MOTE MARINE LABORATORY

ANNUAL REPORT

2016

Mote's Mission

The advancement of marine and environmental sciences through scientific research, education and public outreach, leading to new discoveries, revitalization and sustainability of our oceans and greater public understanding of our marine resources.

PHOTO BY: Nikolai Sorokin/Adobe Stock

Cover Images: Mote President & CEO Dr. Michael P. Crosby, Mote Staff Scientist Emily Hall and Mote intern Florence Cuttat dive a blue hole off Captiva, Florida; Mote interns Kayla Gardner and Erika Neave assist Mote Technician Thomas Burnett with equipment during a phytoplankton ecology study in the Gulf of Mexico; Dr. Robert Hueter attaches a satellite tag to a bull shark's dorsal fin as part of a study to track bull shark movements in Sarasota Bay. *Photos by Conor Goulding and Olivia Raney*.

From the Chairman

Dear Friends,

What a difference a year can make! Just last year our President & CEO, Dr. Michael P. Crosby, publicly announced Mote's first-ever comprehensive fundraising campaign, *Oceans of Opportunity*. Its target of $50 million was calculated specifically to provide the support vital for us to achieve the goals of Mote's *2020 Vision & Strategic Plan*.

I'm proud to report that Mote's Board of Trustees was energized during the *Campaign* and demonstrated their support — with 100 percent of the Board coming together to pledge nearly $12 million. This wonderful demonstration of leadership giving helped to propel the campaign forward and motivated others to get involved.

I would especially like to thank the members of Mote's *Oceans of Opportunity* Leadership Circle, who made 11 contributions of $1 million or more. This special group of community members understands the urgent challenges facing our oceans, and has taken an active role to address them. In addition to its five anonymous members, Mote's *Oceans of Opportunity* Leadership Circle includes:

- Carol and Barney Barnett
- Rick and Nancy Moskovitz Foundation
- Elizabeth Moore
- James D. and Pati Ericson
- Robert and Anne Essner
- Maurice and Carolyn Cunniffe

The generous contributions made by these philanthropic leaders and nearly 24,000 additional campaign supporters will have a lasting impact — not just on Mote's research and education programs — but on our oceans locally and worldwide.

Thank you for your continued support of Mote's mission!

G. Lowe Morrison
Chairman
Mote Marine Laboratory Board of Trustees

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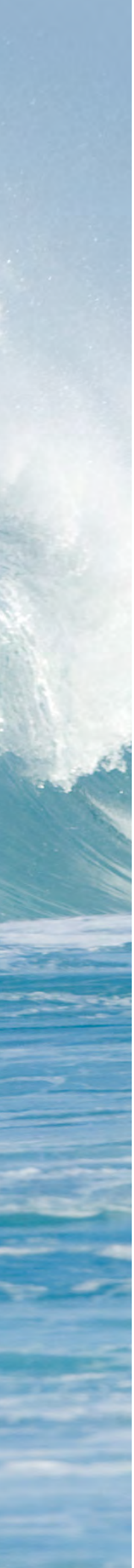

From the President & CEO

Dear Friends,

In 2016, we celebrated one of our most successful years ever as our diverse research programs continued to have positive impacts for oceans around the world. These scientific accomplishments will help address the urgent and significant issues our oceans face today and set the stage for future decades of discovery and understanding that will improve the long-term prognosis for the health and sustainability of our marine environments.

While no single document could capture every finding and each new revelation, this *Annual Report* provides summaries of the transformational research, as well as the educational and outreach accomplishments made by Mote scientists, aquarists, educators and staff members.

Today and throughout our history, these successes were only made possible through the powerful support and wise guidance provided by our outstanding Board of Trustees, the substantial efforts by our more than 1,600 volunteers and the momentous philanthropic support provided by our donors.

During our annual Oceanic Evening gala in October, we commemorated what would have been the 110th birthday of our namesake, William R. Mote, and celebrated the conclusion of the first comprehensive fundraising campaign undertaken in the Lab's 61-year existence. I was humbled and inspired when I announced that Mote supporters across the U.S. and beyond helped us meet and exceed the $50-million fundraising goal set forth through *Oceans of Opportunity: The Campaign for Mote Marine Laboratory*.

More than 23,000 donors of all ages and backgrounds contributed nearly $52 million to our campaign! More than half of the contributors were new Mote donors and remarkably, more than 80 percent of the contributions came from private individuals and families who hailed from every U.S. state, several U.S. territories and even other nations.

Oceans of Opportunity was designed to help us achieve the goals set out in our *2020 Vision & Strategic Plan*. Our 2020 goals focus on growing one of our most important assets, the next generation of the best and brightest minds in marine science, and allowing us to do so much more, including:

- Producing more world-class scientific studies and intellectual property;
- Translating and transferring our research to have more impact;
- Offering more education programs for underserved communities;
- Growing the Lab's endowment.

The funds raised through this campaign will provide the strong foundational underpinnings needed to help us expand our intellectual capacity by attracting and nurturing the next

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LETTER FROM THE PRESIDENT CONTINUED...

generation of innovators who will push the frontiers of science needed to address the grand challenges facing the marine environment worldwide.

Today, the momentum generated by our supporters is already helping to propel our unique, independent non-profit institution into a new era by empowering our freedom to pursue innovative science — for coral reefs, fisheries, endangered species and significant marine ecosystems — and advance the technological developments that will help us protect and sustainably utilize our oceans while also improving the quality of human lives, not just here locally, but in communities around the world.

Our 2020 goals, supported by *Oceans of Opportunity*, are stepping stones toward an even brighter horizon. The end of this campaign is just the beginning. It is the launch of a whole new era for Mote — and a Mote vision beyond 2020.

This is an exhilarating time in Mote Marine Laboratory and Aquarium's history, and I thank you for your support!

Dr. Michael P. Crosby
President & CEO

PHOTO BY: North Shore Surf Photos /Adobe Stock

Oceans of Opportunity:

A Successful Campaign for Mote Marine Laboratory

MOTE BY THE NUMBERS

23,217 campaign donors

more than **$50 MILLION** in donor commitments

11 MEMBERS in Mote's Leadership Circle*

*Donors who contributed $1 million or more to *Oceans of Opportunity*

Mote celebrated the success of its first-ever comprehensive fundraising campaign, Oceans of Opportunity, *and the extraordinary generosity of its supporters at the Lab's annual fundraising event,* Oceanic Evening *in October.*

The event, which drew about 400 ocean supporters for an elegant evening at The Ritz-Carlton, Sarasota, centered on the historic achievement of the Campaign and celebrated our exciting vision for the future. *Oceans of Opportunity* surpassed its goal of $50 million in donor commitments — attaining $51,736,582 — to help secure the funding that Mote needs to achieve the goals outlined in its *2020 Vision & Strategic Plan*, which focuses on:

- Supporting and expanding Mote's annual research and education operations;
- Spurring long-term growth in the endowment to provide security and sustainability for Mote's future;
- Financing construction of a new, state-of-the-art coral reef research facility in the Florida Keys.

"I am continually amazed by the generosity of the community," said Bob Essner, Chairman of the Campaign and a member of the Leadership Circle — a group of community members who each contributed at least $1 million to the Campaign. "Through this Campaign, Mote received support from all over the world and from a wide variety of donors. I don't think of this only as a financial success, but as a huge success in connecting to our local community and with others around the world who believe in one goal: saving our oceans. Thank you from the bottom of my heart, for allowing us to bring about change. It would not have been possible without each and every one of you, and I really mean that."

"The campaign's success marks a pivotal moment for the Lab's science and education missions and will pave a solid road for Mote's future," said Dr. Michael P. Crosby, President & CEO.

"The momentum generated by this Campaign's supporters has given Mote the opportunity to expand its research and education enterprise and propel this institution into a new era," he said. "As Mote's programs grow and prosper, we will be looking beyond the 2020 goals supported by the campaign and ultimately working to transform Mote's Sarasota campus into an international marine science, technology and innovation park that will bring together scientists and entrepreneurs from around the world.

"Achieving this goal is going to require a significant change to our research infrastructure on City Island, which will require building a new informal education center on the mainland where it will serve as a new sixth campus for Mote and bring ocean literacy to our broader community."

In addition to thanking five anonymous donors, Crosby also recognized Carol and Barney Barnett, Maurice and Carolyn Cunniffe, James D. and Pati Ericson, Robert and Anne Essner, Elizabeth Moore and Rick and Nancy Moskovitz Foundation and presented them with gold shark pins custom-designed by Diamond Vault to honor their commitment to our oceans.

Oceanic Evening was Chaired by Judy Graham, Mote Trustee and Board Chairman Emeritus, who has given her time, energy and support to Mote for more than 30 years. "I am honored to be able to be part of the Mote family and to be the Chair of this year's Oceanic Evening," Graham said. "Each gala is an incredible experience to be a part of, but tonight really is a special night. This year's gala celebrates the generosity of this community that has made the *Oceans of Opportunity* campaign such a remarkable success."

The evening would not have been complete without recognizing Mote's namesake, William R. Mote.

Honoring their Commitment: Dr. Michael P. Crosby, Mote President & CEO addresses the audience during Oceanic Evening.

Crosby told event attendees, "Tonight would have been the 110th birthday of William R. Mote, who always said 'for generations we've been taking from the sea and now is the time to start giving back' and that is what this campaign is all about: giving back. I want to sincerely thank everyone who is helping us achieve our goals outlined in our *2020 Vision & Strategic Plan* to enhance our positive impact on the world by 2020 — something that would not be possible without all of you."

Leadership Circle Members Honored: James D. Ericson, Maurice Cunniffe, Elizabeth Moore, Anne Essner, Bob Essner, Carolyn Cunniffe, Nancy Moskovitz, and Richard Moskovitz.

Impacts

MOTE BY THE NUMBERS

$90 MILLION regional economic impact

36,103 K-12 students served*

*Includes in-school, digital learning and on-campus programs

201 undergraduate interns hosted at Mote

34 education outreach programs

344,229 visitors to Mote Aquarium

95,780 Mote Mobile Exhibit viewers

66 patients cared for in Mote's animal hospitals

AFTER-SCHOOL PROGRAMS
BIRTHDAY PARTIES
BREAKFAST WITH THE SHARKS
CUSTOM GROUP PROGRAMS
COLLEGE INTERNSHIPS
EDUCATION TRAVEL PROGRAM
FIELD TRIPS
FLORIDA MASTER NATURALIST
GILLS CLUB
HIGH SCHOOL INTERN PROGRAMS
HIGH SCHOOL VOLUNTEERS
HOMESCHOOL ADVANCE PROGRAM
HOMESCHOOL DAYS
KAYAKING WITH MOTE
MOMMY & ME
MORNING ROUNDS
MOTE MOBILE EXHIBIT
MOTE SCIENCE CAFES
OUTREACH PROGRAMS
PARTNERSHIP SCHOOLS
RAPS: RESEARCH AFTERSCHOOL PROGRAM (KEYS)
RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)
SCOUT WORKSHOPS
SEAHORSE CONSERVATION LAB TOURS
SEASNOOZE OVERNIGHTS
SEATREK DIGITAL LEARNING
SHARK ENCOUNTER
SPECIAL LECTURE SERIES
SUMMER CAMPS
TEACHER WORKSHOPS
TEEN SCIENCE CAFÉS
TRAVELING EXHIBITS
VOLUNTEER OPPORTUNITIES
YOUTH OCEAN CONSERVATION SUMMIT

PHOTO BY: Joe Berg / Way Down Video

IMPACTS: World Class Research at Mote Marine Laboratory

After the Deepwater Horizon

Since the early days of the Deepwater Horizon oil spill, which began April 20, 2010, and released more than 200 million gallons of oil into the Gulf of Mexico, Mote has played a significant role in research investigating how oil exposure can affect marine life during and after a spill.

UNDERSTANDING FISHERIES EFFECTS: Mote scientists are working toward developing rapid health-diagnostic tests based on sub-lethal responses to oil that will better predict short- and long-term impacts of exposure in Gulf of Mexico fishes.

Mote and collaborators are examining how specific levels of oil components affect fish under highly controlled conditions in the lab. These lab studies rigorously examine oil-related changes in immune and reproductive health, viability of offspring and other traits important for maintaining Gulf fish populations; lab results provide important baseline data to better interpret and help "decode" research findings from wild fish sampled during and after the spill. Together, lab and field studies aim to provide a head start in understanding threats to the health of Gulf fisheries for decades to come.

Dr. Dana Wetzel, Manager of Mote's Environmental Laboratory for Forensics, and Dr. Kevan Main, Manager of Mote's Marine & Freshwater Aquaculture Program, are leading the studies into how weathered Deepwater Horizon oil affected the vulnerable early-life stages of red drum, also called redfish (*Sciaenops*), and inland silversides (*Menidia*).

Results show that, in general, both fish species exhibited increased mortality and red drum embryos were more likely to be deformed with increased concentrations of dissolved oil. For both species, the oil-dispersant mixture was by far the most toxic — sometimes by an order of magnitude — than oil or dispersant alone.

YOUNG DOLPHIN DEATHS LINKED TO MATERNAL HEALTH DECLINES AFTER DWH: The increased number of stranded stillborn and juvenile dolphins found in the Gulf of Mexico from 2010 to 2013 was likely caused by the chronic illnesses of dolphin mothers that were exposed to oil from the Deepwater Horizon spill.

Understanding the Impacts: Mote's Dr. Dana Wetzel conducts an oil exposure study at Mote Aquaculture Research Park.

The paper, "Fetal distress and in utero pneumonia in perinatal dolphins during the Northern Gulf of Mexico unusual mortality event" was published in the peer-review journal *Diseases of Aquatic Organisms* and is part of an effort to explain the unusual mortality event in the Gulf involving bottlenose dolphins, between early 2010 and continuing into 2014. The investigations into both the fetal dolphin deaths and the overall effects of the oil spill continue. The long-term effects of the spill on dolphin reproduction are still unknown.

The peer-review study, which included co-author Gretchen Lovewell, Manager of Mote's Stranding Investigations Program, showed that 88 percent of the stillborn and juvenile dolphins found in the spill zone had abnormal lungs, including partially or completely collapsed lungs. That and their small size suggest that they died in the womb or very soon after birth — before their lungs had a chance to fully inflate. Only 15 percent of stillborn and juvenile dolphins found in areas unaffected by the spill had this lung abnormality, the researchers said.

The lead author is based at the University of Illinois at Urbana-Champaign and the co-authors are from the National Oceanic and Atmospheric Administration (NOAA) and other institutions.

Tackling Red Tide

There are thousands of species of algae in fresh and marine waters; these organisms form the basis of the food web and provide an important source of the oxygen we need to breathe. Most species are harmless to humans and animals but some — known as harmful algal blooms (HABs) — produce harmful toxins. Floridians along the Gulf coast are probably most familiar with *Karenia brevis*, the organism that causes our own red tides, which can result in massive fish kills, the deaths of marine mammals, sea turtles, sea birds and — for humans — neurotoxic shellfish poisoning and respiratory impacts, especially for those with asthma and other chronic respiratory conditions. Mote researchers from many different disciplines investigate Florida's red tide to understand how blooms form, how they dissipate and what affects the blooms have on human and animal populations.

FINE-TUNING RED TIDE FORECASTS: A three-year, $1.1 million NASA grant is helping to fine-tune current red tide forecasts with the goal of offering public health managers, coastal residents and visitors better, more localized information on red tide bloom movements and impacts.

Project leaders from NOAA and the Gulf of Mexico Coastal Ocean Observing System (GCOOS) are developing an app that will allow trained beach observers with special low-cost smartphone microscopes to collect videos of water samples and upload them to a cloud-based server for automated evaluation. Mote's Dr. Tracy Fanara, Manager of the Environmental Health Program, is training the observers on how to use the smartphone microscopes. The Florida Department of Health is also a project partner.

Red Tide in Real Time: Smartphone microscopes will help automate red tide detection to improve public health protections.

Dynamic Duo: Mote staff and the Navocean team pose with their technologies: a sailboat drone and a robotic glider.

TESTING RED TIDE TECHNOLOGY: Dr. Jordon Beckler, Mote Postdoctoral Research Scientist and Manager of its Ocean Technology Research Program, worked with engineers from Seattle, Washington-based Navocean to test their solar-powered, sailboat drone technology in tandem with underwater robots Mote normally deploys to monitor harmful algae in the Gulf of Mexico. Robotic gliders can dive up and down underwater, covering depths the Navocean drone cannot reach, while the drone can move more quickly across the surface and access shallower waters than Mote's glider.

Both technologies are designed to collect ocean data more frequently, for longer durations and at lower cost than people working on boats, while sending data to scientists' computers via satellite. This helps alert scientists to changing ocean conditions in real time and schedule manned boat surveys to gather more specific data.

NEXT-GENERATION RED TIDE RESEARCH: Beckler was also awarded an Early-Career Research Fellowship from the Gulf Research Program of the National Academies of Sciences, Engineering, and Medicine to study how the presence of iron may affect harmful algal blooms (HABs) in the Gulf of Mexico. HABs are uncontrolled growth of naturally occurring algae in freshwater or the marine environment, including the toxin-producing algae *Karenia brevis*, which causes Florida's red tide and can result in fish kills, manatee deaths and human health effects.

The two-year, $76,000 grant will allow Beckler to continue his research on ocean iron chemistry to better understand HAB formation and behavior, explore the potential for iron in the environment to indirectly fuel HABs and unravel how iron may affect ecosystem dynamics, economics and human health.

Unlocking Key Information About Our Fisheries

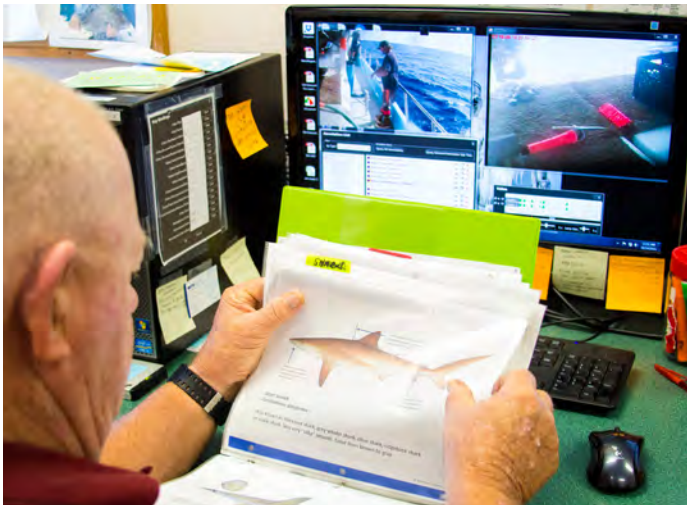
By understanding how fish use habitats and the impacts on species from man-made and natural impacts, we can develop a better understanding of how changes over time impact species and, ultimately, how disturbances affect fish populations. That means we need to develop a better understanding of everything from habitat use patterns to spawning aggregations to impacts from human fisheries.

BLACK GROUPER SPAWNING SITE UNCOVERED: Mote scientist Dr. James Locascio described the first-known U.S. spawning site for black grouper in the *U.S. Fishery Bulletin*, the nation's oldest peer-review fisheries journal. The spawning site, called Riley's Hump, is in the Tortugas South Ecological Reserve, a research-only marine reserve in the Florida Keys. Riley's Hump has been documented as a spawning site for mutton snapper. This new research by Locascio and partners indicates that it is also used by black grouper, red grouper and red hind. The study was funded by a grant from NOAA's Coral Reef Conservation Program. Identifying spawning sites allows resource managers to better understand and protect the spawning stock and habitats that support them and helps to predict the downstream locations where grouper larvae originating at Riley's Hump will settle so that juvenile habitats can be protected as well.

TESTING ELECTRONIC FISH MONITORING: Mote scientists received a grant for more than $500,000 from the National Fish and Wildlife Foundation (NFWF) to continue advancing electronic monitoring of fisheries in the Gulf of Mexico.

In many fisheries, NOAA requires vessels to self-report data on what fish they catch using logbooks and many vessels carry an onboard human observer to record the data. But logbooks don't always provide the level of detail and consistent data needed for fisheries management and it isn't financially feasible to have trained observers on all commercial fishing vessels in the Gulf.

Staff Scientist Carole Neidig is instead studying ways to incorporate electronic monitoring — particularly video — to enhance fisheries documentation. The Ocean Conservancy led the first study of electronic monitoring in the Gulf in 2011 with Mote and other project partners. It showed that electronic monitoring could be successfully applied aboard bottom longline and bandit vessels



Long-Distance Monitoring: Mote staff is proving that electronic monitoring of commercial fishing vessels is an effective solution to aid fisheries management efforts.

fishing for snapper and grouper. Now, leadership of the continued project will shift to Mote. Electronic monitoring equipment will be installed on commercial longline vessels based in Southwest Florida and the Panhandle, Louisiana and Texas. Vessels will receive training and equipment, including closed-circuit video cameras that will operate during fishing, gear sensors to detect fishing activity, a GPS to help detect where fish are caught and a monitor and computer control center with a portable hard drive. Mote will review video and analyze the data. Results will help resource managers document:

- Fish species caught and their locations;
- Bycatch species caught and locations;
- When vessels encounter protected species.

SNOOK RESEARCH: Snook are one of the most sought after catches in Florida's saltwater recreational fishing industry. In an ongoing research project seeking ways to conserve snook in the face of man-made and natural threats, Mote and FWC scientists have been studying the most effective methods to restock wild populations.

Now, thanks to a new privately funded Fisheries Conservation and Enhancement Initiative at Mote, scientists will tag and release 10,000–15,000 hatchery-reared snook in several locations in Sarasota and Manatee counties, including Bowlees Creek, Whitaker Bayou, Hudson Bayou, Phillippi Creek, North Creek and South Creek.

Dr. Ryan Schloesser, postdoctoral scientist at Mote, is documenting which shoreline habitat types juvenile snook prefer along Phillippi Creek, a seven-mile,

estuarine tidal creek system that offers diverse habitats for young snook — from seawalls to natural sites. Do snook reside in natural habitats longer or disperse more quickly from seawalls with no vegetation than those seawalls with vegetation? The ultimate goal is to provide this information to homeowners so that they can make fish-friendly decisions with their shorelines.

Snook Release: Mote postdoctoral scientist Dr. Ryan Schloesser prepares to release a juvenile snook.

TARPON POPULATION CONSERVATION STUDIES: Locascio began his second year of research focused on understanding how tarpon use different habitats during their lifetimes — from larvae to adult. This Charlotte Harbor-based project uses underwater acoustic receivers to listen for the movements of tarpon that have been outfitted with special tags that ping when they swim by the receivers. The Harbor's Boca Grande Pass is the deepest natural pass in Florida and the site of the world's largest known and predictable aggregation of tarpon — which draws millions of recreational fishing dollars to Southwest Florida annually. Understanding how tarpon use varying habitats will help resource managers better protect them at each of their life stages.

Healthy Habitats

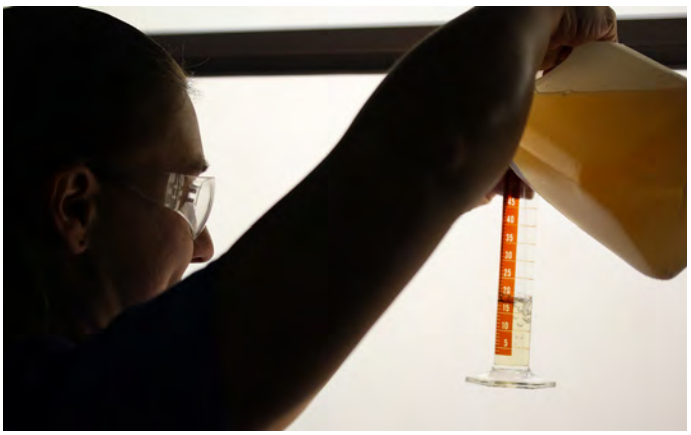
Keeping populations of fish and other marine life healthy isn't just about monitoring the organisms themselves. It often involves the need to understand the quality of the habitats they live in and monitor changes there over time.

KEEPING SEAGRASSES HEALTHY: Seagrass beds shelter and feed small invertebrates, shellfish, sport fish, manatees and more, often providing critical nursery habitat for the early life stages of many species. Seagrass beds may decline if poor water clarity obscures their sunlight. Now, resource managers in Charlotte Harbor have new tools to keep water clarity on target, thanks to a study by Mote's Dr. L. Kellie Dixon, Manager of the Chemical and Physical Ecology Program, and Janicki Environmental, Inc.

The study was funded by the Charlotte Harbor National Estuary Program (CHNEP) and published in the peer-review journal *Florida Scientist*. It provides new mathematical modeling tools that are helping CHNEP and partners produce a concise and easy-to-understand Water Clarity Report Card for resource managers, scientists and members of the public who aim to safeguard Charlotte Harbor's 62,000 acres of seagrass habitat.

Resource managers track the health of Charlotte Harbor's 14 estuary segments, in part, by monitoring changes in water quality and clarity and resulting changes in seagrass coverage. Clarity describes how much light reaches a given depth without being absorbed, scattered or otherwise made unavailable to seagrasses and is critical but tricky to monitor in shallow estuary waters where the changing angular distribution of light can challenge even high-quality measuring gear.

Clarity: Mote Chemist Susan Launay measures a water sample for chlorophyll filtration and analysis.



The new study presents an Optical Model, which translates water quality sampling results — water color, turbidity and chlorophyll from algae — into water clarity values, describing how much light will be blocked from seagrasses at a given depth.

Climate Change Research

Worldwide, oceans absorb about one-third of all the excess carbon dioxide in the atmosphere, which can lead to a reduction in pH and dramatic shifts in seawater carbonate chemistry. But are oceans also releasing carbon?

UNLOCKING THE RUST-BACTERIA CONNECTION IN CARBON RELEASES: A new piece of the global carbon "puzzle" that researchers must solve to fully understand major issues like climate change emerged through new research by Dr. Jordon Beckler. The study, published in the peer-review journal *Marine Chemistry*, showed that carbon dioxide can emerge from the deep ocean in a surprising way.

The study looked at carbon-rich muck deposited as deep as 16,400-feet (5,000-meters) in the ocean, far offshore of coastlines with big river systems. Results suggest deep-dwelling bacteria are releasing carbon dioxide by using unexpected ingredients — metal ions that were once believed to be rare or absent at such depths. This new finding calls into question how much carbon dioxide is really emerging from some deep deposits, while offering new clues on how to find out. Beckler's study used state-of-the-art electrochemical techniques to investigate how bacteria do this at two deep-water carbon deposits offshore of Africa's Congo River and the U.S. Mississippi River.

Beckler performed the research with Georgia Institute of Technology and the Laboratoire des Sciences du Climat et de l'Environnement in France and it was funded in-part by the U.S.-based National Science Foundation and France's Agence Nationale de la Recherche.

Until now, researchers suspected that bacteria in deep-sea, organic-rich sediments were mainly releasing carbon dioxide from organic matter by obtaining oxygen from sulfate. Sulfate is a common, natural chemical in the sea. But in the last few decades, it has been discovered that bacteria prefer to use metal oxides (e.g. iron rust) if they are available. These metal oxides are usually lacking in the deep ocean — they mainly come from land and accumulate in coastal sediments. However, Beckler and colleagues found that high concentrations of metal oxides do accumulate in deep sediments surrounding large rivers.

If bacteria are getting a hold of these metal compounds at depth, they might not be using sulfate — and carbon chemistry predictions might be inaccurate.

Coral Research

Reefs worldwide face growing challenges from increasing ocean temperatures and acidification due to excess carbon dioxide from human activity. Mote research aims to understand those impacts and develop ways to restore depleted reefs.

RESTORATION PROJECT LAUNCHED IN KEY WEST: Mote launched a coral restoration project at Fort Zachary Taylor Historic State Park in Key West with a goal of creating a publicly accessible coral restoration site at the State Park demonstrating the techniques of restoration strategies being led by Mote.

Scientists and volunteers planted 5,500 live fragments of brain, mountainous star and great star corals in the waters off Key West's Fort Zachary Taylor Historic State Park. Dr. David Vaughan, Executive Director of Mote's Florida Keys campus, and others are using a cutting-edge reef-building technique called re-skinning, which enables small

Replanting: Dr. David Vaughan, Executive Director of Mote's Florida Keys campus, plants fragments of coral at Fort Zachary Taylor Historic State Park in Key West.

Fresh Start: A fragment of mountainous star coral (*Orbicella faveolata*) planted at Fort Zachary Taylor Historic State Park.

fragments of boulder corals to rapidly fuse back together to form new coral heads over the dead skeletons of depleted reefs. The project uses corals rescued from dredging projects by NOAA that are then grown at Mote's land-based coral nursery on Summerland Key. After they reach a desired size, the corals are then returned to the wild.

UNDERSTANDING CORAL HEALTH ABROAD: Mote and scientists from King Abdulaziz University (KAU) in Jeddah, Saudi Arabia, launched the most extensive baseline survey to-date of coral reef ecosystems along the Saudi coast of the Gulf of Aqaba — investigating multiple reef species in detail to support conservation. The initial two-week expedition focused on coral abundance, diversity and stress, along with the abundance and diversity of butterflyfish, sea urchins, seagrasses and other species that may indicate the health of this critical environment. Preliminary results suggest that some life forms may be healthier or more diverse in southern Gulf of Aqaba waters further from denser human populations, according to Dr. Michael P. Crosby, President & CEO of Mote and the leading U.S. partner in the expedition. More data and analyses are needed to verify the possible significance of trends, and the researchers aim for another expedition in summer 2017. The expedition, funded by a grant from KAU, covered four Saudi Arabian sites from north to south: Haquel, Ras Dhabrah, Maknah and Ras Alsheikh Hamid

Gulf of Aqaba: Ropes mark transects surveyed by scientists from Mote and King Abdulaziz University off the coast of Saudi Arabia.

National Center for Shark Research

Mote scientists have conducted shark research since the Lab was founded in 1955. Founding Director Dr. Eugenie Clark was a fish researcher who earned the nickname "Shark Lady" for her studies of these ocean predators. Her vision and passion for shark research live on at Mote 61 years later, where we house the only Center for Shark Research designated by the U.S. Congress. Mote scientists are dedicated to studying the biology, ecology and conservation of sharks and their relatives, the skates and rays.

STUDY SHOWS FLORIDA-CUBA SHARK CONNECTION: Scientists with Mote and the University of Havana published the first-ever peer-review scientific paper on the movements and habitat use of the longfin mako, a rare and vulnerable species of shark, based on information from sharks outfitted with satellite-linked tags. The sharks' movements shed light on the life of a rare species while demonstrating an important point: The U.S., Cuba, Mexico and the Bahamas are fundamentally connected by the sea.

Although rare, longfin makos are widely distributed in temperate and tropical waters around the world. This species generally inhabits deeper waters and is less well-known than its shallower-water cousin, the shortfin mako. Because of this lack of data, the species' low reproductive output and its vulnerability to commercial longline fisheries, the longfin mako is a species of special conservation concern.

According to Mote's Dr. Robert Hueter, Director Mote's Center for Shark Research and the lead scientist on the study, identifying critical habitat areas for the species is crucial to its conservation.

UNDERSTANDING WHITE SHARK POPULATIONS: OCEARCH and collaborating scientists tagged and sampled six great white sharks off Nantucket, Massachusetts, during an expedition that wrapped up in October. Resulting data will help researchers better understand the North Atlantic white shark population. Two of the tagged sharks are males — the first satellite tagged in the region. The six large white sharks sampled and tagged during Expedition Nantucket provide a major leap forward in science in the

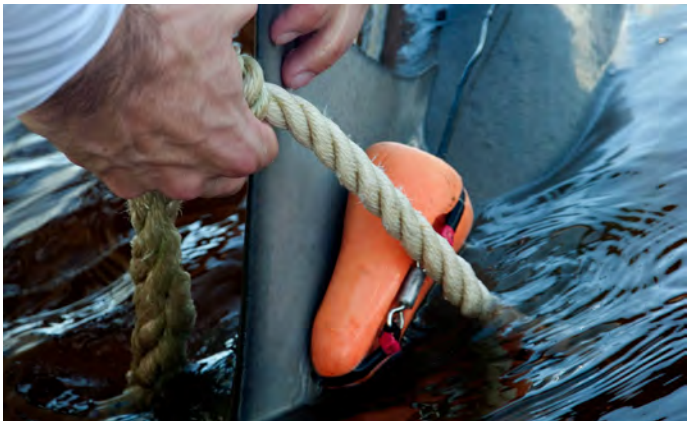
PHOTO BY: OCEARCH

Tagging Sharks: Mote scientists and their colleagues tagged six great white sharks off Nantucket, Massachusetts, in the fall.

Northwest Atlantic, according to lead scientist Hueter. As many as 15 researchers from 12 organizations received samples from the sharks to analyze results from muscle, blood, mucus, genetics, parasites and more, supporting a better understanding of white shark biology, physiology and health.

NEW TECHNOLOGY HELPING SOLVE SHARK FISHERY MYSTERIES: Fitbit-like sensors are the best tools for monitoring whether sharks survive catch-and-release fishing — essential data for fisheries management — according to a peer-review study published in the journal *Fisheries Research* by Mote scientist Dr. Nick Whitney, Manager of Mote's Behavioral Ecology and Physiology Program. Motion-sensing accelerometer tags detect whether a shark has survived and how it recovers from capture stress with much greater certainty than other prevailing

Sharks in Motion: Dr. Nick Whitney attaches an accelerometer tag to a shark in Charlotte Harbor.



technologies, such as satellite or acoustic transmitters. Accelerometers can measure sharks' fine-scale movements directly and with high resolution, including every tail beat, body tilt, ascent and descent. The study was funded by NOAA's National Marine Fisheries Service (NMFS), the federal agency responsible for stewardship of U.S. ocean resources and habitat. The research showed that on average, blacktip sharks took approximately 11 hours to recover from capture stress.

SALMON SHARK SURVIVAL: Dr. Heather Marshall, a Postdoctoral Research Fellow at Mote, is focused on understanding the post-release mortality of salmon sharks, a species that has been fished recreationally in Alaskan waters for more than a decade. While the species faces increasing fishing pressures, no population assessments have been done for them.

Marshall and colleagues, along with staff from Whittier Marine Charters, fitted salmon sharks with High Rate X-Tags, which are programmed to stay on the shark for 30 days and then detach, float to the surface and transmit data to scientists via satellite. The tags record depth and water temperature — information researchers can analyze to infer whether a released shark has survived.

UNCOVERING SPOTTED EAGLE RAY POPULATION INFORMATION: Kim Bassos-Hull, Mote senior biologist, and a team caught and released spotted eagle rays off Longboat Key after fitting them with acoustic tags in an effort to learn more about their life history, reproduction and population status in the first-ever comprehensive spotted eagle ray conservation project in the Gulf of Mexico.

Since the inception of this project in 2009, Mote scientists have learned that in the Sarasota area, there are all size classes of spotted eagle rays from babies (pups) to adults and that some rays either stay in the area or return after periods of months to years. Some pups are born in the late summer and early fall and the rays move or migrate to other locations in winter months when our local waters are too cold.

Mote scientists have also noted a declining then stabilizing trend in numbers of rays observed in aerial and boat surveys, which indicates a need for continued monitoring of this species' status.

Fifteen tagged rays detected multiple times on Mote's acoustic array in New Pass and Big Pass in 2016 indicated that large rays have a certain degree of residency in

Tagging Eagle Rays: Mote Senior Biologist Kim Bassos-Hull tags an eagle ray before releasing it back into Sarasota Bay.

Sarasota Bay. All appear to have followed a red tide bloom in September. Collaborators on the project include the California Academy of Sciences, Mexico's El Colegio de la Frontera Sur (ECOSUR), Georgia Aquarium, Harbor Branch/Florida Atlantic University, University of Havana's Center for Marine Research and University of South Florida Sarasota-Manatee.

LOW METABOLISM EQUALS EVOLUTIONARY SUCCESS FOR NURSE SHARKS: Mote research has revealed that nurse sharks have the lowest metabolic rate measured in any shark — new evidence of the sluggish lifestyle that has helped the species survive for millennia.

The study enhances knowledge about the metabolism of sharks — marine predators whose energy needs are little-understood but suspected to play a big role in the workings of healthy ecosystems. The National Science Foundation (NSF)-funded study was published by Whitney and researchers from Murdoch University, in the peer-review *Journal of Experimental Marine Biology and Ecology*.

Studies have estimated metabolic rates — energy use over time — for only a handful of shark species. Even more rare are studies linking metabolic data with behavior in the wild. The new study is the first published account of nurse sharks' metabolism in the lab: the initial step toward understanding the species' role in the wild.

PHOTO BY: seaphotoart / Adobe Stock

IMPACTS: Ensuring Long-Term Scientific Leadership & Success

When Mote created its *2020 Vision & Strategic Plan*, a key priority was the development of staff recruitment and nurturing programs designed to ensure the long-term success of its research enterprise. Today, Mote has developed key programs that allow us to meet our goals of helping early career scientists as they gain their footing in the research community and of providing support for those in later career stages who are making countless contributions to society. These awards are all funded through generous philanthropic support.

Mote Postdoctoral Research Fellowship

A two-year fellowship provides 100 percent salary support, research start-up, supplies, equipment and mentorship to postdoctoral scientists conducting outstanding work early in their careers.

2016 FELLOWS

Dr. Philip Gravinese
Dr. Noam Josef
Dr. Andrea Larsen
Dr. Robert Nowicki
Dr. Ryan Schloesser
Dr. Paul Suprenand

Mote Eminent Scholar Awards

This award provides 50 percent salary support to Mote Senior Scientists who can use the funding to advance a current research initiative or develop a new one that is consistent with Mote's *2020 Vision & Strategic Plan*.

2016 EMINENT SCHOLARS

Dr. Kellie Dixon, 2016–2018
Dr. Dana Wetzel, 2016–2018

2014-2016 EMINENT SCHOLAR

Dr. Carl Luer

Mote Scholarly and Service Activities

A 25-percent salary support award provides funding for scientists to conduct scholarly and service activities that reinvigorate their research and allows them to give back to the community.

2016 SCHOLARS

Dr. Nathan Brennan
Dr. Tracy Fanara
Dr. Emily Hall
Dr. Robert Hueter
Dr. Kevan Main
Dr. Erinn Muller
Dr. James Locascio
Dr. Vince Lovko
Dr. John Reynolds
Dr. David Vaughan

IMPACTS: Translating & Transferring Scientific Knowledge to the Public

Science and Society

Translating and transferring knowledge to the public has been a key aspect of Mote's mission since the organization's inception. Dr. Eugenie Clark, when she began the Lab in 1955, had a key mandate to share her findings with the local and regional communities. That mandate has continued to this day as Mote researchers and educators help to explain scientific findings to the public, to resource managers and to policy makers through forums, outreach events, special lectures, citizen-science projects and ocean science-focused clubs for youths.

Public Forums

BRINGING SATO-UMI TO SARASOTA: Sato-Umi — the harmony between human communities and the productivity and biodiversity of marine ecosystems — is a Japanese concept that is gaining ground around the world. Since 2013, Mote has been partnered with Japan's Research Institute for Humanity and Nature (RIHN) on a project titled "Formation of Local Environmental Knowledge Systems for Creation and Sustainable Governance of New Commons." This study, with lead partners Dr. Michael P. Crosby, Mote CEO & President, and Prof. Tetsu Sato, leader of RIHN's global integrated local environmental knowledge project, examines how grassroots groups, researchers working in the same geographic area, policymakers and others can blend traditional and scientific knowledge and techniques to restore, conserve and sustainably use natural resources. Some local, successful examples of this concept were presented during the public forum *Sato-Umi: Integration of Science and Community in Restoration, Monitoring and Sustainable Use of Marine Resources* at Mote.

Citizen-Science

SCALLOP RESTORATION: To restore depleted scallop populations in Sarasota Bay and study the best ways to do so, Mote has partnered with the local grass-roots citizen group, Sarasota Bay Watch, and others such as Florida

Scallop Release: Mote scientists and their partners release and monitor the success of young scallops in Sarasota Bay.

Fish and Wildlife Conservation Commission, Sarasota County, Bay Shellfish Co., local business leaders and many volunteer citizen scientists. Jim Culter, Senior Scientist and Benthic Ecology Program Manager at Mote, is heavily involved in this project in which Mote and its partners place young scallops into the Bay, monitor for recovery, work to improve environmental quality and expand community involvement.

MONITORING ENVIRONMENTAL CHANGES: In the Florida Keys, Mote invites the public to report environmental changes through its C-OCEAN project (Community-Based Observations of Coastal Ecosystems and Assessment Network) and its BleachWatch program. Led by Projects Coordinator Cory Walter in coordination with the Florida Keys National Marine Sanctuary (FKNMS), C-OCEAN is designed to provide early detection and assessment of biological events such as coral bleaching, diseased or killed fish, sick or injured sea turtles, algal blooms, discolored water and much more occurring in the Florida Keys and surrounding waters. The BleachWatch program provides early warnings of potential coral bleaching events in the Florida Keys National Marine Sanctuary.

CORAL RESTORATION: Each year, Mote works with two key partner organizations to replenish coral on Florida's reefs. Mote joins forces with the Combat Wounded Veteran Challenge (CWVC) and SCUBAnauts International to plant fragments of staghorn coral in the Lab's underwater restoration area offshore of Mote's Summerland Key coral nursery, led by Erich Bartels, Manager of Mote's Coral Reef Monitoring & Assessment Program. In addition to

boosting coral populations in the wild, this annual mission supports the recovery of veterans who have lost limbs or suffered other severe trauma while serving their country and provides them with an opportunity to teach their leadership skills and mission-focus to youngsters who participate in the SCUBAnauts program.

Youth Science Clubs

SCUBANAUTS COMES TO MOTE: Mote announced that it will host a new Sarasota-based SCUBAnauts International chapter. This club for teens ages 12-18 guides their personal development while involving youngsters in the marine sciences through underwater marine research activities such as special environmental and undersea conservation projects. The chapter will join those already operating in St. Petersburg, Tarpon Springs and Tampa and will be led by the teen members and their parents. Mote's Coral Health & Disease Research Program Manager Dr. Erinn Muller will serve as the chapter's Science Advisor and Mote Aquarium Biologist Heather Hooper will serve as the chapter's Dive Master and Safety Officer.

OCEAN TECHNOLOGY CLUB: Created in 2016, this club allows select students in grades 9-12 and teachers to explore oceanography, physics, chemistry, electronic circuitry and computer programming through real-world examples and applications — from using robotic underwater autonomous gliders to monitor for harmful algae to building tags to be placed on fish to monitor their behavior. Activities and projects are conducted under the mentorship of Mote researchers, led by Dr. Jordon Beckler, Manager of Mote's Ocean Technology Program, with support from the Fisheries Ecology & Enhancement and Fisheries Habitat Ecology programs and GCOOS.

GILLS CLUB: In partnership with the Atlantic White Shark Conservancy, Mote hosts the Gills Club, monthly meetings geared toward girls interested in science, particularly the science of sharks, skates and rays. Meetings include hands-on activities based on current research and introduces girls ages 6-13 to women working in science. (Boys and families are also welcomed at meetings.)

Symposiums and Lectures

SPECIAL LECTURE SERIES: Each year, Mote showcases marine-related topics on Monday evenings in March. This lecture series allows the public to learn more about

Smart About Sharks: Gills Club aims to jump-start girls' interest in science, technology, engineering, and math (STEM) subjects, and boost their chances of entering careers in science.

research being conducted at the Lab and elsewhere. The 2016 series included Dr. Robert Hueter, Associate Vice President for Research, Senior Scientist and Director of the Center for Shark Research, presenting *Tiburones: The Sharks of Cuba*; Dr. Andrea Tarnecki, Postdoctoral Research Fellow in the Marine Immunology Program, presenting *Probiotics in Aquaculture: Tiny Organisms and their Giant Impacts*; Dr. Shirley Pomponi, Research Professor, Executive Director of NOAA Cooperative Institute for Ocean Exploration, Research, and Technology at Harbor Branch Oceanographic Institute – Florida Atlantic University, presented *Exploration: Where we've been, where we're going, why it matters*; Dr. Dana Wetzel, Senior Scientist and Manager of the Environmental Laboratory for Forensics, presented *North to Alaska: Chemistry on Ice*. This Series is presented annually by long-time Mote supporters, Bob and Jill Williams and in 2016 with corporate partner Mariash Lowther Merrill Lynch.

SNOOK SYMPOSIUM: Members of the public were invited to join scientists and resource managers in a discussion about snook management, led in-part by Dr. Kenneth M. Leber, Associate Vice President for Research and Manager of Mote's Fisheries Ecology and Enhancement Program. This day-long symposium focused on snook research and management in Florida and discussion

included the most recent stock assessment, detailing the population recovery following a severe 2010 cold spell that killed thousands of snook in the wild. The symposium also addressed opportunities for improving the management of snook populations. Co-hosts included the Florida Fish and Wildlife Conservation Commission, Snook and Game Fish Foundation, The International Game Fish Association, Coastal Conservation Association Florida, Bonefish & Tarpon Trust, West Palm Beach Fishing Club, Florida Guides Association, Fish and Wildlife Foundation of Florida and the American Sportfishing Association.

Outreach and Engagement

SNOOK SHINDIG: The William R. Mote Memorial Snook Shindig honoring Capt. Scotty Moore, a research-based catch, sample and release tournament, draws in anglers to educate them about snook research and enhancement and allows them to help measure the success of restocking programs. During the tournament, Mote researchers document snook caught to identify individual hatchery-reared fish that have been previously tagged and released.

Catch-and-Release: Dr. Nate Brennan scans a snook caught by Carter Reemelin, to see if it is a fish that was previously tagged by Mote scientists and volunteers.

The tournament allows them to recover vital data that can be used to adjust release protocols and model fishery-enhancement potential. Past tournament results have revealed that changes in snook-release strategies, based on Mote pilot studies, have improved survival of stocked snook by as much as 200 percent.

PICKING SUPER BOWL WINNERS: Mote Aquarium's Hugh and Buffett serve as ambassadors for wild manatees and teach thousands of visitors each year how to protect endangered manatees in the wild. They are trained in behaviors that support their care and help researchers learn more about how they use their senses to navigate the wild — providing important information that can be used in the conservation of wild manatee populations. During this popular annual event, Hugh and Buffett swim toward a target holding the logo of the two teams playing in that year's Super Bowl game, making "predictions" about the winners. Denver Broncos or the Carolina Panthers? Buffett chose the Broncos and Hugh the Panthers. Buffett picked the winner — the eighth time he has picked a winner over the last nine years.

OTTERS & THEIR WATERS DEBUT: Mote Aquarium opened a new public exhibit, *Otters & Their Waters*, which provides an otter's-eye view of watersheds — lands that drain water toward rivers, estuaries and the sea — and are important to people and myriad wildlife. Watersheds mark the intersection between land and coastal oceans, where Mote scientists carry out their research and offers important opportunities to highlight the public about need to protect and conserve these wild areas. The exhibit is "staffed" by three North American River otter ambassadors: Huck, Pippi and Jane. These otters were orphaned too young to survive alone and were raised by wildlife rehabilitators and now call Mote home.

OTHER PUBLIC OUTREACH EVENTS included ELECTRIFY THE ISLAND, the Sarasota-based kickoff event for the sixth annual National Drive Electric Week. This event features electric vehicles and other eco-friendly technologies; the SIESTA KEY CRYSTAL CLASSIC, an international sand-sculpting competition that allows Mote to highlight the need to protect and conserve sea turtle populations, raise funds for those programs and helps to draw some 200,000 visitors annually to Siesta Key Beach; SHARK DAYS AT MOTE, a week's worth of special events culminating in a family festival that allows us to share our passion and pursuit of knowledge about shark science with the public; buoys and ghouls of all ages are invited to dress up in costume each year for a NIGHT OF FISH, FUN & FRIGHT. This safe trick-or-treat event includes creatures from the deep and underwater pumpkin carving in our spooktacular shark exhibit; WORLD OCEANS DAY FAMILY FESTIVAL, a fun opportunity to learn, honor and appreciate our oceans, which help regulate our climate, provide us with the oxygen we breathe, feed millions of people every year and even provide the foundation for many modern medicines.

IMPACTS: Public Service

Scientific inquiry, discovery and innovation are only a part of the equation that has driven our research programs and ensured the long-term and meaningful success of our work. The other part — the other side of the equal sign — that drives our enterprise is our dedication to public service. It is not enough that we work in the laboratory and in the field pushing the envelope of knowledge, we are also dedicated to ensuring that we are working for the good of the communities we serve.

Education Programs

From summer camps to field trips, to internships and mentorships, we believe conservation begins with education. And there is no greater public service than creating ocean-literate students and adults who are knowledgeable about the need to conserve and sustainably use our marine resources. In 2016, Mote's educators and scientists operated an impressive 34 programs.

The ROBERT L. TAYLOR COMMUNITY COMPLEX PARTNERSHIP we created in 2015 grew this year to include monthly after-school programs and two-week summer outreach programs focused on teaching science, technology, engineering and math (STEM) skills to an underserved community. The free program reached 1,200 students. We also partner with Girls, Inc.; Just for Girls; Pace Center for Girls; Boys & Girls Club, Sarasota; Sarasota YMCA; Manatee YMCA; Triad Alternative School; Easter Seals; Laurel Civic Center; Salvation Army Family Impact Program and Harvest House Centers to provide marine-science focused STEM programs. Publix Super Markets Charities helped to support this and other STEM-related outreach and education through a $13,500 grant.

Mote's MOMMY & ME EXPLORING THE BAY PROGRAM was awarded a $10,000 "Nature Play Begins at Your Zoo & Aquarium" grant from the Association of Zoos and Aquariums (AZA). This early childhood education program allows young children and adults to explore coastal habitats of Sarasota Bay.

The RESEARCH-BASED AFTER-SCHOOL PROGRAM FOR STUDENTS (RAPS) in the Florida Keys created in 2016 gives high school students the opportunity to take part in hands-on marine research and conservation focused on coral reef ecology and health. Students learn from experts

Aqua Kids: Sava Shelton examines a sea critter she found during Aqua Kids, one of the several summer camps offered by Mote's Education department.

while carrying out their own research projects for an authentic research-based opportunity.

PROTECTING PUBLIC HEALTH: Water samples from Mote and others contribute to weekly, statewide red tide reports from the Florida Fish and Wildlife Conservation Commission at www.myfwc.com/redtidestatus. Mote's Beach Conditions Reporting System also provides real-time updates on Florida red tide impacts — respiratory irritation and dead fish — and other conditions at 31 Gulf-coast beaches. That's important because when red tides travel inshore on wind and water currents, they can cause respiratory irritation among beachgoers, especially those who have underlying lung diseases. The Florida Department of Health advises that people with underlying chronic respiratory problems like asthma or COPD should avoid red tide areas, especially when winds are blowing toxins on or near shore.

▸ ONLINE AT: www.visitbeaches.org

Beach Conditions: Mote's Beach Conditions Reporting System alerts beachgoers to Florida red tide impacts.

Engaging Public Officials

Each year, Mote's top officials meet with local, state and federal lawmakers to help them better understand the issues facing our ocean ecosystems and marine life so they can make important decisions informed by the latest science.

IN 2016, WE MET WITH Sarasota Mayor Willie Shaw; former State Sen. Nancy Detert (R-Venice), current Sarasota County Commissioner; former State Rep. Alan Hays (R-Umatilla); State Rep. Greg Steube (R-Sarasota); State Rep. Darryl Rouson (D-St. Petersburg); State Rep. Jim Boyd (R-Bradenton); State Rep. Holly Raschein (R-Key Largo); State Rep. Ray Pilon (R-Sarasota); State Rep. Ben Albritton (R-Wauchula); State Rep. Julio Gonzalez (R-South Sarasota County); State Sen. Bill Galvano (R-Bradenton); Clay Hollis, assistant to U.S. Rep. Tom Rooney (R-Florida); Jillian Gates, assistant to U.S. Rep. Vern Buchanan (R-Florida); Melissa Robel, assistant to U.S. Rep. Dennis Ross (R-Florida); U.S. Rep. Darrell Issa (R-California). We also met with Tel Mond, Israel Mayor Roni Golan & Naama Golan and Cuban Embassy Deputy Chief of Mission, Nazario Fernandez and Second Secretary, Alfonso Casanova in support of our international research efforts.

Marine Animal Conservation

RESCUE AND RECOVERY: Mote provides critical support for the rescue and recovery of marine animals — often partnering with the Sarasota Dolphin Research Program, the National Marine Fisheries Service, the Marine Mammal Stranding Network and the Florida Fish and Wildlife Conservation Commission, as well as the concerned citizens who reach out to us through our 24-hour, seven-day Stranding Investigations Reporting hotline covering Sarasota and Manatee counties. Mote received $96,929 from NOAA's John H. Prescott Marine Mammal Rescue Assistance Grant Program to enhance the Lab's vital contributions to the National Marine Mammal Stranding Network. Mote also houses the Dolphin & Whale Hospital and Sea Turtle Rehabilitation Hospital to care for these protected and endangered species so they can be returned to the wild. Mote has responded to more than 1,400 sea turtle strandings and more than 680 dolphin and whale strandings of 25 species. In 2016, Mote cared for 66 turtles in its hospital and

Rehabilitation: Staff from Mote's Sea Turtle Rehabilitation Hospital and Stranding Investigations Program care for a sea turtle patient.

responded to the stranding of a 19-foot-long sperm whale on Little Gasparilla Island in Charlotte County. Earlier in the year, Mote helped to rescue a 10-year-old, long-term Sarasota Bay resident male bottlenose dolphin that had a life-threatening entanglement in a crab trap in Venice Inlet. The response team was able to remove the gear and the dolphin swam away. It was sighted by the Sarasota Dolphin Research Program several times throughout the year, indicating a successful rescue.

SEA TURTLE NEST MONITORING: Sea turtle nesting season runs from May 1-Oct. 31 on Florida's Gulf Coast beaches. Mote's Sea Turtle Conservation and Research Program

First Nest of the Season: Jaime Neill, Mote's Sea Turtle Conservation and Research Program's lead technician on Longboat Key, carefully places sea turtle eggs into their new egg cavity.

has coordinated conservation of sea turtles for 35 years on Longboat Key through Venice. This multi-decade monitoring service provides data that resource managers rely on use to understand the health of threatened and endangered turtle species populations. Long-term data are particularly important because sea turtles are long-lived species. It takes about 30 years for hatchlings born on Sarasota County beaches to return to nest as adults. In 2016, nesting in Sarasota County broke the 35-year record with 4,588 sea turtle nests recorded — a success that many attribute in part to the listing of sea turtles under the endangered species act.

BATTLING INVASIVE SPECIES: Mote hosted its third Sarasota Lionfish Derby, during which divers removed 429 invasive lionfish from the Gulf of Mexico. Each year, Mote teams up with Reef Environmental Education Foundation and ZooKeeper to help raise awareness of the negative impacts that these fish have on the Gulf's marine environment.

The Indo-Pacific lionfish (*Pterois volitans*) has invaded coastal habitats of the western Atlantic Ocean over the past two decades and has the potential to cause major ecological changes in reef fish communities. These efficient predators are venomous, reproduce frequently and year-round and pose a major threat to Florida's native species and ecosystems. They consume more than 120 different species of fish and crustaceans and in heavily invaded areas, they have reduced other fish populations by up to 90 percent. They continue to consume native fishes at unsustainable rates. The only controlling predators of the species in Florida appear to be humans. Lionfish derbies are an important way to educate and encourage divers and snorkelers to harvest large numbers of this invasive species, which has spread along the eastern Atlantic coast, through the Caribbean Sea and Gulf of Mexico. In 2016, local chefs from Indigenous Restaurant, Mattison's Restaurants & Catering, Seafood Shack and Beach House prepared tasty lionfish dishes enjoyed by the Derby's 300 attendees.

Eat 'Em to Beat 'Em: Mote's President & CEO Dr. Michael P. Crosby passes out lionfish burgers to Sarasota Lionfish Derby guests.

EDUCATING PUBLIC LEADERS: Mote helped to promote Florida's eco-friendly seafood and shared its research and expertise with ocean-focused leaders during Capitol Hill Ocean Week (CHOW) in Washington, D.C. Each year, CHOW draws more than 600 national and international scientists, policymakers, leaders from marine industry and conservation to raise awareness of ocean issues and advance ocean policy and stewardship. Mote Senior Scientist Dr. Kevan Main, Manager of Mote's Marine & Freshwater Aquaculture Research Program and World Aquaculture Society Fellow, participated in an expert panel on aquaculture, one of the world's fastest-growing food sources. Mote Aquaculture Research Park is developing technology to raise marine fish in recirculating aquaculture systems that recycle 100 percent of their saltwater, including a prototype aquaponics greenhouse that couples marine fish with salt-tolerant vegetables. Despite the success of domestic innovators, U.S. commercial aquaculture production lags far behind that of many nations, especially in Asia. Mote also partnered with Healthy Earth to highlight sustainably produced sturgeon and caviar from the Healthy Earth operation at Mote Aquaculture Research Park during the 41st Annual NOAA Fish Fry held during CHOW. The Fish Fry showcases sustainable seafood by bringing together many CHOW attendees, members of Congress, leaders of ocean-related government agencies and national to international nonprofit organizations with chefs and seafood producers from across the country.

CHOW 2016: Mote Senior Scientist Dr. Kevan Main serves as an expert on an aquaculture panel.

Notable at Mote in 2016

PHOTO BY: Conor Goulding / Mote Marine Laboratory

New Research Partnership

Mote Marine Laboratory and the University of Guam (UOG) forged a new partnership to benefit scientists, students and faculty while enhancing collaboration in marine research and science education.

Leaders of the two institutions, Mote President & CEO Dr. Michael P. Crosby and UOG President Dr. Robert Underwood, celebrated the signing of a memorandum of understanding (MOU) at UOG's campus in the heart of Mangilao on the island of Guam. The MOU lays the foundation for collaborations in marine research and education serving the common missions and goals of both institutions.

Under the agreement, Mote and UOG will explore opportunities to conduct joint research, partner in teaching and introduce more undergraduate students to the cutting-edge coral reef science at Mote's research facility on Summerland Key.

New partnership: Mote President & CEO Dr. Michael P. Crosby and UOG President Dr. Robert Underwood shake hands after signing a memorandum of understanding (MOU) in Guam.

New Website Supports Reef Research

Mote launched a new website for the Protect Our Reefs specialty license plate, which raises funds to support coral reef research, restoration, education and conservation.

The new site — www.motereefplate.com — is designed to provide an easy, user-friendly experience for Florida drivers who wish to purchase this specialty plate for their car, truck or trailer. Purchase of this license plate includes a $25 donation to Mote Protect Our Reefs grants program and supports:

- Scientific research to uncover the reasons for coral declines;
- Development of new coral restoration methods;
- Public education and outreach programs related to coral loss and recovery.

Run for the Turtles Celebrates 30th Year

Mote's longest-running fundraising event — Run for the Turtles — celebrated its 30th year in 2016. The event, which raises much-needed dollars for sea turtle research and conservation, also helps to raise public awareness about sea turtles and the need to protect female turtles as they come ashore to nest on the beaches where they were born. Mote patrols 35 miles of beaches to protect turtles each year.

Running for a Cause: Participants take off at the starting line for the 1 mile fun walk portion of Mote's 30th Annual Run for the Turtles.

The 5K run/1 mile fun walk is sanctioned by the Manasota Track Club. Mote also works with Positive Tracks, which empowers young people to support causes by participating in active fundraising events, develop their own charitable events and also provides matching funds for events that youth support.

The 30th Annual Run included Dean Cutshall, 73, of Indiana, who participated in the first event in 1986 and has returned for it each year since. "The first run was just delightful," Cutshall said. "I had such a great time. It was right on the beach, early in the morning, and I loved it so much, I made a pact with myself to come to this run every year and it became my excuse to come to Florida." He wore the number 30 during the run.

Center for Interactive Learning Award

Mote's digital learning program, SeaTrek.TV Interactive, earned the highest award in educational, interactive videoconferencing, the Pinnacle Award, for the 2015-2016 school year from the Center for Interactive Learning and Collaboration (CILC).

Mommy & Me: Children and their favorite adults learn together through a SeaTrekTV digital lesson.

The Pinnacle Award is given annually to organizations that receive outstanding scores on program evaluations submitted by educators. The award recognizes remarkable quality of educational content and exceptional skill at program delivery.

SeaTrek.TV brings Mote's research, animals and exhibits to classroom learners using affordable, easy-to-use distance learning technology. These virtual field trips are an exciting way to engage learners with science, technology, engineering and math (STEM) topics.

Program evaluations assess whether presenters are knowledgeable about the content, engage well with the audience and whether the program was engaging, appropriate for the advertised age/grade range, aligned to educational standards and met educational objectives and whether it had an impact on student learning.

Fulbright Visiting Scholar

In 2016, Mote welcomed Dr. Mohammed Rasheed, Fulbright Visiting Scholar from the University of Jordan to study the effects of oil exposure on fish species, including red drum and pompano with Mote Senior Scientists Drs. Kevan Main and Dana Wetzel. With Senior Scientist Dr. L. Kellie Dixon, he investigated inorganic analytical and statistical data analysis techniques. His work at Mote was made possible through the Council for International Exchange of Scholars' Fulbright Visiting Scholar Award, which supports the research and teaching of scholars visiting universities or other organizations in the U.S. Rasheed is a marine science professor at the University of Jordan. He earned a bachelor's degree in chemistry and a master's degree in marine chemistry from Yarmouk University in Jordan. He earned his Ph.D. from Max Planck Institute- Bremen University in Germany.

Notable Among Our Staff...

DR. KEVAN MAIN, Senior Scientist and Manager of Mote's Marine & Freshwater Aquaculture Research Program, was honored by the global aquaculture community when she received the Fellow of the World Aquaculture Society Award. The World Aquaculture Society, which has 3,000 members in about 100 countries, represents the global community of professionals involved in aquaculture — farming aquatic life forms such as fish. Each Fellow is "a member who has made outstanding achievements in aquaculture science, industry, outreach or extension as recognized by his/her peers."

Outstanding Achievement: Mote's Dr. Kevan Main accepts the Fellow of the World Aquaculture Society Award.

Hatchling Helper: Mote's new vet, Dr. Adrienne Atkins, treats a hatchling from the last nest of the season.

We welcomed Veterinarian DR. ADRIENNE ATKINS to oversee the care of our resident animals, as well as the sick and injured dolphins and sea turtles undergoing treatment at Mote's Dolphin & Whale Hospital and Sea Turtle Rehabilitation Hospital. An experienced zoo and wildlife veterinarian born and raised in Florida, Atkins has worked with a range of species from fish to elephants, participated in conservation field projects locally and abroad and assisted with cetacean strandings.

After a national search, Dr. Michael P. Crosby, Mote President & CEO, appointed ERIN (KNIEVEL) KABINOFF as Chief Development Officer. Kabinoff joined Mote in 2013 and helped the organization exceed its $50 million *Oceans of Opportunity Campaign* goal.

DR. JORDON BECKLER was promoted to Manager of Mote's Ocean Technology Research Program, which develops and deploys technology at sea to gather data useful for multiple research programs at Mote and beyond. Data are collected and re-distributed through Mote's Southern Operations-Coastal Ocean Observing Laboratory (SO-COOL) and the Gulf of Mexico Coastal Ocean Observing System (GCOOS). He joined Mote as a staff scientist in 2015.

DR. TRACY FANARA, Manager of Mote's Environmental Health Program, competed to host one of TV's most popular science and engineering shows during "Mythbusters: The Search." The original "Mythbusters," hosted by Adam Savage and Jamie Hyneman, launched on Discovery Channel in 2003 and ran through March 2016. In "Mythbusters: The Search," Fanara was one of 10 contestants competing to become next-generation "Mythbusters" hosts. Contestants applied science, engineering and building skills to tough puzzles. Fanara, an environmental engineer, investigates the effects of marine and freshwater chemicals on public health and oversees the Beach Conditions Reporting System, which provides twice-daily condition updates for 31 beaches along Florida's Gulf coast via www.visitbeaches.org and a free app available in the App Store. Ultimately she made it to the finals but did not win.

Mote welcomed KAY GARSNETT as the new Librarian and Archivist responsible for the Arthur Vining Davis Library and Archives. She manages the library's print and electronic archives and special collections and provides reference, document delivery and research services for library users. Prior to working at Mote, Garsnett worked as an archivist at the John F. Kennedy Presidential Library & Museum, Marian University's School of Liberal Arts, and the Daughters of the Republic of Texas Library at the Alamo. Garsnett has been a certified archivist since 2012.

We welcomed ALLISON WHITTEN as the new Facility Rental and Service Coordinator at Mote, which offers space for special occasions, including weddings, anniversaries, parties and meetings.

Public Relations Manager KAITLYN FUSCO was honored with the Rising Star Award from the Central West Coast Chapter of the Florida Public Relations Association (FPRA). The Rising Star Award recognizes passionate and enthusiastic professionals who make positive impacts through FPRA service and their careers.

AMANDA CHANDLER joined the staff as its new Major Gifts Officer, working with current and new donors to gain support of Mote's scientific research and outreach programs. Chandler, who joined Mote from the Sarasota Opera, graduated from Florida State University with her Master of Fine Arts in Theater & Non-Profit Arts Management. In 1998, she graduated from the University of South Florida with a Bachelor's in English Education.

Tea for the Sea

Tea for the Sea is an annual event that celebrates women's leadership in the fields of science and philanthropy and the convergence of the two. In 2016, more than 130 women attended the Feb. 5 event at Resort at the Longboat Key Club to hear from key speaker Rep. Holly Merrill Raschein, Florida House of Representatives, District 120.

Left: Mote President & CEO Dr. Michael P. Crosby with Donna Boscia.

Center: Rep. Holly Merrill Raschein, Florida House of Representatives, District 120, delivers the keynote address.

Right: Anne Essner and Tea for the Sea Chair Kimberley Carreiro.

PHOTOS BY: Peter Acker Photography

Party on the Pass

Nearly 400 people attended the 2016 Party on the Pass event on Friday, March 18, in support of Mote's hospitals for sea turtles, dolphins and whales. The evening was full of good food provided by local restaurants, good music and good will. A silent auction was held to raise funds for the animal hospitals.

Left: Mote Trustee Jeanie Stevenson with her husband Bayne.

Center: Jenna Rouse and Lynne Byrd from Mote's Dolphin, Whale and Sea Turtle Hospitals.

Right: Mote Trustee Dean Eisner and Stacy Alexander, Assistant Vice President of Community Relations & Communications at Mote.

PHOTOS BY: Peter Acker Photography

Run for the Turtles

More than 1,000 runners and walkers hit the beach to help sea turtles during Mote's 30th Run for the Turtles on April 2, on Siesta Key Public Beach. The Run, a joint effort between Mote, the Manasota Track Club and Sarasota County Parks and Recreation, raises funds to help Mote scientists study and protect sea turtles, which are listed as threatened or endangered under federal law.

Left: Mote Mobile educated Run participants and members of the public about sea turtle anatomy and conservation.

Center: Run Director Paula Clark presents runner Dean Cutshall with his ribbon for 5th place in the men's 70-74 category. This was Dean's 30th year participating in Mote's Run for the Turtles.

Right: Rachel Chambers, age 43, accepts her award as the overall female winner after finishing the race with a time of 21:05.

PHOTOS BY: Conor Goulding / Mote Marine Laboratory

Oceanic Evening

Oceanic Evening drew about 400 ocean supporters for an elegant event that applauded the historic achievement of Mote's comprehensive campaign and shared the Lab's exciting vision for the future. Guests enjoyed live music performed by Double Vision and a gourmet meal featuring sea purslane, a sea vegetable grown at Mote Aquaculture Research Park (MAP) using aquaponics.

Left: Lowe Morrison, Chair of Mote's Board of Trustees, welcomed guests after a whimsical cocktail hour.

Center: Mike and Lori Moran.

Right: Mote Trustee and Oceanic Evening Event Chair Judy Graham.

PHOTOS BY: Conor Goulding / Mote Marine Laboratory

Mote Volunteers

MOTE BY THE NUMBERS

1,798 volunteers at Mote

225,141 HOURS volunteered

85 volunteer award recipients

PHOTO BY: Ella Ferguson / Mote Marine Laboratory

An Honor to Have Their Support

Mote's success depends on having a supportive community that is engaged and involved in its mission. That support is apparent in our volunteer corps — the 1,798 men and women who volunteered 225,141 hours to Mote in 2016. "It is humbling to have so many volunteers who are dedicated to helping Mote achieve its mission of educating the public about the world-class research that happens right here in Sarasota and how the public can become better stewards of the marine environment," said Dr. Michael P. Crosby, President & CEO of Mote.

In 2016, Mote honored two volunteers for an amazing 30 years of service.

As an Aquarium docent, Dwight Davis has shared his passion for the ocean and educated visitors from around the world about Mote's research and conservation efforts. Davis grew up in Florida, first in Tampa, then on Hollywood beach where he became an avid fisherman. After retiring from the advertising business and moving to Sarasota in 1986, Davis heard about Mote from a neighbor, a long-time resident of Sarasota and friend of Mote's Founding Director, Dr. Eugenie Clark. He quickly decided to become a Mote volunteer.

One of Davis' fondest memories of being a volunteer was authoring a book titled "Marine Scene," the compilation of articles he had written for the Longboat Observer newspaper over 14 years. The articles were illustrated by the late Virginia Sanders, who was also a Mote volunteer. The book is still for sale in the Aquarium Gift Shop, with proceeds benefiting Mote.

"Being a volunteer was never work," Davis said. "Every activity – Aquarium guide, lab tours, President of the Volunteer Board, member of the Speakers Bureau,

10,000 Hours: Dr. Michael P. Crosby with the Volunteer Emeritus Award recipients, who have volunteered at least 10,000 hours, or ten years, at Mote.

writer of leaflets and donor testimonials and still more kept me busy. And Mote staff scientists have always kept an open door to help educate me. I never lost interest in marine life, and in fact have gained knowledge over time."

Volunteer, Carl Benninghoff was also honored for 30 years of service to Mote. Carl died just before receiving his formal recognition, but his wife Roberta accepted the award on his behalf. She is also a Mote volunteer. "I was away up north while my twin granddaughters were being born," Roberta said. "While I was gone, Carl got into things on his own and one of the things he got into was Mote. He loved it right away. He always loved studying things and learning things. He loved learning about all the fish, all the Aquarium animals and all the research that is done through Mote. He just really liked being here. It made him happy and when he couldn't be here, he was unhappy."

"Carl, like so many of our volunteers, made such an incredible impact on Mote," said Aly Busse, Assistant Vice President for Education at Mote. "His heart, dedication, enthusiasm and true passion for sharing Mote's mission were all contagious. He will be missed."

Mote also recognized Trustees who reached their own volunteer milestones: Howard (Sam) Seider, Jr., MD (20 years); G. Lowe Morrison (15 years); Susan C. Gilmore (15 years); Arthur L. Armitage (10 years); Robert E. Carter (10 years) and Lt. Gen. Howard G. Crowell (10 years).

SEE FULL LIST OF AWARD RECIPIENTS ▸

2016 Volunteer Board

Angela Briguglio *President*	Anna Marie Martin *Vice President*	Bob Whyte *Treasurer*	Pam Baker *Secretary*

President's Volunteer Service Award

Dick Haber
Betty Linke
John Puckhaber
Sue Stolberg

30-Year Awards

Carl Benninghoff
Dwight Davis

25-Year Awards

Mary Abraham-Kinney
Toni Borman
Suzanne Goodman
Marcia Hastings
Len Ross

20-Year Awards

Dick Aman
Marie Black
Robert Black
Mary Day-Karl
Barb Fulks
Fred Gewirtz
Clara McGonigle
Virginia Miller
Mary Moshonas
Gwen Ross
Howard (Sam) Seider, Jr.*
Edward Tesoriero
Virginia Walsh
Barrie Wilkie

15-Year Awards

Carole Cleland
Dave Cleland
Betty Curry
Susan Gilmore*
David Horrocks
Vinnie Maisto
G. Lowe Morrison*
Fran Okal
Norma Pennington
Margo Post
Colette Purcell
Becky Riffle
Richard Rozanc
Suzie Seerey-Lester
June Elisabeth Taylor

10-Year Awards

Arthur Armitage*
Patricia Battles
Fran Bays
Robert Carter*
Laurel Cohen
Howard Crowell*
Jim Davies
Jack DeCaprio
Elyse Diamond
Barry Dick
Don Dietterick
Joanne Dietterick
Dawn Finnerty
Sondra Fox
Kaili Gould
Sue Hargis Spigel
Marilyn Herbert
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Mary LaFollette
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Jan Pyburn
Bob Rose
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Volunteers Emeritus

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Dick Booth
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Eileen Brown
Gretchen Castner
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PHOTO BY: JAY - Fotolia / Adobe Stock

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MOTE BY THE NUMBERS

11,859 donations

more than **9,500** members

97 corporate members

145 Legacy Society members

$500,000 and over

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Aaron Thiel, Howard and Nancy Cobin, Dr. Michael P. Crosby, Jane Graham-Hyslop, Mote Trustee Alan Rose and Joan Bradbury Kayser at a ribbon-cutting event for Mote's "Otters & Their Waters" exhibit.

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JoEllen and Bill Siemers with Skip and Janis Swan.

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Leadership through Giving

The Mote Leadership Circle is a special group of community members who understand the urgent threats facing our oceans and have provided critical financial support of $1 million or more to the *Oceans of Opportunity Campaign*.

We offer a special thank you to members of the Mote Leadership Circle:

- Carol and Barney Barnett
- Maurice and Carolyn Cunniffe
- James D. and Pati Ericson
- Robert and Anne Essner
- Elizabeth Moore
- Rick and Nancy Moskovitz Foundation
- Five anonymous donors

PHOTO BY: Ulia Koltyrina / Adobe Stock

Membership

MEMBERSHIP MATTERS HERE

More than 9,500 individuals and families choose to support Mote's mission by participating in our Mote Membership program, which provides them ready access to our informal science education center — Mote Aquarium — and to interactive programs that make learning fun.

In return, the funds we raise through our membership program help us keep the lights on, the research boats running and the staff humming.

We thank all Mote Members for their support and invite you to join or renew your membership today. Go online to mote.org/membership or call (941) 388-4441, ext. 373.

Legacy

LEAVE YOUR OWN OCEAN LEGACY

Mote's Legacy Society is made up of inspirational supporters that champion Mote's mission and vision for the future through planned giving. To learn more about joining Mote's Legacy Society, please contact our Development Office at (941) 388-4441, ext. 309.

PHOTO BY: Joe Berg / Way Down Video

Their Legacy will be Healthier Oceans

No matter their diverse backgrounds, Members of Mote's Legacy Society all share the same desire: to protect the long-term health and sustainability of our oceans. They've proven that commitment by designating Mote as a beneficiary in their estate plans. This deferred giving provides key support to allow our Mote scientists and educators to continue doing what they do best: work for the good of our oceans for generations to come.

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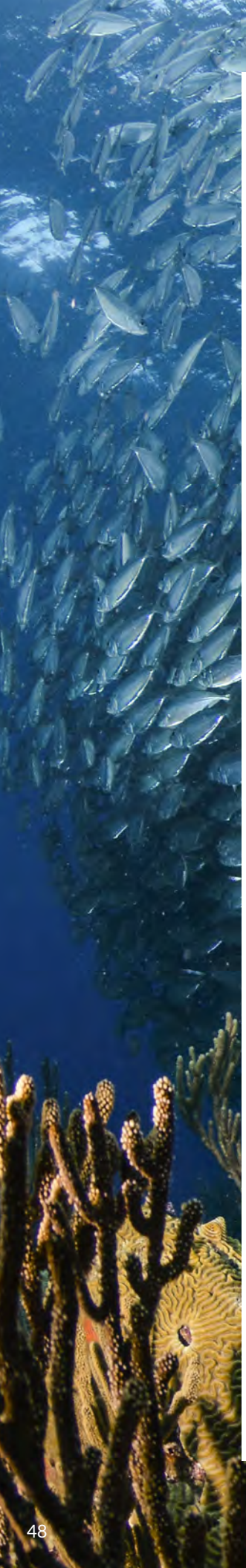

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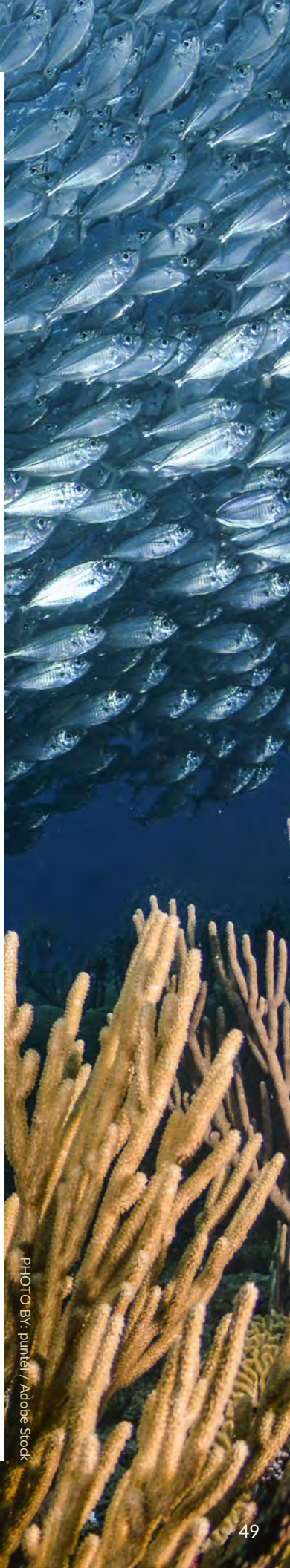


PHOTO BY: puntel / Adobe Stock

Finances

MOTE BY THE NUMBERS

$19 MILLION Laboratory net assets

$15.2 MILLION Foundation net assets (endowment)

$959,800 Protect Our Reefs specialty license plate sales

PROTECT OUR REEFS

Established in 2003, the Protect Our Reefs specialty license plate program provides a $25 donation to Mote Marine Laboratory for each plate sold in the state of Florida and helps to fund coral reef research, restoration, education and conservation. Learn more at motereefplate.com.

PHOTO BY: Martin Hablützel / Adobe Stock

THIS REPORT REFLECTS OUR FINANCIALS FOR A NINE-MONTH PERIOD (JAN. 2016 – SEPT. 2016) DUE TO OUR TRANSITION TO A NEW FISCAL YEAR.

Revenues*

$14,776,397

* Does not include beneficial interest in Mote Marine Foundation

47% Research[1] $6,984,370

39% Education & Outreach[2] $5,713,502

14% Contributions & Investments $2,078,525

[1] Research includes Protect our Reefs program and Mote Aquaculture Research Park management

[2] Education and Outreach includes Aquarium and science education programs

Expense Composition

$16,404,155

82% Program Services $13,512,721

- 56% Research[1] $9,270,515
- 26% Education & Outreach[2] $4,242,206

11% Administrative & General $1,821,042

7% Fundraising $1,070,392

BEHAVIORAL ECOLOGY & PHYSIOLOGY

BENTHIC ECOLOGY

CHEMICAL ECOLOGY

CORAL HEALTH & DISEASE

Publications

CORAL REEF ECOLOGY & MICROBIOLOGY

CORAL REEF MONITORING & ASSESSMENT

CORAL REEF RESTORATION

DOLPHIN RESEARCH

ECOTOXICOLOGY

ENVIRONMENTAL HEALTH & MONITORING

ENVIRONMENTAL LABORATORY FOR FORENSICS

FISHERIES ECOLOGY & ENHANCEMENT

FISHERIES HABITAT ECOLOGY

MANATEE RESEARCH

MARINE & FRESH WATER AQUACULTURE RESEARCH

MARINE BIOMEDICAL RESEARCH

MARINE IMMUNOLOGY

OCEAN ACIDIFICATION

OCEAN TECHNOLOGY

PHYTOPLANKTON ECOLOGY

SEA TURTLE CONSERVATION & RESEARCH

SENSORY BIOLOGY & BEHAVIOR

SHARK BIOLOGY & CONSERVATION

SPOTTED EAGLE RAY CONSERVATION

STRANDING INVESTIGATIONS

MOTE BY THE NUMBERS

220 total Mote staff

80 total research staff

36 doctoral-level research staff

25 research programs

56 total Aquarium staff

1 doctoral-level Aquarium staff member

27 total education staff

PHOTO BY: Conor Goulding / Mote Marine Laboratory

Journal Articles

Balmer, B., Sinclair, C., Speakman, T., Quigley, B., ...**Cush, C.**, ...**Wells, R.,** & Zolman, E. (2016). Extended movements of common bottlenose dolphins (*Tursiops truncatus*) along the northern Gulf of Mexico's central coast. *Gulf of Mexico Science, 33*(1), 93-97.

Bannikov, A.F., **Fraser T.H.** (2016). A new genus and species of cardinalfish (Percomorpha, Apogonidae) from the Eocene of Bolca, northern Italy (Monte Postale site). *Miscellanea Paleontologica, 14,* 13-23.

Beckler, J.S., Kiriazis, N., Rabouille, C., Stewart, F.J., & Taillefert, M. (2016). Importance of microbial iron reduction in deep sediments of river-dominated continental-margins. *Marine Chemistry, 178,* 22-34. doi: 10.1016/j.marchem.2015.12.003

Bik, E.M., Costello, E.K., Switzer, A.D., Callahan, B.J., Holmes, S.P., **Wells, R.S.**,...& Relman, D.A. (2016). Marine mammals harbor unique microbiotas shaped by and yet distinct from the sea. *Nature Communications, 7,* 10516. doi: 10.1038/ncomms10516 **OPEN ACCESS**

Boxman, S.E., **Nystrom, M.**, Capodice, J.C, Ergas, S.J., **Main, K.**, & Trotz, M.A. (2016). Effect of support medium, hydraulic loading rate and plant density on water quality and growth of halophytes in marine aquaponic systems. *Aquaculture Research*, 1-15. doi:10.1111/are.13083

Bright, A.J., Rogers, C.S., Brandt, M.E., **Muller, E.**, & Smith, T.B. (2016). Disease prevalence and snail predation associated with swell-generated damage on the threatened coral, *Acropora palmata* (Lamarck). *Frontiers in Marine Science, 3,* 77. doi: 10.3389/fmars.2016.00077 **OPEN ACCESS**

Christiansen, F., **McHugh, K.A**, Bejder, L., Siegal, E.M., Lusseau, D., **McCabe, E.B.**, **Lovewell, G.**, & **Wells, R.S.**, (2016). Food provisioning increases the risk of injury in a long-lived marine top predator. *Royal Society Open Science, 3,* 160560. http://dx.doi.org/10.1098/rsos.160560 **OPEN ACCESS**

Elkhorn coral, *Acropora palmata*.

PHOTO BY: seaphotoart - Fotolia / Adobe Stock

Water Clarity: Water samples for chlorophyll filtration and analysis.

Colegrove, K.M., Venn-Watson, S., Litz, J., Kinsel, M.J., ... **Lovewell, G.**, McFee, W., & Rowles, T.K. (2016). Fetal distress and *in utero* pneumonia in perinatal dolphins during the Northern Gulf of Mexico unusual mortality event. *Diseases of Aquatic Organisms, 119,* 1-16. doi: 10.3354/dao02969 **OPEN ACCESS**

De Silva, A.O., Spencer, C., Ho, K.C.D., Al Tarhuni, M., Go, C., ... **Wells, R.S.**, & Bossart, G.D. (2016). Perfluoroalkylphosphinic acids in northern pike (*Esox lucius*), double-crested cormorants (*Phalacrocorax auritus*), and bottlenose dolphins (*Tursiops truncatus*) in relation to other perfluoroalkyl acids. *Environmental Science and Technology, 50*(20), 10903-10913. doi: 10.1021/acs.est.6b03515

Dixon, L.K., & Wessel, M.R. (2016). A spectral optical model and updated water clarity reporting tool for Charlotte Harbor seagrasses. *Florida Scientist*, *79*(2-3), 69-92.

Drury, C., Dale, K.E., Panlilio, J.M., Miller S.V., Lirman, D., ... **Bartels, E.**, ..., & Oleksiak, M.F. (2016). Genomic variation among populations of threatened coral: *Acropora cervicornis*. *BMC Genomics, 17,* 286. doi: 10.1186/s12864-016-2583-8 **OPEN ACCESS**

Fleishman, E., Costa, D.P., Harwood, J., Kraus, S., Moretti, D., New, L.F., ... & **Wells, R.S.** (2016). Monitoring population-level responses of marine mammals to human activities. *Marine Mammal Science, 32*(3), 1004-1021. doi: 10.1111/mms.12310 **OPEN ACCESS**

Flowers, K.I., Ajemian, M.J., **Bassos-Hull, K.**, Feldheim, K.A., **Hueter, R.E.**, Papastamatiou, Y.P., & Chapman, D.D. (2016). A review of batoid philopatry, with implications for future research and population management. *Marine Ecology Progress Series, 562,* 251-261. doi: 10.3354/meps11963

OPEN ACCESS: Freely available online.

PHOTO BY: Sarasota Dolphin Research Program/CZS.

Dangerous Habit: A wild dolphin "patrols" near a fishing boat, likely hoping for an easy meal. Some dolphins even go so far as to beg for food from fishermen. Photo taken under NMFS Permit No. 15543.

Fraser, T.H. (2016). A new species of cardinalfish (*Gymnapogon*, Gymnapogonini, Apogonidae, Percomorpha) from the Philippines. *Zootaxa, 4107*(3), 431-438. http://doi.org/10.11646/zootaxa.4107.3.11

Fraser, T. H. & Prokofiev, A. M. (2016). A new genus and species of cardinalfish (Percomorpha, Apogonidae, Sphaeramiini) from the coastal waters of Vietnam: luminescent or not? *Zootaxa, 4144*(2), 227-242. http://doi.org/10.11646/zootaxa.4144.2.5

Frielaender, A.S., Johnston, D.W., **Tyson, R.B.**, Kaltenberg, A., Goldbogen, J.A., Stimpert, A.K.,... & Nowacek, D.P. (2016). Multiple-stage decisions in a marine central-place forager. *Royal Society Open Science*, *3*, 160043. doi: 10.1098/rsos.160043 **OPEN ACCESS**

Gallaway, B.J., Gazey, W.J., Caillouet, C.W. Jr., Plotkin, P.T., Abreau Grobois, F.A., **Tucker, A.D.**,...& Zapata Najera, B.M. (2016). Development of a Kemp's ridley sea turtle stock assessment model. *Gulf of Mexico Science*, *33*(2), 138-157.

Hart, K.M., White, C.F., Iverson, A.R., & **Whitney, N.M.** (2016). Trading shallow safety for deep sleep: juvenile green turtles select deeper resting sites as they grow. *Endangered Species Research, 31,* 61-73. doi: 10.3354/esr00750 **OPEN ACCESS**

Hazelkorn, R.A., Schulte, B.A., & Cox, T.M. (2016). Persistent effects of begging on common bottlenose dolphin (*Tursiops truncatus*) behavior in an estuarine population. *Aquatic Mammals, 42*(4), 531-541. doi: 10.1578/am.42.4.2016.531

Hill, M., **Walter, C.**, & **Bartels, E.** (2016). A mass bleaching event involving *clionaid* sponges. *Coral Reefs, 35*(1), 153. doi: 10.1007/s00338-016-1402-7 **OPEN ACCESS**

Hueter, R.E., **Tyminski, J.P.**, **Morris, J.J.**, Ruiz Abierno, A., & Angulo Valdes, J. (2017). Horizontal and vertical movements of longfin makos (*Isurus paucus*) tracked with satellite-linked tags in the northwestern Atlantic Ocean. *Fishery Bulletin, 115,* 101-116. doi:10.7755/FB.115.1.9

Keenan-Bateman, T.F., McLellan, W.A., Harms, C.A., Piscitelli, M.A., Barco, S.G., ... **Lovewell, G.N.**, ... & Pabst, D.A. (2016). Prevalence and anatomic site of *Crassicauda* sp. infection, and its use in species identification, in kogiid whales from the mid-Atlantic United States. *Marine Mammal Science, 32*(3), 868-883. doi: 10.1111/mms.12300 **OPEN ACCESS**

Lear, K.O. & **Whitney, N.M.** (2016). Bringing data to the surface: recovering data loggers for large sample sizes from marine vertebrates. *Animal Biotelemetry, 4,* 12. doi: 10.1186/s40317-016-0105-8 **OPEN ACCESS**

Locascio, J.V. & Burton, M.L. (2016). A passive acoustic survey of fish sound production at Riley's Hump within Tortugas South Ecological Reserve: Implications regarding spawning and habitat use. *Fishery Bulletin*, *114*, 103-116. doi: 10.7755FB.114.1.9

Lynch, S.D., Marcek, B.J., **Marshall, H.M.**, Bushnell, P.G., Bernal, D., & Brill, RW. (2017). The effects of pop-up satellite archival tags (PSATs) on the metabolic rate and swimming kinematics of juvenile sandbar shark *Carcharhinus plumbeus*. *Fisheries Research, 186,* 205-215. http://dx.doi.org/10.1016/j.fishres.2016.08.013

Stressed Sharks: Dr. Heather Marshall, Mote Postdoctoral Research Fellow, collects a blood sample from a shark for projects by multiple researchers on board the M/V OCEARCH, including Marshall's own research on stress in caught-and-released sharks.

PHOTO BY: OCEARCH

Mallette, S.D., McLellan, W.A., Scharf, F.S., Koopman, H.N., Barco, S.G., **Wells, R.S.**, & Pabst, D.A. (2016). Ontogenetic allometry and body composition of the common bottlenose dolphin (*Tursiops truncatus*) from the U.S. mid-Atlantic. *Marine Mammal Science, 32*(1), 86-121. doi: 10.1111/mms.12253 **OPEN ACCESS**

Muller, E.M., Fine, M. & **Ritchie, K.B.** (2016). The stable microbiome of inter and sub-tidal anemone species under increasing pCO2. *Scientific Reports, 6,* 37387. doi: 10.1038/srep37387 **OPEN ACCESS**

O'Donnell, K.E., Lohr, K.E., **Bartels, E.** & Patterson, J.T. (2017). Evaluation of staghorn coral (*Acropora cervicornis*, Lamarck 1816) production techniques in an ocean-based nursery with consideration of coral genotype. *Journal of Experimental Marine Biology, 487,* 53- 58. http://dx.doi.org/10.1016/j.jembe.2016.11.013

Perrault, J.R., Bauman K.D., **Greenan, T.M.**, **Blum, P.C.**, **Henry, M.S.**, & **Walsh, C.J.** (2016). Maternal transfer and sublethal immune system effects of brevetoxin exposure in nesting loggerhead sea turtles (*Caretta caretta*) from western Florida. *Aquatic Toxicology, 180,* 131-140. http://dx.doi.org/10.1016/j.aquatox.2016.09.020

Quintana-Rizzo E., & **Wells, R.S.** (2016). Behavior of an adult female bottlenose dolphin (*Tursiops truncatus*) toward an unrelated dead calf. *Aquatic Mammals, 42*(2), 198-202. doi: 10.1578/AM.42.2.2016.198

Randall, C.J., Jordán-Garza, A.G., **Muller, E.M.**, & van Woesik, R. (2016). Does dark-spot syndrome experimentally transmit among Caribbean corals? *PLoS ONE, 11*(1), e0147493. doi: 10.1371/journal.pone.0147493 **OPEN ACCESS**

Rolton, A., Vignier, J., Volety, A.K., **Pierce, R.H.**, **Henry, M.**, Shumway, S.E., ... & Soudant, P. (2016). Effects of field and laboratory exposure to the toxic dinoflagellate *Karenia brevis* on the reproduction of the eastern oyster, *Crassostrea virginica*, and subsequent development of offspring. *Harmful Algae, 57*, 13-26. doi: 10.1016/j.hal.2016.04.011

Romero, I.C., Özgökmen, T., Snyder, S., Schwing, P., O'Malley, B.J., ...**Wetzel, D.L.**, ... & Murawski, S.A. (2016). Tracking the Hercules 265 marine gas well blowout in the Gulf of Mexico. *Journal of Geophysical Research*: Oceans*, 121,* 706–724. doi:10.1002/2015JC011037

Scatà, G., Jozet-Alves, C., Thomasse, C., **Josef, N.**, & Shashar, N. (2016). Spatial learning in the cuttlefish *Sepia officinalis*: Preference for vertical over horizontal information. *Journal of Experimental Biology, 219,* 2928-2933. doi: 1242/jeb.129080 **OPEN ACCESS**

PHOTO BY: Joe Berg / Way Down Video

Coral Research: Fragments of staghorn coral (*Acropora cervicornis*) grow in Mote's underwater nursery off Summerland Key, Florida.

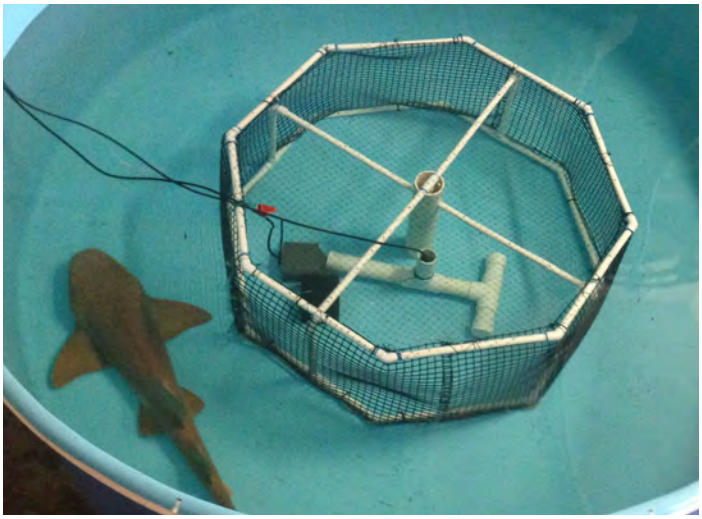
Schloesser, R.W., & Fabrizio, M.C. (2016). Temporal dynamics of condition for estuarine fishes in their nursery habitats. *Marine Ecology Progress Series, 557,* 207-219. doi: 10.3354/meps11858 **OPEN ACCESS**

Shen, D.C., & **Clark, E.** (2016). Territorial and reproductive behavior of the three Caribbean Razorfishes of the Genus *Xyrichtys* (Labridae) at Bonaire. *aqua, International Journal of Ichthyology, 22*(1-15), 33-59.

Sobolesky, P., Parry, C., Boxall, B., **Wells, R.**, Venn-Watson, S., & Janech, M.G., (2016). Proteomic analysis of non-depleted serum proteins from bottlenose dolphins uncovers a high vanin-1 phenotype. *Scientific Reports, 6*, 33879. doi:10.1038/srep33879 **OPEN ACCESS**

Sun, P., Leeson, C., Zhi, X., Leng, F., **Pierce, R.H.**, **Henry, M.S.**, & Rein, K.S. (2016). Characterization of an epoxide hydrolase from the Florida red tide dinoflagellate, *Karenia brevis*. *Phytochemistry, 122,* 11-21. doi:10.1016/j.phytochem.2015.11.002

Red Tide Experiment: Mote Senior Scientist Dr. Richard Pierce directs Mauricio Rodrigues, a USF-REU ecotoxicology intern, during a study on the effects of red tide on bivalves.



Shark Science: A research study at Mote found that nurse sharks have the lowest metabolic rate of any shark measured to date.

Tarnecki, A.M., Patterson, W.F. III, & Arias, C.R. (2016). Microbiota of wild-caught Red Snapper *Lutjanus campechanus*. *BMC Microbiology, 16,* 245. doi: 10.1186/s12866-016-0864-7 OPEN ACCESS

Tyson, R.B., Friedlaender, A.S., & Nowacek, D.P. (2016). Does optimal foraging theory predict the foraging performance of a large air-breathing marine predator? *Animal Behaviour, 116,* 223-235. doi:10.1016/j.anbehav.2016.03.034

Vander Zanden, H.B., Bolten, A.B., **Tucker, A.D.**, Hart, K.M., Lamont, M.M., Fujisaki, I., ... & Bjorndal, K.A. (2016). Biomarkers reveal sea turtles remained in oiled areas following the *Deepwater Horizon* oil spill. *Ecological Applications, 26*(7), 2145-2155. doi: 10.1002/eap.1366 OPEN ACCESS

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Whitney, N.M., Lear, K.O., Gaskins, L.C., & Gleiss, A.C. (2016). The effects of temperature and swimming speed on the metabolic rate of the nurse shark (*Ginglymostoma cirratum*, Bonaterre). *Journal of Experimental Marine Biology and Ecology, 477,* 40-46. doi:10.1016/j.jembe.2015.12.009 OPEN ACCESS

Whitney, N.M., Taquet, M., Brill, R., Girard, C., Schweiterman, G.D., Dagorn, L., & Holland, K.N. (2016). Swimming depth of dolphinfish (*Coryphaena hippurus*) associated and unassociated with fish aggregating devices. *Fishery Bulletin, 114*(4), 426-434. doi: 10.7755/FB.114.4.4.5

Whitney, N.M., White, C.F., Gleiss, A.C., Schwieterman, G.D., Anderson, P., **Hueter, R.E.**, & Skomal G.B. (2016). A novel method for determining post-release mortality, behavior, and recovery period using acceleration data loggers. *Fisheries Research, 183*, 210-221. doi: 10.1016/j.fishres.2016.06.003

Books/Book Chapters Authored or Edited

Leber, K. M., Lee, C. S., **Brennan, N. P.**, Arce S. M., Tamaru, C. S., Blankenship, H. L., & Nishimoto, R.T. (2016). Stock enhancement of Mugilidae in Hawaii (USA). In: D. Crosetti & S. Blaber (Eds.), *Biology, ecology and culture of grey mullet (Muglilidae)* (pp. 467-486). Boca Raton, FL: CRC Press.

Mann, D., **Locasio, J.**, & Wall, C. (2016). Listening in the ocean: New discoveries and insights on marine life from autonomous passive acoustic recorders. In: Whitlow W.L. Au & M.O. Lammers (Eds.), *Listening in the ocean: New discoveries and insights on marine life from autonomous passive acoustic recorders* (pp. 309-324). New York: Springer-Verlag.

Teplitski, M., Krediet, C.J., Meyer, J.L., & **Ritchie, K.B.** (2016). Microbial interactions on coral surfaces and with the coral Holobiont. In: S. Goffredo & Z. Dubinsky (Eds.), *The Cnidaria, past, present and future: The world of Medusa and her sisters* (pp. 331-346). New York: Springer.

Published Conference Proceedings

Banc-Prandi, G., Imhof, K., **Hall, E.**, & **Ritchie, K.B.** (2016). Interspecific coral bacterial competition under ocean acidification scenarios. In: C. Birkeland , S.L. Coles, & N. P. Spies (Eds.) *Proceedings of the 13th International Coral Reef Symposium, Honolulu, Hawaii, 19-24 June 2016*: 58-70. http://coralreefs.org/conferences-and-workshops/proceedings-of-icrs13-2016/

Etti, R.T., Schils, T. (2016). Global biogeography of marine algae with applications for coral reef connectivity. In: C. Birkeland , S.L. Coles, & N. P. Spies (Eds.) *Proceedings of the 13th International Coral Reef Symposium, Honolulu, Hawaii, 19-24 June 2016*: 28-47. http://coralreefs.org/conferences-and-workshops/proceedings-of-icrs13-2016/

Compiled by Kay L. Garsnett, MLIS, CA Librarian/Archivist

Looking Ahead

MOTE BY THE NUMBERS

24 off-site aquariums

5 facilities in Florida

28 total buildings and structures

331,152 total square feet

MAIN CAMPUS
SARASOTA, FL | 10.5 ACRES
(LONG-TERM LEASE, CITY OF SARASOTA)

MOTE AQUACULTURE RESEARCH PARK
SARASOTA, FL | 200 ACRES

BOCA GRANDE OUTREACH OFFICE
BOCA GRANDE, FL

ELIZABETH MOORE
INTERNATIONAL CENTER FOR
CORAL REEF RESEARCH & RESTORATION
SUMMERLAND KEY, FL | 1 ACRE

LIVING CORAL REEF EXHIBIT
NOAA ECO-DISCOVERY CENTER
KEY WEST, FL

PHOTO BY: Martin Hablützel / Adobe Stock

Looking Ahead to 2017

Perhaps our most visible undertaking in 2017 will be the completion of the Elizabeth Moore International Center for Coral Reef Research & Restoration on our campus in the Florida Keys. The facility will be outfitted with 30.1 kilowatt solar panels, a rainwater capture system and other eco-friendly features, making it the first certified LEED Gold facility in Monroe County.

From this facility, which will include residences, offices, wet labs, dry labs, electric car stations and classrooms, Mote and visiting scientists will have a state-of-the-art base to find the best genetic strains of coral for reef restoration; microbial supplies for studying microscopic life forms that can help or harm coral reefs; a carbonate chemistry lab for ocean acidification research and more.

In 2017, Mote will also develop a timeline for achieving an evolution of our City Island campus into an international marine science, technology and innovation park — facilities where we can house not only the 10 new Ph.D.-level scientists envisioned in our *2020 Vision and Strategic Plan*, but also a place that will attract visiting scientists and entrepreneurs from around the world.

Achieving this goal will require a build-out of critical research infrastructure on City Island and will also necessitate building a new center for informal science education learning and an Aquarium on the mainland. This new sixth campus of Mote will create a modern facility for ocean learning and ocean literacy for our residents and visitors.

Achieving our 2020 goals, a successful evolution of our City Island Campus and developing this new Mote campus will bring a $115 million economic impact to Sarasota County alone each year.

City Island: Plans to move Mote Aquarium to the mainland to make room for more research infrastructure on City Island will be under way in 2017.

PHOTO BY: Andy Deitsch

PHOTO BY: Dan Mele / Mote Marine Laboratory

Summerland Key: Mote's Elizabeth Moore International Center for Coral Reef Research & Restoration will be completed in 2017.

This annual report is a production of the Community Relations & Communications Department at Mote Marine Laboratory & Aquarium.
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