiver and tag projects. The map integrates with the OTN's Geoserver to input a portion of the data discoverable on the map. Axiom is working with data providers to receive and integrate feedback on the initial prototype version.

Maintenance of DMAC infrastructure (hardware and software)	The Axiom data system is the backbone of the cyber infrastructure that is leveraged to acquire, archive, and share SECOORA data and information products. The open-source interoperability and data stewardship systems of the SECOORA infrastructure were maintained to provide full-lifecyle data management services. The Gluster storage migration was completed for data volume rebalance. The system firewall was upgraded for additional bandwidth/security, as well a secondary failover/standby unit was added for high availability. The server bootstrapping was enhanced for greater automation and reduced deployment time of new hardware. Last, improved metrics and system performance monitoring, including data portal uptime, database performance, data center power usage, and network traffic, was completed.
Establishment and release of new SECOORA Portal	Two portal versions were released: v2.11a and v2.12. Version 2.11a included expanded data quality flags, v2 backend integration, and custom unit manager. Backend timeseries caching was also incorporated to improve portal responsiveness to real-time conditions. Version 2.12 addressed user-defined improvements, implementation of

Activities	Status
	service error messages, and continuation of portal code migration to an open source platform. Version release notes: https://axiomdatascience.com/portal-updates/
QARTOD Implementation	Basic QARTOD tests were applied for 95 real-time and historical timeseries datasets that are accessible through the SECOORA data portal. Quality flags are summarized on both the station and sensor pages for visual exploration. The documentation of the test code and thresholds are displayed on sensor pages (example) with links available to the v 1.0 version QARTOD GitHub library accessible through the portal. A prototype version of a test configuration management application for users to store and manage configurations across parameters and regions was implemented. Configuration management will be expanded upon in the next reporting period to give users access to and control of more complex QARTOD features and test types. Additionally, the SECOORA DMAC plan was updated to include a table of gross range test parameters.

Goal 2: Maintain existing core observation investments in the region

Milestone A: Maintain High Frequency Radars (HFR) distributed throughout the region

Institution/Contractor	Status
University of South Florida (USF) (Weisberg, Merz) **All HFR sites On-Track**	USF continues to operate and maintain 3 CODAR HFR sites (Naples, Venice and Redington Shores) and 2 WERA HFR sites (Venice and Ft. DeSoto Park) which overlook the USF mooring array. Data are sent to SECOORA, NOAA NDBC, and the IOOS HFR CORDC network for integration, display, and dissemination. Plots of the data are also posted on the USF COMPS Ocean Circulation Group website (http://ocgweb.marine.usf.edu). All radars performed well this reporting period with the exception of the Redington Shores CODAR (up-time 45%) due to low offshore energy conditions.
University of Georgia (UGA), Skidaway Institute of Oceanography (SkIO) (Edwards/Savidge): **CAT On-Track** **JEK On-Track**	Repairs at St. Catherine's (CAT) were significantly delayed due to COVID-19 shutdowns. Approval to for SkIO technicians to access St. Catherine's Island by SkIO small boat while the ferry was still shut down was given in May. With guidance from Helzel and USC partners, SkIO installed the new power amplifier and plan a return visit in early June to complete repairs. The Jekyll Island HFR (JEK) was destroyed during hurricane Irma and hurricane supplemental funding is being used to reinstall the site. However, the original permits for the site were up for renewal by GA DNR so new permits were required prior to site re-installation. GA DNR approved the JEK permits in late May and installation of the new HFR is expected to begin in June, with the station returning to regular operations by July.
University of Miami (Shay) **STF On-Track** **VIR Delayed** **CDN Delayed** **NKL Delayed**	UM has only been able to repair 1 of 3 WERA which were severely damaged in 2017 due to Hurricane Irma. Hurricane supplemental funding was provided in May 2019 and two new HFR were received by UM in late May 2020. Due to COVID-19, field work to install the new HFR are delayed. The North Key Largo (NKL) HFR deployment was in progress when COVID-19 caused Monroe County to close access to the Florida Keys. At this time, UM anticipates access to the NKL site to complete the HFR deployment in early June 2020.
University of NC - Chapel Hill (UNC-CH) (Seim) and Coastal	UNC-CH has turned over the management of Coastal Studies Institute (CSI) to East Carolina University; therefore, SECOORA issued two sub-awards in year 4, one to UNC-CH and one to CSI, to continue operation of the four NC HFR systems. UNC-CH provides operation and maintenance for CORE and overall data management support for all four

Institution/Contractor	Status
Studies Institute (CSI) (Muglia) **CORE - Delayed** **HATY – On-Track** **DUCK – On-Track** **OCR – Delayed**	stations. CSI provides operation and maintenance for HATY, DUCK, and OCR. DUCK and HATY systems performed well during the reporting period. Repairs to the HATY shed, re-wiring, and generator installation, are in progress through Hurricane Supplemental Repairs funding. The CORE site (CODAR, up-time 13%). In mid-December 2019 the transmitter was damaged requiring that the system be sent back to Codar for repairs. Upon re-installation of the system in late March 2020, the on-going difficulties with excessive heat build-up had worsened. To avoid further damage the system was not operated. The pandemic made access to the site difficult. After consultation with Codar, a 24v DC-DC power converter was installed to smooth out the variations in voltage due to solar charging. The system is now running smoothly, although heat build-up and the associated power demands may become problematic during the hottest part of the summer. In early June remote controllable thermostats will be installed to control the building temperature and to have the ability to analyze air conditioning run-time. Through Fill-the-Gaps funding, SECOORA purchased a previously owned WERA deployed in Ocracoke, NC (OCR). The station was completely destroyed during Hurricane Dorian in 2019. No new funding is available to replace the WERA. Efforts are underway to re-install the OCR station as a CODAR as most of the components were already owned by CSI. All components of the system have been acquired including IOOS Loaner TX and RX chassis and a loaner loop box RX antenna. Cables have been made for TX/RX antennas, a rack for TX/RX chassis and computer has been assembled, and both antennas and computer rack are outfitted with lightning protection. The system is undergoing final assembly and an initial test run locally before being installed at Ocracoke. When the initial test run is complete, site preparation and planning for installation at Ocracoke airport will begin.
University of South Carolina (Voulgaris) **All HFRs On-Track**	University of South Carolina is responsible for the operation and maintenance the WERA HFRs located at Georgetown, SC (GTN) and Fort Caswell, NC (CSW). GTN site stopped transmitting on 12/28/19 and no remote communication was possible. Site visit on 1/14-16/2020 restored functionality (manual system reboot) and replacement of the power plug in the WERA power supply. The WERA did not transmit during this period, so no data was collected. GTN site again stopped transmitting on 4/20/2020. A site visit on 4/22/2020 restored communication. The cause of the interruption was identified as a problem with the compatibility of computer operating system with a newer, larger in capacity external USB drive that was installed for offline raw data transfer to the University. The original smaller USB drive was installed and the need for updating the computer and operating system to newer version was noted for future action. USC is preparing to change from the current 8.3 MHz to the FCC's Universal Licensing System (ULS) to operate in the International Telecommunications Union (ITU) HF radar allocated frequency bands. USC has shift to the frequency range 5.250 – 5.275 MHz. Despite its limited bandwidth, this frequency ensures longer ranges compatible with those achieved at the current frequency. New hardware for this relocation has been ordered from the manufacturer. USC and SECOORA are looking for a suitable location for a 3rd HFR between the GTN and CSW sites. Waites Island, SC was scoped first as a potential site, but the cost of electricity installation was too expensive, so this location has been abandoned. The SC State Park at Myrtle Beach has been identified as another suitable location and initial contacts with the SC State Park were very encouraging. However, the finalization of the

Institution/Contractor	Status
	site and permitting was interrupted due to COVID-19 and closure of the state government and other travel restrictions.

Milestone B: Maintain in-situ stations along the Carolina and West Florida Shelf (WFS) coasts

Institution/ Contractor	Status
USF (Weisberg) - Coastal Ocean Monitoring and Prediction System (COMPS) moorings *All moorings On Track (servicing moorings delayed)*	**Operations:** Three real-time surface moorings (C10, C12, C13) were maintained, along with two non-real-time subsurface moorings (C11 and C15). All data from C11 and C15 continue to be uploaded to Research Workspace for data archival and sharing with SECOORA and NCEI. In collaboration with Dr. Kim Yates (USGS) the C12 mooring includes an experimental ocean acidification package; however, USF and USGS are still trying to correct failure points in the system.

Along with the SECOORA-funded buoys, USF maintains two additional real time stations. One is the RESTORE Act-funded C21 station, offshore of St Pete Beach, FL. The second is a "pressure point mooring" (C22) located at the southwest corner of the WFS to the northeast of the Dry Tortugas. This mooring was deployed on 6/27/19 through funding from the NASEM Gulf Research Program.

The following table indicates up-time percentages for USF real-time moored observations.

	C10	C12	C13	C21	C22
Wind	72%	95%	83%	36%	94%
Air Pressure	72%	95%	83%	36%	94%
Water Temperature	72%	86%	80%	17%	94%
Salinity (Surface)	72%	86%	80%	17%	94%
Air Temperature	66%	95%	83%	36%	94%
Relative Humidity	66%	95%	83%	36%	94%
Longwave Radiation	72%	N/A	N/A	N/A	N/A
Shortwave Radiation	72%	N/A	N/A	N/A	N/A
ADCP	34%	66%	22%	28%	95%
Waves	N/A	N/A	N/A	28%	N/A

Discussion of low stats: Two general issues were encountered during the reporting period that affected the entire mooring array as a whole. These are 1) ADCP failures caused by a change in the supply chain of quality underwater mate-able cables and connectors; and, 2) disruptions in cruises and service trip schedules due to the COVID pandemic. USF has found a new supplier for underwater mate-able cables and the new cables will be used for the ADCP the next time USF completes a mooring turnaround cruise. Significant disruptions to planned cruises and a closure to all work-related travel have occurred due to the COVID pandemic. The spring mooring turnaround cruise has been postponed until August.

Data Management: USF has implemented QARTOD recommended QC test for all near real time data. All archived current, wind, and temperature data (July 1998 – Present) from moorings (C10, C11, C12, C13, C14, C15, C16, C17, C18, C19 and C21) have been

Institution/ Contractor	Status
	uploaded to Axiom's Research Workspace. All necessary metadata for these moorings was created as well.
USF (Luther) - Coastal tidal & meteorological stations **CLB, FHP, SHP On-Track** **APK – Delayed**	**Operations:** Sites collecting water level and surface meteorological parameters are Big Carlos Pass, Clam Bayou, Fred Howard Park, Aripeka, and Shell Point. A full suite of water quality sensors are operated on the Clam Bayou site in partnership with YSI/Xylem. All sites have been visited in order to conduct routine/preventative maintenance. Unfortunately, site visits have not been possible since mid-March due to COVID-19 travel restrictions.

<table>
<thead>
<tr><th></th><th>APK</th><th>CLB</th><th>FHP</th><th>SHP</th><th>BCP</th></tr>
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<tbody>
<tr><td>Water Level</td><td>50%</td><td>97%</td><td>99%</td><td>99%</td><td>93%</td></tr>
<tr><td>Air Temperature</td><td>50%</td><td>99%</td><td>99%</td><td>99%</td><td>93%</td></tr>
<tr><td>Air Pressure</td><td>50%</td><td>99%</td><td>99%</td><td>99%</td><td>93%</td></tr>
<tr><td>Relative Humidity</td><td>50%</td><td>99%</td><td>99%</td><td>0%</td><td>93%</td></tr>
<tr><td>Wind (Gust, Speed, Dir)</td><td>50%</td><td>99%</td><td>99%</td><td>99%</td><td>93%</td></tr>
<tr><td>Surface Water Temperature</td><td>50%</td><td>97%</td><td>N/A</td><td>99%</td><td>93%</td></tr>
<tr><td>Precipitation</td><td>0%</td><td>99%</td><td>99%</td><td>99%</td><td>93%</td></tr>
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The CLB water quality sensors collect the following parameters: DO, fluorescent DO, Blue-Green Algae, pH, Chlorophyll concentration, and Turbidity. The water quality data up-time for the reporting period was 97%.

Discussion of Low Statistics: The Aripeka site did not report from Jan. 6 to Mar. 4 due to problems with the GOES transmitter. The GOES transmitter stopped working again in late April. USF staff have been unable to repair the site now due to COVID-19. The Shell Point humidity sensor failed and USF has been unable to swap out the sensor.

Station Leveling: Connecting water level measurements to standard vertical elevation reference levels, particularly the North American Vertical Datum of 1988 (NAVD88), is very important to (i) check the long-term stability of the water level sensor system (i.e., did the sensor elevation shift or settle over time); and, (ii) to compare the water level at different sites to each other and to elevation of land-based infrastructure. USF is working with Air-Sea Measurement Systems (ASMS) for tide gauge maintenance and leveling. Leveling of the Big Carlos Pass and Clam Bayou sites was conducted in late April 2020, covered under the Hurricane Supplemental funding. ASMS is processing the datum information now. The Aripeka site will be the next priority for leveling.

| University of North Carolina - Wilmington (UNCW) (Leonard) - Coastal Ocean Research and Monitoring Program (CORMP) mooring network **All stations On-Track** | **Operations:** UNCW operates 9 moorings in NC and SC coastal waters. Buoy statistics for the reporting period are below. Note that ILM2, LEJ3, and SUN2 have co-located WaveRider buoys (i.e. 2 moorings on station) that provide spectral wave data and water temperature. |

SUN2WAVE: Due to ongoing difficulties and delays associated with the repair of the Teledyne NEMO ADCPs, CORMP will no longer support an ADCP and NEMO at the SUN2 location. Technicians secured a "loaner" Datawell Waverider buoy from CDIP and deployed it at the SUN2 site on 6/13/19 so that wave data continues to be provided. CORMP deployed a new Nexsens CB-650 buoy equipped with an SVS-603 wave sensor near the Waverider in order to evaluate the data quality of the Nexsens system. The Nexsens CB-650 buoy was recovered on Mar. 10 due to a power supply malfunction. The system has been repaired and streamlined, and the SVS-603 inertial wave sensor

Institution/ Contractor	Status
	received a firmware upgrade that will allow a better integration of the buoy hull characteristics. CORMP plans to re-deploy the buoy as soon as a larger research ship is available (COVID is causing delays in ship availability). The borrowed CDIP waverider buoy will be recovered at that time. All telemetry and datalogging features on the new Nexsens buoy are maintained by CORMP technicians and the data will be run through all applicable QARTOD tests.

	ILM2	ILM3	LEJ3	SUN2	CAP2	FRP2
Air Temperature	100%	57%	94%	100%	100%	81%
Air Pressure	100%	89%	94%	100%	100%	81%
Wind Speed, Gust, Direction	100%	100%	94%	100%	100%	81%
Salinity	98%	100%	94%	100%	100%	66%
Surface Water Temperature	99%	100%	94%	100%	100%	55%
Waves (co-located buoys)	100%	N/A	100%	100%	N/A	N/A

Discussion of Low Buoy Statistics:

FRP2: The buoy was replaced during the March 2020 RV Savannah cruise. After deployment, the inductive communications link between the buoy and the CTD exhibited problems. In late April 2020, the buoy began to experience power system problems and ceased reporting. GPS tracking is still functional, and the buoy is onsite. Two trips to repair the buoy in April and May failed due to mechanical issues on the small boat that the technicians were using to access the mooring. A third trip is planned for June 2020.

ILM3: In late February 2020, both air temperature sensors on the buoy failed. Both barometric pressure sensors showed some degradation beginning in late April. Due to weather, other scheduled operations, and field work restrictions due to COVID-19, this sensor was not replaced until May 12, 2020.

Data Management: Bottom temperature, salinity and water column current data from the non-real time bottom frame in Onslow Bay (OB27) are uploaded to Research Workspace every 6-months for inclusion on the SECOORA data portal.

Partner activities: CORMP continues to work with FACT to maintain the VEMCO acoustic receivers on the three Onslow Bay buoys and OB27. VEMCOs are downloaded and cleaned during scheduled mooring maintenance; data are submitted to the FACT node.

Milestone C: Maintain the sensors on NOAA GRNMS buoy

Institution/Contractor	Status
UGA (Noakes) – Support to NOAA's Ocean Acidification Program, NDBC Gray's Reef National Marine Sanctuary (GRNMS) NDBC ID #41008 buoy *On-Track*	**Operations**: During this reporting period, the MAPCO2 sensor on the Gray's Reef Buoy has been reporting at 100% of the time; however, the Seabird and SAMI-pH sensors, typically mounted under the buoy, are not currently installed. The sensors were removed during the buoy visit in November 2019 and could not be immediately serviced and reinstalled due to weather conditions and vessel issues. Additionally, Gray's Reef National Marine Sanctuary has been without a working vessel due to COVID restrictions. Once the vessels are operational again (July or Aug 2020), the project team plans to visit the buoy sometime to replace all the MAPCO2 components and the Seabird and SAMI-pH sensors.

NOAA OAP requested that UGA investigate design concepts to streamline instrument deployment on the NDBC 3-meter buoys; specifically, to find ways to eliminate the need |

Institution/Contractor	Status
	for divers to manually install/remove instruments from under the buoy. The design for the new sensor deployment has continued with the construction of a benchtop model for testing. The team designed a deployment chassis for each of the sensors. The next phase of this project is to determine exactly where on the 3-m buoy the deployment tubes can be installed. The chassis will have to fit through the deployment tube and suspend below the buoy hull so that sensors can take measurements. Considerations for deployment tube locations include both buoy hull construction and tower height limitations. The instruments as installed in the chassis are approximately 175 cm in length so will require sufficient height to clear the SCOOP tower mounted on the buoy. Overall weight for the total instrument package including the deployment tube that is welded to the buoy must also be taken into consideration for proper buoy balance. Each package weighs approximately 47 kg so must be positioned to offset current items previously installed on the buoy.

Goal 3: Begin to address geographic gaps in observations

Milestone A: Establish a regional glider observatory in the South Atlantic Bight (SAB)

Institution/Contractor	Status
UGA SkIO (Edwards) North Carolina State University (NCSU, He) UNC-CH (Seim) USF (Lembke) Georgia Institute of Technology (GIT, Zhang) ***Glider operations On-Track***	The glider team conducted regular maintenance on all gliders, including an intensive session in Jan. 2020, in which software was upgraded on Franklin, Angus, and the glider simulator Sandgnat. Additional maintenance for the SECOORA glider Franklin included conducting thorough glider checklists, updating mission software in shore-side and glider archives, simulated missions, and documentation of the glider status and procedures used.
	SkIO technicians conducted significant testing on the G1 glider Pelagia, on loan from UNCW, which suffered a digifin malfunction. Extensive lab testing revealed no major mechanical malfunctions, and based on advice from the manufacturer and collaborators, the glider's missions and mission parameters were adjusted. The glider was planned to be deployed for a short testing mission in March 2020 but delays due to COVID limited time in the lab, pushing the mission back to June 2020.
	Operations: The USF glider Bass completed a 24-day mission from Feb. 3 to Feb. 27. Bass was deployed off Cape Canaveral, with the help of NASA partner Eric Reyier, with recovery off of GA. Access to data and visualizations.
	Navy-SURTASS glider mission: In addition to the SECOORA-funded activities, SkIO conducted two externally funded glider deployments (Angus, Mar. 18 - Apr. 11 and Apr. 21 – May 14; near Gray's Reef National Marine Sanctuary) for soundscape evaluation in marine protected areas. Angus collected acoustic data via integrated Vemco units and a SoundTrap (passive acoustic) mounted along its forward section. Data from both deployments were contributed to the DAC and are available on the SECOORA portal.

Milestone B: Install a new coastal water quality and meteorological station in Charleston Harbor, SC:

Institution/Contractor	Status
South Carolina Department of Natural Resources (Sanger) **Charleston Harbor - Delayed**	The Charleston Harbor station remains non-operational. PI Sanger has been given permission by SC DNR Marine Resources Division to move the instrumentation to an upstream location on SC DNR property at Fort Johnson. This site is more protected and the likelihood of being hit by a vessel is reduced. Environmental Compliance paperwork for the new site is complete. Instrument deployment and testing was conducted at the new site from Feb. 27 to Mar. 13. Due to COVID, SC DNR are working remotely so testing has ceased. It is hoped that the YSI can be deployed in its new location during the next reporting period.

Goal 4: Continue delivery of operational model forecasts and products to serve priority users

Milestone A: Enhance and operate a Coupled Marine Environmental Assessment and Prediction System for the SE

Institution/Contractor	Status
NCSU (He) - Support and enhance SABGOM model **On-Track**	The project team is on-track with modeling efforts. The team maintains the SABGOM and CNAPS ocean prediction systems, providing time- and space-continuous regional marine environment predictions on a user-interactive web portal. The team has assimilated the following data, which has reduced model errors when hindcasting regional conditions: satellite sea surface height, sea surface temperature, in situ temperature, salinity profiles from ships, Argo floats, and gliders. The team Is exploring use of Amazon Web Service (AWS) cloud computing to run DA nowcast/forecast as it is very computing and time intenstiv3 to run on university infrastructure. Model skill assessments are still underway. Independent data involved in this effort include fixed-location time series data (pressure, temperature, salinity, and velocity time series) from coastal tide gauges and moorings, as well as surface currents measured HF Radar. Finally, NCSU is making contributions to the draft of the *Southeast Ecosystem Status Report,* led by Kevin Craig (NOAA). NCSU's contribution includes providing detailed analyses of long-term variations in key regional marine environmental parameters (e.g. SST, Chl-a, upwelling index, the Gulf Stream transport and positions). The final version of the report is due the end of July.

Milestone B: Operate the WFS FVCOM ocean model

Institution/Contractor	Status
USF (Weisberg) **On-Track**	Real time data and model simulations are publicly available on the internet (http://ocgweb.marine.usf.edu and the SECOORA web site), and are transmitted via THREDDS server to NOAA GOODS. Output from the West Florida Shelf Coastal Ocean Model (WFCOM) and high-resolution Tampa Bay Coastal Ocean Model (TBCOM) are also available via THREDDS server.

USF works with Florida Fish and Wildlife Research Institute (FWRI) on HABs tracking and modeling. USF provides short-term predictions consisting of a 1 day hindcast and 3.5 days forecast of the red tide trajectories for both near surface and near bottom water columns. See FWRI update for HABS tracking and forecasting activities. |

Milestone C: Provide an early warning system for swimming beach and shellfish harvesting waters

Institution/Contractor	Status
USC (Porter) *On-Track*	The project team continues to maintain the platform howsthebeach.org and provide public access to daily estimates of swimming beach bacteria levels for Myrtle Beach, SC, Sarasota, FL, Charleston, SC, and Kill Devil Hills, NC. In addition, detailed daily reports are provided to interested beach managers and public health officials in SC and FL. The team also developed http://howsmyscriver.org for the Saluda River Monitoring Coalition. A new project with the City of Folly Beach, SC (https://howsfollybeach.org/follybeach) provides site-specific water quality data and nowcasts for both the swimming beaches on the Atlantic Ocean side of the island and the shellfish harvesting waters of Folly River on the backside of the island. The team is working with the SECOORA WebCAT project to integrate video feeds from the Folly Beach Pier (swimming beach side of the island) with automated feature extraction algorithms to identify and summarize beach utilization (person counts) during times of weather, currents and water quality warnings. Using validated design and science communication elements, the project team is re-designing the How's the Beach website and app in collaboration with the NIEHS Center for Oceans and Human Health and Climate Change Interactions (OHHC2I) Community Engagement Core. The team will evaluate user experience, continue making updates, and make the site available through SECOORA.

Milestone D: Optimize and enhance the SECOORA Marine Weather Portal (MWP)

Institution/Contractor	Status
SECOORA (Dorton), Second Creek Consulting (Galvarino) *Complete*	The MWP is hosted on the SECOORA website: http://mwp.secoora.org/. No new updates to MWP are occurring.

Milestone E: Python Data Analysis Tools for Oceanographic Services

Institution/Contractor	Status
Independent Contractor, Filipe Pires Alvarenga Fernandes, Oceanographer, Brazil *On-Track*	Activities conducted fall into three areas of work. 1. Assist in development of IOOS.us Documentation and Demonstration sub-pages; 2. Support current and continue developing software packages to IOOS; and, 3. Ensure software deployment via conda-forge packages and updates. All work is reviewed by the IOOS program office. Full details, listing accomplishments this period, are found in Appendix A.

Milestone F: Special Projects

Institution/Contractor	Status
Unmanned Aircraft System (UAS) workshop *Delayed*	Due to COVID-19, SECOORA, in conjunction with NOAA SECART and CariCOOS, had to cancel the UAS technology workshop that was to be hosted in Beaufort, NC, March 31 – April 2, 2020. The planning committee is discussing alternatives, including a virtual workshop or a traveling workshop.

Institution/Contractor	Status
OTT Biology pilot projects *On-track*	Beginning in 2018, SECOORA, Axiom, SC DNR, and SAFMC have worked together to migrate a subset of the SEAMAP-SA surveys from the seamap.org portal to the SECOORA data portal. The goal of this project is to increase user interoperability and responsive system management over the current seamap.org system. During this performance period the following activities were completed to continue the development towards an operational system: ● Data processing and preview of a subset of fish abundance, specimen, and fish length distribution data for two species in the SECOORA data portal map and in an example data view for discovery of data patterns. ● Completed the data transformation, post-processing, and visualization of the reef fish abundance dataset from 1979-2019 for 325 species. Visualizations were completed for fish count, length, abundance, and associated physical environment measurements. The data layer is accessible through the SECOORA data portal map and an example data view highlights how the system can be used for discovery of data patterns. Axiom completed two iterations of the visualization based on feedback from the data providers and updates to their database export format. ● Created a prototype visualization of a hydrocast data deployment in a dedicated platform page in the SECOORA data catalog. ● Transformed data and metadata to Darwin Core format in the Research Workspace. ● Met with the SEAMAP researchers in May 2020 to review data visualizations, receive feedback, and discuss a strategy for revising the Reef Fish dataset visualization and building out a user report query system. ● Completed technical scoping for the EAV database schema map using the existing supplied data, including a reporting system for user metrics, user report queries/requests, and exporting or querying data for inclusion in the visualization system. A prototype version of the reporting system will be made available to SEAMAP in July 2020 for feedback/revisions.
OTN/ATN *On-Track*	SECOORA contracts with Joy Young, Fisheries Data Solutions and Chris Kalinowsky, Georgia Department of Natural Resources, in support of ATN. Progress reports from Young and Kalinowsky have been submitted to the IOOS ATN manager. These reports are included in Appendix B.
Scholarship *On-track*	SECOORA worked with members at the UNC Coastal Studies Institute (CSI, Mike Muglia and John McCord) to submit a 2020 Hollings Scholar opportunity. Natalie Murphy was selected as the Scholar; however, due to COVID-19, she is unable to be on campus at CSI. Therefore, CSI personnel and SECOORA are providing a "virtual" Hollings Scholar Opportunity. In the future, if travel restrictions are eased, Natalie does plan to visit CSI, even if only for 1-2 weeks, later this summer. Natalie is currently developing HFR products to engage relevant stakeholders in the fishing community. She has met with several fisherman to get feedback and we have contacted Dave Tilley, owner of the website Saltwatercentral.com, to explore partnerships for delivering HFR products to the fishing community. Natalie will also work on ocean energy projects that are on-going at CSI.

Institution/Contractor	Status

Regional Ocean Data
 On-track
	In January, meetings were held with OCM, BOEM, NOAA NCCOS, and others to further refine the project, focused on sand resources in the southeast. TNC lead Mary Conley, was contracted to convene webinars to enhance regional coordination across federal, state, university, and private entities engaged in sand management in the southeast; conduct a survey to identify an initial set of gaps and research opportunities; and, develop a story map or one pagers on the "state of sand" in the SE. Megan Treml, under contract with SECOORA, is the project coordinator and will assure the project remains on track. A Steering Committee (Committee) has been created to guide the project over the coming year; and meetings of the Committee were held in April and May.
	
	 SPECIAL AWARD CONDITIONS: For work associated with Regional Ocean Partnership funds, provide a report describing:
	
	     a. The work that was completed, summarizing the approach taken to accomplish the tasks
	         i. See above
	     b. Any data products that were developed as a result of these activities, and summarize the process for developing those products;
	         i. No data products were developed. A presentation for the Regional Data Sharing Initiative Webinar (5/29) was produced, as well as meeting agendas and notes from the steering committee meetings.
	     c. A plan for future continuation of the work;
	         i. Summer 2020, the project team will host 2-3 webinars with a focus on states and their partners to discuss:
	             1. Existing sand data collection
	             2. State-based sand resource tools
	             3. Use of federal tools
	             4. Information needs
	             5. Current decision-making process
	     d. New relationships that were established
	         i. The individual steering team members are stakeholders of SECOORA, but the steering committee is a new group, focused on collaboration among state and federal agencies.

Southeast and Caribbean Disaster Resilience Partnership (SCDRP) **On-Track**	The SCDRP changed its name to the Southeast & Caribbean Disaster *Resilience* Partnership in January 2020. The name change is meant to recognize the broader topical scope related to disaster recovery to include climate adaptation and resiliency issues as the organization develops its Strategic Plan. The SCDRP held its winter meeting in Jacksonville, FL, from January 28-29, 2020. Over 70 people were in attendance over the two days. The SCDRP began its strategic planning effort with exercises and sessions as a significant part of the winter meeting activities. Participant input is needed to ensure that the partnership develops a member-driven plan. Four monthly SCDRP member calls were conducted, with the number of participants ranging from 30-50. The SCDRP participated in a the "Coastal Hazards and Climate Resilience" Virtual Panel for the May 2020 SECOORA Annual meeting. The recording is available: https://secoora.org/coastal-hazards-and-climate-resilience-virtual-panel/

Institution/Contractor	Status
Additional Observations Initiative **On-Track**	SECOORA hosted a competitive mini-proposal opportunity in Year 3. Dr. Eric Montie, USC Beaufort, received $30,000 for his proposal, *Integrating Biological Sound and Noise Measurements into Regional Coastal Ocean Observing Systems (RCOOS) in Estuaries of South Carolina*. This is a one-year project, start date 6/1/2019. The project team deployed passive acoustic recorders, water level loggers, and temperature loggers at study sites in Charleston Harbor (CHS) and North Inlet Winyah Bay (NI-WB). Due to COVID-19, instrument recovery has been delayed. The NI-WB sensors were recovered on May 21. The CHS instruments will be recovered in July. A no cost extension has been provided so that the project team can recover CHS instruments and work in the lab to analyze data, once restrictions have eased.

Goal 5: Initiate new operational products to meet additional user needs

Milestone A: Implement a HAB forecasting system for the WFS.

Institution/Contractor	Status
Florida Fish and Wildlife Research Institute (FWRI) (Hubbard) **On-track but Spring research cruises cancelled**	Field surveys targeting key harmful algal bloom (HAB) dynamics occurred Sept. 2019, Nov. 2019, and Jan. 2020 which corresponded to the beginning, peak, and end of the bloom. SECOORA funding for this project allows additional transects north of Charlotte Harbor, an area not typically sampled during AOML HAB surveys. This allowed FWRI, USF, and Mote to collect samples specific to *K. brevis* research that would not be typically be collected as part of AOML's routine efforts. An opportunistic survey was conducted Feb. 3-6 onboard the R/V Weatherbird that transited ~100 km offshore, providing an opportunity for PIs to collect discrete samples for trace metal, dissolved nutrient, and phytoplankton cell abundance. Remote sensing data was provided by USF prior to and during the cruises to allow for adaptive sampling and helped determine the final cruise plan including the addition of new sampling sites while the cruise was ongoing. Short-term predictive forecasts provided by USF further informed the understanding of the ocean circulation in critical bloom areas. Additional cruise surveys were planned during March and May but were cancelled due to COVID-19.

Goal 6: Continue building critical elements of the observing system by adding biogeochemical and marine sound sensors, and HFRs

Milestone A: Implement a regional ocean sound observing initiative to characterize and measure sources of sound production and establish acoustic baseline levels.

Institution/Contractor	Status
Mote Marine Laboratory (Locasio) **On-Track**	During this project period, the PI started a library of labeled acoustic data of important commercial fish species. These data will ultimately be used in supervised machine learning programs (e.g. neural networks) to detect and classify species-specific acoustic signals associated with reproductive behavior. The first species for inclusion in the audio library are black grouper and red grouper, both of commercial importance to the SAFMC. To date 463 black grouper acoustic signals, in categories of single calls or multiple calls (e.g. choruses), have been cataloged. These data have been sent to Dr. David Mann and are being reviewed a second time by PI Locascio for quality assurance. Dr. Mann and a student working with him at Loggerhead Instruments will begin applying the neural nets to these data to evaluate detection efficiency. The PI also invited Dr. Carrie Wall-Bell to collaborate on this project. Dr. Wall-Bell has submitted recordings of red grouper for inclusion in the audio libraries being created. **Student engagement**: PI Locascio is training a USF student intern to read spectrograms and classify and label the acoustic signals associated with black grouper. A student in the Data Science graduate program at New College in Sarasota, FL is also interning on this project. She is researching different machine learning approaches to apply to these data.

Milestone B: Install and operate new HFRs: *On Track*

Institution/Contractor	Status
Florida Institute of Technology (FIT)/Lazarus **On-Track**	FIT worked with SECOORA and NOAA to officially change the lead PI from George Maul to Steven Lazarus. Progress includes an official basing action from Patrick Air Force Base, allowing the use of base facilities for HFR installation. Dr. Lazarus has not completed the PAFB real property and utility agreements nor arranged for a lock change, rack, and AC installation yet. The PI is waiting on a site visit and resolution of the receiving array antennae issue behind (versus along) the dune line. Dr. Lazarus also is working with Indian River County Parks personnel to establish a second HFR location at Treasure Shores Park. Due to COVID-19, FIT personnel have been unable to make site visits to determine the best layout for the HFR at either location. Currently, a site visit to the Treasure Shores location is scheduled for June 12.
SkIO/Savidge **On-Track**	Through the Fill the Gaps campaign, SkIO purchased two used WERA that were leased through the NSF PEACH project (PI Savidge). SkIO plans to deploy the WERA at Kennedy Space Center (KSC) and Canaveral National Seashore, both locations in FL. The required permit for Canaveral National Seashore has been approved and the associated Environmental Compliance Questionnaire has been submitted to NOAA IOOS. KSC requires a land-use agreement between NOAA – NASA before an HFR can be deployed on their site. Oriana Villar, IOOS Regional Coordinator and John Hueckel, NASA KSC, are drafting the land-use agreement. The Environmental Compliance questionnaire for this site will be completed and submitted to IOOS in June 2020.

2) Scope of Work
Scope of work is as described in the Year 4 Statement of Work.

3) Personnel and Organizational Structure
Current lists of SECOORA Members and Board are available on our website. Additionally, SECOORA personnel job descriptions and employee CVs are available on: http://secoora.org/certification.

4) Budget Analysis
SECOORA's April 31, 2020 financial report for Year 1 and 2 combined funds shows a budget balance remaining of approximately $18,800. The April 31, 2020 financial report for Year 3 funds shows a budget balance remaining of approximately $788K. The April 31, 2020 financial report for Year 4 funds shows a budget balance remaining of approximately $2.7M. We are within budget and on track with spending. SECOORA continues to receive invoices regularly from our sub-awardees and we process them during bi-monthly administration meetings. All invoices are paid within forty-five days. SECOORA continues to draw from ASAP monthly. As a reminder SECOORA pays out its monthly operational costs (i.e. payroll, etc.) and then conducts the ASAP draws in the middle of the following month for both the preceding month's operational expenses and the sub-awardee invoices.

Appendix A – Python Data Analysis Tools for Oceanographers

Progress and Accomplishments during the reporting period (June 1, 2019 - November 30, 2019)
The tasks were divided into:

1. Assist in the development of the IOOS.us Documentation and Demonstration sub pages;
2. Support current and continue developing important software packages to the IOOS enterprise;
3. Ensure software deployment via conda-forge packages and updates.

1) Assist in the development of the IOOS.us Documentation and Demonstration sub pages.

Added a notebook to find IOOS models in the catalog to the IOOS Data Demo Center (ioos/notebooks_demos #347) and fixed the interactive plots in the QARTOD Water Level notebook (ioos/notebooks_demos #350).

Updated the IOOS package skeleton with modern Python techniques and guidelines (ioos/ioos-python-package-skeleton #2, #3, and #5). Two new features that worth noting are the codespell hook, to check code and documentation for misspelled words and the auto PyPI publication (#4 and #7).

Improved the IOOS metadata editing documentation, fixed and image link (ioos/ioos-metadata #24) and added two experimental GitHub actions (ioos/ioos-metadata #25) to help inspect the final HTML.

2) Support current and continue developing important software packages to the IOOS enterprise

This activity can be divided into two three-sections: (a) packages from the IOOS GitHub organization, (b) packages from third party organizations that are important for IOOS, and (c) pangeo/cloud support.

  a) Dropped all Python 3 code from *compliance-checker* to reduce the maintenance burden (ioos/compliance-checker #734) and improved packaging according the IOOS skeleton guidelines (ioos/compliance-checker #756, #794, and #796). Replaced the file content with the file name in the in-memory netCDF file function (ioos/compliance-checker #816).

  Applied the IOOS skeleton guidelines to *erddapy* (ioos/erddapy #102, #103, #104, #105, #106, #107, #108, #113, #120, and #121).

  Some work was done to improve the type annotations and to use a canonical list of ERDDAP serves (ioos/erddapy #110, #111, #112, and IrishMarineInstitute/awesome-erddap #14), added a netCDF file option using the Climate and Forecast response and in-memory data whenever possible (ioos/erddapy #115 and #119). *Erddapy* no longer fetches the URL header to improve speed of the URL queries (ioos/erddapy #116).

  b) Fixed the *proj* library name in cartopy's setup (SciTools/cartopy #1463).
  The *netCDF4-python*, *cf-units* and *cf-time* packages are essential dependencies of *compliance-checker*. Some work was done to improve their installation (SciTools/cf-units #156, Unidata/cftime #149, and Unidata/cftime #157), dropped Python 2 code (SciTools/cf-units #157), added Python 3.8 tests (SciTools/cf-units #158), fixed *numpy.alen* deprecation (Unidata/netcdf4-python #1009), and Windows testing (Unidata/netcdf4-python #989).

  The IOOS catalog clients rely on *OWSLib* to read, parse, and query data. Added Python 3.8 tests, dropped Python 2 code, and fixed *pyproj* deprecation to "future proof" the library (geopython/OWSLib #635, #659, and #661).

  Some work was done in the libraries used in the IOOS Data Demo Center examples and data processing: *python-ctd*, *python-oceans*, *nbb*, *branca*, *utide*, and *echopype*. Fixed pandas 1.0 syntax (pyoceans/python-ctd #77 and pyoceans/python-oceans #67). Improved packaging in *ctd* (pyoceans/python-ctd #82, #83, #84, #85, #87), *nbb* (ocefpaf/nbb #1), *branca* (python-visualization/branca #68, #69, and #70), *utide* (UTide #80, and #82), and *echopype* (OSOceanAcoustics/echopype #141). Improved *ctd*'s handling of pressure keys and columns names (pyoceans/python-ctd #86, #78), and better plotting wrapper for *matplotlib* (pyoceans/python-ctd #79).

c) Pangeo's cloud deployment is quite demanding and the images can take a while to build and test. In order to insure that at least of the images will get built the jobs were split and push the ESIP first (pangeo-data/pangeo-stacks #113). Also, to reduce the image size, some packages were removed or optimized to the smaller useful version possible (pangeo-data/pangeo-stacks #120, #121, and #138).

Two new packages were created under the pangeo umbrella and both are up to date with IOOS packaging guidelines (xgcm/xcape #22 and hetland/xroms #4).

3) Ensure software deployment via conda-forge packages and updates

This effort can be separated into (a) infrastructure maintenance, (b) new packages, and (c) package updates.

a) Conda-forge relies heavily on automation to migrate to new versions and update packages. The migrations performed were *libnetcdf 4.7.3* (conda-forge/conda-forge-pinning-feedstock #354, #357), *proj 6.3.0* (conda-forge/conda-forge-pinning-feedstock #368, #373), *proj 6.3.1* (conda-forge/conda-forge-pinning-feedstock #405), *proj 7.0.0* (conda-forge/conda-forge-pinning-feedstock #533) and *geos 3.8.1* (conda-forge/conda-forge-pinning-feedstock #428).

Some of the migration needs to be patched to adjust the pre-existing packages to unforeseen changes like *libwebp* renaming (conda-forge/conda-forge-pinning-feedstock #553), *libnetcdf* ABI change (conda-forge/conda-forge-repodata-patches-feedstock #39), and fixed the *openssl* (conda-forge/conda-forge-pinning-feedstock #402).

Additional work to improve the infrastructure by fixing a deprecation in the bot's scripts (regro/cf-scripts #715) and removing *gfortran* from Windows CIs (conda-forge/conda-forge-ci-setup-feedstock #71).

b) The following packages were added: *pyvis*, *xlayers*, *pygeoapi*, *intake-geopandas*, *nomkl*, *pangeo-notebook*, *woops*, *poetry-core*, *pep517*, *cfdm*, *tzdata*, *cf-plot*, *interrogate*, and *safer* (conda-forge/staged-recipes/pull/10417, #10578, #10592, #1092, #10922, #10969, #11139, #11478, #11613, #11801, #11802, #11855, and #11856).

c) The package updates list can be found in the Pull Requests links section at the end of the document.

Relevant new products or tools developed during the reporting period

Pangeo cloud deployment required a mechanism to compare different image builds and to "lock" a specific build "solve" in order to build it quicker by skipping solves when there are no changes to the image. Conda-lock was created to achieve those goals and help cloud deployments (mariusvniekerk/conda-lock #11, #16, #6, #7, and #9).

Stakeholder engagement and outreach efforts during the reporting period

IOOS is participating in the 2020 Ocean Hack Week. The meeting will be virtual this year due to COVID-19 and several adaptations to the documentation and infrastructure were required to the event (oceanhackweek/oceanhackweek.github.io #44, #47, #48, #50, #51, and #55).

Pull Requests links

- conda-forge/altair-feedstock #33
- conda-forge/bokeh-feedstock #47
- conda-forge/cdo-feedstock #81
- conda-forge/climlab-feedstock #35
- conda-forge/climpred-feedstock #6
- conda-forge/cmocean-feedstock #15
- conda-forge/cmocean-feedstock #16
- conda-forge/compliance-checker-feedstock #36
- conda-forge/compliance-checker-feedstock #37
- conda-forge/django-feedstock #97
- conda-forge/erddapy-feedstock #23

- conda-forge/expat-feedstock #23
- conda-forge/gdal-feedstock #393
- conda-forge/geoviews-feedstock #16
- conda-forge/ghostscript-feedstock #9
- conda-forge/google-api-python-client-feedstock #40
- conda-forge/h5py-feedstock #67
- conda-forge/jaxlib-feedstock #16
- conda-forge/jaxlib-feedstock #22
- conda-forge/kealib-feedstock #34
- conda-forge/libnetcdf-feedstock #98
- conda-forge/libspatialite-feedstock #51
- conda-forge/libwebp-feedstock #24
- conda-forge/matplotlib-feedstock #232
- conda-forge/matplotlib-feedstock #233
- conda-forge/md-toc-feedstock #14
- conda-forge/owslib-feedstock #20
- conda-forge/owslib-feedstock #23
- conda-forge/pandoc-feedstock #61
- conda-forge/panel-feedstock #26
- conda-forge/pre-commit-feedstock #11
- conda-forge/python-daemon-feedstock #6
- conda-forge/python-gist-feedstock #5
- conda-forge/qgis-feedstock #106
- conda-forge/r-rgdal-feedstock #35
- conda-forge/rasterio-feedstock #155
- conda-forge/regionmask-feedstock #2
- conda-forge/seapy-feedstock #13
- conda-forge/setuptools_scm-feedstock #38
- conda-forge/sixs-feedstock #8
- conda-forge/social-auth-core-feedstock #9
- conda-forge/wgrib2-feedstock #12

Appendix B – OTN Progress Reports

FACT Data Wrangler Progress Report to ATN, Joy Young

Timeframe: 1 December 2019 – 31 May 2020

Communication

- Assisted with the first virtual meeting of the FACT Network on June 4th. Best attendance (n=86) on record. Abbey Wakely from SECOORA was instrumental for its success by hosting and managing the technical aspects.
- Attended the biannual FACT meeting in West Palm Beach FL 4-6 December. Gave oral presentation on the data sharing system. Facilitated a data workshop on 4 December.
- Worked with Clayton Pollock to assimilate data from the Unites States Caribbean Acoustic Network (USCAN) into the FACT node.
- Oral presentations on the FACT Network given at /for Harbor Branch Oceanographic Institute (24 Feb 2020), SECOORA webinar series (24 March 2020), and ACT-MATOS meeting (2 April 2020).
- Identified unmatched detections from the node that matched tag metadata from the old FACT and ACT dropbox list. Identified FACT tag owners and requested any missing tag metadata be uploaded. Majority of replies declined due to the inactivity of the project (i.e. project ended years ago). Detections matched to ACT members were provided with instructions on how to register with the ACT_MATOS node.
- Worked with Axiom and SECOORA to produce a public map of FACT projects. To be displayed on the FACT website. Identified and removed an issue that prevented updated data from being available for harvest. Working with OTN and Axiom staff to also show FACT projects that are housed in the OTN database.

Data Policy Materials

- An Interim FACT Steering Committee was established in Dec 2019 to create a charter for a permanent steering committee. Led interim committee by organizing and chairing four conference calls, taking notes during the meeting and creating a working document for a steering committee charter. As part of its duties, the committee will manage an equipment loaner program.

Data Acquisition

- Starting in July, we will begin collecting and processing temperature data from stand-alone sensors and specialized receivers and detections from mobile platforms.
- Cross matching between the FACT and MATOS_OTN node began in February 2020. In the last event, 5 ACT tag projects were matched to FACT detections and 19 FACT tag projects were matched to two ACT detections. Nodes are also crossmatched with the OTN.
- USCAN database partially migrated into the node proper. Identified need to contact USCAN tag PIs individually to load tag metadata.
- Recruited members from six new organizations.
- Recruited 8 new projects (total number of projects registered is 108).
- Completed two major data processing events in February and April. Between the two events:
  - Processed data from 48 tag and array studies
  - Number of detections increased by 13% (129.4 to 149.3 million detections).
  - Number of deployments increased by 13% (7,666 to 8,875 deployments).

- o   Number of tags increased by 10% (5,979 to 6,557 acoustic tags).
- The number of unmatched detections (e.g., yet to be resolved and false detections) has decreased from 10% to 8.5% of total detections.
- Growth is expected to increase at a similar rate as more new and historic projects and organizations are added. We anticipate at least one jump in the size of the node as the USCAN dataset is fully processed.

Quality Assurance Quality Control

- Identified a need to update the VEMBU database to reflect new formatting for the node and include depth measurements for temperature loggers.
- In April, implemented verification steps during the data push formally conducted by OTN staff.
- Identified a need to request tag and receiver specifications. In April, solicited a select group of tag owners for sensor tag specifications to be loaded into the node. In July, we will openly request the information from all members.

Other

Due to field work restrictions, researchers have not been able to download receivers at normal intervals. This was reflected in the slighter lower numbers in the April data push and we anticipate the July data push will be similar. However, the decrease in new data has allowed more time to process historic datasets and resolve outstanding metadata issues.

Chris Kalinowsky, GA Department of Natural Resources

Timeframe: December 1, 2019 through June 1, 2020

Overview

Beginning on October 15, 2018 the Georgia Department of Natural Resources-Coastal Resources Division partnered with the Animal Tracking Network (ATN) through the Southeast Coastal Ocean Observing Regional Association (SECOORA) to maintain a Coastal Receiver Array (CRA) comprised of 24 autonomous acoustic receivers in Georgia's nearshore and offshore waters along St. Simons Island. This network of receivers 'listens' 24-hours-a-day, 7-days-a-week for the presence of marine species fitted with uniquely coded Vemco acoustic transmitters. Receivers record the presence of acoustically tagged animals that pass within approximately 300 meters of the receiver.

The CRA nearshore component consists of 8 Vemco VR2W receivers attached to United States Coast Guard (USCG) Aid to Navigation (ATON) buoys along the St. Simons shipping channel, starting at the channel entrance and extending to approximately 6 miles offshore. The offshore component consists of 16 Vemco VR2W receivers anchored to the seafloor and ranges from 6-24 miles offshore (Figure 1). Receivers are serviced 2-3 times a year to download data and replace batteries. Georgia's CRA complements similar projects conducted by other state, federal, academic, and non-governmental groups, but is the only one of its kind in Georgia nearshore marine waters. The detection data for tagged animals are shared with other researchers, locally, regionally, and internationally via the Florida Atlantic Coast Telemetry (FACT) Network. These data are used to better define the migration and habitat preferences of many coastal migratory species.

Georgia's CRA was initially deployed in 2014 through federal funding, in cooperation with SC Department of Natural Resources, to track the nearshore movements of Atlantic Sturgeon *Acipenser oxyrinchus*. That funding expired in 2018 and the project wrapped up leaving the longevity of the CRA in jeopardy. Recognizing the importance of this array, the ATN partnered with GADNR to fully fund operation of the array in 2019. That funding was recently renewed to include a second year in 2020. The GADNR/ATN partnership was formed at a critical point in the timeline of the CRA project. Stable funding had expired, equipment was aging, and the temporary funding in 2018 through the Georgia Natural Resources Foundation only provided for one additional maintenance service. Had alternative long-term funding not been established quickly, the CRA project would have ended and receivers would have been removed from the water. Being the only active offshore telemetry array of its kind in Georgia, this would have created a large gap in regional observational coverage and would have detrimentally impacted many ongoing regional telemetry projects. One of the ATN's primary objectives by way of this grant was to stabilize the presence of available telemetry infrastructure in the southeast region. This successful partnership between GADNR and the ATN kept receivers in the water and ensured the continuation of this project through at least 2020.

Research and Fisheries Management Impacts

Data from the CRA have been shared with 46 different research groups from 10 different state, federal, and non-governmental organizations. These data represent 41 different species (670 different individuals) inclusive of threatened and endangered species. Included in this number are 179 Atlantic Sturgeon, 13 loggerhead sea turtles *Caretta caretta*, 15 Kemp's ridley sea turtles *Lepidochelys kempii*, 58 Atlantic Tripletail *Lobotes surinamensis*, 10 Red Drum *Sciaenops ocellatus*, 28 Tiger Shark *Galeocerdo cuvier*, and 40 White Shark *Carcharodon carcharias*. This collaboration continues to provide groundbreaking data on the movements of marine animals. For example, Cobia *Rachycentron canadum* detection data collected by the CRA is being used by resource managers with the Atlantic States Marine Fisheries Commission (ASMFC) to guide current and future resource management. Data from Georgia's CRA were used as part of the SAFMC Southeast Data, Assessment, and Review (SEDAR) Atlantic Cobia Stock Identification Workshop hosted April 10-12, 2018. The results from the workshop were used to provide stock delineation guidance to the SAFMC SEDAR 2019 Atlantic Cobia Stock Assessment.

The continuous operation and strategic location of the CRA have proven valuable for many studies that track animal movements between overwintering habitat in Florida and critical habitats to the north. Being that the array has changed very little since it was established, researchers are able to examine repeat migrations of animals through the region across multiple years. The array fills a major gap between similar arrays in South Carolina and Florida. Data from the array are vital to several recently funded regional studies. This includes an ongoing tagging

study on the migrations of Cobia by researchers in Virginia, North Carolina, South Carolina, Georgia, and Florida. Without Georgia's array there would be a significant and detrimental gap in array coverage in the Southeast.

Current funding from the ATN has allowed for the expansion of Georgia's CRA further into offshore waters. In Fall 2018, as a result of extended funding, Georgia DNR was able to extend the coverage of the original receiver line by adding 8 additional receivers to the end. This extended the range of observational coverage from 14 miles to 24 miles offshore and crosses an additional offshore artificial reef system (Figure 1). We expect that this modification will allow us to capture acoustic tag data from a greater number and diversity of species. Additionally, the modification should allow for a comparison to be made between site use at differing reef locations (nearshore vs. offshore).

Progress Update December 1, 2019 – May 31, 2020

Due to the global COVID-19 pandemic, spring field operations for Georgia's CRA were postponed until safe procedures for field operations could be established. In following with social distancing requirements, CRD limited field operations of small vessels to any project requiring no more than 2 persons onboard. Maintenance of the nearshore array requires a minimum of 3 people onboard to retrieve, service and download each receiver while safely maintaining vessel position alongside each ATON (Figure 2). The offshore component consists of 16 Vemco VR2W receivers anchored to the seafloor and ranges from 6-24 miles offshore (Figure 1). These units are diver serviced and require large boat operations consisting of a minimum crew of 7 (dive corps of 4, vessel crew of 2, and scientific staff of 1). Large vessel field operations will recommence in Summer 2020, allowing for the resumed maintenance of the Coastal Array. Currently, all deployed receivers should be fully operational and received new batteries during the last maintenance cycle. Therefore, no loss of animal detection data (due to power failure) is anticipated as a result of suspended spring operations. It is possible that some loss may occur due to mooring damage or loss. However, this is normal to the routine operation of the array and is accounted for by maintaining an inventory of backup receivers that can be redeployed immediately. All mooring units were inspected during the last download cycle and determined to be in good condition. Therefore, receiver loss due to the increased service interval is not a major concern currently.

During this update period, data sharing continued to occur. Tag and receiver information was updated, matches occurred, and data was shared through the FACT data node. The FACT node continues to be an essential tool facilitating the matching and sharing of telemetry data throughout the Southeast region. Further development and increased utilization of the node by other researchers will continue to improve telemetry studies within the region and beyond.

The maintenance and service of project vessels continued during this update period. A new chart plotter/GPS was purchased and installed on one vessel while another vessel had several worn items replaced. Additionally, the project large boat (R/V Marguerite) was hauled out and received necessary repairs. These charges were split between all projects that utilized it. These vessel repairs account for the charges posted in the most recent invoice.

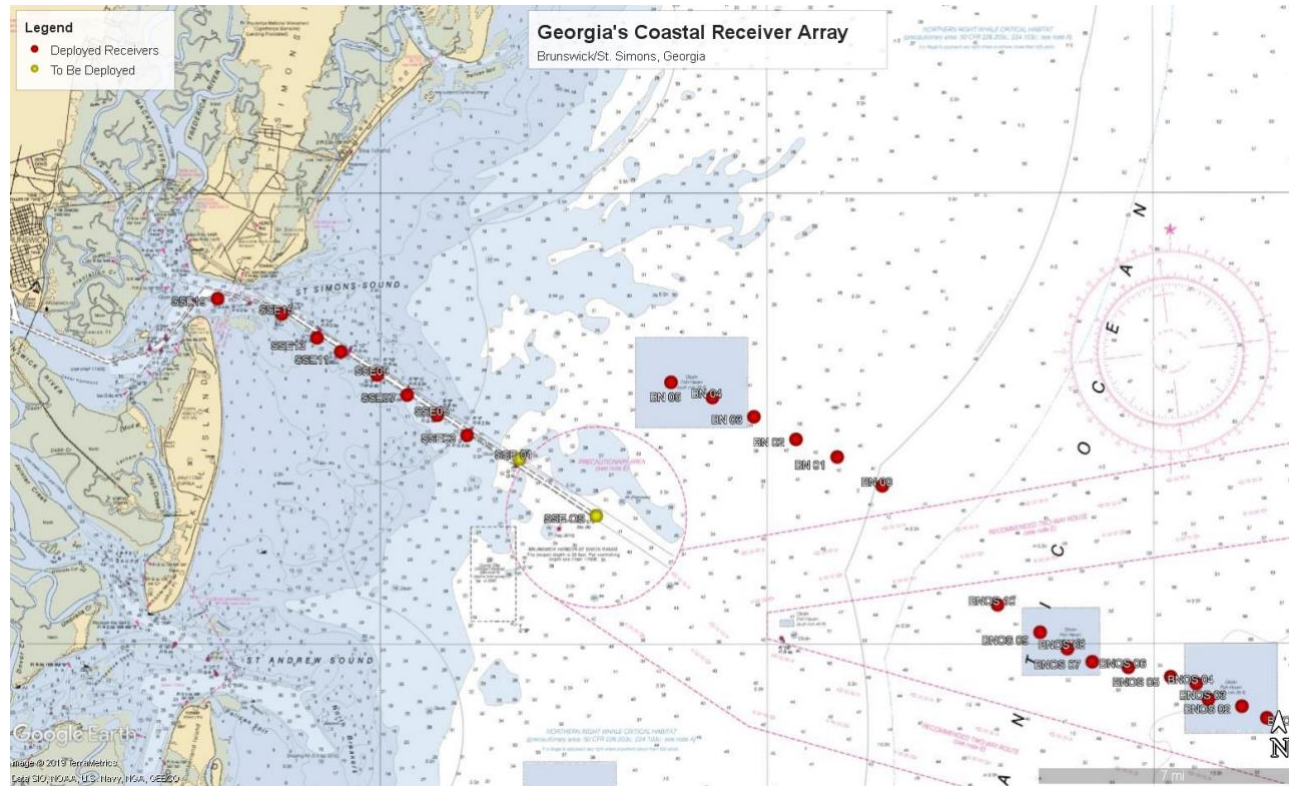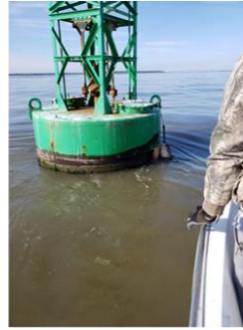Figure 1. Georgia's Coastal Receiver Array (Current configuration fall 2019).

Figure 2. ATON line deployment, fall 2019.

| New rigs | Mounted Vr2W | Buoy Attachment | Deployment | Harness Attachment |