

November 7, 2016

To: Harbor Branch Oceanographic Institute, Inc. Foundation Board

From: Megan Davis, Ph.D., FAU Harbor Branch Interim Executive Director

cc: Patrick Boles, FAU Harbor Branch Associate Executive Director of Operations
Daniel Flynn, Ph.D., FAU Vice President for Research
Anton Post, Ph.D., FAU Harbor Branch Incoming Executive Director

Re: FAU Harbor Branch Highlights since April 28, 2016 HBOIF Board Meeting

1. HBOI Foundation Research and Education Grant Updates – for Active Grants in FY2017 (See HBOIF Grant Progress and Final Reports for FY2016 for additional updates)

A. *Applying New Technologies to Transform Marine Natural Products Drug Discovery (PIs: Amy Wright, Esther Guzmán, Peter McCarthy, Shirley Pomponi)*

- **Implement New High Content Screening Assays in Cancer Immunology:** Assays targeting the molecules B7H4 (enhances oncogenicity and inhibits apoptosis in pancreatic cancer cells) and FoxP3 (a molecule that helps to pancreatic cancer cells evade immune response) had been set up with 127 pure compounds and 56 peak library fractions tested in both assays. Data has been analyzed and templates and protocols to streamline the data analysis were created. The analysis of the tested subset has identified 3 potential leads in the FOXP3 assay that need to be repeated for confirmation. Due to technical error, there were no leads identified in the B7H4 assay; these tests will be repeated and hopefully will show less variability. The assay will be used to screen and analyze more samples with 180 other peak library samples. (E. Guzmán)
- **Natural Product Chemistry for the Project:** Fractionation on 30 organisms with 589 fractions were completed and added to the enriched fraction library. These were tested for antibiotic activity against the drug resistant pathogens MRSA and *Pseudomonas* and 33 actives were detected. One compound has been identified from these hits. Preliminary screening in the cancer immunology assay (above) revealed three lead fractions in the FoxP3 assay. The analytical data on these hits have been reviewed and additional chemical investigation will be conducted after the activity is confirmed. E. Guzmán and A. Wright will submit a small grant proposal to continue this work. (A. Wright)
- **Biofilm Disruption and Microbial Cultivation:** The issues associated with the development and imaging of biofilms have not been overcome, therefore, this work has not led to a reliable assay for antibacterial discovery. The scientists will be determining the antibacterial activities of peak fractions generated by fractionation and microbial fermentation. Information on all microbial fermentation samples generated as a part of this project is being collated to allow preparation of the samples for biological evaluation.

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As a part of this process samples with very low weights will be combined to allow evaluation as pooled extracts from a single fermentation. (P. McCarthy)

- **Growing Mixed Culture of Sponges in Microcultures to Produce Natural Products:** Production of the gel microdroplets continues to be optimized. The design for the microfluidic chips has been simplified, and new chips are in production. After they are received encapsulating cells of single species and species mixtures will be conducted. Problems with analysis of images using the high content imager have been resolved, and data for the first batch of challenges between four sponge species are being analyzed. (S. Pomponi)

B. *Love Your Lagoon: Seagrass Nursery for Indian River Lagoon Restoration (PI: Dennis Hanisak, Co-PI Paul Wills)*

- The initial planting of *Halodule* in all six of the seagrass nursery tanks has been completed; the last tank was finished Nov. 3. All of the experimental units (plugs of seagrass transported from the field in pots) are surviving in the tanks and after several weeks, these inocula begin to spread within the tanks. The goal is that *Halodule* will cover the whole area in these tanks by spring.
- One of the biggest challenges in using a closed system for this nursery is that the water temperature in the summer gets very high (exceeding 35 °C at times). To mitigate the impact of high temperature shade cloth is placed over the tanks to keep them within the temperature range that *Halodule* can tolerate, yet provide sufficient light for growth.
- This project has successfully demonstrated that the correct dosage of slow-release fertilizer (Osmocote) can be a good source of nutrients for the seagrass in the tanks. The dosage is adjusted as the level of biomass in the tanks increases.
- The growth of snails in the tanks is helping to keep the algal epiphytes in check. There was an introduction of snails with one of the seagrass collections. With previous work done by D. Hanisak he found that the use of both snails and pinfish at ecologically relevant levels in experiments can be used to regulate epiphyte loads on the seagrass.
- Currently the six tanks with seagrass are in various stages of development. Studies and observations on how to manage the seagrass relative to the major environmental factors (light, temperature, and nutrients) and biotic factors (epiphytes, epifauna) that drive seagrass survival and productivity are underway. Given the environmental conditions in the tank, the researchers are assuming that the seagrass in the HBOI nursery will continue to increase over the winter even though in nature this is a time when seagrass productivity is low. This is due to the fact that the HBOI nursery conditions are more favorable for growth primarily because of better light conditions. The researchers will be able to confirm this in about three months.

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C. *Love Your Lagoon: Indian River Lagoon Graduate Research Fellowships (PI: Peter McCarthy)*

- The proceeds from the 2016 HBOIF Love Your Lagoon gala (and a small carry forward from FY2014 gala) are being used to support Indian River Lagoon Graduate Research Fellowships at FAU Harbor Branch (FY2017).
- A Request for Proposals was issued on March 4th, 2016 and proposals were received from 14 FAU college graduate students who are performing research relevant to the Indian River Lagoon while working with a member of the FAU Harbor Branch faculty.
- A committee was convened to review the applications (Drs. Peter McCarthy (chair), Matt Ajemian, and Mingshun Jiang) and recommendations were sent to Harbor Branch Interim Executive Director, Dr. Megan Davis, and to the President and CEO of the Harbor Branch Foundation, Katha Kissman.
- All fourteen students received funding for their projects: \$62,830 (54.6%) is committed to student research assistantship salary and fringe; \$3,597.00 (3.1%) is for tuition; \$6,625.50 (5.8%) is for travel related to experimental work and presentation of research at scientific conferences; and \$42,073.05 (36.5%) is for the purchase of necessary equipment and supplies related to their research projects.
- The students have all expressed their thanks for the valuable support that the Indian River Lagoon Graduate Research Fellowships program provides. They will present their research at the 2017 Indian River Symposium.

2. Faculty Hires (see CVs sent by previous announcement emails)

- **Dr. Nicholas Dickens**, Associate Research Professor is FAU Harbor Branch's newest faculty hire and started at Harbor Branch on September 12, 2016. His specialty is bioinformatics. He is the eighth (and last) researcher supported by the HBOIF New Faculty Hiring Plan grant. He has come from the Wellcome Trust Centre for Molecular Parasitology at University of Glasgow, where he headed the bioinformatics team. He is interested in the application of bioinformatics and -omics to answer biological questions.
- FAU Harbor Branch Assistant Research Professor, **Dr. Annie Page-Karjian**, DVM, Ph.D., started May 2016. She is serving as veterinarian for Harbor Branch's Marine Mammal Research and Conservation Program and is setting up her research program (Marine Wildlife Veterinary Medicine and Research) to study in the areas of epidemiology, pathogenesis, and ecology of infectious diseases and neoplasia of marine mammals and turtles.
- **Dr. Aaron Adams**, Senior Scientist started at Harbor Branch on Oct 3, 2016. Aaron has lived, worked, and fished on both coasts of the US and throughout the Caribbean, where he has conducted fish research for > 25 years. He conducts applied research with conservation implications (from coral reef to recreational species), with particular interest in fish habitat ecology. One of Aaron's projects is on the Bonefish & Tarpon Trust (BTT) bonefish restoration project located at Harbor Branch.

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3. FAU Harbor Branch Research and Education Selected Highlights (please see eNews, eBulletin and HBOIF Board emails for other highlights)

RESEARCH ACTIVITIES

a) Ocean Exploration – Mariana Trench:

- This summer FAU Harbor Branch scientists (Drs. Shirley Pomponi and Deb Glickson) were lead scientists on the NOAA-funded expedition to the Pacific Ocean's Mariana Trench (the “Grand Canyon” of the sea) aboard the *Okeanos Explorer*. Deb served as geology science on leg 1 and Shirley served as the biology science lead on leg 3. An active hydrothermal vent was imaged for the first time during the Marianas expedition. Many other discoveries were made during the expedition and can be seen on the NOAA website.

b) Indian River Lagoon – Algal Bloom Crisis:

- Researchers at FAU Harbor Branch continue their active engagement in Indian River Lagoon studies and outreach that help county, state and federal agencies with management decisions for restoration and conservation of the estuary and near by ecosystems. Harbor Branch’s work also helps to inform the community of the issues and solutions for Lagoon health.
- The activities include understanding the health and population dynamics of the dolphins, sharks and rays (SLP funded); seagrass monitoring and restoration (SLP and SJRWMD funded); nutrient pollution related to land sources including septic tanks (SLP and County funded); and the impact of freshwater discharges on St. Lucie coral reef (SLP and Florida Sea Grant funded).
- Harbor Branch researchers were called upon as experts during the summer algae bloom crisis and a special presentation hosted at Harbor Branch “Treasure Coast Harmful Algal Bloom Situation Analysis” was presented by Dr. Ian Walsh, Director of Science & Senior Oceanographer, Sea-Bird Scientific and WET Labs, Inc. on July 27 in the middle of the crisis. Dr. Walsh working with Drs. Dennis Hanisak and Dr. Brian Lapointe used LOBO data from the St. Lucie Estuary to provide insights as to why the bloom was occurring and Dr. Jim Sullivan was called upon by media and others during the crisis as a subject matter expert on the algae type, toxins and causes of the bloom. Dr. Sullivan was also instrumental in developing a collaborative algal bloom team and received rapid funding from NOAA.
- During Hurricane Mathew the LOBO network recorded the water quality and weather real-time and a summary blog submitted by D. Hanisak of this information is on the HBOI website. This is the first time real time data was available during a hurricane in the Indian River Lagoon.
- Due to the various issues up and down the Lagoon this past year, the theme for the 2017 IRL symposium is *Indian River Lagoon: An Estuary in Peril*, Feb 9-10.

c) Shark Tagging in New York:

- FAU Harbor Branch Assistant Research Professor Dr. Matt Ajemian and Research Coordinator Mike McCallister were part of the research team working with OCEARCH to tag sharks off the coast of New York. The team believes that this area serves as a nursery area for Great White Sharks based on previously tagged adult sharks. They were

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able to tag nine juvenile Great Whites. This work with Ajemian was featured in an article in the Wall Street Journal and appeared on the CBS affiliate in New York.

- d) Biological Oceanography - Underwater Holographic Imaging System:
- FAU Harbor Branch Research Professor Dr. Jim Sullivan was recently awarded a multi-year grant from NSF (\$900,000) to pursue work on an underwater holographic imaging system for long term studies of 3D marine particles, both in the ocean and in the IRL. Others on the team include Drs. Fraser Dagleish, Laurent Chérubin, Adi Nayak, Lysel Garavelli and Malcolm McFarland.
- e) Coral Reef Health and Ecology:
- Members of FAU Harbor Branch's Coral Reef Health and Ecology Lab, led by Dr. Joshua Voss, recently conducted their third technical diving cruise at the Gulf of Mexico's Flower Garden Banks National Marine Sanctuary. As part of the Mesophotic Coral Reef Project, funded through the NOAA Cooperative Institute for Ocean Exploration, Research, and Technology, the objectives of this cruise were to assess responses in the coral transplant experiment at its one-year time point, further explore and characterize the mesophotic coral communities, and to survey shallow and mesophotic *Montastraea cavernosa* corals for the prevalence of different colony morphotypes.
- f) Aquaculture - Bonefish & Tarpon Trust (BTT) Partnership
- In August Harbor Branch scientists Drs. Paul Wills, Marty Riche and Matt Ajemian along their staff; Jon Shenker of Ichthyological Research, LLC,; and BTT worked together along with fishermen to capture 22 wild bonefish broodstock (adults) from the Florida Keys. They were transported to Harbor Branch to be conditioned for spawning and husbandry. Bonefish sportfishing helps to contribute millions of dollars each year to Florida's economy through recreation and tourism.
- g) Archeology - Old Vero Dig
- FAU Harbor Branch archaeologists (Drs. Jim Adovasio and Andy Hemmings and crew) discovered what they believe are bones from an ancient, extinct species of bison, likely 13,000 to 14,000 years old. The discovery was made in May during the final stretch of excavation efforts for 2016 at the Old Vero Site in Vero Beach. Dr. Greg O'Corry-Crowe, Research Professor, contributes ancient DNA research as part of this project. This project is a partnership with the community based organization and volunteers – Old Vero Ice Age Site Committee (OVIASC). With funding from Florida Division of Historical Resources and OVIASC the 2017 excavation will begin in January and go through until May.

EDUCATION AND OUTREACH ACTIVITIES

- a) Everglades Foundation and FAU Harbor Branch Graduate Student Scholarship
- Three FAU graduate students will pursue innovative research projects that will benefit the greater Everglades restoration effort. This was made possible because of the new Everglades Foundation / FAU Harbor Branch Oceanographic Institute ForEverglades Scholarship program that was launched this year. Everglades Foundation and FAU Harbor Branch each matched \$20,000 in scholarship funds. A press release of the awardees is being developed with both organizations.

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b) Mission Ocean Discovery (MOD)

- The MOD Initiative has a new Mission Ocean Discovery Coordinator, Dr. Gabby Barbarite that started in June 2016. Gabby is managing 5 MOD activities: Ocean Discovery Visitor Center, Immersion Tours, Marine Science Friday, Ocean Explorers, and assisting with Ocean Science Lecture Series. The Ocean Discovery Visitor Center will reopen with new exhibits (Aquaculture and Marine Biomedical) on January 3, 2017, the Immersion Tours will start on January 18 and the Marine Science Friday's will also start in January. More information is on the HBOI website.
- FAU Harbor Branch partnered with the Elliott Museum in Stuart to provide a view into the innovative technology being developed by Harbor Branch scientists and engineers to explore the ocean. The "Sight, Sound and Dynamics in the Sea: The Role of Technology in Ocean Exploration" exhibit is on display at the Elliott September 15 to November 27. The partnership included two lectures at the Elliott - Bill Baxley, Chief Engineer for FAU's Southeast National Marine Renewable Energy Center and by Dr. Shirley Pomponi, Executive Director of NOAA's Cooperative Institute for Ocean Exploration, Research and Technology. This partnership was made possible through the efforts of Anna Brady (Harbor Branch) and Jennifer Esler (Elliot Museum)

c) FAU Harbor Branch Education Activities

- The 2016 **Summer Intern Program** was a great success. There were 13 students funded by The Link Foundation, 4 by the Gertrude E. Skelly Charitable Foundation, and 1 by the NOAA Cooperative Institute for Ocean Exploration, Research & Technology. The program began on May 31 and concluded on August 4 with a day of presentations by the interns summarizing their research projects. This program is run by Drs. Dennis Hanisak (Link) and Amy Wright (Skelly).
- FAU Harbor Branch hosted on November 3 one of the preliminary rounds of FAU Graduate College's inaugural **Three Minute Thesis (3MT)** competition. Twelve graduate students participated from Colleges of Science, Nursing, Education, and Business. All participants gained unique professional development experience and enhanced their ability to concisely communicate their exciting research. Drs. Josh Voss and Peter McCarthy working with Dr. Deb Floyd (Dean of Graduate College) and the team helped to organize the heat at Harbor Branch. The winners were: first place and people's choice is Carlie Perricone (P. McCarthy's student), runner up is Stephanie Kelly (Ken Dawson-Scully) and 2nd place is Michael Studivan (Josh Voss). The FAU final competition will take place in Boca Raton on November 18.
- Harbor Branch in partnership with FAU Office of Admissions hosted for the first time a **pre-collegiate open house** for 25 high school counselors in the 4-county region (Martin, St. Lucie, Indian River and Brevard) on September 16 at Harbor Branch. Presentations highlighting the many exciting opportunities available to their students at FAU were made by Undergraduate Admissions, College of Engineering & Computer Science, Harriet L. Wilkes Honors College, Charles E. Schmidt College of Science, Undergraduate Research & Inquiry, and Harbor Branch. A roundtable discussion lunch and HBOI tour were also included. A students and parents open house is scheduled for February 25, 2017 at Harbor Branch. For the September 16 event, Norma Gammons was led organizer for Harbor Branch and many faculty (incl Drs. Jim Masterson and Peter McCarthy) and staff were involved from Harbor Branch and FAU Admissions.

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- **MS Marine Science and Oceanography degree** and Ph.D. Integrated Biology Marine Science and Oceanography track are actively being processed for approval to start fall 2017. Up to 5 classes in each fall and spring will be taught by Harbor Branch faculty and other courses will be taught at Boca Raton and other campuses. This will increase the number of graduate students at Harbor Branch taking courses and conducting their research.
- d) Development:
 - Development activities at Harbor Branch have continued, however, at a reduced level due to the departure of development team members. Anna Brady has continued to manage incoming donations, organizing the logistics for special group visits to Harbor Branch such as Indian River Estates in August and a recent group in November that involved a FAU alumni and his colleagues. Anna also is involved in organizing Harbor Branch's Speakers Bureau, which includes arranging logistics for Harbor Branch researchers to give presentations in the area. Harbor Branch is working with FAU Institutional Advancement to send out an annual appeal letter in early December.
- e) Sea Technology Advertising Donation:
 - FAU Harbor Branch continues to benefit from full-page advertisements provided as an in-kind donation by C. Amos Bussmann. These advertisements provide FAU Harbor Branch with a highly visible space to spotlight its research. This generous offer was renewed for 2016-2017.

4. New Items in Discussion

- Harbor Branch just received notice that **Raytheon** won the Navy contract bid for working on a sonar array for the Navy's LCS combat ship. Harbor Branch will be involved with all stages of the design along with fabrication. Harbor Branch engineers (Ben Metzger, Geoff Beiser and fabrication and machine shop staff) worked on the pilot tow body launch and recovery. Harbor Branch was one of the partners that was instrumental in helping Raytheon win the bid because of our work and ocean seagoing experiences. Harbor Branch will receive initially \$875,000 and the project will commence soon.
- **USDA ARS and FAU** are working together to establish a warm-water marine aquaculture center for excellence at Harbor Branch. FAU Harbor Branch is working with USDA ARS administrators, legislators and scientists to build out the concept.
- **Marine Research Hub** leadership summit was held on November 4th at the Ft. Lauderdale International Boat Show and Presidents from FAU, FIU and NSU and Dean of UF RSMAS discussed their marine research programs and ways to build partnerships. In attendance from FAU: President Kelly, Drs. Dan Flynn, Megan Davis, Javad Hameshi; and Ryan Britton and Tony Abbate. The Marine Research Hub initiative is being led by Marine Industries Association of South Florida and the Greater Fort Lauderdale Alliance.
- **Guy Harvey Outpost** and FAU Harbor Branch have just begun a preliminary discussion about how FAU Harbor Branch can provide science and outreach activities for their proposed Okeechobee site. Also in October Guy Harvey Outpost featured Harbor Branch in one of their blogs during the seafood month.
- **Harbor Branch Marine Mammal Stranding Center** has been inspected by NOAA NMFS and renovation is being completed (new screen enclosure, floors, pool repairs). It is anticipated that this triage center will be open in the first quarter of 2017.