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 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 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 sites in the river, bay and reefs 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.
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 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.
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 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 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.
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 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 Dalgleish, 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. Dalgleish 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 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.

LASER SYSTEMS REVOLUTIONIZING UNDERSEA IMAGING

A laser illuminates a test-tank target

Exotic lionfish are a common sight on Pulley Ridge

2012 HERA INCLUDES STUDENTS, FEATURED ON NATIONAL TELEVISION

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

Last summer, Harbor Branch’s Dolphin Health and Environmental Risk Assessment (HERA) program set out for the 8th year in search of health 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.
Mark your calendars now for these special events focusing on the Indian River Lagoon...

www.indianriverlagoon.org

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 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.
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 multitrophic 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 cwillso1@fau.edu.
SPECIALTY LICENSE PLATE INFO
Harbor Branch Florida specialty license plates support research, conservation and education. Visit www.fau.edu/hboi for details.

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.

SPEND THE HARBOR BRANCH 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.