SCIENTIFIC & TECHNICAL ADVISORY COMMITTEE

DELAWARE CENTER FOR THE INLAND BAYS
Research. Educate. Restore.

November 1, 2019 -- 9:00 a.m. to 12:00 p.m.
DNREC Lewes Field Facility, end of Pilottown Road, Lewes

Attendees:

STAC MEMBERS	CIB STAFF	OTHER
Jennifer Volk, Chairperson	Michelle Schmidt	Caitlynn Mitchell
Kari St. Laurent	Bob Collins	Aaron Givens
Judy Denver		Mike Duffy
Ed Whereat		Kate Fleming
Sergio Huerta		Richard Dimmick
Jen Volk		Steve Smailer
Chris Main		Maddy Lauria
Ellen Dickey		Ashley Tabibien
Doug Janiec		Karey Tiedeman
Ed Hale		Bonnie Arvay
Tyler Monteith		Nicole Rodi
Kelly Somers		
Claire Simmers		
Kathy Coyne		
Richard Watson, Secretary		

Call to order and Welcome – Jennifer Volk at 9:03 AM

Introductions

Announcements – Jennifer Volk

DelRAP and the Coastal Observer Application - Tina Callahan, University of Delaware

Tina began her presentation with a brief introduction. The University of Delaware's Sustainable Coastal Communities Initiative (SCCI) focuses on unleashing the power of citizens to transform their communities and help them achieve their sustainability goals. Their approach is to focus on civic engagement that will generate solutions from community participants rather than being enacted from the outside.

They believe that a community's success depends upon having an organized, active and informed citizenry; competent, inspirational, honest, and forward-thinking leaders; and, responsible, caring and effective community institutions, services, and businesses.

The Sustainable Coastal Communities Initiative (SCCI), the University of Delaware and others have created the Delaware Resilience Awareness Program (Delaware Sea Grant DelRAP) to engage the public in documenting and helping others learn about the ways intensifying storms and flooding affect residents. The goals of this program include:

1. Raising awareness of statewide problems with sea-level rise and intensifying storms through digital storytelling, and
2. Creating a platform and process for concerned citizens to provide geo-tagged photographic evidence of sea-level rise and intensifying storm impacts within their communities.

The project aims to gain insights about local perceived threats in a changing coastal environment through multiple methods including storytelling and citizen science. A major product of this project, the Coastal Observer app, has been developed and will be described further.

In 2018, SCCI collaborated with Dr. Jules Bruck to create a Coastal Resilience Design Studio (CRDS) that sought to provide a structure for involvement in projects related to coastal resiliency that serves to connect community, educators, students, citizen-scientists, not-for-profits, governmental entities, and private-sector professionals. The first pilot project undertaken by CRDS was to assist the Greater Lewes Foundation and the City of Lewes with development of a sustainable landscape design for the DeVries Monument, an historical marker commemorating the first European settlement in Delaware.

Tina then described the Resilient and Sustainable Communities League (RASCL), which is a collaborative network made up of 19 partners working to promote resilience and sustainability in communities across the State of Delaware. Resilient, sustainable communities are the backbone of a thriving state. The member organizations of RASCL are committed to working together to provide technical expertise and support to Delaware communities in order to increase their capacity to adapt, mitigate, and respond to environmental changes, including climate change. She also noted that the registration was open for the Annual RASCL Summit on November 15, 2019 (registration closes November 6th).

Tina then discussed the various concepts of DelRAP. Delaware has a rich history that includes:

1. Asa Coastal State (tidal and non-tidal histories);
2. Heritage (Native American, Dutch, Swedish and others);
3. Economics (agriculture and tourism); and
4. Areas impacted by coastal storms and rising sea level.

The DelRAP personnel realize that the citizens have stories about the impacts of weather and climate change and their goal is to provide a means of documenting these stories to raise the level of awareness of sea level impacts throughout the state. Design charettes will be developed with community member input and discussions and discovery will take place through visual exploration around topics related to big storms and rising sea level.

It should be noted that STAC Chairperson Jennifer Volk is one of the co-Principal Investigators for this effort.

DelRAP's goals are as follows:

1. Raise awareness statewide problems with sea level rise and intensifying storms through the art of digital storytelling; and
2. Create a platform for data collection for residents to collect written and photographic evidence of sea level rise impacts to their communities.

The digital storytelling will be performed through a series of workshops held throughout the state and will be aided by the use of the Coastal Observer app.

The Coastal Observer app is a smartphone apps with interactive maps that operate on the SPOTTERON platform with its wide range of features and advanced tools. All apps on the platform are part of a Citizen Science network.

Climate change will impact where and how humans live. As tides rise and storms intensify, humans will be forced to adapt to the changing environment and increase resiliency by learning more about local impacts of rising tides and intensified storms. The Coastal Observer App encourages citizens to become active in monitoring weather and water locally and will help researchers build a pathway for a sustainable future. The Coastal Observer App is generously supported by CENFOODS and Plant and Soil Sciences.

Tina then provided an introduction into using the Coastal Observer App. To start the program, you have to identify what it is that you are recording from the following:

1. Water Scene,
2. Water Level,
3. Water Quality, and
4. Weather

The program then leads you with a series of prompts to record the information that you are observing. The observations that are made by citizens help to reinforce the sensor data collection. It also helps to identify what is "important" to the citizens. She indicated that possible collaborators on the project could be Project WiCCED and the King Tides Project.

"Water in the Changing Coastal Environment of Delaware" (Project WiCCED) is to assess threats and develop solutions to mitigate the human and natural pressures threatening water security in Delaware's changing coastal environment. King Tides Project International is an initiative delivered by a network of organizers on coastlines around the world.

Questions

1. *Do you have continued funding for this project?* Yes, through Project WiCCED
2. *Do you have data that indicates that we should change certain monitoring locations?* We would like to coordinate the WiCCED 5-year monitoring plan to RASCL and NOAA.
3. *Are you considering using the data as a Gap Analysis?* Yes, where possible. Unfortunately, most people submit from a single location. We would not be assured that we would be getting a true Gap Analysis.

4. *What Quality Control is being performed on the data?* Yes, graduate students review the App and check the data.
5. *Have there been any policy decisions developed that would thwart developers?* Not sure although the App could serve that purpose. The data developed are qualitative in nature and do not have statistical value.

Tina then demonstrated the use of the Application using an example of inputs for "Weather". She indicated that there will be a "Road Show" in the spring that will show how to use the App. To many potential users. She was asked what water levels could be input (wind or tide)? She answered that you can click on multiple inputs including "Other".

Bio-Monitoring 2.0 - The Power and Promise of Environmental DNA (eDNA) Sampling - Louis Plough, Horn Point Laboratory, UMCES

Dr. Plough discussed the use of genetic and genomic tools, such as eDNA, to sample aquatic environments, including recent methodological progress and ongoing technical challenges. He described two projects where he has used eDNA successfully to monitor fishes in the Chesapeake Bay.

Dr. Plough began with a brief introduction into the work being performed at the Horn Point Laboratory. He stated why biodiversity is important because it supports a healthy ecosystem and natural resources. He indicated that there are threats to bio-diversity from overharvesting, Climate Change and invasive species. He indicated that there is increased/renewed interest on focusing on our local bio-diversity baseline and for monitoring for invasive species. He suggested that bio-monitoring by surveying DNA in the environment can be used for conservation bio-monitoring, fisheries management, and detection of invasive species.

What is eDNA? It is the collection of DNA from any species, found in the environment (aquatic, soil, air). Dr. Plough's focus is on macrobial DNA from fish, invertebrates and plankton. This DNA is produced by the sloughing of cells, mucous, feces, gametes, hair and other body parts.

He indicated that the advantages of using eDNA include the following:

1. Non-invasive sampling (just take water sample,
2. Ability to sample remotely nor in hard to reach places; and
3. Sequence based identification ("DNA Bar-code") versus morphological identification.

Dr. Plough described the eDNA sampling process. He indicated that the workflow was relatively simple. You sample the water, filter the sample, extract the DNA and then perform the PCR/sequencing. He indicated that it was possible to sample many sites cheaply, possibly using "citizen scientists" or even high school biology classes. He stated that the PCR based assay amplifies target species or communities.

However, he did indicate that there were the following sampling challenges:

1. Filtering of water in sites with variable water quality might lead to sample degradation or inhibition;
2. Assay development (qPCR – quantitative polymerase chain reaction) bioinformatics (metabarcoding); and
3. The relationship between molecular/sequencing abundance and true abundance (possible fate and transport issues?).

Dr. Plough then discussed the filter material and pore size used for sampling. He indicated that plastic membrane filters with different pore sizes and materials are used to retain materials of different sizes. He stated that 90% of the macrobial (fish) DNA is between 1 and 10 microns and that 60% of the eDNA is in the smallest size fraction of less than 0.2 micron.

He discussed the differences between targeted versus species specific (eDNA) monitoring by stating that the metabarcoding employs a "universal" gene or marker and the qPCR targets a sequence from a single species. In choosing between the gene or marker, mitochondrial DNA is popular because it has a high copy number and significant online resources (databases) are available. He described the trawl surveying process and indicated that they "searched" for the Loch Ness Monster but only found eels.

Dr. Plough then described the eDNA analyses of River Herring in the Chesapeake Bay. He stated that a petition to list the River Herring on the Threatened Species List in 2103 had been denied.

He then described the Keystone Herring Initiative Monitoring Plan. This plan included habitat usage in at least ten tributaries, run counts in five tributaries and a fish passage assessment. He indicated that the objectives were to:

1. Develop a robust eDNA assay for detection and quantification of river herring (alewife and blueback herring), and
2. Examine species-specific patterns of presence and abundance across the Chesapeake Bay.

The design and efficiency of the assay was then described. Dr. Plough indicated that mitochondrial data was publicly available for Alosines and Clupeidae. He further stated that the qPCR assay was tested against DNA of 15 estuarine/freshwater fish and that the assay was River herring specific.

Dr. Plough described the verification process in the Chesapeake Bay. He stated that there were shore specific patterns of river herring habitat use with eDNA determinations for 112 out of 445 samples (25%). The process was highly sensitive down to approximately one copy and there were species identification for 98% of the samples. Using the eDNA data obtained, they were able to determine the following herring spawning times:

1. Alewife spawn earlier in the spring (March-April), and
2. Blueback herring spawn later in May.

Dr. Plough compared eDNA with traditional sampling methods and stated that there was a high correlation between ichthyoplankton (net samples) and eDNA datasets (N=362 and Spearman's Rho =60). A log-log plot of eDNA versus ichthyoplankton yielded an $R^2 = 0.48$.

In summary, Dr. Plough concluded that eDNA is a robust and sensitive approach to quantify the relative abundance of river herring. It is highly correlated with other "catch" survey data and can recover run-timing differences between species. He indicated that the eDNA data is being incorporated into a habitat use model.

Dr. Plough then discussed the use of eDNA with the Atlantic Sturgeon. Atlantic Sturgeon have suffered from overfishing and habitat degradation with five population segments currently considered endangered. He then described the tagging and monitoring program of Atlantic Sturgeon in Chesapeake Bay. He then discussed the possibility of using eDNA (it has been considered but not thoroughly evaluated). He indicated that there was a concern about low abundance and low detection probability (Atlantic Sturgeon don't have scales so there will be less shedding and less eDNA sample material). He indicated that their goal is to develop and validate an eDNA assay for the Atlantic Sturgeon.

He then described some of the data that has been already collected. He stated that the eDNA process works for lab, pond and field trials but there were low eDNA abundances compared to other species. He concluded that eDNA has great promise with lots of work still needed. He completed his presentation by discussing remote sensing with eDNA and sample preservation techniques.

Questions

1. *When sampling in water, are you seeing tropical fish?* No. We are also not able to identify the life stage of the fish; is it one large fish or many small fish.
2. *For the extraction standard, are you looking at degradation and extraction efficiency?* They do triple samples for inhibition control. Diagnostic extractions are variable. Degradation does occur during freeze/thaw of samples.
3. *Is their DCIB interest in this process?* There was a general discussion concerning possible collaboration.
4. *Did you identify freshwater mussels during the surveys?* Not usually, since they were focusing on the fish.
5. *Where are the freshwater mussels located?* Dr. Plough indicated that they might be able to develop a method to locate the mussels. He indicated that they have an archive of 800 species eDNA. He also stated that they are looking for a universal preservative.

Progress Report on CCMP Update - Michelle Schmidt, CIB

The draft report is complete and is out to signatories for review. Public comment period will follow during which STAC members should review and comment. They are projecting a Spring 2020 completion date.

Update on Inland Bays Modeling Effort - Jenn Volk/Olivia Devereaux

They have issued a White Paper through the subcommittee and are currently reviewing comments that have been received to date. They plan on issuing a Final Report.

Delaware Coastal Zone Enhancement Program Section 309 Assessment and Strategy Development Process – Bonnie Arvay, Delaware Coastal Management Program

Bonnie distributed the attached program description. They are seeking volunteers to assist in the assessment. There was a brief discussion about this program. DCIB/STAC would have

interest in several areas including Marine Debris, Aquaculture, and Coastal wetlands. The final report is due in May.

Planning for 2021 State of the Bays Report - Jennifer Volk, CIB

Jenn indicated that they are looking for volunteers for the subcommittee to complete the survey**.**

All STAC members were requested to submit their updated CVs/Resumes and an indication of whether they desired to continue membership on the STAC

The meeting was adjourned at 11:40 AM

Attachment

Delaware Coastal Management Program – Coastal Zone Management Act Section 309 Enhancement Program – 2021-2025 Assessment and Strategy