Final Report
Purchase Order - Scope of Work
Florida Fish and Wildlife Conservation Commission (FWC)
Service Period: March 15, 2021 through June 30, 2021

Project Title: **Expansion of Telemetry Efforts at Western Dry Rocks, Florida Keys**

Principal Investigator(s): Danielle Morley, Assistant Research Scientist and Dr. Alejandro Acosta, Research Administrator I, Florida Fish and Wildlife Conservation Commission, South Florida Regional Lab, Marathon Florida

Project Dates: March 15, 2021 through June 30, 2021

Background:

The Florida Fish and Wildlife Conservation Commission (FWC) has implemented a 4-month seasonal closure on Boca Grande Bar near Western Dry Rocks located ~10 miles southwest of Key West. This seasonal closure (April 1 – July 30) will protect a multi-species spawning aggregation site while commercially and recreationally important species such as mutton snapper, permit, and grey snapper use the area to reproduce (Figure 1). The regulations will sunset in 7 years. The FWC is developing a science plan to comprehensively understand the efficacy of this management decision and staff will be required to report progress during year 3, year 5, and then provide a comprehensive report in order for a future Commission to evaluate the sunset provision.

This closure is a part of an ecosystem-based restoration and management strategy on Florida's Coral Reef, something that the science community and the resource management agencies recognize as vital. Just as the active outplanting of corals is a strategy being employed to restore coral cover on reefs, this action has the potential to restore a more robust trophic structure on Florida's Coral Reef. In essence, these management activities are attempting to address the restoration of the coastal ecosystem, each from their own vantage point. These funds provided for this research and monitoring infrastructure are certainly part of a necessary and broad-based ecosystem restoration strategy.

A central need for the evaluation of this spawning aggregation will be the ability to effectively monitor the status of the aggregations through time, to better understand the movement of snapper species that use this spawning location, and how the spawning from this location contributes recruits to Florida's Coral Reef. Although the FWC is committed to conducting the necessary research and monitoring, equipment listed in this scope of work will vastly increase our capacity to begin this project.

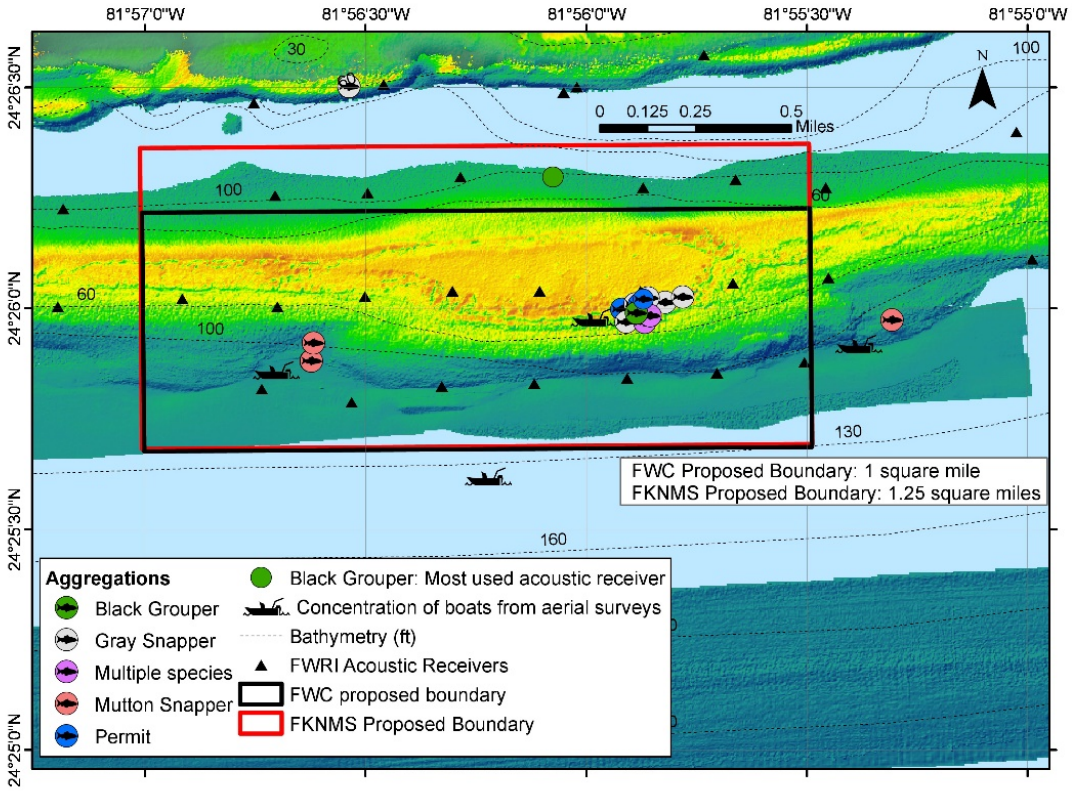


Figure 1 Map of study area showing existing array of acoustic receivers, the reported aggregation sites, and the FWC closure area.

Project Goals and Objectives:

This project will provide additional equipment necessary to monitor the connectivity of reef fish spawning aggregations across Florida's Coral Reef by two means:

- The purchase of underwater acoustic receivers and acoustic tags will be used to monitor mutton snapper and grey snapper movement at Western Dry Rocks over several years. This information will reveal the seasonal patterns of snapper use at Western Dry Rocks as well as provide understanding on the extent to which snappers from the area move to Western Dry Rocks from their home sites to reproduce. Because these tags can last multiple years, it is even possible to document behavioral changes in the tagged fish that may have arisen due to the implementation of this closure and how animals using the Western Dry Rocks area connect to the broader reef ecosystem.
- Purchasing a portable split beam active acoustic equipment will allow scientists to locate and map the physical extend of any fish aggregations. This equipment will also allow for estimates of the biomass at the aggregation sites and see if there are any patterns over time.

This information gathered during this monitoring will be shared with the Florida Keys National Marine Sanctuary Advisory Council, the Florida Fish and Wildlife Conservation Commission, DEP, and community stakeholders as they evaluate the effectiveness of this closure at Western Dry Rocks.

Quality Assurance

Per Florida Department of Environmental Projection requirements, project information must include a description about proposed methodology for sampling, analysis, quality control, and experimental data evaluation procedures. The full list of requirements are here: QA_Process_MFMP_10-17-18.pdf

Methodology for using equipment

The acoustic telemetry tags and receivers purchased will enable FWC scientists to expand their acoustic array coverage near Western Dry Rocks and increase the number of fish that will be tagged. This equipment can last for many years and will be maintained by FWC in perpetuity. Currently, FWC maintains 31 acoustic receivers (Figure 1) in the Western Dry Rocks area. However, with an average detection radius of ~500 m, there are many detection gaps in the current array. This equipment will help fill those gaps ensuring that if tagged animals move into and out of the area, their presence will be recorded.

The EK80 Mini Entry System will allow FWC scientists to survey the area for underwater biomass from the boat and to characterize the benthic habitat of the site. Once a large biomass is observed in the water column, divers can be immediately deployed to ground truth the species present and give size estimations. Using this system will also allow scientists to geospatially reference the location of the aggregations as well as get spatially explicit size estimations of the aggregations and determine if there are patterns to the location or spatial extent of the aggregation over time. The EK80 Mini Entry System is portable and can be used on different FWC vessels via a pole mount system of attachment. Table 1 describes the different types of data that will be collected with this equipment and how this information relates to management.

Datatype	Justification
Telemetry – animal movement	Will record unique animal IDs of tagged fish in the vicinity of an acoustic receiver as well as temperature. This allows for better understanding of fish behavior at the aggregation sites as we track how far animals travel from their home sites to reach the aggregation sites and if temperature changes influence the timing of these aggregations.
Acoustic split beam profiles from the EK80 Mini Entry System	Measure of backscatter in the water column can be used as a proxy for animal biomass. Measuring the backscatter will quantify the size of aggregations and determine if there are any changing patterns over time. Additionally, this system will collect benthic mapping information allowing for a detailed map of each aggregation site to be generated.

Table 1 Summary of datatypes and their use for understanding spawning aggregation use at Western Dry Rocks.

Task Description and Methodology:

Purchase Equipment

a) *Purchasing for all equipment* will occur at the start of the project. All listed equipment is commercially available.
   a. *Acoustic receivers and tags typically take 4-6 weeks to ship the order.*
   b. *EK80 Mini Entry System takes up to 60 days to ship the order.*

Deliverables:

All final invoice(s) will be submitted to DEP no later than June 15, 2021 or earlier for the 2020-21 fiscal year. All deliverables, presentations, and social media posts will acknowledge the financial assistance provided by the State of Florida, as administered by DEP's Coral Protection and Restoration Program.

Task 1: Purchase equipment

FWC will provide a report on equipment orders, a full receipt of payment for the orders, and complete the first billing no later than June 15th, 2021.

Timeline:

March 15, 2021 – June 30, 2025

Task #	Task	Date
1	Create PO for EK80 Split Beam	16 March 2021
	PO approved and equipment ordered	22 March 2021
	Equipment arrived	17 May 2021
2	Create PO for acoustic tags and receivers	17 March 2021
	PO approved and equipment ordered	05 April 2021
	Equipment arrived	21 May 2021

Budget State FY2020-21:

$100,000 total cost for purchasing acoustic receivers, acoustic tags, and an EK mini portable entry split beam system. All supplies and equipment purchased through this agreement will remain the property of FWC.

Grand Total: $100,000

Deliverables:

- EK80 Portable Entry System purchased and field testing is currently ongoing.
- Acoustic receiver tags are purchased and 3 tags have already been deployed in fish at Western Dry Rocks with additional tags scheduled to be deployed June 22nd -28th 2021
- Acoustic receivers are purchased and new stations have been built to hold them. These new stations and acoustic receivers are scheduled to be deployed in the Western Dry Rocks region June 22nd – 28th.
- Researchers presented Western Dry Rocks telemetry study design to FACT Network meeting on June 17th 2021, used DEP logo to acknowledge funding contributions.

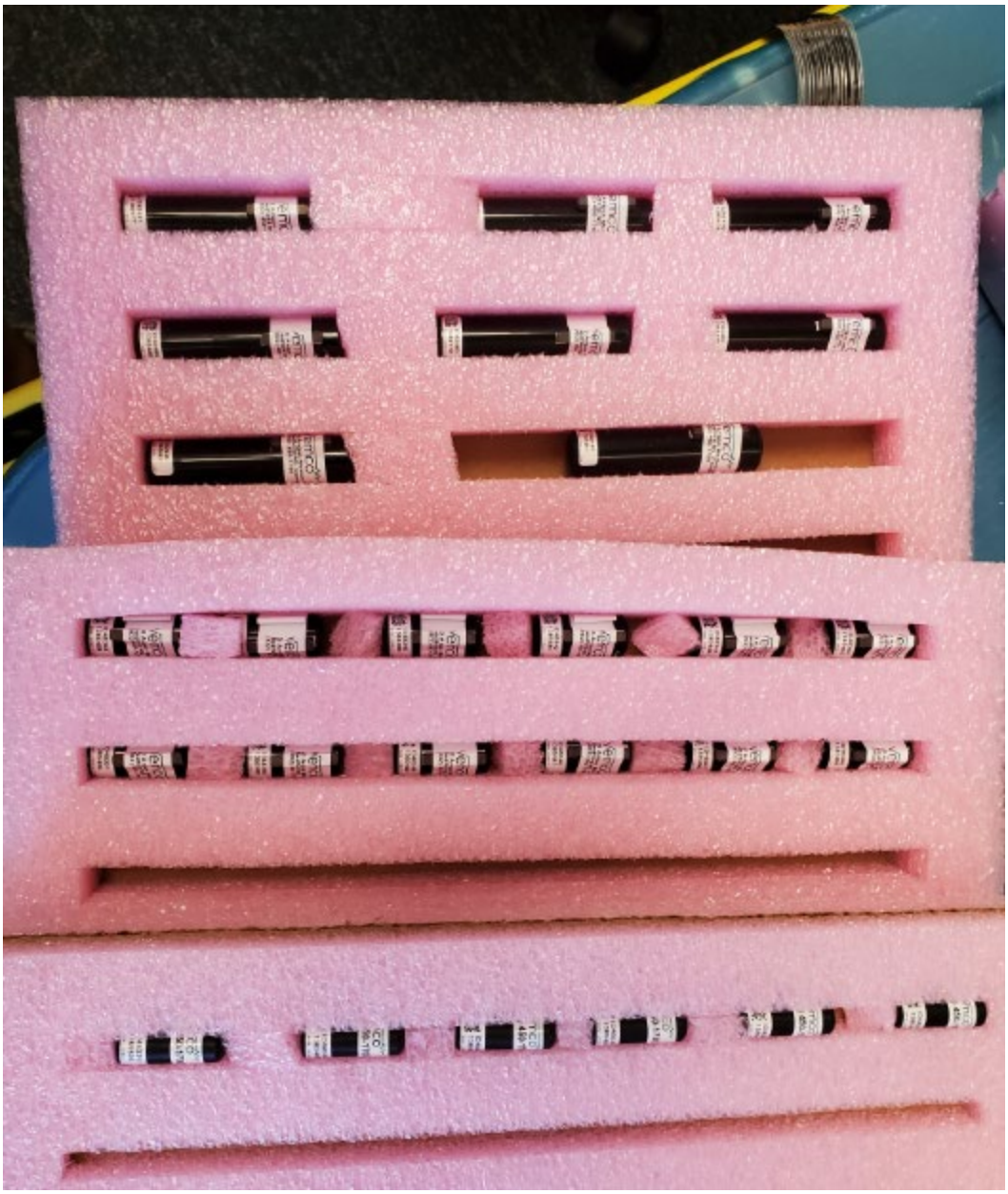
Photographs of equipment purchased

EK80 Split Beam computer component

Transducer component for EK80

Close up of single acoustic receiver

All of the acoustic receivers on the shelf



Acoustic tags purchased with this grant