Four Years of Observations Provide Vital Information Concerning the Coastal Circulation on the Shelf off Southeast Florida.

Variability of the coastal currents impact relevant issues such as navigation; acoustics; search and rescue operations; beach erosion; and coastal pollution from sewage plants, harmful algal blooms, and oil spills. On June 18, a moored oceanographic buoy was redeployed by personnel from South Florida Ocean Measurement Center (SFOMC) member institutions Nova Southeastern University and University of South Florida, using FAU’s research vessel *Stephen*. The buoy, along with a bottom mounted instrumentation array, provides monitoring of the physical-oceanographic environment of the southeast Florida shelf.

The buoy and bottom array are located near a line extending east from the shore, starting at a point about 2.3 kilometers south of the NSU Oceanographic Center. The surface buoy is located in 20 meters of water about 2.1 kilometers offshore and includes an Acoustic Doppler Current Profiler (ADCP) and four Sea-Bird Electronics MicroCats at 5 or 10 meter intervals along the mooring cable for measuring water temperature and conductivity profiles. The bottom array is located in 10 meters of water about 1.65 kilometers offshore and includes an ADCP and Sea-Bird Electronics wave and tide gauge. NSU divers periodically recover the instruments to download data and replace batteries.

An intriguing feature of the circulation on the shelf off southeast Florida is the energetic baroclinic supertidal oscillation, which produces 10-hour period current velocity oscillations with a 0.5-m s⁻¹ amplitude. Four years of observations with the NSF/USF environmental array have provided important information concerning this phenomenon. The phenomenon appears to be seasonally modulated (maximal in summer months); there is also significant interannual variability. The results of this four-year study have been presented at the International Association of Physical Sciences for the Oceans in Sapporo, Japan (July 1–11, 2003) and described in two articles (Soloviev et al., 2003a; 2003b).

References: See page 2.
People on the Move

Andrew Rogerson, Ph.D., attended the annual meeting of the Society of Protozoologists in Oregon on June 3 where he gave the vice presidential address “Tales of a wandering eukaryotic microbiologist.”

Jane Dougan, Director of Distance Learning and M.S. student Arlo Hemphill attended “Coastal Zone 03,” Coastal Zone Management Through Time Conference, in July in Baltimore, Maryland. The conference brought together over 1,000 international ocean and coastal management professionals.

At the end of July, M.S. students Lance Jordan and Dan Fahy went to Eleuthera, Bahamas, to work with M.S. student Bob Patterson on his thesis project. While there, they surveyed the coral reef fish assemblages. Light traps (which attract and capture larval fishes) were also deployed over several nights to examine the larval fish supply on the Caribbean and Atlantic sides of the island.

Alex Soloviev, Ph.D., attended the 2003 General Assembly of the International Association for the Physical Sciences of the Oceans (IAPSO) that was held in Sapporo, Japan, July 1–11. He presented the paper, entitled “Horizontal mixing in the eastern Pacific warm pool,” coauthored by R. Lukas. Another IPSO paper, “Energetic baroclinic oscillation on the southeast Florida shelf,” coauthored by A. Soloviev, R. Weisberg, was presented by Mark Luther (USF).

During the week of July 20, Soloviev lectured at the Summer Geophysical Fluid Dynamics School at WHOI. For more than two decades, this summer program has been attracting top students in the field of fluid dynamics, physical oceanography, and related areas. On July 24, Soloviev presented a seminar at the WHOI Physical Oceanography Department, entitled “Horizontal T-S mixing in the western Pacific warm pool as a nonlinear diffusion process.”

Brian Ettinger recently attended Working Diver Training at the U.S. Environmental Protection Agency Diver Training Center in Gulf Breeze, Florida. The course was attended by U.S. EPA, local and federal law enforcement agencies from around the United States, FDEP, U.S. Army, Mote Marine Laboratory, and members of environmental agencies from other states. Developed by the NOAA Diving Program, the U.S. EPA Diving Program allows for reciprocity between NOAA and the U.S. EPA working divers. The course concluded with a rather lengthy and thorough diving exam based on the NOAA Diving Manual 4th Ed.

Publications


Nielsen J.T., R. Duarte, and V. Dragojlovic. (2003) Oxidation of an Unknown Cycloalkene, Cycloalkanol, or Cycloalkanone to a Dicarboxylic Acid: Discovery Oriented Experiment for Organic Chemistry Students. Chem. Educator, 8, 241–243. (Janne Nielsen is an M.S. student at NSUOC, and Robert Duarte is an undergraduate student at the Farquhar College of Arts and Sciences.)

Other News

Boat Finds New Life in Research

On July 15, a group set out on the inaugural voyage of NSU R/V Explorer. The boat was donated by Robert Fehlhaber of Fort Lauderdale. The Explorer is a 38 Foot Mark Bertram Sport Fisherman, refitted for research. After purchasing a larger boat, Fehlhaber decided to donate the Bertram to a facility that would use it for educational purposes. NSUOC fit the bill. On board the vessel for its “maiden” voyage were scientist David Gilliam, Ph.D., along with researchers Dan Fahey, Elizabeth Glynn, Jamie Vernacchio, Brian Walker, Brian Ettinger, and Shawn Gil with Captain Lance Robinson at the helm.

Coral spawning

On the night of July 28, 2003, spawning of Acropora cervicornis (staghorn coral) was observed in shallow, nearshore waters off Fort Lauderdale. Coral polyps released pink bundles that contain eggs and sperm, which are released as the bundles break-up near the surface. Gametes float along with the currents until they mix, and fertilization occurs, forming a larva that will settle to form a new coral colony. On the night of July 28, spawning occurred between 2300–2320h, with a moderate proportion of colonies spawning. An estimated 50 percent of the colonies present at the study thicket spawned. Within those colonies that spawned, nearly 20–25 percent of the branches released gametes, mainly along the upper portions. This is the second time that NCRI researchers have documented the reproductive activity of staghorn corals in Fort Lauderdale waters. According to prior observations, this year’s spawning event was not as impressive as in 2001, and principal investigator Bernardo Vargas-Angel, Ph.D., suggests that staghorn colonies may continue spawning throughout the month of August.

These observations are important, since waters off Fort Lauderdale may harbor the largest and northernmost A. cervicornis population in the continental United States. Staghorn corals are fast growing species, pivotal to reef building and providing essential habitat to numerous species of invertebrates and fish. The staghorn coral population off Fort Lauderdale develops in close proximity to the city’s highly urbanized coastal features and presumed anthropogenic stressors, such as increased freshwater discharge, coastal runoff, sedimentation, sewage effluent, nutrient enrichment, and ship traffic (Thomas et al. 2000, Vargas-Angel et al. in press). Thus, their presence is ecologically significant, providing an interesting counterpoint to the declining and disease-stricken A. cervicornis populations throughout the Caribbean, and especially in the Florida Keys National Marine Sanctuary.

Interestingly, other benthic cindarias observed to spawn during the days that followed the full of July included: Erythropodium caribbeorum, Eunicea sp., and Plexaura spp. The coral lab wants to express gratitude to Megan Berkle, Brian Ettinger, Ryan Moyer, Nick Garbarino, Arlo Hemphill, and Jessica Craft for their collaboration and interest with the night dives.
GHRI Shark Research Continues to Receive International Recognition.

The shark conservation research being conducted by Mahmood Shivji, Ph.D., and his graduate students continues to receive widespread media attention, including a cover story in the magazine Science News (see right), and recent articles in the San Jose Mercury News, Oman Daily Observer, New York Daily News, and Canadian Wildlife magazine. The forensic techniques developed in Shivji’s lab are being used to assist NOAA’s Office of Law Enforcement in their fisheries enforcement duties. GHRI students Jennifer Magnussen, Debra Abercrombie, Marcy Henning, and Janne Neilsen recently worked on five cases of confiscated shark fins and found fins from prohibited species in four of the cases, resulting in over $100,000 in fines being assessed by NOAA against the fishery violators.

Stingray Ecology and Conservation Project

Mahmood Shivji, Ph.D., and M.S. students Mark Corcoran and Matthew Potenski spent five months in the Cayman Islands working with Oceanographic Center adjunct faculty member Guy Harvey and Brad Wetherbee researching southern stingray movement behavior and population demographics. The primary focus of the research was to determine if the daily feeding by tourists was affecting the natural history of the stingrays. Preliminary data suggests that the fed stingrays are highly residential at the feeding sites, and have smaller activity spaces compared to non-fed animals at adjacent locations. M.S. student Vince Richards and Farquhar College of Arts and Sciences B.S. student Veronica Akle are studying genetic relationships of southern stingrays from throughout the Caribbean to determine if the Cayman animals form a genetically unique group. Ph.D. student Demian Chapman and Mark Corcoran have just had a paper documenting the mating behavior of southern stingrays accepted for publication in the journal Environmental Biology of Fishes.

Recent scientific publications from the Guy Harvey Research Institute


Conservation Genetics Lab Chases Sharks and Rays in Belize

by Demian Chapman

Glover's reef atoll rises from the abyss approximately 30 miles east of the Belize Barrier reef system. One of only four coral atolls in the Caribbean Sea, Glover's is a UNESCO World Heritage Site and was targeted for conservation in the mid-1990s by the establishment of a large Marine Protected Area (MPA) that encompasses approximately one third of the lagoon. These conservation efforts have been remarkably successful and today the nearly 700 patch reefs that pepper the lagoon are replete with Caribbean spiny lobsters, snapper, and groupers, species decimated by over-fishing elsewhere in the region. Likewise, the shallow sea-grass meadows that fringe the reef crest are home to large numbers of queen conch, permit, bonefish, and sea turtles. Beyond the lagoon on the outer reef, where the coral encrusted wall plunges back into the deep, enormous schools of grouper and snapper congregate to spawn each year, largely unmolested by the fishers that have pushed their species to the brink of extinction. As populations of all of these animals appear to be healthy and increasing, the Wildlife Conservation Society (WCS), the organization largely responsible for developing this MPA and maintaining a research station and base of operations for fisheries enforcement officers, asked the question: What about the sharks and rays of Glover's? Although fish and invertebrate surveys of the area had been carried out, and revealed the most diverse assemblage of all the Caribbean atolls, there have been no studies of which sharks and rays utilize the atoll. In general, next to nothing is known about the sharks and ray fauna of the whole Belize Barrier reef system. This is quite disturbing, given the massive population crashes seen in some species in the Northwest Atlantic and the continuing exploitation of sharks in parts of the Caribbean, both for local consumption and export to foreign markets (particularly the Asian dried fin trade).

Since 2000, M.S. student Demian Chapman has been working with Ellen Pikitch, Ph.D., of the WCS to find out which sharks and rays live and breed around Glover's reef. In April and May 2003, Chapman; his major professor Mahmood Shivji, Ph.D.; M.S. students Debra Abercrombie; Vince Richards; Marcy Henning; Janne Nielsen; and other members of the Guy Harvey Research Institute’s Conservation Genetics Laboratory, traveled to Belize, with the goal of continuing the survey and building upon findings from previous years. The result of these four years of long lining, gillnetting, and field observations has been the finding that at least nine species of sharks and three species of ray can be found at Glover's in the spring and summer. These species range in size from dinner-plate sized yellow stingrays (Urobatis jamaicensis) to school-bus sized whale sharks, Rhincodon typus (see picture). Most significantly, the team has found solid evidence that at least three species—the nurse, Ginglomostoma cirratum; lemon, Negaprion brevirostris; and Caribbean reef, Carcharhinus perezi—breed in the lagoon. This evidence is based upon captures of free-swimming newborn animals and small juveniles and in some cases is backed up by the captures of gravid females. In fact, this year, the team was fortunate enough to witness a 2.6 m (8.7 foot) female lemon shark give birth to a baby, as she was being tagged and released. These findings establish that Glover's is an essential habitat for these species and helps to strengthen the arguments that it should continue to be vigorously protected.

Aside from the species which breed in the lagoon at Glover’s, the atoll is visited by a number of more pelagic species. These include the tiger, Galeocerdo cuvi-
M.S. degree specialties are marine biology, coastal zone management, and marine environmental science. Each course carries three credit hours or may be audited. Tuition is $525 per credit hour (50 percent less for audit). Classes meet once a week from 6:30 to 9:30 p.m. at the Oceanographic Center (unless otherwise specified). The fall term runs from September 29–December 19, 2003, (unless otherwise specified). Registration ($25 nonrefundable fee) is September 15–October 13. Teachers may take courses for recertification credits for $800 (nondegree-seeking status). For further information, call Andrew Rogerson, Ph.D., or Melissa Dore at (954) 262-3610 or 800-396-2326, or email imcs@nova.edu. More information can be found at the Web site www.nova.edu/ocean/.

nonindigenous species introductions; impediments to marine conservation; scientific constraints; developing tools and forums for conserving marine biodiversity, and evaluating existing marine biodiversity initiatives currently in place and planned. Management approaches such as marine protected areas, no-take or completely protected reserves, and special management areas will be discussed and evaluated.

The course will consist of assigned readings, extensive discussions and panel participation, review of latest developments in marine biodiversity research and conservation, and preparation of several review and planning documents. In the course, students will also incorporate emerging scientific information from taxonomy, systematics [both morphological and molecular methods], and evolutionary theory at both macro- and microscale processes as it impacts and affects marine biodiversity. While all marine systems will be considered, the course will focus specifically on tropical marine ecosystems, especially coral reefs. Meets Tuesdays. Instructor: James Thomas

Coral Reef Geology and Evolution
OCMB-7015
Throughout earth history, bioconstructions, reefs being the most noticeable, have been focal points of organismal evolution, which is recorded in the fossil record as well as the growth fabrics and lithologies of the reef rocks. Organism-environment, and environment-sedimentology feedbacks create distinct signatures that allow us to gain detailed insight into the ecological functioning of reef communities long since gone and the environment they lived in—if only we can make the rocks talk. LAB FEE $50. Meets Thursdays. Instructor: Bernhard Riegl

Scientific Diving and Coral Reef Assessment
OCMB-9700
This course is designed to provide continuing SCUBA diving education and teach basic scientific diving techniques, especially as applied to coral reef assessment. Upon successful completion of the course, the student will be a certified Scientific Diver in the NSUOC Scientific Diving Program. In addition, the student will have the opportunity to acquire higher recreational PADI certifications including: Advanced Open Water Diver, Rescue Diver, and several other specialty certifications. LAB FEE $473. ($100 Deposit due starting 9/2/03) LIMITED TO 16 STUDENTS. Meets Tuesdays. Instructors: David Gilliam and Capt. Lance Robinson

Distance Education Courses
Coastal Policy
CZMT-0612
This Web-based distance education course explores the issues, problems, and potential political and public policy solutions to the challenges of achieving smart, sustainable stewardship of the seashores. Primary emphasis is on the United States experience. Students read two outstanding books and participate in online activities includ-
ing original case studies, online tests, and selected interactive discussion with each other, the professor, and guests. Optional weekend or extended 3-credit field trips to experience and examine coastal policy venues in Fort Lauderdale and Palm Beach (Florida, USA) and other coastal locations will also be available. Instructor: Steffen W. Schmidt

Environmental Remote Sensing
CZMT-0655
Increasingly, work in coastal zone management requires at least a passable knowledge of Geographic Information Systems (GIS) and Remote Sensing. This course provides hands on training with the latest GIS and Remote Sensing techniques. This Web-based course includes interactive hands on computer training and lesson-based Web instruction. Environmental Remote Sensing deals with the application of image processing tools to environmental problems. Areas covered by these courses include: Remote Sensing Theory, Type of Imagery, Mosaicking, Photo Interpretation, Image Enhancement and Classification Procedures, Accuracy Assessment Procedures, and Importing GPS Polygons. The course will also provide you with

1. Basic and Advanced Skills to use the latest in Remote Sensing Software by ERDAS, Inc.
2. The necessary advanced training to apply these skills to environmental studies.
3. The ability to apply these skills to "real world" regional and global environmental problems.
4. Training in techniques that cannot be found in other online remote sensing courses.

Class instruction will focus on application of these techniques to actual environmental case studies. Instructor: Stacy Myers

Resolving Environmental and Public Disputes
CZMT-0675
This course focuses on the theoretical bases, practical applications, process orientations, and actual intervention into complex multiparty, multi-issue public disputes regarding management of the coastal zone. The emphasis is on social/environmental interactions and sources of political and economic conflict over human health, environmental protection, and natural resource scarcity. Instructor: Jeanmarie Pinto

Water: Cross-cultural, Scientific and Spiritual Perspectives, CZMT-0710
This course will introduce students to the expanding international dialogue regarding water and the coastal zone that is now occurring amongst the scientific, interfaith and policy communities. We will consider and evaluate whether this may result in new understanding and a greater commitment towards our stewardship of water, and particularly the coastal environment. Instructor: O.P. Dwivedi

Thesis Defenses


Demian D. Chapman, “Application of molecular techniques to studies of reproductive natural history and conservation of sharks: Case studies involving the bonnethead, Sphyrna tiburo (Sphyrinidae) and great white, Carcharodon carcharias (Lamnidae).” Committee members: Mahmood Shivji, Andrew Rogerson and Charles Messing. July 18.


Seminars
Bill McGraw, Ph.D., an independent aquaculture consultant, presented a talk on “Inland farming of marine shrimp in freshwater in the USA” on July 2.


Capstone Review


WINTER TERM CLASSES
January 5–March 26, 2004
Oil Pollution
Plankton Ecology
Aspects of Marine Pollution
Concepts of Physical Oceanography
On June 16 and 17, the Oceanographic Center welcomed twenty-four St. Louis ninth graders and their chaperones for the NSUOC portion of the SEA SCIENCE Aquatic Ecology Program. While visiting the center, these not-quite-high-school students participated in a variety of activities both at the OC campus and the Aquaculture Research Center (ARC). Their first day began with an introduction to the center by James Thomas, Ph.D., followed by a general tour around the campus led by graduate students Lauren Shuman, Fleur Ferro, Becky Freeland, and Jim Schiffbauer. While on the tour, students were taken to various "stations" in order to learn about current projects. These projects included a discussion of the coral lab led by graduate students Heather Halter and Erin Hodel, a tour of the aquaculture mangrove and shrimp ponds led by project manager Cathy Mattison, a tour of the coral and wet labs in the Melon building with a discussion on coral cores by doctoral candidate Kevin Helmle, and a demonstration and video on fish counts presented by doctoral candidate Paul Arena. The students were then presented with an introduction to marine mammals by Edward Keith, Ph.D., who gave them a chance to guess the identity of the mammalian skeleton located in the Forman lobby. After this exhausting morning schedule, the students broke for a brief lunch only to resume their hectic day with an investigative beach tour led by Thomas. By far the highlight of the entire program for many in the group was the introduction to sea turtles and a hatchling release demonstration that evening, led by graduate student Stefanie Oullette, who is project manager for the Broward County Sea Turtle Conservation Program.

Program Director Rick Voskuil and crew returned to the center for even more oceanography lessons the next day. Lectures resumed with an introduction to electron microscopy led by Patricia Blackwelder, Ph.D., followed by yet another guided tour. This go round included different projects such as an overview of the research being conducted in the microbiology lab, led by doctoral candidate Tina Gwaltney and graduate students Kara Nowosielski and Marie Cuvelier; an overview of the EM led given by Missy Dore; a glimpse at the aquaculture tanks and how they connect to the rest of our aquaculture work, led by Cathy Mattison and librarian Kathy Maxson; and finally, a snack break in the houseboat, with a briefing on NCRI’s Coral Nursery and/or some of the shark research going on in Mahmood Shivji’s lab. The students then headed off for the ARC, where they met with graduate students Jenna Barrett and Michele Blackburn in order to “fish” the fish tanks. This was a favorite for others in the group, many of whom had never fished before. It’s not an experience they’ll forget soon, either. The Miami Herald did a feature story about their ARC visit, complete with color photos.

This summer’s visit was a pilot project between SEA SCIENCE and the OC to explore the feasibility of perhaps conducting several more sessions next summer.
Student in the News

Ian Gibson, a scientist with the Connecticut Department of Environmental Protection, had his picture featured in a July 6 New York Times article titled, “In Sound’s New Economy, Fewer Old Salts.” Gibson, an M.S. student at the center, defended his capstone review on July 17.

Deep Water ROV Surveys

Charles Messing, Ph.D., and NCRI research assistant Ryan Moyer are studying the distribution of benthic macrofauna off the northern Straits of Florida from 65 to 200 meters using Remotely Operated Vehicle (ROV) technology. After the Phantom-class ROV is launched and about fifty feet of tether paid out, a hydrographic wire held vertically by a 200–600-pound weight is lowered; additional tether is fastened at intervals to the wire as it descends, taking the ROV with it into deeper water. Running this operation in the Gulf Stream with 5-foot seas, a 4-knot current and 15-knot winds required considerable mastery of technique and coordination between the ship’s and the ROV’s crew. Video and digital still photographs were transferred up the tether to on-board monitors and computer. In March and April, the team completed work on the Florida platform margin just off the coast of Fort Lauderdale. In June, Messing and Moyer traveled to Freeport, Grand Bahama Island, to perform the deep-water surveys there as well. Based on the data collected, Messing and Moyer are working with Brian Walker and Richard Dodge, Ph.D., to map the distribution of the benthic macrofauna on either side of the Straits of Florida. Their preliminary results indicate that, except for typical reef-dwelling organisms such as corals, gorgonians and sponges at the shallow end of the depth range, the large attached organisms on the Florida side of the Straits are completely different from those on the Bahamas side. Many-armed sea stars and burrowing anemones dominate the gently sloping, muddy sea floor off Fort Lauderdale, while gorgonians and black corals are the most prominent large organisms on the steep, sand-veneered rocky Bahamas slopes.
Marcy Henning about to release a juvenile Caribbean reef shark. (Photo courtesy of M. Henning)

Elizabeth Glynn inventories stony corals for the Southeast Florida Monitoring project.

Published quarterly by
Nova Southeastern University
3301 College Avenue
Fort Lauderdale, Florida 33314-7796

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