



# Flower Garden Banks National Marine Sanctuary

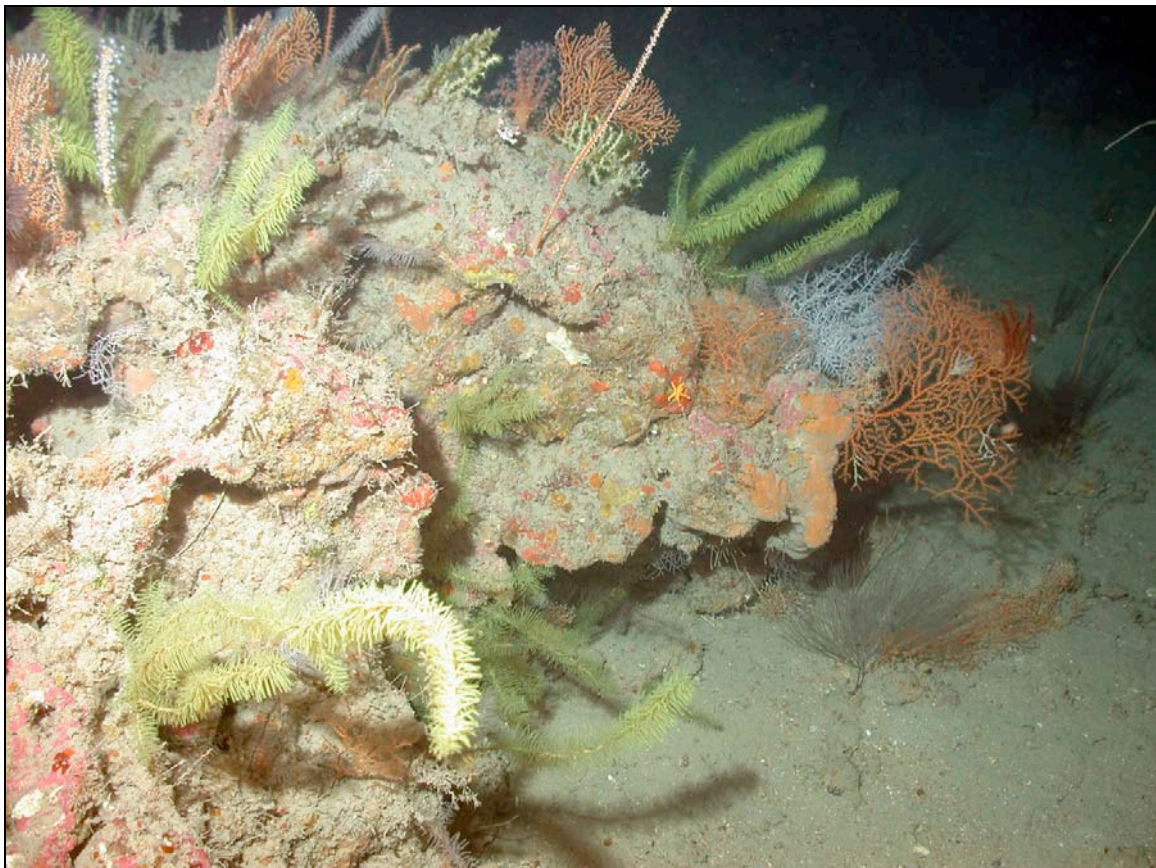
## Research Summary

2005



Prepared by  
Emma L. Hickerson

Assisted by  
Doug Weaver  
G.P. Schmahl



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## A. OVERVIEW

The purpose of this document is to report the activities of the Research team during 2005. The team included Emma L. Hickerson (Research Coordinator), G.P. Schmahl (Sanctuary Manager), and Doug Weaver (GIS specialist).

## B. SUMMARY

The FGBNMS research team was involved in 16 research cruises in 2005, at a value of approximately \$216K for cruises in the NW GOM, \$119K of which came directly out of FGBNMS FY05 budget. The FGBNMS utilized approximately \$97K worth of research time and equipment through partnerships with industry, IMAX, Ocean Futures, and Gulf Diving, Inc., for NWGOM projects. Two ROV cruises continued the characterization of the reefs and banks in the Northwestern Gulf of Mexico. A multibeam bathymetry survey was conducted at Stetson Bank. A pool of 47 sanctuary personnel, scientists, and volunteer divers conducted approximately 692 SCUBA dives during the 2005 field season. For the first time, coral disease and hurricane response cruises were carried out. A coral bleaching response cruise was also conducted. Other activities included biological surveys and collection, equipment maintenance, and image collection. Thirteen Sanctuary permits were processed, and an additional 9 were ongoing. A special issue of the *Gulf of Mexico Science Journal* was published, highlighting research activities in and around the FGBNMS. A Habitat Characterization Workshop was conducted in Galveston, to lay the groundwork to restructure the scheme used to characterize the Sanctuary resources.

## C. CRUISES (\$ amt. represents approximate shiptime value)

**1. FGBNMS Winter Research Cruise – M/V Spree (\$6,200).** February 23 – 24, 2005. 11 participants (9 divers, 2 non-divers) conducted 36 SCUBA dives at the West and East Flower Garden Banks and Stetson Bank. Water temperature EFGB and WFGB: 72F, Stetson Bank: 66F. 5'-7' seas, and 30-50 knot winds cut the cruise down to 1.5 days. YSI datasondes at all three sites were successfully changed out, and the acoustic receiver at the East Flower Garden Bank was recovered. The Stetson Bank receiver has been lost. It appears that the instrument rack at Stetson has been dragged from the original position. Dr. Mary Wicksten (TAMU) collected a new record of crustacean for the West FGB – a lobster-like creature that is related to hermit crabs - *Munida pusilla*. Dr. Fred Gurgel (Univ. of LA, Lafayette) collected algae for cataloging, and Dr. Craig Burnside (Bainbridge College, GA) conducted queen conch surveys. Despite only one dive opportunity at Stetson Bank, he was able to locate one tagged conch, which was tagged in June, 2004. Water samples were collected for Dr. Niall Slowey and Amy Bratcher's (TAMU) paleoclimatological studies. Elasmobranch and other biological observations of note: WFGB: 2 tiger sharks, 1 spotted eagle ray, 1 southern stingray, 1 wahoo; EFGB: 7 spotted eagle rays. Stetson Bank: many spinner sharks jumping out of water, 1 scalloped hammerhead, 1 spotted eagle ray, ~100 king mackerel, 1 loggerhead sea turtle, 2 brown pelicans. It is noted that a large area on the EFGB has been affected by white plague. This is alarming, as this is the first observation of a large area, including multiple heads and species (*Diploria strigosa*, *Porites astreoides*, *Montastraea franksi*), being affected by coral disease at the FGBNMS. Previously, reports of single colonies being

affected locally have been reported. We hope to schedule a cruise dedicated to the quantitative documentation of this disease outbreak, and conduct surveys throughout the reef caps to determine the extent of the occurrence of the disease. Schmahl, Hickerson, Weaver.

**2. FGBNMS Disease Response – M/V Spree (\$6,200).** April 13-14, 2005. A two day cruise was conducted to survey the East (EFGB) and West Flower Garden Banks (WFGB) to determine the status of a white plague coral disease outbreak, as reported by G.P. Schmahl and Emma Hickerson (EFGB – Buoy #4) from February 23, 2005. A total of 26 dives were conducted by five divers at five different buoy locations – three at the East Flower Garden Bank, and two at the West Flower Garden Bank. A total of 41 colonies were observed with white plague symptoms – most appeared to have slowed down their progress as compared with the active lesions observed in February, 2005. ID tags and margin nails were placed in seven colonies exhibiting active white plague symptoms. During the initial observations, the following species were observed to be affected by the disease outbreak: *Montastraea franksi*, *M. faveolata*, *Diploira strigosa*, and *Porites astreoides*. During this latest effort, three additional species were observed to be affected: *M. annularis*, *Stephanocoenia intersepta*, and *Colpophyllia natans*. Seven coral species have been documented as affected by white plague at the FGBNMS to date. Conditions: 40’-80’ visibility, water temperature 68-70F, no – little current, 2-4’ seas. Schmahl, Hickerson, Gittings.

**3. Miami Terrace, Florida – Johnson Sea Link Cruise.** Sponsored by Harbor Branch Oceanographic Institute Biomedical Research Team. Joined cruise from April 13-15 and made two submersible dives between 850 and 1200 feet on the Miami Terrace to survey deep slope invertebrate and fishes of hard bottom communities. Served as deep reef fish expert on the cruise. Weaver.

**4. FGBNMS - DFH10 – ROV Cruise (\$20,000) – M/V Fling – May 9-13, 2005.** Conducted 14 ROV surveys. 4 surveys at West FGB, 6 surveys at East FGB, 2 in between the banks on an escarpment, and 2 at Stetson Bank. Obtained over 750 high resolution digital images, and 19 hours of digital video. Documented previously unreported species of scleractinian coral, *Dichocoenia stokesii* on the north reef at the East FGB. Approximately 60,000 square meters of additional coral reef area of high coral cover was added to the Sanctuary numbers as a result of surveying the crest of the depression above the brine seep on the East FGB. Interesting *Agaricia* sp. outcroppings were also documented on the north reef of the East FGB. The first active mud volcano known in the Sanctuary was documented at the West FGB. Previously undocumented deep reefs were surveyed between the East and West FGB. The datasondes were changed out at all 3 banks. Schmahl, Hickerson, Weaver

**5. FGBNMS – Coral Coring/Coral Disease Cruise (\$12,400) – M/V Fling – May 23-27, 2005.** Supported TAMU researchers, Dr. Niall Slowey and Amy Bratcher, to conduct coral coring ops for paleoclimatological investigations. Participants included Steve Gittings (NMSP HQ), Billy Causey (FKNMS), John Halas (FKNMS), Lauri MacLaughlin (FKNMS), Chris Reich (USGS), Don Hickey (USGS), and Amy Bratcher

(TAMU). Five *Montastraea faveolata* cores and two *Siderastrea siderea* cores were obtained, each at least 2m in length. This represents around 200 years of growth in *M. faveolata* and 400 years in *S. siderea*. The cruise opportunity was taken to bring out a coral disease team to assess the coral disease and obtain samples for diagnoses. Participants included Andy Bruckner (NOAA Fisheries, DC), Kim Ritchie (Mote Marine Lab), Bob Jonas (George Mason University), Geoff Cook (George Mason University), and Beth Zimmer (Florida International University). Hickerson, Kurelja.

**6. Stetson Bank – Multibeam survey (\$6200 + \$12,000 – rental of Reson 812 and technician) – M/V Spree – May 31 – June 2, 2005.** Conducted multibeam echosounder survey of Stetson Bank, using the RESON 8125 leased package in collaboration with Mr. Burr Bridge of RESON, inc. Conducted patch tests at GA288 and GA296 artificial reef zones, fully mapped Stetson Bank and surrounding deep patch reefs. Also mapped a portion of the Freeport Liberty Ship Artificial Reef Assemblage south of Freeport, TX in collaboration with Gulf Diving, LLC, Louisiana State University, and Texas Parks and Wildlife. The surveys resulted in sub 1m resolution for Stetson Bank and the deep ring, and revealed previously unknown structures in the region, including numerous anchor scars radiating from the main bank. Weaver

**7. FGBNMS – Long Term Monitoring – M/V Fling (\$20,000)– June 6 – 10, 2005.** Annual Long Term Monitoring contracted to PBS&J, GeoMarine, Inc., Dauphin Island Sea Lab, and Boston University. Successfully completed both East and West Flower Garden Banks. A colony of *Acropora palmata* was discovered by Beth Zimmer (PBS&J) at the SE corner of the study site on the East Flower Garden Bank – the first on this bank, and the second for the Sanctuary. All three datasondes were changed out. Hickerson.

**8. Stetson Bank – Long Term Monitoring (\$9,300)– M/V Fling – June 13 – 15, 2005.** A team of 9 sanctuary staff and volunteers successfully conducted the annual collection of long term monitoring images (49 stations) at Stetson Bank. Four Reef Environmental Education Foundation (REEF) volunteers conducted REEF fish surveys. Dr. Mary Wicksten (TAMU) conducted crustacean surveys and collections. A new record for Stetson Bank, *Processa fimbriata*, the big-eye shrimp was collected, and *Portunus sayi* was reported. Dr. Craig Burnside (Bainbridge College) conducted queen conch surveys and tagged conch. Four previously tagged conch were sighted – tags were placed on the animals in June 2004. Tags were placed on eleven additional conch. Sanctuary photographers, Frank and Joyce Burek documented the cruise. Sightings of note include a greater hammerhead shark (*Sphyrna mokarran*), two sandbar sharks (*Carcharinus plumbeus*), a loggerhead sea turtle (*Caretta caretta*), and our resident hawksbill sea turtle (*Eretmochelys imbricata*), who has now been living at Stetson Bank for at least six years. Hickerson, DeBose.

**9. FGBNMS Mooring Drilling (\$10,500) – M/V Spree – June 20 – 22, 2005.**

**10. Agency/Industry Information Transfer Cruise (\$10,500) M/V Fling – August 8-10, 2005.** Hickerson, Schmahl, DuPuy

**11. Coral Spawning M/V Spree (\$12,400), Holo Kai (\$50,000), and R/V Pt. Glass (\$10,000)**– August 23 – 27, 2005. This year there were two major film projects being conducted during this event. First, the production crew from Ocean Futures were at the Flower Garden Banks aboard the vessel HOLO KAI (owned by the Oceanic Conservation Organization - see: <http://www.4oco.org/> ) to film a segment for the National Marine Sanctuary PBS documentary. For the coral spawning segment, Dr. Mark Vermeij (University of Amsterdam) provided expertise related to coral reproductive ecology and investigated the use of fluorescence technology in coral recruitment studies. The segment also included filming of the below water portions of the oil and gas platform located inside the boundary of the sanctuary, and included an "on-platform" interview with Tracy Krohn, the Chief Executive Officer of W&T Offshore, the company that operates the platform. Second, Howard and Michelle Hall were at the Flower Garden Banks aboard the charter vessel M/V SPREE to film coral spawning for an upcoming IMAX 3D film (Denizens of the Deep). The IMAX camera and underwater housing weighs close to 1500 lbs., and had to be lifted into the water with a crane. In addition, the sanctuary vessel POINT GLASS was on hand to help support the Ocean Futures diving operations, and to conduct additional research. The major coral spawning event was documented by both crews before Hurricane Katrina cut short the cruise by 2 days. Schmahl, Hickerson, Weaver, Kurelja.

**12. DFH11 (\$17,250 + \$5000 for ROV) – M/V Spree.** September 12-16, 2005. The Sanctuary research team surveyed the area using a remotely operated vehicle (ROV) contracted through the National Undersea Research Center at the University of Wilmington, North Carolina (NURC-UNCW). The goal of the cruise was to continue groundtruthing high resolution multibeam bathymetry to develop a characterization map of the Sanctuary, and to collect biological and geological samples. A total of 24 ROV surveys were conducted for a time period of over 22 hours, and 29 samples were obtained. The majority of the samples were black corals (antipatharians). A leader in black coral taxonomy, Dr. Dennis Opresko, from the Smithsonian, was on hand to direct the sampling. Coral genetics students, Mercer Brugler (University of Louisiana at Lafayette) and Carlos Umana (Universidad de los Andes) both participated in the cruise, and will conduct genetic analysis of the samples. At least 2 new records of fish species were added during the surveys: striped grunt and gag, with a number of separate populations of gag observed. Hickerson, Weaver.

**13. Fall Research Cruise/Post Hurricane Response – M/V Spree (\$13,600).** October 10-13, 2005. The Flower Garden Banks National Marine Sanctuary research team conducted a post-hurricane cruise to the Sanctuary last week. This was the first opportunity for the team to survey the reef since both Hurricanes Katrina and Rita. Limited surveys revealed significant mechanical impacts at all three sites within the Sanctuary, including large boulders of reef rock and coral (up to 4m x2m in size) removed and tossed around the reef, and at up to 1m of sand removed or redistributed from the sand flats. Large barrel sponges (*Xestospongia muta*) have suffered considerable damage, including partial and full removal, and filling up with sand. Coral tissue, sediment, and water samples were collected for contaminant analysis through a collaboration between the FGBNMS, NCCOS, and the University of Hawaii. These

collections were made in response to a large body of polluted water that made its way out from the TX/LA coast to the FGBNMS after Hurricane Rita. To add insult to injury, the coral is undergoing a bleaching event - initial observations indicate between 35% and 48% of the colonies are bleached to some extent - partially or fully. The bleaching appears to be affecting 100% of the fire coral (*Millepora alcicornis*) and great star coral (*Montastraea cavernosa*), and affecting at least eleven other species to varying degrees. Hickerson, Weaver.

**14. Bleaching response cruise – R/V PT. GLASS (\$5000) – October 18-20.** A two day coral bleaching survey with colleagues from Texas A&M University aboard the NOAA Vessel POINT GLASS from October 22-24th. Seven phototranssect surveys were conducted at five buoys during SCUBA dives at East and West Flower Garden Bank to document bleaching occurrence and species composition. Preliminary results indicate 36-50% of colonies exhibited some level of bleaching, with *Millepora alcicornis*, *Montastraea cavernosa*, and *Stephanocoenia intersepta* near 100% bleached. *Montastraea franksi*, *Montastraea faveolata* and *Diploria strigosa* exhibited partial bleaching within individual colonies, with approximately 50% of colonies affected. Damage caused by Hurricane Rita was noted at all five buoys visited. Weaver, Kurelja

**15. NOAA's Undersea Research Lab – AQUARIUS. Saturation Mission.** November 1 – 20, 2005. Key Largo, FL. Prepared, trained, and conducted a Saturation Mission in the Aquarius Undersea Research Lab, in the FKNMS. Supported acoustic tagging project led by James Lindholm (Phleger Institute for Environmental Research), and funded by PIER, NURC, and NMSP. Fish tagging and behavior surveys targeted black grouper, blue parrotfish, and hogfish. 24 receivers were placed on the reef tract, 38 acoustic tags were surgically implanted into fish (18 black grouper, 12 blue parrotfish, 8 hogfish), 44 twenty-minute behavior surveys were conducted, 50 twenty-minute GPS transects were conducted. Hickerson

**16. Post-hurricane assessment cruise – M/V SPREE (\$6200) – November 11-13, 2005.** Contracted PBS&J to conduct assessment of study areas at EFGB and WFGB. John Embesi from TPW&D assisted G.P. Schmahl in assessments. Extensive damage to the *Madracis mirabilis* field at EFGB#2 was documented. Schmahl, Embesi.

#### **D. CANCELLED AND/OR POSTPONED CRUISES:**

1. Coral Disease Response Cruise – April 4-8, 2005. Postponed due to weather.
2. Coral Disease Response Cruise – April 18 – 22, 2005. Cancelled due to lack of disease activity.
3. DFH10 – ROV Cruise – May 1 – 6, 2006. Postponed due to weather.
4. DFH 11 – ROV Cruise – September 3 – 12, 2004. Nancy Foster shiptime cancelled due to Hurricane Katrina.
5. Fall Research Cruise - September 19 – 23, 2005. Postponed due to Hurricane Rita.

## **E. CONFERENCES, MEETINGS, PRESENTATIONS, TRAINING, ETC.**

1. Gulf of Mexico Fisheries Management Council Meeting. Baton Rouge, LA. January 12, 2005. Provided input to Habitat Protection Committee and Council for HAPC (Habitat Areas of Particular Concern) and Coral EFH designations. Hickerson.
2. Minerals Management Service Information Transfer Meeting – New Orleans, LA. January 13, 2005. Seafloor Mapping of the Flower Garden Banks Region. Weaver (presenter), Hickerson
3. Annual Science Coordinator’s Meeting – Homestead and Everglades, Florida. January 31 – February 4, 2005. Hickerson
4. Coastal GeoTools Conference – Myrtle Beach, South Carolina. March 7-10, 2005. Seafloor Mapping of the Flower Garden Banks Region, NW Gulf of Mexico” presentation. Weaver.
5. Communications Training – College Station, Texas. March 22 – 24, 2005. Hickerson, Weaver, Schmahl.
6. GIS Training – Silver Spring, Maryland. April 18-22, 2005. Intro to ArcGIS9 and Coastal Applications in ArcGIS. Weaver.
7. Channel Islands Deepwater Monitoring Workshop – Santa Barbara, California. April 26-28, 2005. Weaver.
8. Offshore Technology Conference – Houston, Texas. May 3, 2005. Weaver.
9. NOAA Metadata Standards Workshop – Silver Spring, Maryland. May 20, 2005. Weaver.
10. Gulf States Habitat Mapping Working Group – New Orleans, LA. May 26-27, 2005. Weaver.
11. Coastal Zone Management Conference – New Orleans, LA. July 18-21, 2005. Presentation: Planning a network of protected areas in the northern Gulf of Mexico. Schmahl.
12. ESRI Users’ International Conference – San Diego, CA. July 25-29, 2005. Weaver.
13. Society for Conservation GIS – Monterey Bay, CA. July 30 – August 2, 2005. Weaver.

14. Habitat Characterization Workshop – Galveston, TX. August 16-17, 2005. The Flower Garden Banks NMS conducted a "Benthic Habitat Classification Workshop" at the NOAA Fisheries Laboratory (soon to be the FGBNMS offices) in Galveston, TX. The purpose of this workshop was to gain input from a variety of experts for a habitat classification scheme to be used in the development of a benthic characterization map of the sanctuary. Participants include Andy Shepherd (NURC/UNCW), Dr. Kathy Scanlon (USGS Woods Hole), Troy Holcombe (Texas A&M), Dr. Will Schroeder (Dauphin Island Sea Lab), and Dr. Tom Bright. In addition, participants from the National Marine Sanctuary Program (HQ and field), other parts of NOAA, Texas Parks and Wildlife, and the Minerals Management Service provided input. The National Marine Sanctuary Foundation sponsored an evening social at the Moody Gardens Aquarium. Schmahl, Hickerson, Weaver.

#### **E. PUBLICATIONS:**

Aronson, R.B., W.F. Precht, T.J.T. Murdoch, and M.L. Robbart. 2005. Long-Term Persistence of Coral Assemblages on the Flower Garden Banks, northwestern Gulf of Mexico: Implications for Science and Management. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25(1):84-94.

Boland, G.S., and P.W. Sammarco. 2005. Observations of the Antipatharian "Black Coral" *Plumapathes pennacea* (Pallas, 1766) (Cnidaria: Anthozoa), Northwestern Gulf of Mexico. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25(1):127-132.

Borneman, E.H., G.M. Wellington. 2005. Pathologies affecting reef corals at the Flower Garden Banks, northwestern Gulf of Mexico. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25(1):95-106

DeBose, J. L., and M. Vecchione. 2005. First documentation of the roper inshore squid, *Loligo roperi* (Cohen 1976), in the Gulf of Mexico. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25(1):132-135.

Gardner, J.V., and J. Beaudoin. In Press. High-Resolution Multibeam Bathymetry and Acoustic Backscatter of Selected Northwestern Gulf of Mexico Outer Shelf Banks. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science, 21 (1): 5-29.

Gavio, B., and S. Fredericq. 2005. New species and new records of offshore members of the Rhodmeniales (Rhodophyta) in the northern Gulf of Mexico. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25(1):58-83

Gavio, B, E.L. Hickerson, and S. Fredericq. 2005. *Platoma chrysymenioides* sp. nov. (Schizymeniaceae), and *Sebdenia integra* sp. nov. (Sebdeniaceae), two new red algal species from the northwestern Gulf of Mexico, with a phylogenetic assessment of the Cryptonemiales-complex (Rhodophyta). Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25(1):38-57



Hickerson, Emma L. and G. P. Schmahl. 2005. Status of the Coral Reef Ecosystems of the Flower Garden Banks, Stetson Bank, and other Banks in the Northwestern Gulf of Mexico. In *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2004*. NOAA/NCCOS. 201-221.

Hickerson, E., and G.P. Schmahl. 2005. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Introduction. *Gulf of Mexico Science*. 25 (1):2-4

Precht, W.F., M. L. Robbart, G.S. Boland, and G.P. Schmahl. 2005. Establishment and initial analysis of deep reef stations (32-40m) at the East Flower Garden Bank. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, *Gulf of Mexico Science*. 25(1):124-127.

Salazar, M.H., et al. 2005. Rediscussions and taxonomic notes on species of the *Synalpheus townsendi* Coutiere, 1909 complex (Decapoda: Caridea: Alpheidae). *Zootaxa* 1027:1-26

Scanlon, K. M., S.D. Ackerman, and J.E. Rozycki. 2005. Sedimentary Environments of East and West Flower Garden Banks Area. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, *Gulf of Mexico Science*. 25(1):115-123.

Schmahl, G.P. and E.L. Hickerson. (In press) McGrail Bank, a deep tropical coral reef community in the northwestern Gulf of Mexico. In: *Proceedings of the 10<sup>th</sup> International Coral Reef Symposium*.

Schmahl, G.P. and E.L. Hickerson, (In Press) Deep tropical coral reef communities in the northwestern Gulf of Mexico.

Tunnel, J.W., S.A. Earle, and R. R. Ferguson. 2005. Foreword. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, *Gulf of Mexico Science*. 25 (1):1

Vize, Peter D. 2005. Deepwater broadcast spawning by *Montastraea cavernosa*, *Montastraea franksi*, and *Diploria strigosa* at the Flower Garden Banks, Gulf of Mexico. *Coral Reefs*. DOI 10.1007/s00338-005-0082-5.

Vize, P.D., J.A. Embesi, M. Nickell, D.P. Brown, and D.K. Hagman. 2005. Tight temporal consistency of coral mass spawning at the Flower Garden Banks, Gulf of Mexico, from 1997 – 2003. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, *Gulf of Mexico Science*. 25(1):107-114.

Weaver, D.C. and E. L. Hickerson, (In Press) *Halichoeres bureki*, a new wrasse (Pisces: Labridae) from the Flower Garden Banks National Marine Sanctuary, Northwestern Gulf of Mexico. *Gulf of Mexico Science*.

Weaver, D.C., et al. (In Press) Deep reef fish surveys by submersible on Alderdice, McGrail, and Sonnier Banks in the Northwestern Gulf of Mexico.

Wicksten, M.K. 2005. Decapod crustaceans of the Flower Garden Banks National Marine Sanctuary. 2005. Dedicated Issue, Flower Garden Banks National Marine Sanctuary, Gulf of Mexico Science. 25 (1):30-37

#### **F. OTHER SCIENCE PRODUCTS**

- Initial Habitat Characterization Maps, to meet NOS Milestone
- Deep Water Habitat cruise notebooks (DFH10 and DFH11)
- 2005 Research Report
- Publication of special issue of Gulf of Mexico Science journal.
- Input into The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005

#### **G. ADDITIONAL SCIENCE ACTIVITIES:**

- Submitted FY06-12 shiptime requests and needs.
- Acquisition of Reson 8125 multibeam at Stetson Bank
- Submitted monthly shiptime reports to NMAO.
- Provided funding to REEF to report on last 10 years of REEF surveys at the FGBNMS.
- Coordinated with researchers in CRCP proposal submissions.
- Creation of database describing biological and habitat characteristics of over 8000 images collected from ROV surveys.

#### **H. RESEARCH AND SCIENCE PARTNERSHIPS**

- Azure Photographic Services
- Bainbridge College
- Boston University
- Dauphin Island Sea Laboratory (DISL)
- Environmental Protection Agency (EPA)
- Florida International University
- GeoMarine, Inc.
- George Mason University
- Harbor Branch Oceanographic Institute
- Hawaii Institute of Marine Biology
- Minerals Management Service (MMS)
- Mote Marine Laboratory
- National Aquarium
- National Undersea Research Center (NURC)
- NOAA Fisheries
- North Carolina Coastal Ocean Service (NCCOS)

- PBS&J
- Reef Environmental Education Foundation (REEF)
- Rotterdam Zoo
- Texas A&M University (TAMU)
- Texas A&M University - Corpus Christi (TAMU-CC)
- Texas A&M University – Galveston – (TAMUG)
- Texas A&M University (TAMU) – Geochemical and Environmental Research Group (GERG)
- Texas Parks and Wildlife (TPWD)
- U.S. Geologic Survey (USGS) – Woods Hole
- University of Calgary
- University of California – Davis (UC-Davis)
- University of Houston
- University of Louisiana – Lafayette
- University of Miami
- University of New Hampshire (UNH)
- University of Texas, Medical Branch – Port Aransas
- University of Utah
- Wildlife Conservation Society (WCS)

#### **I. SCIENTIFIC INTERPRETATION/OUTREACH ACTIVITIES**

1. Maintenance of slide library
2. Maintenance of digital slide catalog/library
3. Maintenance of Power Point presentation catalog
4. Maintenance of video library (annotations)
5. Development of PowerPoint presentations for various events
6. Attended Sanctuary Web discussions.
7. Coordination of sighting data from recreational dive vessels.
8. Assisted with DUOY participant selection process.
9. Coordinated diving operations on Agency/Industry Cruise.
10. Assisted with DUOY Teacher Workshop application process.
11. Attended the Opening of the Tennessee State Aquarium

#### **J. MANAGEMENT ACTIVITIES**

- Unit Diving Supervisor duties
- Writing of permits for science activities
- Attended Sanctuary retreats
- Responded to oil and gas industry spill drills in Manager's absence.
- Attended Gulf of Mexico Fisheries Management Council Meeting.
- Participated in TPEC for FGBNMS LTM.
- Participated in Joint Industry Project (JIP) conference calls.
- Participated in development of the State of the Sanctuary Report.

## **K. TECHNOLOGY**

1. Upgrade to ARC GIS9 program, ArcInfo 9.1 and ArcView 9.1 single use licenses with Spatial and 3D Analyst Extensions.
2. Purchase of HP800 DesignJet plotter.
3. Purchase of Media GIS platform.
4. Purchase of Olympus 7070 digital still camera and Light and Motion housing
5. Purchase of Olympus C765 digital still camera, housing and lights
6. Upgrade of Sony PC100 – PC1000 digital equipment and housing
7. Purchase of YSI salinity and temperature probe.
8. Maintenance and development of media equipment.
10. Research for underwater technologies to further Sanctuary's capabilities.