florida sea grant

COASTAL SCIENCE *symposium*

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AGENDA

8:30 Opening Remarks — Joe Glover, Provost, University of Florida; Karl Havens, Director, Florida Sea Grant

9:00 Resilient Communities

Tom Ankersen	*Less-than-fee beachfront acquisition strategies to protect and enhance sea turtle nesting habitat in Florida: A feasibility study and pilot project*
Sungmoon Jung	*Promoting preventative mitigations of buildings against hurricane through enhanced risk-assessment and decision-making*
Libby Carnahan	*Collaborative sea level rise planning in Tampa Bay, FL*
Chang/Ruppert	*Coupling risk and resilience assessment for networked sustainable drainage systems in a coastal city under climate change impact*

10:15 Break

10:45 Recognizing Eastside High School Ocean Bowl Team - Dorothy Zimmerman

11:00 Fisheries

Kai Lorenzen	*Fisheries forums: Crafting processes and tools to enable place-based cooperative governance of Florida's saltwater recreational fisheries*
Angela Collins	*Fishing for data: Using cooperative research and acoustic telemetry to assess efficacy of barotrauma mitigation techniques and long-term survival of groupers after recreational catch and release*
Yuying Zhang	*Developing a size-structured stock assessment model for the spiny lobster, Panulirus argus, in the southeast United States*

12:00 Lunch

1:00 Aquaculture

Kevan Main	*Innovations in land-based marine aquaculture: Integrated production of marine fish, sea vegetables and wetland restoration plants*
Josh Patterson	*Developing aquaculture as a tool for active coral restoration in Florida*
Leanne Flewelling	*Evaluation of rapid brevetoxin tests for use in shellfish regulation, shellfish industry, and aquaculture*
Laura Tiu	*Building an aquaponics community of practice in the Florida Panhandle*

2:15 Break

2:45 Recognizing Mahogany Youth Fisheries Outreach Program - Charles Sidman

3:00 Healthy Coastal Environments

Jennifer Adler	*Walking on Water - National Geographic Education*
Tim Gowan	*A quantitative framework to evaluate vessel collision risk for marine mammals in Florida*
Maia McGuire	*Florida Microplastic Awareness Project*
Tiffany Troxler	*The effects of projected sea-level rise on Everglades coastal ecosystems: Evaluating the potential for and mechanisms of peat collapse using integrated mesocosm and field manipulations*
Joshua Voss	*An integrative assessment of estuarine impacts on coral health: A case study in South Florida*

4:30 Closing Remarks,

5:00 Poster Session

6:00 Conclusion

Less-than-fee beachfront acquisition strategies to protect and enhance sea turtle nesting habitat in Florida- a feasibility study and pilot project. *Thomas T. Ankersen, Jennifer Lomberk, Melissa Hill and Tom Kay, University of Florida Levin College of Law.*

Relevance: Florida's sandy beaches, and the greater beach-dune ecosystem, present special conservation challenges due to their dynamic nature and close proximity to human inhabitation. Arguably, regulatory efforts to protect the beach-dune system have proved inadequate, a problem now exacerbated by ongoing sea level rise.

Response: Supported by the National Fish and Wildlife Foundation, The Archie Carr Center for Sea Turtle Conservation, the Sea Turtle Conservancy and Florida Sea Grant, this report describes a project undertaken by the Conservation Clinic at University of Florida Levin College of Law in partnership with the Alachua Conservation Trust to explore the feasibility of using the law of private property to supplement the current system of beach –dune regulation. We analyze the use of the less-than-fee property interest known as a "conservation easement" on coastal properties as a tool to protect Florida's beaches from incompatible anthropogenic activities, with the specific goal of preserving sea turtle nesting habitat.

Results: The project is currently concluding its pilot phase, testing the theoretical efficacy of less-than-fee approaches to beach-dune conservation in Florida. The pilot phase identified target areas based on habitat quality, surveyed property owners within those target areas, conducted the legal research required to implement a less than fee approach, and drafted a model coastal conservation easement for sea turtle habitat protection. Two conservation easements are currently in negotiation with several other properties targeted.

Contact: Tom Ankersen, ankersen@law.ufl.edu

Promoting preventive mitigations of buildings against hurricanes through enhanced risk-assessment and decision-making. *Sungmoon Jung, Department of Civil and Environmental Engineering, Florida A&M University – Florida State University College of Engineering*

Relevance: Hurricanes and tropical storms continue to cause excessive property loss. An effective approach to lessen damages due to the hurricane is hardening or mitigation of homes. Mitigation actions also improve resilience of the coastal communities because more buildings will remain functional even after the storm, or quickly recover compared to unmitigated buildings. While the benefit is clear, it is challenging to change the behavior of homeowners so that they take mitigation actions.

Response: While behavioral patterns of homeowners are difficult to control, premium reduction will incentivize them over time. A major challenge for insurers to reduce the premium for stronger homes is the large uncertainties in the cost-benefit analysis. We have partnered with CoreLogic/EQECAT, a catastrophe risk modeling company, to identify opportunities of promoting mitigation of buildings against hurricanes. Failure probabilities of building components (with and without mitigation actions) were obtained, considering uncertainties in expected performance against hurricanes. Enhanced risk assessment for various scenarios were conducted.

Results: Loss analysis against hurricanes has been conducted using the approach developed in this project. Average annual loss (AAL) and average exceedance probability (AEP) for 50, 100, and 250 years were computed for all counties of Florida. Benefit of mitigation was quantified considering uncertainties in capacity of structural components. The average annual loss in Florida was 0.53%, 0.21% and 0.13% for the weak, average and strong house models. Therefore, improving the capacity of structural components would decrease the loss by nearly 4 times. The developed models were shared with a risk-modeling company. The results were also be published in a journal, targeting hurricane risk analysts.

Contact: Sungmoon Jung, sjung@eng.fsu.edu

Collaborative sea-level rise planning in Tampa Bay, Florida. *Libby Carnahan, University of Florida IFAS Extension Pinellas County, Florida Sea Grant Agent*

Relevance: Coastal communities surrounding Tampa Bay, Florida, are low-lying, densely-populated and therefore vulnerable to sea-level rise. In response to requests from local governments in the Tampa Bay region, Florida Sea Grant (FSG) and the Tampa Bay Regional Planning Council (TBRPC) are facilitating coordinated efforts to guide sea-level rise adaptation planning in the region.

Response: The FSG Agent is facilitating the Tampa Bay Climate Science Advisory Panel (CSAP), a scientific advisory group whose goal is to provide scientific support to local governments planning for a changing climate. The group is comprised of local experts researching and implementing adaptation projects related to climate change. The TBRPC is convening a network of planners, developers, emergency managers and policy makers through the ONE BAY: Resilient Communities Working Group in order to improve the regional capacity of the area to withstand uncertainty and adverse impacts associated with sea level rise and other coastal hazards.

Results: Under the facilitation of the FSG Agent, the scientists participated in a year-long iterative process of literature review, expert speaker presentations, and facilitated discussion, and in September 2015 published the final "Recommended Projection of Sea-Level Rise in the Tampa Bay Region". With this shared projection, the TBRPC is leading area governments to coordinate, develop, and implement appropriate coastal adaptation and risk reduction strategies. Since the adoption of the SLR Recommendation, local governments are increasing their awareness of climate change and sea-level rise issues and incorporating adaptation strategies into their planning processes. Some such efforts that will be discussed.

Contact Libby Carnahan, lcarnahan@ufl.edu

Coupling risk and resilience assessment for networked sustainable drainage systems in a coastal city under climate change impact. *Ni-Bin Chang and Justin Joyce, University of Central Florida, Rahim Harji, Pinellas County Government, Thomas Ruppert, Florida Sea Grant College Program, Peter Singhofen, Streamline Technologies, Inc.*

Relevance: This project sheds light on coupling potential flood risk and drainage infrastructure resilience to support the screening and selection of flood control measures and low impact development technologies. The study area is in a low-lying community (Mariners Cove) of the Cross Bayou watershed. It is tied to the National Flood Insurance Program and the Capital Investment Plan/Stormwater Management Plan of the Pinellas County, Florida providing suggestions for future relevant action plans and policies.

Response: The research team conducted multi-scale flood hazard analyses from storm surge to inland inundation, exposure assessment, and vulnerability impacts on Mariners Cove community in Tampa Bay via an integrated modeling framework. The resilience assessment of drainage infrastructure in the Cross Bayou Watershed was conducted to highlight the complexity for characterizing flood risk while evaluating such risk under various levels of adaptive capacity from traditional flood management measures to low impact development.

Results: Findings indicate that the coupling of flood risk and infrastructure resilience is achievable by the careful formulation of flood risk associated with a resilience metric, which is a function of the hazard(s) considered, vulnerability, and adaptive capacity via a Copulas analysis. The results also give insights into improving existing methodologies for municipalities in flood management practices such as incorporating multi-criteria flood risk evaluation that includes resilience. Management scenarios related to the National Flood Insurance program at the Federal level and the Capital Investment Plan at the County level can be concluded finally to demonstrate the application potentials.

Contact: Ni-Bin Chang, nchang@ucf.edu; Justin Joyce, jejyce@gmail.com

Fisheries Forums: Crafting processes and tools to enable place-based cooperative governance of Florida's saltwater recreational fisheries.

Kai Lorenzen, Chelsey Crandall, Jynessa Dutka-Gianelli, Juliane Struve, School of Forest Resources and Conservation, University of Florida; Joy Hazell, Betty Staugler, Florida Sea Grant Extension and Ken Leber, Mote Marine Laboratory.

Relevance: Challenges to the sustainability of Florida's saltwater recreational fisheries and/or their ability to provide full benefits arise from anthropogenic habitat degradation, high and increasing fishing pressure, and environmental disturbances. Current state and federal fisheries management systems are not well set up to address many of these challenges which can vary at relatively small spatial scales and often involve impacts from outside the fisheries sector.

Response: The project developed and pilot-tested place-based Fisheries Forums as a means of facilitating long-term engagement of local fishers in identifying and addressing local issues affecting fisheries. A majority of Florida's coastal fishers undertake most of their fishing activities within a limited 'home range' of 30 to 50 miles and often have deep knowledge of local environmental and management issues combined with a strong sense of place attachment and stewardship of resources. Place-based Fisheries Forums harness these assets and help fishers identify and address critical issues at appropriate scales.

Results: Pilot testing of Fisheries Forums has shown that coastal fisheries stakeholders in Florida can engage in sustained, place-based collective action, particularly where avid recreational fishers and fishing guides are present and basic logistic and facilitation support is available. Deliberations encompassed a broad range of issues including habitat and environmental concerns, rather than focusing primarily on fishing regulations. Deliberations led to meaningful action towards habitat improvement and voluntary fishing/boating restrictions aimed at improving fishing on sea grass flats. However, continued outside support is necessary to sustain Forums, manage possible conflicts and bring actions to fruition.

Contact: Kai Lorenzen, klorenzen@ufl.edu

Fishing for data: Using cooperative research and acoustic telemetry to assess efficacy of barotrauma mitigation techniques and long-term survival of Groupers after recreational catch and release. *Angela Collins, Florida Sea Grant, UF/IFAS Extension, Manatee County*

Relevance: Groupers comprise one of the most economically important reef fisheries in the southeastern United States. Management restrictions necessitate recreational discard, and the associated release mortality is an important consideration during stock assessments. Discard mortality estimates are uncertain, and vary by species, season, gear and depth.

Response: Using a cooperative team of recreational anglers, Gag grouper (n = 96; 44–80 cm) were caught on hook and line and monitored via acoustic telemetry on the west Florida shelf. Capture depths ranged to 40 m and fish were tagged during all seasons. After tagging, individuals were either placed back into the water without barotrauma mitigation, were vented to assist descent, or were returned to the bottom using a descending device.

Results: Monitoring periods ranged to 794 days for Gag grouper (mean = 161 d). Telemetry data indicate strong site fidelity and high survival (>90%) after recreational catch and release on the west Florida shelf (to depths of 40 m). Cooperative partnerships such as these are cost-effective, efficient and provide a realistic assessment of fish mortality after catch and release.

Contact: Angela B. Collins, abcollins@ufl.edu

Developing a size-structured stock assessment model for the spiny lobster, *Panulirus argus*, in the southeast United States. *Yuying Zhang, Assistant Professor, Marine Sciences Program, Department of Biological Sciences, Florida International University*

Relevance: The spiny lobster fishery is one of the most economically important fisheries in the Caribbean. In the past decade, multiple stock assessment models have been developed to assess the stocks, including the Catch-At-Age Model and the Delury Model used in the Southeast US. However, the last stock assessment was rejected by the Review Panel due to three concerns: 1) large uncertainty in natural mortality because of the PaV1 lobster virus, 2) limited knowledge of the stock-recruitment relationship because of the external recruitment from upstream Caribbean stocks, and 3) inaccurate and imprecise estimation of the age composition because of the variation in the age-size keys.

Response: To address these concerns, a new size-structured stock assessment model has been developed for the Southeast US spiny lobster. The complex life history and fisheries process of the Caribbean spiny lobster makes the size-structured model more effective than the age-structured models. As the spiny lobster lacks calcified structures to mark age directly, uncertainty and error could be introduced in the age-structured model during the length-age transformation. The flexible-setting size structure avoid the PaV1 and stock recruitment relationship concerns. The developed stock assessment model also describes seasonal sex-specific population dynamics of the spiny lobster. Seasonal step could better reflect the reality, as the efforts of both commercial and recreational fleets display seasonality. In addition, an auxiliary individual-based model has been developed to quantify the growth of spiny lobster. The uncertainty of the parameters and the biological reference points have been estimated in the stock assessment model.

Results: Both sensitivity and retrospective analyses indicate that the size-structured stock assessment model can provide management advice for the Southeast US stock. Similar methods can also be applied to other crustacean species, or even fin-fish species, whose age-size key has large variations.

Contact: Yuying Zhang, yzhang13@fiu.edu

Innovations in land-based marine aquaculture: Integrated production of marine fish, sea vegetables and wetland restoration plants. *Kevan L. Main, Mote Marine Laboratory, and Suzanne Boxman, University of South Florida.*

Relevance: The US seafood trade deficit exceeds $11B and currently, more than 90% of seafood consumed in the United States is imported. Commercial marine aquaculture is not only an untapped market for U.S. entrepreneurs – it is also envisioned as a critical resource for the health of our citizens and for long-term national food security. Future expansion of environmentally friendly, land-based aquaculture is needed to meet the ever increasing demand for safe and sustainable seafood.

Response: An innovative and sustainable, land-based integrated aquaculture or aquaponic system was designed and constructed. For two years, marine fish and edible halophytes/sea vegetables were produced, harvested from the marine aquaponic system, and sold in local markets. The research goal was to develop and evaluate a prototype system that could be expanded to establish the foundation for a successful and sustainable, land-based US marine aquaculture industry.

Results: Our study provided information on water treatment capacity, nutrient cycling, and biomass production. Extensive analysis of solids, organic matter, nutrients in water, and plant biomass was used to develop detailed mass balances on the system. The combination of recirculating aquaculture system technology and integrated fish and plant production resulted in high ammonia removal rates, allowing the system to support high fish biomass densities (38.8 kg/m^3 in Year 1 and 48.33 kg/m^3 in Year 2), and to produce market size redfish in 11-12 months. Organic solids were harvested from the sand filter and used as fertilizer for wetland restoration plants. New markets were identified for sea vegetables in a local farmer's market, with sustainable chefs and in the Eat Local food community.

Contact: Kevan L. Main, kmain@mote.org; Suzanne Boxman, boxman.suzanne@epa.gov

Developing aquaculture as a tool for active coral restoration in Florida. *Joshua T. Patterson, School of Forest Resources and Conservation and Florida Sea Grant, University of Florida / IFAS | Center for Conservation, The Florida Aquarium*

Relevance: Florida's coral reefs support 44,500 jobs in the state and have an estimated asset value of $7.6 billion derived from tourism, recreation, and shoreline protection. These figures do not include significant additional value from contributions to fisheries. A host of anthropogenic and natural stressors have damaged Florida's reefs to such an extent that the system may no longer constitute an ecologically functional coral reef and its framework is net erosional in some areas.

Response: Global and regional remediation of the environmental conditions causing coral reef decline will be necessary to reestablish significant ecological function. In the interim, aquaculture has emerged as a restoration tool. Efforts by a group of non-profits, agencies, and academics in Florida make the state an international leader in developing and scaling up coral restoration aquaculture. Since 2012, well over 100,000 nursery grown coral colonies have been "outplanted" to Florida reefs. The federal Recovery Plan for coral species listed under the Endangered Species Act includes aquaculture for population enhancement as a key recovery strategy component.

Results: Production methods have been developed, studied, and refined. Targeted research and trial-and-error aquaculture have generated improved operating practices for nursery managers. Outplanting strategies and techniques are lesser studied and offer an opportunity to increase restoration efficiency. Genetic tools are employed in all Florida nurseries to quantify stock diversity. Researchers are exploring this diversity to identify corals with desirable traits such as disease resistance, thermal tolerance, and fast growth. Coral restoration aquaculture has expanded very rapidly in a short time and continued improvements in science and practice will maximize effectiveness of this management tool.

Contact: Josh Patterson, joshpatterson@ufl.edu

Evaluation of rapid brevetoxin tests for use in shellfish regulation, shellfish industry, and aquaculture. *Leanne Flewelling, Alina Corcoran, Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission*

Relevance: Blooms of the dinoflagellate *Karenia brevis* threaten the productive Gulf of Mexico shellfish industry. Brevetoxins produced by *K. brevis* can result in Neurotoxic Shellfish Poisoning in humans if contaminated shellfish are eaten. Therefore, shellfish harvesting areas are closed when *K. brevis* concentrations exceed 5,000 cells/L and are re-opened once *K. brevis* levels decrease. While effective, these NSP closures come at a steep economic cost to the shellfish industry. The APHA mouse bioassay – the only approved method for regulatory NSP testing – has many drawbacks, and the delays caused by the time required to analyze samples and low sample throughput compound economic losses. To mitigate economic harm and ensure public health, rapid alternative methods for NSP testing are needed.

Response: Among the many chemical and biological methods developed for brevetoxin detection, enzyme-linked immunosorbent assays (ELISAs) have performed well. We evaluated two brevetoxin ELISA assays as potential alternatives to the mouse bioassay and conducted a single lab validation of an ELISA, focusing on three commercially and recreationally important species: oysters, hard clams, and sunray venus clams.

Results: A brevetoxin ELISA kit marketed by MARBIONC Development Group was validated according to Interstate Shellfish Sanitation Conference guidelines; a robust comparison of the ELISA and the mouse bioassay using more than 500 shellfish samples was conducted; and a proposal was submitted to the ISSC for consideration of this ELISA as a Limited Use Method. If approved, this method will improve the efficacy and efficiency of the NSP program in Florida, reduce economic losses suffered by the shellfish industry, and provide a tool for other Gulf States to incorporate into NSP regulatory processes.

Contact: Leanne Flewelling, leanne.flewelling@myfwc.com; Alina Corcoran, alina.corcoran@myfwc.com

Building an aquaponics community of practice in the Florida Panhandle. *Laura Tiu, Florida Sea Grant, UF/IFAS Extension, Okaloosa and Walton Counties.*

Relevance: A University of Florida Extension's high-priority initiative is "increasing the sustainability, profitability, and competitiveness of agricultural and horticultural enterprises." One food production method currently being investigated is aquaponics, where fish and plants are cultured symbiotically in a recirculating water system. This has led to an increasing demand for information and training on small-scale food production methods. This effort will be the first regional effort to develop an aquaponics community of practice in the panhandle of Florida.

Response: Creating a community of practice (COP) is one model to address information and training needs of clientele. Aquaponics is a relatively new food production system that is complex and requires intensive training and support. The objective for this project was to develop a series of workshops and a Listserv to provide timely aquaponic information to subscribers, and build a hobby-scale demonstration system for hands on training at the Walton County Extension Office using a Florida Sea Grant mini-grant.

Results: A new Aquaponics Community of Practice was launched in 2016. Introductory workshops were held in Walton, Okaloosa and Leon counties. A total of 94 participants attended the three events. Three advanced workshops were also conducted. An aquaponics list serve was created to provide timely aquaponic information to subscribers. In under a year, over 176 people have subscribed to the list serve. A small hobby-scale aquaponics system was constructed at the Walton County Extension Office, stocked with catfish, and seeded with lettuce. The system has been featured in a Hobby-Gardening workshop and is available to view during office hours. This presentation will elaborate on the successes and challenges of this small effort.

Contact: Laura Tiu, lgtiu@ufl.edu

Walking on Water. *Jennifer M. Adler, School of Natural Resources and Environment, University of Florida*

Relevance: In Florida, we spend our lives walking on water – the Floridan Aquifer underlies almost the entire state and supplies drinking water to 92% of Florida's population (Marella 2010). Human actions at the land surface have direct impacts on the aquifer, which is threatened by pollution, over-pumping, salt water intrusion, and development in the springsheds (Florida Springs Task Force 2000), but it's hard for people to understand their connection to this water that they cannot see. In schools, insufficient funding for environmental education and lack of teacher expertise regarding Florida's unique freshwater ecosystems combined with the absence of aquifer-specific statewide education standards means that few students learn about the aquifer.

Response: The immersive environmental education program *Walking on Water* is a response to the need for new approaches to education and communication regarding Florida's freshwater. The program puts underwater cameras in the hands of 5th grade students and allows them to explore the springs creatively through art, specifically conservation photography, and creative environmental writing. A follow-up visit in the classroom takes the students "cave diving" in the aquifer via a 360-virtual tour, the first in an underwater cave.

Results: A theme that emerged in students' written responses to the program was that underwater photography helped students see the spring in a new way by encouraging them to look more closely and see details they would have otherwise missed. Students also noted that photography allowed them to study the species that lived there and see the spring as an important home for plants and animals. Pre-post tests showed significant increases in knowledge, especially for students in non-magnet programs. This is the first evaluation of an environmental education program that uses underwater photography and virtual tours as teaching tools, and these preliminary results show the promise of using immersive science and arts education to teach about the environment and build a water ethic in the next generation of Floridians.

Contact: Jennifer M. Adler, jennifermadler@ufl.edu

A quantitative framework to evaluate vessel collision risk for marine mammals in Florida. *Timothy Gowan, Florida Fish and Wildlife Research Institute; Julien Martin, Wetland and Aquatic Research Center, U.S. Geological Survey; Bradley Udell, Department of Wildlife Ecology and Conservation, University of Florida; Brittany Combs, College of Marine Science, University of South Florida*

Relevance: Collisions with watercraft cause a significant portion of overall mortality for some marine mammal populations. Protection zones that regulate the speed and operation of vessels are a primary management action intended to protect marine mammals, yet implementation of these zones can be contentious with waterway users. The design of these protection zones must balance multiple objectives, including the protection of wildlife and minimizing socioeconomic costs. The ability to quantify collision risk is necessary to optimize the design of protection zones but presents a challenge because an unknown number of mortalities go unobserved or cannot be tied to their place and time of occurrence.

Response: We developed a conceptual framework to quantify risk of vessel-strike mortality to marine mammals. This framework allows the input of different parameters (e.g., vessel speed, animal abundance) and their uncertainty to evaluate potential management actions. In contrast to previous metrics of relative risk, our approach incorporates the effects of animal and boat size, speed, and behavior on the processes leading to lethal collisions. We illustrate its application for Florida manatees and North Atlantic right whales in real seascapes while providing updated estimates of key parameters. We also demonstrate the use of this framework to evaluate effectiveness of management actions and optimize protection zones.

Results: Our framework allowed us to predict risk across time and heterogeneous landscapes, account for uncertainty, and evaluate the sensitivity of results to inputs. We were able to quantify risk under alternative management scenarios, identify areas of high risk, and optimize the design of protection zones based on objectives such as minimizing risk or minimizing costs to waterway users. We anticipate that this framework can be a valuable decision tool for agencies such as FWC and NOAA Fisheries to evaluate potential management actions and to identify data gaps for future research.

Contact: Tim Gowan, tim.gowan@myfwc.com; Julien Martin, julienmartin@usgs.gov

Florida Microplastic Awareness Project. *Maia P. McGuire, Florida Sea Grant, UF/IFAS Extension, Flagler and St. Johns Counties.*

Relevance: Microplastics are small pieces of plastic (less than 5 mm in size) that are becoming ubiquitous in the marine environment. The amount and type(s) of microplastics found in Florida's coastal waters are unknown. There is a need to raise awareness about the sources of microplastics, the abundance of microplastics in Florida's waterways, and the threats that microplastics might pose, both to wildlife and humans.

Response: In 2015 the Flagler County Sea Grant agent initiated the statewide Florida Microplastic Awareness Project (FMAP), which was created using funds from a 2015 NOAA Marine Debris Program Outreach and Education grant. The FMAP teaches people about microplastics and their possible impacts. It promotes ways for people to reduce their personal plastic waste generation. The project also trains citizen scientists to sample and analyze local coastal waters for the presence of microplastics.

Results: Since September 2015, the volunteer effort has allowed the collection and analysis of over 1,050 samples from more than 350 locations around the state. This is the first large-scale data set for microplastics in Florida waters. It shows that:

- The majority of coastal water samples collected in Florida (90%) contained at least one piece of plastic. On average there are over eight pieces of plastic per liter of water.
- The plastic in the samples was primarily (83%) in the form of microscopic fibers.
- Microbeads (from facial scrubs and other personal care products) comprised only a small portion of the plastics found (6%).

More than 1,100 people have completed the FMAP pledge. On average, people pledged to make 3.4 behavior changes (and are already taking 4 of the suggested actions). In follow-up surveys received from over 110 pledge-takers, people reported on average having made three behavior changes. 85% reported having shared information about microplastics with others.

Contact: Maia P. McGuire mpmcg@ufl.edu

The effects of projected sea-level rise on Everglades coastal ecosystems: Evaluating the potential for and mechanisms of peat collapse using integrated mesocosm and field manipulations.
Tiffany Troxler, Florida International University; and Fred Sklar, South Florida Water Management District

Relevance: In the Florida Everglades, peat soils critical to maintaining wetland elevation are collapsing due to rising seas and saltwater intrusion. Peat soils are fragile—too little freshwater can dry them up, while too much saltwater causes plants to die and peats to wash out, creating open-water slurry holes where the peat used to be. The peat surface is a fundamental building block of Everglades wetlands, where foundational species call home, generating millions in tourist dollars each year, protecting the aquifer from saltwater intrusion, supplying drinking water for 1 out of 3 Floridians, and protecting humans from hurricane damages.

Response: Florida Sea Grant researchers have quantified the physical, chemical and biological effects associated with exposing brackish and freshwater sawgrass peat communities to elevated salinity in field and laboratory manipulations.

Results: Results of the project show that increased salinity in peat soils resulted in loss of peat structure and decline in the growth of plants that form the peat. The research team is working closely with the South Florida Water Management District, Everglades National Park and the Everglades Foundation to produce actionable science to inform future management and policy development. Understanding sea-level rise impacts in association with enhanced freshwater flow to Taylor and Shark River Sloughs has profound implications for Everglades operational decisions, restoration scenario evaluations, adaptive management and reduced ecological risk due to peat collapse.

Contact: Tiffany Troxler, troxlert@fiu.edu; fsklar@sfwmd.gov;

An integrative assessment of estuarine impacts on coral health: A case study in South Florida. *Joshua D. Voss, Harbor Branch Oceanographic Institute at Florida Atlantic University, and Jeff Beal, Florida Fisheries & Wildlife Conservation Commission*

Relevance: Effective water management strategies are critical for conserving coral reef communities, particularly in nearshore systems subject to increased human alterations. St. Lucie Reef in southeast Florida is strongly influenced by freshwater discharges from the Indian River Lagoon, St. Lucie River, and its expanded watershed, including Lake Okeechobee. The study area represents the northernmost limit for numerous coral species along Florida's Atlantic coast and the northern extent of the South East Florida Coral Reef Initiative region.

Response: This study assessed the impacts of freshwater discharges and thermal stress on coral health on St. Lucie Reef. Dominant coral species were assessed using field surveys, photogrammetry, and next generation molecular methods for coral gene expression and endosymbiotic algal communities. Coral population structure was also quantified using microsatellite markers. The individual and combined effects of discharge exposure and thermal stress on corals were evaluated in a controlled *ex situ* experiment. Finally, an outreach video and classroom curricula were produced to highlight the ecological importance of St. Lucie Reef and water quality issues in the study area.

Results: Pulses of freshwater and subsequent impacts on salinity and light on the reef were concomitant with both heavy rainfall and controlled discharge events. In response, reef corals exhibited variable expression of genes related to xenobiotics, osmoregulatory stress, and symbiosis regulations. Time series samples from the reef and results of the controlled *ex situ* experiment indicate that thermal stress likely plays a greater role than freshwater discharges in regulating algal endosymbiont populations within host corals. Therefore, efforts to reduce the severity of freshwater releases, and to improve their timing, may enhance coral reef persistence in southeast Florida. The scientific and outreach products from this project contributed to the success of three 2017 Florida congressional bills that support improved water quality and coral reef health in southeast Florida.

Contact: Joshua Voss, jvoss2@hboi.fau.edu; Jeff Beal, jeff.beal@myfwc.com

Regional Florida artificial reef workshops - planning for people and pisces. *Holly Abeels, Angela Collins, Joy Hazell, L. Scott Jackson, Laura Tiu, and Chris Verlinde, Florida Sea Grant, University of Florida/IFAS*

Relevance: Artificial reefs contribute significantly to local economies, providing recreational opportunities for anglers and divers, and generating at least $3.1 billion of economic activity in Florida. Artificial reefs are also used as mitigation tools in areas that have suffered environmental perturbations or habitat degradation. Florida Sea Grant and UF/IFAS Extension aim to ensure artificial reef deployment and monitoring are informed by the best available science.

Response: Regional artificial reef workshops were designed to bring together managers, coordinators, scientists, contractors and local stakeholders involved in all aspects of artificial reef research and deployment. One-day workshops were held across the state as a cooperative effort between Florida Sea Grant and UF/IFAS Extension and the Florida Fish and Wildlife Conservation Commission. These regional workshops provided an open forum to highlight local efforts while also providing information regarding new science and overall policy at the state and federal levels.

Results: Three regional artificial reef workshops were held across Florida over the course of one year (March 2016 – February 2017). Approximately 150 stakeholders attended statewide and workshop evaluations indicated that almost all participants learned new information that was directly applicable to their job. Regional workshops are an efficient method for communication and provide a conduit for information exchange at a local level that informs best practices for future artificial reef development, deployment and scientific monitoring within the state of Florida. This is critical for continued evolution of artificial reef programs that best address the needs of stakeholders and reef species.

Contact: Holly Abeels, habeels@ufl.edu; Angela Collins, abcollins@ufl.edu; L. Scott Jackson, lsj@ufl.edu

Importance of aroma analysis in seafood quality measurements.
George L. Baker IV, Florida Sea Grant / Food Science & Human Nutrition Department, University of Florida / IFAS

Relevance: Seafood quality is not easily defined. Instances where a seafood has "gone bad" are typically related to an unpleasant odor (or aroma). Alternatively, seafood "freshness" is often used to describe a combination of pleasant sensory descriptors like "sea breeze" or "cucumber". Because seafood is a mixture of organic and inorganic chemical compounds, we can separate and identify them individually using analytical instrumentation found in a chemistry laboratory. What results from this analysis is an "aroma fingerprint" of the aromatic chemical compound mixture found in a particular seafood product. Seafood quality is most often attributed to the sensory measurement of off-aromas and the main reason the seafood is discarded before it is consumed. Panelists trained in traditional sensory measurement techniques for seafood quality are taught to compare descriptive terms of the actual item described. For example, if a panelist discerns a "mushroom-like" aroma in a seafood product, then they are trained to rate seafood samples against the intensity of a fresh mushroom. A sensory evaluation technique that uses the identified chemical compounds in seafood products as tools for quality evaluation purposes is currently in development.

Response: A prototype for a portable seafood aroma compound delivery system was developed for seafood processors to use to identify specific product quality defects.

Results: A method using a kit of diluted aroma chemicals from frozen, raw whiteleg shrimp (*Litopanaeus vannamei*), like 2,4,6-tribromoanisole (sea breeze), 1-octen-3-one (mushroomy), 4- heptenal (fishy), 2,6-nonadienal (cucumbery), and 1,5-octadien-3-one (metallic) will be developed, evaluated and refined by sensory specialists, and used to train seafood industry representatives at a shrimp sensory school to be held in May 2018.

Contact: George L. Baker IV, glba@ufl.edu

Be Seagrass Safe: A social media campaign. *Savanna C. Barry, UF IFAS Nature Coast Biological Station, Florida Sea Grant*

Relevance: Ecosystem functions provided by seagrasses support a robust fishing and boating economy in Florida. Despite protection and management, Florida's seagrasses face multiple threats including water quality declines and physical damage (scarring) by boat propellers and vessel groundings. Seagrass scarring is an increasing problem in Florida and an urgent issue because natural recovery from physical damage may exceed ten years. Over time, erosion and scouring in scarred areas can result in reduced resilience of seagrasses and eventually lead to loss of seagrasses.

Response: Boater education is one strategy that can help reduce seagrass scarring in a cost-effective manner. As part of an ongoing boater education effort, a team of Florida Sea Grant agents and communications staff launched a social media campaign aimed at increasing the visibility of the Be Seagrass Safe message and encouraging boaters to take a seagrass safe boating pledge. Pre-campaign surveys indicated that boaters largely understand seagrasses are important but do not consider scarring a threat to seagrasses. Thus, the social media effort focused on linking seagrass scarring to loss of seagrass services to better connect boaters with the message of seagrass protection.

Results: Social media is a relatively new tool in extension programming and web-based analytics offer an important mechanism to evaluate and identify strategies to improve social media campaigns. In all, 32 social media posts were disseminated via five channels (Facebook, Instagram, Twitter). These posts reached a total of 43,920 people, received 869 likes or shares, and resulted in a 136% increase in web site views. Despite the large number of people reached by the posts, an extremely small percentage followed the link (0.21%) and completed the seagrass safe boating pledge (0.07%). This suggests that strategies such as stronger incentives, simpler user-interfaces, and/or creative approaches (e.g., regional contests) may be required to increase pledge numbers.

Contact: Savanna C. Barry, savanna.barry@ufl.edu

Preliminary results of the 2017 scalloping season monitoring in Taylor County waters, Florida, USA. *Victor Blanco, UF/IFAS Taylor County Extension Agent, Florida Sea Grant.*

Relevance: Scalloping in the Nature Coast and Big Bend seagrass beds regions of the Gulf of Mexico in Florida has historically been a very important recreational and economic activity. FWC annually reviews the status of the scallop stock in this area and results of surveys have continually shown that the scallop population within the Big Bend counties is key to the sustainability of the recreational harvest. However, most aspects related to scalloping in Taylor County waters as a recreational fishing activity remain unknown, which is an opportunity to better understand and manage the awareness and knowledge about the resource and its economic impact locally.

Response: A passive method for assessing the recreational scalloping activity in the Harvesting Area 2 of Taylor County State waters is being performed applying surveys in 2 public boat ramps (Keaton Beach and Steinhatchee). The goal is to carry out a qualitative and semi-quantitative analysis to describe the involved variables on the scalloping activity to estimate fishing effort in Taylor County, the economic impact to local businesses, prioritize and develop educational/communication tools for different stakeholders, and support decision making and managing practices at State and local levels. This preliminary report describes the results of analysis of data from June 16 to August 9, as a total of the 2 sampled locations.

Results: Data of 30 variables related to the activity was collected. The results indicate that fishing pressure over the scallop population in Taylor County waters remains high (almost 80% of boaters go scalloping, and almost 70% collect the daily limit), with an important local economic impact (average $450/day/boat), especially during weekends. Extension activities must focus on sharing monitoring results with State and local key stakeholders to improve regional knowledge of the impact of the activity in the County. If the level of fishing effort remains high or increases, population might suffer the hazard of overfishing in the near future, so extra management measures must be taken.

Contact: Victor Blanco, victorblancomar@ufl.edu

Establishing the St. Joseph Bay Water Watch program. *Ray Bodrey, UF/IFAS Gulf County Extension Director*

Relevance: St. Joseph Bay's scallop production has been declining of recent. Over harvesting, seagrass reduction and water quality are all potential concerns regarding the decline. The population in coastal Gulf County is also growing at a significant rate and marine water quality concerns are at the forefront. The City of Port St. Joe has aging stormwater infrastructure and in many cases throughout the city, stormwater infrastructure does not exist. Nonpoint source pollution impacts from stormwater could influence unfavorable conditions on the St. Joseph Bay if water quality is not routinely monitored. Failing water quality standards on the bay could have a two-fold effect on Gulf County. From a natural resource standpoint, further declining scallop populations is a potential devastating aquatic ecology concern, as a healthy scallop harvest from the bay is a critical economic driver for tourism.

Response: UF/IFAS Gulf County Extension embarked on a citizen scientist water quality program. With training and assistance from Florida Sea Grant agents, the St. Joseph Bay Water Watch Program was established. The goal of the program is to train citizen scientists to monitor potential "hot spots" of water quality concern on the bay. Project partners, such as the Florida Department of Agriculture and the St. Joseph Bay Aquatic Preserve (DEP) will assist in selecting the sampling stations. These stations will be monitored monthly, by analyzing key healthy marine water quality parameters, such as dissolved oxygen, temp, salinity, pH, visibility and even microplastics. The parameter measurements will be referenced with marine water quality standard criteria to see if failing measurements exist.

Results: The water quality data will be compiled monthly and shared on a public website. A quarterly report of data will be made available to decision makers of county stormwater controls, such as the Gulf County Board of Commissioners and the County Administrator. Data will also be shared with other research and government entities. If "hotspot" areas warrant further investigation, Water Watch will assist in a more comprehensive study of parameters.

Contact: Ray Bodrey, rbodrey@ufl.edu

Living on the edge: The balance between economy and environment.
Becca Burton, and Dorothy Zimmerman, Communications Office, Florida Sea Grant, University of Florida.

Relevance: Most of Florida's 20 million residents live in coastal counties, and over 80 million tourists visit the coast each year. This concentration of people, activities and economies contributes more than 80% — almost $562 billion — to the state's economy annually.

Response: Florida Sea Grant is a university-based research program that helps balance the growth of local economies with protection of the coastal environment. Outreach is integrated with UF/IFAS Extension at the University of Florida, one of the nation's leading land-grant universities. To support the research, extension and education programs of Florida Sea Grant, the communications office develops and implements diverse and wide-ranging communication efforts that effectively provide relevant information to Sea Grant partners, Florida residents and visitors.

Results: Key examples of the way Florida Sea Grant has become the "go to" organization around the state on a wide range of issues affecting economic prosperity of coastal communities are presented. These include the GIS-based waterway management system that has saved taxpayers an estimated $5 million since 2006; the legal extension team that has helped foster growth for the emerging clam aquaculture industry in Cedar Key; and the technical assistance provided to Florida's artificial reef community, an activity that contributes an estimated $253 million annually to the economies of Southwest Florida.

Contact: Becca Burton, rlburton@ufl.edu; Dorothy Zimmerman, dozimmer@ufl.edu

Gulf of Mexico climate outreach community of practice: A model for adaptation dialogue. *Libby Carnahan, University of Florida IFAS Extension Pinellas County, Florida Sea Grant Agent*

Relevance: Climate change and associated sea-level rise are affecting the Gulf States of Florida, Alabama, Mississippi, Louisiana, and Texas and it is predicted the impacts will increase in future years.

Response: The Gulf of Mexico Climate Outreach Community of Practice (Gulf Climate CoP) formed in 2010 to bring extension, outreach and education professionals together with government staff and elected officials to share best practices for climate change adaptation planning. The group's three working objectives include (1) explore the state of climate science in the Gulf region, (2) learn how coastal communities can adapt to climate change impacts, and (3) share lessons-learned related to climate communication.

Results: These objectives are met through an annual 3-day workshop that rotates annually in location around the Gulf. Components of each workshop include expert scientific presentations, a hands-on tools café, a panel of government employees sharing on-the-ground adaptation practices, breakout group working sessions, and a field tour. The Gulf CoP has attracted over 300 members from diverse organizations, and members utilize different mechanisms for engagement including webinars, work groups, social media, and an annual in-person meeting. Gulf Climate CoP has fostered multi-state collaboration on projects including but not limited to Regional Floodplain Management Workshops, Coastal Resilience Indices, and a small grants program for coastal communities. Detailed examples of success and best practices from the CoP's six years in operation will be shared in the poster.

Contact Libby Carnahan, lcarnahan@ufl.edu

Meaningful action gives satisfaction: the role of stakeholder engagement in recreational fisheries. *Chelsey Crandall, Kai Lorenzen, Martha Monroe, and Jynessa Dutka-Gianelli, School of Forest Resources and Conservation, University of Florida*

Relevance: It is important that natural resource management provide opportunities for the public to participate in management decision-making that people perceive to be meaningful and genuine, and the success of collaborations between government and user groups depends on whether users feel their input is listened to. There are many opportunities for people to participate in the fisheries management decision-making process in the state of Florida; however, we don't know how stakeholders feel about these opportunities.

Response: We used an online survey to explore people's perceptions of engagement opportunities and their overall satisfaction with fisheries management. A meaningful action scale was included to measure whether or not fishers perceived opportunities to participate in management in a meaningful way.

Results: Though most (89%) survey respondents agreed that public input should be included in decision-making, few agreed it is (19%) or that managers listen to public input (13%), and only 15% agreed there are opportunities for them to participate. Almost half (42%) were dissatisfied with management, with 40% disagreeing that they had opportunities for meaningful participation. Results showed a significant correlation between meaningful action and satisfaction, with those who perceived opportunities for meaningful action in the management process also more satisfied with management overall. On average, respondents had the most trust for Extension/Sea Grant agents and the least for Federal Councils; notably, those who scored lowest on the meaningful action scale also had significantly lower levels of trust for fisheries professionals. Results establish a need to increase awareness of participation opportunities and to show how participation impacts management, and suggest that providing engagement opportunities that are viewed as meaningful should increase satisfaction with management.

Contact: Chelsey Crandall, kicksea@ufl.edu

Coastal shoreline restoration: A new special topic module within the University of Florida Master Naturalist Program. *R. LeRoy Creswell and Marty Main — Florida Sea Grant Extension Program, University of Florida*

Relevance: Many coastal shorelines in Florida have been damaged by excessive erosion from boat wakes and storms, degraded water quality, and modifications for coastal development and agriculture — or they have been armored with seawalls or rock bulkheads. Living Shorelines are an environmentally friendly alternative to stabilize coastal wetlands and waterfront property. Natural shorelines include oyster reefs that stabilize submerged sediments and reduce wave energy on the shoreline. At the water's edge, marsh grass and mangrove trees can provide a cost-effective natural alternative to shoreline armoring that provide ecosystem services, complex habitat, and biotic diversity.

Response: A new Master Naturalist Special Topics Course has been developed will provide classroom instruction and hands-on activities addressing the characteristics of living shorelines, site selection and design plans for restoration projects, implementing a shoreline restoration project, and monitoring restoration sites for success. As with other 24-hour FMNP special topics, *Coastal Shoreline Restoration* will include classroom presentations, hands-on activities, and field trips to established restoration sites and citizen-science living shoreline programs. This is the first training module in a new restoration series within the Florida Master Naturalist Program that will include special topic programs devoted to freshwater, upland, and urban restoration.

Results: The *Coastal Shoreline Restoration* module has been presented to Florida Master Naturalist instructors through a series of workshops conducted around the state and is available on the FMNP website. Powerpoint presentations, instructional manuals, and additional reference materials and resources are provided.

Contact: LeRoy Creswell, creswell@ufl.edu; Marty Main, mmain@ufl.edu.

Designing coastal management decision support systems: Exploring the progression and transmission of coral diseases. *Pamela J. Fletcher, Florida Sea Grant College Program, University of Florida, Institute of Food and Agricultural Sciences; Henry A. Bartelet, Research Fellow, DynaMundo, United States*

Relevance: Coral reef ecosystems are in decline as a result of a combination of local, regional and global stressors. Changes to reef ecosystems are important to humans and the environment due to the ecosystem services they provide, estimated to be nearly US$ 30 billion each year worldwide, mainly from tourism, fisheries, and coastal protection. Amid the growing global and local pressures on the coral reef, the reefs in the Caribbean are now facing an additional threat: coral disease.

Response: This analysis improves our understanding of coral health and disease transmission. We use modelling approaches to examine 1) multiple stressors to coral growth, survival, recruitment and reproduction, and 2) how the spread of a coral disease affects coral ecosystems. The preliminary model simulation outcomes can, based on systems leverage analysis, be used to identify the most important topics which need further research. When new information becomes available through laboratory research, field studies and/or data gathering, the prior probabilities will be updated and become more accurate.

Results: This poster explores coral stressors and existing theories about the progression and transmission of coral disease to begin a dialogue to evaluate the extent and spread of disease, and to identify potential management actions. The purpose of the Bayesian causal network and two system dynamic models are used as a basis to facilitate discussion to incorporate stakeholder (coral disease experts) knowledge to assist managers in developing management alternatives and a framework to prioritize areas for further research on coral disease.

Contact: Pamela Fletcher, fletchp@ufl.edu

Invasive to native. *Brittany J. Hall-Scharf, Florida Sea Grant, UF/IFAS Hernando County; Joshua T. Patterson, Florida Sea Grant, University of Florida / Center for Conservation, The Florida Aquarium; Savanna C. Barry, UF/IFAS Nature Coast Biological Station, Florida Sea Grant*

Relevance: In 2015, Hernando County updated its Noxious Plant Control ordinance to require removal of lead tree (*Leucaena leucocephala)* and Brazilian pepper tree (*Schinus terebinthifolia)* within the county. These invasive species can be detrimental to native vegetation. To date, the County has removed 4,367 lead trees and 1,212 Brazilian pepper trees; additional removals are scheduled. Unfortunately, removing these trees from coastal areas can lead to shoreline erosion. Prompt reestablishment of native vegetation is needed at these removal sites to restore important ecosystem services such as storm protection, pollution filtration, and wildlife habitat.

Response: Florida Sea Grant, UF/IFAS Extension Hernando County, and Master Gardeners partnered with local schools to grow native coastal vegetation for the County's designated removal sites. A community event sponsored by Florida Sea Grant, UF/IFAS Extension, Hernando County Tourism, Hernando County Government, Red Mule Runners, and local vendors was held to raise funds to support the project. Hernando Environmental Land Protectors donated remaining funds needed for nursery supplies. Intertidal plants were donated by the Florida Fish and Wildlife Conservation Commission and coastal upland plants were sourced from Master Gardeners.

Results: To facilitate the growth of intertidal and coastal upland plant species upon removal of the invasive trees, two types of plant nurseries were constructed at local schools. Master Gardeners and parent volunteers were trained by Sea Grant on intertidal plant nursery construction while an agriculture class completed construction of the coastal uplands nursery. A total of 100 upland plants and 1,000 intertidal plants will be raised by students throughout the 2017-2018 school year. Ten vegetated buffers will be planted at County removal sites to reduce erosion. By participating in hands-on-habitat restoration activities, students will understand the value of maintaining a healthy environment and learn the skills needed to properly operate and sustain these nurseries in perpetuity.

Contact: Brittany Hall-Scharf, bhallscharf@ufl.edu

Removal efficiency and recolonization of lionfish on high-density artificial reefs in the northern Gulf of Mexico. *Holden Harris, School of Natural Resources and Environment, UF/IFAS; William Patterson, and Micheal Allen, Department of Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, UF/IFAS.*

Relevance: Mitigating the negative impacts of lionfish is a top priority for the ocean management community, and artificial reefs in the northern Gulf of Mexico have among the highest lionfish densities in their invaded range. Spearfishing tournaments and the establishment of a lionfish fishery have successfully removed thousands of lionfish from the northern gulf, but few data exist to evaluate the efficacy of lionfish removals and the levels of effort required to mitigate lionfish impacts in this region.

Response: This study assessed removal efficiency and recolonization rates of lionfish to assist managers determine the amount of effort needed to achieve management targets. Removal efficiency was examined by using the Leslie method to model how multiple passes on 6 removal sites affected the relative abundance of lionfish remaining in a localized population. Following removals, 5 rounds of ROV surveys on removal and control reefs (n = 24 reefs) were conducted between October 2016 and June 2017 to monitor lionfish recolonization and reef fish community restructuring. We developed a linear mixed effects model framework to examine factors that affected the duration of reduced post-removal lionfish density.

Results: Removal efficiency for the first, second and third pass was 87%, 98%, and 100%, respectively, and appear to be significantly higher than on continuous coral habitats. Lionfish recolonization was estimated to be 0.052 fish per 100 m^2 per day, or about 1.5 per month. Community structure analysis for ROV video will continue for a second year and assess baseline and changes in reef fish community structure. Differences in lionfish densities, diet, removal efficiency, catchability, detection, exposure and recolonization, may suggest management approaches for lionfish in the northern Gulf of Mexico may need to differ from those for coral reef dominated habitats.

Contact: Holden Harris, holdenharris@ufl.edu

Functional ecomorphology of shark pectoral fins. *Sarah L. Hoffmann and Marianne E. Porter, Florida Atlantic University Department of Biological Sciences*

Relevance: The kinematics of shark maneuvering are not well understood, likely due to challenges associated with calibrating large volume environments for three-dimensional (3D) analysis. Previous 2D kinematic studies describe asynchronous pectoral fin movements in two species during yaw turning, which is hypothesized to increase drag and generate a turning moment. The extreme morphological and ecological diversity within sharks further confound our understanding of the role of pectoral fins in maneuvering. The goal of this study is to describe the morphology and function of shark pectoral fins among morphologically diverse species that navigate various environments.

Response: We adapted 3D motion capture technology for use with fully submerged cameras to document the maneuvering kinematics of free swimming sharks. Using 3D analyses, we quantified pectoral fin rotation and estimated drag force on the fin for two species. We also described the morphology and material properties of shark fins from 12 species.

Results: We found that Pacific spiny dogfish¸ *Squalus suckleyi*, predictably rotate their pectoral fins in three axes during turning. Preliminary data demonstrate that the bonnethead shark, *Sphyrna tiburo*, initiates similar pectoral fin rotation during turning; however, we hypothesize that the Pacific spiny dogfish pectoral fins have more rotational freedom than bonnethead. We found that species found nearshore in architecturally complex environments have more flexible pectoral fins whereas pelagic species have fins shaped to maximize hydrodynamic efficiency. Similarly, we predict that the fins of inshore species have more rotational freedom than pelagic species. These data provide information on the evolution and adaptation of sharks and may inspire the design of autonomous underwater vehicles for use in different environments. This study is also the first to examine the 3D kinematics of free swimming sharks and further development of this technology will advance our ability to study large, free swimming animals.

Contact: Sarah Hoffmann, shoffmann@fau.edu; Marianne Porter, me.porter@fau.edu

Estimating the Cost of Copepod Nauplii Production in Marine Aquaculture. *Jennifer Johns and Charles Adams, Department of Food and Resource Economics, University of Florida.*

Relevance: Larval copepods have been shown to provide the exceptional nutritional value for several species of marine ornamental fish that are candidates for commercial culture. Although the technical aspects of culturing copepod nauplii are known, the financial characteristics and economic feasibility of the culture process are unknown. This project focuses on determining the cost of producing cultured copepod nauplii to be used as a live-food organism during the early life stages for marine, ornamental fish by Florida growers.

Response: In the first stages of this project, the cost of producing copepod nauplii using the current prototype production system at the University of Florida's Tropical Aquaculture Laboratory will be assessed. A description of the physical components and operational parameters of the current system, as well as the cost per unit of copepod nauplii produced will be determined. All components of the current system, including those needed for water holding/filtration and the production of the live algae, the latter of which is food required for the copepods, will be described. This information is needed to determine an investment cost of the prototype operation. Non-cash expenditures and all variable costs will then be incorporated to generate an estimate of operating costs. Both the fixed and variable costs will be entered into a detailed spreadsheet of financial data.

Results: As a result of this project, existing and prospective marine, ornamental fish growers will be provided with preliminary financial information on producing copepod nauplii. They will be able to analyze the cost of adding a production system to their operations and assess the change to their profitability. They can also better assess the profitability of incorporating new candidate species of fish into their operations.

Contact: Jennifer Johns, jenniferjohns@ufl.edu; Chuck Adams, cmadams@ufl.edu

Expand your outreach with the Florida Master Naturalist Program.
Shelly A. Johnson, University of Florida / IFAS Extension

Relevance: The Florida Master Naturalist Program (FMNP) is a statewide environmental and conservation education program that promotes awareness, understanding, and respect of Florida's natural world among Florida's citizens and visitors. We rely on instructors to voluntarily offer the program, in turn, FMNP graduates expand the program impact by sharing their knowledge and assisting others to understand sustainability, connectivity, and biodiversity. The FMNP serves the needs of both lay and professional audiences (e.g. teachers, park rangers, ecotour guides), and encourages but does not require volunteer service.

Response: To encourage recruitment and retention of instructors, the FMNP provides teaching materials (course manuals, PowerPoint presentations, videos, supplemental materials), registration support, marketing assistance, evaluation tools, instructor training, and mentoring). We have curriculum for 8 unique courses that align with current outreach objectives of many organizations, addressing all major ecosystems in the state (coastal, freshwater, and uplands) and applied skills (wildlife monitoring, habitat evaluation, conservation science, environmental interpretation, and coastal shoreline restoration). There is no cost for becoming an instructor and $75/student is provided to instructor organizations to offset costs and build programmatic funds.

Results: The FMNP is taught by a network of >150 professionals representing dozens of organizations (including UF/IFAS Extension, Sea Grant, other government, nonprofit, and private entities). During 2001-16, the FMNP issued 12,900 course certificates to 7006 persons. Over 80% of instructors use course projects to benefit their organization's objectives and obtain new volunteers for ongoing projects; 90% of graduates state they are motivated to continue learning and educate others. Expand your outreach by becoming a FMNP instructor, volunteering your time as a guest lecturer, or hosting a field trip!

Contact: Shelly Johnson, shelly.johnson@ufl.edu

Capitalizing on local capacity to develop a statewide volunteer water monitoring program. *Lisa Krimsky, UF/IFAS Extension, Florida Sea Grant***,** *Shelly Krueger, UF/IFAS Extension- Monroe County, Florida Sea Grant, and Ana Zangroniz, UF/IFAS Extension- Miami-Dade County, Florida Sea Grant*

Relevance: The waters surrounding south Florida are designated Outstanding Florida Waters and a significant economic driver for the region, yet little notice has been paid because of their perceived health.

Response: To enhance awareness, two community-based volunteer water quality monitoring programs: *Florida Keys* and *Biscayne Bay Water Watch*, were developed. Volunteer "boots on the ground" provide an effective means to leverage limited funding and foster stakeholder support, and these models have expanded to a statewide *Water Watch* program. Successful expansion is contingent on volunteer participation and ensuring volunteer data could be used for resource management. Since the real value of volunteer-generated data depends on consistency, it is imperative to begin program development by defining standard operating procedures (SOPs) for reliable, verifiable data collection. Working with the Environmental Protection Agency, we developed a quality assurance project plan to ensure quality-assured/quality-controlled (QA/QC) volunteer data.

Results: Currently, these programs are undergoing further validation SOPs with our state-agency, the Florida Department of Environmental Protection, in order for these volunteer data to be used by natural resource managers in coastal Florida. Although *Water Watch* focuses on water quality, its development can provide examples of lessons learned for other applications and best practices for citizen science initiatives.

Contact: Lisa Krimsky, lkrimsky@ufl.edu, Shelly Krueger, shellykrueger@ufl.edu, Ana Zangroniz, azangroniz@ufl.edu

Expanding dark sky zones around Florida Panhandle conservation lands to improve sea turtle nesting beaches. *Erik Lovestrand, Franklin County Extension Director/Florida Sea Grant RSA II; Scott Jackson, Bay County Florida Sea Grant RSA IV;Ray Bodrey, Gulf County Extension Director/Sea Grant Agent II; Karen Shudes, Dark Skies Project Manager, Bay, Gulf, Franklin.*

Relevance: Artificial lighting is a significant issue for sea turtle nesting along much of Florida's coastline. Nesting females are deterred by brightly lit beaches and the phototactic nature of hatchlings causes them to go towards the brightest horizon when they emerge after dark. If this happens to be away from the Gulf of Mexico hatchlings often perish.

Response: Funding became available in 2016 through the Deepwater Horizon Natural Resources Damage Assessment fund. UF/IFAS/Florida Sea Grant Faculty in Bay, Franklin and Gulf Counties worked together to acquire a grant for turtle-friendly lighting retrofits in the multi-county area. Four staff were hired for the term of the project. One turtle lighting specialist was placed in each of the counties to work directly with homeowners and businesses and one Project Manager was hired to coordinate the multi-county work, reporting on deliverables, etc.

Results: Lighting retrofit needs have been identified within 1000 feet of conservation lands through survey work by the Fish and Wildlife Commission. Over the 3-county area 345 property records were included in the project. Field staff have made contact attempts with all of the owners/property managers to offer assistance. Lighting supplies have been purchased for initial round of retrofits with owners who have returned a good-faith pledge to be responsible for installation of the lights. Staff are continuing to develop pledges and retrofit plans with willing homeowners and businesses. Results regarding energy and cost savings for property owners will be calculated after retrofits are completed.

Contacts: Erik Lovestrand, elovestrand@ufl.edu; Scott Jackson, lsj@ufl.edu; Ray Bodrey, rbodrey@ufl.edu; Karen Shudes, kshudes@ufl.edu

Estimating offshore vessel abundance in the Southeast US. *Nancy Montes, Bob Swett and Charles Sidman, Florida Sea Grant, University of Florida, and Tim Fik, Department of Geography, University of Florida.*

Relevance: The study area faces the difficult yet critical management challenge of sustaining economic viability while maintaining the integrity of coastal environmental resources. It comprises many water-based anthropogenic activities, including three major ports, two major naval stations, and an unknown number of commercial and recreational vessels that use offshore waters. There is also an unknown number of boaters utilizing to the area from nearby Florida counties, neighboring states, and from other countries. However, traffic abundance estimates are scarce.

Response: Field observers recorded information about boats transiting the St. Marys, St. Johns, and St. Augustine inlets on 64 sampling days from January 2011 to May 2012. Data was collected from sunrise to sunset on each sampling day. Each month, four days were randomly selected based on determined groups (weekend, holiday, etc.). Data collection was conducted using 3 Nikon D3100 body cameras and 2 Nikon AS Zoom-Nikkor 70-300mm f/4.5-5.6G lenses and 1 Sigma APO 150-500mm F5-6.3 lens. We used capture-recapture approach to estimate seasonal abundance of offshore recreational vessels.

Results: Over the course of the 17 months of data collection, 39,317 events were recorded which involved different vessel categories (e.g., commercial, recreational, and military). The majority of vessels sightings correspond to recreational vessels (86%). The greatest number of events (45%) were recorded at St. Johns inlet, followed by St. Augustine inlet (31%), and St. Marys inlet (23%). After accounting for multiple sightings of the same vessel, either by sampling day or on different seasons, we calculated the capture-recapture history for 10,464 unique vessels IDs. Based on the number of sightings per vessel throughout the different seasons, there were more sightings of offshore recreational vessels during the spring and summer seasons (and estimate population of around 8,000) than in winter and fall (approximate 5,000 vessels).

Contact: Nancy Montes, nancymontes@ufl.edu; Bob Swett, rswett@ufl.edu

Offshore recreational boating characterization in the Southeast US.
Nancy Montes, Bob Swett and Charles Sidman, Florida Sea Grant, University of Florida, and Tim Fik, Department of Geography, University of Florida.

Relevance: As demand for the use of waterways increases, so does the need for enhanced public access, maintenance of waterway infrastructure, public safety, and environmental protection. There was, however, little information available to resource managers and planners that describes the actual use patterns and preferences of the offshore boating community. This report represents the first effort to characterized offshore recreational boating in the northeast Florida and southeastern Georgia region.

Response: The study process involved (1) inlet observations to identify the characteristics and owners of vessels observed transiting the main study area inlets; (2) a map-based mail survey; (3) the identification of boater groups (winter, spring, summer, and fall); (4) the construction of spatial databases identifying trip departure sites, offshore destinations, and travel routes.

Results: The average survey respondent was 55 years old with 20 years of boating experience. The average number of trips during each season varied significantly, ranging from 3 trips in winter to 8 trips in summer. Reported trips were most associated with vessels that fell in the “open fisherman” category with and average length of 27 feet. Most trips originated from boat ramps (59%), followed by marina wet slips (22%) and they took place during weekends (55%). Summer and Spring boating trips accounted for 30% and 28% of all reported trips, respectively; and 58% of all trips overall. The greatest mapped density is restricted to the areas near and west of the main river entrances (St. Marys, St. Johns, and St. Augustine inlets). From each river entrance, recreational boating routes spread out moving mainly west (towards offshore waters), but also there are some routes traveling north and south, and between inlets. Recreational vessels using the St. Augustine inlet traveled the furthest to reach the fishing ground at the ledge zone.

Contact: Nancy Montes, nancymontes@ufl.edu; Bob Swett, rswett@ufl.edu

Managing invasive species in the coastal zone of Escambia County Florida. *Rick O'Connor, Florida Sea Grant, University of Florida, Escambia County Extension*

Relevance: In 2010, the first lionfish in the Pensacola area was reported. This immediately generated concern from local fishing and dive charters as well as numerous recreational anglers. The economic value of the artificial reef program in Escambia County, which supports these stakeholders, is around $144 million annually to local economy. With the arrival of the lionfish, there was fear for the future of this resource. As with other parts of the state, invasive species of all kinds have become problematic, this includes the coastal and marine systems.

Response: The first action was to work with the community to form a non-profit through which a lionfish management program developed. The program included removal events as well as education and outreach efforts. Eventually the Agent worked to develop another non-profit and, along with these non-profits, collaborated with the county and state agencies to hold larger events and provide additional education. The Agent's work with lionfish led to similar work with other coastal invasive species, particularly a new arrival beach vitex.

Results: Between 2013 and the present 13,193 residents were educated about coastal invasive species issues in the Pensacola area, particularly lionfish and beach vitex. During events organized by Sea Grant, nonprofits, and local and state agencies 16,214 lionfish were removed. Lionfish are voracious predators, consuming at least 70 different species of small reef fish, which are in turn are food for the commercially sought after grouper and snapper. It was recently discovered that they are consuming small vermillion snapper, which is the largest commercial fin fishery in the Pensacola area. 70% of the know vitex in the county has been removed protecting coastal dune systems.

Contact: Rick O'Connor, roc1@ufl.edu

National seafood safety training coordinated by Florida Sea Grant credited as leading factor of foodborne illness reduction. *Steve Otwell, Emeritus, Food Science and Human Nutrition Department, University of Florida and Dorothy Zimmerman, Florida Sea Grant, University of Florida*

Relevance: Seafood is a $65 billion industry in the U.S., and consumption is at an all-time high. Seafood is a healthy food choice for people of all ages; however, it is often prepared and served in ways that do not reliably kill pathogens. Since the mid-1990s, all domestic seafood processors and importers have used the HACCP (Hazard Analysis and Critical Control Point) management system to meet federal food safety regulations. Foodborne illness remains a pressing public health concern and fish continues to be one of the most common foods implicated in outbreaks.

Response: Florida Sea Grant leads the National Seafood HACCP Alliance for Training and Education, a network of Sea Grant programs, processors, and government agencies that provides the HACCP training required to market fish and fishery products in the U.S. Alliance programs annually train more than 2000 individuals, and to date have graduated more than 40,000 participants from 28 nations. The training also supports the commercial viability of 5,400 seafood firms in the US and US territories. Official training curricula has been developed in English and Spanish; the materials have been unofficially translated into more than 10 other languages. Alliance training efforts have trained all FDA inspectors in the nation, most state-based inspectors and over 90 percent of the nationally based seafood processing firms. A cadre of 400 trainers is now available to continue training in every seafood-producing nation in the world.

Results: The National Seafood HACCP Alliance training is cited by federal authorities as a leading factor in the significant decline of fish-associated foodborne illness outbreaks over the last decade. According to recent data compiled by the Centers for Disease Control and Prevention, the outbreaks of foodborne illness from seafood consumption in the U.S. have declined significantly, from an average of 65 per year from 1998-2004, to 32 per year from 2005-2012. The trend appears to be for further decreases. The CDC specifically cited the efforts of the Seafood HACCP Alliance as one of the leading factors for the trend.

Contact: Steve Otwell, otwell@ufl.edu; Dorothy Zimmerman, dozimmer@ufl.edu

The interactive effects of temperature and habitat complexity on the feeding performance of the invasive lionfish, *Pterois volitans*. *Louis M. Penrod, Department of Biological Science, Florida Institute of Technology*.

Relevance: Lionfish have invaded the Western Atlantic and are depleting native fishes through competition and consumption. Their latitudinal expansion can be attributed to the lionfish's wide thermal tolerance, but there has been no explanation for their use of novel habitats (seagrass beds, mangroves, man-made structures, etc.). Research on how these lionfish perform in structurally complex habitats across different temperature regimes is needed to better understand the mechanisms driving the lionfish invasion.

Response: Lionfish are acclimated to 20, 25, or 30 ℃. A repeated measures design for habitat complexity is run with each fish being tested in open water and models simulating seagrass beds, mangroves, and branching reefs. Lionfish are filmed feeding on five prey (*Gambusia sp.*) with a high speed camera. Both the swimming and feeding performance of the attack are analyzed and compared across habitats and temperatures.

Results: This work is currently ongoing but preliminary research at Florida Institute of Technology studying the effects of temperature on lionfish's feeding performance has shown that many of their jaw kinematics are thermally insensitive. Although the feeding component of an attack does not change with temperature, the swimming component is thermally sensitive. Considering the influence of temperature on their swimming and the potential impact of habitat on their maneuverability, it is likely that temperature and habitat complexity will have an additive, detrimental effect on the feeding performance of lionfish.

Contact: Louis M. Penrod, lpenrod2011@my.fit.edu

Development of a strategic marine area plan for Hernando County to guide conservation and access for nature-based tourism.

Alexandra Barshel, Emma Pistole, Samantha Sanders, Tom Ankersen, UF Levin College of Law, and Micheal Allen, UF IFAS Nature Coast Biological Station

Relevance: The RESTORE act, which was signed in response to Deep Horizon oil spill, created a trust to distribute funds to affected counties throughout the Gulf of Mexico. These funds were set aside to restore and protect the environment and economy of affected counties and will be distributed over the course of 15 years. Hernando County has acquired some of those funds to develop a plan for the management of marine resources within its jurisdiction. Hernando County exercises political authority over marine habitat extending from its coastline to nine miles offshore. Typically, most of this area is not considered in comprehensive management plans. However, increasing threats to Florida's coasts from sea level rise, storm events, habitat loss, and oil spills necessitate the need for increased local management and planning within the marine environment.

Response: Florida Sea Grant and the Conservation Clinic at the University of Florida's Law School is helping Hernando County develop a Strategic Marine Area Plan (S-MAP). S-MAP is a long-term plan for the restoration, enhancement, and management of Hernando County's coastal area. The objective is to identify coastal areas where conservation is required and where nature-based tourism can be accommodated.

Results: Hernando county's pristine coast draws a large amount of nature based recreation and tourism. This project is supporting local industries by monitoring, protecting, and enhancing marine resources within the region is vital to the county's economic resilience. This presents a unique opportunity for long term planning related to the county's coastal resources. The plan generated by this project will help the county prioritize the enhancement of oyster reefs, artificial reefs, and fisheries enhancement through a biological assessment and the mapping of bottom habitats and other natural coastal areas for improving Gulf access and identifying appropriate locations for conservation and nature-based recreation.

Contact: Alexandra Barshel, abarshel@ufl.edu; Emma Pistole, epistole@ufl.edu, Samantha Sanders, s.sanders@ufl.edu

Variation in age and growth of bonefish, Albula species among Cuban habitats. *Jake Rennert, Florida Institute of Technology, Jon Shenker, Florida Institute of Technology, Aaron Adams, Harbor Branch Oceanographic Institute, Florida Atlantic University, Jorge Angulo Valdez, University of Florida*

Relevance: Bonefish (*Albula spp.*) are a prized sportfish among avid anglers worldwide. Two morphologically indistinguishable species of bonefish (*Albula vulpes* and *Albula goreensis*) exist in the circumtropical waters of the western Atlantic. *A. vulpes* grows faster and reaches larger sizes in the Florida Keys than in the Bahamas and other insular regions, but the mechanisms driving this variation have not been identified.

Response: To investigate the varying growth of bonefish in Cuba, specimens were obtained from fish markets at 3 sites around the periphery of the island from November 2016 to January 2017. Sagittal otoliths and fin clips were collected from each fish, and sex was determined by examining gonads. Fin clips were sent to the Genetics Laboratory at the Florida Fish and Wildlife Research Institute for identification. Otoliths were aged by embedding, sectioning, and examining thin sections. A total of 222 bonefish were sampled, with a size range of 187-530mm FL, and aged by embedding, sectioning, and examining thin sections of the otoliths.

Results: Genetic testing indicated that 134 were *A. vulpes*, 59 were *A. goreensis*, and 7 were hybrids. The oldest fish collected were 8 and 9 years old for *A. vulpes* and *A. goreensis* respectively. Growth of *A. vulpes* was rapid until the age of 5 years then slowed, with females reaching larger sizes than males. The fewer specimens for *A. goreensis* prevented calculation of sex-specific growth curves. The overall von Bertalanffy growth model of the two-different species were found significantly different. Predicted values were greater at all ages for *A. vulpes* with exception of age 0 fish. *A. vulpes* grew to larger sizes than *A. goreensis*. The insight of varying growth patterns between *A. vulpes* and cryptic species allows for better management of the species, and further distinguishes differences in the biology of *A. vulpes* and *A. goreensis*.

Contact: Jake Rennert, jjr1690@gmail.com

An overview of bay scallop (*Argopecten Irradians)* restoration efforts in Charlotte County, Florida with future directions. *Betty Staugler, Florida Sea Grant, University of Florida IFAS Extension, Charlotte County; Joshua Patterson, Florida Sea Grant, University of Florida.*

Relevance: The bay scallop *Argopecten irradians* is a filter feeding bivalve that lives in seagrass beds and once supported commercial fisheries along the west coast of Florida. Populations declined due to various factors, and in 1994, commercial harvest was prohibited and recreational harvest was severely restricted. However, scalloping and the scallops themselves still represent a beloved symbol of summertime leisure to many Floridians. Further, when coastal waters are able to support bay scallops it is a sign of reasonably good water quality conditions.

Response: Significant resources have been devoted to bay scallop restoration in Florida. In Charlotte County, the University of Florida's Sea Grant Program has conducted bay scallop restoration work for the last five years. Aquaculture was used for larval seeding, juvenile production and release, and dock caging of spawning aggregations. Larval seeding is widely viewed as effective in augmenting populations of adult scallops if performed on a substantially large scale. Efforts to date have included nine larval releases averaging 2.9 million larvae per release, 16 juvenile releases averaging 1,900 juveniles per release, and two releases of volunteer-grown adult scallops averaging 525 scallops per release.

Results: Charlotte Harbor restoration efforts are increasing and the effectiveness of large scale larval seeding in Charlotte Harbor will be evaluated. Preliminary data indicate that scallops are more likely to be found near historical release sites. Red tide remains an impediment to bay scallop restoration in southwest Florida. A method for parentage analysis in Florida Gulf Coast scallop populations is being developed. This tool will allow us to document restoration success and genetic diversity of cultured scallop larvae. Microsatellite-based parentage analysis has the potential to conclusively identify a scallop as the direct product of restoration efforts and determine the relative genetic contribution of each potential parent in the group of broodstock.

Contact: Betty Staugler, staugler@ufl.edu; Joshua Patterson, joshpatterson@ufl.edu

Application of triploidy to an emergent oyster culture industry on Florida's West Coast. *Leslie Sturmer, Florida Sea Grant Extension, University of Florida (UF)/IFAS; Carter Cyr, School of Forest Resources and Conservation, UF/IFAS; and Reggie Markham, School of Forest Resources and Conservation, UF/IFAS*

Relevance: To address increased interest in oyster aquaculture on Florida's west coast, a demonstration project was initiated which allows for evaluation of an oyster breeding process to local conditions. The project objectives are two-fold: 1) Document production performance and assess the health of diploid and triploid oysters *Crassostrea virginica* under commercial conditions, and 2) Quantify the effects of different culture methods and seasonal harvests.

Response: Oysters were provided to eight shellfish growers in four coastal counties, each receiving 2,500 triploid and diploid seed in July-August 2016. A variety of culture systems used by growers also provided for evaluation of site and gear interaction on ploidy type. In addition, a similar number of oysters were cultured by the UF project team in replicated trials to determine optimal management practices and stocking densities for floating Vexar bag culture.

Results: After eight months of culture, triploid oysters were larger than diploids at five of the six participating farms, while meat weights of triploids were greater than diploids at four of the six farms. Survival was commercially acceptable in floating bags and adjustable long line systems as opposed to bottom cages. In the UF trials, triploid oyster growth was significantly greater than diploids with respect to shell length, width, height, total weight, and meat weight. In contrast, survival was higher in diploid oyster bags (ave 97%) versus triploid oyster bags (ave 90%). Stocking densities (125-175/bag) had little effect on production. Oyster parasites (Dermo *Perkinsus marinus*, mudworm *Polydora websteri*) were not prevalent in samples at harvest. To evaluate seasonal differences, triploid and diploid oyster seed were also planted in March-April 2017 by participants and UF with harvest anticipated in the fall. This project will result in increased awareness of the benefits of triploidy and accelerate the adoption of a new bivalve species for culture.

Contact: Leslie N. Sturmer, Lnst@ufl.edu

Marine debris, a global issue that is getting local attention by 4-H'ers in Sarasota County. *Armando J. Ubeda, Florida Sea Grant, University of Florida/IFAS*

Relevance: Marine debris is one of the most widespread and resolvable pollution problems plaguing the world's oceans and waterways. Sarasota County's 37 miles of coastline are not an exception to this problem. The local government, private institutions, grass-roots groups, and local schools conduct cleaning activities to reduce the amount of marine debris in coastal and marine ecosystems. The activities carried out by 4-H'ers normally consist of local clean-ups combined with play time, without opportunities to learn about sources of marine debris, types, solutions, and the ecological and economic importance of their cleaning efforts.

Response: Sarasota County Sea Grant has created a program that solves this problem by maximizing and enhancing existing cleaning efforts by adding an educational component. Now Sarasota youth have the opportunity to learn about marine debris and then conduct a local clean-up afterward. The program objective is to build a base for a successful marine pollution prevention initiative using the county 4-H program. This program consists of presentations and hands-on activities that teach about marine debris issues, types, sources, solutions and a local cleanup. The program is conducted in partnership with Sarasota County Parks, and it is being advertised throughout the county schools.

Results: This is an ongoing program – three schools have participated , for a total of 237 Sarasota youth. There are four schools scheduled to participate in this program in the next three months. Marine debris is a global problem that needs immediate attention, and mitigation efforts at local levels are important. Education and outreach efforts are essential to prevent and solve this problem; especially programs like this that target the younger generations.

Contact: Armando J. Ubeda, aubeda@ufl.edu

What can the difference between δ15N in liver and muscle tell us about the lives of individual fish? *J.L. Vecchio & E. B. Peebles, College of Marine Science, University of South Florida*

Relevance: Tissue stable isotope values, such as δ15N & δ13C, are commonly used to infer trophic position and basal resource use in fishes. Recent advances have allowed for stable isotope values to be used to infer movement when paired with an isoscape background, such as the one created by Radabagh & Peebles for the West Florida Shelf. The cells in different tissue types are renewed at different rates, which causes dietary isotope shifts to be assimilated into each tissue type on varying time scales. Fish liver tissue is turned over in one to three weeks; whereas, turnover of white muscle may take up to three months. If given enough time, each tissue type will eventually establish a new equilibrium with the changed diet. Understanding short-term (weeks-months) movement patterns for individual fish can be useful for evaluating fishing regulations and understanding the range of trophic histories within a species.

Response: We first conducted a literature review of captive marine fishes, demonstrating that equilibrium δ15N values in liver tissue have been reported to average 1.8‰ lower than in white muscle. This information was then used as a baseline value to examine various causes of departure from the 1.8‰ within wild fish since wild fish are rarely in equilibrium with their diet.

Results: Several wild species have been examined, both from literature and from local populations of fisheries species on the West Florida Shelf. Short-term movement, growth, and seasonality have all been explored as potential sources of disequilibrium; however, a single, definitive cause for disequilibrium has yet to be established. It seems likely that a variety of causes may contribute. Work will continue to model the contributions of various sources to the disequilibria of δ15N between liver and muscle tissue in wild fish populations on the West Florida Shelf.

Contact: Julie Vecchio, jvecchio@mail.usf.edu; Ernst Peebles, epeebles@mail.usf.edu

Navarre Beach Sea Turtle Lighting Retrofit Project. *Chris Verlinde, Fl. Sea Grant Extension, Santa Rosa County, UF/IFAS*

Relevance: As a result of the Deepwater Horizon oil spill and associated clean-up activities coastal habitats and resources along the Florida Panhandle were disturbed and severely damaged including beach nesting habitats for sea turtles. Studies have shown that bright lights disorient and disturb sea turtles during nesting and as hatchlings traverse the beach to the Gulf of Mexico. Of the four species of sea turtles that utilize Navarre Beach for nesting, 3 are federally listed as endangered and the loggerhead is listed as threatened.

Response: Santa Rosa County received funding to retrofit 612 gulf front balcony lights on 5 condominiums, 33 pool deck lights, 48 pole lights located along the road and in parking lots with sea turtle friendly fixtures and bulbs. This was done by working with property managers and homeowner associations of the condimium buildings and Gulf Power for road and some parking lot lights. Property owners/managers signed a good faith agreement to install fixtures and bulbs and maintain them as needed. In addition, funds were received to develop sea turtle friendly education materials. A rack card, window cling and magnets were developed at the request of property managers to be used in welcome packages and in rental and residential units.

Results: This project has the potential to reduce lighting impacts on sea turtles along approximately a half mile area of beach. Property owners may see a decrease in energy costs as a result of installing energy efficient LED bulbs. Sea turtle nests are just beginning to hatch on Navarre Beach, 18 nests have been found as of August 2017. Educational materials have been distributed to condominiums, private residents and organizations. The materials are popular with visitors and residents.

Contact: Chris Verlinde, chrismv@ufl.edu

Influence of freshwater input on the composition and diversity of microbial communities associated with *Thalassia testudinum* (turtle grass) blades *Margaret A. Vogel, Thomas E. Miller, Department of Biological Science, Florida State University, and Olivia U. Mason, Department of Earth, Ocean, and Atmospheric Science, Florida State University*

Relevance: Seagrasses are foundational species that act as nurseries, feeding grounds, and habitats for a wide variety of species from algal epiphytes to manatees. However, with increasing development along our coastlines, eutrophication and degraded water quality are becoming increasing threats to these important habitats and coverage is thought to be declining on a global scale. While the effects of degrading water quality on seagrasses are well characterized, little is known about the microbial communities that are associated with seagrass blades and how these communities change in response to stressful conditions.

Response: This study aims to characterize the microbial communities associated with *Thalassia testudinum* (turtle grass) blades and correlate changes in community composition with environmental and host conditions. Fives sites were established within Apalachee Bay, Florida extending approximately 2 miles offshore along a gradient of freshwater input caused by the St. Marks River. Microbial samples were taken from the five sites during three sampling events (July-September 2016). In addition, seagrass surveys were conducted and environmental conditions were recorded throughout the study period.

Results: Results indicate the biofilm microbial communities on *T. testudinum* blades significantly differ from the communities in the water column at each site (permanova, $p<0.01$). In addition, community composition significantly differs due to site and sampling time (permanova, $p<0.01$) and these changes correlate with both environmental conditions and host characteristics (envfit, $p<0.05$). These results will be used to develop experiments to directly test which factors are driving these compositional changes. Further studies will also be conducted to investigate the dynamics between these microbial communities and their seagrass host in order to understand how these communities relate to seagrass health as a whole to better protect and manage these valuable ecosystems.

Contact: Margaret A. Vogel, mvogel@bio.fsu.edu

Acoustic and satellite-linked tracking of large bull sharks in southwestern Florida. *Krystan A. Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program & University of Florida; Randall S. Wells, Chicago Zoological Society's Sarasota Dolphin Research Program; Robert E. Hueter, Mote Marine Laboratory; and William E. Pine, III, University of Florida*

Relevance: Predator-prey interactions between large sharks (primarily bull sharks) and coastal dolphins have been documented through observations of shark bite scars on resident bottlenose dolphins in Sarasota Bay, Florida. Habitat use and movements by resident dolphins are well documented; yet, the factors contributing to observed movement patterns and habitat choices are not fully understood. While predation is thought to be a strong driver of habitat use and social dynamics for the dolphins, information regarding habitat use by their large shark predators is extremely limited in coastal nearshore habitats. The purpose of this study is to identify movement patterns and habitat use of large bull sharks in Sarasota Bay relative to the resident bottlenose dolphin community, leading to a better understanding of habitat associated predation risk within the estuary.

Response: Advances in acoustic telemetry technology and autonomous receiver networks, such as iTag in coastal Florida, have greatly increased the likelihood of successfully tracking large sharks in coastal environments. To understand the spatial relationship between coastal shark predators and dolphin prey, bull shark movements and habitat use are being assessed using active and passive telemetry. In addition, the use of satellite-linked tags provides movement data in places where no acoustic receivers are deployed. The information gathered from these various electronic tags will be integrated with information of dolphin habitat use, survival, and behavior.

Results: In April, 2017, five bull sharks (four females and one male, 172-200 cm total length) were tagged with passive acoustic V16 tags. Acoustic receiver gates, located in passes connecting Sarasota Bay to the Gulf of Mexico, monitor when and if these sharks enter or exit the bay. One of the five sharks, nicknamed "Miss Lillie," was additionally fitted with a Smart Position or Temperature Transmitting (SPOT) satellite-linked tag and has traveled extensively along the Florida Gulf coast.

Contact: Krystan Wilkinson, krystan@mote.org

Sea Grant builds bridge of trust with people who have questions about the impacts of oil spills. *Monica Wilson, Florida Sea Grant; Christine Hale, Texas Sea Grant; Emily Maung-Douglass, Louisiana Sea Grant; Larissa Graham, Steve Sempier, Tara Skelton, and LaDon Swann, Mississippi-Alabama Sea Grant*

Relevance: A substantial amount of oil spill science information has been released since the 2010 Deepwater Horizon oil spill. However, people whose livelihoods depend on a healthy Gulf of Mexico can face challenges in interpreting and comparing research results.

Response: Through a partnership between the Gulf of Mexico Research Initiative (GoMRI) and the four Gulf of Mexico Sea Grant College Programs, GoMRI funded the Sea Grant Oil Spill Science Outreach Program. The program consists of a 6-member, multidisciplinary team of extension and communications professionals located throughout the region. They have one-on-one and large group engagement with stakeholder groups and share peer-reviewed research results. As a new program, the team members had to build contacts, create networks, and become a source for oil spill science. In order to examine whether the team members' relationships were making the team a trusted source of information, Sea Grant partnered with NOAA's Office of Coastal Management to conduct a social network analysis of oil spill science information.

Results: The 2016 NOAA/Sea Grant social network analysis revealed the Sea Grant oil spill science outreach team is now embedded in the oil spill science information network and are sought as a trusted resource of information. The team has formed trusted relationships with many groups throughout the region. The oil spill response community has included team members in Area Committee meetings and asked them to help update their plans for future spills. Industry leaders have asked team members to present emerging oil spill science at national, regional, and local meetings, including local health training sessions, emergency response meetings, and fisheries events. In less than three years, the Gulf of Mexico Sea Grant oil spill science outreach program has matured to become a trusted resource for current oil spill science information and a source of expertise to contribute to contingency planning for future spills.

Contact: Monica Wilson, monicawilson447@ufl.edu

Initiation of a Tetraploid Induction Program for the Oyster Industry. *Huiping Yang, Fisheries and Aquatic Sciences Program, School of Forest Resources and Conservation, University of Florida.*

Relevance: Triploids are valuable for oyster farming because of their superior growth, improved meat quality, and year-round harvest. With the expansion of oyster farming in Florida, the demand for triploid oyster seed is rapidly increasing. Commercial 100% triploid seed production is reliant on tetraploid breeding stocks through crossing of tetraploids with normal diploids. Therefore, tetraploid stock is the key technology for triploid oyster farming.

Response: Tetraploid induction in shellfish has been a challenge. The first success was reported in the Pacific oyster through a unique approach in which oocytes from triploids were fertilized with normal sperm, followed by the inhibition of polar body I. To date, this method has been led to production of viable tetraploids in several oyster species including Pacific oysters, eastern oyster and Suminoe oysters. For oyster industry in the Gulf region, tetraploids for seed production are only available from Louisiana State University, and the tetraploid oysters from the U.S. east coast are prohibited by the Gulf states to prevent transferring of a deadly oyster disease (MSX). With more farms to culture oysters in Florida, triploid seed production has become the most major constraint to the oyster aquaculture industry. To overcome this constraints, development of a tetraploid oyster program is the solution. With recognition of this critical needs, a one-year project was funded by the Gulf States Marine Fisheries Commission (GSMFC) in 2017 to allow us to initiate a tetraploid oyster program.

Results: Currently, this project is ongoing through collaborating with several shellfish hatchery farms. Chemically induced triploids have been produced in 2017 through inhibiting polar body II, and are currently cultured in the collaborating farms for project continuation in 2018. This is the first step for tetraploid production. Availability of Florida tetraploid stocks will allow the hatcheries to produce enough triploid seed to meet the industry's need.

Contact: Huiping Yang, huipingyang@ufl.edu

Investigating Temporal Variation in Stable Carbon and Nitrogen Isotope Values of Florida Caribbean Spiny Lobster *Panulirus argus (Latreille, 1804)* Recruits. *Nan Yao, Department of Biological Sciences, Florida International University and Yuying Zhang, Department of Biological Sciences, Florida International University*

Relevance: The limited knowledge on the recruitment dynamics of the *Panulirus argus (Latreille, 1804)* has long being an issue for biologists, as well as fishery scientists. The long pelagic larval stage and the current conditions in the Caribbean Sea led to the hypothesis that the Caribbean spiny lobster stocks are demographically open. Multiple approaches have been applied to investigate the stock connectivity, including bio-physical modeling and genetic markers.

Respond: Stable isotope analysis has been proven to be a useful tool to study animal movement. It has been widely applied on both terrestrial as well as aquatic species. However, this method has never been applied to the Caribbean spiny lobster. In this study, we use stable isotope analysis on the pueruli of four stages that arrived in the Florida Keys from August 2014 to July 2016.

Results: The results reveal that the stable isotopic values differ between the feeding and non-feeding stages. The $\delta^{13}C$ and $\delta^{15}N$ of monthly samples display a huge temporal variation during the two-year sampling period. Cluster analysis suggest that there are four potential source populations that could contribute to the monthly recruits. In addition, the monthly composition of the source population oscillated during our study period. The results of our study suggest that the Florida stock receives the majority of recruitment from outside source populations. Meanwhile, a minor part of the recruitment could result from self-recruitment.

Contact: Nan Yao, nyao001@fiu.edu; Yuying Zhang, yzhang13@fiu.edu

Notes

Science Serving Florida's Coast
PO Box 110400
University of Florida
(352) 392-5870
flseagrant.org