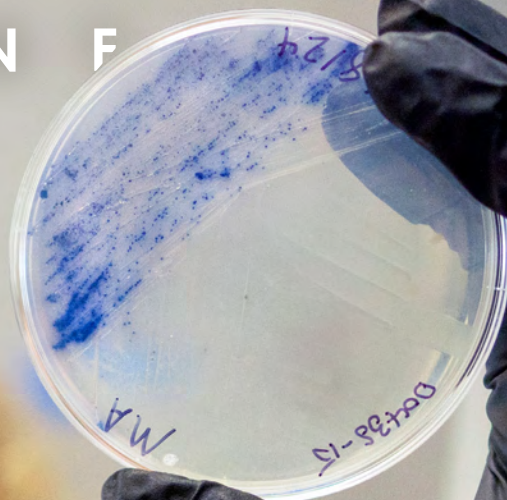


MOTE

M A G A Z I N E

SPRING 2024



A YEAR OF DISCOVERY

Our 2023 breakthroughs & your support—by the numbers

A GLOBAL MISSION

Mote research far
and wide

SECURING CORALS' FUTURE

Learning from a
tough summer

SEAGRASS INITIATIVE SPROUTS

Watch this exciting
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Mote Magazine (ISSN 1553-1104) is published by Mote Marine Laboratory, a world-class nonprofit research and science education organization devoted to the ocean and its future. Through marine science stories, Mote hopes to enhance ocean literacy among the public and encourage conservation and sustainable use of marine resources.

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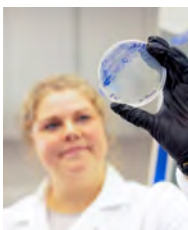
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Sarasota Magazine

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On the cover

Dr. Kirstie Francis cultures ocean-derived microscopic life in an effort to find new sources of medicine.

Learn more: Page 7
Photo by: Hayley Rutger



20 FISHERIES ELECTRONIC MONITORING

See the latest tools and tech Mote scientists are testing to collect data on grouper, snapper and other catches in the Gulf of Mexico reef fish fishery.

PHOTO BY HAYLEY RUTGER

COVER STORY

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Helping Florida's Coral Reef after a stressful summer.

18 STEM EDUCATION

Exciting school partnerships on the horizon thanks to Mote Science Education Aquarium.

22 EVENTS CALENDAR

Get ready for a busy summer and early fall packed with exciting Mote events!



Looking back, moving forward

Mote Marine Laboratory's mission and your support added up to a brighter future for our ocean in 2023. Now, we're celebrating with a special year-in-review edition of Mote Magazine. Keep reading for a by-the-numbers summary of our favorite scientific advancements, educational milestones and special Mote-ments with supporters and sea fans like you!

COMING TO THE RESCUE



25 TURTLES REHABILITATED

and released by Mote caregivers this year. All sea turtle species are threatened or endangered, so every single individual we return to the ocean matters.

2,344 SEA TURTLE HATCHLINGS

received rehabilitative care at Mote this summer.



5 MANATEES RESCUED

with help from Mote after they were displaced by Hurricane Idalia.

MOTE ASSISTED THE STATE RESCUE LEAD, FWC.*



860 CALLS ANSWERED

by Mote's 24-hour hotline for stranded marine animal response (888-345-2335) this year. (340 calls about manatees, 284 about sea turtles, 74 about dolphins and whales, 162 others).



3 DOLPHIN CALVES RESCUED

from life-threatening entanglements by Mote and partners. Each rescued bottlenose dolphin benefits the conservation of its population.

PARTNERS: CLEARWATER MARINE AQUARIUM, FWC*, SDRP*, SEAWORLD ORLANDO, UNIVERSITY OF FLORIDA. SUPPORTED BY NOAA FISHERIES JOHN H. PRESCOTT MARINE MAMMAL RESCUE ASSISTANCE GRANT PROGRAM.



528 UNIQUE SEA TURTLES TAGGED

for identification and 908 turtle encounters documented by Mote scientists on turtle nesting beaches on Siesta Key, Casey Key, and Venice. Mote also collected and released 6,511 hatchlings in 2023 for conservation research.

411 DISTINCT MANATEES

were photo-documented by Mote scientists on Florida's east coast this year to understand how they responded to changes in a warm water refuge.

SUPPORTED BY FLORIDA POWER & LIGHT

208 MANATEES

recorded during Mote's Sept. 25, 2023, survey in Sarasota County, the 3rd highest count in Mote's 38-year aerial survey history. This year, Mote conducted 72 hours of aerial (airplane) surveys to support manatee management and conservation.



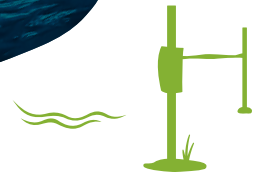
NEW SEA TURTLE PROTECTION ZONE

announced this year by Mote:

A voluntary zone where boaters are encouraged to slow down to avoid striking sea turtles in Sarasota Bay, Florida, waters.

40 YEARS:

how long Mote scientists have documented some individual manatees that we photo-documented again this year. In southwest Florida, Mote's team identified 429 individual manatees.



4,284 SEA TURTLE NESTS

documented by Mote scientists and volunteers on beaches from Longboat Key through Venice, Florida, this summer, including 4,091 loggerhead and 193 green sea turtle nests—our highest number of green nests ever recorded and highest overall number of nests ever recorded in Venice.

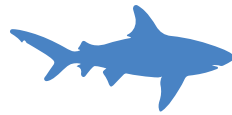
LONGBOAT KEY MONITORED IN PARTNERSHIP WITH LONGBOAT KEY TURTLE WATCH

AN ALLY TO TURTLES, MANATEES & MORE



+6 RAY SPECIES

being studied by Mote scientists to aid conservation. For example, Mote monitors trends of longnose stingrays & endangered Atlantic chupares with fishers in Belize.



63% DECLINE OF 5 MAIN REEF-SHARK SPECIES

documented this year by **Global FinPrint**, a worldwide initiative turning shark science into conservation at Mote. Overfishing is the main threat, reported project partners in the prestigious peer-reviewed journal *Science*.

+50 SHARK SPECIES

stand to benefit from international trade regulations strengthened by CITES* in late 2022—a decision informed by Mote and partners in the Global FinPrint initiative.

17 ENDANGERED RAYS

(Atlantic pygmy devil rays) sampled & tagged off Florida's Panhandle & 4 tagged on Florida's east coast—firsts for the species that will aid conservation & management. PARTNERS: MOTE, OKALOOSA'S COASTAL RESOURCE TEAM, INWATER RESEARCH GROUP. SUPPORTERS: SAVE OUR SEAS FOUNDATION, GEORGIA AQUARIUM.

+100° FAHRENHEIT:

2023's hot summer water temperatures led Mote to evacuate thousands of stressed corals from its underwater nurseries. Mote scientists have started returning recovered corals to the water and **learning from this extreme event** to restore resilient reefs.



3 TYPES OF MANATEES

(Florida, Antillean & African) were better understood this year through Mote's peer-reviewed research on manatee vocalizations. Recording sounds is the most efficient way to detect certain manatee species and can help us determine age (calf vs. adult).



100 CORALS

were given new treatments for the deadly black band disease or served as controls in a study in the Lower Florida Keys. 88% of treated corals had no active disease one week later.

PROJECT BY MOTE & OCEAN ALCHEMISTS, LLC.



+215,000

CORALS RESTORED to date (2008–2023) by Mote scientists on Florida's Coral Reef, including **45,714 this year.**



+21,000

CORAL OFFSPRING from 5 species joined Mote's collection through coral breeding events this year in the Florida Keys.



40 MANATEES

& 54 SEA TURTLES rescued from red tide areas were sampled for blood plasma for a new study. Mote and Florida Gulf Coast University scientists will analyze the animals' protein profiles for signals of red tide toxicity. **This research may improve treatment & diagnosis of animals whose symptoms continue after red tide dissipates.**

~\$7 MILLION

awarded to Mote by NOAA* for a 4-year, transformative coral restoration initiative at 10 key sites on Florida's Coral Reef.

750 NEW CORALS

added to Mote's International Coral Gene Bank, including 6 new species. The Gene Bank preserves corals to protect populations at risk of extinction.



110,888 CARIBBEAN KING CRABS:

juveniles produced as of late 2023 by Mote's new Florida Coral Reef Restoration Crab Hatchery Research Center dedicated to producing native crabs to help control algae on restored reefs.

*CITES: Convention on International Trade of Endangered Species of Fauna and Flora • FPL: Florida Power & Light • FWC: Florida Fish and Wildlife Conservation Commission • NOAA: National Oceanic and Atmospheric Administration • SDRP: Sarasota Dolphin Research Program: A Chicago Zoological Society Program in partnership with Mote Marine Laboratory

HELPING CORALS OUT OF HOT WATER

SPEARHEADING RED TIDE MITIGATION

+300 RED TIDE MITIGATION OPTIONS

tested to date by the Mote-FWC* Florida Red Tide Mitigation & Technology Development Initiative as of fall 2023. About a **dozen promising mitigation options** will move into controlled, permitted field testing to decrease red tide impacts.

1ST PEER-REVIEWED STUDY

published as a result of Mote-FWC* Red Tide Initiative by Mote, University of Central Florida and Woods Hole Oceanographic Institution. Results: One type of clay product ("Modified Clay II") might be able to treat red tide without impacting adult blue crabs. Clay binds to and sinks red tide (*Karenia brevis*) algae.

+100 PARTNERS joined Mote in a new **national program: the U.S. Harmful Algal Blooms Control Technologies Incubator (US HAB-CTI)** focusing on nationwide saltwater and freshwater algae.

FOUNDING PARTNERS: MOTE, NOAA* AND UNIVERSITY OF MARYLAND



83 COASTAL SITES IN 5 STATES

MONITORED by Mote's **Beach Conditions Reporting System** (visitbeaches.org) as of late 2023, including 23 new sites added this year. PARTNERS: SECOORA, UNIVERSITY OF SOUTH CAROLINA, NORTH CAROLINA STATE UNIVERSITY, SOUTHEAST FLORIDA ACTION NETWORK (SEAFAN). SUPPORT FROM FWC*.



30-DAY MISSION completed by Mote's **underwater glider Dora** this year—our longest ever—to monitor offshore conditions relevant to red tide research. Three autonomous gliders are now collecting ocean data for Mote.

16,337 WATER SAMPLES

analyzed for red tide algae by Mote-FWC* Cooperative Red Tide Research Program this year—a **key part of a statewide monitoring network.**



HURRICANE IAN

spurred a new study by Mote and

University of Maryland on impacts of intense stormwater flow into the Gulf of Mexico. Study topics: How might storms intensified by climate change worsen ocean acidification, lower dissolved oxygen & boost algae blooms?

FUNDED BY NATIONAL SCIENCE FOUNDATION



8 SCIENTIFIC TEAMS FROM AROUND THE WORLD

did research in Mote's Climate & Acidification Ocean Simulator (CAOS) this year. In late summer/fall the system protected corals evacuated from Mote's underwater nurseries against extreme heat.

*DEP: Florida Department of Environmental Protection • FWC: Florida Fish and Wildlife Conservation Commission
*NOAA: National Oceanic and Atmospheric Administration • IFAS: Institute of Food and Agricultural Sciences

NUTRIENT SENSOR

deployed by Mote in New Pass, Sarasota, Florida, is monitoring nitrate in real time to help us better understand water quality challenges.

PARTNERSHIP WITH UNIVERSITY OF LOUISIANA, LAFAYETTE, SUPPORTED BY GULF OF MEXICO COASTAL OCEAN OBSERVING SYSTEM



REPORT TO U.S. CONGRESS

drew upon Mote's expertise to inform federal leaders of ocean-acidification threats in U.S. southeast waters. REPORT: OCEAN

CHEMISTRY COASTAL COMMUNITY VULNERABILITY ASSESSMENT BY THE INTERGOVERNMENTAL WORKING GROUP ON OA

3-NATION CONFERENCE

on ocean acidification invited a Mote scientist to participate and exchange knowledge with peers from the U.S., Cuba and Mexico on this threat to our shared marine resources.



SECRET PASSAGES FROM AQUIFER TO SEA?

Mote scientists continued seeking "submarine seeps" where underground freshwater from the Upper Floridan Aquifer moves into Gulf of Mexico saltwater environments, and they launched a new round of research on deep Gulf habitats called blue holes, investigating whether they supply nutrient-rich freshwater offshore and provide a "food" source for red tide blooms.

FINDING SOLUTIONS THROUGH CHEMISTRY

296 STRAINS
of microscopic life isolated from deep-sea sediments and marine species and added to the Mote Microbial Library. **Mote scientists mine these microbial isolates for new potential sources of medicine.**

+6,500 feet (2,000 meters): **Deepest sites** in the Gulf of Mexico where **Mote scientists collected sediments to search for medically useful microscopic life.** PARTNERSHIP WITH NOAA* AND U.S. GEOLOGICAL SURVEY (MESOPHOTIC AND DEEP BENTHIC COMMUNITIES (MDBC) PORTFOLIO)



NEW EFFORT TO SAVE SEAGRASS: **Mote launched the Seagrass Restoration Technology Development Initiative this year.** Worldwide, seagrass meadows have shrunk ~29% since the late 1800s. Severe recent declines in Florida's Indian River Lagoon have left manatees starving. Science-based restoration is needed. SUPPORTERS: DEP*, NOAA* AND THE RON AND MARLA WOLF FOUNDATION

131 MICROBIAL ISOLATES from the ocean were **screened by Mote** for their ability to fight pathogens (sources of disease, including antibiotic-resistant bacteria). **18.3% of these isolates can fight one or more pathogens.**

3 RAY VENOMS

screened (from spotted eagle rays, Atlantic stingrays and cownose rays) for bioactivity against 3 human cell lines by Mote and University of South Florida. **Studying venom can lead to discovering novel drugs.**



2 NEW SEAGRASS STUDIES

published by Mote and University of Florida scientists this year improved our understanding of **how to support healthy seagrass meadows.**

CANCER-FIGHTING PROTEINS FROM SHARKS

are one big step closer to being purified and available for medical research to improve human cancer therapies. Mote scientists used 3 antibodies to help separate these proteins from a natural mix of compounds produced by shark immune cells. **The newly separated protein is estimated to have 400 times greater cancer-fighting activity** than the original mixture if compared milligram for milligram.



5 OF 6 SURVEYED SPAWNING SITES HAD FEWER GOLIATH GROUPER in 2022 vs. 2013, signs of **possible declines revealed in Mote's peer-reviewed study** published this year in the journal *Fishes*. PARTNERSHIP WITH FLORIDA STATE UNIVERSITY AND FLORIDA INTERNATIONAL UNIVERSITY WITH FUNDING FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.



10,000 LBS. OF RED DRUM

& 1,000 pounds of plants reared in Mote's Ron & Marla Wolf Aquaponics Center this year to demonstrate & promote commercialization of **sustainable seafood farming technology.**

+170,000 DETECTIONS OF MOTE-TAGGED FISH made in the environment this year—including a snook we released almost 6 years ago. **Recent Mote-released snook had the highest survival rate we've measured to date.**



~20,000 RED DRUM released in Southwest Florida by Mote to optimize responsible fisheries enhancement practices and replenish sportfish populations affected by events such as red tide. PARTNERSHIP WITH *FWC AND SUPPORTERS AT SALT STRONG

750 SAMPLES collected from **24 data-deficient fish species** by Mote and commercial fishery collaborators in Florida and Texas this year to aid fisheries management.

200,000 CATCHES DOCUMENTED

as of late 2023 by Mote scientists and partners who have **recorded video from 575 commercial reef fish fishing trips** in the Gulf of Mexico since 2016 to **support sustainable fisheries.**

SUSTAINABLE FARMING training program launched by Mote and University of Florida IFAS* Sarasota County. SUPPORTERS: GREEN JEANS FOUNDATION, AMERICAN RED CROSS



CREATING A MORE SUSTAINABLE FUTURE

CELEBRATING OUR SUPPORTERS

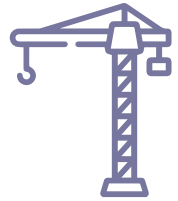
4,600 NEW DONORS & MEMBERS



joined Mote's ever-growing family this year, helping to champion our marine science, conservation and education mission.

2,000 MOTE SUPPORTERS

engaged with our fundraising events this year, empowering Mote to achieve more for our oceans locally and globally.



LARGEST EXHIBIT AT MOTE SEA:

The Gulf of Mexico exhibit began coming to life in summer 2023 as huge acrylic windows weighing 27,900 pounds and 22,200 pounds were installed—one of several big moments in the construction of our new hub for marine STEM education, Mote Science Education Aquarium (Mote SEA).

1,377 MOTE VOLUNTEERS CONTRIBUTED 159,796 HOURS

of service across every facet of Mote this year, including some exciting new roles: **33 dedicated volunteers** helped educate visitors at Mote's new Education Outreach Center at Anna Maria City Pier and **+50 volunteers** assisted in Mote's coral restoration efforts through our new citizen science program in Key Largo, Florida.



4/4 STARS AND 100%

—the highest possible scores awarded to Mote this year by Charity Navigator. This means that Mote is a highly effective nonprofit organization and our supporters can give with confidence.

368 SUPPORTERS

—including donors, corporate sponsorships and public contributors—are powering the completion of Mote Science Education Aquarium (Mote SEA), which is anticipated to open in winter 2024.



14,419 MOTE MENTIONS

in news media stories this year—**twice as many as last year**—allowed Mote to share our mission of marine science, conservation and education with more people worldwide.

105,000 FOLLOWERS

on Facebook, 54,500 on Tiktok, 52,000 on Instagram, 19,000 on X (twitter), and 13,379 on LinkedIn connected with Mote's mission this year.



28 BRIEFINGS for local, state & national government leaders

were provided this year by Mote President & CEO Dr. Michael P. Crosby and fellow Mote scientists, a key way that we translate & transfer our knowledge to inform societal decisions vital to the ocean's future.



54 MILLION:

combined reach of Mote's Facebook, Instagram, X (Twitter) and LinkedIn. Together Mote's profiles on these social platforms also had 5.1 million impressions and an engagement rate of 5.51%.

100 PEOPLE FROM 15 STATES

attended the Women of the Water Conference at Mote. This event allowed industry, research,

academia, and government professionals to share experiences and address challenges facing U.S. aquaculture through research, community and collaboration. HELD BY THE FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES DIVISION OF AQUACULTURE IN PARTNERSHIP WITH MOTE AND FLORIDA SEA GRANT.

STAYING IN TOUCH



EXHIBITING EXCELLENCE

353 SPECIES OF MARINE LIFE

called Mote Aquarium home this year, serving as ambassadors in our mission to educate people of all ages about the ocean.

9 OFFSITE EXHIBITS

maintained by Mote in Florida this year: 7 in Sarasota-Manatee area, 2 in the Florida Keys.



2 NEW EXHIBITS

wowed Mote Aquarium visitors this year: The limited-time exhibit Voyage to the Deep based on "20,000 Leagues under the Sea" and the long-term display Trailblazers in STEM featuring diverse scientists who shaped their fields.

VOYAGE TO THE DEEP WAS SUPPORTED IN-PART BY SARASOTA COUNTY TOURIST DEVELOPMENT TAX REVENUES.

73 HIGH SCHOOLERS

participated in the teen volunteer program, which provides students with an opportunity to volunteer during the school year. Engaging Mote visitors throughout Mote Aquarium, each interpretive station features hands-on learning activities and focuses on Mote research. Teen volunteers also assist in programs conducted by the Mote Education Department, including camps, special events, and outreach.



NEW K-12 NEEDS ASSESSMENT

launched by Mote to ensure local public schools can access the 3 teaching labs and 4 workforce training labs being developed for the new Mote Science Education Aquarium (Mote SEA).

182 UNDERGRAD INTERNS

contributed 87,360 hours to Mote's mission this year. 41 of those participated in advanced research experiences supported by NSF* and philanthropic funding and focused on reaching underrepresented minority students.

NEW



homeschool programs engaged 54 participants with Mote in Summerland Key and Key Largo.

31 MENTORS TRAINED to better support underrepresented minority students in marine STEM

through a Mote-led workshop at Louisiana State University—the first transfer of knowledge and tools developed through the Mote-led MarSci-LACE partnership to an external academic institution.*MARINE SCIENCE LABORATORY ALLIANCE CENTER OF EXCELLENCE: A PARTNERSHIP LED BY MOTE THAT OPENS DOORS TO MARINE STEM CAREERS FOR UNDERREPRESENTED MINORITY STUDENTS.



NEW ROLE:

Diversity & Inclusion Advisor to Mote's President & CEO—taken on by Mote Aquarium Biologist III Amanda Felix to help support the participation of underrepresented minorities in STEM internships and other science education and career development opportunities.

NEW CITIZEN-SCIENCE PARTNERSHIP

between Mote and ScubaPro is inviting citizen scientists from all over the world to help restore corals with Mote scientists.

63,236 PARTICIPANTS

from 45 states and around the world including Canada, Japan and Kenya engaged with Mote's structured, informal science education programs, outreach programs and educational booths this year.

MAKING SCIENCE ACCESSIBLE FOR ALL



MOTE MAKING WAVES AROUND THE WORLD

BY EMMA MCINTYRE

This past year has seen significant growth in Mote's International Marine Science Diplomacy Initiative. We are partnering with scientists in a growing number of nations to exchange ideas and methods for the good of our oceans and society.

"We continue expanding our marine research, science education and public outreach programs to positively impact the restoration, conservation and sustainable use of marine biodiversity, healthy habitats and natural resources in Florida and around the world," said Dr. Michael P. Crosby, President & CEO of Mote.

The ocean provides over half the planet's oxygen, food and jobs for billions, new medicines, recreation and more. However, our ocean faces severe challenges—overfishing, the loss of essential coral reefs, harmful algal blooms and more—that threaten marine life and humanity's quality of life worldwide.

The countries coping with these challenges have national boundaries, but ocean ecosystems do not. To heal the oceans, marine scientists worldwide must work together.

Uniting the best and brightest scientists is our specialty at Mote—allowing us to uncover solutions for urgent ocean issues. Here is a snapshot of the research Mote advanced with international partners this year.

HIGHLIGHTS FROM MOTE'S INTERNATIONAL MARINE SCIENCE DIPLOMACY INITIATIVE

Mote scientists are leading the world's largest reef shark and ray survey, Global FinPrint, partnering with local scientists, fishermen and others at 19 new sites worldwide. These sites represent the second round of FinPrint research. The first round began at Florida International University and transformed into successful conservation efforts led by Mote. The first FinPrint survey deployed 22,000 baited, remote, underwater video stations on about 400 reefs in 58 nations and territories. Findings led to most reef shark species being listed as being threatened with extinction by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, as well as new international trade regulations under the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES).

Mote has a long history of marine science partnerships in the Middle East, where diverse nations border a common natural treasure: beautiful coral reefs of the Red Sea and Gulf of Aqaba.

In the early 1950s, Mote Founding Director Dr. Eugenie Clark conducted groundbreaking fish research in the Red Sea. She later became a champion of conservation for the Red Sea and Gulf of Aqaba. Mote President & CEO Dr. Michael P. Crosby's focus on the region—including his leadership of U.S., Israeli and Jordanian



Above: Red Sea Ecosphere Conference Keynote Speaker Dr. Michael P. Crosby, President & CEO of Mote, with His Royal Highness Prince El-Hassan bin Talal in Aqaba, Jordan, during November 2022.

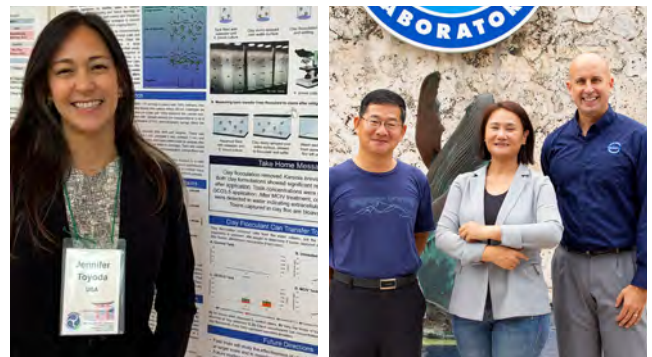
partners in the Red Sea Marine Peace Park Cooperative Research, Monitoring and Management Program—has laid groundwork for longstanding partnerships including the Mote-Israel Cooperative Marine Research Program (MIC). Today, Mote and Israeli scientists continue collaborating to study the resilience of Red Sea corals facing ocean acidification, disease and other challenges.

Mote scientists have also partnered with Jordanian scientists to study Red Sea coral reefs. Earlier this year, Mote was invited to serve as an advisor and partner for establishing a new marine science and technology hub and aquarium in Aqaba, Jordan, modeled on Mote. Dr. Crosby has since met with His Majesty King Abdullah II to discuss Mote's involvement with capacity building, educational exchange programs, applied marine science and technology development.

Mote is collaborating with many other countries on different projects. Mote scientists are working with Japan, Chile and Korea to test technology to mitigate the impacts of harmful algal blooms. In Mozambique, Mote scientists are assessing remote coral reefs and turtle nesting habitats. In Belize, we're leading Earthwatch's Shark and Ray Conservation expedition. Most recently, Dr. Tung-Yung Fan visited our Florida campuses to discuss his coral restoration work conducted at the National Museum of Marine

Biology & Aquarium in Taiwan. Mote and the Museum are implementing new partnerships in coral research, restoration and marine science education.

Mote scientists have also begun building harmful algal bloom research collaborations with Japanese, Korean and Chilean scientists—for example, by presenting promising technology for red tide mitigation during the 20th International Conference on Harmful Algae in Hiroshima, Japan. There, Mote and partners from Woods Hole Oceanographic Institution highlighted their discoveries that modified clay can remove red tide cells and decrease the concentration of their toxins. Mote's research focuses on the Gulf of Mexico's red tide algae while adding to the growing scientific literature on mitigation options for harmful algae around the world. ■



Left: Dr. Jennifer Toyoda presents her research on harmful algae in Japan. **Right:** Mote Vice President for Sponsored Research & Coastal Policy Programs Kevin Claridge (right) with Taiwanese colleagues Dr. Tung-Yung Fan and Tzu-Jung Chiu.

“WHEN MARINE SCIENTISTS FROM DIFFERENT NATIONS WORK TOGETHER, WE BUILD TRUST BY SHARING KNOWLEDGE AND INVOLVING MANY SEGMENTS OF SOCIETY IN OUR COMMON MISSION TO SAFEGUARD THE OCEAN. EVEN WHEN INTERNATIONAL RELATIONSHIPS ARE TENSE OR LIMITED, MARINE SCIENCE CAN OPEN DOORS TO COLLABORATION AND COMMUNICATION FOR THE GOOD OF OUR SHARED WATERS.” — DR. MICHAEL P. CROSBY



FERTILE GROUND FOR INNOVATION

BY HAYLEY RUTGER

This year, Mote Marine Laboratory announced a novel research initiative focused on restoring seagrasses—essential but threatened plants that feed manatees, shelter seafood fishes and protect and stabilize coastlines.

The Seagrass Restoration Technology Development Initiative is the latest of several massive, multi-partner, research enterprises entrusted by state and federal leaders to Mote—recognizing our ability to unite the best and brightest minds to solve the ocean's toughest challenges.

"In the last five years alone, Mote has been selected by the State of Florida to lead game-changing R&D partnerships for restoring seagrass and mitigating red tide, and we've been selected by the National Oceanic Atmospheric Administration to expand our harmful algae mitigation scope nationwide," said Mote President & CEO Dr. Michael P. Crosby. "We are deeply grateful that our societal leaders have invested millions of dollars and immense trust in our mission to restore marine ecosystems, strengthen the blue economy and improve communities' quality of life."

Through these and other major initiatives, Mote and partners develop science-based solutions and intellectual property and transfer them to agencies and industries best suited to scale them up.

THE ROOTS OF SEAGRASS RECOVERY

Seagrass meadows worldwide have shrunk about 29% since the late 1800s. Severe recent declines in Florida's Indian River Lagoon have left manatees starving.

To recover these vital marine plants, Mote was selected to administer the Seagrass Restoration Technology Development Initiative (403.93344 Florida Statutes) in partnership with the Florida Department of Environmental Protection's (DEP's) Aquatic Preserve Program and the University of Florida (UF).

Mote and Initiative partners are working to develop, test and implement innovative, effective, cost-efficient and environmentally sustainable technologies and approaches for restoring coastal seagrass ecosystems. As fiscal year 2023 ended, Mote was planning a new seagrass research nursery and preparing a request for proposals to recruit our best and brightest peers in seagrass genetics, resilience, sustainable production and other restoration essentials.

Going forward, Mote, UF and DEP will create a 10-year statewide strategic plan for Florida seagrass restoration. Mote also aims to develop, with private foundation support, a market for "blue carbon" offsets—using seagrasses' natural ability to capture carbon dioxide and mitigate climate change.

Gulf of Mexico: The Florida Red Tide Mitigation & Technology Development Initiative—led by Mote in partnership with the Florida Fish and Wildlife Conservation Commission (FWC)—has screened more than 300 potential compounds for effectiveness since 2019 and has 35 projects completed or ongoing, all focused on mitigating the Gulf of Mexico's severe red tides, blooms of *Karenia brevis* algae.

National The U.S. HAB Control Technologies Incubator (US HAB-CTI) was announced in October 2022 as a partnership between Mote, University of Maryland's Institute of Marine and Environmental Technology and the National Oceanic and Atmospheric Administration (NOAA), which provided a \$7.5-million grant. So far, US HAB-CTI leaders have awarded \$1 million in competitive funding to partners testing HAB mitigation technologies for salt- and freshwater systems nationwide.



RED TIDE MITIGATION: FROM COAST TO COAST

Red tides kill fish and other wildlife, cause respiratory issues in people and drain millions of dollars from Gulf of Mexico economies. Other devastating harmful algal blooms (HABs) affect people worldwide.

The good news? This year, Mote's R&D initiative to mitigate red tide in the Gulf has sparked a national-level sister program.

Left: Mote Senior Scientist Dr. Dana Wetzel and Staff Chemist Rebecca Medvecky prepare to test a natural algicide against red tide in Mote's controlled systems. **Top Right:** Mote Senior Scientist Dr. Richard Pierce tests a natural compound for its ability to mitigate red tide, while examining how it affects economically important shellfish.

Mote's HAB and seagrass initiatives use a rigorous, tiered R&D process to advance new technologies from the lab to real-world application. This process also includes assisting partners with field implementation regulatory processes and managing intellectual property to provide revenue for the next wave of scientific solutions.

"Mote is using the best practices found in academia and research to develop intellectual property and generate sustaining revenue through tech transfer," said Mote Chief Innovation Officer Dr. Alex Beavers. "Tech transfer is widespread in some fields but is a new and emerging area for marine science. Mote is quickly becoming a global leader." ■





CARING FOR CORALS:

WHAT'S NEXT?

Florida's Coral Reef experienced record-breaking heat waves in summer 2023—with a combination of temperatures exceeding 100 degrees Fahrenheit, higher-than-normal salinity and low oxygen water from Florida Bay.

In response, Mote Marine Laboratory immediately began an unprecedented evacuation of thousands of stressed and dying corals from our four offshore coral nurseries, with the help of over 70 staff members, six Mote research vessels, and incredibly generous support from individuals and local businesses in the Florida Keys community.



Above: A coral being grown at Mote's land-based nursery in the Florida Keys.

Below: Mote Staff Biologist Louis Schlecker works with corals in the land-based nursery.

BY KAITLYN FUSCO

In a matter of days, Mote carefully transported thousands of corals from our offshore nurseries in Sand Key, Looe Key, Islamorada and Key Largo to our three land-based coral nurseries in Summerland Key, Islamorada and Key Largo, along with our 200-acre Sarasota-based Mote Aquaculture Research Park (MAP).

After nearly three months of supportive care to help the corals recover, Mote's expert coral reef restoration researchers began the multistep process of reintroducing thousands of healthy, rehabilitated corals back into our underwater nurseries. More than 11,000 corals have since been returned and placed into the pipeline for restoration outplanting.

Throughout the return effort, Mote followed strict protocols outlined by the National Oceanic and Atmospheric Administration (NOAA) and the Florida Fish and Wildlife Conservation Commission (FWC). These protocols included a veterinarian health certification of all evacuated corals before their return to offshore nurseries. Corals were closely examined for any potential diseases or pests that could spread on the reef.

Back in their offshore nurseries, these corals underwent a strict, 30-day observation period. They will be reassessed by Mote staff and cleared for restoration outplanting purposes. Our normal coral restoration operations—outplanting nursery-grown corals to reefs in need—are projected to resume early this year.



"While many corals on the reef perished during the unprecedented environmental event, we also identified numerous corals that survived, thrived, and some that never even bleached," said Mote President & CEO Dr. Michael P. Crosby. "These corals are ones we want to pay particular attention to as we look to the future of science-based, genetically resilient coral reef restoration."

The only outplanted elkhorn corals that have survived within the Lower Keys are Mote's sexually produced, resilient genotypes (genetic varieties of coral that can rebound from stress events). A similar trend was observed for Mote's sexually produced, outplanted staghorn coral.

These resilient corals—the offspring of parent corals that Mote strategically bred—did better overall than outplants produced by asexual reproduction. Asexual reproduction involves fragmenting

a coral and growing the pieces into new corals with identical genes, rather than combining genes from two breeding parents. The fact that these sexually produced corals survived is a testament to Mote's methods—which the Lab will continue to scale up. That means identifying and amplifying diverse, resilient coral genotypes on restored reefs by boosting our efforts in assisted coral sexual reproduction and by asexually reproducing resilient corals genotypes.

Mote's immediate goal is to continue gathering and analyzing data from this stress event, apply what was learned to future data-driven restoration techniques, and boost the production and diversity of "massive" species—like brain and star corals—which are inherently more heat tolerant than the branching staghorn and elkhorn species. We will also use our proven techniques to speed the growth of the coral species and genotypes that did well during this event. ■

Crabs are coral champions

As part of our holistic, science-based approach to coral reef restoration, Mote researchers look forward to releasing hatchery-reared Caribbean king crabs produced from Mote's new Florida Coral Reef Restoration Crab Hatchery Research Center to reef sites off Key West.

These crabs will play crucial roles in maintaining the delicate equilibrium of coral ecosystems by grazing on macroalgae. As macroalgae populations surge due in great part to loss of invertebrate and vertebrate grazers over the last several decades, they can smother and weaken coral structures, leaving them vulnerable to disease and bleaching events. Caribbean king crabs have emerged as champions in the fight to mitigate algae overgrowth and rescue threatened coral reefs.

The crabs' positive impacts were previously masked by their low natural abundance. Increasing their abundance facilitates coral growth, settlement, survival and recruitment, dramatically improving coral reef restoration outcomes and reinforcing coral reef resilience against the mounting challenges of human effects and environmental stressors.

About two months after the ribbon cutting for Mote's Florida Coral Reef Restoration Crab Hatchery Research Center, the facility has produced 467

broodstock crabs with 182 hatched clutches that have produced about 110,888 juveniles.

Once the juvenile crabs reach 30 millimeter carapace width (about three to five months after hatching), the Mote team will release them onto various reef sites. Over three months, beginning in the first quarter of 2024, approximately 300 crabs will be released at three separate reefs sites off Key West (100 crabs per reef site).



Right: Mote Staff Biologist Cierra Bair holds a Caribbean king crab in Mote's Florida Coral Reef Restoration Crab Hatchery Research Center.

MOTE SEA: MAKING SCIENCE ACCESSIBLE FOR ALL



Above: Mote staff conduct hands-on activities with local students.

BY HAYLEY RUTGER

In the past year, more than 63,236 children and adults engaged with Mote Marine Laboratory's informal science education programs, outreach programs and educational booths—a new record.

Demand for Mote programs is growing—and not just because they're fun ways to get children into the water and interns into our real working labs. Mote is helping students advance from education to career opportunities in marine STEM (science, technology, engineering and math)—including students facing financial or cultural barriers in these fields.

Many local students will start their journey into marine STEM at Mote Science Education Aquarium (Mote SEA), the rebirth of our public Mote Aquarium projected to complete construction this coming winter at Nathan Benderson Park near Interstate 75 and University Parkway in southwest Florida.

Mote SEA will have the capacity to provide no-cost education programs to 70,000 local public school students. This year, Mote welcomed Dr. Kristen Ranges to champion these efforts. She's starting with a needs assessment to ensure K-12 students in local counties will be able to access Mote's engaging, inclusive and comprehensive science curricula.

"First, we're looking at logistics and operations—for example, working with the school systems to secure bus transportation and decide which groups of students and how many will visit Mote SEA's teaching labs at a given time."

"The Mote research themes for each teaching lab are advanced, but we'll be working with students as young as kindergartners—so these labs are meant to be super flexible and our curricula will be adjusted to the students' needs." Dr. Ranges said. "Even within a single grade level, students will come from different schools with different resources for STEM education. We need to meet them where they are."

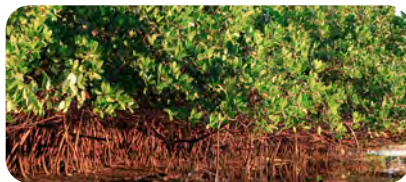
Dr. Ranges is working to link state education standards with Mote research concepts, and in the coming months, she'll work directly with local teachers to solidify and test the curricula for Mote SEA.

"We are extremely excited about the cutting-edge learning and research opportunities Mote SEA will be able to provide our students," said Dr. Sarah Burkett, Science Program Specialist for



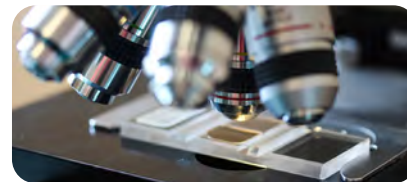
OCEAN TECHNOLOGY LAB

features a 3D printer, laser cutter, LED touch displays and other tools that will help students build and test their own autonomous underwater vehicles and tackle other marine engineering activities.



MARINE ECOLOGY LAB

features animal habitats, live animal ambassadors and large murals that will help students explore themes such as connected ecosystems and water quality.



BIOMEDICAL/IMMUNOLOGY LAB

allows students to use tools such as digital microscopes and explore topics like finding new medicinal compounds from the ocean and using DNA to investigate conservation-related questions, such as the paternity of sea turtle hatchlings.

Sarasota County Schools. "The interactive laboratory experiences both inside and outside the classroom will be immersive, supporting student learning in a new, unique way."

Mote SEA won't just deepen students' education—it will also help bridge gaps between education and careers through four STEM Workforce Training Labs on the second and third floors: the Aquaculture Lab, Conservation Lab, Coral Lab and Veterinary Clinic & Diagnostic Center.

In these labs, interns and program participants including high schoolers, undergraduates and graduates will gain technical skills, increased science literacy and career-building networking opportunities by working alongside Mote scientist mentors on their ongoing projects.

With time, Dr. Ranges and her Mote teammates look forward to building deeper connections among the Teaching Labs, Workforce Training Labs and Mote's existing school programs. For example, Mote is currently rolling out a partnership with Bayshore High School to introduce and improve access to STEM careers for students in minority populations that are historically underrepresented in marine science.

Mote Associate Vice President for Education Aly Busse said: "At Mote SEA, and throughout our communities, our goal is to give students multiple entry points into marine STEM and build their knowledge along with their sense of belonging, science identity, self efficacy and confidence around STEM." ■

A MOMENTOUS YEAR

In 2023, construction teams put the final structural beam into place for Mote SEA, a milestone called "topping off." Mote staff, supporters and members of the media celebrated with a topping off ceremony—one of many highlights in this incredible year of construction progress.

Mote SEA's interior began coming to life last summer. On July 25 and 26, a crane lifted two massive windows made of acrylic (clear, strong, aquarium-grade material) into place for the 400,000-gallon Gulf of Mexico shark conservation habitat—the largest exhibit in Mote SEA. Other pieces of amazing interior were shaping up rapidly as this magazine went to press.

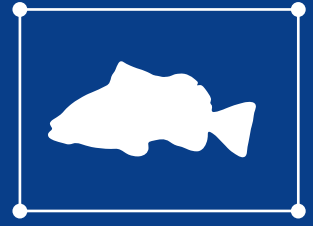
We anticipate that the certificate of occupancy (C.O.)—a formal approval from Sarasota County certifying that Mote SEA meets all required construction requirements and is safe for occupation—will be applied for in late summer 2024. Once the C.O. is issued, our aquarium biologists can undertake Mote's transport and acclimation process for the wide array of animals that will ultimately call Mote SEA home. Most exciting of all: Mote SEA is on schedule to welcome its first visitors in winter 2024.



Above: Mote staff attend the "topping off" celebration for Mote SEA.

E-FISH-IENT

monitoring for Gulf Fisheries



BY EMMA MCINTYRE

Commercial fishing in the Gulf of Mexico provides a steady source of fresh seafood and boosts the economy through job creation. To keep wild fisheries in ecological harmony as market demands increase, it's important to balance the needs of people and fish populations. Central to this goal is collecting comprehensive data—knowledge to inform industry and fishery management about sustainable fishing practices.

An innovative and increasingly vital source of that data is the Mote Center for Fisheries Electronic Monitoring at Mote (CFEMM). CFEMM has partnered with the fishing industry for a series of pilot studies using video recording and analysis technology to collect accurate, independent data on the Gulf of Mexico commercial reef fish fishery to inform decision makers. Now, new technology is helping the team obtain high quality data more *e-fish-iently*.

In 2016, in partnership with Saltwater Inc., CFEMM installed video cameras, computer processors and sensors on partnering vessels. Video recordings are reviewed by the CFEMM team to document the targeted catch species, incidental bycatch (non-targeted species), whether the fish was kept or discarded, its condition upon capture and its short-term survival when released. Mote shares data in confidential reports to the individual vessel participants and provides grouped data to the SouthEast Data, Assessment, and Review (SEDAR), a state, federal and community collaboration that evaluates fish population data in NOAA* Fisheries' Southeast Region and advises government fishery managers.

Recently, CFEMM has significantly expanded their data collection capabilities using standard electronic monitoring (EM) systems with video cameras mounted above water, while also integrating innovative technology approaches, many of which are new to EM in the Gulf region and beyond:

- Underwater cameras improve identification of large sharks released near the vessel and help scientists record each

shark's sex, size range and fate at release.

- A discard chute was tested to record measurements of discarded fish.
- Boom-mounted stern cameras were installed to capture the post-release status of discarded fish.

Tracking discarded fish, particularly protected species, is critical for management to produce reliable assessments of the species stocks.

"We're finding that EM is a reliable source of fisheries data and it can be used to boost other vital processes for assessing fisheries health—for example, collecting biological samples from fish species from which not much information is available to determine the health of the population," said CFEMM Director Carole Neidig. "Our EM systems and integration of innovative tools and methods can even be used to document entanglements and hook placement, and provide the views needed to identify sharks underwater that are caught and released without being brought onboard."

In collaboration with NOAA* Southeast Fisheries Science Center, Texas A&M University and with assistance provided by Texas Sea Grant, commercial reef fish fishermen engaged in a unique project collecting biological samples from fish. This information helps to fill data gaps in species genetics, age and growth for NOAA to use in improving management plans. Participating vessels provided CFEMM with 262 fish, from which length and weight measurements were recorded, and approximately 750 biological samples, including otoliths (ear bones for estimating fish age), and fin clips (for genetic analysis) were obtained.

Looking forward, CFEMM aims to better integrate artificial intelligence (AI) into their data collection.

"Our early AI algorithm detects if there is a fish in the frame and creates a track of the fish coming onto the boat,"

*National Oceanic and Atmospheric Administration

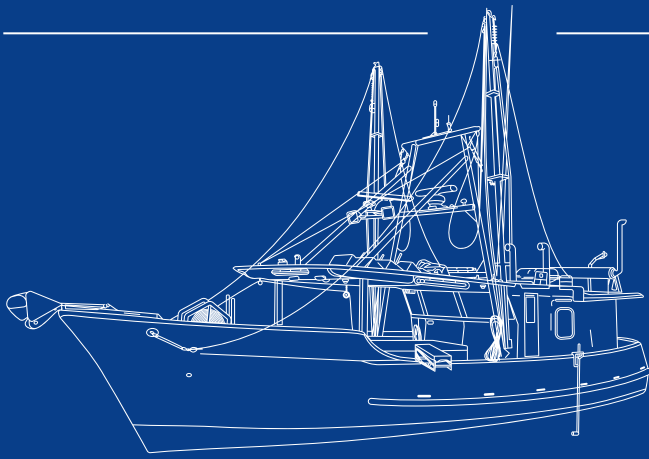


ILLUSTRATION BY KATIE HARRINGTON

said Mote Research Technician Katie Harrington, who helped train the algorithm in partnership with CVision AI. Over time they plan to fine tune it to do more. “We are working to train it to eventually detect the species of fish.”

Mote’s team also hopes to deploy Saltwater, Inc.’s new portable EM systems, allowing CFEMM to expand its impacts and support sustainable fisheries:

“These systems are efficient, compact—easy to install and remove,” Neidig said. “They open the door for us to launch EM in partnership with other fisheries like charter and private sectors. Just a few portable systems can be used to engage multiple boats.” ■



Above: Mote research technician Katie Harrington holds a speckled hind, a Gulf of Mexico fish sampled to improve fisheries data through the Center for Fisheries Electronic Monitoring at Mote.

MEET THE CFEMM TEAM



Carole Neidig, CFEMM Director

Manages all things CFEMM, coordinates with project partners and writes proposals to secure competitive grants so that CFEMM can expand its positive impacts.



Max Lee, Center Coordinator

Manages the fleet of participating vessels, as well as the documenting of catch, bycatch, discards, and other important data from EM videos. Manages the CFEMM extensive database & coordinates data contributions to management & industry.



Katie Harrington, Research Technician

Refines CFEMM’s data automation processes, leveraging R software and geographic information systems like ArcGIS to compile recorded catch events into automated data products and deliverables tailored for industry stakeholders and management.



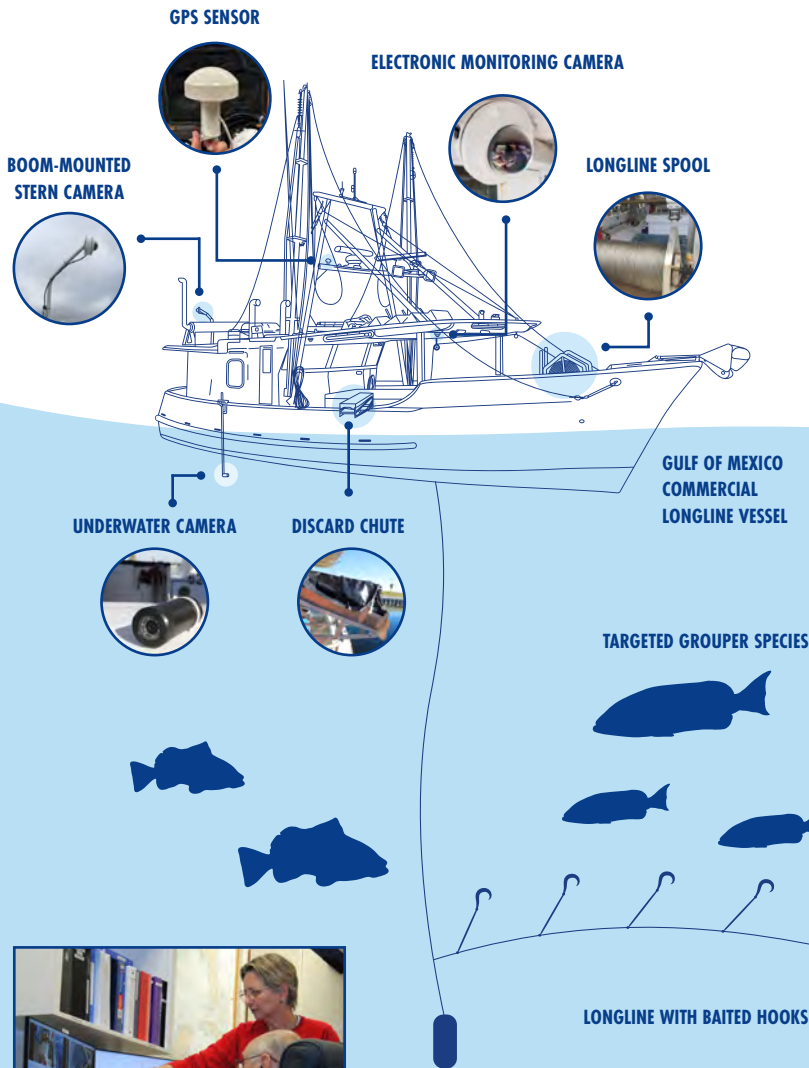
Dr. Ryan Schloesser, Fisheries Ecology & Enhancement Research Program Manager

Assists with analysis of large datasets and development of mixed models, and provides expertise with data programming languages.

[MOTE.ORG/CFEMM](https://mote.org/cfemm)

TURN THE PAGE FOR A FISH-EYE VIEW OF THIS RESEARCH ▶

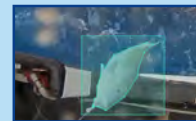
EM: A FISH-EYE VIEW



- 1: Set up electronic monitoring (EM) gear on partner fishing vessel.
- 2: Capture video of longline haul coming in. Fishers collect fish for scientists to obtain biological samples.
- 3: Mote CFEMM scientists process video & analyze data.
- 4: Mote shares grouped findings with fishers, managers, & scientists, contributing to informed fisheries decisions.
- 5: Mote & partners continue to upgrade & improve EM tech & processes.



Top to bottom: Hotspot map of sandbar shark bycatch to help fishers avoid this non-target species; portable EM system; AI tool detecting fish in videos.



POSITIVE EM-PACTS

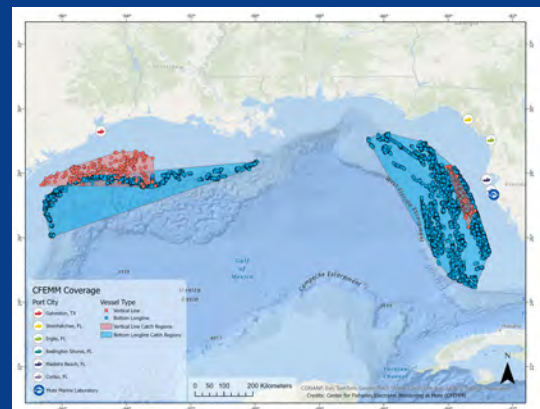
+613 COMMERCIAL FISHING TRIPS reviewed, covering 5,186 sea days.

+210,000 CATCH OBSERVATIONS recorded, including species identification and their catch and release dispositions.

NEW STUDY OF UNDERWATER EM CAMERAS:

Neidig, C., Lee, M., Patrick, G., & Schloesser, R. (2024). Employing an innovative underwater camera to improve electronic monitoring in the commercial Gulf of Mexico Reef Fish Fishery. *PLOS ONE*.

COAST-TO-COAST RESEARCH in the Gulf of Mexico thanks to partnering fishers in Florida and Texas



Map: Locations of fishing trips monitored by CFEMM

Photo above, left: Mote's Carole Neidig helps CFEMM volunteers process EM video

Events calendar

Registration is required for all. More events: mote.org/events

SPRING 2024

APRIL 06

38th Run for the Turtles

5K or 1-mile race to support Mote's Sea Turtle Conservation & Research Program. Register: mote.org/run

APRIL 09-10 (NOON TO NOON)

Giving Challenge

A 24-hour day of giving where all gifts to Mote will be matched 3:1 up to \$100. Learn more at mote.org/GC2024

APRIL 17

SEAsonal Tasting at Nathan Benderson Park

A scrumptious tasting by restaurants of University Town Center (UTC) benefiting the new Mote Science Education Aquarium (Mote SEA), a future neighbor in the UTC community. 6-8:30 p.m. \$125. mote.org/seasonaltasting

APRIL 20

Breakfast with the Sharks

Enjoy breakfast with Mote's resident sharks, see a live feeding & have your shark questions answered. 8-9:30 a.m. Ticket prices online. mote.org/breakfast

APRIL 27

Sensory Saturday

Guests with sensory processing differences or autism spectrum disorders can access Mote Aquarium an hour early for a calmer environment. 8:30-9:30 a.m. Tickets: mote.org/tickets. Details: mote.org/sensory

SUMMER 2024

MAY - AUGUST

Breakfast with the Sharks

Enjoy breakfast with Mote's resident sharks, see a live feeding & have your shark questions answered. 8-9:30 a.m. Summer dates: May 18, June 15, July 6, August 10. Ticket prices online. mote.org/breakfast

Mote Day Camp

Single-day sessions with STEM activities, water exploration, Aquarium tours and more for ages 5-10. 9 a.m.-1 p.m. on select dates. \$54/day for Mote members, \$60/day for non-members. mote.org/daycamps

JUNE - AUGUST

Summer Camp

Marine science-themed, hands-on activities for ages 5-13. Each Monday-Friday camp is \$270 per week for members, \$300 for non-members. mote.org/summercamp

JUNE 8

World Ocean Day

World Ocean Day is officially observed on June 8 worldwide, allowing people around our blue planet to celebrate and honor the shared ocean that connects us all. Mote's celebration will take place Saturday, June 8, from 9:30 a.m. to 3:00 p.m. in our Aquarium Courtyard. Participate in World Ocean Day at Mote by purchasing Admission tickets to visit the Aquarium. mote.org/worldoceanday

FALL 2024

SEP. 15

Breakfast with the Sharks

Enjoy breakfast with Mote's resident sharks, see a live feeding & have your shark questions answered. 8-9:30 a.m. Ticket prices online. mote.org/breakfast

OCT. 5

Sharktoberfest

Sample local and regional brewery selections and enjoy live entertainment, food stations and more. Tickets & sponsorships online. mote.org/sharktoberfest

OCT. 26

Oceanic Evening

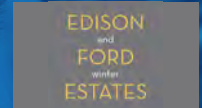
Mote's signature annual black-tie gala. 6 p.m. Tickets & sponsorships online. mote.org/oceanic

Did you know?

Mote Members receive FREE or discounted admission to **MORE THAN 100** zoos, aquariums, museums and gardens across the country.



Free in May



Free in September



Free in June



Free in October



Free in July & August



Free in November



Free in August



50% off All Year



50% off All Year



50% off All Year

Check out the full list at:

MOTE.ORG/RECIPROCAL

*Some restrictions apply. Please see website for details.



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