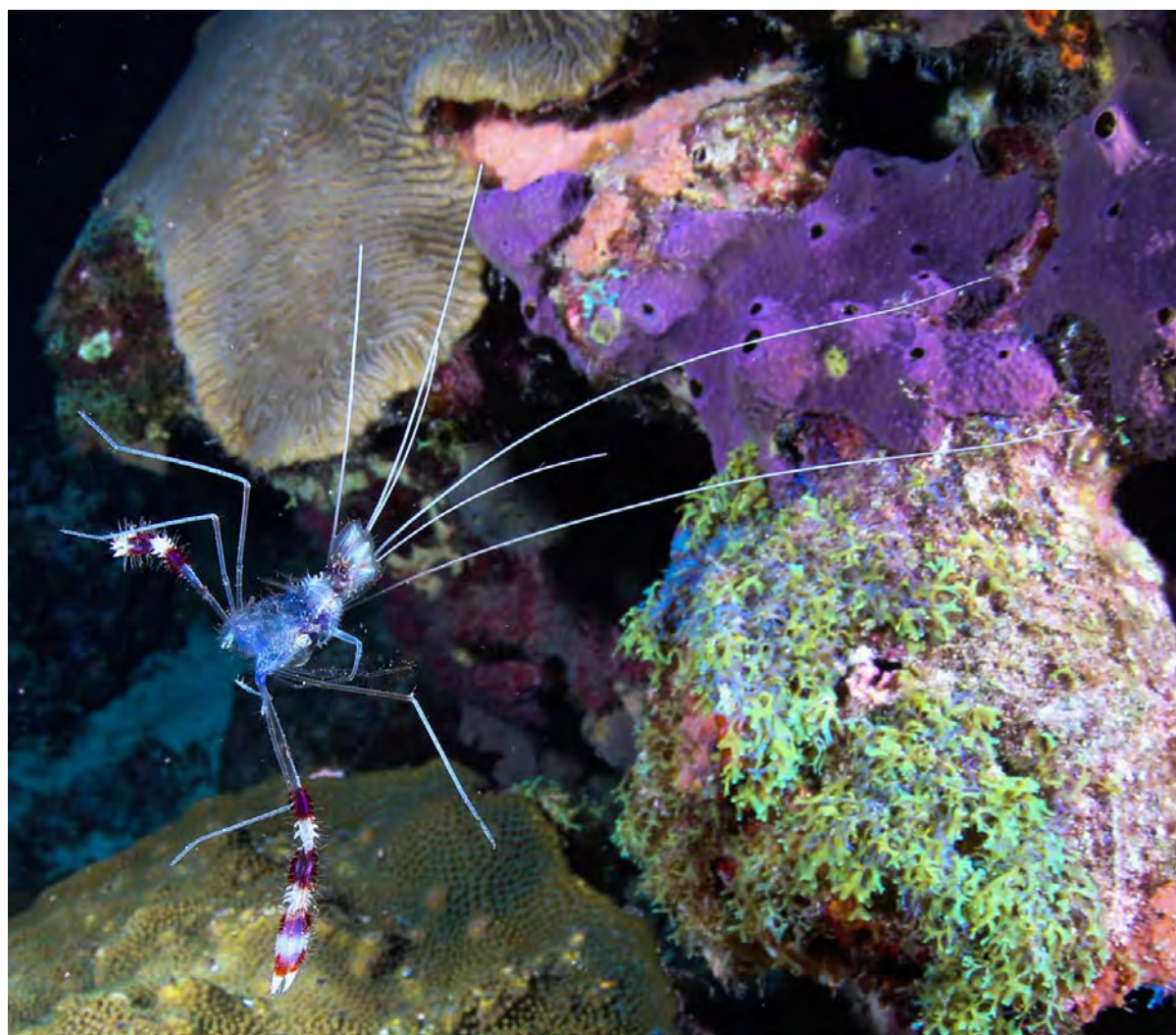


2018 RESEARCH AND MONITORING REPORT



March 2019

The purpose of this document is to report the activities of the Flower Garden Banks National Marine Sanctuary research team during FY2018.

National Oceanic and Atmospheric Administration
Office of National Marine Sanctuaries
Director
John Armor

Flower Garden Banks National Marine Sanctuary
Superintendent
G.P. Schmahl

Research Coordinator
Emma L. Hickerson

Research Staff

John Embesi, HIA-389A Project Manager, Research Assistant
Michelle Johnston, Flower Garden Banks LTM Project Manager
Jimmy MacMillan, Water Quality Project Manager, Research Specialist
Marissa Nuttall, Stetson Bank LTM Project Manager
Travis Sterne, Research Assistant (outgoing – August 2018)
Raven Walker, Research Assistant

Cover Photo Image credit: A recent molt of a banded coral shrimp floats through the water column.

Emma Hickerson /FGBNMS

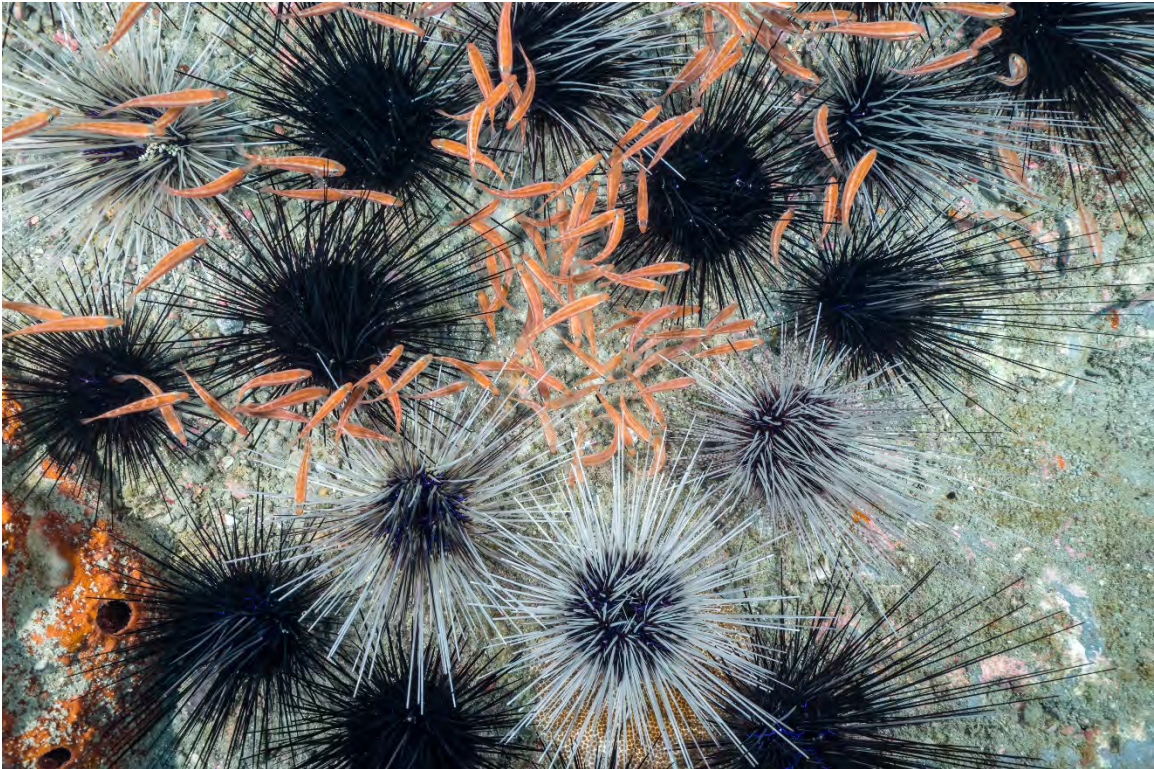


ACRONYMS

BOEM – Bureau of Ocean Energy Management	NDC – NOAA Dive Center
BSEE – Bureau of Safety and Environmental Enforcement	NMSF – National Marine Sanctuary Foundation
DFH – Deepwater Fish Habitat	NOAA – National Oceanic and Atmospheric Administration
EFGB – East Flower Garden Bank	NOS – National Ocean Service
GIS – Geographic Information System	NPR – National Public Radio
CIOERT – Cooperative Institute of Ocean Exploration, Research and Technology	NWGOM – Northwest Gulf of Mexico
CRCP – Coral Reef Conservation Program	OA – Ocean Acidification
CUNY – The City University of New York	ONMS – Office of National Marine Sanctuaries
DSCRTP – Deep Sea Coral Research and Technology Program	OCS – Outer continental shelf
EFGB – East Flower Garden Bank	PSBF – Potentially Sensitive Biological Features
FDA – Food and Drug Administration	REEF – Reef Environmental Education Foundation
FGBNMS – Flower Garden Banks National Marine Sanctuary	RESTORE – Resource and Ecosystems Sustainability, Tourist Operations, and Revived Economies of the Gulf Coast States
FKNMS – Florida Keys National Marine Sanctuary	ROV – Remotely Operated Vehicle
FSU – Florida State University	SAC – Sanctuary Advisory Council
GCFI – Gulf Coast Fisheries Institute	SCUBA – Self Contained Underwater Breathing Apparatus
GIS – Geographic Information System	TAMUCC – Texas A&M University – Corpus Christi
HD – High Definition	TAMUG – Texas A&M at Galveston
IA – interagency agreement	TPWD – Texas Parks and Wildlife Department
LTM – Long-Term Monitoring	UH – University of Houston
MG – Moody Gardens	UL-L – University of Louisiana at Lafayette
MOCNESS – Multiple Opening/Closing Net Environmental Sensing System	UNC-University of Carolina
MBON – Marine Biodiversity Observation Network	UNCW – University of North Carolina – Wilmington
NABS – National Association of Black Scuba Divers	UT – University of Texas
NASA – National Aeronautics and Space Administration	UTRGV – University of Texas-Rio Grande Valley
NCCOS – National Centers for Coastal Ocean Science	UTB – University of Texas - Brownsville
NCDDC - National Coastal Data Development Center (NCDDC)	UVP – Underwater Vehicle Program
NCRMP – National Coral Reef Monitoring Program	WFGB – West Flower Garden Bank

Overview

The Flower Garden Banks National Marine Sanctuary (FGBNMS) research team was involved in 17 research cruises and expeditions during the 2018 field season. The R/V *Manta* was utilized by the team for a period of 42 days to conduct operations. Other vessels of opportunity were utilized for a variety of reasons for a total of 18 days. A pool of 30 sanctuary personnel, scientists, and reciprocity divers conducted 490 scuba dives, 16% of which were conducted by reciprocity divers. Activities included biological surveys and sample collections, removal of invasive species, equipment maintenance, image collection, and dive safety training. Seven sanctuary permits were processed, and an additional 13 were/are ongoing.



A school of fish swim among an impressive aggregation of spiny sea urchins at Stetson Bank.
Photo: G.P. Schmah/NOAA

FY 2018 HIGHLIGHTS

FGBNMS summer scholars

Flower Garden Banks National Marine Sanctuary hosted two summer scholars, Grace McDermott and Rebekah Hernandez, for the summer of 2018. Grace was a NOAA Hollings Undergraduate Scholar from the University of Maine majoring in marine biology. Rebekah was a cooperative institute scholar from University of Texas-Rio Grande Valley (UTRGV) and working on her master's degree in marine science. Throughout the summer they worked on the FGBNMS long-term monitoring historic dataset. Specifically, they created coral ID guides for each long-term monitoring repetitive photostation at East Flower Garden Bank (EFGB) and West Flower Garden Bank (WFGB). They then used the guides to reanalyze percent cover in repetitive photostations from 1989, comparing the old stations to the most recent 2017 photostations. Overall, there was a significant increase in coral cover from 1989 (52%) to 2017 (62%) in the WFGB repetitive photostations. At EFGB, while coral cover did increase from 1989 (56%) to 2017 (62%), the difference was not significant over time. The coral keys created by Grace and Rebekah will help FGBNMS staff correctly ID corals in repetitive photostation images to speed up analysis, as well aid in more detailed time series data analyses.



Grace and Rebekah at FGBNMS on the first day of their scholarship program. Photo: Michelle Johnston/NOAA

Moody Gardens partnership

Moody Gardens has provided critical support to FGBNMS by providing highly trained divers and access to specialized training since 2015, helping FGBNMS achieve research, monitoring, and management goals. In turn, FGBNMS provides unequalled opportunity to directly support initiatives which enhances the experience of Moody Gardens' guests, staff development, and their mission to the "...advancement of rehabilitation, conservation, recreation, and research." In FY 2018, Moody Gardens (MG) support provided approximately 240 in-kind man hours (~\$4,800 equivalent) for field work, assisting in fish and benthic data collection for long-term monitoring projects, monitoring equipment exchanges, post hurricane assessments, and mooring buoy maintenance and installations. Additionally, they have supported the FGBNMS dive team by providing two joint training programs (~\$1,400) to certify NOAA divers in specialized tasks and a collaborative educational outreach event for World Oceans Day, including a *Chasing Coral* viewing with paneled discussion on the largest theater screen in Texas, reaching over 12,000 people. These contributions represent 14% of all research and management dives conducted at FGBNMS in FY 2018 and data collected will contribute directly to two peer reviewed publications. Further, these endeavors build recognition of FGBNMS' national significance as MG scientific divers share their observations and experiences in the field to their over 250,000 annual visitors. This exchange of education through scientists (FGBNMS), biologists (MG), and the public provides real-time access to active efforts exploring the value of our world's ocean and its resources.



Moody Gardens scientific diver Rachel Parmer following the completion of a mooring buoy installation at Stetson Bank.
Photo: G.P. Schmahl/NOAA

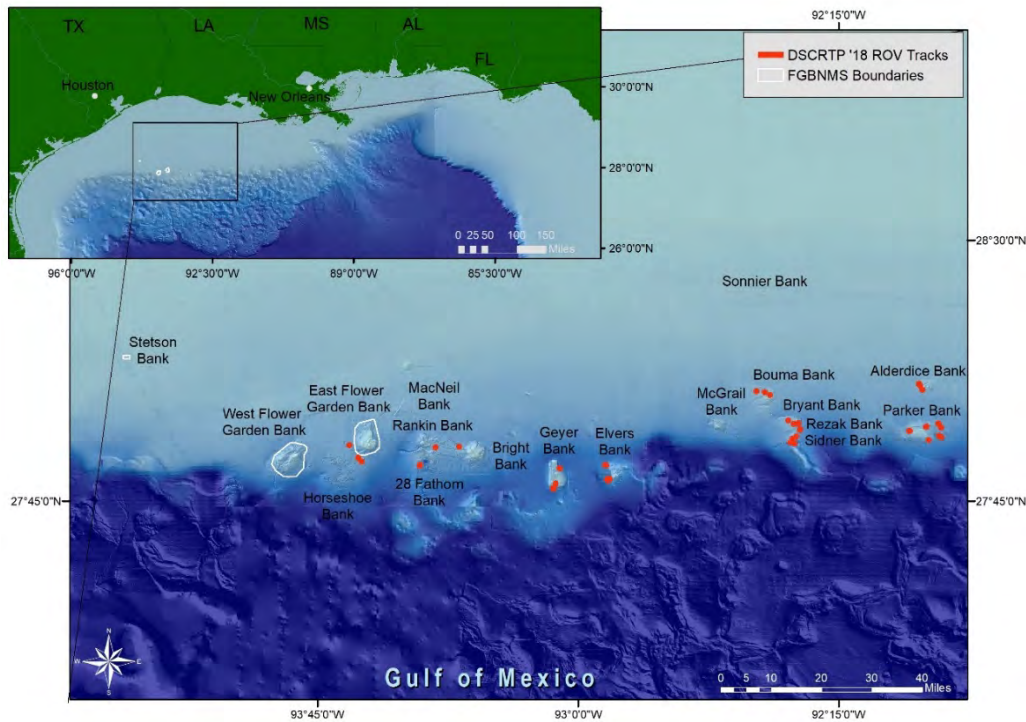


Divers complete full facemask training under the guidance of Moody Gardens instructors.
Photo: Jake Emmert/ Moody Gardens



FGBNMS Biologist Michelle Johnston dissects a lionfish during World Oceans Day at Moody Gardens.
Photo: Rebekah Hernandez/NOAA

Northwest Gulf of Mexico ROV cruises



Surveys were conducted in the locations marked in red, during the two FGBNMS/DSCRTP cruises in 2018.

Two remotely operated vehicle (ROV) cruises, sponsored by NOAA's Deep Sea Coral Research and Technology Program (DSCRTP), were conducted on board R/V *Manta*, using the Mohawk ROV, operated by UNCW-Undersea Vehicle Program. The ROV is owned by National Marine Sanctuary Foundation.

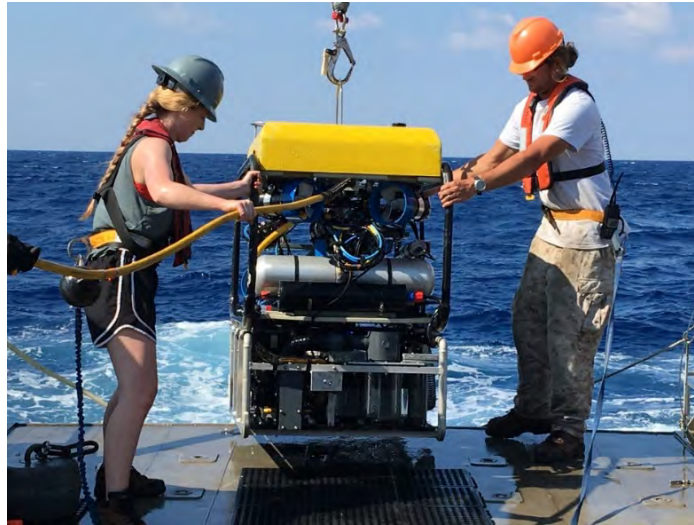
Cruise I : DFH 35 – July 22-26, 2018

A total of 13 ROV dives were conducted at Elvers, Geyer, EFGB, and the Bright Bank Complex, between 61 and 156 meters, yielding a total bottom time of 19 hours, and 1905 images. During the dives, 24 seafloor transects were completed. A total of 23 biological specimens were collected during the expedition, both targeted collections and those incidentally collected when caught in ROV propellers. Participant organizations included FGBNMS, DSCRTP, The City University of New York (CUNY), and UTRGV.

Cruise II: DFH 37 – September 6-10, 2018

A total of 21 ROV dives were conducted at Alderdice, Parker, Sidner, Rezak, Bouma, Bryant, and Elvers Banks between 60 and 142 meters, yielding a total bottom time of 23 hours, and 2261 images. During the dives, 41 seafloor transects were completed. A total

of 68 biological specimens were collected during the expedition, both targeted collections and those incidentally collected when caught in ROV propellers. Participant organizations included FGBNMS, DSCRTP, CUNY, UTRGV, and University of Louisiana-Lafayette (UL-L). To our delight, Dr. Tom Bright, one of the first oceanographers/biologists to study in the region, joined the expedition. Bright Bank is named after him.



FGBNMS Hollings scholar, Grace McDermott, assists Jason White (UNCW-UVP) recover the Mohawk ROV onboard the R/V *Manta*.



An array of black corals, gorgonians, crinoids, sponges, and other invertebrates carpet the seafloor at this location at 127m/416ft depth at Elvers Bank. Photo: NOAA/UNCW-UVP

East and West Flower Garden Banks Long-term Monitoring Project

The FGBNMS Sanctuary research team and the R/V *Manta* crew, along with volunteer divers from FGBNMS, Moody Gardens, and NOAA's Southwest Fisheries Science Center - Santa Cruz Lab, conducted annual long-term monitoring field work at WFGB during August 14-17, 2018 and August 21-24, 2018 at EFGB. Monitoring tasks completed during the cruises included fish surveys, urchin and lobster surveys, benthic random photo transects, photographing repetitive monitoring stations and lateral coral growth stations, water sample collection, and instrument exchange. The long-term monitoring project at the Flower Garden Banks is a collaboration between NOAA's FGBNMS and Department of Interior's Bureau of Ocean Energy Management (BOEM). In more than 28 years of continuous monitoring, the coral reefs of FGBNMS have maintained high levels of coral cover and supported relatively diverse and abundant fish populations as well as other vertebrate and invertebrate species.

Stetson Bank Long-term Monitoring Project

The Stetson Bank long-term monitoring project completed its 26th consecutive year of data collection in 2018, and the fourth year of the Bureau of Safety and Environmental Enforcement (BSEE) interagency agreement (IA) (E14PG00052). Random and repetitive surveys were completed on the shallow bank crest by scuba divers and in mesophotic habitat by a remotely operated vehicle. Divers noted the presence of numerous smooth-hound sharks (*Mustelus sp.*) on the bank crest and a new exotic species, the regal demoiselle (*Neopomacentrus cyanomos*), schooling with brown chromis (*Chromis multilineata*) around high relief features and vase sponges on the bank crest in densities of ~70/100m². Additionally, divers noted the new growth of several colonies of touch-me-not sponge (*Neofibularia nolitangere*) and fire coral (*Millepora alcicornis*).

HIA-389A Monitoring Project

FGBNMS staff observed, documented, and photographed the partial removal of the HIA-389A platform located within sanctuary boundaries. This involved severing and removing the top section. A subsequent inspection of the platform occurred on August 12, 2018. FGBNMS and NOAA Fisheries divers confirmed that the platform piles and conductors were severed at the correct depths. During the inspection, the exotic regal demoiselle was documented on the platform. ROV surveys of the structure were scheduled to be completed in August, but were postponed due to Hurricane Florence. They have been rescheduled for 2019.



The FGBNMS research team was on hand to observe and photo-document the partial removal of HIA-389A at East Flower Garden Bank. The majority of the structure, from 65 ft to the seafloor at around 400ft depth, is still in place. Photo: G.P. Schmahl/NOAA

Lionfish Invitational cruises 2018

Trained volunteer divers and research partners from across the country conducted fish surveys and lionfish removals during two separate, permitted FGBNMS Lionfish Invitational cruises taking place on board the M/V *Fling* June 26-28, 2018 and August 27-30, 2018. These cruises were the third and fourth Lionfish Invitational public removal events in the northwest Gulf of Mexico. In June, despite losing a day due to unfavorable weather, a total of 364 lionfish were removed, and 83 were sighted but not removed. A total of 152 lionfish were removed from EFGB, 129 from WFGB, and 83 from Stetson Bank. The largest lionfish (415 mm) was removed from Stetson Bank and the smallest lionfish (155 mm) was removed from WFGB. There was an 81% removal success rate averaged among all the removal dive teams. A total of 771 lionfish were removed from FGBNMS in August 2018, and 219 were sighted but not removed. A total of 372 lionfish were removed from EFGB, 358 from WFGB, and 41 from Stetson Bank. The largest lionfish (444 mm) was removed from EFGB and was a new Texas State record. The smallest lionfish (90 mm) was removed from Stetson Bank. An additional 38 lionfish were removed from the *Kraken*, a shipwreck near Stetson Bank. Five were live removals and were donated to Moody Gardens Aquarium. There was a 74% removal success rate averaged among all the removal dive teams.

Sanctuary and researcher partners will examine the lionfish for age, growth, and stomach contents to see which and how many native fish species lionfish are eating. In addition to the sanctuary, Texas Lionfish Control Unit, Ripley's Aquarium of Canada, and Fling Charters supported the event. The work is part of an effort to better understand the effects of lionfish, an invasive species, on native fish communities and habitats in the sanctuary. Since 2000, Indo-Pacific lionfish populations have increased in the waters off the southeastern United States, Caribbean, and Gulf of Mexico, a serious concern among scientists and resource managers. Lionfish have venomous spines that can be painful to swimmers, divers, and fishermen. They can cause significant impacts to local fish populations, and have been documented to eat over 100 species of fish and invertebrates, including commercially important species such as snapper and grouper.



Participants from the two lionfish invitationals conducted in 2018.

CRUISES and EXPEDITIONS

All of the following cruises were conducted on board the R/V *Manta* by the FGBNMS research team, unless indicated otherwise:

October 14-15, 2017 ROV – Stetson Bank LTM
October, 10-15, 2017 Post Harvey (R/V *Point Sur*)
October, 30-31, 2017 Water Quality
November 8, 2017 Stetson Bank Water Quality
April 24, 2018 – Water Quality (*Hull Raiser*)
June 11-14 NCRMP Cruise – (M/V *Fling*)
June 25-28, 2018 Lionfish Removal cruise I – (M/V *Fling*)
June 26-29, 2018 Mooring Buoy Maintenance/Water Quality
July 16-19, 2018 Stetson Bank LTM
July 22-26, 2018 DSCRTP NWGOM I ROV
July 29-31, 2018 Stetson Bank LTM ROV
August 3-4, 2018 Mooring Buoy Maintenance/Coral Spawning
August 8-10, 2018 Mooring Buoy Installation – Stetson Bank
August 14-17, 2018 EFGB LTM
August 21-24, 2018 WFGB LTM
August 27-30, 2018 Lionfish Removal cruise II – (M/V *Fling*)
September 6-10, 2018 DSCRTP NWGOM II ROV



Changing out water quality instrumentation at EFGB Mortality Site. Photo: G.P. Schmahl/NOAA



ADDITIONAL R/V *Manta* CRUISES

The R/V *Manta* was chartered by several user groups during the 2018 research season.

October 10-12, 2017 Santiago Herrera RESTORE ROV

June 22, 2018 Steve DiMarco Glider Recovery

July 9-13, 2018 Josh Voss/CIOERT Technical Diving

September 18-22, 2018 Santiago Herrera RESTORE ROV

September 24-25, 2018 Suzanne Fredericq RESTORE ROV

ADDITIONAL SCIENCE ACTIVITIES

1. Coordination of IA between BOEM and FGBNMS for collection of high resolution imagery of 24 reefs and banks in the NWGOM and South Texas
2. Deployment of sound traps
3. Deployment of tilt/current meters
4. Permitting
5. Scheduling of R/V *Manta*
6. Coordination of scuba operations
7. Coordination of shipboard research equipment and activities
8. GIS support
9. Science presence at SAC meetings
10. Participation in NOAA Coral Collaboration calls
11. Participation in NOAA Deep Sea Coral calls
12. Participation in RESTORE planning calls

SCIENCE INTERPRETATION

1. Hosting of multiple Chasing Coral screenings
2. Development of FGBNMS Image Lending Library
3. Participation in Inspire Film Festival – development of imagery.
4. Interviews for media – magazines, newspapers, radio
5. Contribution to digital slide catalog/library
6. Contribution to video library, including annotations
7. Development of PowerPoint presentations for various events
8. Content for sanctuary website
9. Facebook postings
10. Web-based research reports and blogs
11. Response to “Into the Sea” mail. Hickerson



A series of FGBNMS metal print images provided backdrops for Inspire Film Festival discussions at an Art Gallery at the event in The Woodlands. These images later became part of a Lending Library of images now in place at the sanctuary. Funding for images provided by National Marine Sanctuary Foundation. PHOTO: Emma Hickerson/NOAA

CONFERENCES, MEETINGS, PRESENTATIONS, TRAINING, ETC.

1. ESRIs Oceans Forum. Redlands, CA. October 31-November 2, 2017. Nuttall
2. Texas Dive Safety Officer meeting. December 1, 2017. San Marcos, TX. Nuttall
3. Core Policy Training. December 5-7, 2017. Santa Barbara, CA. Hickerson
4. Underwater Field Methods, TAMUG Scientific Methods Class, Galveston TX. Nuttall
5. Coral Confusion, Seaside Chats, Galveston TX. February, 2018. Nuttall
6. CPC Management Meeting, CPC, San Diego CA. Nuttall
7. Sea Turtle Saturday Presentation. Galveston, TX. February 17, 2018. Johnston
8. Seaside Chat – Mortality, Bleaching, and Hurricanes – Oh My! Galveston, TX. March 7, 2018. Johnston
9. EFGB Mortality Event – NOAA’s Deep Coral Program. Johnston

10. Inspire Film Festival. February 16-19, 2018. The Woodlands, TX. Hickerson, Schmahl
11. Mortality Event Mini Symposium. February 27-28, 2018. Galveston, TX. Johnston, Hickerson, Schmahl
12. Sea Turtles. Stephen F. Austin college students. Galveston, TX. May 17, 2018. Hickerson
13. *Chasing Coral* – Houston Museum of Natural Science. Houston, TX. June 6, 2018. Hickerson.
14. *Chasing Coral* – Moody Gardens. Galveston, TX. June 8, 2018. Hickerson, Schmahl
15. 2018 Lionfish Summit – Florida Fish and Wildlife Conservation Commission. Cocoa Beach, FL. October 2-4, 2018. Johnston
16. Mesophotic Coral Reef Ecosystems Gorgon Research Conference, Lewiston, ME. June 18-22, 2018. Nuttall



Maintenance of mooring buoys is one of the responsibilities of the FGBNMS research team. The program is funded, in large part, by National Marine Sanctuary Foundation. Photo: G.P. Schmahl/NOAA

PUBLICATIONS

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Recruit symbiosis establishment and Symbiodiniceae composition influenced by adult corals and reef sediment. bioRxiv. <http://dx.doi.org/10.1101/421339>
- Garavelli, L., Studivan, M.S., Voss, J.D., Kuba, A., Figueiredo, J., and Cherubin, L.M. 2018. Assessment of Mesophotic Coral Ecosystem Connectivity for Proposed Expansion of a Marine Sanctuary in the Northwest Gulf of Mexico: Larval Dynamics. *Frontiers in Marine Science*. 5:174. Doi: 10.3389/fmars.2018.00174
- Hu, X., Nuttall, M.F., Wang, H., Yao, H. Staryk, C. J., McCutcheon, M.R., Eckert, R.J., Embesi, J.A., Johnston, M.A., Hickerson, E.L., Schmahl, G.P., Manzello, D., Enochs, I.C., DiMarco, S., and Barbero, L. Seasonal variability of carbonate chemistry and decadal changes in waters of a marine sanctuary in the Northwestern Gulf of Mexico. *Marine Chemistry*. Volume 205, 20 September 2018, Pages 16-28. <https://doi.org/10.1016/j.marchem.2018.07.006>
- Johnston, M.A., Nuttall, M.F., Eckert, R.J., Blakeway, R.D., Sterne, T.K., Hickerson, E.L., Schmahl, G.P., Lee, M.T., MacMillan, J., Embesi, J.A. 2018. Localized coral reef mortality event at East Flower Garden Bank, Gulf of Mexico. *Bulletin of Marine Science*. <https://doi.org/10.5343/bms.2018.0057>
- Johnston, M.A., T.K. Sterne, R.D. Blakeway, J. MacMillan, M.F. Nuttall, X. Hu, J.A. Embesi, E.L. Hickerson, and G.P. Schmahl. 2018. Long-Term Monitoring at East and West Flower Garden Banks: 2017 Annual Report. Marine Sanctuaries Conservation Series ONMS-18-02. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Flower Garden Banks National Marine Sanctuary, Galveston, TX. 124 pp.
- Maher, R.L., Johnston, M.A., Brandt, M.E., Smith, T.B., Correa, A.M.S.. 2018. Depth and coral cover drive the distribution of a coral macroborer across two reef systems. *PLoS ONE* 13(6):e0199642. <https://doi.org/10.1371/journal.pone.0199462>
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- Perez-Portela R., Bumford A, Coffman B, Wedelich S, Davenport M, Fogg A, Swenarton MK, Coleman F, Johnston MA, Crawford DL, Oleksiak MF. 2018. Genetic Homogeneity of Lionfish Across the Northwestern Atlantic and the Gulf of Mexico

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DOI:10.1038/s41598-018-23339-w

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Stewart, J.D., Nuttall, M., Hickerson, E.L., Johnston, M.A. 2018. Important Juvenile Manta Ray Habitat at Flower Garden Banks National Marine Sanctuary in the Northwestern Gulf of Mexico. Marine Biology 165:111. Doi.org/10.1007/s00227-018-3364-5

Stewart, J.D., Nuttall, M., Hickerson, E.L., Johnston, M.A. 2018. Correction to: Important Juvenile Manta Ray Habitat at Flower Garden Banks National Marine Sanctuary in the Northwestern Gulf of Mexico. Marine Biology 165:151. Doi.org/10.1007/s00227-018-3409-9

FUNDING

BOEM – E&W LTM - \$375,000

BSEE – HIA-389A - \$105,000

BSEE – SB LTM - \$239,100

BOEM – NWGOM Multi-beam Mapping - \$360,000 – ship time, NOAA Hydro

DSCRTP - \$48,000 – NWGOM Habitat Characterization maps, cruises – labor

DSCRTP - \$115,000 – NWGOM ROV Cruises, ROV support

IOOS - \$11,764 – Water Quality data – labor

Hurricane Harvey funds - \$42,000 – mooring buoys – labor and supplies

NEW SANCTUARY BIOLOGICAL RECORDS



Maori basslet (*Lipogramma schrieri*). This fish was first described in early 2018 from a specimen in Curaçao. This is likely the first sighting of this species in the Gulf of Mexico. Location: Geyer Bank. Depth: 141m/462ft. Photo: NOAA/UNCW-UVP



Regal demoiselle (*Neopomacentrus cyanomos*). This is an exotic species from the Pacific. Documented at all three banks of the sanctuary in 2018, as well as on HIA-389A. It is well established at Stetson Bank, with thousands seen by staff. Photo: G.P. Schmahl/NOAA

PERMITTED ACTIVITIES WITH PARTNERS

- National Coral Reef Management Program (Edwards) – Biannual fish and benthic surveys
- Texas Lionfish Control Unit (Hale) – two Lionfish Invitational trips on board the M/V *Fling* – permit for participants to remove lionfish
- M/V *Fling* – removal of lionfish
- Harbor Branch Oceanographic Institute (Voss) – Characterization of mesophotic corals through genetic connectivity assessment and a reciprocal transplant experiment, collection and transplanting of coral tissue
- Boston University (Davies), Rice University (Correa), University of Houston (Santiago) – Impact of freshwater runoff from Hurricane Harvey on coral reef benthic organisms and associated microbial communities – collection of coral and sponge samples.
- Boston University (Davies) – Understanding symbiosis of reef-building corals – collection of coral tissue
- University of Louisiana – Lafayette (Fredericq)– Unsuspected eukaryotic life inhabits rhodolith forming coralline algae (Hapalidiales, Rhodophyta), a remarkable marine benthic microhabitat – collection of algal nodules
- LeHigh University (Herrera) – Population connectivity of deepwater corals – collection of two species of octocorals
- TAMU-Geochemical and Environmental Research Group – maintenance of Texas Automated Buoy V
- University of Texas – Rio Grande Valley (Hicks) – removal and analysis of recruitment racks
- Texas A&M University – Galveston (Eytan) – genetic connectivity of exotic fish – regal demoiselle.
- NOAA Fisheries – Pascagoula (Rademacher) – SEAMAP Fish Survey – Southeast Area Monitoring and Assessment Program. Deployment of baited camera array, and plankton sampling
- W&T, Inc. – Partial removal of HIA-389A
- Texas Parks and Wildlife Department – Authorization for remaining HIA-389A structure to remain in sanctuary in TPWD Artificial Reef Program

RESEARCH AND SCIENCE PARTNERSHIPS

- American Museum of Natural History (AMNH)
- Boston University
- Bureau of Ocean Energy Management (BOEM)
- Bureau of Safety and Environmental Enforcement (BSEE)
- Cooperative Institute of Ocean Exploration, Research and Technology (CIOERT)
- City University of New York (CUNY)
- Deep Sea Coral Research and Technology Program (DSCRTP)
- Harbor Branch Oceanographic Institute (HBOI)
- Moody Gardens (MG)
- National Centers for Coastal Ocean Science (NCCOS)
- National Coastal Data Development Center (NCDDC)
- Reef Environmental Education Foundation (REEF)
- Rice University (Rice)
- Ripley's Aquarium
- Scripps Institution of Oceanography
- Smithsonian Institution
- Texas A&M University (TAMU)
- Texas A&M University – Galveston (TAMUG)
- Texas A&M University – Corpus Christi (TAMU-CC)
- University of Delaware
- University of Houston
- University of North Carolina – Wilmington – Undersea Vehicle Program (UNCW- UVP)
- University of Texas – Rio Grande Valley (UTRGV)

2018 RESEARCH STAFFING

1. John Embesi, CPC, HIA-389A Project Manager, Research Assistant
2. Emma Hickerson, Research Coordinator
3. Michelle Johnston, Flower Garden Banks LTM Project Manager
4. Jimmy MacMillan, CPC, Water Quality Manager, Research Specialist
5. Marissa Nuttall, CPC, Stetson Bank LTM Project Manager
6. G.P. Schmahl, Sanctuary Superintendent
7. Travis Sterne, CPC, Research Assistant (outgoing, August, 2018)
8. Raven Walker, CPC, Research Assistant

R/V *Manta* core crew provided through a contract with CPC:

1. Justin Blake
2. Cassidy Brown
3. Karol Breuer
4. Deck position filled by various people

FGBNMS NOAA Divers:

1. Fernando Calderón Gutiérrez (volunteer)
2. Jacque Cresswell (volunteer)
3. Kelly Drinnen
4. John Embesi
5. Emma Hickerson
6. Michelle Johnston
7. Sarah Linden (volunteer)
8. Jimmy MacMillan
9. David McBee (volunteer)
10. Marissa Nuttall (UDS)
11. Dustin Picard
12. G.P. Schmahl
13. Adrienne Simoes-Correa (volunteer)
14. Jenny Van de Pluym (volunteer)
15. Raven Walker

For more information contact:

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A manta ray glides over the coral reef at Flower Garden Banks National Marine Sanctuary. Photo: John Embesi/NOAA

