### 2020 Cooperative Summer Field Training Program

**USGS Project Scientist**
Amanda W.J. Demopoulos

**Project start date**
5/1/2020

**Duration**
3-6 months, with the possibility of an extension

**Location**
Gainesville, FL

**Type of Intern**
ESA

**Title of Project**
Connectivity of coral ecosystems in the northwestern Gulf of Mexico: applications of microchemistry and isotopic analysis to fish and coral populations

**Background**
With continued anthropogenic threats to the marine environment, there is an urgent need to make decisions that will lead to the effective management and conservation of vulnerable coral ecosystems in the Gulf of Mexico (GoM). The establishment of marine protected areas (MPAs) is not only essential to protect and conserve coral ecosystems but has been identified as one of the key restoration strategies for benthic communities impacted by the Deepwater Horizon (DWH) oil spill. The Flower Garden Banks National Marine Sanctuary (FGBNMS) has proposed to expand the boundaries of current protected areas to encompass additional coral sites. The overall goal of the study is to provide ecosystem connectivity information and tools to GoM resource managers, with a focus on the FGBNMS, the banks in the boundary expansion alternatives to the east of the sanctuary, and areas further afield in the GoM and the Caribbean.

This funded project seeks to understand the processes that shape 3D connectivity networks in shallow (15-40m), upper mesophotic (40-85m), and lower mesophotic (85-150m) coral ecosystems of the northwestern GoM. To achieve these objectives, the team will integrate field sampling, state-of-the-art genetic, chemical, and ecological analyses with high-resolution habitat suitability, oceanographic and larval dispersal modeling approaches. The team will work closely with managers to plan research activities and transfer knowledge and tools through online interactive products, reports, meetings and workshops. This collaborative effort links research outcomes that will enhance our understanding of GoM ecosystems and provide the information required to guide effective management of MPAs in order to restore degraded coral communities and preserve long-term viability of coastal ecosystems.

**Objectives**

We will target key sessile and mobile species occurring at the following depth ranges: shallow (15-40m), upper mesophotic (40-85m), and lower mesophotic (85-150m) to A) understand habitat use and trophic connectivity over short time scales (weeks to months) by using stable isotopes and other chemical elements, and B) examine ecological connectivity over longer time scales using ecogeochemical markers, specifically, isotopes and other chemical elements to reconstruct animal movement and/or dietary history.
## Intern Tasks
The intern will be involved in processing a subset of the samples collected in the field. Specifically, the intern will:
1. Potentially participate in an offshore research expedition
2. Dissect fish and invertebrates collected at sea, prepare samples for isotope analysis.
3. Compare data from study sites with existing data from the literature
4. Process and analyze stable isotope data to develop preliminary food-web diagrams
5. Write a brief summary report, including basic statistical comparisons of the stable isotope results from across the different research stations.

## Expected Results and Benefits to the Intern
This work will enhance our understanding of the diversity and energy flow within remote and understudied mesophotic reef and deep-sea habitats. By establishing focused studies at several locations, we will be able to compare food webs and trophic function in disturbed and non-disturbed environments, some of which are under consideration for future expansion of the Flower Gardens National Marine Sanctuary. This work will enable a better understanding of disturbance impacts on vulnerable deep-sea ecosystems. The intern will learn a variety of research techniques that can be applied to different scientific endeavors both in the field and laboratory. He/she will learn how to collect and process samples for fish and invertebrate identification and stable isotopes, identify marine invertebrates, develop and test hypotheses, analyze data and summarize research results. These basic skills are among those required to conduct scientific investigations and for preparing manuscripts and reports. In addition, the techniques used in this research are the same as those applied to conduct environmental assessments in other marine and freshwater environments. Thus, the intern will develop skill sets that may be used in future work for the government and consulting agencies, including environmental assessments and understanding disturbance impacts to marine environments.

## Skills and Interests of Candidates
For this position, it is recommended that the student is pursuing or has completed a degree in Biology, Marine Sciences, or Zoology. Demonstrated course completion in invertebrate zoology and chemistry is also recommended, but not required. Experience with basic statistical analysis and Microsoft Excel is required. Interest and knowledge of marine invertebrates and community ecology is desirable, general interest in marine science is recommended, as are good communication skills.

## Project Type
Lab Work; Office Work;

## Project Discipline
Ecology; Modeling;