

## **Environmental Studies Program: Ongoing Study**

**Study Area(s):** Western Gulf of Mexico

**Administered By:** Gulf of Mexico Region

**Title:** Long-Term Coral Reef Monitoring at the Flower Garden Banks, Gulf of Mexico: 2014–2016 (NSL #GM-14-06)

**BOEM Information Need(s) to be Addressed:** This project is an important tool to allow for BOEM to monitor the sensitive habitats that BOEM has the potential to impact through the development of OCS resources. Additionally, this site serves as a sentinel site within the northern Gulf of Mexico for environmental quality and baseline conditions.

**Total BOEM Cost:** \$300,000

**Period of Performance:** FY 2014–2017

**Conducting Organization(s):** Flower Garden Banks National Marine Sanctuary/NOAA

**Principal Investigator(s):**

**BOEM Contact(s):** Mark Belter ([mark.belter@boem.gov](mailto:mark.belter@boem.gov))

### **Description:**

**Background:** The coral reefs of the East and West Flower Garden Banks are well documented to be among the healthiest in the western Atlantic and Caribbean region. While many coral reefs have experienced significant declines in coral cover and vitality, the reefs of the FGB remain in relatively stable condition. Coral reefs are focal points for marine biodiversity, provide critical habitat for a variety of fish and invertebrate species of commercial and recreational importance, supply valuable public recreational opportunities, and contribute to local and regional economies. The health of coral reefs may be threatened by a number of potential sources, including direct and indirect impacts from human activities. Due to concern about potential impacts of offshore oil and gas development, DOI (through the Minerals Management Service – now BOEM) started monitoring the East and West FGB in 1975 and on a regular basis since 1988 to assess the health of the coral reefs to establish baseline data and determine if these reefs were impacted by nearby OCS exploration and production activities.

NOAA's FGBNMS was established under the National Marine Sanctuaries Act, 16 U.S.C. 1442(e), (NMSA) in 1992. The FGBNMS manages and protects the coral reef and associated habitats of the East and West Flower Garden Banks, and Stetson Bank. The mission of the FGBNMS is to protect the resources through a wide range of activities including conservation, research, monitoring, education, and outreach efforts. With an agreement signed in 1995, and co-funding initiated in 1996, NOAA (through FGBNMS) has maintained a cooperative partnership with DOI (through BOEM) to support the ongoing program to monitor the status of the coral reefs of the East and West Flower Garden Banks.

The long-term monitoring effort is designed to assess the health of the coral reefs, through the evaluation of changes in living coral and other benthic community cover, coral growth rates, reef fish population dynamics, water quality and other indices of reef vitality. This program is of significant interest to both NOAA and BOEM, whom share responsibility to protect and monitor these important marine resources.

The need for an ongoing monitoring program at the Flower Garden Banks is critical to ensure an adequate baseline is available to discriminate among the drivers of variation within the ecosystem of the northern Gulf of Mexico. The relative pristine conditions of the site combined with the historical data collection and the proximity to OCS development makes the Flower Garden Banks an ideal sentinel site for continued support of a long-term monitoring program.

**Objectives:** This study is designed to monitor environmental conditions of the coral reefs at the East and West Flower Garden Banks located within the Flower Garden Banks National Marine Sanctuary (FGBNMS or Sanctuary). The biological health of the coral reef community shall be monitored to detect any significant effects from natural and/or human-induced activities that could potentially endanger the coral community integrity. Surveys at both the East and West Flower Garden Banks shall be performed over a two-year period. Annual data collecting cruises on each bank shall be conducted during late summer or early fall (generally August or September) each year of the agreement.

**Methods:** Observations shall be made to evaluate coral reef diversity, growth rates, and long-term changes in individual coral colonies, accretionary growth, and general coral reef community health. In general, survey techniques are listed and described in detail in monitoring reports from previous reporting periods (Long-term Monitoring at the East and West Flower Garden Banks 2009-2010 (IA No. M09PG00011)). The following is a summary of the current monitoring methods that will be continued within each study site:

- a) Sixteen (16) photographic transects ten (10) meters in length shall be taken in a stratified random manner with four (4) transects randomly located in each quadrant of each study site.
- b) Forty (40) repetitive quadrat stations shall be maintained in each study site to detect and evaluate long-term changes in individual coral colonies.
- c) Eleven (11) repetitive quadrat stations at the East Flower Garden Bank and twelve (12) repetitive quadrat stations at the West Flower Garden Bank shall also be maintained with permanent posts in coral reef habitat at depths between 100 and 130 feet.
- d) Thirty (30) permanent stations for monitoring lateral growth of the scleractinian coral *Pseudodiploria strigosa* shall be maintained in each study area. Repetitive close-up photographs shall be taken at established sites to enable them to be revisited and the same coral margin re-photographed.

- e) Cores of *Orbicella faveolata* (previously named *Montastraea faveolata*) coral colonies shall be taken on each bank during the FY2015 long-term monitoring cruise.
- f) A minimum of two (2) videotaped transects of 100 m length shall be flown at each site to show the general conditions of the coral and to help document the condition of certain individual coral heads and other features for future reference. In addition to the four (4) 100 m boundary line transects, a 360° circular-view video shall be performed at each of six (6) corner markers (three (3) on each bank marking the ends of two (2) adjacent boundary lines. Using the corner markers as a center point, the video camera should be held nearly horizontal and low to the reef, and panned slowly in a full circle.
- g) Fish counts shall be performed at both banks using both the Reef Visual Census (RVC) (Bohnsack & Bannerot, 1986) stationary visual technique and belt transect technique (NOAA, Center for Coastal Monitoring and Assessment) for quantitatively assessing community structure of coral reef fishes.
- h) Eight (8) of the 16 random transects mentioned in requirement a), will be utilized to conduct coral recruit and colony size surveys.
- i) *Diadema antillarum* (long spined urchin) surveys shall be conducted to establish current population levels as a basis for comparison with future observations.
- j) In addition to *Diadema antillarum* surveys, *Panulirus argus* (spiny lobster), *Panulirus guttatus* (spotted lobster), and *Pterois volitans* (lionfish) surveys shall be conducted in conjunction with *Diadema antillarum* surveys along study site boundary lines.
- k) Water quality instruments deployed long-term in the field shall be serviced and all data downloaded at least four times each year at approximate three-month intervals.
- l) A minimum of three (3) water samples shall be collected quarterly at both banks at the surface, mid-water, and near bottom using a vertical 10 liter sampling bottle and analyzed for chl *a*, ammonia, nitrate, nitrite, TKN, and phosphorous.

**Current Status:** The final report is complete and in review.

**Final Report Due:** July, 2017

**Publications Completed:**

Johnston, M.A., R.J. Eckert, T.K. Sterne, M.F. Nuttall, X. Hu, J.A. Embesi, E.L. Hickerson, and G.P. Schmahl. 2016 Long-Term Monitoring at East and West Flower Garden Banks: 2015 Annual Report. U.S. Marine Sanctuaries Conservation Series ONMS-16-02. U.S. Department of Commerce, National

Oceanic and Atmospheric Administration, Flower Garden Banks National Marine Sanctuary, Galveston, TX. 86 pp.

Johnston, M.A., M.F. Nuttall, R.J. Eckert, and J.A. Embesi. 2015. Long-Term Monitoring at East and West Flower Garden Banks: 2014 Annual Report. U.S. Marine Sanctuaries Conservation Series ONMS-16-02. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Flower Garden Banks National Marine Sanctuary, Galveston, TX. 63 pp.

**Affiliated WWW Sites:** Please visit the FGBNMS web page for reports ([http://flowergarden.noaa.gov/document\\_library/scidocuments.html#ltm](http://flowergarden.noaa.gov/document_library/scidocuments.html#ltm)).

**Revised Date:** June 20, 2017