Florida Sea Grant's

2012 Coastal Science Symposium

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SPEAKERS' ABSTRACTS

Valuing and Sustaining Florida's Coastal Fishing and Seafood Processing Industries. *Chuck Adams, Florida Sea Grant, Food and Resource Economics Department, University of Florida / IFAS*

Rationale: The 2009 American Recovery and Investment Act reauthorized and modified the Trade Adjustment Assistance (TAA) for Farmers Program. The program was initially created in 2004 to provide assistance to agricultural producers experiencing a significant decrease in the prices for their products due to an influx of imports. Though the program involves cash assistance, the overall goal is to help participants adjust to a changing economic environment. Applicants agree to extensive training aimed at helping them strengthen their businesses, including developing Business Adjustment Plans. Legislators modified the 2004 program to include commercial fishing operations, provided that their foreign competition was from aquaculture products. The 2009 version as enacted applied to impacts from both foreign aquaculture and wild-caught seafood products. To participate, the shrimp trawling industry had to petition for eligibility before individual operations could apply for the benefits that many needed.

Response: Florida Sea Grant had a history of working with fishermen seeking support through the TAA program and began working with industry partners and Sea Grant programs around the Gulf region to complete a regional petition establishing the case for inclusion of the shrimp trawling industry in the revised TAA program. This included compiling data about regional shrimp catches and shrimp import trends. The Southern Shrimp Association filed the successful petition in 2010. Applicants could qualify as part of an initial group selected in 2010 and eligible for $12,000 in support, or a 2011 group eligible for a total of $4,000. Florida Sea Grant worked with industry to identify appropriate training topics such as … alternative shrimp marketing methods, ensuring the quality of shrimp on boats during operations, job opportunities outside of shrimping, and reducing operational costs by increasing fuel use efficiency. Florida Sea Grant assisted in creating the needed training units (DVDs, voiced over on-line PPTs, handout materials, etc.) on these four key topics — then organized and offered the necessary training events, and also pushed successfully to make these courses available online to make it easier for shrimpers to participate. Florida Sea Grant continues to work closely with shrimpers to help them navigate the TAA program system and maximize their chances of receiving available aid.

Results: Florida Sea Grant organized 48 workshops at six locations. Through these events and online offerings, approximately 240 commercial shrimpers received required training. As of October 2012, Florida Sea Grant's efforts had helped hundreds of Florida shrimp trawlers receive nearly $2.0 million in aid. The financial support process, which continues through 2013, could potentially double that amount by 2013 when the TAA program ends. Estimates suggest the overall program has helped to sustain 500 jobs.

Disease in the Florida spiny lobster fishery and its connections to the Caribbean. *Donald C. Behringer, Fisheries and Aquatic Sciences & Emerging Pathogens Institute, University of Florida.*

Rationale: The Caribbean spiny lobster (*Panulirus argus*) is one of the most economically valuable fisheries in Florida and the Caribbean. Shortly after 2000, many of these fisheries experienced major declines from which most have not recovered. The declines were coincident with discovery of a viral disease, termed *Panulirus argus* Virus 1 (PaV1), found infecting small lobsters. Although it may seem obvious to attribute these declines to PaV1, spiny lobsters are heavily fished and have a complex life cycle connected across the Caribbean.

Response: The first step in understanding the effect of the virus on the Florida fishery was to determine if those in the fishery are infected. The next steps were to determine how the disease affects the way traps work or if traps affect disease transmission. To find out, we worked with fishermen on a series of trap surveys and experiments. However, throughout much of the Caribbean fishermen do not use traps, but use artificial shelters termed "casitas". There has been considerable pressure on Florida resource managers to legalize casita use in Florida, so we are now studying how casita-like aggregations affect disease dynamics.

Results: Although a lobster from a trap was never observed with PaV1 symptoms, analysis of blood samples showed 11% were positive, including females with eggs. Experiments showed that traps harboring an infected lobster caught fewer lobsters, and healthy lobsters confined in traps with diseased lobsters became infected more frequently. These findings indicate that adult lobsters may act as carriers for the virus and potentially pass it to their offspring, while the behavioral alterations caused by the virus and the confining nature of traps may reduce lobster landings and increase transmission. These and other recent findings have shed light on the interaction between fishing practices and disease dynamics and how the disease is connected among lobster populations in the Caribbean.

Ecosystem-based fishery policy evaluation and optimization along the west Florida shelf. *David Chagaris, Fisheries and Aquatic Sciences Program, University of Florida and Florida FWC Fish and Wildlife Research Institute, Michael S. Allen, Fisheries and Aquatic Sciences Program, University of Florida, and Behzad Mahmoudi, Florida FWC Fish and Wildlife Research Institute.*

Rationale: Fisheries operate as part of the larger ecosystem that includes other species, the physical environment, and fishing communities. Historically, fisheries managers focused on achieving sustainable catch of a target species without much consideration to processes such as predator-prey interactions and changes in system productivity. To address these shortcomings and avoid any unintended consequences of fishing, a more holistic approach to assessment and management of fish stocks is required.

Response: We developed a time-dynamic food web model of the west Florida shelf, with emphasis on the reef fish fishery, and screened a set of scenarios relevant to managers (e.g. rebuilding gag, longline effort reduction, and changes in primary production). We used the model to assess the trophic impacts of each scenario on biomass and fishery performance after 20 years. Next, we searched for optimum harvest policies that balanced the tradeoff between conservation and socio-economic objectives. Lastly, we used a spatial model to assess the performance of some hypothetical marine protected areas (MPA).

Results: We found from model simulations that there are winners and losers in all policy options. The model predicted modest impacts on other species from rebuilding gag stocks but predicted more pronounced effects when fishing effort was drastically altered. We determined from the policy optimization search that the combined fishery is currently sub optimal in both profits and reef fish biomass but that several policy options could move us closer to an optimal state. The spatial simulations showed that MPAs covering up to 30% of the total area would enhance both biomass and fisheries value, but the effect on each species depends on its movement rate and exploitation status. This model is intended to provide policy makers with a more comprehensive picture of how their decisions impact, and are impacted by, other components of the system.

Development of test-based data on hurricane-induced building interior, utility, and contents damage for improved risk prediction and mapping. *Arindam Gan Chowdhury, Department of Civil & Environmental Engineering, Florida International University and Jean-Paul Pinelli, Civil Engineering Department, Florida Institute of Technology*

Rationale: Hurricane wind-driven-rain induced building interior damage escapes most damage surveys. In the absence of physical data, total interior damage is estimated in risk models by oversimplified, empirical functions of exterior damage based on engineering judgment and guesswork. This can significantly affect loss estimates and, therefore, policy decisions on the built coastal environment. Therefore, there is a strong need for obtaining benchmark test-based data, for estimating total interior vulnerabilities under hurricane wind-rain effects, and incorporate such data in catastrophe risk models such as the Florida Public Hurricane Loss Model (FPHLM). Such work will enhance catastrophe models' risk assessment capability and develop accurate risk mapping.

Response: The project obtained data on hurricane-induced interior, utilities, and contents damage using full-scale controlled and repeatable experimentation at Florida International University's (FIU) state-of-the-art Wall of Wind (WOW) facility. Innovative WOW research is conducted on full-scale portions of building models in realistic Category 1 to 5 turbulent winds, accompanied by wind-driven rain with various intensities and rain-drop size distributions achieved by using variable nozzles.

Results: Based on test-based results new vulnerability models are developed for interior, utilities, and contents damage. The realistic test-based vulnerability models, unlike current empirical models, reflect the physical reality of hurricane effects on interior damage. These models will significantly enhance the loss prediction capability of the existing FPHLM and develop more accurate hurricane risk distribution estimates map for the State of Florida in terms of expected annual loss (EAL). The enhanced FPHLM will provide public policy deciders and emergency managers with a tool that will enhance their decision making-process for major disaster declarations. The new vulnerability models will help insurance companies to make quantitative assessments of the cost effectiveness of different mitigation strategies.

Field trials to evaluate practicality of fish descending gear in the Gulf and South Atlantic, *John Stevely, UF/IFAS Manatee County Extension, Florida Sea Grant College Program, Bryan Fluech, UF/IFAS Collier County Extension, Florida Sea Grant College Program, & B. Staugler, UF/IFAS Charlotte County Extension, Florida Sea Grant College Program*

Rational: Recent closures of several Gulf reef fish fisheries have focused attention on the importance of successful release and survival of fish caught in deeper water. Currently, Gulf of Mexico anglers are required to vent reef fish suffering from barotrauma, but research from the U.S. west coast indicates that survival of released rockfish can be significantly increased using recompression practices that quickly return fish to depth while minimizing injury. There is now a growing interest among researchers, managers, and the sport fishing industry to utilize these methods in the Gulf and south Atlantic.

Response: Florida Sea Grant funded an extension project to conduct field trials to evaluate the practicality of various fish descending devices, and work with anglers to determine if they would use the gear and what barriers might exist that would prevent them from adopting these practices.

Results: Sea Grant extension agents, in collaboration with local advisory committee members, charter captains and recreational anglers have released hundreds of reef fish using various fish descending devices since December 2011. Field trials are expected to last through 2013. Feedback about recompression techniques has been generally positive, although some descending gear types have received more favorable ratings than others. Agents have already begun sharing this input with key stakeholders at regional and national conferences, and continue to compile data regarding the usefulness of the gear in Florida waters. These efforts will ultimately assist fishery managers in developing more user-centered policies that aim to reduce the incidents of discard mortality in the region.

Climate Change Education and Facilitation Efforts in Monroe County, Florida. *Doug Gregory, Florida Sea Grant, University of Florida and Monroe County Extension Service*

Rationale: Sea level rise is an important aspect of climate change to coastal areas. The Florida Keys (Monroe County) is one of the most vulnerable areas within Florida to the impacts of sea level rise. Both adaptation through improved infrastructure planning and mitigation of future negative impacts through reduction of greenhouse gas emissions are important. Extension and Sea Grant, as educators and facilitators, are ideally suited to help coastal communities address sea level rise concerns.

Response: Extension organized a sustainability workshop, the Green Living & Energy Expo (GLEE), in 2005. Our FCS position was expanded in 2006 to include Community Development to address sustainability issues, including production of a greenhouse gas inventory for Monroe County. In 2008, the Sea Grant Agent taught four solar classes for contractors at the local community college. In 2009, Monroe County requested Extension to assume liaison duties of their community advisory committee, the Green Initiative Task Force and, in 2011, the Climate Change Advisory Committee. Also in 2009, Monroe County joined the Southeast Florida Climate Compact (Compact) and Extension provided continuing support for this multi-county collaborative initiative. From 2010 through 2012 Extension assisted the County with managing a $3.2M ARRA Energy Efficiency and Conservation Block Grant (Energy Grant) allocated to eight different projects involving three municipal partners.

Results: The 2005 energy expo resulted in establishment of the GLEE community non-profit organization and encouraged Monroe County to sign the US Mayors' Climate Agreement in 2007. The Extension led greenhouse inventory immediately saved the County $35,000 annually and was used by the Compact as part of their regional inventory. The County's Public Works Department resulted in an annual savings of $60,000 simply by turning off the central air conditioning in one building for 2 hours a night. Extension staff led the County's Green Initiative Task Force in development of a Sustainable Vision Statement that was the basis for new climate and energy elements in the County's comprehensive plan and for the Monroe County Community Climate Action Plan. Monroe County has adopted the Florida Green Building Coalition's Commercial Building Standards for all future County buildings, established a greenhouse gas emissions reduction target, and adopted a specific sea level rise projection for planning purposes. Of the 51 contractors took the solar installation class taught by Extension, 18 achieved national certification in a standardized test, 3 electrician students expanded their business to include solar and an electrical engineer graduate from FAU was encouraged to teach similar courses in South Florida. The completed Energy Grant included: 1) installation of solar water heaters; 2) an education effort led by Extension that included production of a 15 minute video on sustainability; 3) Installation of energy efficient ball field lights in Key West; 4) development of a climate action plan and installation of energy efficient park and street lighting in Marathon; 5) development of an Energy Efficiency and Conservation Strategy for county operations; 6) retrofit of an HVAC system in a major county building complex; 7) purchase of six hybrid vehicles for the County fleet; and 8) installation of solar park lights for Islamorada. Currently, Monroe County is attracting national press for its sustainability efforts and because of its vulnerability to sea level rise. Monroe County has adopted the sea level rise projections of 3-7 inches by 2030 and 9-24 inches by 2060 as a basis for its mitigation and adaptation efforts. Future buildings built by the County will not only follow energy reduction principles but will be built at least 1 foot higher than in the past to accommodate potential sea level rise. Monroe County has established a new Sustainable Program Manager position to continue the initial efforts and momentum spearheaded by Extension. Extension has been a 'catalyst for change' within Monroe County in climate awareness and readiness.

Advancing Cryopreservation of Sea Oats Germplasm for Dune Restoration. *James Sadler, Michael Kane, Hector Perez and Fe Almira, Department of Environmental Horticulture, University of Florida/IFAS*

Rationale: In the southeast United States, coastal dunes serve as a natural barrier against the destructive forces of hurricanes and storms but are continually being eroded. Dune stabilization is usually accomplished by planting native dune species including sea oats, *Uniola paniculata* L. Sea oats are commercially propagated by seed; however, frequent hurricane damage to seed donor populations has significantly limited seed availability for site-specific planting. An efficient sea oats micropropagation protocol was developed to complement seed propagation by creating a living germplasm library. Methods for the long-term storage of genetically diverse sea oats plants and seed are needed. To achieve this, the feasibility of low temperature (-196°C) cryogenic storage of shoot tips and whole seed in liquid nitrogen was examined.

Response: Cryopreservation procedures of rapid freezing vitrification and alginate encapsulation-dehydration for cryogenic storage and recovery of shoot-tips from micropropagated sea oats and sterilized seedlings were examined. The effects of pretreatment with various cryoprotectants and cold acclimation treatments were examined prior to freezing. Cyropreservation of whole seed was also studied by drying whole seed over saturated salt solutions prior to freezing in liquid nitrogen.

Results: Shoot-tips cryopreserved by rapid freezing-vitrification exhibited 0 to 60% recovery and 0 to 39.5% regrowth rates. Alginate encapsulation-dehydration appears to be a more efficient cryopreservation method with a 0 to 59% recovery and 0 to 48% regrowth rates following storage in liquid nitrogen. Pre-drying sea oats seed before freezing resulted in a post-freezing germination rate ranging from 67.2 to 86.0%. These results indicate that cryopreservation is a viable method for the long-term storage of genetically diverse sea oats shoots and seed germplasm required for commercial production of site-specific genotypes for ecologically sound dune restoration.

Production of marine fish and plants in a sustainable, low-salinity recirculating system. Kevan L. Main, N.P. Brennan, M. Nystrom, A. Nissanka and K. Dixon, *Mote Marine Laboratory*; G. Sharell, Jr., *Aquatic Plants of Florida*; S. Boxman, S.J. Ergas and M.A. Trotz, *University of South Florida/ Civil and Environmental Engineering*

Rationale: Increased demand for seafood using environmentally sustainable technologies requires innovative and creative approaches in aquaculture. At the same time, high costs associated with recirculating aquaculture systems has resulted in studies to evaluate the integration of fish and plant production. These integrated systems can address issues, such as solid waste management, nutrient cycling, food production, and environmental enhancement.

Response: Performance of an integrated aquaculture system that produced Florida pompano (*Trachinotus carolinus*) and native marine wetland plants was evaluated at Mote Aquaculture Research Park in Sarasota, Florida. Fish were reared in a brackish-water system and wastewater was directed to (1) a greenhouse system containing plants (mangroves, rush, cordgrass, saltwort) or (2) a geotube filtration system where solids were contained in a mesh bag. Water from both systems was sterilized and returned to the fish tanks. Removal of nitrogen and phosphorus from the system was monitored, along with nutrient uptake by the plants. Juvenile pompano were reared to market sizes and plant production was grown for marine shoreline habitat restoration efforts.

Results: Monitoring of pompano performance revealed excellent fish health, growth and survival. At the same time, the integrated system produced multiple cohorts of mangroves, cordgrass, rush and saltwort plants. Results from water chemistry and quality tests demonstrated that macrophytes aid in solids and wastewater treatment. Future economic analysis will determine if the sale of fish and plants provides sufficient financial benefit to offset the expenses associated with inland aquaculture.

"*What we've got here is a failure to communicate*"

Steve Otwell, PhD
Florida Sea Grant Seafood Specialist

Keynote Presentation

Communicating knowledge and confidence in advice and facts regarding the status and utilization of our nation's coastal waters and resources is becoming more complicated. This situation seems unreasonable relative to the proliferation of new and efficient communication tools and talent. Historically, access to immediate and continuous information is more obvious and convenient than in any prior decade, but apprehension and indifference is growing for information from government, University and other science-based sources. For example, on certain issues, some movie stars can have more impact on general public opinions than empirical results. A series of seafood and fishery topics will be used to illustrate the problem and engage the lunch audience with movie scripts to encourage discussion for solutions.

Grouper Forensics. *John H. Paul, Robert M. Ulrich, David P. Fries, and Gary Hendrik. USF College of Marine Science and Bioplex, Inc.*

Rationale: Grouper are one of the most economically important seafood products in the state of Florida and their popularity as a high-end restaurant dish is increasing across the U.S. There is an increased incidence rate of the purposeful, fraudulent mislabeling of less costly and more readily available fish species as grouper in the U.S., particularly in Florida. This is compounded by commercial quotas on grouper becoming increasingly more restrictive, which continues to drive both wholesale and restaurant prices higher each year. Detection of fraudulent fish replacement (i.e. grouper "imposters") is especially difficult if distinguishing features such as skin, head, and tail have been removed. What is needed is field detection technology that could accurately determine the authenticity of grouper meat. Such technology would be extremely valuable to assist buyers at the wholesale and retail seafood markets.

Response: We have developed a hand held field deployable device and grouper-specific assay for use in the device for grouper authentication. The assay employs Nucleic Sequence-Based Amplification (NASBA) which is an isothermal amplification assay that in this instance targeted to the 16S rRNA of most of the fish allowed to be called "Grouper". Grouper-specific oligonucleotides were designed for NASBA amplification and molecular beacons that fluoresce upon binding to the amplicon. A handheld, four sample thermoregulated fluorometer has been developed by Bioplex, Inc. to perform NASBA analysis in the field.

Results: We have developed a generic grouper assay that detects the majority of the grouper species listed on the 2011 FDA Seafood List, including all of the species found in Florida waters. The prototype NASBA handheld analyzer (the QPyre) works extremely well with the grouper assay we developed. We now are doing beta testing and market research as we move toward commercialization of this technology.

Effect of Moisture on the Strength of Closed-cell Spray-Applied Polyurethane Foam as a Structural Retrofit for Wood Roofs, *David B. Roueche[1], Kenton E. McBride[1], David O. Prevatt, PhD., PE (MA)[2], Graduate Research Assistant, Assistant Professor of Civil & Coastal Engineering, Engineering School of Sustainable Infrastructure and the Environment, University of Florida*

Rationale: A well-known source of damage to houses in hurricanes occurs when water bypasses failed roof coverings. Damage surveys found this failure mechanism to be prevalent following the 2004 Florida hurricanes, recording evidence where water entered the interior through joints in the wood roof decks. One possible solution has been to use closed-cell spray-applied polyurethane foam (ccSPF), sprayed to the underside of the roof as a secondary water barrier, in addition to its primary function as a thermal barrier. In studies at the University of Florida, researchers found that the ccSPF layer also significantly increases the wind uplift resistance of a wood roof deck due to its strong bond to wood substrates. This presentation describes a research project that investigated the effects of incidental water leakage on the strength of the ccSPF-to-wood bond and on moisture retention characteristics in a wood roof.

Response: The study, conducted in two phases, consisted of the construction and long-term testing of full-scale roof attics, and bench-type studies using small-scale samples. Eight wood roof attics with asphalt shingle roofing were exposed to outdoor environmental conditions in Gainesville, FL, as well as to natural and simulated rainfall, for 150 days in phase 1 and over a year in phase 2. Each roof attic was retrofitted using ccSPF, self-adhered membrane underlayment and/or air gaps between the sheathing and ccSPF. Numerous ½ in. diameter holes (leak gaps) were cut into the roofing to represent sources of water leaks. An automated data recording system was used to continuously monitor temperature, and moisture content changes in the wood, and to make the data available in real-time through a web-based application. At the end of each exposure period the roof panels were harvested and structural tests were performed to determine their wind uplift capacity (or ultimate failure pressure). Concurrently, small-scale testing was conducted to measure the tensile strength of the wood-to-ccSPF bond for samples exposed to up to 16 weeks of intermittent water sprays to evaluate characteristics of moisture distribution in 6 in. x 6 in. wood (OSB and plywood) roof deck samples representing common construction patterns such as vertical or horizontal sheathing joints, and the configurations of full-scale retrofit systems.

Results: The results demonstrated that while ccSPF remains highly effective as a structural retrofit it could result in elevated moisture content within the wood substrate, for extended periods of time. High moisture contents observed in both the sheathing and roof-framing members (as much as 60% in the wood framing), would likely accelerate deterioration of the wood. Thus, two techniques to mitigate moisture retention by using of self-adhered waterproofing membrane and including an underside-deck air gap within the ccSPF retrofit layer were implemented, resulting in substantial reduction (90% and 80%, respectively) in moisture contents within the sheathing. When the study concludes in January 2013, the research team will present design and installation guidelines for the use of ccSPF-retrofitted residential roofs. ccSPF is an effective structural retrofit and secondary water barrier despite producing some moisture retention in wood substrates, and once techniques are implemented to minimize water leakage and repair leaks it can be useful for more sustainable construction in Florida and other hurricane-prone states. The fact the wood-ccSPF composite structure retains water for longer periods that do traditional (not ccSPF-retrofitted) roof decks requires owners be made aware of the need for more aggressive maintenance and more frequent inspections throughout the life of the structure.

Law and Planning for Local Governments Confronting Coastal Hazards, *Thomas Ruppert, Florida Sea Grant Climate Specialist, University of Florida*

Rationale: Coastal hazards form an inherent part of the landscape in Florida. Florida's coast is vulnerable to hurricanes, storm surge, even flooding from rain. Coastal communities confront challenges from salt-water intrusion contaminating their water supplies. Erosion threatens public and private property and infrastructure. Sea-level rise is and will continue to exacerbate these hazards. Local governments in Florida, especially during the current economic difficulties, struggle with how to best understand and respond to the needs to plan for response to coastal hazards. Of particular interest to local governments are the planning tools and the legal implications for minimizing risk while balancing the desires to minimize local government expenditures due to hazards, maximize tax revenues, protect property, and maximize use of property.

Response: Florida Sea Grant (FSG) has responded through a suite of related projects and presentations about coastal hazards and planning. FSG has undertaken legal analysis of how laws protecting property private property may affect local government planning responses to hazards. FSG conducted surveys of coastal residents to assess the efficacy of current state laws on notice. FSG has brought together this research and other critical legal and policy developments relevant to coastal planning in workshops targeting local government planners and attorneys. FSG has also begun cooperation with a county to foment productive stakeholder involvement in coastal policy development.

Results: FSG published a legal analysis on the importance of giving notice—or disclosing—coastal hazards to potential property purchasers. This includes recommendations on structuring notice requirements to educate potential property purchasers. FSG also conducted survey research to determine the efficacy of Florida's current law on coastal disclosure in property transactions. The research showed that current law is woefully inadequate to accomplish its stated goal; the work concluded with specific recommended statutory changes to address the weaknesses identified. To promote awareness of this and other resources for local governments to adapt to coastal hazards, FSG has established its "Coastal Planning" website. Since sea-level rise exacerbates existing hazards, adaptation to sea-level rise helps address these other hazards as well. This website serves as a resource for local government attorneys and planners seeking to understand what has been done and what options they have for adapting to sea-level rise.

FSG has organized and hosted the workshops "Adaptive Planning for Sea-Level Rise: Legal Issues for Local Government." FSG has reached 85 people through these workshops, primarily local government officials. The workshops have increased participants' knowledge of the science of sea-level rise as well as their awareness of policy response options and the legal issues involved. FSG is working with the Environmental and Land Use Law Section of the Florida Bar to expand these workshops to include climate change adaptation legal issues for local governments in Florida. Finally, Sarasota County and FSG successfully applied for funds to work together in a stakeholder process that will be designed to allow completion of the County's Post Disaster Redevelopment Plan (PDRP). We are currently working together on cutting edge technology that will promote stakeholder involvement with data and decision-making to create buy-in and support for the PDRP.

Eliminating barriers to commercial production of the sunray venus clam in Florida. *Leslie Sturmer, Shellfish Aquaculture Extension Program, University of Florida and John Scarpa, Aquaculture and Stock Enhancement Program, Harbor Branch Oceanographic Institute at Florida Atlantic University*

Rationale: The Florida shellfish aquaculture industry provides an estimated $53 million a year to the state's economy and brings jobs to over 900 people. However, the industry is built on a single clam species *Mercenaria mercenaria*. The sunray venus clam (SRV), *Macrocallista nimbosa*, a native species commercially fished during the 1960-70s, is being evaluated as a new aquaculture species to diversify the industry. In our previous research, we spawned SRV clams, cultured larvae, produced seed, and reared them through growout using techniques similar for commercial hard clam culture. The existence of a latent market was determined via a consumer acceptance study. The goal of this project is to demonstrate to industry sectors the culture and market potential of SRV clams through enhanced hatchery production, growout site selection, and determination of product attributes.

Response: Separate lines of broodstock were created using multiple parents to capture genetic diversity for future selection by commercial hatcheries. Proper broodstock development was demonstrated at workshops to hatchery operators to assist in the initial production of seed for the industry. Production performance of SRV clams was evaluated at commercial leases by providing seed to growers and assessing growth and survival. A relationship between soil (sediment) and SRV productivity was examined and established. Soil preferences were further defined by culturing SRV clams in known soil types. To help guide market development, shelf life, sensory, and nutritional profiles of cultured SRV clams were determined. Product attributes were examined with respect to market standards for molluscan shellfish by providing SRV clam samples and surveying wholesalers and their buyers.

Results: This project yielded data and materials to fill voids in our previous SRV clam projects, thus eliminating or lowering barriers to commercialization of this new aquaculture species, facilitating technology transfer to the Florida hard clam industry, and promulgating market development.

Developing 21st Century Coastal Inundation Maps for Coastal Communities, *Y. Peter Sheng, Coastal and Oceanographic Engineering Program, Engineering School of Sustainable Infrastructure and Environment, University of Florida*

Rationale: 75% of the world population lives within the coastal zone - 100 km from the coastline. Coastal communities are subject to increased risk of coastal inundation and damage to the built and natural environment due to increasing hurricane intensity and sea level rise caused by climate change. Present coastal inundation maps, e.g., the Flood Insurance Rate Maps produced by FEMA, do not contain climate change impact and sea level rise and hence are inadequate to protect coastal communities from future flooding.

Response: This paper presents a science-based methodology for developing 21st century coastal inundation maps for coastal communities by incorporating the impact of climate change on hurricane intensity and frequency as well as sea level rise. Past hurricane climatology will be used to develop the ensemble of hurricanes, which will be used to drive an integrated coastal inundation modeling system with atmosphere-surge-wave-land coupling, in contrast with the conventional "bath-tub" models used for coastal inundation mapping. Application of this methodology to the SW Florida coast will be described, followed by a new Florida Sea Grant funded case study on Broward County which is starting this month.

Results: Coastal inundation maps for the SW Florida show that, under the worst case sea level rise scenario (~1m), there is significant increase in the coastal inundation risk. Increased hurricane intensity but reduced hurricane frequency appear to neutralize the effect of climate change on hurricane-induced coastal inundation. However, the results may be different for the SE Florida coast where the waves are much higher and play a more important role in affecting the storm surge and coastal inundation.

Shark fisheries management and conservation: Insights from genetic analyses. *Mahmood S. Shivji, Guy Harvey Research Institute and Save Our Seas Shark Center, Oceanographic Center, Nova Southeastern University.*

Rationale: In light of major, globally widespread concerns about shark overfishing, fishery sustainability and conservation, the U.S and many other countries wish to collect shark landings and trade data on a species and optimally stock-specific basis to better monitor exploitation rates and improve stock assessments. Main obstacles to this effort include the considerable difficulty in identifying many exploited shark species, especially as body parts (e.g., carcasses and fins) that are typically landed and found in international trade, and the very limited genetic stock structure information available for most sharks. Since many fishery sharks are highly migratory and exploited by multi-national fisheries, their management and conservation needs to be considered in an international context. There is an urgent need for methods to accurately identify shark body parts to species and elucidate stock structure of cosmopolitan sharks on a US-wide and global scale to achieve national and international management and conservation goals.

Response: With Florida Sea Grant (FSG) funding, we have developed highly streamlined genetic forensic methods to rapidly and accurately identify shark body parts (including dried fins) to species level. FSG funding has also been instrumental in allowing us to embark on a US and global scale characterization of shark genetic stock structure.

Results: The forensic methods we have developed are being used to assist NOAA's Office for Law Enforcement in their regulatory responsibilities, and have also allowed us to characterize the volume and species composition of the global shark fin trade. The latter analyses have provided the first quantitative characterization of the fin trade, including estimates of a median of 38 million sharks per year contributing to the trade as of the year 2000. Our findings have been widely used in shark fishery policy formulation and have played an important role in raising public awareness for conservation and educational efforts.

Bay scallops in Southwest Florida: A good thing growing. *Betty Staugler, Florida Sea Grant, Charlotte County, University of Florida /IFAS; and Joy Hazell, Florida Sea Grant, Lee County, University of Florida/IFAS.*

Rationale: At one time, the Florida bay scallop could be found from Palm Beach to Pensacola. Today, consistently healthy populations can only be found in selected locations along Florida's West Coast, well north of Charlotte and Lee counties. Recently, bays scallops have been seen in greater numbers in our area, magnifying the need to assess their current status, initiate restoration efforts and monitor for recovery.

Response: Although the Florida Fish and Wildlife Conservation Commission has been randomly surveying bay scallop populations since 1993, we wanted to get local citizen scientists in Southwest Florida involved. We have been recruiting volunteers to help us evaluate local distribution and abundance through "Scallop Searches," which are no-harvest events that teach everyday, nature-loving people about active field research and the importance of the bay scallop. Sea Grant volunteers in Charlotte County also help restoration efforts by placing scallops in cages at their docks to monitor their health and encourage spawning. For better regional collaboration, we have formed a SW Florida bay scallop working group comprised of scientists and educators from FWC, county governments, nonprofits, commercial hatcheries and Sea Grant.

Results: Over 300 citizens have volunteered on Sea Grant-led bay scallop projects annually, and we have provided field research methods training and demonstrations to over 1300 people since 2009. In Charlotte County alone, volunteers contributed more than $29,000 in time and vessel use during 2011. What we learn about abundance and distribution locally has helped us determine site suitability for upcoming larval releases. The regional working group is now focusing on developing a consistent educational message regarding bay scallop status and restoration potential.

Statewide Crab Trap Removal Program *Elizabeth A. Staugler, Florida Sea Grant, University of Florida IFAS, Charlotte County Extension*

Rationale: The Gulf States Marine Fisheries Commission estimates that 250,000 derelict crab traps are added to the Gulf of Mexico waters each year. Greater awareness regarding the impact of derelict traps on marine life, the environment and public safety led the Florida Fish and Wildlife Conservation Commission (FWC) in 2003 to implement policies allowing for Commission approved volunteer based cleanups. In 2009 they implemented rotational gear closures to further derelict trap removal efforts. As a result of prior successful outreach collaborations between FWC and Florida Sea Grant, FWC expressed interest in receiving FSG assistance in developing statewide crab trap clean up capabilities and an outreach and education strategy for promoting derelict crab trap removal efforts during the closures.

Response: The main project approach included a series of meetings between FSG, FWC and key stakeholders to develop a statewide protocol for conducting volunteer blue crab trap clean up events in a short time over large regions. Educational resources and guidelines were also developed. More recently, new methods for removal of unbouyed traps using side scan technology have been developed and are being implemented in the Peace River region.

Results: As a result of these efforts, the state's capacity to remove derelict traps has greatly increased. Annually over 1000 traps are removed statewide through volunteer cleanup efforts. Additionally, two outreach videos and a "How To" factsheet assist interested volunteer groups in event organization. Finally the side scan technology is expanding the removal capabilities to underwater regions that were previously inaccessible. In addition to the habitat enhancement realized when traps are removed, this project is also allowing resource managers to gain insight into how long traps remain fishable when lost. This could lead to new ghost trap reduction technologies such as improved biodegradable panels or cull rings.

National Working Waterfronts and Waterways Network. *Bob Swett, Florida Sea Grant, IFAS Fisheries and Aquatic Sciences, University of Florida and Alan Hodges, Food and Resource Economics Department, University of Florida*

Rationale: People who work on the water or in shore-side jobs that support marine industries are the cultural and economic heart of many coastal communities. In order to do their work, they must have reliable and unimpeded access to the waterfront. However, threats to sustaining working waterfronts have grown and communities are increasingly concerned about protecting access to ensure the long-term sustainability of water-dependent jobs and businesses. Coastal communities need successful strategies to preserve access to waterfronts and waterways in order to continue to be vibrant places to live and work.

Response: Participants at the 2nd National Working Waterways and Waterfronts National Symposium on Water Access (9/2010) agreed to establish a National Working Waterfronts and Waterways Network (NWWN). The NWWN is now operational and the founding steering committee is implementing its mission to increase the capacity of coastal communities and stakeholders to make informed decisions, balance diverse uses, ensure access, and plan for the future of their working waterfronts and waterways. Network membership comprises both the public and private sector, and eligibility includes municipalities, state and federal agencies, nonprofits, universities, Sea Grant programs, businesses, industry associations, and individuals dedicated to supporting and enhancing our nation's working waterfronts and waterways.

Results: In the fall of 2011, the Economic Development Administration, U.S. Department of Commerce, funded seven partner organizations (who also are NWWN founding members) from around the country to identify community and economic development tools for preserving working waterfronts and waterways. Products from this effort center around research on community and economic development strategies, policy and legal tools, and creating outreach and education strategies. Information and results are disseminated through a web-based clearinghouse and biennial symposiums as took place in Norfolk, VA in 2007 and Portland, ME in 2010, and will take place in Tacoma, WA in 2013.

Assessment of pathogenic *Vibrios* in oysters, *Anita Wright, Melissa Jones, Melissa Evans, Michael Hubbard, Chris Hanna, Lei Fang, Jessica Lepper, Victor Garrido, Steve Otwell*

Relevance: *Vibrio* species are estimated to cause 80,000 infections each year in the U.S., accounting for approximately 75% of all seafood-borne bacterial disease (Newton et al, 2012). *V. vulnificus* (Vv), *V. parahaemolyticus* (Vp) and *V. cholerae* (Vc) are the most common pathogens in this genus, and raw oyster consumption and exposure of wounds to seafood or seawater are the primary vectors for Vibrio-associated diseases. Rapid and simultaneous assessment of these species is needed for evaluating the risks associated with seafood consumption and handling. Virulent strains of these species are generally rare in the environment, and most isolates from oysters lack essential virulence factors required to cause disease in humans. Therefore it is important to determine not only presence/absence of *Vibrio* species in seafood, but also the virulence potential associated with these strains.

Response: Apalachicola Bay, Florida is responsible for 95% of the oyster production in the state; therefore, research has focused on this region. Our objectives were to 1) *integrate a commercial multi-species rapid detection method into Vibrio monitoring programs and post-harvest process (PHP) validation trails in Florida; 2) determine relative distribution of virulent strains for the different Vibrio species in Apalachicola Bay; and 3) inform and train appropriate user groups about monitoring and mitigation of Vibrios.*

Results: Our research showed that the multiplex qPCR assays gave excellent agreement with standard microbiological analysis of the three species in oysters and reduced assay time by days. This method was integrated into the Oyster Industry Laboratory in Apalachicola, FL and used to validate thermal PHP protocols for effective reduction of Vibrios in oysters. Several non-thermal methods (antimicrobial peptides, chitosan, and EDTA) have also been evaluated experimentally. The oyster management practice to reduce Vibrios populations by "relaying" oysters to locations with higher salinity was simulated under *in vitro* conditions. Although growth of Vc and Vv was inhibited in nutrient medium at 35 ppt ASW, Vp showed robust growth up to 100 ppt. Shifting cultures from 20 ppt ASW to 30 or 35 ppt ASW reduced the ability of Vv and Vc to grow on agar, but viable cells were still detected by qPCR. In collaboration with the Apalachicola National Estuarine Research Reserve, Vibrio isolates were recovered from oyster, water, fish, sediment, and plant samples, and strains are currently being evaluated for genetic and phenotypic characterization. These studies demonstrated that the qPCR assay is a viable alternative to standard methods and offers rapid simultaneous evaluation of the three species in oysters.

POSTER PRESENTATORS' ABSTRACTS

Brevard county ecotourism boating program. *Holly Abeels, Brevard County Extension Service, University of Florida/IFAS*

Rationale: With the economic downturn and price of fuel and other costs associated with boat charters increasing, fishing charter captains in Brevard County were looking into other avenues of increasing business. Ecotourism is a growing business around the world and is one way that fishing charter captains can use their knowledge of local waterways to market charters to varying clientele that they may not normally get with only offering fishing charters.

Response: The UF/IFAS Brevard County Extension Office partnered with the Space Coast Office of Tourism and Florida Sea Grant to develop an ecotourism program for local boat captains that will promote economic development in Brevard County. The program is designed to introduce boat captains to ecotourism in Florida and the necessary information needed to start a nature-based tourism business. The training program consisted of 12 hours of classroom work and included information on wildlife in Brevard County, principles of environmental interpretation, business creation and practices, and eco- and nature tourism practices. The captains will continue to have trainings once a year with topics to include social media based marketing, outreach plans and opportunities, business plans, and current research for the area.

Results: The captains who completed the course created an incorporated business called Space Coast Boating Adventures. All the captains participated in development of the business to promote nature, historic, and fishing tours. This business will allow the captains to supplement the fishing charters they already do and allow them to work together in development of this ecotourism business. The captains continue to work in development and marketing of the business and see the benefits of working as a group instead of individually. They will continue their education through Brevard County Extension as we work with them in developing a registration program for their website and marketing within local hotels and businesses.

Habitat selection among fishes and shrimp in the pelagic *Sargassum* community: The role of habitat architecture. *Chelsea Bennice and Dr. Randy Brooks, Biological Science Department, Florida Atlantic University.*

Rationale: Pelagic *Sargassum* offers an excellent system for testing both spatial and structural effects of habitat architecture and how a complex habitat can influence biotic interactions. Therefore, it is crucial to identify and conserve essential fish habitats (pelagic *Sargassum*) to maintain a healthy environment and sustainable fisheries.

Response: This study investigated the habitat architecture of pelagic *Sargassum fluit*ans to determine its effects on habitat selection for one species of shrimp (*Leander tenuicornis*) and two species of fish (*Stephanolepis hispidus* and *Histrio histrio*). Specifically, I manipulated inter-thallus spacing (low, medium, and high inter-thallus spacing) and depth (shallow versus deep) of *Sargassum* habitats independently (in separate experimental trials) to test whether the spatial components of habitat architecture are important for habitat selection. Additionally, two differing habitats (*Sargassum* sp. versus intermingled seagrass species *Thalassia testudinum* and *Syringodium filiforme*) were tested to determine whether the structural component of habitat architecture was important for habitat selection.

Results: Results of this study showed no significant results for inter-thallus spacing experiments for *L. tenuicornis* and *S. hispidus*. However, *H. histrio* selected habitats with medium inter-thallus spacing in two treatments. Additionally, large individual *H. histrio* contributed mostly to the significant effects. All three species selected habitat choices with a greater depth aspect. Finally, *L. tenuicornis* and *H. histrio* selected habitat choices with greater structural complexity (*Sargassum* habitat). These results demonstrate clearly that habitat architecture (i.e., spatial and structural components) of this pelagic macroalga influences habitat selection by these shrimp and fishes. Given the overall high species richness of associated fauna in *Sargassum* mats, this complex algal architecture likely impacts many additional organisms, as well.

Going Coastal in Pinellas County, *Libby A. Carnahan, Pinellas County Sea Grant Extension Agent*

Rationale: Pinellas County, the most densely populated county in Florida, is a peninsula bound by Tampa Bay and the Gulf of Mexico. The County's unique geography, contribution of its coastal resources toward its economy and overall quality of life require a community that is well-versed in the importance and sensitivity of marine resources.

Response: The Pinellas County Sea Grant Extension Program has developed two marine education series designed to connect the community with marine science education and research. The ongoing "Going Coastal" marine science education series introduces the community to the habitats, organisms, and ecology of Tampa Bay and the Gulf of Mexico. To fulfill the need for higher level information, the "Salty Topics" series, is designed to bring the marine research scientists to the general public**.** The "Going Coastal" and "Salty Topics" series have leveraged partnerships, utilized modern technology and revitalized an existing education center to provide quality no-cost education programs. I utilize Turning Technologies audience response system to gauge interests, opinions, and level of base knowledge about topics. The system familiarizes the presenter with his audience, while engaging the participants.

Results: The 2011-2012 programs have drawn in 735 participants ranging from toddlers to senior citizens to 24 Going Coastal and 8 Salty Topics programs. In evaluations, participants reported a wide range of pre-existing knowledge, emphasizing the community's desire for both introductory and higher level information. Eighty-eight percent of participants reported significant knowledge gain as a result of the marine education programs.

Assessing the non-monetary value of Florida's coastline: Spatial quantification of the social values of ecosystem services in Sarasota Bay, FL, *Zachary D. Cole, zaccole@hhp.ufl.edu*

Rationale: Increasing development along Florida's coastline and the corresponding pressure on relevant ecosystems creates a need for more effective spatial planning and management of these environments as an essential component to resolving conflicts and adapting to changes in environmental conditions. Research that incorporates social value perceptions of coastal ecosystem services into regional assessments is critical to developing a more robust understanding of natural-social interactions in those environments.

Response: In this research we measured and mapped the social values of ecosystem services according to coastal resource users in and around Sarasota Bay, Florida. To characterize social values of ecosystem services, we used a combination of expert methods and an online mapping survey to ascertain locations that held important value to self-identified groups of users. After identifying an international panel of experts with experience and knowledge of coastal systems, we conducted a Delphi exercise to determine common coastal uses and a typology of social values derived from ecosystem services in the coastal zone. These data formed the basis of questions put to a random sample of residents adjacent to Sarasota Bay through an online, interactive mapping survey. Survey respondents provided information about coastal use, use preferences, the relative importance of different categories of social values, and locations that were highly valued within those categories.

Results: Using statistical and spatial analytic tools within a GIS, we analyzed the survey data. The results are presented in maps showing important areas where stakeholders concurred and diverged in their perceived values of the coastal environment. By representing, in map form, the spatial dimensions of social values of ecosystem services, this analysis can help inform processes of coastal and marine spatial planning. The sustainable management of coastal areas necessitates the inclusion of social value assessments in concert with more customary assessments of biological and physical systems.

The Gulf and Caribbean Fisheries Institute: A scientific forum for fisheries and marine resource management in the Gulf of Mexico and the wider Caribbean. *R. LeRoy Creswell, Florida Sea Grant, University of Florida*

Rationale: Founded in 1947, the Gulf and Caribbean Fisheries Institute (GCFI) is dedicated to advancing the goals of sustainable use, wise management, conservation, and restoration of fisheries and marine resources in the Gulf of Mexico and Caribbean region. GCFI seeks to achieve these goals by providing a forum for the exchange of information and perspectives among decision-makers, scientists, managers, educators, students, and resource users**.**

Response: The author and Florida Sea Grant play an active role in support of GCFI initiatives including dissemination of research findings, administration and editorial support, sponsorships of technical sessions, and providing student awards.

Results: The annual GCFI Institute provides a scientific forum for exchanging information on current and planned research and Management in the region. The scientific presentations from each Institute are published annually in the Proceedings of the Gulf and Caribbean Fisheries Institute provided in printed and electronic format and available as a free, searchable archive on the GCFI website [www.gcfi.org]. Special symposia are hosted through partnerships and dedicated to topical issues, such as "Billfish Research and Implications for Management in Gulf and Caribbean Waters", "Marine Protected Areas, Fishery Reserves and Parks", "Biology and Management of Fish Spawning Aggregations". "Emerging Technologies for Assessing Marine Habitats and Fishery Resources" and others which are often presented in special publications, typically peer-reviewed journals and books. GCFI has spawned several affiliated organizations that participate in GCFI Institutes and conduct concurrent workshops, such as the Caribbean Association of Marine Protected Area Managers (CaMPAM) and "Fishers for Fisheries" (F4F), which recognizes regional and local fishers who are conservation minded and promotes sustainable utilization of marine resources. In partnership with the Gulf of Mexico Sea Grant Programs, FL Sea Grant supports two annual "Student Awards for Academic Excellence" which provides funding for travel to the GCFI Institutes.

Improving the understanding of South Florida's marine environment through science communications *Pamela J. Fletcher, Florida Sea Grant, University of Florida*

Rationale: South Florida is a complex, diverse ecosystem wrought with many management challenges. Competition between natural resources, their use by a growing population, and the need to preserve and conserve protected areas is not unique. Nevertheless, improving the understanding of the linkages among people and their environment is a critical component in the local decision-making process.

Response: Tropical connections, a book about south Florida's marine environment was developed to deliver science communications to improve the understanding of these linkages and the importance of managing people and their resources for the benefit and enjoyment of future generations. Over 160 researchers and managers contributed to the development of the publication. The pages are filled with limited text, illustrations, pictures and graphs that present scientific information in a format that is easy to read and understand. The information is assembled into fact pages that can be read individually, or by chapter. Each chapter has an introduction summarizing the content, and is accompanied with an annotated bibliography for those seeking additional information. The target audiences are decision makers, educators, students and lay readers.

Results: The books have been provided to schools in south Florida, decision makers, and resource managers to promote an improved understanding of this environment. This project was funded in part by the "Protect Our Reefs" specialty license plate. By purchasing a Protect Our Reefs license plate, Florida drivers help protect coral reefs and support coral reef researcher, conservation and outreach programs throughout the state. For more information, visit www.mote.org/4reef

Climate change and coastal ecosystems: Florida Sea Grant and the Florida Fish and Wildlife Conservation Commission (FWC) working for the future of Florida. *Whitney Gray, Florida Sea Grant/FWC*

Rationale: As the scientific and public communities come to increasing agreement on the science of climate change, the effects are already being felt in coastal Florida. Rising sea level, increasing temperatures, changes in precipitation patterns and intensity are all being experienced across the state. The challenges to managing coastal ecosystems in the face of climate change are just beginning and require coordination and cooperation across state agencies and stakeholders.

Response: With cooperative funding from both Florida Sea Grant and FWC, a position of Sea Level Rise Coordinator was implemented to serve both agencies, enhancing their existing efforts, bringing attention and focus to the effects of climate change on coastal ecosystems and coordinating efforts within and between both organizations. Synergies between Florida Sea Grant and FWC are being explored. Communication and education on climate change within each organization are being enhanced and coordinated. Outreach to stakeholders on behalf of both organizations is being undertaken.

Results: While the Sea Level Rise Coordinator project is barely six months underway, numerous efforts have been completed or are in progress with a variety of stakeholders. A proposed research project on climate change adaptation options for gopher tortoises (*Gopherus polyphemus*) at the Kennedy Space Center will begin in April 2013. Internal communication within FWC on climate change research and issues has been enhanced with the update of an intranet site and updated blog serving FWC staff. Similar inreach will be pursued for Florida Sea Grant as well. Climate change information and presentations have been given to agencies and organizations across the state. Cooperation with the FWC's Coastal Wildlife Conservation Initiative has resulted in outreach to coastal Florida communities.

The Outstanding Florida Waters Policy: Analyses of water quality data sufficiency, *Hollie Hall, Department of Soil and Water Sciences, University of Florida, hollierhall@gmail.com*

Rationale: The Outstanding Florida Waters (OFW) designation is the highest state level of protection given to any Florida water body. All waters flowing through public lands were designated 1979. Since then additional waters have been designated through stakeholder petitioning processes. The OFW anti-degradation standard is enforced through limited permitted discharges into the designated water body. The rule stipulates that water quality cannot be degraded below a designated baseline year of either 1979 or the year prior to designation. There are 350 OFWs in the state; which include lakes, rivers, estuarine systems and the Florida Keys.

Response: This study is investigating whether enough water quality data exists to determine whether or not the OFW designation is deterring water quality degradation.

Determining Thermal Lethality to Reduce Presences of Potential Pathogenic *Vibrio Spp.* in Oysters, *Crassostrea virginica,* *Christopher Hanna, Steve Otwell, Keith Schneider and Anita Wright, Food Science and Human Nutrition Department, University of Florida, Gainesville, FL*

Rationale: Additional controls are necessary to prevent continuing illnesses associated with *Vibrio spp.* in oysters, *Crassostrea virginica*. The primary bacterial culprits have been *Vibrio parahaemolyticus* and *V. vulnificus* with continuing concerns for associated *Vibrio spp.* (i.e. *V. cholerae* serogroup 01). Despite efforts to introduce post harvest processing (PHP) methods designed to reduce the presence of naturally occurring *Vibrio spp.,* cooking remains the most effective control. Use of cooking is advanced by directives in the National Shellfish Sanitation Program (FDA) and the Model Ordinance guidelines maintained by the Interstate Shellfish Sanitation Conference (I.S.S.C), but these recommendations lack clarity for proper cooking methods or appropriate determinations for thermal lethality.

Response: In response, a series of trials were conducted to determine the standard thermal parameters for lethality all of the aforementioned *Vibrio spp*. Trials with whole oysters with elevated levels of *V. vulnificus* and *V. parahaemolyticus* were conducted (at 48, 50 and 55°C) to determine the protective effects of the food system on the bacteria. The methods are based on routine survival in a phosphate buffered system (PBS) media, followed by comparison with naturally occurring *Vibrio spp.* in whole oysters. These lab trials were further substantiated in cooking trials to mimic and measure actual commercial restaurant operations.

Results: Results from the restaurant standard cooking practices as well as the U.S. Food Code proved effective in reducing or eliminating the potential *Vibrio spp.* pathogens. These results support the integration of HACCP based concepts for more effective cooking controls in restaurant operations.

Changing Boater Behavior to Protect Seagrass Using a Social Marketing Approach. *Joy Hazell, Florida Sea Grant, University of Florida/IFAS Lee County Extension, Monaghan, Agricultural Education and Communication Department, University of Florida / IFAS*

Rationale: The field of Community Based Social Marketing (CBSM) is useful in effectively changing public behaviors to promote sustainability. Convincing the public to change can be made easier by identifying target audiences, lowering the barriers to acceptance and offering tangible benefits. The Pine Island Sound, located in SW Florida, is a fragile marine environment whose seagrass beds are under pressure. Our project specifically aims to reduce propeller scarring of seagrass beds in a targeted location, the Pine Island Commercial Marina (PICM) by employing CBSM techniques to develop a successful education and outreach program.

Response: We used ethnographic and survey research to profile PICM users including recreational boaters, sports fishermen, commercial fishermen and contractors serving a small population of outer island residents. All of these users pilot their boats over shallow seagrass beds, which have seen extensive propeller scarring and damage. We have conducted observations of boater behavior in the PICM channel and administered a questionnaire to a convenience sample of recreational boaters.

Results: Non-randomized observations suggest approximately 10% of boaters take a shortcut out of the available channel and cut across the shallow seagrass beds. Anecdotal evidence from interviews with boaters confirms this finding as nearly all interviewees reported seeing other boaters occasionally take a shortcut out of the channel. Despite this, all interviews indicate that this is a large reduction in past behaviour when many users took the shortcut. Many captains said they no longer take the shortcut because of the outreach efforts of the marina manager. This reflects the influence of social norms but still leaves the issues of long-term maintenance of the new behaviour. Representatives from user groups will be asked to join a working group to hear research findings and design strategies to improve long-term boater compliance with use of the channel.

Increasing Submerged Habitat Restoration in Southwest Florida through Policy Reform. *Althea S. Hotaling, School of Natural Resources and Environment, University of Florida, Robert A. Swett, School of Forest Resources and Conservation, University of Florida, Thomas Ankersen, Director, Conservation Clinic, Levin College of Law, University of Florida, Robert B. Lingle, Levin College of Law, University of Florida and Charles W. Listowski, West Coast Inland Navigation District, Venice, Florida.*

Rationale: In coastal Florida, the development and maintenance of docks, marinas, and channels frequently cause destruction of seagrass beds. Seagrass loss is accompanied by a loss of the ecosystem services the beds provide, such as sediment stabilization, water filtration, protection from storms, and habitat and nursery grounds for fish species. The current legal framework for seagrass protection and the implementation of mitigation for seagrass loss could be improved.

Response: An in-depth review of the law and policy that applied to seagrass restoration and mitigation was carried out. Interviews with stakeholders and policy makers were also completed and recommendations formed.

Results: It is believed that policymakers could revise the Uniform Mitigation Assessment Method to include more assessments related specifically to the ecology of seagrass beds and their ecosystem services. Seagrass mitigation is currently carried out by the permittee that applied to create or maintain the seagrass-impacting development. In comparison, wetland mitigation is typically carried out by publicly or privately operated mitigation banks. The creation of mitigation banks for seagrass restoration would streamline the process of seagrass mitigation and promote the public's interest in seagrass restoration.

Comprehensive artificial reef program meets stakeholder needs. Bill Lindberg, Florida Sea Grant Extension (SFRC-FAS, UF-IFAS); John Stevely, Florida Sea Grant Extension, Chuck Adams, Florida Sea Grant Extension (FRED, UF-IFAS) and Bryan Fluech, Florida Sea Grant Extension.

Rationale: Artificial reefs are popular with U.S. recreational fishers and divers, and enhance commercial harvests internationally. Distinctions between socio-economic and ecological enhancements were confounded in past debates about Attraction versus Production. Thus, reefs were not used by fisheries managers as spatial habitat management tools to enhance wild fish stocks.

Response: In partnership with the Florida Fish and Wildlife Conservation Commission and numerous colleagues, Florida Sea Grant advances responsible artificial reef development. Extension forums bring together diverse stakeholders (fishing interests, county staffs, state and federal resource agencies, environmental regulators and university researchers) for technical exchanges and continuing education. Individual Agents facilitate local reef projects. Regional socio-economic studies and large-scale, long-term reef experiments evaluate effects on coastal communities and targeted fish stocks. Extension delivers results to stakeholders, providing guidance and information for decision-making.

Results: In 2010, 180 diverse stakeholders attended the Florida Artificial Reef Summit, held every 4-5 years. The Florida West Coast Artificial Reef Coordinators' Workshop attracts 45-55 participants annually. Economic analyses fostered by these workshops documented recreational use of artificial reefs worth $253 million to six coastal counties. From 2010 to 2012, reef projects in Bay, Collier, Manatee, Okaloosa, Taylor and Santa Rosa counties were facilitated by Sea Grant Agents. By 2012, the Steinhatchee Fisheries Management Area was completed to enhance juvenile grouper growth and survival, the first such application in the nation. In 2009, Florida Sea Grant's habitat specialist gave the opening keynote for the 9th International Conference on Artificial Reefs and Associated Habitats (9th CARAH, Brazil) and in 2012 hosted the program chair of the 10th CARAH (Turkey) as a Visiting Scholar.

Engaging Recreational Fishers and Divers through Social Media to Provide Community Monitoring of Artificial Reefs in Bay County, Florida, USA. *L. Scott Jackson, Florida Sea Grant Extension - Bay County Board of County Commissioners (BOCC), University of Florida-IFAS*

Rationale: LORAN-C service was discontinued February 2010, yet Bay County continued to report reef locations on official website only in LORAN. Mathematical conversion from LORAN to GPS coordinates is inaccurate. Erroneous reef information and coordinates frustrated boaters, expending additional hours and fuel searching for reefs that have been misreported, moved, or no longer exist. Published reef data needs to reflect the current condition and exact location.

Response: Bay County Sea Grant Advisory Committee suggested an interactive website for local artificial reefs where users could share their observations and experiences with the public. Florida Sea Grant Communications helped create website policies for comments, video, and image sharing. UF-IFAS IT provided PHP code to manage and update our WordPress site hosting information on over 240 public reefs. The Bay County Agent provided training information to area diving and fishing clubs, and through strategic partnerships with the Board of County Commissioners, Panama City Beach TDC, Mexico Beach Artificial Reefs Association. Additionally, the website has been promoted through television, newspaper, and newsletters. Informational flyers with QR-codes link smartphones to a mobile version of the website have been shared with area businesses.

Results: Bay County BOCC provides a direct link to the new website which is moderated by the Sea Grant Agent. ESRI embedded maps, photos, and YouTube videos provide an enriching interactive experience. Discussion with individual users and groups is providing increased communication and direction for reef monitoring efforts. Monitoring Bay County's reef sites and providing accurate locations to the public, using a grassroots approach, is a fraction of the initial deployment costs.

Enhancing K-12 Science Education and Creating Environmental Stewards. *Maia P. McGuire, University of Florida/IFAS Extension/Florida Sea Grant.*

Rationale: There is an increasing emphasis on service learning, not only in Florida schools, but nationwide. Teachers are looking for opportunities to teach or reinforce science topics with hands-on activities. It is hoped that by engaging students in environmental protection or restoration activities, those students will become life-long stewards of Florida's environment.

Response: Over the past decade, I have worked with schools and teachers in northeast Florida to help them incorporate coastal science into their curricula and to help them find or create service learning opportunities for their students that benefit coastal habitats or species. I have partnered with Dr. Ruth Francis-Floyd (UF School of Veterinary Medicine) to create an 18-lesson manatee curriculum for third grade. Among other things, the lessons address threats to manatees. Additionally, I have worked with schools on three occasions to conduct sea oats plantings to restore dunes in Flagler, St. Johns and Nassau Counties.

Results: Pre- and post-tests and teacher evaluations show that elementary students have learned about manatee issues, and have increased their awareness about the need to protect manatees as a result of our curriculum. Third grade students in Flagler County built and installed two monofilament recycling containers to try and reduce manatee entanglements in local waterways. Agriculture students at Matanzas High School learned how to raise sea oats plants from tissue-cultured plantlets provided by Dr. Mike Kane (UF Environmental Horticulture Department). After rearing them for six months, the students used the sea oats to restore dunes in Beverly Beach. Students in St Augustine High School's Academy for Future Teachers instructed and supervised fifth grade students in planting sea oats at Anastasia State Park. Students are developing math, science and writing skills while conducting environmental projects that benefit their local communities.

Our evolving role in emergency operations in the Franklin County community. *William T. Mahan Jr., Franklin County, University of Florida/IFAS Extension, Florida Sea Grant Program*

Rationale: The responsibilities of local emergency management offices have changed significantly, since September, 2001. Since then, there have been a number of changes to the structure and operation of state and local emergency operation centers. There's also been a series of natural and man-made emergencies that have given the UF/IFAS and Florida Sea Grant extension program an opportunity to increase its leadership roles in Franklin County.

Response: Franklin County extension has responded by providing researched-based information, education and assistance to elected officials, government agencies, NGOs, and residents and visitors during emergencies caused by Hurricane Dennis (2005), the Deepwater Horizon spill (2010), Tropical Storm Debby (2012) and the current commercial oyster fishery failure. The Extension agent is a well-defined partner embedded within the county's emergency operations center, and acts as a member of the teams for support function, animal protection, volunteers and donations, and damage assessment. In addition, the extension program provides critical training to local response managers before disasters strike, assisting with the delivery of coastal resilience assessment workshops for the county emergency staff and the City of Carrabelle so local managers can identify both strong and weak 'links' in their emergency plans.

Results: We have done it all, from answering phones in the EOC to appearing on nationally broadcast news segments. We've helped residents with their questions on evacuating animals large and small, replacing storm-damaged landscapes, and identifying oil-spill look-alikes on county beaches. We've shown businesses how to document, file and collect on claims placed for storm and oil spill damages. We have helped advertise and coordinate the BP Vessel of Opportunity Program, providing boat captains and displaced fishermen with work during stalled economic times. We have helped instruct area seafood dealers how to do conduct sensory evaluations of seafood so they could comply with FDA rules and continue selling product to retail buyers. Our efforts showcase how Franklin County Extension is prepared to quickly respond to emergencies in an effective and organized manner.

Spatial and temporal analyses of encounters between the North Atlantic right whale (*Eubalaena glacialis*) and recreational vessels in the southeastern United States. *Nancy Montes, School of Natural Resources and Environment, University of Florida, Bob Swett, School of Natural Resources and Environment, University of Florida, Florida Sea Grant, Charles Sidman, Florida Sea Grant, and Barb Zoodsma, Southeast Regional Office, NOAA Fisheries Service.*

Rationale: The southeastern United States provides the only known calving and nursing ground of the endangered North Atlantic right whale (*Eubalaena glacialis*). The region also is an important area for water-based anthropogenic activities that include several military bases, shipping ports, and associated commercial and recreational vessel traffic. This situation increases the risk of right whale/human encounters, even though federal law prohibits approaching right whales within a distance of 500 yards. However, information about the spatial distribution and overlap of recreational vessels (length of 65ft or less) with right whales, and information about compliance with the 500 yard rule is very limited.

Response: We will model the spatial distribution and overlap of *E. glacialis* with recreational vessels to generate relative probabilities of encounter. Right whale sightings reported by the Early Warning System will be compared with environmental variables found to influence their distribution (e.g., sea surface temperature and bathymetry) to determine the relative probability of whale occurrence. The relative probability of occurrence of recreational vessels will be derived using information from a map-based survey that asks boaters to describe their boating trip routes and destinations. Modeling results will be used to estimate encounter rates and to generate maps that show areas with high/low monthly whale/vessel encounter rates. We also will use a human dimensions approach to explore compliance. Specifically, we will use the Integrated Behavior Model to understand and measure factors that increase one's intention to comply with right whale regulations. The data for this analysis will be provided by a mail survey.

Results: Information from this project can be used by managers and educators to improve current management, education, and communication strategies to promote compliance with right whale regulations.

Bringing back the bayous; improving water quality in Escambia County
Rick O'Connor, Florida Sea Grant, University of Florida

Rationale: People of the Pensacola area have utilized water and other natural resources from the bay for centuries. In recent years, increased development along the waterfront removed vegetation that naturally reduces organic nutrient runoff increasing the amount of fertilizers and animal waste reaching these bayous. This increase in nutrients quickly caused increased turbidity, decreased submerged vegetation, decreased dissolved oxygen, leading to frequent fish kills. The increase in fecal coliform bacteria forced health warnings to be posted on all three major bayous and, at times, actually close them for recreational use. The frequency of fish kills and public warnings in the local bayous not only reduced public use but made it difficult for the community to attract new businesses and residents to the downtown area. Educating the public within the watershed of these bayous on methods to reduce nutrient runoff and restore natural shorelines will help improve water quality in the bayous thus the quality of life for the city.

Response: Programs are planned to educate citizens on methods and benefits of "Florida Friendly Yards", "Living Shorelines", and the "Clean Marina" Programs. A program will be developed to monitor water quality before and after residents adopt some of these practices. This program is a team approach that will include the Florida Department of Environmental Protection, Lakewatch volunteers, high school science programs, and extension agents from Sea Grant and the University of Florida/IFAS.

Results: This is a new program currently under development. Education programs are planned to begin early spring of 2013.

Development of the Marine Baitfish Aquaculture Industry in Florida. Cortney L. Ohs, University of Florida / IFAS, Indian River Research and Education Center, Program in Fisheries and Aquatic Sciences and R. LeRoy Creswell, Florida Sea Grant.

Rationale: There is a strong demand for the ideal size and species of baitfish, and an aquaculture produced marine baitfish could provide anglers with a consistent supply of desired species in the appropriate size classes, regardless of season. Much aquaculture research has occurred on multiple species of marine baitfish, and there is a need to educate current and potential aquaculture producers about these research results. Additionally, bait distributers and retail store owners need to know the best holding systems and methods to maximize survival.

Response: NOAA Sea Grant Aquaculture Extension and Technology Transfer grants program funded this three year program. It has five objectives: 1) Conduct workshops and in-service trainings to educate on regulations, culture systems, broodstock acquisition, spawning methods, egg handling, larval culture, growout methods, low salinity culture, and marketing. 2) Conduct two surveys on market potential – one for anglers and one for bait retailers. 3) Develop extension literature on culture methods, hauling methods, and holding systems in bait stores. 4) Design and construct effective baitfish holding systems with proper filtration to increase survival of baitfish marketed by producers and retailers. 5) Educate live haulers to increase knowledge of water quality and acclimation procedures necessary to maximize survival of marine baitfish.

Results: Ten workshops and two in-service trainings have been held and educated over 500 participants. A survey was conducted on 250,000 licensed Florida anglers and over 15,000 responded. A second survey on bait retailers is currently being conducted. Results of the surveys will define the current market potential for baitfish. We published two Southern Regional Aquaculture Center publications on pinfish and pigfish culture methods. We constructed and evaluated hauling systems and are constructing holding systems to demonstrate to haulers and retailers the best methods and systems to maximize survival of fish being transported and held in retail stores.

Seafood Safety Education And Training Program For Seafood Commerce And Recreation In Florida, *Phil Lynn, Chris Hanna, Charlene Burke and Steve Otwell, FL Sea Grant Program/Aquatic Food Products Program, Food Science and Human Nutrition Department, University of Florida*

Rationale: Keeping seafood fresh and safe for consumers is a challenging task for harvesters, wholesalers, distributors, retailers and restaurants. Federal guidelines require that all seafood processors or importers intending to sell seafood in the U.S. follow the HACCP protocol, the Hazard Analysis and Critical Control Point system. Keeping up to date on the latest handling and processing techniques, regulations and other critical information is essential for all segments of the seafood industry, highlighting the need for ongoing practical education options.

Response: The Florida Department of Agriculture and Consumer Services has initiated a project with Florida Sea Grant to develop and deliver a number of outreach programs and specific training materials and courses that address the prevailing and persistent seafood safety issues in Florida's commercial and recreational fisheries. One plan is a special public and commercial educational outreach program called Check It Out!, which is based on a progressive accumulation of questions and answers that will be formatted and linked with a network of expert responses.

In response to mandates from federal authorities, all responsible state agencies must initiate additional training for clam and oyster producers. Existing training programs in Florida are becoming outdated, so revised versions will be developed, including an advanced program that supports a voluntary 'merit system' to encourage and reward harvesters that want special distinction.

A series of HACCP training programs and accompanying seafood safety background information will reach all processing and retail operations in Florida that want additional educational support. Finally, the Florida Food Safety and Food Defense Advisory Council has unanimously agreed to support a *Florida Seafood Safety Team* for better inter-agency coordination and communications.

Results: The Check It Out! program is in the concept stage while the collaborators address modes for website development, primary contact points and record maintenance. The Florida Seafood Safety team will convene an annual seafood safety forum in mid-2013 involving all pertinent state agencies to discuss seafood safety issues. HACCP courses will be delivered through the National Seafood HACCP Alliance, based at the University of Florida.

Network Analysis of the Gulf of Mexico Commercial Red Snapper Fishery IFQ Program 2007-2009. *Andrew J. Ropicki, 2011 NMFS-Sea Grant Fellow in Marine Resource Economics, Food and Resource Economics Department, University of Florida and Sherry Larkin, Food and Resource Economics Department, University of Florida*

Rationale: In 2007 the Gulf of Mexico Red Snapper Fishery was the first fishery in the Gulf of Mexico to be transitioned to Individual Fishing Quota (IFQ) management. The stated goals of the program were to reduce overcapacity and overfishing in the fishery and to eliminate the problems associated with derby fishing; namely, market gluts and fishing in hazardous conditions. In order for the IFQ program to achieve these goals the trading *markets* must function effectively. Research is needed in determining how quota is traded in these markets and how trading affects the fishery.

Response: This research analyzes the trading of quota (both permanent trades and short-term leases) and fish using network analysis techniques to determine how trading occurs between market participants and how IFQ management changed the fishery.

Results: Preliminary analysis has shown that trading is localized and there are price discrepancies in the quota markets that bring into question the efficiency of the markets. In addition, the research shows the growth of new roles in the fishery including quota brokers and lease dependent fishers. Further research should provide valuable insights into how different aspects of the program affect participants in the fishery, which could lead to innovations in program design, fishery regulations, trading mechanisms or other changes to increase the efficiency of the fishery.

Seafood At Your Fingertips: An outreach program for the Florida consumer, *Brooke Saari[1], Lisa Krimsky[1], Holly Abeels[1], Bryan Fluech[1], Elaine Courtney[1], Kendra Zamojski[1], Elizabeth Shepard[1], Chuck Adams[1], Steve Otwell[1], Jeanna Merrifield[2], Cinthia Sandoval[2], [1]University of Florida IFAS & Florida Sea Grant, [2]Wild Ocean Seafood Market*

Rationale: There are many forms of seafood information provided by various local, national and international agencies. However, much of this information is outdated, incorrect, conflicting or not reputable creating confusion and mixed messages for the consumer. Similarly, extension agents are apprehensive about providing seafood-related educational programs to clientele due to lack of access and/or understanding of factual, clear information.

Response: The Seafood at Your Fingertips program was created by a multi-disciplinary team consisting of professionals in the seafood, marine, nutrition and industry fields. The objectives of this program are to provide extension agents in Florida with updated, easy-to-access information regarding seafood, which will result in increased consumer awareness and consumption. Through the use of focus groups and a statewide survey to consumers and non-consumers of seafood, materials were designed using their input in order to provide the information needed and wanted. The program includes outreach education modules that are given as a resource kit for extension educators to teach their clientele about Florida seafood through program modules and workshops in nutrition, safe preparation, seasonality and purchasing. In-service training will be provided through webinars on the kit content as well as guidance on teaching the curriculum. Additionally, a mobile application is being created for the general consumer to assist in purchasing and handling of seafood and to assist in promoting seafood consumption.

Results: The combining of education modules, public displays, and the mobile application will provide a wide-reaching Florida Seafood promotion opportunity. Overall, a more informed public is the ultimate goal, with targeted informational programs developed from citizen input.

Investigating Methods to Reduce and Control Sodium Levels in Shrimp, *Molly Sims, Laura Garrido, and Steve Otwell, Aquatic Food Products Lab, Food Science and Human Nutrition Department, University of Florida, Gainesville, FL. msims@ufl.edu*

Rationale: As the majority of Americans consume well over the recommended 2,400 mg of sodium per day, the seafood industry is facing the possibility that they will have to reduce sodium levels in seafood products. Shrimp in particular often has increased levels of sodium due to the increasing use of processing ingredients to maintain favorable moisture and flavor. The challenge is to select moisture retention treatments that result in lower sodium levels while maintaining consumer acceptance.

Response: The basic approach used to determine preference were untrained consumer panel ratings for cooked shrimp with prior exposure to a variety of different processing ingredients. *Litopenaeus vannamei* farmed in Ecuador were treated with a variety of sodium and moisture retaining agents. All treatments were compounds or blends currently available for commercial applications. Low sodium treatments utilized potassium functioning as a sodium replacement. Consumer panelists (n = 100) were presented five different shrimp and asked to rate overall likeability of the following characteristics on a 9-point hedonic scale: texture, saltiness, flavor, and color. Consumers were additionally asked to rate the saltiness, firmness, moistness, and purchase intent on a 5-point Just About Right scale.

Results: The results were collected on Compusense™ and analyzed using ANOVA and Tukey's test for significant differences. It was found that shrimp in the sodium level 500-700 mg/100g and moisture 80-82% were best liked. In one panel four low sodium shrimp ranging from 253-347 mg/100g sodium were compared to the standard STPP treated shrimp containing 631 mg/100g sodium. In this trial it was found that there was no significant difference between the shrimp that had 347 mg/100g sodium and 263 mg/100g sodium in comparison with higher sodium shrimp. The shrimp with 253 mg/100g sodium and 259 mg/100g sodium were given less preferential ratings. The results indicate that although it will be a challenge for the shrimp industry to decrease sodium levels, it is possible to create a product that consumers will enjoy and purchase.

Statewide Crab Trap Removal Program *Elizabeth A. Staugler, Florida Sea Grant, University of Florida IFAS, Charlotte County Extension*

Rationale: The Gulf States Marine Fisheries Commission estimates that 250,000 derelict crab traps are added to the Gulf of Mexico waters each year. Greater awareness regarding the impact of derelict traps on marine life, the environment and public safety led the Florida Fish and Wildlife Conservation Commission (FWC) in 2003 to implement policies allowing for Commission approved volunteer based cleanups. In 2009 they implemented rotational gear closures to further derelict trap removal efforts. As a result of prior successful outreach collaborations between FWC and Florida Sea Grant, FWC expressed interest in receiving FSG assistance in developing statewide crab trap clean up capabilities and an outreach and education strategy for promoting derelict crab trap removal efforts during the closures.

Response: The main project approach included a series of meetings between FSG, FWC and key stakeholders to develop a statewide protocol for conducting volunteer blue crab trap clean up events in a short time over large regions. Educational resources and guidelines were also developed. More recently, new methods for removal of unbouyed traps using side scan technology have been developed and are being implemented in the Peace River region.

Results: As a result of these efforts, the state's capacity to remove derelict traps has greatly increased. Annually hundreds of traps are removed statewide through volunteer cleanup efforts. Additionally, two outreach videos and a "How To" factsheet assist interested volunteer groups in event organization. Finally the side scan technology is expanding the removal capabilities to underwater regions that were previously inaccessible. In addition to the habitat enhancement realized when traps are removed, this project is also allowing resource managers to gain insight into how long traps remain fishable when lost. This could lead to new ghost trap reduction technologies such as improved biodegradable panels or cull rings.

Estimating diffusivity and migration patterns with mark-recapture modeling for permit (*Trachinotus falcatus*) *Sarah M. Stephens, Fisheries and Aquatic Sciences, University of Florida*

Rationale: Understanding diffusivity and migration patterns of highly mobile species can be important to the scale of Marine Protected Areas (MPAs) and implementation of other conservation work. Permit (*Trachinotus falcatus*) are an important game fish in Florida and are currently protected by the Special Permit Zone (SPZ) in the Keys and South Florida. However, little is known about permit populations in regards to migration, spawning, site fidelity, and inshore/offshore movements. I investigate multiple spatial-temporal scales to understand fish movement and interactions between recreational fishing sectors.

Response: The Bonefish Tarpon Trust (BTT) comprised of conservation oriented fly fishing guides and anglers, implemented a Florida wide tagging study placing 600+ dart tags over a two year period 2009-2011 with very little recapture success. For my research, I improve upon the BTT design by targeting two areas exploited by reef (offshore) and flats (inshore) fishing industries. Through a mark-recapture high reward dart tag program I aim to increase reporting rates and model diffusivity between inshore/offshore environments.

Results: As tag returns increase, I will model onshore-offshore movement and regional migration relating to perceived spawning aggregates on wrecks and reefs. Modeling diffusivity of permit and interactions between the recreational sectors supports implementation of the Florida SPZ. Additionally, these models will guide improvements to the BTT study design as permit tagging studies are extended into Mexico and Belize.

Spatial and temporal variation in nursery habitat for juvenile fishes in a river-dominated estuary: a diet and stable isotope analysis. *Mollie A. Taylor, Florida State University Coastal and Marine Lab, J. Kevin Craig, NOAA NMFS Beaufort Laboratory, Jeff Chanton, Department of Earth, Ocean and Atmospheric Science, Florida State University , and Rachel M. Wilson, Department of Earth, Ocean and Atmospheric Science, Florida State University*

Rationale: The value of estuaries as nursery habitat for juvenile fishes depends on their connection with coastal watersheds that provide nutrients, freshwater, and other materials essential to the productivity of these ecosystems. This connectivity is of particular importance for river-dominated estuaries that experience considerable spatial and temporal variation in hydrography and flow of alluvial materials. Apalachicola Bay is one of the most productive estuaries in the northern hemisphere, largely due to the intensity and duration of freshwater output. Variation in nutrient and fresh water input to the Bay may alter habitat quality with regard to foraging success for juvenile estuarine-dependent fishes.

Response: Using juvenile spot (*Leiostomus xanthurus*), I am testing the hypothesis that spatial and temporal variation in diet composition, foraging success, and organic matter source are related to seasonal variation in river flow and associated environmental conditions. I will be testing this hypothesis through analysis of diet composition, stomach fullness, and stable isotope analysis of $\delta^{13}C$, $\delta^{15}N$, and $\delta^{34}S$. Juvenile spot were sampled monthly in 2009 and 2010 from 12 locations throughout Apalachicola Bay.

Results: Juvenile spot are demersal foragers and their diets are dominated by harpacticoid copepods. Other prey items include: calanoid copepods, ostracods, small bivalves, nematodes, amphipods, chironomid larvae, and polychaetes. Very little spatial and temporal variation in diet composition was observed. Main dietary differences were seen in East Bay which has often been cited as the primary nursery habitat due to its close proximity to the outflow of the Apalachicola River. Stable isotope analyses reveal that riverine influence on juvenile fish may be mediated through the sources of organic matter rather than prey species composition. It is important to understand how alluvial materials contribute to juvenile fish foraging in order to better inform policy makers on decisions regarding water diversions and upstream river modifications.

Determinants of feeding performance in marine-fish larvae, *Ralph G. Turingan, Matthew L. Wittenrich, Jessica L. Beck and Justin Anto, Department of Biological Sciences, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901*

Rationale: Over five decades of research on post-metamorphic (i.e., juvenile- and adult-life history stages) fishes have resulted in our current, substantial understanding of the functional morphology, mechanics, performance, diversity and evolution of fish-feeding systems. In contrast, we have a limited understanding of these features of the feeding systems in pre-metamorphic (i.e., post-hatch larva stage) fishes despite our knowledge that the environmental regimes that conspecific fishes experience are extremely different between the two life-history stages.

Response: In an attempt to contribute to our understanding of the feeding systems in marine-fish larvae, we present empirical evidence of the pre-metamorphic ontogeny of functional morphology, kinematics and feeding performance in several species of marine fishes. In addition, we test some hypotheses concerning fish feeding systems by contrasting key performance metrics between post-larval and larval marine-fish conspecifics.

Results: Our studies indicate that (1) earlier stage larvae feed on a restricted type of prey, whereas older larvae feed on more diverse prey types; (2) the prey-capture kinematics of fish larvae is stereotypical across prey types; (3) key functional-morphological components of the feeding mechanism become more complex and integrated as larva develops from hatching to metamorphosis; and (4) the scaling of key feeding-morphological metrics is different between pre-metamorphic and post-metamorphic fishes. This suggests that the functional-morphological determinants of feeding performance, as well as the pattern of morphology-performance relationships in juvenile and adult fishes may be different from those of larval conspecifics.

Beaches to Woodlands: A Diverse Marine Science Program in Santa Rosa County, Florida.
Christina M. Verlinde, UF/IFAS Florida Sea Grant Extension, Santa Rosa County, Florida

Rationale: Santa Rosa County includes lush natural resources such as rivers, creeks, estuaries, an oyster fishery, state lands, and the Gulf of Mexico. Residents, community leaders and visitors drive the marine programs and information in Santa Rosa County.

Response: Issues addressed by the agent include everything from educating hunters on proper deer carcass disposal to monitoring snorkeling reefs recently placed in the Santa Rosa Sound and Gulf of Mexico. Water quality monitoring, artificial reef program development, Living Shorelines education and coastal restoration projects are included in this diverse program. In addition, schools, 4-H, and the Navarre Beach Marine Science Station request programs on a regular basis. The Florida Master Naturalist Program is very popular in the county. FMN graduates have been dependable volunteers and contribute many volunteer hours to the program each year.

Results: With many issues being addressed, successes include: the local canoe club has reported a reduction in deer carcasses being left on stream banks, a Navarre Beach Marine Science Station has been established, five artificial reefs in the Gulf of Mexico have been depolyed, volunteer groups were engaged to assist with Deepwater Horizon Oil Spill recovery efforts, water quality data collection took place on five lakes with the Florida Lakewatch Program, approximately thirteen acres of oyster reef/salt marsh was restored in Blackwater Bay, 114 derelict crab traps were removed from near-shore habitats, and a workshop on boating and waterway management was organized.

Fishes that spawn on artificial reefs: management implications *Frederic E. Vose, University of Florida/IFAS-Levy County Extension; William Lindberg, University of Florida / IFAS, Fisheries & Aquatic Sciences; Thomas Frazer, University of Florida/School of Natural Resources & the Environment; David Snyder, Continental Shelf Associates International.*

Rationale: Artificial reef programs are quite successful in generating revenue for local economies (Swett, 2011), and are very popular with both the diving and angling communities. Similar to providing public access points through boat ramp infrastructure, new reef construction has an annual cost-benefit ratio of 10x or more annually, and is a big draw for visitors from other parts of Florida and southeastern states, particularly southern Georgia (Sidman et al., 2011).

Response: The construction of reefs, particularly when placed nearer to shore than existing natural reef areas, increase fishing access and harvest and should be viewed primarily as a fishing tool, not a conservation tool. Artificial reefs change fish behaviour and in some cases make fish more vulnerable during critical periods in life history. Some species are the Carolina wrens of the fish world, making poor choices for locations to build benthic nests or aggregating to spawn.

Results: Although there are some potential benefits from providing artificial structure, e.g. increased growth rates, in most cases the reefs provide readily available geopositions for anyone with inexpensive GPS equipment wanting to harvest fish. Sheepshead, gray triggerfish and Gulf flounder are all highly attracted to manmade structure and these species do not benefit biologically when targeted by divers and anglers during reproductive seasons. As typically used, artificial reefs enhance harvest for socio-economic management objectives, but do not necessarily enhance reef fisheries stocks, as a net effect of habitat functions.

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