

Environmental Studies Program: Ongoing Study

Title	Long-Term Coral Reef Monitoring at the Flower Garden Banks (FGB), Gulf of Mexico: 2019-2022 (GM-18-x01)
Administered by	Gulf of Mexico Regional Office
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Procurement Type(s)	Interagency Agreement
Conducting Organization(s)	Flower Garden Banks National Marine Sanctuary, NOAA
Total BOEM Cost	\$750,000
Performance Period	FY 2019–2023
Final Report Due	February, 2024
Date Revised	August, 2021
PICOC Summary	
<i><u>Problem</u></i>	BOEM requires baseline information on the hermatypic coral communities and associated community assemblages at Flower Garden Banks National Marine Sanctuary for the purpose of monitoring the health of these communities and enabling detection of short- and long-term responses to environmental and anthropogenic disturbances. These data inform BOEM NEPA analyses, impact mitigation development, and various consultations.
<i><u>Intervention</u></i>	Observations will be made to evaluate coral reef diversity, growth rates, and long-term changes in individual coral colonies, fish assemblages, water quality parameters, and general coral reef community health during the years 2019-2022.
<i><u>Comparison</u></i>	BOEM and NOAA will collaborate to analyze observations within the context of short-term environmental disturbances and anthropogenic factors.
<i><u>Outcome</u></i>	The objectives for this continued long-term monitoring effort are to collect data that will enable BOEM and NOAA to assess the long-term health of the coral reefs, and in the event of disturbance, detect any response, evaluate contributing factors, and assess impacts and significance.
<i><u>Context</u></i>	The hermatypic coral reefs of East and West Flower Garden Banks are well documented to be among the healthiest in the western Atlantic and Caribbean region. Such reefs are marine diversity hot spots, providing habitat for a variety of fish and invertebrate species, including threatened and endangered species and species of commercial and recreational importance.

BOEM Information Need(s): Ongoing monitoring at Flower Garden Banks National Marine Sanctuary (FGB) is critical to ensure adequate baseline information that enables federal resource managers to discern among natural and anthropogenic drivers of variation within the ecosystem of the northern Gulf of Mexico, especially among the topographic features of the Outer Continental Shelf (OCS) edge. This information is used by BOEM and NOAA to design management policies that minimize any negative impacts to hermatypic coral reefs from permitted energy activities.

The continued high coral cover documented at East and West FGB makes these banks unique among the region's coral reefs and justifies the need for continued protection. Sustained monitoring allows researchers to document changes in reef community condition, link changes to oceanographic events, and compare to historical baselines. This level of monitoring enables resource managers to make informed decisions regarding management and research amid threats such as climate change, water quality degradation, and natural disturbances such as storms.

Background: The hermatypic coral reefs of East and West FGB have been documented as among the healthiest in the western Atlantic and Caribbean region. While many comparable coral reefs have experienced significant declines in coral cover and vitality, the reefs of the FGB remain in relatively stable condition. The health of coral reefs may be threatened by a variety of potential sources including direct and indirect impacts from anthropogenic activities. Due to concern about potential impacts resulting from offshore oil and gas development, DOI (through the Minerals Management Service – now BOEM) started systematic monitoring at East and West FGB in 1988 to assess the health of the coral reefs and to establish baseline data to better detect any impacts from nearby OCS exploration and production activities. Overall, some of the most important trends documented in the program's 30 years of monitoring include stable coral cover at East FGB and significantly increased coral cover at West FGB, significantly increasing macroalgae cover at both banks, and significantly increasing seawater temperature at reef depth.

Objectives: The primary objective of this study is to assess the health and vitality of the hermatypic coral reefs, evaluate water quality parameters, and provide an analysis of the status of the coral reefs in comparison with historical data, within the context of OCS oil and gas exploration, development, and production.

Methods: The monitoring protocols are detailed in a joint BOEM-NOAA document, IA M19PG00001, for monitoring the coral reefs of East and West FGB. BOEM and NOAA review protocols annually to ensure methods achieve program objectives, incorporating changes as appropriate to adapt to dynamic and evolving conditions and information needs. The physical health of the coral reef community is monitored to detect any significant effects from natural and/or anthropogenic disturbances that could potentially endanger coral community integrity. Surveys of random sites and established repetitive stations on East and West FGB are performed. Annual data collection cruises on each bank are conducted during summer or early fall each year of the study, and water quality is monitored quarterly.** NOAA publishes an annual report in the Marine Sanctuaries Conservation Series, detailing observations, analyses, and results following the completion of each field season. As appropriate, historic long-term monitoring data may be reanalyzed to develop statistically comparable long-term data series. Collected data is submitted to and archived with National Centers for Environmental Information (NCEI).

**Field work in 2020 associated with this study was canceled due to COVID-19 restrictions.

Specific Research Question(s):

1. What is the current baseline condition of hermatypic corals, their habitat, and associated benthic reef community?
2. How are benthic percent cover, fish community dynamics, water quality parameters, and coral community demographics changing over time?
3. How have acute events impacted the reefs?

What do current ecological trends tell BOEM and NOAA about potential short- and long-term impacts of OCS oil and gas activities and cumulative natural and anthropogenic impacts?

Current Status: The primary accomplishments of Fiscal Year 2021 include:

1. Publication of the 2019 Flower Garden Banks Long-Term Monitoring Report: Johnston, M.A., K. O'Connell, R.D. Blakeway, J. MacMillan, M.F. Nuttall, X. Hu, J.A. Embesi, E.L. Hickerson, and G.P. Schmahl. 2021. Long-Term Monitoring at East and West Flower Garden Banks: 2019 Annual Report. National Marine Sanctuaries Conservation Series ONMS-21-02. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Flower Garden Banks National Marine Sanctuary, Galveston, TX. 88 pp.
2. Completion of both lab and pool testing of the Oceanbotics SRV-8 ROV.
3. Submission of a machine learning coral identification proposal to the NOAA FY21 High Performance Computing and Communications Program's Information Technology Incubator (not funded).
4. Completion of water quality equipment maintenance in advance of 2021 field work.
5. Completion of a reduced capacity (3 crew, 5 diver) three-day cruise on the RV Manta to conduct dives on East and West FGB and Stetson Bank. Long-term monitoring water quality instruments were exchanged, and data downloaded.
6. Beginning formatting LTM data for 2016, 2017, and 2019 for archiving and upload to NCEI.
7. Analysis on historic repetitive photostations continued along with the drafting of a manuscript in lieu of a 2020 annual report as no fieldwork took place in 2020 due to COVID-19 restrictions.

Publications Completed: FGB Long-term monitoring reports (2011-2019) are located at the below websites.

Affiliated WWW Sites:

<https://flowergarden.noaa.gov/science/sciencereports.html>

https://sanctuaries.noaa.gov/science/conservation/conservation_reports.html