

December 2012

The purpose of this document is to report the activities of the Flower Garden Banks Research Team during FY2012.

National Oceanic and Atmospheric Administration

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Cover Photo

Rare sighting of a Caribbean two-spot octopus, *Octopus filusus*. This photograph represents only the second sighting of this species in the sanctuary, and the first at East Flower Garden Bank.

Image credit: G.P. Schmahl/FGBNMS



Overview

The FGBNMS research team was involved in 13 research cruises and expeditions during the 2012 field season. The R/V MANTA was utilized by the research team for a period of 48 days to conduct operations. A pool of 35 sanctuary personnel, scientists, and reciprocity divers conducted 738 SCUBA dives during the 2012 field season. Activities included biological surveys and sample collection, removal of invasive species, equipment maintenance, maritime heritage mapping, and image collection. Two sanctuary permits were processed, and an additional six were/are ongoing. FGBNMS Sanctuary Superintendent permit was utilized to install long-term monitoring stations and sight pins, and remove invasive species.



Technical diver Christine Addison conducts a benthic survey at approximately 150ft depth during the CRCP NCCOS/FGBNMS Technical Diving cruise. Image credit: Greg McFall/GRNMS

FY 2012 HIGHLIGHTS

2009/2010 EAST AND WEST FLOWER GARDEN BANK LONG-TERM MONITORING REPORT DRAFT

Prior to 2009 the FGBNMS Long-Term Monitoring has been conducted by contractors who completed both the field work and the report writing for East and West Flower Garden Banks. In 2009 FGBNMS took over the data collection and report writing, in partnership with MMS/BOEMRE/BOEM. The first report to be compiled with this new arrangement was completed in 2012, led by Dr. Michelle Johnston. Michelle was brought on by FGBNMS in October 2011 as Project Manager for the East and West FGB LTM work. The report is currently in final review with BOEM and should be released early FY2013.

NEEMO15 – FGBNMS PARTNERS WITH NASA

Emma Hickerson and G.P. Schmahl were recruited by NASA to participate in NASA's Extreme Environment Mission Operations (NEEMO) to pilot DeepWorker submersibles in conjunction with NASA's quest to identify technology and methodology to explore Near Earth Asteroids (NEA's). NEEMO 15 took place in October 2011. General goals of the mission were to conduct fish surveys, collect general biological observations, and inventory benthic components as well as collect information for presence and density of invasive species (specifically *Tubastraea* sp. and lionfish). The Deepworker submersibles simulated the use of Space Exploration Vehicles (SEV's) by NASA in future NEA characterization missions. In addition to the submersible operations, NASA astronauts



saturnated and conducted excursions from the ARB to simulate working out of a space station on future NEA missions. Emma and G.P. conducted five dives in the Deepworker submersibles for a total of approximately 17 hours of dive time. The submersible dives were supervised by Nuytco, Inc., and were conducted from the NASA/USA Ship Liberty Star. The purpose of the dive operations was to conduct benthic and fish surveys as analogs to NASA's Space Exploration Vehicle (SEV) surveys to characterize asteroids

during future missions. NASA also monitored the submersible pilots fatigue levels and workload stress levels during the dives. This NEEMO project was the 15th to take place as part of a program that trains astronauts in an underwater environment. The astronauts went through a saturation mission in Aquarius that simulates conducting excursions from a space station in a low gravity environment. This year astronauts from

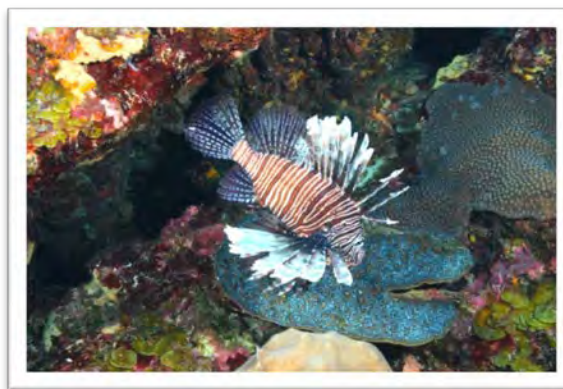
the Canadian and Japanese Space Programs joined NASA astronauts during the saturation mission. Despite the fact that the mission was plagued with tropical weather issues, the saturation mission and Deepworker operations were deemed a success. Dr. Jane Lubchenco toured the Mobile Mission Control Center (MMCC) during the project. They were recruited for NEEMO 16, but unfortunately had to decline based on obligations. Another ONMS DeepWorker submersible pilot, Steve Gittings, who was offered as a replacement, was able to participate in 2012 mission.

NATIONAL MARINE SANCTARY FOUNDATION AND FGBNMS TO PURCHASE SCIENCE CLASS REMOTELY OPERATED VEHICLE

Flower Garden Banks National Marine Sanctuary and the National Marine Sanctuary Foundation have been working through the process of purchasing a science class remotely operated vehicle (ROV). This ROV will replace a system that is maintained and operated by University of North Carolina - Wilmington. The current system has been a workhorse and expertly operated by Lance Horn, a lead in the UNCW Undersea Vehicle Program for many highly successful cruises with the FGBNMS exploring and characterizing the deep water habitats in the northwestern Gulf of Mexico. The current system is old technology, and the new vehicle will provide substantial upgrades to capabilities, including enhanced visualization through HD cameras, increased sampling capabilities, and an upgrade to fiber optic umbilical technology. UNCW will continue to operate and maintain the new system, which will be available as a regional asset for the ONMS program.

FGBNMS TRACKS AND RESPONDS TO LIONFISH INVASION

Lionfish were first captured in southern GoM off the northern Yucatan peninsula in December 2009. In September of 2010, two lionfish were sighted at Sonnier Bank by TAMUG researchers. This was the first confirmed sighting of lionfish at the natural banks in the northwestern Gulf of Mexico, about 60 miles east of East Flower Garden Bank. The first lionfish report in the sanctuary came from recreational divers at West Flower Garden Bank the week of July 20, 2011. On July 27, 2011 photographic evidence was provided by a separate group of divers at Stetson Bank. To date, a total of 171 lionfish have been



observed around the NW GoM banks and surrounding oil and gas platforms, and 56 of those lionfish have been observed in sanctuary waters. Forty lionfish have been removed (32 from sanctuary waters) for genetic analysis in partnership with the NOAA Laboratory in Beaufort, NC. Three lionfish have been removed and kept at the FGBNMS

office for education and outreach purposes. The lionfish that are removed are also being dissected for gut content analysis, to identify which fish are being targeted as prey at the FGB. Sanctuary staff are tracking the invasion at the FGB and surrounding banks by documenting the locations of lionfish removals and observations. Through the development of lionfish sighting forms (available on the FGB website), recreational divers are also able to provide observations and pictures of lionfish sightings. The FGB is also working with the recreational dive charter the FLING, as dive masters have been permitted to remove lionfish in the sanctuary. Divers on board the M/V FLING use weighted float chains to mark a lionfish when diving at the sanctuary, and then permitted dive masters remove the lionfish in the marked locations. As the invasion spreads, community involvement and targeted local removals at the FGB will be important control strategies.



Sanctuary staff use pole spears to remove lionfish from the reef. Image credit: G.P. Schmahl/FGBNMS

	2010	2011	2012
East FGB	0	9	30
West FGB	0	4	37
Stetson	0	2	103

Table 1. Number of lionfish sightings each year by bank

FGBNMS PARTNERS WITH FDA TO INVESTIGATE CIQUATERA

Flower Garden Banks National Marine Sanctuary (FGBNMS) and the Food and Drug Administration (FDA) are developing a formal collaboration to look at the seasonality of ciguatera through quarterly sampling of algae and fish, assessment of ciguatera in invasive lionfish in fish. The FDA and partners at University of Texas Marine Science Institute have received an award through EcoHab, a project that identifies FGBNMS as one of the study sites. FGBNMS will also provide samples as available from other northwestern Gulf of Mexico reefs and banks.

In late 2011 a Houston couple reported to the Flower Garden Banks National Marine Sanctuary that they became ill after eating grouper caught within sanctuary boundaries. Their symptoms appeared consistent with ciguatera poisoning. FGBNMS collaborated with FDA to respond to the possible ciguatera poisoning case. Samples of the grouper, along with samples of numerous other fish caught during the same fishing trip were screened for the ciguatoxin. In 2007, a seafood advisory was released targeting seafood processors. This advisory remains in effect. In November, 2012, FGBNMS and FDA collected samples of fish and algae for continued monitoring.

Ciguatera

Ciguatera is a food borne illness that is caused by a toxin produced by a dinoflagellate, *Gambierdiscus sp.*, that is associated with algae on the reef. The toxin moves up the food chain and can end up in the flesh of reef fish such as barracuda, snapper, grouper, and jacks. The toxins cannot be cooked out of the fish, or tested prior to consumption. It is odorless, tasteless, and heat resistant. Symptoms include gastrointestinal and neurological effects. Gastrointestinal symptoms include nausea, vomiting, and diarrhea, usually followed by neurological symptoms such as headaches, muscle aches, tingling, prickling, numbness, lack of muscle coordination, vertigo, and hallucinations. Severe cases can also result in cold allodynia, which is a burning sensation on contact with cold. Ciguatera is often misdiagnosed. The symptoms can last from weeks to years, and in severe cases, cause long-term disability. There is no effective treatment or antidote for ciguatera poisoning.



FGBNMS PARTNERS WITH BP AND LIQUID ROBOTICS TO TEST WAVE GLIDERS

Flower Garden Banks National Marine Sanctuary collaborated with Russell Putt, contractor to BP, in the deployment of wave gliders to conduct acoustic and current surveys in the Gulf of Mexico. Three Liquid Robotics wave gliders were deployed the week of December 5th from two locations along the Gulf Coast. Two of the gliders were outfitted with acoustic packages to detect marine mammals in the East and West Gulf of Mexico, and one glider, outfitted with an Acoustic Doppler Current Profiler, was programmed to conduct surveys

at East Flower Garden Bank to collect data as a contribution to a study being conducted by the Navy Research Lab. The glider time was donated by BP. The gliders are on contract to BP as part of the Deepwater Horizon response activities. The ONMS program is interested in these gliders for ocean observing capabilities.

USS HATTERAS

The USS Hatteras was an iron-hulled steamship that was lost in a battle with the CSS Alabama on January 11, 1863. It was the only Union warship sunk in combat in the Gulf of Mexico during the Civil War.



Image: Starboard paddlewheel photographed by Jesse Cancelmo during the 2012 expedition.

FGBNMS PLAYS KEY ROLE IN USS HATTERAS

Flower Garden Banks National Marine Sanctuary provided onshore support, R/V MANTA ship support, NOAA scuba divers, and on-site coordination to assist in operations to collect 3-D imagery of the historic Civil War shipwreck of the USS HATTERAS. Divers were challenged by limited visibility (0-15ft), aggressive triggerfish, and no use of compasses due to the proximity to the iron wreck. The objective was to place a Teledyne BlueView instrument on the seafloor around the wreck to collect high-resolution imagery. Three Federal agencies, a state agency, non-profits, private sector businesses, citizen volunteers, a member of the clergy, and several students were involved with the project.

The wreck of the HATTERAS is largely intact, resting 57 feet underwater in sand and silt. The project will provide an unparalleled view of the wreck site, giving the public a unique 3-D look at the wreck, while also allowing scientists to document previously

unexplored elements of the site. NOAA plans to present results from the mapping mission in Galveston next January during local events marking the 150th anniversary of the sinking of the *Hatteras* and the Battle of Galveston.

The USS HATTERAS is located in federal waters, but the ship is administered by the Navy. The vessel is protected by the Sunken Military Craft Act as a war grave – two of the Hatteras crew went down with the ship, and their bodies were never recovered. They are presumed to lie inside the buried hull.

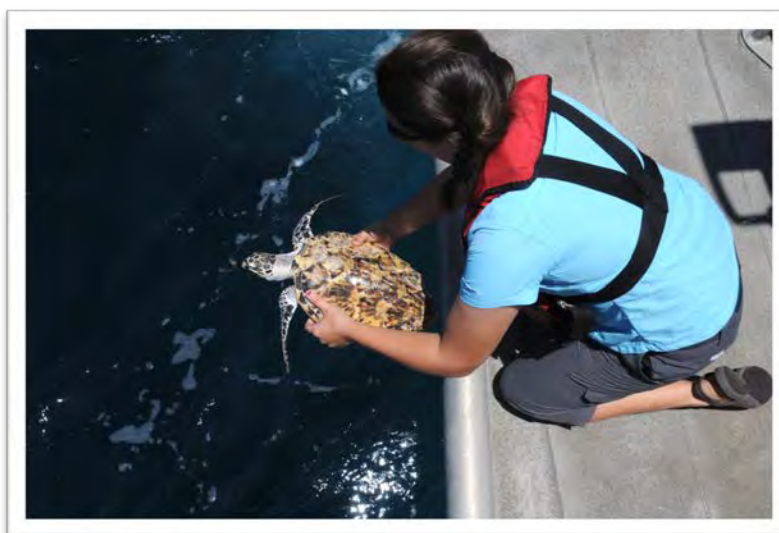
Funding and support for the underwater archeology project was provided by the Edward E. and Marie L. Matthews Foundation, the OceanGate Foundation, and Teledyne BlueView. Participants included NOAA's Maritime Heritage Program and Flower Garden Banks NMS, the Dept of Interior's Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement, TX Historical Commission, the US

Navy's History and Heritage Command, Tesla Offshore LLC, and private citizens including Houston underwater photographer and FGBNMS SAC member, Jesse Cancelmo.

FGBNMS PARTNERS WITH NOAA FISHERIES SEA TURTLE FACILITY TO RELEASE REHABILITATED SEA TURTLES

NOAA Fisheries Sea Turtle Facility, located in Galveston, Texas, responds to sea turtle strandings and accidental captures along the Texas coast from Matagorda Bay to Port Arthur. The animals are treated for illness and injury at the sea turtle facility until they are healthy enough for release back into the Gulf of Mexico. Common ailments the animals are treated for include entanglement (fishing gear, onion sac, etc.), hook ingestion, heavy parasite infestation, and boat strikes.

This year, FGBNMS provided support to release multiple recovered animals during scheduled cruises. Turtles were released at or near the banks of FGBNMS and the site of the shipwreck, USS HATTERAS. A total of 10 Kemp's Ridley sea turtles (*Lepidochelys kempii*) were released in weed lines, within 40 miles of shore, and 8 Hawksbill sea turtles (*Eretmochelys imbricata*) were released further offshore into sargassum mats. Release locations were selected based on each animal's predicted life history for its size and species.

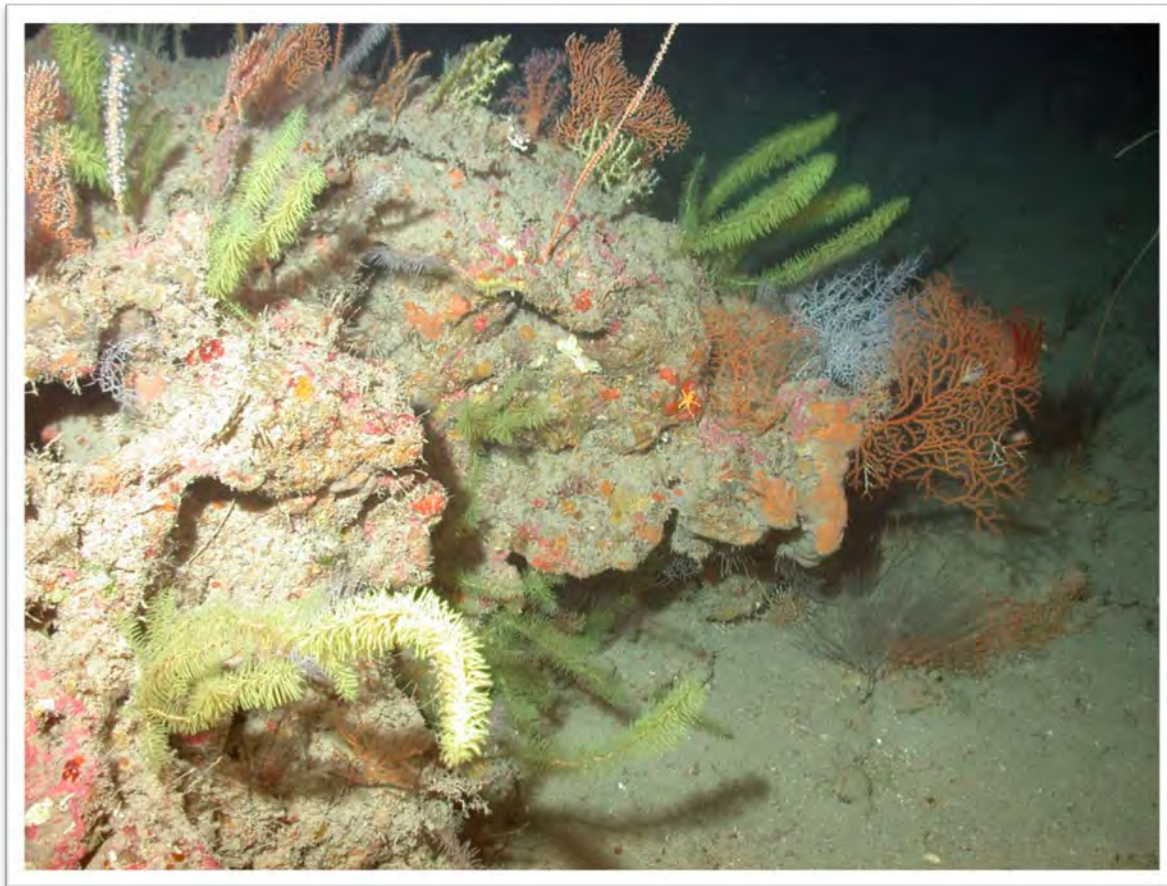


Marissa Nuttall releases a rehabilitated hawksbill sea turtle. Image credit: FGBNMS

BLACK CORAL DISTRIBUTION AND DIVERSITY

A study, funded by the Deep Sea Research and Technology Program, is underway to explore the diversity and distribution of black corals in the mesophotic zone of the northwestern Gulf of Mexico. The study includes the validation of in situ identification methods for black corals in this region, supporting a movement from destructive

sampling to in situ identification methods. Using historic exploratory remotely operated vehicle (ROV) data collected by FGBNMS from 2003 through 2010, predictive habitat suitability maps that incorporate environmental parameters, will be generated. These maps can be used to generate suitability maps for other locations within the region, and can be used to focus research effort.



A variety of antipatharians (black corals) and gorgonians in deepwater habitat commonly found at Flower Garden Banks NMS. Image credit: UNCW/FGBNMS

CRUISES and EXPEDITIONS



The R/V *MANTA* stands by as technical and science support divers hover at 20ft on a safety stop. Photo credit: Emma Hickerson/FGBNMS

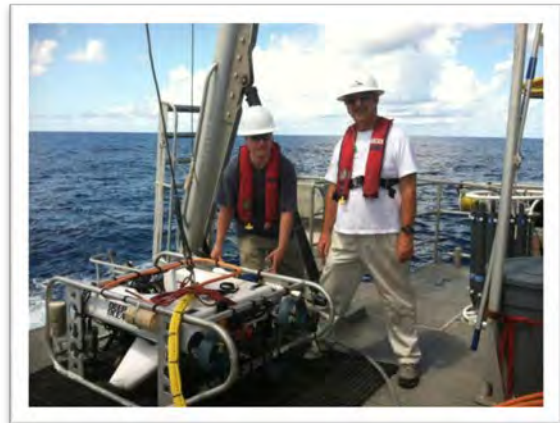
1. NW GULF OF MEXICO POTENTIALLY SENSITIVE BIOLOGICAL FEATURES ROV I

ROV – FGBNMS/LUMCON/UNCW (LEG 1)

October 24-28, 2011

5 DAS funded by BOEM

The Flower Garden Banks National Marine Sanctuary research team joined partners from the Bureau of Ocean Energy Management (BOEM), University of North Carolina (NURC/UNCW), and Louisiana University Marine Consortium (LUMCON) to explore habitat in the northwestern Gulf of Mexico. This study focused on characterizing the potentially sensitive biological features that



occur outside of the BOEM designated No Activity Zones (NAZ) around banks in the northwestern Gulf of Mexico. The team conducted over 16 hours of Remotely Operated Vehicle (ROV) surveys, collected 8 sediment samples using a benthic grab, obtained 8 water samples, and took 8 hydrocarbon samples. Despite being chased in early by approaching foul weather, the team was able to complete the majority of tasks planned for Horseshoe and 29 Fathom Banks during this cruise. Additional banks are scheduled to be visited and explored in the following years.



2. NASA'S NEAR EARTH EXTREME ENVIRONMENT MISSION OPERATIONS (NEEMO 15)

October 2011

Aquarius, Conch Reef, Key Largo, Florida Keys NMS

G.P. Schmahl and Emma Hickerson participated in the NASA-NEEMO 15 mission that took place at the Aquarius Reef Base (ARB) at Conch Reef in the Florida Keys National Marine Sanctuary.

3. WATER QUALITY CRUISE

March 25-26, 2012

2 DAS funded by NMSF/CIMPISHIP FUND

FGBNMS research team collected water samples at all three banks, and also downloaded water quality instruments. Surveys on HIA389A were conducted to document presence of hermatypic corals. Several sharks were observed including hammerheads, sandbar, and Caribbean reef sharks. Silky sharks were observed on HIA389A. Some lionfish were removed.

4. STETSON BANK LONG TERM MONITORING

May 29-June 1, 2012

4 DAS funded by NMSF/CIMPISHIP FUND

The Flower Garden Banks research team and divers from ONMS and TAMUG conducted the annual Stetson Bank Long-Term Monitoring effort. Repetitive photostations located around the reef were photographed, in addition to fish, urchins, and lobster surveys. This cruise marked the 20th consecutive year of monitoring activity at Stetson Bank.



5. WFGB REFURBISHMENT

June 26-30, 2012

5 DAS funded by BOEM

NOAA Flower Garden Banks scientific divers and R/V MANTA crew, along with BOEM and TAMUG divers, refurbished the WFGB long-term monitoring study site. New marker pins were installed and the study site was remapped. During the cruise, divers were visited by sea turtles and a whale shark!

6. MOORING BUOY INSTALLATION

July 19-20, 2012.

2 DAS funded by NMSF/ROWAN FUND

The Flower Garden Banks National Marine Sanctuary research team completed a cruise to deploy new moorings at East and West Flower Garden Banks, and Stetson Bank. Mooring buoys allow visitors to moor their boats safely within the sanctuary without using an anchor that is destructive to corals. A total of 5 new buoys were deployed, resulting in a total of 5 buoys at East Flower Garden Bank, 3 at West Flower Garden Bank, and 4 at Stetson Bank. In addition, FGBNMS partnered with National Marine Fisheries' Turtle Research Facility to release 7 rehabilitated hawksbill sea turtles. Many of these turtles were found along the Texas coast entangled in marine debris, and have been rehabilitated by NMFS staff to be released into the Gulf of Mexico. The FGBNMS research team was also joined by researchers from Texas A&M University to run test deployments of a glider. This instrument is able to navigate the ocean while conducting dives from the surface to the seafloor, collecting water quality data along the way. Instruments of this kind can be used to monitor many parameters, including dissolved oxygen and even detection of oil. Texas A&M recently obtained an oceanographic glider and conducted test deployments on this cruise to get the glider prepared for long-term deployments.





7. EAST AND WEST FLOWER GARDEN BANKS LONG-TERM MONITORING

July 23-27, 2012

5 DAS jointly funded by NMSF/CIMPSHIP FUND and BOEM

The NOAA Flower Garden Banks National Marine Sanctuary research team and R/V MANTA crew, along with Bureau of Ocean Energy Management (BOEM), Texas A&M University Galveston, and Gray's Reef National Marine Sanctuary Team Ocean

divers, conducted long-term monitoring at East and West Flower Garden Banks July 23-27, 2012. Between the East and West Flower Garden Bank study sites, a total of 32 random transects, 8 coral cores, 48 fish surveys, 86 repetitive photos, 76 lateral photos, 4 sea urchin and lobster surveys, 2 perimeter videos, and 6 YSI drops were completed. Maintenance was performed on 24 photo stations and invasive species, including lionfish and *Tubastrea sp.*, were removed. During the cruise, divers were visited by a large loggerhead sea turtle and manta rays.

8. CRCP/NCCOS/UNCW FGBNMS ROV

July 30-August 2, 2012.

5 DAS funded by FGBNMS

The Flower Garden Banks National Marine Sanctuary research team returned from a cruise to explore and document the mesophotic habitats of East and West Flower Garden Banks in partnership with NOAA's Center for Coastal Monitoring and Assessment Biogeography Branch. In addition, the team was joined by student volunteers from Texas A&M University at Galveston.



A remotely operated vehicle (ROV) from University of North Carolina at Wilmington (UNCW) was used to explore these habitats, providing a live video feed of the sea floor to researchers aboard the R/V MANTA. The team conducted a total of 76 random transects in soft bottom habitat, deep coral habitat, coralline algae reefs, and algal nodule zones. These transects will be analyzed for coral and fish composition, providing baseline information about these mesophotic habitats. In addition, acoustic surveys were conducted at night to quantify fish biomass in the surveyed areas. During the ROV

dives, researchers observed several lionfish, an invasive species in the Gulf of Mexico, Caribbean, and Atlantic. The team was also treated to a visit from pods of Pantropical Spotted and Bottlenose Dolphins.



9. CORAL SPAWNING I

August 7-11, 2012

4 DAS funded by FGBNMS

FGBNMS research team along with researchers from University of Texas (Sarah Davies) and University of Oregon (Dr. Eli Meyer) documented and studied the mass coral spawning event last week. The corals spawned magnificently, however not as precisely as has sometimes occurred. This

is probably due to the full moon falling very early in the month and very close to midnight. Spawning barrel sponges and Christmas tree worms were also observed. The team also had the privilege of releasing three sea turtles - two Kemp's Ridleys and one hawksbill. These animals were rehabilitated by NOAA's Galveston Sea Turtle Facility. Other activities included rehabilitation and installation of long-term monitoring repetitive photo stations, and removal of invasive lionfish and orange cup coral. Dr. Sylvia Earle was also at the sanctuary with the Harte Research Institute to witness the coral spawning event.



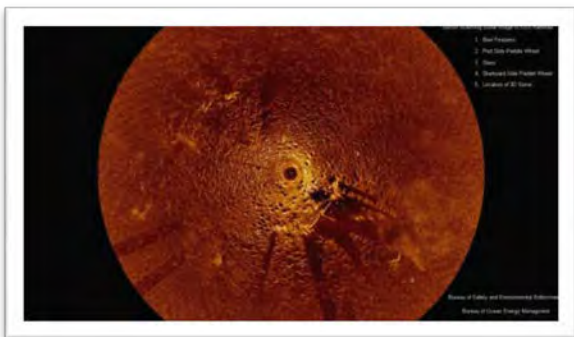
10. CRCP SHALLOW/CORAL SPAWNING II

September 3-7, 2012

5 DAS funded by NMSF/CIMPSHIP FUND

The Flower Garden Banks National Marine Sanctuary research team, NCCOS, CIOERT and Texas A&M University - Galveston divers conducted scuba operations from the R/V MANTA during the week of September 3, 2012. They conducted randomly placed benthic and fish surveys around the coral caps of East and West Flower Garden Banks. This was the third and last cruise for

this project, collecting baseline information for a potential research area. This project was co-funded by NOAA's Coral Reef Conservation Program. The last night of the cruise coincided with the predicted September mass coral spawning event.



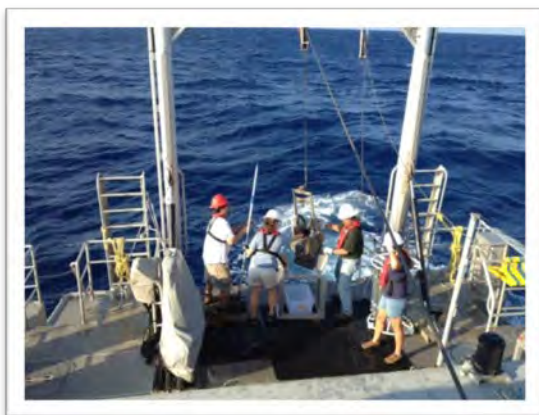
11. USS HATTERAS MAPPING

September 10-14, 2012

2 DAS funded by FGBNMS

Flower Garden Banks National Marine Sanctuary provided onshore support, R/V MANTA ship support, NOAA scuba divers, and on-site coordination to assist in operations to collect 3-D imagery of the historic Civil War shipwreck of the USS

HATTERAS. Divers were challenged by limited visibility (0-15ft), aggressive triggerfish, and no use of compasses due to the proximity to the iron wreck. The objective was to place a Teledyne BlueView instrument on the seafloor around the wreck to collect high-resolution imagery. Three Federal agencies, a state agency, non-profits, private sector businesses, citizen volunteers, and several students were involved with the project.



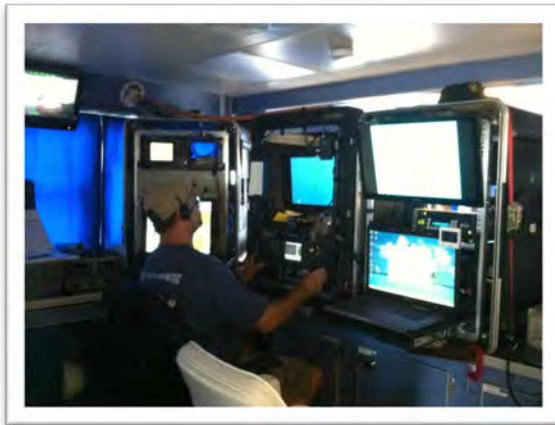
12. POTENTIAL SENSITIVE BIOLOGICAL FEATURES II ROV

September 19-23, 2012

5 DAS funded by BOEM

The second of seven research cruises to explore and characterize "potentially sensitive biological features" (PSBF) was conducted aboard the R/V MANTA. The project, funded through an interagency agreement with the Bureau of Ocean Energy Management (BOEM), will

document biological communities found on low-profile (less than 3 meters) hard-bottom features associated with selected reefs and banks in the northwestern Gulf of Mexico. The FGBNMS research team, in association with Dr. Paul Sammarco (Louisiana State University), will utilize a remotely operated vehicle (ROV) provided by the University of North Carolina Wilmington to quantify benthic habitat in depths ranging from 50 to 150 meters in the vicinity of Rankin and 28 Fathom Banks. The areas of interest lie outside "no-activity zones" designated by BOEM, but may be potentially sensitive to activities related to oil and gas development. Characterization of these features will aid in the management of offshore energy resources. Water and benthic samples were collected for hydrocarbon analysis, and antipatharians were collected for Marissa Nuttall's graduate project.



13. POTENTIAL SENSITIVE BIOLOGICAL FEATURES III ROV

September 26-30, 2012

5 DAS funded by BOEM

The third of seven research cruises to explore and characterize "potentially sensitive biological features" (PSBF) was conducted aboard the R/V MANTA. The project, funded through an interagency agreement with the Bureau of Ocean Energy Management (BOEM), will document biological communities found

on low-profile (less than 3 meters) hard-bottom features associated with selected reefs and banks in the northwestern Gulf of Mexico. The FGBNMS research team, in association with Dr. Paul Sammarco (Louisiana State University), utilized a remotely operated vehicle (ROV) provided by the University of North Carolina Wilmington to quantify benthic habitat in depths ranging from 50 to 150 meters in the vicinity of Bright and Geyer Banks. Unfortunately quite a few lionfish were encountered. A mud volcano, and small brine seep were also encountered, as well as an interesting outcropping of glass sponges. The areas of interest lie outside "no-activity zones" designated by BOEM, but may be potentially sensitive to activities related to oil and gas development. Characterization of these features will aid in the management of offshore energy resources. Water and benthic samples were collected for hydrocarbon analysis, and antipatharians were collected for Marissa Nuttall's graduate project.

ADDITIONAL R/V MANTA CRUISES

The R/V MANTA was chartered by several different user groups during the 2012 research season. TAMUG has a reduced day rate of \$3650/day plus fuel, as part of an MOU between TAMUG and FGBNMS. Other charters are charged approximately \$5000/day plus fuel.

December 4-7, 2011 NRL Navy Research Lab. Movement of water around topographic features – East Flower Garden Bank was used as a model for this project.

May 19-26, 2012. University of Texas Marine Science Institute – Geology Techniques. University of Texas Marine Science Institute (UTMSI) provided a trip to both graduate and undergraduate students for hands-on field research as they survey geological points of interest surrounding Port Aransas.

June 8, 2012. National Association of Black Scuba Divers. Members of the student summit being held in Houston/Galveston were treated to a few hours of R/V MANTA operations.

June 9-16, 2012. TAMU. Hypoxia. Texas A&M researcher Steve DiMarco and his students conducted surveys to map the spatial extent of the hypoxic zone of the northern Gulf of Mexico.

July 18, 2012. Hatteras mapping support. FGBNMS R/V MANTA provided support to a NOAA Hydrographic team conducting a mapping cruise to map the USS Hatteras, a Union warship sunk in 1863 off the coast of Galveston. This effort was in partnership with ONMS Maritime Heritage (Jim Delgado), and State of Texas, Texas Historical Commission (Amy Borgens). This was in preparation for an investigation of the wreck scheduled to take place in September 2012

August 14-21, 2012. Hypoxia. Texas A&M researcher Steve DiMarco and his students conducted surveys to map the spatial extent of the hypoxic zone of the northern Gulf of Mexico.



R/V MANTA. Photo credit: Ryan Eckert/FGBNMS

ADDITIONAL SCIENCE ACTIVITIES

1. Deepwater Horizon Oil Spill Response
2. Permitting
3. Scheduling of R/V MANTA
4. Coordination of SCUBA operations
5. Coordination of shipboard research equipment and activities
6. Submission of NOAA fleet shiptime requests and needs
7. Regional GIS support
8. Science presence at SAC meetings
9. Participation in Deep Sea Coral calls
10. Participation in development of NOAA Gulf of Mexico Digital Atlas
11. Support of Artificial Reef Working Group activities

SCIENTIFIC INTERPRETATION/OUTREACH ACTIVITIES



2012 Deepwater habitat mural – Ocean Discovery Day. Photo credit: FGBNMS

1. Deepwater poster series, deepwater collage interpretation piece
2. Shallow water mural activity development, including instructions, species descriptions, and template

3. Significant contribution to National Association of Black Scuba Divers Summit, Houston/Galveston, TX
4. Contribution to digital slide catalog/library
5. Contribution to video library, including annotations
6. Development of PowerPoint presentations for various events
7. Provided significant content for sanctuary website
8. Web-based research reports and blogs
9. BLUE Ocean Film Festival, OceansLIVE. Monterey, CA, September 23-29, 2012
10. Response to "Into the Sea" mail



NABS Summit, 2012. Photo credit: FGBNMS



CONFERENCES, MEETINGS, PRESENTATIONS, TRAINING, ETC.

1. November 2, 2011. National Geographic Marine Recreation Community Workshop. Galveston, TX. Nuttall, Johnston, Embesi, Eckert. Linus, the FGBNMS Lionfish, made his debut as a science interpretation centerpiece.
2. December 1, 2011 Guardian Full Face Mask Introduction. Hickerson, Embesi, Nuttall, Johnston, Weekley
3. December 5-9, 2011 Gulf of Mexico Summit. Schmahl, Hickerson, Johnston
4. January, 2012. Marine Debris Summit, Galveston, TX. Research staff attended.
5. January 28, 2012. Houston Dive Club meeting. FGBNMS presentation. Johnston.
6. February 2, 2012 Lionfish presentation - Gulf of Mexico Fisheries Management Council. Mobile, AL. Schmahl, Johnston
7. February, 2012 Underwater Research Methods. TAMUG. Nuttall
8. February 8, 2012 Research 2011 update to SAC
9. February 22, 2012 Seaside Chat, New Krewe in Town. Johnston

10. March 5-9, 2012 Unit Diving Supervisors Meeting. Seattle, WA. Hickerson
11. March 7, 2012 Seaside Chat, Manta Rays, Whale Sharks, and Sea turtles, Oh My. Nuttall
12. March 13, 2012 FGBNMS Presentation. Humpback Whale NMS. Maui, HI. Hickerson
13. March 14, 2012 Whale Shark Research. Deep Blue Resort, Utila. Nuttall
14. March 21, 2012 First Aid/CPR/O2/AED training – TAMUG. FGBNMS NOAA Dive Unit
15. March 24, 2012 Ocean Discovery Day. NOAA campus, Galveston, TX. Worked with Jacqui Stanley to develop and carry out mural event, coordinated purchase of reusable bags. Developed deepwater poster series including key and information piece.
16. April 10, 2012 JR Harris Elementary School with Jacqui Stanley. Mural, corals, lionfish.
17. April 19, 2012 CHUM Divers. Houston, TX. Lionfish. Johnston
18. May 20-24, 2012 GRNMS Research Cruise. Johnston.
19. May 22, 2012 Patton Elementary, Austin, TX
20. July 9-13, 2012 International Coral Reef Symposium. Cairns, Australia. 1) Science-based design of coral protected areas in the Gulf of Mexico (Schmahl) 2) Flower Garden Banks – A Refuge in the Gulf of Mexico (Hickerson)
21. July 9-13, 2012. ICRS, Cairns, Australia – Billy Causey presented papers for Hickerson and Schmahl
22. August 24, 2012 Texas Coral Reefs, Rice University, Houston, TX. “The Flower Garden Banks, remarkable coral reefs of the northwestern Gulf of Mexico”. Presentation: G.P. Schmahl. FGBNMS research team attended.



Loggerhead sea turtles (*Caretta caretta*) are the most commonly seen species of sea turtle in the sanctuary. Image credit: G.P.Schmahl/FGBNMS

ABSTRACTS AND PUBLICATIONS

- DeBose J, Nuttall M, Hickerson E and Schmahl G (Accepted) A high latitude coral community at the tipping point: Stetson Bank, northwestern Gulf of Mexico.
- Johnston M, Nuttall M, Eckert R, Embesi J, Schmahl G, Hickerson E (in Review) Long-term monitoring at the East and West Flower Garden Banks, 2009-2010.
- Schmahl G, Hickerson E, and Nuttall M (Accepted) Science-based design of coral protected areas in the Gulf of Mexico. Proc 11th Intl Coral Reef Symposium
- Hickerson E, Schmahl G, Johnston M, Nuttall M, Embesi J, Eckert R, (Accepted) Flower Garden Banks – A Refuge in the Gulf of Mexico. Proc 11th Intl Coral Reef Symposium

FUNDING

- \$39K – NOAA Deep Sea Coral Program - Antipatharian Distribution and Suitability Mapping in the Mesophotic Zone of the Northwestern Gulf of Mexico
- \$79,100 – BOEM – Refurbishment of the East and West FGB LTM sites
- \$202,848 BOEM – PSBF (includes ROV time)
- Partnership in \$4M ciguatera project with FDA and UTMSI



Madracis field east of the study site at East Flower Garden Bank. Image credit: Emma Hickerson/FGBNMS

NEW SANCTUARY BIOLOGICAL RECORDS



Barred hamlet *Hypoplectrus puella*
Credit: Paul Humann

Atlantic moonfish *Selene setapinnis*
Photo credit: SEFSC Pascagoula
Laboratory; Collection of Brandi Noble,
NOAA/NMFS/SEFSC



Candy Basslet *Liopropoma carmabri*
(No image)



Black point sculling crab *Cronius ruber*
Photo credit: G.P. Schmahl/FGBNMS

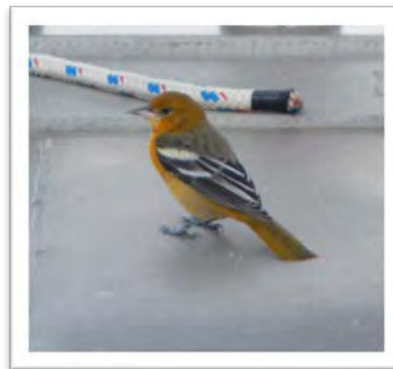


Pan tropical spotted dolphin *Stenella attenuata*

Image credit: NOAA Fisheries

Baltimore Oriole (female) *Icterus Galbula*

Image credit: FGBNMS



Brown Noddy (2003 photograph) *Anous stolidus*

Image credit: FGBNMS

RESEARCH AND SCIENCE PARTNERSHIPS

- Bureau Ocean Energy Management (BOEM)
- Cooperative Institute of Ocean Exploration, Research and Technology (CIOERT)
- Coral Reef Conservation Program (CRCP)
- Food and Drug Administration (FDA)
- Harte Research Institute for Gulf of Mexico Studies (HRI)
- National Centers for Coastal Ocean Science (NCCOS)
- National Coastal Data Development Center (NCDDC)

- Smithsonian Institute
- Texas A&M University (TAMU)
- Texas A&M University – Galveston (TAMUG)
- Texas A&M University - Corpus Christi (TAMU-CC)
- University of North Carolina – Wilmington (UNCW)
- University of Texas



Manta ray (*Manta birostris*). To date 75 individual manta rays have been identified using their spot patterns. A catalog of the individuals is available on the FGBNMS website: <http://flowergarden.noaa.gov/science/mantacatalog.html#catalog>. Photo credit: G.P. Schmahl/FGBNMS

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AMERICA'S UNDERWATER TREASURES