

**Office of National Marine Sanctuaries/National Centers for Coastal
Ocean Science Long-term Agreement (ONMS/NCCOS LTA)**

**2004 Annual Liaison Report on Existing and Potential ONMS/NCCOS
Collaborative Studies at the Flower Garden Banks National Marine
Sanctuary (FGBNMS)**



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December 2004

**NCCOS/FGBNMS Partnership
FY04 Annual Liaison Report:
Flower Garden Banks National Marine Sanctuary (OCNMS)**

By

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December 2004

1. Introduction

A partnership between National Centers for Coastal Ocean Science (NCCOS) and the National Marine Sanctuaries (ONMS) was initiated in 1999 to provide a stronger and more effective science base for managing NOAA's National Marine Sanctuaries. Under this partnership, NCCOS's role is to work with ONMS to understand sanctuary management needs and together, design strategic research to address those needs. Through this collaboration the research findings and related information can then be applied to the development and implementation of effective management plans. The following four research priorities are to be the focus of this effort over the next several years: (1) baseline characterizations of sanctuary resources; (2) monitoring for potential environmental changes; (3) "anticipatory science" to develop and test new technologies for monitoring the health of these systems; and (4) special studies to address specific critical issues that may develop. Research liaison positions were established in 2002, within NCCOS to help facilitate this process for each of NOAA's National Marine Sanctuaries. NCCOS liaison activities at the Flower Garden Banks National Marine Sanctuary (FGBNMS) began in spring 2003. Each year, as part of the partnership process, the NCCOS liaison and FGBNMS research coordinator will be working together to assess current research gaps and needs relative to the sanctuary's management goals, and to make recommendations for how the partnership can be leveraged to help address these needs. The purpose of the following report is to provide such an assessment for the FY04 annual reporting period.

2. Sanctuary Overview

The FGBNMS, one of 13 National Marine Sanctuaries, is located 105 to 115 miles south of the Texas/Louisiana border and covers 42 nm² of ocean waters in the Gulf of Mexico (Figure 1). The sanctuary consists of three of the many underwater salt domes scattered across the northern Gulf of Mexico. The East Bank (Figure 2) is a pear shaped dome 3.1 miles in diameter that spans 19.2 nm² and rises to within 60 feet of the surface. It is composed of 250 acres of reef crest

with a natural brine seep located on the margin of the bank and forming an underwater salt lake about 100 feet in diameter and ten inches deep. The West Bank (Figure 3) is an oblong shaped dome, 6.8 miles by 5 miles, rising to within 66 feet of the surface. It spans 22.5 nm² with 100 acres of reef crest. Stetson Bank (Figure 4) was added to the sanctuary in 1996, is the nearest to shore at 70 miles south of Galveston, TX and spans less than one nm². It rises to within 56 feet of the surface and is composed of about 59 acres. It is a series of parallel high ridges, referred to as pinnacles. The East and West Flower Garden Banks are perfectly located to provide a balanced habitat for Caribbean reef building corals: hard surfaces for attachment, clear sunlit water, a steady floating food supply and warm water temperatures (68 to 85°F). The high diversity portions of the reefs are found from 55' to 140' deep. The large, boulder shaped corals provide substantial vertical relief with plenty of nooks and crannies for animals hiding from predators or laying in wait for prey. The sanctuary is home to 30 species of coral, 80 species of algae, about 280 species of fish, over 250 macroinvertebrate species, and a healthy population of large juvenile and adult

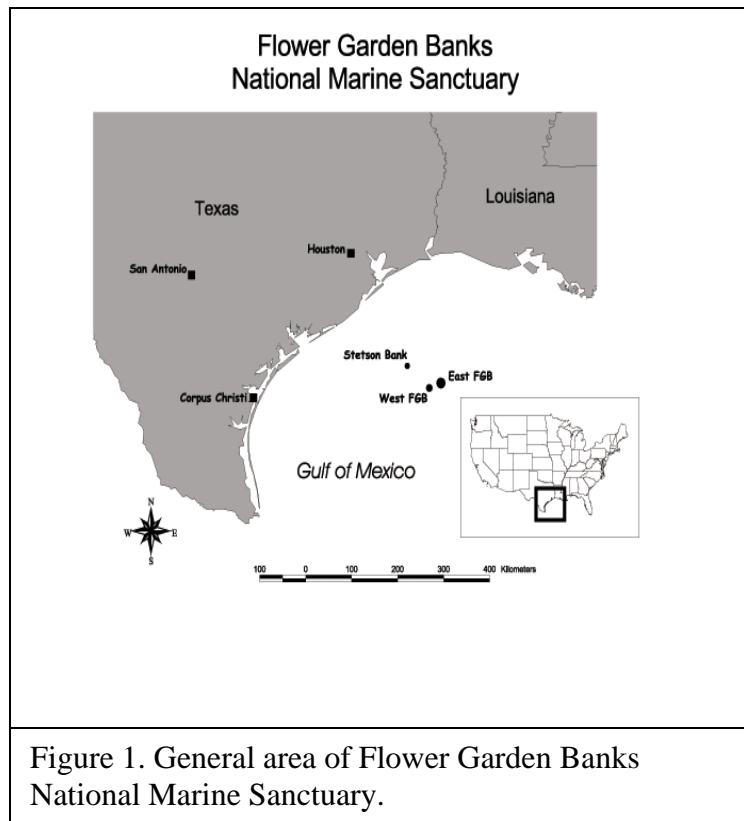


Figure 1. General area of Flower Garden Banks National Marine Sanctuary.

loggerhead turtles and at least one resident juvenile hawksbill turtle. The shallow hyper-saline “lake” at East Bank created by a brine seep has resulted in an area of extremely low oxygen and high sulfur content making it unsuitable for most animals. However, a certain type of bacteria thrives in this environment and provides a food source for fish that can dart into the brine soup for a bite. Because of cooler winter temperatures and increased turbidity at Stetson

Bank, coral growth is prevented from covering the siltstone bedrock. However a large population of fire coral, sponges and other encrusting organisms as well as many fish and invertebrates can be found in this area. At depths ranging from 150-290 feet, the habitat is dominated by coralline algae, sediment and rock outcrops. This habitat covers several square miles, a much larger area than is

inhabited by corals. Although less is known of the biota in this habitat, some believe that the species diversity may be comparable to that on the coral reefs

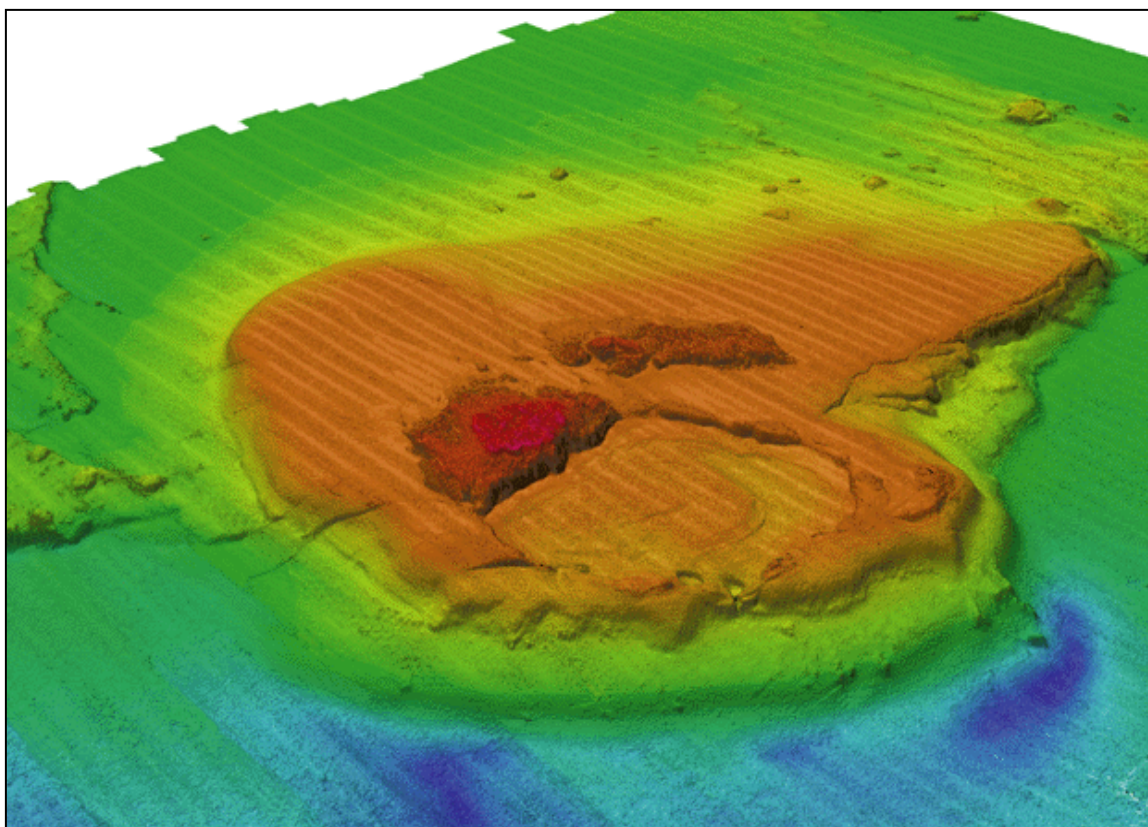


Figure 2. Oblique view of East Flower Gardens (towards northwest)

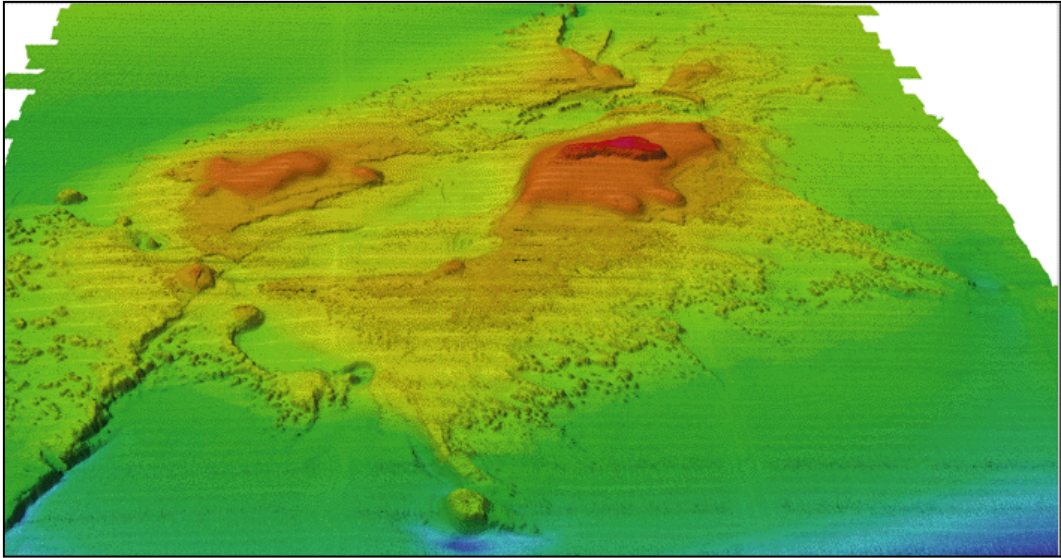


Figure 3. Oblique view of West Flower Gardens (towards north)

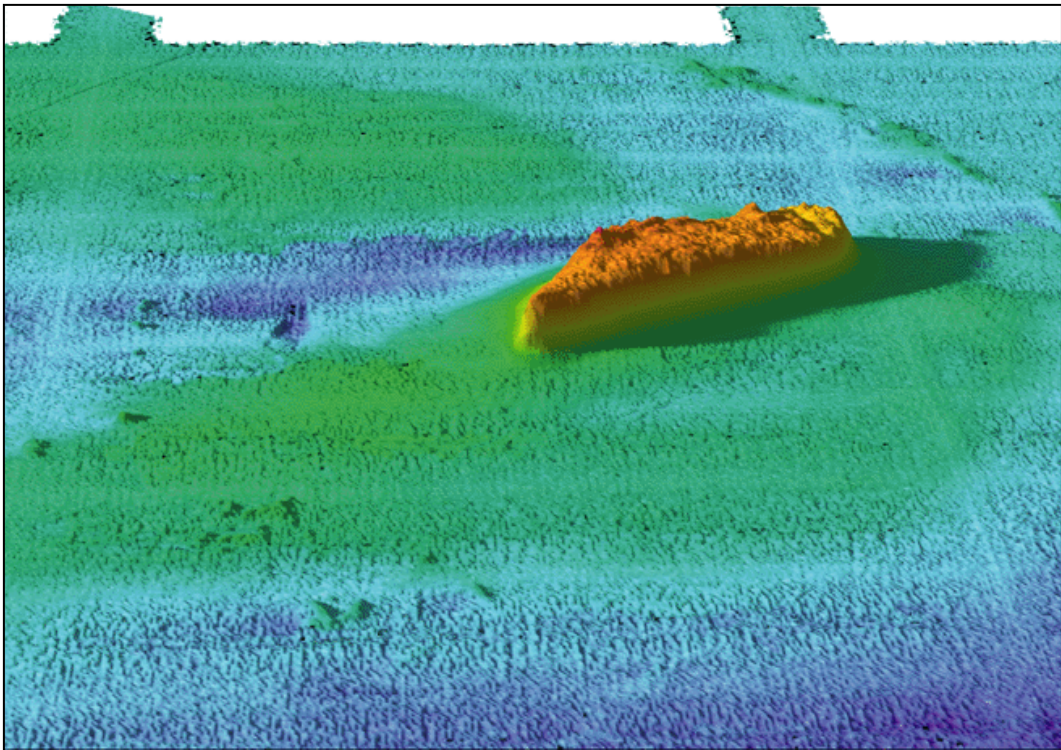


Figure 4. Oblique view of Stetson Bank (towards north)

The FGBNMS was designated as a national marine sanctuary in 1992. The overall goal of the sanctuary is to conserve, protect, and enhance its biodiversity, ecological integrity, and natural resources through effective research and educational programs, and by encouraging compatible commercial and recreational uses. Certain activities are prohibited within the sanctuary in order to help protect its resources (Table 1).

Table 1. Regulated activities within the Flower Garden Banks NMS.

- Injuring, removing, possessing, or attempting to injure or remove living or non-living Sanctuary resources
 - Feeding fish and certain methods of taking fish, including spearfishing
 - Vessel anchoring and mooring; designated an international “no-anchoring zone” by the International Maritime Organization
 - Discharging or depositing polluting materials within the Sanctuary
 - Discharging or depositing polluting materials outside the Sanctuary boundaries that subsequently enter the Sanctuary and injures a Sanctuary resource or quality
 - Exploring for, developing, or producing oil, gas, or minerals within the “No Activity Zone” established by the Minerals Management Service
 - Altering the seabed or constructing, placing, or abandoning any structure or material on the seabed
-

The Sanctuary’s distance from shore affords some protection from land based human impact, but it offers no protection from water based human activities and creates special hardships for management and enforcement operations. Sanctuary staff has met this challenge by working closely with a variety of other entities, including the recreational and research dive communities, educators, industry, academia, nonprofit organizations, and other government agencies. Resource protection objectives are met through a multi-disciplinary approach that includes education and outreach, science (research and monitoring), management, and regulation enforcement. To strengthen Sanctuary research and monitoring efforts, staff actively pursues cooperative partnerships with universities, nonprofit organizations, industry and other government agencies. These mutually beneficial relationships can be used to facilitate a wide variety of activities. In addition to annual monitoring of general reef health, typical research activities include: population census and behavioral studies on fish, turtles, sharks and rays; identification of algae communities; mass coral spawning; studies on the genetics of fish, turtles, corals and zooxanthellae; paleoclimatology; coral diseases; habitat characterization of all three banks; and exploration of the deep water areas of the Sanctuary. Four main targets for the Sanctuary’s education and outreach efforts are recreational divers, oil and gas industry representatives, teachers, and students. To make the best investment of resources, Sanctuary staff partners with private nonprofit organizations, universities, primary and secondary schools, industry, and other government agencies.

3. Management Goals and Concerns

Developing a Management Plan - One of the major goals of the Flower Garden Banks National Marine Sanctuary (FGBNMS) is developing their site-specific Management Plan. The 2002 National Marine Sanctuary Management Plan Review Handbook scheduled the FGBNMS to begin this process in FY03. The management plans are site-specific documents that summarize existing programs and regulations; guide preparation of annual operating plans; articulate visions, goals, objectives and priorities; guide management decision making; guide future project planning; ensure public involvement in management processes; and contribute to attaining the goals and objectives of the National Marine Sanctuary Program. Although valuable, the process to develop this Plan is costly. Budget uncertainties raises concern over whether this goal can be achieved in the given timeframe.

Protection of Marine Resources - Protection of Marine Resources within Sanctuary Boundaries as well as protection of the resources that are biologically and ecologically connected is an overarching goal of the FGBNMS. High resolution bathymetric mapping of the northwestern Gulf of Mexico topographical features has provided detailed baseline maps up which to plan direct surveys and characterization efforts. These maps have been used to update previous site characterizations with new technologies (ie high resolution digital imagery, submersibles, ROV and enhanced sampling capabilities). Together this has allowed an expanded characterization of these marine resources, including unprotected coral communities and associated reef fish, invertebrates and algae.

There is concern that these topographic features that harbor these coral communities are afforded little protection and are vulnerable to activities such as trawling, anchoring and salvaging. The only protection afforded these areas currently is through the Minerals Management Service who regulates the Oil and Gas industry.

Inventory and characterization of these areas are necessary to determine their condition and the biological and ecological connectivity of these areas to the FGBNMS. The deep water benthic communities also require added effort to inventory and determine their condition. Only through determining the existence and understanding the biological connectivity and factors that influence the health and vitality of these organisms can a determination be made as to whether these areas too are critical habitat for coral communities or other marine communities and as such are in need of Federal protection. Due to the distance and large coverage area, additional ship time would allow more in-depth characterization of these sites.

Fisheries – The East and West Banks of the Flower Gardens are not isolated “islands”. They likely depend on source populations existing far outside the FGBNMS boundaries to provide recruits and in turn may also serve as a source population to other reefs. Determining the population dynamics (i.e., sink and source, reproductive status, recruitment, tagging studies) for these resources is needed and could be accomplished by collaborations with NCCOS fishery biologists at CCFHR and geneticists at CCEHBR. There is also a need to foster international and inter-agency collaborations with managers of these source populations as well as those that have shared management authority with pelagic and/or commercially important species, such as snappers, groupers, mackerel, jacks, and whale sharks.

Unchecked fishing activities are one source of damage to the Sanctuary’s biota and habitat (i.e., incidental sea turtle mortalities and physical damage to benthic communities from long-line fisheries). Inadequate enforcement of fishing regulations in the FGBNMS is a continuing concern and results from dwindling wildlife law enforcement support and the remoteness of the Sanctuary. This can however provide an opportunity to investigate the feasibility of using new surveillance technologies that may be able to fill this gap in enforcement.

Oil & Gas Industry - Mounting concerns exist within the FGBNMS’s management over the increased activity by the oil and gas industry both within the Sanctuary and adjacent to this resource. These include such seismic disturbances, laying additional pipelines within the sanctuary, disturbing critical habitat and increased vessel traffic. The Sanctuary needs a means to assess whether these activities are detrimental to the health of the Sanctuary; in other words, are these resources being adequately protected?

Recreational Diving – Recreational diving activities can result in a form of chronic low-level stress such as might occur from diver interactions, resulting in physical damage or transmission of biological agents from other dive locations or dive boat operations and associated anthropogenic materials concentrated at dive sites.

Education – FGBNMS staff view education as one of their most important goals and a mission for the Sanctuary. There is a need to be sure they are reaching the right people in the right locations. They also have a goal of increasing their outreach and enhancing their ability to interpret science for the general public and also play a role in the educational process by teaching teachers increasing their capabilities in science interpretation. Several areas of potential collaboration between NCCOS and the FGBNMS is in preparing posters, assisting in scientific writing and in graphic arts.

4. Current Sanctuary Projects

Although there were significant information gaps identified in the area of population genetics, mapping and health assessment that could be addressed through NCCOS-NMS collaborations, **for a second year there were no projects funded for FY04** to work in the Flower Garden Banks National Marine Sanctuary. A list of current research projects (with contact information) is provided in **Table 3**. The many examples that are included illustrate the wide range of ongoing work on important resource issues facing the sanctuary.

5. Research Gaps and Future Needs

Table 2 lists examples of relevant research topics at FGBNMS for various types of projects that meet management objectives and may be addressed with NCCOS collaborations. Additional topics have been identified as high priorities for future work relative to the various project categories:

Table 2. Examples of long-term research objectives at FGBNMS.

1. Existing Knowledge

There is a need to constantly update the taxonomic species list of organisms living in the FGBNMS. There is a need to enhance these efforts in evaluating the benthic communities.

2. Inventorying and Monitoring

- Augment current monitoring protocols by updating as new technologies become available that can provide more accurate measures of cause and effect and allow prognosis of given health assessments.
- Expand analysis of the TABS buoy data. Data is currently coming in but it is not being analyzed;
- Conduct side scan mapping of reef cap as well as the entire Sanctuary area to provide focused high resolution images;
- Acoustic and or satellite tracking of pelagics, extracted species, and other marine organisms;
- Study of plankton—species and timing of spawning events.

3. Experimental Studies

- Conduct studies to determine source populations of key community members through traditional population dynamic (i.e. recruitment studies) and population genetic analysis of source populations. Proposed collaborations between CCFHR (Hare), and FGBNMS have outline projects, but are currently unfunded.

- Studies which address Harmful Algal Blooms (HABs) in particular analyses for the presence and possible sources of ciguatera toxins have been proposed by CCEHBR (Morton) for collaboration with FGBNMS. These studies could assist fishing regulations by providing health warnings.
- Conduct studies to investigate whether heavy metals are present on benthic feeding fish and turtles and if present does it present a health risk for these organisms. This study would include biotoxicity and heavy metal analysis in sea turtle tissues.
- Studies focused on Health assessment of sea turtles as well as using FGBNMS resident sea turtles as control individuals in health assessment studies for wider geographic studies
- Coral Health Assessment to determine if the keystone species for this Sanctuary are undergoing subclinical stress that could result in compromised health and if detected, identify possible management strategies to alleviate the stress(es).
- Conduct water analysis around live-aboard dive boats during plume events from marine heads to determine the effects of increased nutrients.

4. Modeling

- Realistic models of the population dynamics of fish and biodiversity of corals, other invertebrates and sea turtles in order to support sound management decisions regarding the long-term health of such key resources.
- Determine the interaction and risk of increased predation on sargassum bed inhabitants by high level predatory fish. (1) If increased predation occurs, do stationary vessels and/or man-made structures which are know attractants for high level predatory fish, contribute to an increased risk of predation? (2) Are the sargassum beds fractured to a greater extent in the Gulf of Mexico compared to elsewhere? (3) Is predation increased on sargassum users (i.e., sea turtle hatchlings) by any of these factors singly or in combination?
- Determine the effect of deeper reef coral morphology on levels of sedimentation – does increased sediment result in increased accumulation on corals with depth due to their naturally flatter morphology and thus larger surface area for accumulation.
- Determine the effect of temporal changes in sand condition, including productivity, thickness, and availability of resources - Do such disruptions as storm events change normally highly productive sand patches? The effects of natural and accidental changes are unknown. Can these impacts be modeled?
- Use ROVs to update studies conducted approximately 20 years ago and evaluate spatial and temporal changes that may have occurred in near-field contamination around the oil well HI-389A, located within the Sanctuary.

5. Mapping

There is a need to develop focused high resolution maps for regions associated with coral caps, drowned and partially drowned reef zones, coupled with

biological community maps with locations of high fish populations (i.e., groupers, snappers), likely spawning events, spawning aggregations and aggregations of rare species (i.e., marbled groupers).

6. Information Management

- Enhance database system for cataloging information;
- Enhance electronic information network to facilitate more timely and efficient information exchange (e.g., web site);
- Enhance GIS capabilities to incorporate scientific and geological information gathered within the sanctuary in a web interface format; and
- Incorporating the status of current research projects, results of prior research projects, and management decisions based on the outcome of these projects into the education and public-outreach programs developed for the sanctuary (e.g. web site, workshop and conference proceedings, student programs, volunteer programs, public forums, adult continuing education classes, and other related means of delivery).
- Real-time video for enforcement, documenting vessel usage camera links on buoys or platforms and for direct feed into classrooms, webs or aquariums

7. Education

- Education plays a significant role in managing the Flower Garden Banks National Marine Sanctuary. One of their goals is to foster public appreciation of the marine resources in the sanctuary and provide citizens with the necessary knowledge to make informed decisions that lead to responsible stewardship of aquatic ecosystems. To achieve this goal, educational opportunities are extended to all ages in a variety of venues. Education opportunities include exhibits and hands-on activities at trade shows and conferences, presentations in conjunction with workshops offered by other entities, brochures, videos, posters, newsletters, trained Naturalists on Board, Ocean Discovery Days and formal workshops. Educational goals also extend to recreational dive operations and oil industry representatives.

An additional detailed analysis of information needs for the FGBNMS was performed in 2001, as part of a system-wide evaluation of all 13 National Marine Sanctuaries. Results of this national workshop (Gittings et al. 2002; also see <http://sanctuaries.nos.noaa.gov/library/national/science_eval.pdf>) suggested that the following three management issues warrant the greatest increase in research activity for the FGBNMS:

- Zoning;
- Fishing/Harvest Effects
- Restoration/Rehabilitation

Six priority endpoints were identified that warrant consideration for targeted science and include:

- Recruitment
- Effects of fishing on predator-prey dynamics
- Harvest levels and impacts
- Recovery trajectories following various impacts
- Population dynamics of key species
- Community dynamics, including trophic structure and species.

6. Overview of NCCOS Science Capabilities Available to Assist With Sanctuary Needs

Detailed descriptions of the National Centers for Coastal Ocean Science (NCCOS) can be obtained through the NCCOS website and associated links at <http://www.nccos.noaa.gov>. Highlights of this information (extracted from the website) are presented here as a brief overview of NCCOS programs and capabilities that can be leveraged through the NCCOS-NMS partnership to help the FGBNMS fill data gaps and future management needs.

NCCOS, with headquarters in Silver Spring MD, was formed as a part of the National Ocean Service in March 1999 as a means of consolidating its coastal research capabilities. Five research centers exist at present under NCCOS: the Center for Sponsored Coastal Ocean Research (CSCOR) in Silver Spring, MD; the Center for Coastal Monitoring and Assessment (CCMA) also in Silver Spring, MD; the Center for Coastal Fisheries and Habitat Research (CCFHR) in Beaufort, NC; the Center for Coastal Environmental Health and Biomolecular Research (CCEHBR) with facilities both in Charleston, SC and Oxford, MD; and the Hollings Marine Laboratory (HML) in Charleston, SC. Collectively across these centers, NCCOS offers a broad range of complementary capabilities in disciplines such as marine ecology and biology, fishery ecology and management, marine pathology, microbiology, molecular and cellular biology, genetics, biochemistry, ecotoxicology, environmental chemistry, marine forensics, remote sensing, biogeography, ecological statistics, GIS analysis, environmental risk analysis, coastal-resource management, and information technology.

NCCOS conducts and sponsors a variety of monitoring, assessment, research, and technical-assistance projects to support the coastal stewardship role of NOS and to help NOAA achieve its related national strategic goal of sustaining healthy coastal ecosystems. The combined capabilities listed above are available to

address a broad range of environmental issues pertinent to this mission. Key goals are to:

- Deliver high-quality science in a timely and consistent manner using strong, productive partnerships;
- Develop and maintain relevant research, long-term data collection and analyses, and forecasting capabilities to support people who manage and use coastal resources;
- Build capacity in the private, local, and state sectors by transferring technology and by providing technical assistance and knowledge; and
- Conduct anticipatory science needed to manage potential impacts of multiple stresses on coastal ecosystems.

In addressing these goals, NCCOS currently is focusing its science on five major categories of ecosystem stress:

- Climate change,
- Extreme natural events,
- Pollution,
- Invasive species, and
- Land and resource use.

Understanding how these complex issues affect the quality and quantity of coastal habitats, and the diversity, abundances, and integrity of component living resources, is vital for the effective management of our Nation's coastal ecosystems. NCCOS is attempting to develop this knowledge by focusing its efforts currently on four ecosystem categories: coral reefs, estuaries, National Estuarine Research Reserves, and National Marine Sanctuaries. The latter commitment to working within sanctuaries has been formalized through the ongoing NCCOS-NMS partnership.

NCCOS also provides a capability to perform Integrated Assessments (IAs) as a strategy for addressing coastal ecosystem effects with respect to any particular combination of the above stressor and ecosystem categories. Integrated assessments consist of the following steps: (1) documenting status and trends of ecosystem and/or cultural resource conditions, (2) relating such trends to their environmental or economic causes and consequences, (3) predicting outcomes of alternative management actions, and (4) providing guidance for implementing the alternatives. A successful IA is one that is responsive to policy-relevant questions, includes peer review and public participation, is broadly integrative and synthetic, is based on high-quality existing information, and is predictive. The IA approach provides a science-based framework for determining the source and scale of an existing environmental problem and evaluating various alternative management strategies. NOS is currently using an IA approach to examine the effectiveness of the existing network of Marine Protected Areas (MPAs) along the coasts of Washington, Oregon, and California in meeting goals of Executive

Order #13158 (i.e., preserving biodiversity, sustaining fisheries, and preserving cultural artifacts).

Each NCCOS center provides a unique set of capabilities that could be utilized to help support sanctuary research and educational needs. These Centers and their corresponding programs include:

Center for Sponsored Coastal Ocean Research (CSCOR). The center is located in Silver Spring, Maryland. CSCOR operates the Coastal Ocean Program (COP), which is a federal-academic partnership providing predictive capabilities for managing coastal ecosystems. COP supports research in three areas: coastal fisheries ecosystems, cumulative coastal impacts, and harmful algal blooms/eutrophication. For further information contact the CSCOR website at <http://www.cop.noaa.gov>.

Center for Coastal Monitoring and Assessment (CCMA). The center is located in Silver Spring, Maryland. CCMA monitors, surveys, and assesses coastal environmental quality, habitats, and resource distribution. CCMA also is home of the National Status and Trends Program (NS&T), which conducts long-term contaminant monitoring at more than 350 estuarine and coastal sites around the country. Information from the Center's monitoring and assessment studies are synthesized and evaluated to determine the impacts of contaminant exposure and changes in coastal habitats on the distribution and abundance of living marine resources. CCMA's major program areas are in biogeographic characterization, bioeffects monitoring, and remote sensing. For further information contact the CCMA website at <http://ccmaserver.nos.noaa.gov>.

The Center for Coastal Fisheries and Habitat Research (CCFHR). The center is located in Beaufort, North Carolina. CCFHR consists of the following teams conducting a combination of laboratory and field research: Fisheries Oceanography and Ecology; Plankton Ecology and Physiology; Applied Spatial Ecology and Habitat Characterizations; Fish Ecology, Habitat Restoration, and Contaminants; and Coastal and Estuarine Ecosystem Restoration Research. Key areas of research include: coastal habitat utilization and restoration such as sea grass beds, fish ecology, chemical and physiological processes, ecology and oceanography of harmful algal blooms, population dynamics of reef and coastal fish species, and marine protected species (sea turtle and marine mammal). For further information contact the CCFHR website at <http://shrimp.ccfhrb.noaa.gov>.

Center for Coastal Environmental Health and Biomolecular Research (CCEHBR). The center has laboratories both in Charleston, South Carolina and Oxford, Maryland. CCEHBR provides scientific information required to resolve important issues related to the health of coastal ecosystems, environmental quality, and related public health impacts. Chemical, biomolecular, microbiological, histological, toxicological, and ecological research tools are used to characterize the health of coastal ecosystems, including living resources and

their associated habitats, and to assess and predict the causes and consequences of various human and natural stressors on the integrity of these resources. Major research areas include: marine biotoxins and harmful algal blooms, marine ecotoxicology, marine pathology, marine biotechnology and genetics, coral health and disease, invasive species management, health of marine protected species (sea turtles and marine mammals), marine forensics, environmental risk analysis, and coastal ecology. For further information contact the CCEHBR website at <http://www.chbr.noaa.gov>.

Hollings Marine Laboratory (HML). The center, named after Senator E. Fritz Hollings, is located in Charleston, South Carolina. HML, which opened recently in 2002, is a newly established multi-institutional, multi-disciplinary laboratory providing science and biotechnology applications to sustain, protect, and restore coastal ecosystems, with emphasis on linkages between the environment and human health. Major research areas include: environmental/analytical chemistry, marine genomics, molecular biology and physiology, coral health and disease, contemporary use of pesticides, ecotoxicology, proteomics, and aquaculture production and disease. HML is co-occupied by several partnering institutions including NCCOS, South Carolina Department of Natural Resources, University of Charleston, National Institute of Standards and Technology (NIST), and the Medical University of South Carolina. It is governed by an Executive Board, a Science Board, and several operational committees, under the leadership of a NOAA/NCCOS laboratory director. For further information contact the HML website at <http://www.nccos.noaa.gov/about/hml.html>.

7. Summary of Ongoing and Planned Partnership Activities for FGBNMS

FY04 Progress

A collaboration between FGBNMS and NCCOS/CCEHBR has been established to assess coral condition using standard visual reef assessment coupled with a comprehensive cellular diagnostic system (CDS). The FGBNMS, although remote from coastal land use inputs is not completely isolated from anthropogenic stress. Anthropogenic stressors such as dive operations and nearby oil-drilling operations are two possible stressors that are being evaluated in this study. *There is a need for continued work, but no funds were available to pursue preliminary findings.*

Plans and Recommended Activities for FY05 (and beyond)

There are no NCCOS/NMS projects funded for FY04 for work in the Flower Garden Banks National Marine Sanctuary.

1. Continuation of interactions between the NCCOS liaison (Woodley) and FGBNMS research coordinator (Hickerson) in efforts to stay abreast of

FGBNMS research needs and to help facilitate the responsiveness of NCCOS science to meeting such needs. Efforts will be made to optimize the efficiency of this process through routine communications and the use of tools, such as the present liaison document, to promote the exchange of information on science capabilities, future management needs, and new ideas for research to address such needs.

2. Implementation of new NCCOS/NMS partnership study of the effects of chemical toxicants (i.e., Irgarol 1051 antifoulant paint) on coral health (recommended for funding FY05).
3. Facilitation of projects to be conducted by other NCCOS investigators at FGBNMS through the NCCOS/ONMS partnership. Liaison assistance will be provided as needed to facilitate this and any other new projects initiated through the partnership.
4. Remote sensing – Rick Stumpf - CCMA (FY05) – Characterization of temperature, and Chlorophyll in NMS waters – looking at satellite data, time series, looking at increased levels of chlorophyll and patterns identify linkages

Needed Assistance from NCCOS, but Unfunded.

1. Conduct studies to determine source populations of key community members through traditional population dynamic (i.e. recruitment studies) and population genetic analysis of source populations. Proposed collaborations between CCFHR (Hare) and FGBNMS have outline projects, but are currently unfunded.
2. Studies which address Harmful Algal Blooms (HABs) in particular analyses for the presence and possible sources of ciguatera toxins have been proposed by CCEHBR (Morton) for collaboration with FGBNMS. These studies could assist fishing regulations by providing health warnings.
3. Assistance in benthic community analysis.

8. Contacts

NCCOS

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National Marine Sanctuary Management Plan Review Handbook
National Marine Sanctuary Program
http://sanctuaries.nos.noaa.gov/library/national/MP_handbook.pdf

Table 3. Current and Recent Science at the Flower Garden Banks NMS Updated August 20, 2004

Project	Investigator(s)	Affiliation
Characterization and Assessment of deep water habitat of the FGBNMS	G.P. Schmahl, Emma Hickerson, Doug Weaver	FGBNMS
Deep water coral reef communities of the NW GoM	G.P. Schmahl, Emma Hickerson, Doug Weaver	FGBNMS
Gorgonians and antipatharians of the FGBNMS and NW GoM	G.P. Schmahl, Emma Hickerson, Doug Weaver	FGBNMS
High resolution multibeam bathymetry of the topographic features of the Northwest GOM	G.P. Schmahl, Emma Hickerson, Doug Weaver Jim Gardner	FGBNMS USGS, NOAA/Office of Ocean Exploration, Minerals Management Service
Characterization and assessment of topographic features of the Northwestern GOM	G.P. Schmahl, Emma Hickerson, Doug Weaver	FGBNMS
High resolution multibeam bathymetry of the FGBNMS	Jim Gardner	University of New Hampshire (formerly USGS – Menlo Park)
Occurrence of Elasmobranchs at the FGBNMS	FGBNMS (continuation of work by Jeff Childs)	FGBNMS
Manta Ray Census and individual identification	FGBNMS (continuation of work by Jeff Childs)	FGBNMS
Sea Turtles – persistence of individuals using barnacle patterns as identification	Emma Hickerson	FGBNMS
Fish surveys	REEF	
Coral spawning and reproduction	Peter Vize	University of Calgary/Univ TX
Coral Genetics – Agaricia and Porites	Joel Stake	ULL
Algae biodiversity and genetics	Suzanne Fredericq	ULL
Crustaceans of FGBNMS	Mary Wicksten	TAMU
Fish cleaning behavior	Mary Wicksten	TAMU
Coral paleoclimatology	Niall Slowly, Amy Bratcher	TAMU
Taphonomy – Shelf and Slope Experimental	Eric Powell	

Taphonomy Initiative		
SEAMAP – Assessment of fish populations on reef and banks in the GoM	Kevin Rademacher	NMFS Pascagoula
Demographics, Attitudes, Management Preferences and Economic Impacts of Sport Divers	Bob Ditton	TAMU
Cephalopods of the FGBNMS, specifically association of squid aggregations and coral spawning events	Jennifer Debose	UC-Davis
East and West Bank Long-Term Monitoring	under contract to PBS&J, Geo-Marine, Inc., and Dauphin Island Sea Lab	Contract administered by FGBNMS and MMS
Stetson Bank Long Term Monitoring	FGBNMS	
Coral Diseases FGBNMS	Eric Borneman	University of Houston
Brittle Star Reproduction	Peter Vize	University of Calgary
Coral Degradation: Environmental Molecular Diagnostics	Cheryl Woodley	NCCOS
Sponges of the FGBNMS	G.P.Schmahl	FGBNMS
Whale Sharks – occurrence of individuals using spot patterns	Rachel Graham	FGBNMS/Wildlife Conservation Society
Satellite tagging of whale sharks	Rachel Graham	FGBNMS/Wildlife Conservation Society
Acoustic tagging of elasmobranches, grouper and snapper	Rachel Graham	FGBNMS/Wildlife Conservation Society
Queen Conch (<i>Strombus gigas</i>) at the Flower Garden Banks NMS	Craig Burnside	Wesleyan College
Paleoclimatology using cone snails	Ethan Grossman	TAMU
Algae/coral dynamics	Juan Jimenez	University of Houston
Superficial sediments of the FGBNMS	Kathy Scanlon	USGS (Woods Hole)

Appendix I. Flower Garden Banks National Marine Sanctuary 2004 Permits

Proposal #	PI	Institution/Agency	Project Title	Permitted activity	Expiration Date
FGBNMS-2003-002	Eric Grossman	Texas A&M University	The effects of temperature variation on scope for growth in the piscivorous cone snail, <i>Conus ermineus</i>	Collection of cone snails	12/31/2004
FGBNMS-2003-003	Jennifer DeBose	University of California - Davis	Cephalopods of the FGBNMS	collection of representative cephalopods	12/31/2004 (to be renewed)
FGBNMS-2003-005	Cheryl Woodley	NCCOS	Coral degradation: environmental molecular diagnostics	collection of coral tissue and water samples	12/31/2004 (to be renewed)
FGBNMS-2003-010	Niall Slowey, Amy Bratcher	Texas A&M University	Paleoclimatology of the corals of the Flower Garden Banks NMS - monitors of environmental change	Collection of coral cores	12/17/2004 (to be renewed)
FGBNMS-2004-001	G.P. Schmahl	FGBNMS	General Managers Permit	conduct general management activities	12/31/2008
FGBNMS-2004-002	Kevin Rademacher	NMFS-Pascagoula	SEAMAP 2004	fish trap and video camera array deployment	12/31/2004
FGBNMS-2004-003	Mary Wicksten	Texas A&M University	Invertebrates of the FGBNMS	collection of representative invertebrates	12/31/2005
FGBNMS-2004-004	Craig Burnside	Texas Wesleyan University	Population Dynamics of the Queen Conch of the FGBNMS	Capture and tagging of <i>Strombus gigas</i> .	12/31/2005
FGBNMS-2004-005	Eric Borneman	University of Houston	Coral Diseases of the FGBNMS	Coral tissue collection, coral tagging,	12/31/2005

FGBNMS-2004-006	Joel Stake	University of Louisiana	Agaricid coral genetics	collection of coral tissue	12/31/2005
FGBNMS-2004-007	Rachel Graham	Wildlife Conservation Society	Satellite and acoustic tracking of elasmobranchs, grouper, and snapper	attachment of satellite and acoustic tags to elasmobranchs, grouper and snapper, deployment of acoustic receivers	12/31/2005
FGBNMS-2004-008	Peter Vize, Paul Brown	University of Calgary	Coral Reproduction	Collection of coral gametes, coral tissue, tagging of coral heads	12/31/2004
FGBNMS-2004-009	Ian MacDonald	Texas A&M University - Corpus Christi	Panoramic camera deployment	Deployment of panoramic camera	12/31/2005
FGBNMS-2004-010	Bill Precht, Rich Aronson, Ken Deslarzes	PBS&J, Dauphin Island Sea Lab, Geo-Marine, Inc.	Long Term Monitoring of the FGBNMS	small cores for paleoclimatology, algae collection, coral tissue for disease, installation of photo stations, equipment, marker posts, water collection	12/31/2005
FGBNMS-2004-011	Les Kaufman	Boston University	Larval input and trophic dynamics of the ichthyofauna of the FGBNMS	collection of specific fish species, and associated prey, including coral tissue	12/31/2005



Sampling coral along 100 m transect.