

Director's Report: Restoring Resiliency, Protecting our Oceans & Coastlines (theme for 2015 FSUCML Open House)

Five years ago, the Deepwater Horizon Blow Out brought global attention to the Gulf of Mexico, and intense focus on the effects of the oil spill on biological diversity and the interconnected habitats extending between the coastline and the deep sea. We watched as some coastal habitats seemed to recover quickly while others in the deep sea remain affected even now, and we asked whether this was the worst thing that had ever happened in the Gulf. History quickly revealed that the oil spill has much competition for the number one spot, from overfishing, agricultural and industrial pollution, and habitat loss due to development and poor coastal management practices. The dead zone off Louisiana, the increasing levels of mercury in fish, and the erosion of wetlands even in the Florida Big Bend - a relatively undeveloped area - all affect the resiliency and health of the Gulf of Mexico ecosystem

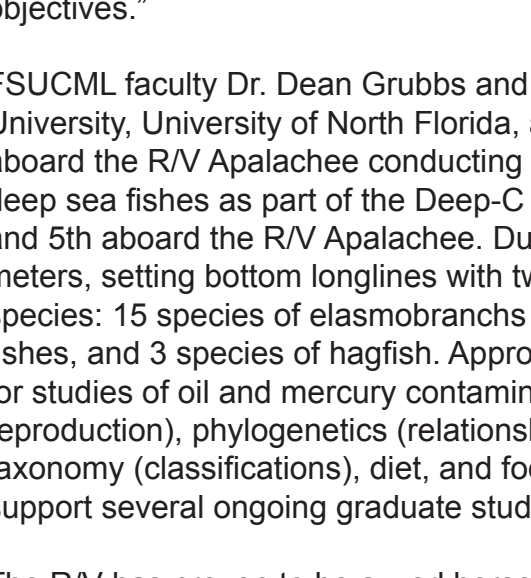
Resilience is the capacity of nature to absorb disturbance and still retain its basic structure and function. It is the cornerstone of sustainability. Systems that are biologically diverse are more resilient. Think of our local habitats -- seagrass meadows, oyster reefs, saltmarshes, and other wetlands that protect their inhabitants, retain sediments and dampen storm surge, filter the air and water of pollutants, and fix carbon, thereby helping to curtail carbon dioxide buildup in the atmosphere while capturing nutrients for plant growth. These highly productive, vulnerable systems are responsible for this entire suite of services operating beneath our very noses.

What we sometimes fail to recognize is that we humans are an integral part of the ecosystem. We are among the many beneficiaries of all the services that coastal and marine ecosystems have to offer, wholly dependent upon them for our survival, and largely responsible for their current condition. We bear the brunt of the effects that lost resilience imposes on natural capital and on human health and economies.

Active engagement in protecting our oceans and coastlines is something we all can do. We celebrate that ability and our scientific knowledge of the sea in our 2015 Open House. **Restoring Resiliency, Protecting Our Oceans & Coastlines.** Please join us on April 25th, 2015 for a day at the lab with family and friends.

Marine Operations: Supporting Research Across the University

R/V Apalachee Makes Waves in Research



The R/V Apalachee has been extremely busy. Since May, our flagship has completed over 90 days at sea and provided a platform for conducting research for the Florida State University Coastal and Marine Laboratory, The Deep-C Consortium, The Florida Fish and Wildlife Commission, and the National Oceanographic and Atmospheric Administration. Recent trips include four missions for FWC, four missions for NOAA, and three missions for Deep-C. These missions ran from four to eleven days each.

The FWC and NOAA researchers conduct offshore monitoring of reef fish in the Gulf. They use camera systems and chevron traps to observe collect reef fish in waters from 10 - 110 meters. "The Apalachee worked well for our sampling requirements," Sean Keenan, Marine Research Associate for the FWC said. "The vessel is well equipped

to deploy/retrieve our sampling gear and captains were willing to conduct 24-hour operations to improve our overall sampling efficiency. The vessel and FSU staff were willing to go the extra mile to accomplish our cruise objectives."

FSUCML faculty Dr. Dean Grubbs and Dr. Chip Cotton, along with graduate students from Florida State University, University of North Florida, and University of West Florida, recently returned from a 10-day cruise aboard the R/V Apalachee conducting research to investigate the effects of the Deepwater Horizon oil spill on deep sea fishes as part of the Deep-C Consortium. This was the 10th overall cruise for this research project and 5th aboard the R/V Apalachee. During the cruise, the team fished 38 stations at depths from 173 to 1860 meters, setting bottom longlines with two fish traps attached. The crew captured 343 fishes from 35 different species: 15 species of elasmobranchs (sharks, skates), 17 species of bony fishes, and 3 species of hagfish. Approximately 3000 samples were collected for studies of oil and mercury contamination, life histories (age, growth, reproduction), phylogenetics (relationships among groups of organisms) taxonomy (classifications), diet, and food webs. Most of these samples support several ongoing graduate student research projects.

The R/V has proven to be a workhorse for carrying out a wide array of scientific research, from dropping and retrieving underwater cameras and fish traps in shallow water to pulling large sharks from thousands of feet of seawater, the Apalachee has proven herself time and time again.

Captain Robbie Shakespeare and Second Captain Bobby Francis have done an amazing job maintaining and improving the vessel. Recent improvements include the installation of a new navigation system, the installation of new shelving in the dry lab, and major improvements to the vessel's hydraulic system.

While it has been a successful summer cruising season, Marine Operations is already looking towards the future to see how the R/V Apalachee can become even more productive on its future missions. The lab is exploring the possibility of installing a state-of-the-art weather station aboard the vessel. Data provided by this weather station could eventually become available to mariners in the northeastern Gulf of Mexico, an area that traditionally has limited access to such data. The lab is also looking into the possibility of acquiring a new winch and a CTD, an oceanographic instrument used to determine the conductivity, temperature, and depth of the ocean. These instruments will not only improve scientific interest in using the R/V Apalachee, but the data they generate will significantly assist scientists in conducting future research aboard the vessel.

Diving Into Science Training

This past summer, Marine Operations Manager, Jon Schneiderman, and dive technician, Sonja Bridges, conducted dive-related workshops for FSU faculty, staff, and students as well as for researchers from the Florida Fish and Wildlife Commission, the Florida Department of State's Archeology Division, the National Parks Service, and the National Oceanographic and Atmospheric Administration.

Because scientific divers must be prepared for both in-water and out-of-water emergencies, one of the more popular workshops FSUCML offers is training in CPR, First Aid, and Automated External Defibrillation. Students are provided with intense, hands on training to thoroughly prepare them for diving emergencies. These workshops were conducted at both the lab as well as several locations on the main campus.

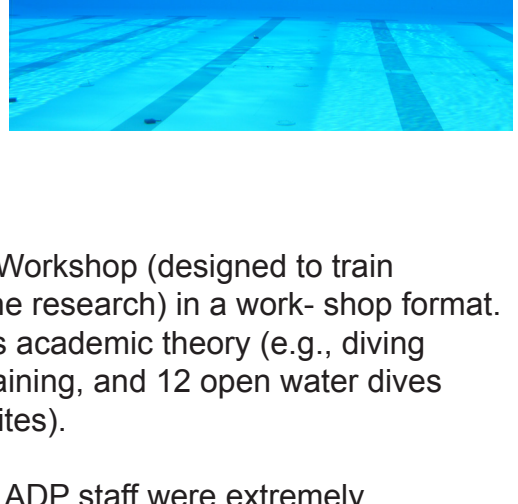
This summer, the Dive Program offered an Introduction to Scientific Diving Workshop (designed to train scientists how to safely and effectively use diving as a tool to conduct marine research) in a work-shop format. This intensive workshop (over 100 hours of training all in two weeks) covers academic theory (e.g., diving physics, physiology, decompression theory, accident management), pool training, and 12 open water dives (using Cherokee Sink in Wakulla County and Panama City Beach as dive sites).

Ryan McKenzie, a graduate student in the class, noted that, "The FSUCML ADP staff were extremely knowledgeable and the training I received has equipped me with a diverse set of skills that can be applied to my research. Scientific diving will be a key component to my master's research conducting behavioral observations of reef fishes."



ADP will offer a for-credit graduate level course in Science Diving during the spring semester and non-credit workshops in May and August.

Congratulations to Austin, Anthony, and Ryan for completing their Scientific Diver Training! (pictured left)



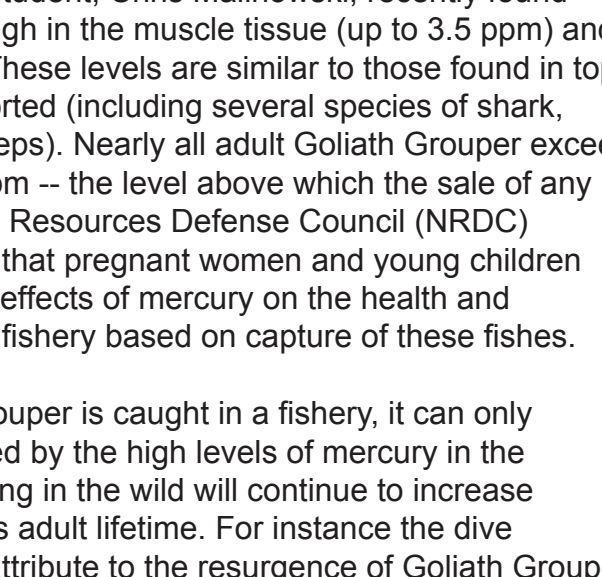
Back from the brink: Atlantic Goliath Grouper recovery in the southeastern U.S.

By Dr. Chris Koenig

The Atlantic Goliath Grouper (*Epinephelus itajara*), a once abundant species in the southeastern U.S. (especially in Florida), experienced first slow and then rapid declines that started over 100 years ago. Water management projects in South Florida dating back to the early 1900s initiated the decline by reducing the quality and coverage of mangrove habitat essential as nursery habitat for the juvenile stage of this fish. Intense fishing pressure that started in the 1980s enhanced the decline dramatically. By the late 1980s, the decline was so obvious that a petition to the Gulf of Mexico Fishery Management Council (FMC) for a fishing moratorium from a single grouper fisherman met with virtually no opposition. The South Atlantic FMC and the Caribbean FMC followed suit, closing the fishery throughout the region in 1990. Goliath Grouper continue to be listed as over-fished in the United States, although the population has made a continuous recovery over the last 24 years.

High quality mangroves habitat off southwest Florida, particularly in the Ten Thousand Islands, is key to the ongoing recovery of Goliath Grouper populations. This extensive habitat, which borders on and derives relatively pristine water from the Big Cypress Swamp, provides significant habitat for juveniles during their 5-year estuarine sojourn. Most of the mangrove habitat of South Florida, however, has been destroyed by development or has such low and variable water quality that its value as nursery habitat is nil.

Low-relief natural reefs and high-relief artificial reefs that dot the east and west Florida shelves, provide the architectural complexity that Goliath Grouper and many other reef fish seek. Goliath Grouper enhance the structural complexity of these reefs by excavating sediment from around the reef base, and in so doing, increase the abundance and diversity of other resident species. Artificial habitat, which is continually expanding as the Florida Fish and Wildlife Commission deploy more structures designed to enhance local fishing opportunities, are preferred by adult Goliath Grouper, and used as spawning sites off southeast and southwest Florida. Despite the expanding availability of artificial reef habitat, it is the diminishing mangrove habitat that presents a severe bottleneck to the full recovery of Goliath Grouper.



Mercurial views on a viable fishery--Adult Goliath Grouper in the Gulf of Mexico have heavy mercury contamination in both muscle and liver tissues. FSUCML doctoral student, Chris Malinowski, recently found mercury contamination in Atlantic populations that are at least as high in the muscle tissue (up to 3.5 ppm) and much higher in the liver (35 ppm in Atlantic, ~25 ppm in the Gulf). These levels are similar to those found in top level predators, which have the highest levels of mercury ever reported (including several species of shark, Swordfish *Xiphias gladius*, and Tilefish *Lopholatilus chamaeleonticeps*). Nearly all adult Goliath Grouper exceed the US Food and Drug Administration's (FDA) action level of 1.0 ppm -- the level above which the sale of any fish species is prohibited-- and far exceed the level that the Natural Resources Defense Council (NRDC) considers "very high." Indeed, at 0.5 ppm, the NRDC recommends that pregnant women and young children avoid these fishes in their diet because of the well-known negative effects of mercury on the health and neurological development of humans. It is hard to imagine a viable fishery based on capture of these fishes.

Dead or Alive! Revenues to Florida's Economy-- If a Goliath Grouper is caught in a fishery, it can only generate the market value of that one fish one time (a value deflated by the high levels of mercury in the tissues). However, the economic return from that same fish persisting in the wild will continue to increase because divers can see and photograph it repeatedly throughout its adult lifetime. For instance the dive industry reports tripling revenues over the last 5 years which they attribute to the resurgence of Goliath Grouper on offshore reefs. Divers from all over the world come to see the spectacle of scores of adult Goliath Grouper aggregating on reefs, with each fish exceeding 300-500 pounds. It is clear that maximum benefit to the fish, to Florida's economy, and to other reef fish (because of habitat-enhancing behaviors of Goliath Grouper) are gained by allowing Goliath Grouper to recover to its natural equilibrium level.

Focus on Students and their Research

New Graduate Students



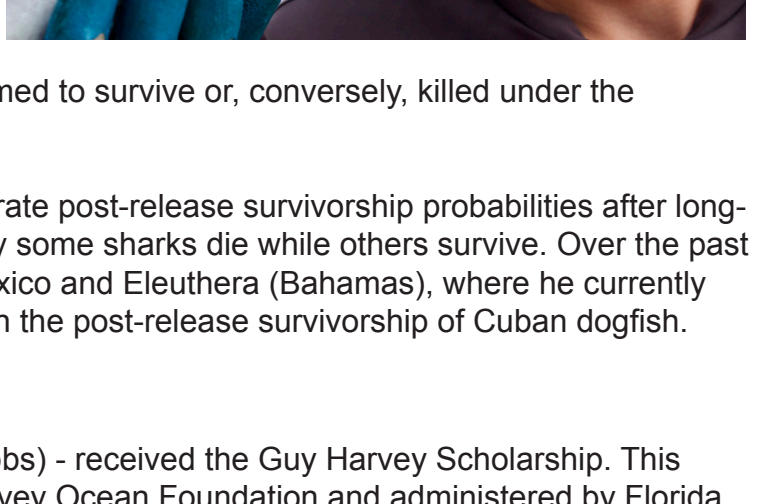
The FSUCML is excited to welcome two new graduate students in the Department of Earth Ocean and Atmospheric Science this year, Austin Heil and Ryan McKenzie! Austin (Advisor, Dr. Sandra Brooke), joins us after being a technician in the Brooke Laboratory. His research focus is understanding how reef fish -- specifically juvenile Gag Grouper (*Mycteroperca microlepis*) -- use live-bottom hard grounds as intermediate habitats, especially related to comparing their diets on artificial and natural reefs. Ryan (Advisor, Dr. Felicia Coleman) joins us after working with the Florida Fish and Wildlife Conservation Commission on largemouth bass (*Micropterus salmoides*) research. He will be investigating the social and environmental factors affecting the

population structure of Black Sea Bass, *Centropristis striata*, in local shallow reef habitats especially as these behaviors effect sex change in this protogynous fish.

We look forward to hearing from these grad students next year to learn more about their research.

Grad Spotlight: Brendan Talwar

As many coastal fish stocks have declined and technology has advanced, industrial fishing fleets have turned their attention to the deep sea. Many deep sea fishes are slow growing, mature late, and have few offspring, making them highly vulnerable to exploitation and risk of extinction. Deep sea sharks are at the extreme end of this spectrum, with gulper sharks often cited as one of the least resilient species in all of our oceans. Despite this concern, both the gulper shark *Cetorhynchus* sp. and the Cuban dogfish *Squalus cubensis* are common bycatch (non-target) species in deep water longline and trawl fisheries that operate below 200m. They often experience high mortality rates when pulled to the surface due to severe temperature, pressure, and light related stress. Those still alive at the boat are either released and presumed to survive or, conversely, killed under the assumption that none will survive after release.

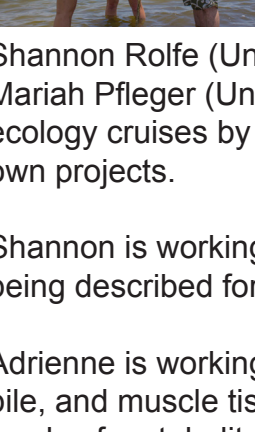


Brendan's primary research goals are 1) to estimate accurate post-release survivorship probabilities after long-line capture in the tropics, and 2) to better understand why some sharks die while others survive. Over the past few months, Brendan has collected data in the Gulf of Mexico and Eleuthera (Bahamas), where he currently teaches a high school semester abroad course focused on the post-release survivorship of Cuban dogfish.

Awards & Degrees



Bianca Prohaska (Advisor Dr. D Grubbs) - received the Guy Harvey Scholarship. This scholarship is funded by the Guy Harvey Ocean Foundation and administered by Florida Sea Grant. There were over 50 applicants this year. This scholarship will support her research, "Reproductive and Stress Physiology of Deep Demersal Sharks in the Northeastern Gulf of Mexico."



Bob Ellis (Advisor Dr. F Coleman) - received the John A. Knauss Policy Fellowship. This fellowship is sponsored by the National Oceanic and Atmospheric Administration's National Sea Grant College Program. It gives graduate students the opportunity to engage in the legislative process and learn how science and policy interact in the area of ocean, coastal, and Great Lakes resources and is in the national policy decisions affecting those resources. Bob will therefore be moving to D.C. in February for this opportunity.

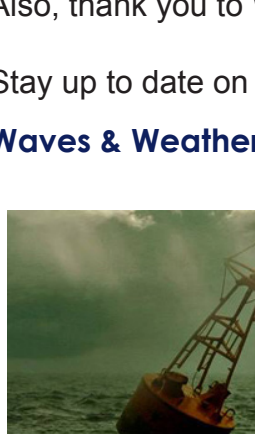
While Others Complete Their Degrees

A special congratulations to two Master's students who finished their degrees in April this year. Cheston Peterson (Advisor Dr. Grubbs) studied the community structure and trophic ecology of sharks and large bony fishes in the Big Bend region of Florida, perhaps the least developed part of the state. He will continue this project for his doctoral work under Dr. Grubbs's tutelage. Travis Richards (Advisors Dr. Grubbs and Dr. Kevin Craig, NOAA) studied the trophic ecology of Spotted Seatrout (*Cynoscion nebulosus*) in Apalachicola Bay. He is now a research assistant at the University of Georgia where he will study the foraging ecology of Salmon fishes.

Visiting Student Researchers



Robyn Zerebecki (University of British Columbia) started at the FSUCML as a technician years ago, and loved it so much that she returned to conduct her graduate work studying local saltmarshes to determine the process by which vegetative stems sprout new, genetically identical plants. She can then assess how stressors, such as a consumer marsh periwinkle, affect the plant productivity.



Postica Levine (Northeastern University) is working on her graduate research in partnership with entomological associate Dr. Stephen Gosnell on oyster aquaculture research. She examined the effects of the presence of predators for varying amounts of time on oyster growth, which is important to understand in order to combat depleting oyster populations.

Shannon Rolfe (University of Central Florida), Arianne Leary (University of North Florida), Rebecca Varney, and Mariah Pfleger (University of West Florida) assisted Dr. Chip Cotton and Dr. Dean Grubbs on Deep-C fish ecology cruises by helping to identify specimens and collecting samples. Each student is also working on their own projects.

Shannon is working on characterizing reproductive biology of 2 species of dogfish (*Squalus*), one of which is being described for the first time.

Adrienne is working on toxicology studies in different deep sea species over time. She is looking at blood, liver, bile, and muscle tissue samples of species including sharks, dogfishes, and other animals to determine what levels of metabolites (substances that the body turns toxic chemicals into so that the animal can process it) are occurring over time.

Rebecca is doing population genetics of hagfish. She had confirmed the validity of three different species of hagfish in the Gulf of Mexico.

Mariah has worked with hagfish tissue samples, looking at a species found in the Gulf of Mexico and a species found near Japan. She has determined, through genetics and morphology studies, that these are in fact two different species of hagfish. The species found in the Gulf of Mexico will now need to be named.



Marisano James (University of California, Davis) back for a 2nd year, visiting the lab in search of the elusive insect parasite, Strepsiptera. Marisano studies how the eyes of these tiny organisms react to various stimuli, and has caught and reared wasps, stored in salt marshes at the crack of dawn, and stayed awake for nights on end, all to collect Strepsiptera for his research.

Outreach

New Kiosks at the FSUCML



The FSU Coastal & Marine Laboratory (FSUCML) is excited to announce the arrival in the first in a series of kiosks about the habitats of Apalachee Bay. Facing the bay, the first kiosks introduces visitors to some of the local submerged marine habitats, including seagrass meadows and hardbottom reefs, stressing ecosystem services they provide.

Special thanks to the Friends of the Lab for the generous donations that made these kiosks possible. Want to become a Friend of the Lab? Click here for more information.

Also, thank you to Wilderness Graphics (Tallahassee, FL) for designing, building, and installing the kiosks.

Stay up to date on the kiosks on [Facebook](#).

Waves & Weather

If you haven't already seen it, check out the new FSUCML weather station. This station is one of many put in place in the region by UCOMPASS to encourage STEM learning among students of all ages. Data can be downloaded to track changes in pressure, air and water temperature, solar radiation, and many other physical measures. There is also a ZapMap, that displays locations of lightning strikes as they happen in North America.

Live webcams at the lab overlook the boat basin and Apalachee Bay at one point and provide a direct shot of the sky at another.

To see data streaming from the FSUCML Weather Station or find other data important for folks working or playing in the water in our area, click here.

Special thanks to Ed Mansouri and WeatherSTEM for installing this exciting new weather station!

FSUCML on Display

The Apalachicola National Estuarine Research Reserve is hosting a marvelous display that highlights the ongoing research conducted by FSUCML faculty and graduate students, ranging from deep sea corals, to goliath grouper, lionfish, and coastal sharks.

Want to learn more about the critters found in marine habitats in the area? Check out FSUCML's display of "Fast Facts" on deep-sea sharks, oysters, river otters, and more!

The display also features a showing of Saving Sawfish, an episode of the Changing Seas public television series produced by WPBT2 in Miami, which includes research by FSUCML's Dr. Dean Grubbs.

Be sure to stop by the Reserve and check out the display, available until February, 2015.

Become a Friend of the Lab!

With the support of the marine operations group and all the other staff at the FSUCML, the research conducted by faculty, grad students, and undergraduates continues to expand in novel areas on critically important topics, from the shoreline to the deep sea. What does this mean to you? It means that there are even more ways that you can contribute to FSUCML's success, whether you want to contribute funds or your time. Private support of any kind provides us with tremendous flexibility to respond rapidly to exciting new opportunities and to plan for long-term development. So please consider joining a group of dedicated people who support our mission.

Friends of the Lab
How can you help? Contact us about volunteering with the staff or researchers. You can make private tax-deductible donations to the MARINE LAB FUND (choose from drop-down) on the Florida State University Foundation's secure website [here](#). By donating \$20 or more, you can receive as a gift an FSUCML mug or a t-shirt (we'll need your size) If you have any questions, please contact FSUCML at 850-697-4095 or fsucml@fsu.edu.

The Florida State University Coastal & Marine Laboratory
3618 Coastal Highway 98, St. Teresa, Florida 32358
www.marinelab.fsu.edu (850) 697-4120