

Fall 2012

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NSU Oceanographic Center

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Currents



A NEWSLETTER FROM NOVA SOUTHEASTERN UNIVERSITY'S OCEANOGRAPHIC CENTER

Oceanographic Center Celebrates Opening of Center of Excellence

In this special issue of Nova Southeastern University Oceanographic Center's (NSU OC) *Currents* newsletter, we are commemorating the opening of our new research facility: The **Center of Excellence for Coral Reef Ecosystems Research** (CoE CRER).

The 86,000-square-foot CoE CRER has been made possible in part by a grant from the U.S. Department of Commerce's National Institute of Standards and Technology (NIST). The grant of \$15 million was more than matched by NSU and will provide urgently needed state-of-the-art research facilities while expanding scientific inquiry.

Research in this new multidisciplinary research building is addressing national and international priorities in coral reef research in five themes: 1) Impacts of global and local stressors together with restoration; 2) Geospatial assessment and mapping; 3) Deep sea coral reefs and biodiversity; 4) Genetic and genomic connectivity; and 5) Hydrodynamics.

Coral reef ecosystems throughout the world are extremely valuable biologically, environmentally, and economically. Florida coral reefs represent up to 84 percent of the area of coral reefs in the United States, contributing more than \$6 billion in revenue and 71,000 jobs annually in South Florida alone. These exquisite, living natural resources have been in existence for more than 215 million years. They provide employment, food, recreation, biodiversity, habitat, chemicals for human health, and coastal protection. Millions of tourists and residents enjoy SCUBA diving, snorkeling, and fishing on coral reefs—activities that provide substantial income for residents of coastal communities and the surrounding areas.

Unfortunately, the coral reefs of Florida, the nation, and the world are under extreme threat from both global and



The Center of Excellence for Coral Reef Ecosystems Research

local stressors. Research is urgently needed to improve understanding, management, and conservation.

As one of the National Oceanic and Atmospheric Administration's (NOAA's) external Coral Reef Institute partners, the NSU OC National Coral Reef Institute (NCRI) has long supported NOAA's mission by providing outstanding scientific research to support federal, state, and local management and conservation in providing local, regional, national, and international research products that can offer solutions to the coral reef crisis.

The CoE CRER will be the only research facility in the nation dedicated entirely to coral reef science. Major goals include fundamental research to find management and conservation solutions to pressing coral reef issues. Facilities include offices; laboratories; collaboration, research training, and fieldwork staging areas; SCUBA support areas; and sea water purification

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Oceanographic Center Celebrates Opening of Center of Excellence

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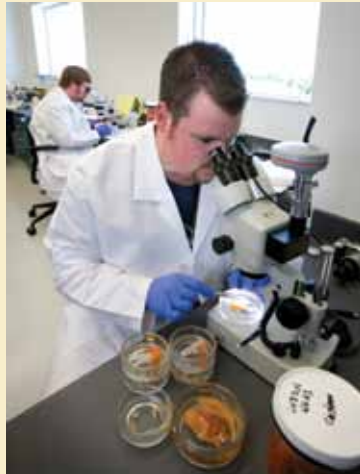


and distribution to inside and outside laboratories. The research marina has been completely renovated with new seawalls and dockage facilities.

The Oceanographic Center is now designed for high-quality and impactful research and education by current and new faculty members, researchers, visiting scientists, post-doctoral fellows, and graduate students. Students from around the world participate in our Ph.D. program; M.S. degrees in Marine Biology, Coastal Zone Management, Marine Environmental Sciences, and Biological Sciences; and an M.A. in Marine and Coastal Studies.

We are proud of our wonderful new facilities and are very thankful for the tremendous support that the center has received from NSU, NIST, NOAA, the state of Florida, Broward County, private industries, and our valued donors!

As part of this special edition of Currents, we are focusing on various activities and parts of the Oceanographic Center, including news, the various labs, fieldwork, and community service. 🐟





In the News

OC Spotlighted for Coral Transplant Work

This March, Oceanographic Center researchers and students (Ph.D. candidate **Abby Renegar** and M.S. student **Keri O'Neil**) organized the delicate operation of transplanting 28 healthy, laboratory-raised staghorn coral colonies onto a threatened reef off the coast of Fort Lauderdale. Monthly monitoring has shown that the transplanted colonies are growing well and have not experienced any mortality or evident disease.

Such research is important because staghorn and elkhorn corals were the first coral species to be listed as threatened under the federal Endangered Species Act. These species have been particularly hard hit, with the South Florida and Caribbean Reef populations declining by 90 percent.

This work is a corollary to our offshore coral reef "nurseries" program spearheaded by NSU OC faculty member David Gilliam, Ph.D., and Ph.D. candidate Liz Larson. Located in Broward County, these offshore nurseries have provided more than 1,000 transplants to damaged areas.

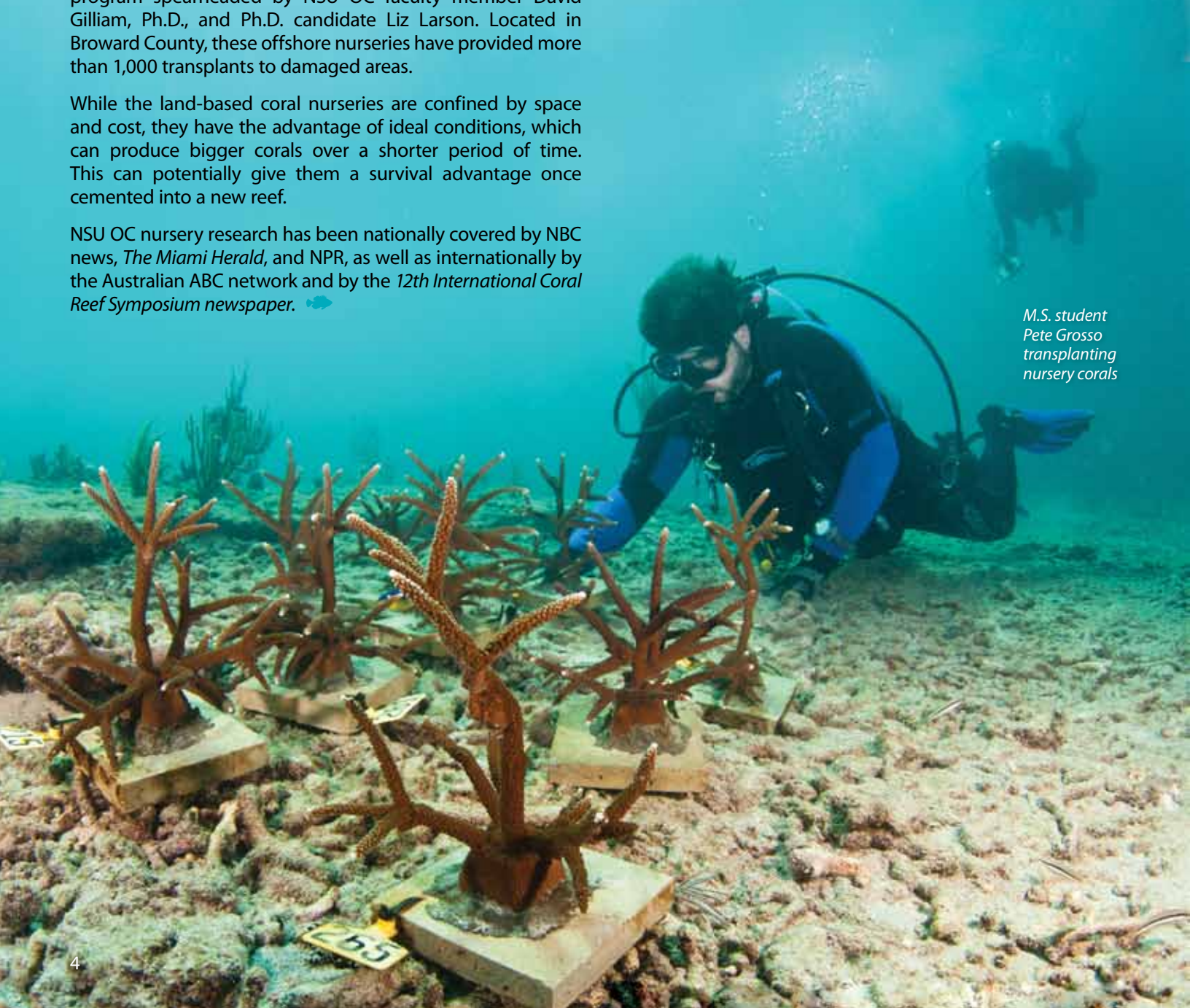
While the land-based coral nurseries are confined by space and cost, they have the advantage of ideal conditions, which can produce bigger corals over a shorter period of time. This can potentially give them a survival advantage once cemented into a new reef.

NSU OC nursery research has been nationally covered by NBC news, *The Miami Herald*, and NPR, as well as internationally by the Australian ABC network and by the *12th International Coral Reef Symposium newspaper*. 🐟



Photos courtesy of Kirk Kilfoyle

M.S. students Cameron Baxley and Pete Grosso transplanting corals



M.S. student Pete Grosso transplanting nursery corals



Mahmood Shivji, Ph.D.

Fish Tested for Authenticity in Restaurants

This year, **Mahmood Shivji, Ph.D.**, OC professor, advised and worked with international ocean conservation organization, OCEANA. This prominent NGO sampled 61 Florida seafood businesses. The results showed that there was a one in three chance of a customer actually getting the fish that he or she ordered.

“Red Snapper is almost always substituted for something else well over 80 percent of the time,” states Shivji. “It is out-and-out consumer fraud.” There are potential health risks in these substitutions too, since substitutes are often contaminated with pollutants.

Fish substitutions were found in all levels of restaurants. While there are regulations to protect consumers, there is little oversight. As part of this investigation, ABC news reported that less than 0.001 percent of all inspections cover fraudulent labeling.

Center of Excellence Wins Building Award

Moss & Associates has won the Design-Build Institute of America’s Best Overall award in the Education Category in Florida for the construction of the OC’s Center of Excellence for Coral Reef Ecosystems Research facility.

The Design-Build Institute of America is the only organization that defines, teaches, and promotes best practices in design-build. Design-build is an integrated approach that delivers design and construction services under one contract with a single point of responsibility.

Oceanographic Center Studies Swordfish in Florida Straits

The Florida Straits, located between the Florida Keys and Cuba and between Florida and the Bahamas, are the ideal breeding ground for swordfish in North America. Since 2001, this fishery has been highly regulated after overfishing decimated the swordfish population. One practice banned in the Straits was “long line fishing”, where 1,000 hooks on a single line were used to catch large numbers of fish. Currently, juvenile swordfish measuring 47 inches or less must be released.


OC M.S. student **Jenny Fenton**, with Research Scientist **David Kerstetter, Ph.D.**, tagged, caught, and released juvenile swordfish and tracked their survival rates. Of the 16 fish caught and released, five died within a day. Nine survived without problems.

With the federal wildlife authorities considering relating some of the swordfish restrictions, Fenton’s findings are important to maintaining this fishery. One potential decision is whether or not to allow recreational fishermen to sell their catches commercially. While the local swordfish stocks have returned to healthier levels, catch-and-release fishing has resulted in some juvenile swordfish deaths.



Swordfish

To allow recreational fishermen to sell their catch could negatively impact this fishery. Fenton states, “If this happens, the number of juvenile swordfish caught could skyrocket in the Florida Straits.”

This study was sponsored by the NOAA Fisheries Service. 

In the Lab

STONY CORAL LABORATORY

Researcher: Richard Dodge, Ph.D.

Associated Scientist: Kevin Helmle, Ph.D.

"With the guidance that the present is key to the past, coral skeletons and reefs are investigated to better understand the history of past growth and construction that can inform projections of future reef and related changes."

Research Focus: Sclerochronology is the study of the time-dependent growth of the coral skeleton for reconstruction of past environmental and climate histories of the ocean.

Research Activities:

- analyses of coral skeletal growth
- growth chronology construction and study for historical reconstruction
- structure of coral reefs
- extension, density, and calcification of coral skeletons
- reef geology and time history
- elevated coral reefs
- ecosystem services and habitat equivalency analysis
- coral reef restoration



Core and x-radiograph of 300-year-old reef building coral sampled off Hollywood, Florida. This specimen tells the history of changing sea conditions, especially the drainage of the everglades. (Left) X-radiograph of slab revealing annual density bands. These have been dated with reference to the collection date. (right) Slab taken from a core sample of a coral skeleton.

DEEP SEA BIOLOGY LABORATORY

Researcher: Tamara Frank, Ph.D.

"What happens in the deep sea affects everything that happens on the surface, and what happens on the surface affects what happens in the deep sea. You cannot influence one part of the ecosystem without impacting the global ecosystem."

Research Focus: Research involves visual physiology of deep-sea animals and zooplankton ecology, with emphasis on effects of down welling light on their daytime distribution patterns and vertical migrations.



Phronima sedenteria, a deep-sea crustacean that uses biological light guides to help it see



The Johnson-Sea-Link submersible back on the surface after a dive to 800 m to collect deep-sea animals

Research Activities:

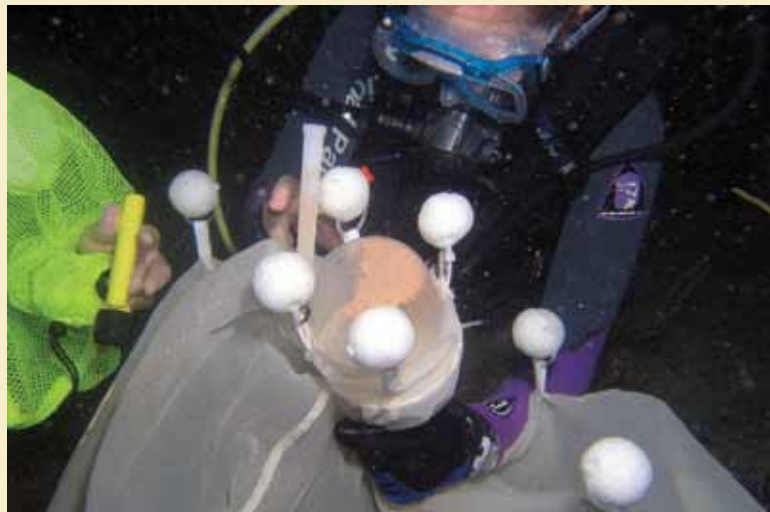
- examination of plankton biodiversity, particularly over coral and other hard-bottom communities
- visual physiology
- deep-sea ecosystems
- bioluminescence
- vertical migrations of macrozooplankton and micronekton
- effects of oil spills on deep-sea crustaceans

CORAL HISTOLOGY LABORATORY

Researcher: D. Abigail Renegar, M.S., Ph.D. candidate

"Histology is an important tool in many aspects of marine science, including disease diagnosis, reproduction, and the impacts of environmental change on physiology. Histological research is a key component in the assessment of coral health and resilience, allowing evaluation of the effects of environmental change on coral tissue structure, composition, and function."

Research Focus: Histology is the microscopic structural study of tissues and cells. This laboratory uses histological and histopathological techniques to study and assess cellular morphology as it relates to function in multiple aspects of coral biology.



Spawning in Acropora cervicornis

ICHTHYOLOGY LABORATORY

Researcher: Richard Spieler, Ph.D.

"Numbers of fish species and fish populations are in decline locally and globally, yet fish are extremely important and are key biologic, ecologic, and economic components of marine ecosystems all over the world. In order to best understand, conserve, and manage fish, it is critical to gain the most complete knowledge of the resources. The work of this laboratory involves the study of many aspects of important fish species, both here in Florida and internationally."

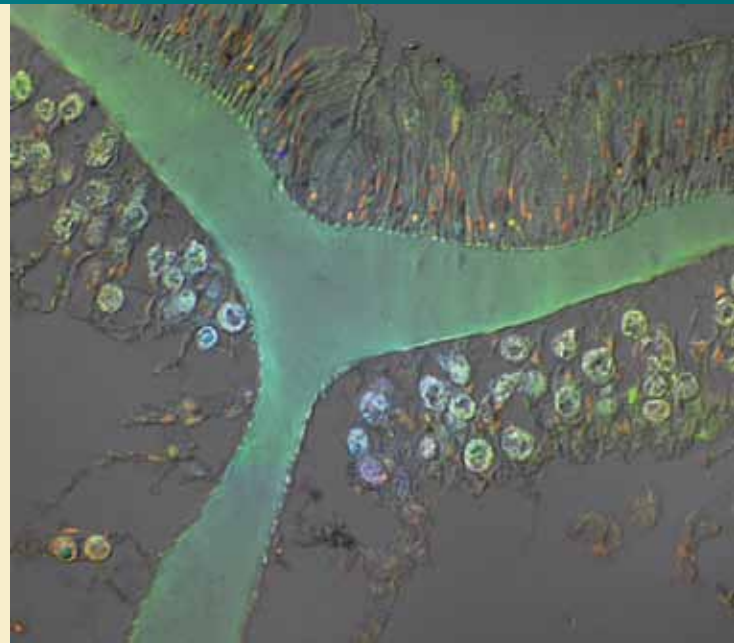
Research Focus: Ichthyology involves the general field of fish biology. Research here covers both basic and applied aspects of the diverse fields of anatomy, physiology, ecology, and natural history of many fish with emphasis on those that depend on coral reefs.



Researchers monitoring fish populations on "reef balls"



Nassau grouper (Epinephelus striatus)



Longitudinal section of Montastraea cavernosa

Research Activities:

- qualitative and quantitative evaluation of coral cells and tissues
- assessment of coral health and reproductive status
- prediction of coral spawning events
- examination of the effects of environmental stress and change on the structure, composition, and function of coral tissues and cells
- study of coral diseases and the presence of pathogens or parasites



Artificial reef construction for deployment in the Republic of Palau in the western Pacific to compare settlement and growth on introduced substrates

Research Activities:

- vascular anatomy of fishes
- field assessment of fish diversity and abundance
- neurobiology and behavior of fishes
- yellow stingray biology
- artificial reef structure and function
- coral reef ecosystem restoration

MICROBIOLOGY AND GENETICS LABORATORY

Researcher: Jose Lopez, Ph.D.

"Modern genetics permits fundamental descriptions of life at the molecular level, explains the basis of biodiversity, and can help develop potential sentinels (bioindicators)—such as marine sponges and micro-organisms—as indicators of environmental change."

Research Focus: Applying and advancing modern biotechnology and genomic (complete hereditary material) sciences for a better understanding of marine organisms and their functions.

Research Activities:

- evaluating and developing sponges as ocean sentinels (bioindicators) for the effects of stresses, including oil and chemical oil dispersants applied after oil-spill accidents, such as the Deepwater Horizon oil spill
- applying advanced biotechnology, molecular genetics, and computational data analysis (bioinformatics) methods to describe basic marine organismal functions
- assessing ecological roles of micro-organisms in marine habitats
- investigating population genetics of marine sponges
- placing sponges on the Tree of Life with novel genetic data
- performing "Next Generation" DNA sequence analysis of marine invertebrate organisms

PHYSICAL OCEANOGRAPHY LABORATORY

Researcher: Alexander Soloviev, Ph.D.

"Understanding ocean physics provides marine biologists, geologists, and ocean engineers with crucial details required to answer questions relating to environmental, societal, and defense issues."

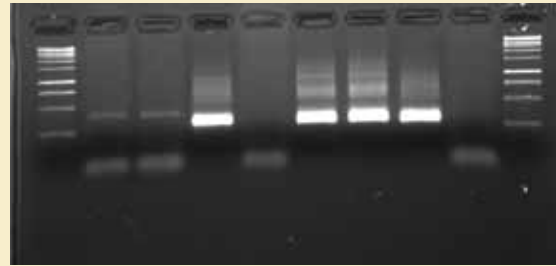
Research Focus: Solution-oriented, basic and applied research in ocean dynamics, thermodynamics, and air-sea interactions in collaboration with oceanographic organizations in the United States, Germany, Canada, and South Korea. The lab is involved in explorations including new generation synthetic aperture radar (SAR) satellites, three dimensional sonar technology, and high-resolution numerical models.



Getting ready for an experiment during synthetic aperture radar (SAR) satellite overpass



Part of the team involved in studying the effects of Deepwater Horizon oil and dispersant on marine sponges. From left to right: M.S. student Emily Smith; postdoctoral scientist Marie Cuvelier; and Associate Professor Jose Lopez, Ph.D.



Standard agarose gel showing different DNA bands (PCR products) being size separated via electrophoresis for further purification and DNA sequencing



Xestospongia sponge, a common species on local reefs



Associate Professor Alexander Soloviev, Ph.D., with state-of-the-art acoustic Doppler current profiler (ADCP) mooring developed and maintained by the Physical Oceanography Lab in the Florida Straits since January 2007

Research Activities:

- structure and dynamics of the near-surface layer of the ocean
- high-resolution numerical modeling of fine-scale oceanic features
- natural and artificial processes in the upper ocean from space
- air-sea interface under hurricane conditions and dispersion of oil spills
- carbon dioxide (CO₂) uptake by the oceans
- coastal ocean circulation and coral reef hydrodynamics

REPRODUCTION AND EVOLUTION LABORATORY

Researcher: Nicole Fogarty, Ph.D.

"Sperm are infinitesimally small; it is truly remarkable that they are able to find tiny eggs in a vast ocean. Fertilization success in the sea is especially astonishing when considering the recent dramatic declines in the density of many broadcast spawners."

Research Focus: The initial step to reproductive success is fertilization, yet we know little about this life history stage in most marine invertebrates. Our research focuses on ecological and evolutionary questions related to the fertilization success of broadcast spawners. We are particularly interested in how density-dependent mechanisms of reproduction will influence invertebrate population recovery, as well as spawning synchrony, reproductive isolation, and speciation.



*Nicole Fogarty, Ph.D.,
preparing coral samples*



*Acroporid larva looking for a place to settle
on crustose coralline algae next to recently
metamorphosed corals*

Research Activities:

- invertebrate fertilization and larval ecology
- density dependent reproductive isolating barriers
- allee effects on invertebrate reproduction
- coral reproduction isolation and speciation
- Caribbean *acroporid* coral hybridization dynamics
- coral demographics
- pheromones involved in coral spawning synchrony
- exogenous hormones and pollutants on invertebrate reproduction
- gamete chemoattractants
- coral mapping using GIS
- coral clonal structure using microsatellite markers
- coral morphometrics

SYSTEMS BIOLOGY AND GEOLOGY LABORATORY

Researcher: Bernard Riegl, Ph.D.

"Climate change has adversely impacted coral reefs in a variety of ways. Our research investigates coral stress and resilience to identify best pathways for reef survivorship in an uncertain future."

Research Focus: An interdisciplinary approach to the systems biology of coral reefs in response to past and future global and other changes.



Biology meets geology.

Research Activities:

- coral reef geology
- population dynamics of reef organisms
- forecasting of reef trajectories
- hydrographic surveying particularly sonar-based seafloor discrimination
- integrating optical remote-sensing to provide high-resolution maps of the seafloor
- coastal zone management



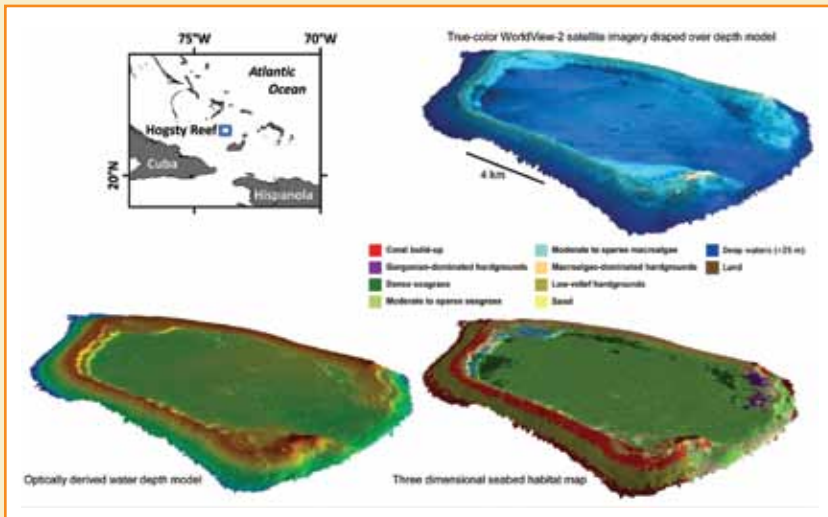
*Professor Bernhard Riegl, Ph.D.,
maintaining hydrographic
survey hardware and software
built by the laboratory*

REMOTE SENSING AND GIS LABORATORY

Researcher: Sam Purkis, Ph.D.

"Mapping the extent and status of coral reefs is a necessary precursor to planning for their protection. In the remotest reaches of the ocean, as on our doorstep, we must know the location of our resources if we are to conserve them. A global framework for conservation is critical and can be obtained using current earth observation technology."

Research Focus: The lab undertakes projects based around the theme of using remote sensing to monitor coral reef systems. The group has worked extensively in the Middle East and the Indian, Atlantic, and Pacific Oceans and endeavors to fuse observations made from space, with ecological observations made on the ground, in order to unravel the dynamics of coral habitats at reef-scale.



Bathymetry and habitat maps for Hogsty Reef, southern Bahamas. In collaboration with the Khaled bin Sultan Living Oceans Foundation



Sam Purkis, Ph.D., associate professor, principal investigator in the Remote Sensing and GIS Lab

Research Activities:

- regional-scale assessment of coral reefs
- marine spatial planning
- ocean conservation
- space and airborne remote sensing
- comparative sedimentology (the present is key to the past)
- numerical simulation
- geophysics
- marine and petroleum geology

CONSERVATION BIOLOGY AND GENETICS LABORATORY

Researcher: Mahmood Shivji, Ph.D.

"The proper function of oceans is based on a network of intricate interactions among its species and their environments. Understanding these interactions and conserving these species, especially top predators, is essential for maintaining healthy ocean ecosystems"

Research Focus: Conservation biology is an interdisciplinary science that applies field and genetic research methods to the understanding, conservation, and management of marine species.



Professor Mahmood Shivji, Ph.D., performing surgery on a tiger shark to insert an acoustic tag



M.S. student Teagan Gray conducting DNA analysis of shark fin samples for law enforcement

Research Activities:

- shark, billfish, and coral reef fish conservation biology and ecology
- shark and billfish migration patterns
- coral reef ecosystem connectivity and biodiversity
- DNA forensics for fish identification and fisheries law enforcement

CORAL REEF RESTORATION ASSESSMENT AND MONITORING LAB (CRRAM)

Researcher: David Gilliam, Ph.D.

“The protection and conservation of coral reef ecosystems will only advance through strong collaboration among coral reef scientists and local, state, and federal resource managers.”

Research Focus: The CRRAM lab focuses on coral reef ecology with an emphasis on restoration, assessment, and monitoring. Research includes investigating the ecology, restoration, and conservation of staghorn coral (*Acropora cervicornis*) populations. The lab has a strong resource-management focus and works closely with local, state, and federal agency resource managers.



*Ph.D. candidate Liz Larson measuring the growth and recording the health of a staghorn coral (*Acropora cervicornis*) colony, an ESA-listed threatened species*

Research Activities:

- studying the basic ecology of staghorn and other corals
- evaluating threats to coral reefs and their communities
- monitoring coral reef health
- conducting reef damage recovery and restoration projects
- investigating methods to improve restoration success

Park researchers with NSU research scientist Brian Walker, Ph.D. (standing far left); Assistant Professor Dave Gilliam, Ph.D. (seated, left); Ph.D. candidate Liz Larson (center); and M.S. students Stephanie Bush (seated, right) and Mauricio Lopez-Padierna (seated, far right) working in Veracruz, Mexico, assisting the Parque Nacional System Arrecifal Veracruzano with coral reef assessment studies.



CORAL RESTORATION LABORATORY

Dean: Richard Dodge, Ph.D.

“Local and global degradation of coral reefs necessitates research to better identify causes of stress and to develop methods for sound restoration. Understanding the effects of environmental change and anthropogenic stressors on corals and coral reefs is essential to the preservation and protection of coral reef ecosystems worldwide. Restoration science, if properly developed and applied, can help to promote reef recovery.”

Research Focus: The Coral Restoration lab is a general purpose laboratory for experimental examination of the effects of natural and anthropogenic stressors—including pollutants and climate change—on coral reef organism biology and ecology. Coral reproduction and health are studied under controlled conditions. Coral nurseries, in the laboratory and in the field, provide scientists with specimens of multiple coral species for research and experimentation. Nurseries can contain a genetically diverse living stock of corals for reef restoration experimentation and implementation.

Research Activities:

- impacts of single and multiple interacting coral stressors including nutrient load, acidification, temperature, salinity, oil, chemical dispersants, and other pollutants on corals and coral reef organisms
- coral life history, genetics, and reproduction
- coral diseases and coral-microbial interactions
- propagation of multiple coral species for experimentation and restoration
- living stock collection of corals protected from environmental change
- rearing and transplantation of nursery corals for reef restoration

Ph.D. candidate Abigail Renegar and OC alumna Erin Hodel with experimental corals in the laboratory

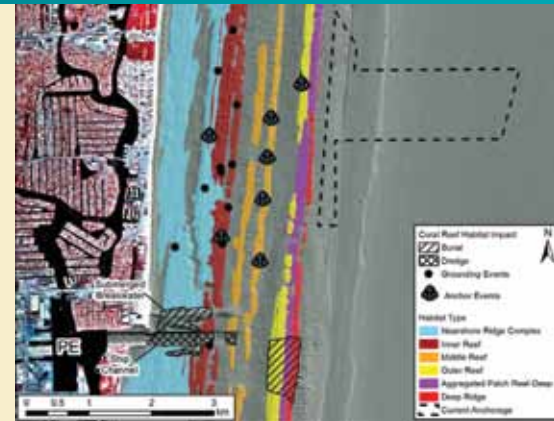


GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND SPATIAL ECOLOGY LABORATORY

Researcher: Brian Walker, Ph.D.

“Research on the spatial arrangement of coral reef habitats and their constituents will generate sound data for science, policy, conservation, and management of coral reef ecosystems.”

Research Focus: The lab utilizes Geographic Information Systems (GIS) as a tool to study the ecology, distribution, and spatial arrangement of benthic (sea bottom) coastal and ocean habitats and marine organisms. This research provides maps and other spatial information for enhancement of knowledge, conservation, and resource management.



Historical port development and shipping impacts at Port Everglades, Florida



*Research scientist
Brian Walker, Ph.D.*

Research Activities:

- spatial ecology—seascape/landscape ecology, spatial dynamics of coral reef communities, latitudinal coral reef biogeography, marine faunal relationships to topography
- seafloor characterization—benthic habitat mapping (shallow and deep water), accuracy assessment, mapping techniques, and technologies
- scientific research study design—optimized research study design using GIS spatial data, developing and evaluating assessment and monitoring methodologies
- management applications of scientific research
- coral habitat impact assessment (shallow and deep), marine spatial planning, *Acropora* monitoring and mapping, anchorage placement/modification, special event impact minimization planning
- coral reef geology—historical perspectives gained from present-day morphology and community dynamics

INVERTEBRATES LABORATORY

Researcher: Charles Messing, Ph.D.

“By far the most diverse creatures in the sea are the invertebrates—the animals without backbones. Many species are not yet discovered or described. The work of this laboratory focuses on expanding our knowledge of these extraordinary organisms, both in the fossil record and in the ocean today, to help us understand how marine ecosystems work. You cannot understand ecology or biodiversity unless you know what’s there.”

Research Focus: The lab focuses on scientific classification, evolutionary relationships, and ecology of marine invertebrates.



Charles Messing with a new species of octocoral collected via the Johnson Sea-Link submersible at a depth of 600 meters in Northwest Providence Channel, Bahamas



A rich community—including deep-sea coral, crinoids, sea urchin, spider crab, colonial anemones and worm tubes—grows on a carbonate ridge at a depth of 600 meters in the Strait of Florida. The deep-water limestone formations in the Florida Straits support a wide variety of creatures and habitats about which we still know very little.

Research Activities:

- systematics, ecology, and evolution of marine animals without backbones
- living and fossil crinoids (sea lilies and feather stars)
- sponge classification and identification
- habitat characterization of deep-ocean slope communities
- ecology and speciation of deep-sea coral reefs
- deep-ocean reef and other habitat mapping

CRUSTACEAN AND AMPHIPOD LABORATORY

Researcher: James Thomas, Ph.D.

"The questions are in the lab; the answers are in the field."

Research Focus: Our primary research focuses on the ecology and evolutionary biology of cryptic coral reef invertebrates, with an emphasis on commensal amphipod and decapod crustaceans.

Research Activities:

- crustacean and amphipod taxonomy
- using invertebrates as model organisms for global biodiversity
- taxonomy, systematics, and ecology of novel amphipod species
- using biological models for investigating potential environmental impacts to the Florida Keys inshore and offshore reef systems
- dissection and microscopy of marine invertebrate species inhabiting cryptic sponges in various biological niches (e.g., Great Barrier Reef, Florida Reef Tract, French Polynesia, and New Zealand)
- reproductive biology of crustaceans, with further analysis of the potential effects of bopyrid parasitism on the fitness of snapping shrimp colonies (Genus: *Synalpheus*)



M.S. student Brittnee Barris collecting shrimp in the Florida Keys

FISHERIES LAB

Researcher: David Kerstetter, Ph.D.

"As human use of the oceans increases, the field of fisheries science becomes vital to the sustainability of harvested wild populations. The fisheries laboratory provides a resource for both the management agencies and the fishers themselves through a combination of biological research, gear conservation engineering, and outreach."

Research Focus:

Fisheries science is the discipline of managing and understanding the harvesting of aquatic species, including finfish. It is a multidisciplinary field, which draws on aspects of oceanography, ecology, engineering, ichthyology, socioeconomics, and management to provide an integrated picture of fisheries and their effects on the environment. Fisheries research at the Oceanographic Center has historically focused on the commercially and recreationally important coastal and pelagic fishes, including billfish, tunas, and swordfish. More recently, the fisheries laboratory has engaged in alternative fishing gear outreach programs in Turkey, Morocco, and the Gulf of Mexico.



OC students from the Fisheries Research Laboratory collect specimens during the tournament



M.S. student Travis Moore

Research Activities:

- conservation gear engineering
- socioeconomics of South Florida recreational fishing tournaments
- effects of anthropogenic contaminants in coastal pelagic fishes
- age and growth of tunas and mesopelagic fishes
- electronic tagging of tunas and swordfish
- trophic analyses of coastal pelagic fishes, mangrove fishes, and seabirds
- modeling and description of fisheries bycatch interactions 🐟

In the Field

OC NCRI Researchers and Students Observe Coral Spawning

Once a year, coral spawning—the release of millions of eggs and sperm into the ocean—occurs after the full moon in the hottest month of the year. For several years, OC National Coral Reef Institute (NCRI) researchers **Alison Moulding**, Ph.D., **David Gilliam**, Ph.D., Ph.D. candidates **Abigail Renegar** and **Liz Larson**, and other students have been observing this phenomenon off the coast of Broward County. In addition to the work done in Broward County, Assistant Professor **Nicole Fogarty**, Ph.D., observed coral spawning off the coast of Belize.



Corals spawning in the lab



Nets set up to collect fertilized eggs



Ph.D. candidate Liz Larson collecting fertilized eggs

While researchers in Broward County collected fertilized eggs to be grown in the on-shore nursery, laboratory researchers at the OC watched as the laboratory corals also spawned. Once the nursery corals grow to a minimum size, they will be returned to the ocean to help restore reefs that have been physically damaged by events such as anchors and ship groundings.

Sea Turtle Project Releases 2012 Nesting Data

As of July 31, 2012, the Broward County Sea Turtle Conservation program has recorded a record 3,040 nests. They have already exceeded the record number of nests for the 2000 season and the turtle nesting season will run for two more months.

The Loggerhead turtles have deposited more than 2,800 clutches, which continues a general upward trend that began in 2008. So far, the Green sea turtles have made 144 nests this year and will continue to nest for the rest of the season.

The endangered Leatherbacks have made a nearly record number of 40 nests in the county this year. Leatherback nesting has fluctuated over the years, but they have not failed to nest in the county since 1982. The record of 42 nests was set in 1997.



OC alumna Lisa Morse measuring a sea turtle nest



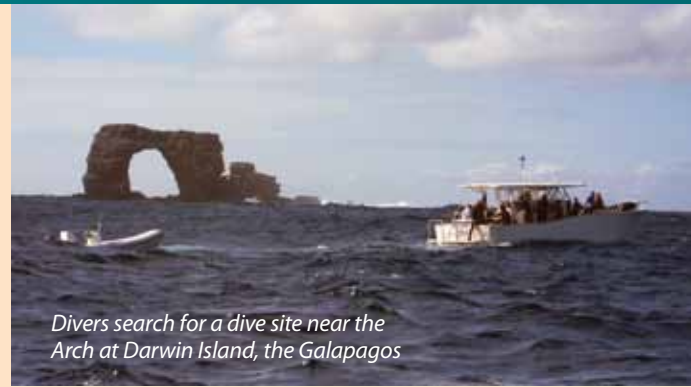
Newly hatched Loggerhead Sea Turtles

NSU Oceanographic Center operates the Broward County, Florida Sea Turtle Conservation Program in partnership with Broward County government. The program provides for the conservation of endangered and threatened sea turtle species within Broward County. Associate Professor **Curtis Burney**, Ph.D., is the principle investigator of the program.

Sea turtle nesting season in Broward County begins in early March each year with Leatherback sea turtles, then Loggerheads in April and Greens in May and June. Leatherbacks are less predictable and can nest as early as February or March. Nesting continues through September, with the peak season typically being the end of June and the beginning of July.

OC Researchers and Students Participate in Galapagos Islands Research Cruise

This June, OC faculty members, students, and NCRI researchers participated in a research cruise to seven islands in the Galapagos. **Sam Purkis**, Ph.D.; **Joshua Feingold**, Ph.D.; and **Bernhard Riegl**, Ph.D.; along with Ph.D. candidate **Jeremy Kerr** and M.S. student **Alexandra Dempsey** joined with researchers from the University of Miami's Rosenstiel School of Marine and Atmospheric Sciences (RSMAS) and Galapagos National Park (GNP) to gather data on coral communities along the coasts of Darwin, Wolf, Marchena, Floreana, Isabela, and San Cristobal Islands.



Divers search for a dive site near the Arch at Darwin Island, the Galapagos



A whale shark passes by at Darwin Island, the Galapagos

Whale sharks, hammerhead sharks, sea lions, sea turtles, dolphins, and penguins swam over and around the scientists as the expedition gathered information on sea floor topography, habitat distributions, benthic community structure, and other data to understand the resilience of the Galapagos' coral communities.

The Living Oceans Foundation sponsored the trip as a part of their Global Reef Expedition, an ambitious project to visit remote coral reefs in each ocean basin. The Galapagos National Park provided logistical support.

Faculty Members, Researchers, and Students attend ICRS in Australia

The 12th International Coral Reef Symposium was co-hosted this year by the ARC Centre of Excellence for Coral Reef Studies and James Cook University. Held in Cairns, Australia, from June 8–13, the symposium is hosted ever four years, and draws faculty members, research scientists, and students representing the OC and NCRI. Presenters held eight workshops and published a combination of 15 abstracts and posters.

Topics included dredging and shipping impacts on southeast Florida coral reefs; utilizing GIS in coral reef conservation; extreme heat-adaptability and coral population responses to climate extremes; population dynamics of four unique *Acropora cervicornis* populations; response of *Cinachyrella's* bacterial community to oil contamination; condition and management of coral reefs in Veracruz, Mexico; *Acropora cervicornis* symbionts and diseases investigated by next generation sequencing; survival and fecundity of *Eunicea flexuosa* (Cnidaria: *Octocorallia*) transplants; and satellite imaging coral reef resilience for regional scale management.



A local fisherman with Travis Moore (second from left), Henry DeBey, and Captain Tim Palmer and Nourredine Abid and Said Benchoucha (Moroccan Fishery Scientist) at the Port of Tanger, Morocco

Fisheries Researchers go to Morocco

As part of a research project exporting swordfish alternative gear, M.S. student **Travis Moore**, along with South Florida fishing captain Tim Palmer and NOAA International Affairs representative Henry DeBey, traveled to Morocco to outline the project and evaluate local facilities and materials with Moroccan Ministry officials and commercial fishing industry representatives. This completed phase one of the project.

Phase two—which will involve returning to Morocco to teach the local fishers how to construct and fish with the gear, as well as evaluate catch rates—is planned to take place at a later date. Moore is studying with OC research scientist **David Kerstetter**, Ph.D. 🐟



Back row (left to right): Gwilym Rowlands, Sam Purkis, Ph.D.; Dean Richard Dodge, Ph.D.; Barbara Dodge; Brian Walker, Ph.D.; Charles Walton; Paola Espitia; and David Gilliam, Ph.D.; Front row (left to right): Wendy Wood-Derrer; Nicole Fogarty, Ph.D.; Liz Larson; Mauricio Lopez-Padierna; and Bernhard Riegl, Ph.D.

In the Community

SHARK Exhibition at the Museum of Art

SHARK, an exhibition at the Museum of Art in Fort Lauderdale, takes visitors through more than 70 artists' perspectives on these fascinating creatures, from predators to victims to pop culture icons.

The exhibit, which opened this May, is curated by acclaimed marine artist and author Richard Ellis and presented in association with the Oceanographic Center. The multimedia exhibition features drawings, paintings, photography, sculptures, and videos by artists from all over the world.

Visitors can engage with the exhibition before stepping into the museum by downloading the SHARK mobile integration onto their smartphones and tablets. This family-friendly application offers gaming, shark facts, shark tracking, and a family resource guide. It can be downloaded via a mobile bar code or a link on the museum Web site (www.moaffl.org). Furthering the interactive experience are installations throughout the exhibition of education stations that answer questions about the habits of sharks and the need for conservation.



OC Dean Richard Dodge, Ph.D.; Guy Harvey; and NSU President and CEO George L. Hanbury II, Ph.D.



Wendy Wood-Derrer; Richard Dodge, OC dean; Barbara Dodge; exhibit curator Richard Ellis; Peter Verhoog; and Georgina Wiersma, CEO of Save Our Seas Foundation



Max and Gavin Helmle with their dad Kevin enjoy family day at the SHARK exhibit with SOSF Tee shirts

OC Goes to the Classroom

Director of Academic Support and Administration **Melissa Dore** and M.S. student **Stephanie Hayes** took the OC on the road and introduced 20 home-schooled children to the ocean and its wonders. The students learned about food webs, marine animals, and the oceans themselves through games and hands-on learning. Educational and community outreach is one of the missions of the OC. 🐟



OC staff member Melissa Dore and M.S. student Stephanie Hayes introduce students to ocean science.

Oceanographic Center— More Than 45 Years of Research

Established in 1966, the Oceanographic Center (OC) was one of the first schools of what was then known as Nova University, a young university established in 1964. The initial OC was on a large houseboat situated on 15th street in Fort Lauderdale. The center was a unique research facility that provided opportunities for Nova University to establish a reputation in the research and academic community. Several of the first 17 graduates of Nova University emanated from the OC. From 1969 to 1970, the Oceanographic Center moved to its current location on Port Everglades, adjacent to the Navy base. Since that time, the OC has added buildings, faculty members, research, and academic programs, with more than 75 percent of the extramural grants and contracts of the entire university. 🐟



Aerial view of the Nova University Oceanographic Center—image circa 1973



Abraham S. Fischler, second president of Nova University (1970–1992), on board one of Nova University Oceanographic Center's vessels—image circa 1970



Actor Steve McQueen consults William Springer Richardson, director of Nova University Oceanographic Center, on the development of submersibles for a movie produced by McQueen's production company Solar Productions—image circa 1968



Pat Blackwelder, Ph.D., then assistant professor, engaged in coccolith research on a transmission electron microscope—image circa 1980



Richard Dodge, then assistant professor, cutting a coral by the Boat basin—image circa 1979

Scholarships

The following students have received scholarships to support their research in the 2011–2012 academic year:

Scholarship Sponsor

Annual Scholarship Fishing Tournament

Scholarship Recipient/Project

Andrea Bernhard

Ph.D. candidate **Andrea Bernhard's** research uses genetic tools for understanding stock structure of recreational and commercial fish species, including billfish, groupers, and sharks.

Scholarship Sponsor

Batchelor Foundation

Scholarship Recipient/Project

Brittnee Barris

M.S. Thesis Project: "Eusocial population structure and ecology of alpheid shrimp in the loggerhead sponge *Spheciospongia vesparium* and other selected sponge hosts along the Florida Reef Tract."



SEM of Bopyrid isopod

Over the past eight months, Barris has been able to collect and analyze more than 3,000 specimens related to the research/thesis project funded by the Batchelor Foundation. Among these individual snapping shrimp, she has been able to quantify not only a significant reproductive change of a quasi-social species living in the Florida Keys, but also the prevalence of parasitism in this region, which is already temperamental to environmental stressors. Most recently, she has been processing samples to photograph with a scanning electron microscope to further analyze the reproductive biology and parasite-host relationship among these three common shrimp species.



Andrea Bernhard (left) thanks tournament participants while Richard Dodge, OC dean, looks on.

Scholarship Sponsor
Gale Foundation

Scholarship Recipient/Project
Anastasios Stathakopoulos

Stathakopoulos' doctoral research involves geological/geotechnical core-drilling of ancient coral reefs in South East Florida. His dissertation, which is entitled "A multi-proxy determination of coral reef formation and environmental conditions during the holocene in South East Florida," aims to understand how and when these reefs were formed; the environmental conditions and sea level in the recent past; and how this relates to modern times. Ultimately, he intends to identify if the information gleaned from the geological record of the recent past can aid in understanding effective management strategies for coral reefs of the present and future.



Anastasios Stathakopoulos (right) with Bernhard Riegl, Ph.D., OC professor

Scholarship Sponsor
Kevin Kohler Memorial Scholarship Research Fund

Scholarship Recipient/Project
Naoko Kurata and Kate Vella

Naoko Kurata was awarded for her research project, "Biosurfactant-producing marine bacteria in the sea surface microlayer and their effect on synthetic aperture radar imaging of fine features on the sea surface."

Kate Vella was awarded for her research project, "Microbial effects on the production and transformation of surfactants within the microlayer and subsurface waters in application to remote sensing techniques."



M.S. students Naoko Kurata and Kate Vella with Associate Professor Alexander Soloviev, Ph.D.

Scholarship Sponsor
InCapital/John Radke

Scholarship Recipient/Project
Alexandra Dempsey

Dempsey has worked on a number of different projects including the geostatistical comparison of modern and ancient carbonate reef systems, ecological, geological, and bathymetric mapping from satellites, and analysis of acoustic sub-seabed profiles, as well as sediment collection and analysis.



Alexandra Dempsey's M.S. thesis project: "A global audit of reef morphology using Google Earth Pro"

Scholarship Recipient/Project
Alexandra Campbell

M.S. Thesis Project: "Genetic sequence characterization of marine bacterial diversity from South Florida nearshore and offshore waters over space and time."

Campbell's project will expand microbial characterizations that are currently ongoing at the AOML by adding a "next generation" deep DNA sequencing component to the water samples currently collected for FACE. This will increase the number of sequences and overall data volume over standard sequencing by a few orders of magnitude. Following DNA extraction, modern bioinformatics methods will be applied to analyze the DNA data, which are currently being applied in the laboratory. The overall goal is to compare microbial communities between different Broward County sites and between different seasons in one–two years.

Scholarship Sponsor
Title V PPOHA Fellowship

Scholarship Recipient/Project
Allison Santos and Kayelyn Simmons

Part of the \$2.8 million grant to the Oceanographic Center through the federal Department of Education Promoting Postbaccalaureate Opportunities for Hispanic Americans (PPOHA) Program, its guidelines specify the development of a flexible, supportive, and effective academic and career pathway as students with bachelor's degrees efficiently transition into graduate degrees. 🐡



Fellows Kayelyn Simmons (left) and Allison Santos (right), both in black shirts, with the 2012 Oceanographic Center Peer Mentors—assisting the mentors is part of their fellowship.

Recent Graduate Student Defenses

The following graduate degree defenses have taken place in 2012

- Burkhart, Tandace, "The search for novel sponge genes: Comparative analysis of gene expression in multiple sponges." Committee: Jose Lopez, Ph.D., chair; Mahmood Shivji, Ph.D.; and Aurelien Tartar, Ph.D. Thesis. July 13.
- Bush, Stephanie, "Post-injury recovery, reattachment, survival, and growth of the giant barrel sponge, *Xestospongia muta*, offshore Southeast Florida." Committee: David Gilliam, Ph.D., chair; Charles Messing, Ph.D.; and Vladimir Kosmynin, Ph.D. Thesis. June 29.
- Fenton, Jenny, "Post-release survival and habitat utilization of juvenile swordfish in the Florida Straits." Committee: David Kerstetter, Ph.D., chair; Mahmood Shivji, Ph.D.; and Arthur Mariano, Ph.D. Thesis. July 27.
- Hill, Allison Nicole, "A review of faunal responses to seagrass habitat impacts and the effect of mechanical anthropogenic disturbances." Committee: Amy Hirons, Ph.D., chair, and Richard Spieler, Ph.D. Capstone. May 15.
- Iacovazzi, Joseph, "Structure and function of *Symbiodinium spp.* of marine invertebrates." Committee: Pat Blackwelder, Ph.D., chair, and Jose Lopez, Ph.D. Capstone. July 12.
- Karch, Amanda, "Use of simulation analyses to investigate yellow fin tuna (*Thunnus albacares*) growth models in the Atlantic Ocean incorporating gear selectivity." Committee: David Kerstetter, Ph.D., chair; Amy Hirons, Ph.D.; and Shannon Cass-Calay, Ph.D. Thesis. January 27.
- Kul, Christopher, "Effects of climate change and North Atlantic oscillation on arctic ice melting and the North Atlantic marine ecosystem." Committee: Curtis Burney, Ph.D., chair, and Edward Keith, Ph.D. Capstone. July 19
- Kumar, Sandhya, "Investigating the role of biofilms in pathogenic infections." Committee: Jose Lopez, Ph.D., chair, and Peter Murray, Ph.D. Capstone. April 27.
- McGrath, Emily, "The feasibility of rubble-binding propagation for use in reef restoration." Committee: David Gilliam, Ph.D., chair; Jose Lopez, Ph.D.; and Amanda Borque, Ph.D. Thesis. April 27.
- Morin, Christopher, "Learning and long-term memory formation in *Danio rerio* through two sensory modalities." Committee: Richard Spieler, Ph.D., chair; Jose Lopez, Ph.D.; and Joseph Huston, Ph.D. Thesis. March 23.
- Patel, Jignasa, "Meta-transcriptome profiles of the marine sponge, *Axinella corrugata*, and its microbial consortia: A pyrosequencing approach." Committee: Joe Lopez, Ph.D., Chair; Andrea Ottesen, Ph.D.; and Aurelien Tartar, Ph.D. Thesis. July 16.
- Seubert, John, "The impacts of deforestation on the ecological and economic goods and services provided by mangrove ecosystems." Committee: Curtis Burney, Ph.D., chair, and Edward Keith, Ph.D. Capstone. July 24.
- Veverka, Laura, "Flagship Down: An analysis of factors that contributed to the extinction of the Chinese river dolphin, the Baiji." Committee: Edward Keith, Ph.D., chair, and Charles Messing, Ph.D. Capstone. July 17.
- Viragh, Brea, "The effects of a new bridge on manatee (*Trichechus manatus latirostris*) use of the FPL discharge canal at Port Everglades, Florida." Committee: Edward Keith, Ph.D., chair; Amy Hirons, Ph.D.; and Daniel Odell, Ph.D. Thesis. July 20.
- Woodward, Samantha, "The effects of physical barriers on nesting behavior and nesting success in loggerhead turtle, *Caretta caretta*; green turtle, *Chelonia mydas*; and leatherback turtle, *Dermochelys coriacea* in South Florida, USA." Committee: Curtis Burney, Ph.D., chair, and Kenneth Banks, Ph.D. Capstone. March 23.

Oceanographic Center Publications 2011–2012 by Faculty Members, Researchers, and Students


- Afonso, A.S., F.H.V. Hazin, F. Carvalho, J.C. Pacheco, H. Hazin, **D.W. Kerstetter**, D. Murie, and G.H. Burgess. (2011). Fishing gear modifications to reduce elasmobranch mortality in pelagic and bottom longline fisheries off Northeast Brazil. *Fisheries Research* 108: 336–343.
- ***Basten, B.L.**, R.L. Sherman, A. Lametschwandtner, and **R.E. Spieler**. (2011). Development of Embryonic Gill Vasculature in the Yellow Stingray, *Urobatis jamaicensis*. *The Anatomical Record*. 294: 1423–1432.
- *Benavides, M.T., **R.L. Horn**, K.A. Feldheim, **M.S. Shivji**, S.C. Clarke, S. Wintner, L. Natanson, M. Braccini, J.J. Boomer, S.J.B. Gulak, and D.D. Chapman. (2011). Global phylogeography of the dusky shark, *Carcharhinus obscurus*: implications for fisheries management and monitoring the shark fin trade. *Endangered Species Research* 14: 13–22.
- ***Bernard, A.M.**, K.A. Feldheim, and **M.S. Shivji**. (2012). Development and characterization of eleven novel microsatellite loci for the roundscale spearfish *Tetrapturus georgii* and their cross-species amplification among other billfish species. *Journal of Fish Biology*. (In Press).
- ***Bernard, A.M.**, K.A. Feldheim, **V.P. Richards**, R.S. Nemeth, and **M.S. Shivji**. (2012). Development and characterization of fifteen novel microsatellite loci for the Nassau grouper (*Epinephelus striatus*) and their utility for cross-amplification on a suite of closely related species. *Conservation Genetics Resources*. (In Press). DOI 10.1007/s12686-012-9688-4
- *Bigelow, K.A., **D.W. Kerstetter**, **M.G. Dancho**, and J.A. Marchetti. (2012). Catch rates with variable strength circle hooks and the potential to reduce false killer whale injury in the Hawaii-based tuna longline fleet. *Bulletin of Marine Science*.
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- ***Burney, C.M.** and **L. Wright.** (2011). Sea Turtle Conservation Project, Broward Co. Florida. Technical Report 2010. Broward County Environmental Protection Department, Biological Resources Division. Fort Lauderdale, Florida, 47 pp.
- ***Burney, C.M.** and **L. Wright.** (2012). Sea Turtle Conservation Project, Broward Co. Florida. Technical Report 2011. Broward County Environmental Protection Department, Biological Resources Division. Fort Lauderdale, Florida, 43 pp.
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