

THE BULLETIN

Winter 2013

There is a balance to nature that has evolved over millennia, and when rapid change is introduced to natural systems, consequences can be dramatic. This truth is an apt summation of a recently published study by Research Professor Brian Lapointe, Ph.D, entitled, "Effects of Hurricanes, Land Use, and Water Management on Nutrient and Microbial Pollution: St. Lucie Estuary, Southeast Florida," and, indeed, much of his research into the causes and effects of harmful algal blooms. The study suggests that discharges from Lake Okeechobee are primary among

TRACKING TROUBLED WATERS

several factors producing a "perfect storm" of environmental degradation in the St. Lucie Estuary (SLE).

Estuaries contain a mixture of freshwater from the land and seawater from ocean inlets, and the mix varies with the amount of rainfall. The SLE also is fed by drainage canals; especially the C-44 canal, which connects the estuary to Lake Okeechobee and is used to manage

lake water levels through controlled discharges. Periods of heavy rainfall lead to increased freshwater runoff, high lake levels and lake discharges, which greatly reduces saltwater concentrations (i.e., salinity) in the SLE. Persistent low salinity in an estuary can be fatal to saltwater species such as oysters and seagrasses, and make fish vulnerable to infectious agents that are unable to survive normal estuary salinity. Similarly, low salinity allows bacteria from septic systems, a known source of SLE pollutants, to survive and multiply. Dr. Lapointe's study analyzed land-use patterns and water samples collected from 25 SLE locations during

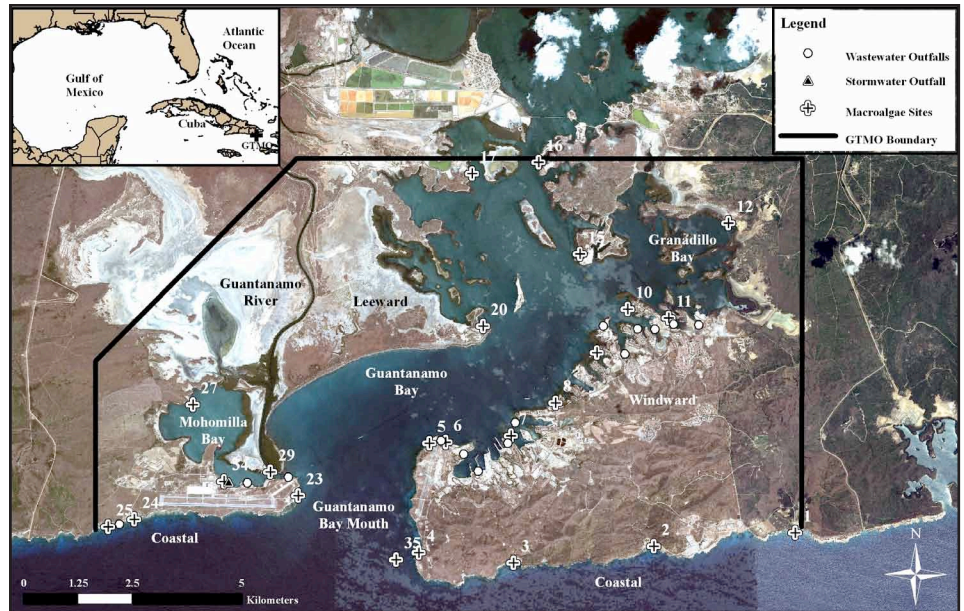
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discharges from the 2004 and 2005 hurricane seasons and during a period of relatively fewer discharges. Salinity was less than 1 part-per-thousand in June and November 2005 – versus the norm that typically exceeds 12 parts-per-thousand – and there were significantly more violations of bacteria regulatory standards during these periods compared with the March 2006 sampling.

Freshwater Not Necessarily Clean

The bacteria problem is made worse by elevated nutrient concentrations, which is a second factor affecting SLE health. Common sources of nutrients, such as fertilizers, in waterways include agricultural and residential runoff, both of which were evident in this study. Nutrient concentrations were two- to threefold higher than proposed SLE targets during 2005 samplings, and could be linked to C-44 discharges in the SLE South Fork and to canals and golf course runoff in the North Fork.

Higher nutrient concentrations also foster explosive growth of algae, a third challenge facing the SLE. Extensive surface blooms occurring shortly after the June 2005 sampling were traced to conditions caused by the C-44 discharges and the transport of cyanobacteria, also known as blue-green algae, from Lake Okeechobee, which hosts frequent blooms. Part of what makes cyanobacteria blooms harmful is the toxins they produce, and in the case of the 2005 SLE blooms, the



U.S. Naval Station at Guantanamo Bay with sampling sites marked

concentrations were high enough to affect human health.

The study recommends increased stormwater retention, minimization of Lake Okeechobee discharges, and enhanced treatment of both stormwater and sewage to minimize future stormwater-driven water quality variations in the SLE. Beyond effects on SLE animal and plant life, the authors note that the harmful impact of freshwater releases extends to the coral reefs just outside the St. Lucie Inlet, which marks the northern boundary of tropical reef corals in south Florida.

Cuban Coral Concerns

The effects of runoff on coral also attracted Dr. Lapointe to the U.S. Naval Station at Guantanamo Bay, Cuba, to address concern about algal blooms along the reefs just outside the bay. Persistent blooms can decimate coral and associated reef communities – the Florida Keys have lost 95% of Elkhorn coral cover this way – and the Navy wanted to determine if its operations could be responsible for the conditions enabling the blooms.

Flying into the base, however, Dr.

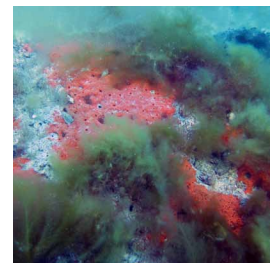
Lapointe’s attention was drawn to the waters of the nearby Guantánamo River, which carried a green hue and produced a visible plume upon entering the bay and spilling into the Caribbean Sea.

The river passes by the city of Guantánamo and its approximately 244,000

residents before meandering through farm areas on its way toward the ocean. Analyses of water and algal samples from multiple

Macroalgae blooms on coral confirmed his suspicion that nutrients from the river are feeding the blooms.

Identifying the factors that contribute to harmful algal blooms doesn’t resolve the issues, but it does provide information that can guide decisions. Dr. Lapointe’s research has influenced legislation in the past, and perhaps public concern about the condition of the SLE will again render his work transformational.



Macroalgae blooms on coral



Dr. Brian Lapointe



S.D. McCulloch

The MMRC team tends to the whales at Harbor Branch

It all began the morning of September 2nd when a beach walker spotted a pod of whales that had come ashore at Avalon State Park Beach – almost directly due east of Harbor Branch. A call came into the Harbor Branch Marine Mammal Research and Conservation (MMRC) headquarters, sending program staff and volunteers into action. As a member of the National Marine Fisheries Service (NMFS) Marine Mammal Health and Stranding Response Network, MMRC serves as a first responder when regional marine mammal assistance is required in

GREAT WHALE RESCUE

the southeast region. Other responders included NMFS network members from the Marine Mammal Conservancy, SeaWorld, Ocean Embassy, the Georgia Aquarium Field Station and Hubbs-SeaWorld Research Institute.

Support was also provided by the Florida Fish and Wildlife Conservation Commission, local law enforcement, the American Red Cross and the Busch Wildlife Sanctuary.

The 22 short-finned pilot whales, the largest more than 25 ft. long, were sustained on the beach by more than a hundred volunteers of all ages who worked throughout the day in an effort to keep the animals wet, shaded and as comfortable as possible. Seventeen of the whales died and five of the younger animals were transported to the Harbor Branch Critical Care Center for marine mammals in the late afternoon by Harbor Branch and Florida Fish and Wildlife Conservation Commission marine ambulance rescue units. Despite around-the-clock care and veterinary treatment, one more whale perished.

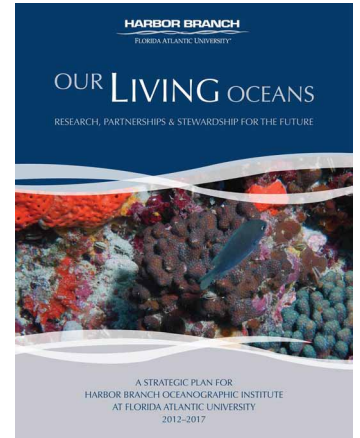
Three days after the stranding, the four surviving whales were transported to SeaWorld in Orlando for further care and evaluation.

This important rescue effort and others like it are made possible through the sales of Protect Florida Whales and Protect Wild Dolphins specialty license plates.

EXECUTIVE DIRECTOR'S REPORT



It's natural at the turn of the calendar year to cast glances both back and ahead, and we at Harbor Branch are looking back at our first five years as a part of Florida Atlantic University and ahead through the lens of our 2012-2017 strategic plan: Our Living Oceans: Research, Partnerships & Stewardship for the Future. I invite you to review the plan at our website (www.fau.edu/hboi) to see how we're pursuing Ocean Science for a Better World.



The first half of the plan focuses on the marine science and technology research at the heart of our mission. The remainder covers the efforts and collaborations we undertake to support, enhance and extend the reach of our mission. For example, research leads naturally to education, so we have focused on working with our FAU colleagues to teach and train tomorrow's scientists and engineers. In the same spirit, we're expanding public outreach efforts to spread further the message of human-ocean interdependence. We're also seeking partnerships that use our research as fuel for economic development in our region and state.

Being a part of FAU allows us to extend our capabilities and expand our reach, and so it feels appropriate at this time to celebrate both our five-year anniversary and the course we've set for the voyage of discovery ahead. We truly appreciate and depend upon your interest, and we hope that you'll continue on with us.

Margaret Leinen
Executive Director

RESEARCH BRIEFS

HARBOR BRANCH RESEARCHER PRESENTS CORAL REEF STUDY IN AUSTRALIA

This past summer, FAU Harbor Branch Assistant Research Professor Sara Edge, Ph.D., joined scientists from across the globe for a symposium in Cairns, Australia, where she presented the results of her study (conducted with Assistant Research Professor Joshua Voss, Ph.D.) on the effects of oil and dispersants on coral health. Results of the study indicate that in the presence of dispersant, black



Dr. Sara Edge (right) and colleague

band disease progression is inhibited, likely due to a negative impact of the dispersant on the disease microbes. Molecular diagnostics of the symbiotic algae in coral tissues (zooxanthellae) indicate that exposure to dispersed oil and dispersant alone increases cell death and decreases respiration and photosynthesis. Zooxanthellae exposed to oil (no dispersant) reveal a significant increase in cellular respiration. Corals exposed to dispersed oil and dispersant alone reveal an elevated general stress response. The response of corals to oil alone is still under investigation. Following her presentation, Dr. Edge enjoyed a dive on the Great Barrier Reef.

STUDY FINDS QUEEN CONCH STILL STRUGGLING

FAU Harbor Branch Research Associate Amber Garr, Ph.D., has researched endangered Queen conch populations in the Florida Keys following a 25-year fishery closure that was intended but failed to help the species sufficiently recover. In an effort to determine the impact of heavy metals on conch larval recruitment, four sites were tested for the presence of copper and zinc in the water, phytoplankton, sediment and seagrass epiphytes over seven months. Field concentrations of copper often surpassed water quality standards, and also negatively impacted growth, survival and development of the larvae. Chronic exposure to copper disrupted the metamorphic success of competent larvae and decreased post-metamorphosis survival. Exposure to copper in the late larval stages increased mortality, suggesting that heavy metals are having a



Dr. Amber Garr

negative effect on Queen conch larval recruitment in localized areas of the Florida Keys.

RESEARCHERS PATENT POTENTIAL PANCREATIC CANCER TREATMENT

FAU Harbor Branch Assistant Research Professor Esther Guzmán and Research Professor Amy Wright are co-inventors on a U.S. Patent awarded in July 2012 covering the potential use of manzamine A, a natural product isolated from a marine sponge, as a treatment in pancreatic

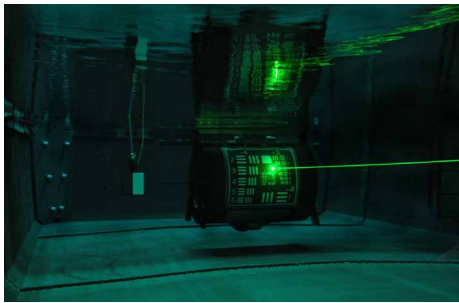


Dr. Esther Guzmán

cancer. Researchers found that while manzamine A is not very cytotoxic on its own against pancreatic cancer cells, it makes them more susceptible to other drugs and, more importantly, stops the cells from migrating. Migration of cancer cells is a marker of metastasis, the process by which cancer cells spread to other organs. Aggressive metastasis is one of the deadliest characteristics of the disease. This work was published in the journal *Investigational New Drugs* in 2011, and the work to understand the mode of action of manzamine A in pancreatic cancer cells continues in Dr. Guzmán's lab.

LASER SYSTEMS REVOLUTIONIZING UNDERSEA IMAGING

Researchers with FAU Harbor Branch's Ocean Visibility and Optics Lab, with support from the Office of Naval Research, have developed a new way of seeing undersea. For decades there have been two main methods: sonar, which operates over long distances but reveals



A laser illuminates a test-tank target

only information regarding seabed distance and density, and cameras, which must be positioned close to targets and are very limited in murky waters. Assistant Research Professor Fraser Dagleish, Ph.D. and his team are working to generate and transmit high-resolution images with a scanned laser transmitter module that illuminates targets with pulses of laser light and a multiple photodetector receiver, allowing them to capture images at distances up to 10 times farther than what is possible with traditional cameras. Recent tests conducted eight miles off Fort Pierce produced crisp images at distances of 30 meters, whereas in clearer water off Fort Lauderdale, similar images were produced at more than 80 meters. To capture comparable images with a camera, the lens would need to be within 2-3 meters of the target. Dr. Dagleish estimates that the system will be capable of producing quality images at distances of over 100 meters. Applications for the undersea imaging include naval mine detection and characterization, inspection of ship hulls and pipelines, high-resolution imaging of reefs, wrecks and other geological structures.

RESEARCHERS INVESTIGATE DEEP CORAL REEFS

Harbor Branch researchers Dennis Hanisak, John Reed, and Stephanie Farrington had key roles in the first of four planned cruises over the next two years to Pulley Ridge in the Gulf of Mexico. The goal of their research is to determine how the deep coral reefs of Pulley Ridge may help to replenish key fish species and other organisms in the troubled downstream reefs of the Florida Keys National Marine Sanctuary and Tortugas Ecological Preserve. Pulley Ridge, a relatively healthy coral ecosystem off the southwest coast of Florida, at depths of 200-330 feet is home to important commercial and recreational fisheries such as grouper and snapper. With the well-documented decline of Florida's reefs, areas like Pulley Ridge may serve as sources of larvae that can help sustain the Florida Keys' reef ecosystem and the tourism economy that depends on it. The cruises are part of a five-year collaboration of more than 30 scientists at ten different universities, pooling their expertise with state and federal agency scientists through NOAA's Cooperative Institute for Marine and



Exotic lionfish are a common sight on Pulley Ridge

Atmospheric Studies at the University of Miami in coordination with the Cooperative Institute for Ocean Exploration, Research and Technology at Harbor Branch with funding from NOAA's National Centers for Coastal Ocean Science.

2012 HERA INCLUDES STUDENTS, FEATURED ON NATIONAL TELEVISION

Last summer, Harbor Branch's Dolphin Health and Environmental Risk Assessment (HERA) program set out for the 8th year in search of health



All research is carried out under NMFS Research Permit No. 14352-02

statistics for bottlenose dolphins in the Indian River Lagoon. Over the past decade, more than 200 Indian River Lagoon dolphins have been captured, examined, sampled, marked and safely released. Researchers enlisted the help of FAU Pre-Veterinary Marine Biology students to assist with the annual assessments along with FAU faculty, graduate students and postdoctoral candidates from the FAU Charles E. Schmidt College of Science and the College of Engineering and Computer Science. In order to be eligible to participate, students had to complete a three-day interactive training course. This year's HERA team also included well-known television host Jeff Corwin, who filmed the premier for his nationally syndicated television show "Ocean Mysteries." The episode featuring HERA aired in October. Funding for HERA, which operates under special NOAA authorization, is provided by the "Protect Wild Dolphins" Florida Specialty License Plate.

FOUNDATION NEWS

Link Service Garners Recognitions

Foundation Board member emerita Marilyn C. Link received the Florida Atlantic University President's Distinguished Service Medallion at the summer commencement ceremony in August. This honor is bestowed upon individuals who have rendered service of great value to the University and the community at large. Link's contributions include her years as Harbor Branch Managing Director and as a Foundation Board member, as well as her leadership of the Link Foundation, which helped establish

the nation's first undergraduate ocean engineering program at FAU and continues to support scholarships through fellowships and the Harbor Branch Summer Internship Program. On National Philanthropy Day in November, Link was named the 2012 Outstanding Individual Philanthropist by the Indian River Chapter of the Association for Fundraising Professionals. The recognition, which stemmed from a joint nomination by the Harbor Branch Oceanographic Institute Foundation and the Indian



Marilyn C. Link (left) and President Mary Jane Saunders

River State College Foundation, celebrates her long-time dedication to philanthropic giving on the Treasure Coast.



Hendrix Directing Development

This past summer, Melodye Hendrix joined Harbor Branch as its new Director of Development and Outreach. She has held similar positions at the Duke University School of Medicine, Norman Adrian Wiggins School of Law at Campbell University and University of Central Florida (UCF) College of Business Administration. Hendrix earned two degrees from UCF - a Bachelor of Arts in Broadcast of Communications and a Master of Arts in Interpersonal Communication and she also served as UCF's Director of Alumni Relations. Hendrix is a central Florida native with extensive experience in media and community relations.

SAVE THE DATE

Mark your calendars now for these special events focusing on the Indian River Lagoon...
www.indianriverlagoon.org

Wednesday, February 6 at 6:30 p.m. at St. Edwards School

Ocean Science Lecture Series in partnership with the Yale Club of the Treasure Coast:
"The Interconnectedness of Natural and Human Systems: From Global Change to the Indian Rive Lagoon"

Sir Peter Crane, Dean of the Yale School of Forestry and Environmental Studies

Thursday, February 7 from 5:30 p.m. – 7 p.m.

Harbor Branch Johnson Education Center, Indian River Lagoon Symposium
"Meet the Scientists" poster session

Friday, February 8 from 9 a.m. – noon:

Forum on Lagoon Health, Johnson Education Center,

6-10 p.m. 2nd annual "Love Your Lagoon" dinner, Harbor Branch Plaza:

Tickets available online www.indianriverlagoon.org or call 772-466-9876 ext. 224

Specialty License Plate FY2012 Update

During the 2012 fiscal year, the four specialty license plates supporting Harbor Branch yielded more than \$2.37 million in funding for research and education programs. The Protect Wild Dolphins tag continues to be a top seller, followed by Save Our Seas, Protect Florida Whales and Aquaculture. Here are some highlights from the FY 2012 report on revenue and research spending:



Aquaculture

Aquaculture research awards (\$385,024) enabled the initiation of a leading-edge integrated multi-trophic aquaculture research program, new understanding about the viability of Florida apple snail stock enhancement and the effects of invasive species, and proof of two distinct genetic populations of the same oyster species along Florida's Gulf coast that would influence any future stock enhancement efforts (e.g., consequent to an oil spill). The funds also supported a postdoctoral investigator, two summer interns, a graduate student thesis project, four publications, four scientific presentations and eight instances of educational outreach.

Save Our Seas

Save Our Seas research awards (\$967,089) enabled development of the Indian River Lagoon Observatory and Indian River Lagoon Symposium, which enable Harbor Branch to take a leadership role in Indian River Lagoon research; establishment of long-term Indian River Lagoon nutrient monitoring to help reveal the composition and causes of harmful algal blooms and seagrass production; continued long-term nutrient monitoring of coral reef and seagrass communities in the Florida Keys; new understanding about visual function of three valuable Indian River Lagoon fish species; and ongoing study of stressors on St. Lucie Reef, Florida's northernmost coral reef. The funds also supported six postdoctoral investigators, five graduate students,

three summer interns and 13 scientific presentations.

Protect Wild Dolphins

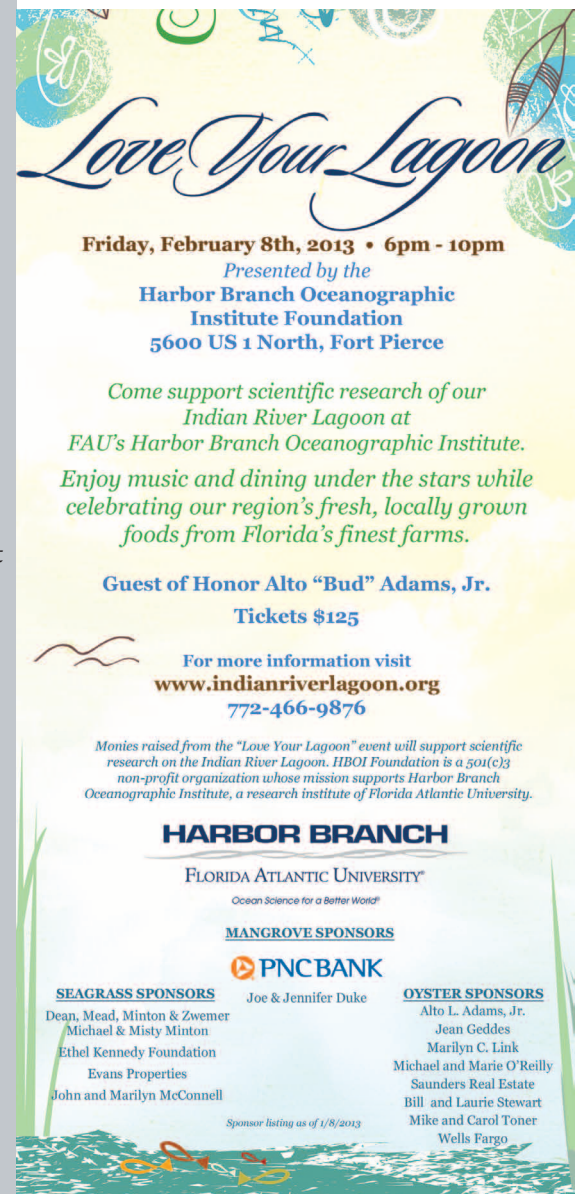
Protect Wild Dolphins research awards (\$1,778,660) enabled around-the-clock readiness and facilities for dolphin interventions, supporting 16 call responses for disentanglements and recovery of animals, as well as four necropsies and valuable educational opportunities for students and faculty; examination and sample collection from 18 IRL dolphins as part of the Health and Environmental Risk Assessment project; satellite tagging and tracking of four IRL dolphins; and hair sample collection from human consumers of IRL fish to determine mercury exposure for comparison with the same in dolphins. The funds also supported a postdoctoral investigator, two graduate students, one graduate student thesis project, 19 publications, 19 scientific presentations and two instances of educational outreach.

Protect Florida Whales

Protect Florida Whales research awards (\$260,523) enabled around-the-clock readiness and facilities for whale interventions, supporting five call responses, three necropsies and 22 valuable educational opportunities for students and faculty; coordination of a team of citizen scientists to monitor right whales, the most endangered marine mammal in Florida waters; new understanding of the vocalization habits of right whales; and continued cardiomyopathy research in pygmy sperm whales. The funds also supported a postdoctoral investigator, seven scientific presentations and 22 instances of educational outreach.

Friends Receive New Membership Card, Benefit

Making its debut in 2012 was the Friends of Harbor Branch membership card, enabling members to enjoy reciprocal benefits at over 300 science institutions and museums worldwide. These benefits include free or reduced admission and special discounts in gift shops. The Friends of Harbor Branch also entitles members to special VIP tours of the campus, invitations to special trips, tours and lectures at members' pricing. For more information, contact Cindy Willson at 772-242-2226 or cwills01@fau.edu.



Love Your Lagoon

Friday, February 8th, 2013 • 6pm - 10pm
Presented by the
**Harbor Branch Oceanographic
Institute Foundation**
5600 US 1 North, Fort Pierce

*Come support scientific research of our
Indian River Lagoon at
FAU's Harbor Branch Oceanographic Institute.
Enjoy music and dining under the stars while
celebrating our region's fresh, locally grown
foods from Florida's finest farms.*

Guest of Honor Alto "Bud" Adams, Jr.
Tickets \$125

For more information visit
www.indianriverlagoon.org
772-466-9876

Monies raised from the "Love Your Lagoon" event will support scientific research on the Indian River Lagoon. HBOI Foundation is a 501(c)(3) non-profit organization whose mission supports Harbor Branch Oceanographic Institute, a research institute of Florida Atlantic University.

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Ocean Science for a Better World®

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Sponsor listing as of 1/8/2013

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5600 US 1 North
Fort Pierce, FL 34946



Pictured from left: Wells Fargo representatives Kelly Ward, Kate Wilson, Travis Robins and Mike Harpole and Kim Mullins with Harbor Branch Executive Director Dr. Margaret Leinen and Ocean Discovery Center (ODC) Director Dr. Jim Masterson

Wells Fargo Aquaculture Pavilion Opens

By virtue of a generous \$45,000 gift from the Wells Fargo Foundation, the Harbor Branch Ocean Discovery Center has a new exhibit to help explain aquaculture research to its more than 10,000 yearly guests and students. The November 1 grand opening of the Wells Fargo Aquaculture Pavilion featured remarks from Harbor Branch and Wells Fargo leadership and attracted a variety of dignitaries. The open-air Pavilion features two recirculating fish aquaculture systems, informational displays about the exhibit and the science of aquaculture, and workspace for hands-on activities.

SPECIALTY LICENSE PLATE INFO

Harbor Branch Florida specialty license plates support research, conservation and education. Visit www.fau.edu/hboi for details.



Don't miss the OCEAN SCIENCE LECTURE SERIES

Wednesdays at 4 p.m. and 7 p.m.
January 16 – April 3, 2013
Download a complete listing
of the presentations
at www.fau.edu/hboi



Ocean Discovery Center

Gift Shop and Friends of Harbor Branch program office located on site.
Hours: Monday-Friday, 10 a.m. to 5 p.m.; Saturday 10 a.m. to 2 p.m.
Phone: 772-242-2293 • To schedule group tours, call 772-242-2417.