

CORIS Submittal for Project 1068 - 2011 – Assess/monitor affects of MPA status on reef fish populations and spawning aggregations in the Tortugas Ecological Reserves.

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CORIS Product Name – Annual Progress Report

Brief description of activities conducted in FY2011

We completed band transects, RVC cylinder point counts and REEF (Reef Environmental Education Foundation) roving diver surveys on fixed stations in the Tortugas Ecological Reserves, north and south, in order to characterize resident fish populations. We conducted habitat characterization transects as well on stations in both reserves. We retrieved and redeployed temperature loggers and overnight video cameras on the primary stations where mutton snapper aggregate in large numbers. Additionally, we completed a total of 22 hours of split beam sonar operations over three nights, mapping and characterizing habitat and fish aggregations.

Description of accomplishments & results

We completed a six day research cruise to the Tortugas Ecological Reserves, July 13-18, 2011. Sixteen research divers completed a total of 219 research dives, sampling 16 stations in the south reserve (Riley's Hump) and nine stations in the north reserve. Multiple randomly oriented transect visual censuses were completed on all stations. Cylinder point counts were completed on 14 of 16 stations on Riley's Hump and five of nine stations in the north reserve. REEF (Reef Environmental Education Foundation) roving diver surveys were completed on nine of 16 Riley's Hump stations and two of six north reserve stations. Lionfish predator-prey transects were completed on 16 of 16 Riley's stations and seven of nine north reserve stations. Habitat characterization transects were completed on all Riley's stations and seven of nine north reserve stations. We completed three nights of split beam sonar operations to characterize potential spawning aggregations of reef fish and their habitat, totaling approximately 155 linear kilometers of acoustic transects. Three bottom temperature loggers were retrieved, downloaded and redeployed.

We continue to document recovery of previously exploited reef fish species since the inception of protection afforded by reserve designation. Numbers of transects on Riley's Hump on which key species were seen and percentage of total transects done are given below.

Mutton snapper – 36 transects – 40 % vs. 51% in 2009.

Black grouper – 23 transects - 26% vs. 21% in 2009.

Yellowfin grouper – 5 transects - 6% vs. 1% in 2009.

Nassau grouper – 2 transects - 2% vs. 2% in 2009.

Goliath grouper – 2 transects – 2% vs. 1% in 2009.

Red grouper – 16 transects – 18% vs. 6 % in 2009.

Other groupers (hinds, scamp, yellowmouth, graysby, coney) – 39 transects - 43% vs. 20% in 2009.

There were substantial increases in percentage of transects on which important species were seen compared to 2009 for mutton snapper, black grouper, red grouper and the other groupers category. In addition, in 2011 we had three transects on which more than 40 mutton snapper were seen, compared to two transects in 2009. Thus we continue to document increasing numbers of mutton snapper aggregating at Riley's Hump, offering evidence of a continued recovery of the spawning aggregation.

Equally as important as the recovery of reef fish aggregations is our documentation of the apparent successful invasion of lionfish to the Tortugas Ecological Reserves. Our team sighted our first lionfish observation in April 2010. In July 2011 divers observed lionfish on 20 transects, and numbers observed per transect ranged from one to eleven. Additionally there were several observations of lionfish seen off transect. This result led us to institute a lionfish predator-prey transect survey on this cruise, which we hope to continue in future years, so that we may gather prey community data, both pre- and post-invasion, to determine if lionfish are impacting the local fish communities. We feel our reef fish monitoring project is a good vehicle with which to monitor and document any impacts on the ecosystem caused by the invasion of lionfish.

Use of fishery sonar continued to identify areas of high fish biomass and locations of aggregations. Three survey locations were repeatedly surveyed over the 3 nights: Mutton snapper location (near Station 12/12A), Grouper Ledge in southeast region of Rileys Hump, and Southwest Pinnacles. The latter two locations were suggested as possible sites that were sampled using passive acoustics to record fish sounds. A new survey location in the western region (New Spag) of the Reserve was identified during an independent mission conducted by Florida Fish and Wildlife Commission (FWC) in March of 2011 when a large aggregation of cubera snapper and black grouper were found near an outer ledge in about 50 m depth. Fishery sonar surveys were restricted to nighttime periods, so we were not able to verify the identification of the acoustic signatures to species.

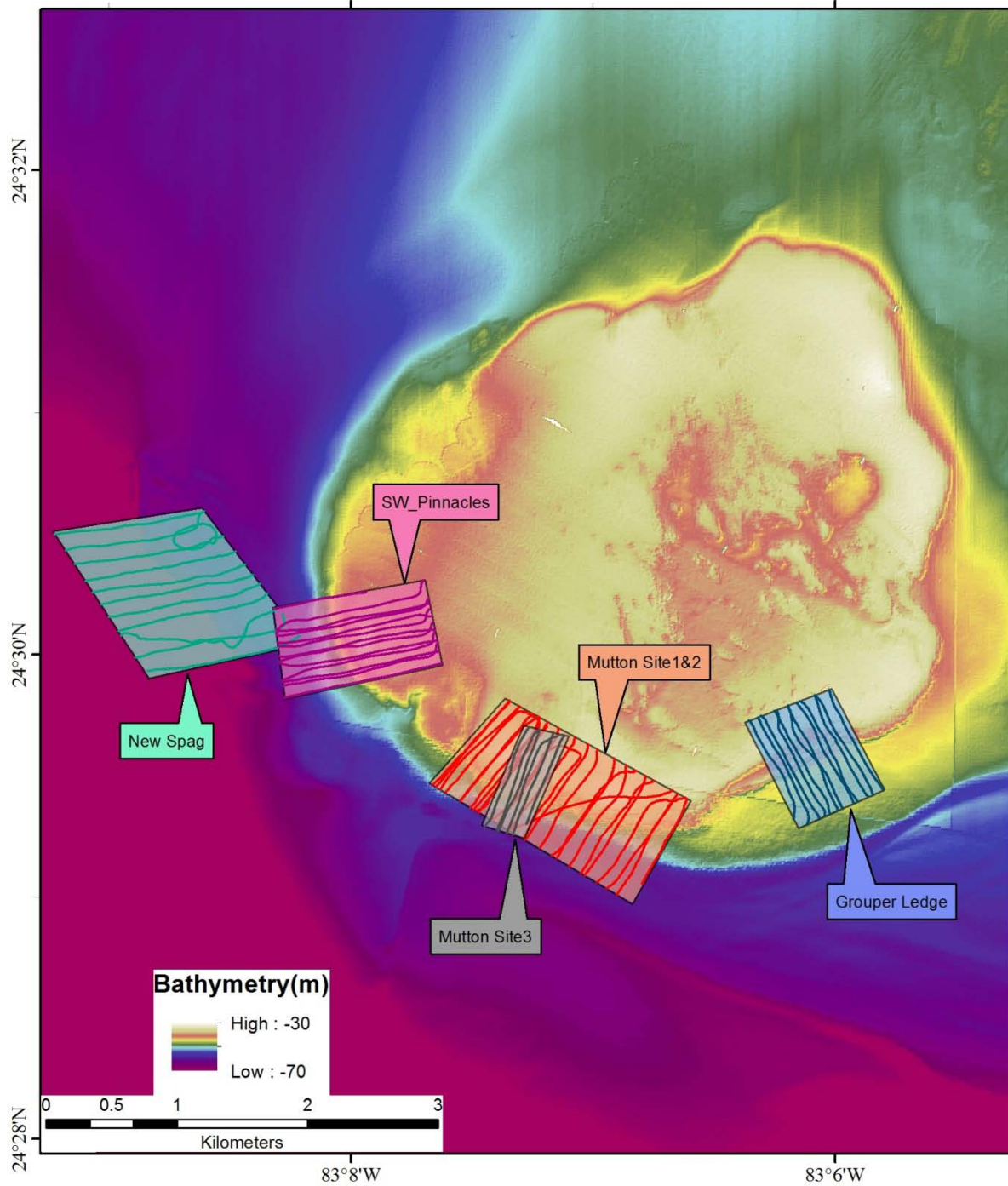


Figure 1. Distribution of fishery sonar surveys for spawning aggregations around Riley's Hump. See table 1 for additional details on survey distance and coverages.

Table 1. Metrics for fishery sonar survey coverage at Riley's Hump

Region	Linear survey distance (km)
Mutton 1&2	73
Mutton 3	14.1

<i>Grouper Ledge</i>	24.6
<i>SW Pinnacles</i>	24.2
<i>New SPAG</i>	19.1

How project supports goals & objectives of CRCP

This project supports the following goals and objectives of the CRCP:

Reduce the Adverse Impacts of Human Activities	Strengthen Existing MPAs
Reduce the Adverse Impacts of Human Activities	Reduce Overfishing
Understand Coral Reef Ecosystems	Monitor Coral, Fish, and Other Living Resources
Understand Coral Reef Ecosystems	Research Impacts of Management Actions

How project supports management of coral reef resources

This project continues to provide evidence that severely exploited species, once protected from excessive fishing pressure, may indeed recover. The previous finding of mutton snapper spawning occurring again after years of heavy overexploitation should further justify and advance the use of marine protected areas as a viable management tool to protect both coral reef fishes and coral reef habitat. Documentation of the increases in abundance of exploited species once they are protected from fishing benefits coral reef ecosystems (reef fish populations plus the coral reef habitat they use) by showing the effectiveness and utility of using MPAs as a management tool to protect these ecosystem components.

List of project Partners and their roles

We are working in partnership with NCCOS, FWC, the University of South Florida (USF), the SEFSC Miami laboratory, Reef Environmental Education Foundation (REEF) and FKNMS to monitor the living marine resources of the Tortugas Ecological Reserves' valuable marine protected areas in the southeastern U.S. FWC, NCCOS, USF, REEF and SEFSC Miami provided divers to help collect data, NCCOS provided expertise and equipment to collect split beam sonar data for detecting fish aggregations. FKNMS continues to support this research via the permitting process and guiding our overall research through discussions of the Sanctuary's research information needs.

FY2011 Publications /Presentations -None

Setbacks or challenges encountered in FY2011

There were no major issues with the execution of the project this year. We did lose a portion of a day to weather, but this is not unusual, and we were able to make up the work originally planned for that day. This year seemed to be an unusually high-current year, and we lost some transects for this reason, high current impacting our ability to get the same amount of work done as we would on a low current dive. We were only able to complete 90 transect counts in 2011

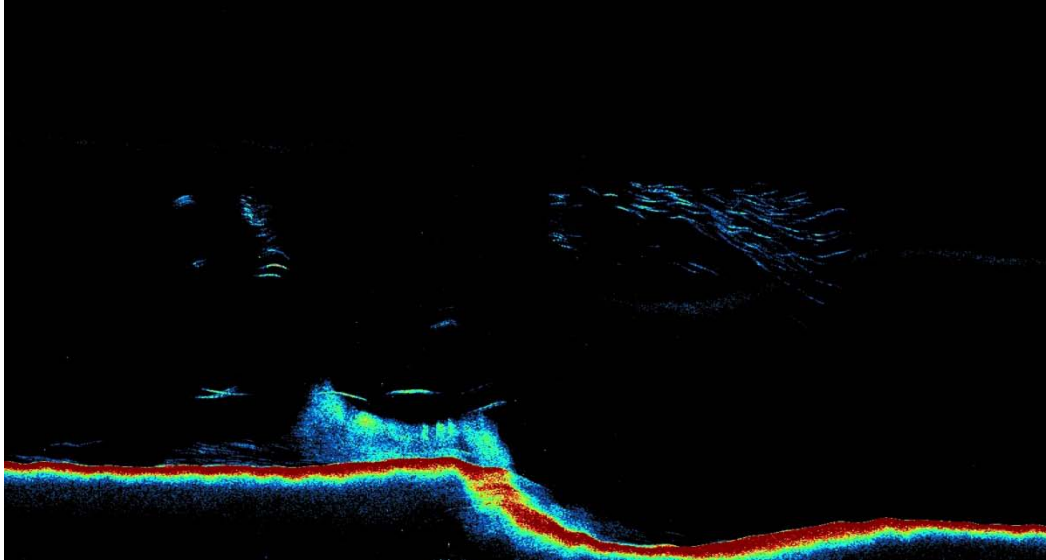
vs. 107 in 2009. Still, we were fortunate to avoid any catastrophic weather events such as hurricanes that could have caused us to cancel the entire cruise.

Comments on future direction of project

We envision continuing our biennial monitoring of population status of snapper grouper stocks and habitat in the Tortugas Ecological Reserves pending initially promised funding in 2013 and 2015. In addition, we have begun initial data collection on prey community composition and lionfish abundance at most stations on Riley's Hump, and we would like to continue this time series of data for two more years (biennially) in order to be able to draw conclusions about how lionfish are impacting the native fish community. Lionfish were first seen on Riley's Hump in April 2010, and since then their abundance has increased dramatically. Given their voracious nature, they do have the ability to significantly impact the composition of the native prey communities. Another facet of 2013/2015 research will be investigation of an apparent cubera snapper aggregation off the southwest edge of Riley's Hump, in approximately 180 feet of water. One fish in video footage taken of that aggregation in summer 2012 appeared to exhibit documented spawning coloration of cubera snapper from a spawning aggregation from Belize and described in the published literature. We are investigating ways we can explore this aggregation using technical divers, ROVs, drop cameras, etc., in the summer of 2013.



The original invader, lionfish seen on Station 15, Riley's Hump, April 2010.



Fishery sonar echogram showing dense aggregation of small fish near bottom and school are larger fish in the watercolumn.