

CORIS Submittal for Project ID#: 20505-2010: Coupling of passive and active acoustics to assess grouper aggregations in the TER.

Michael L. Burton, NMFS Beaufort Laboratory, SEFSC, 101 Pivers Island Rd., Beaufort NC 28516-9722.

Chris Taylor, CCFHR, 101 Pivers Island Rd., Beaufort NC 28516-9722; James Locascio, College of Marine Science, University of South Florida, St. Petersburg, FL

CORIS Product Name: Annual Progress Report for FY2010

Project Summary:

Goals: Project goals were several. Primarily, we wanted to collect visual census transect data enumerating all major species of groupers in order to determine if protection of fishes via ecological reserve designation was having any effect on population numbers. Secondly, we wanted to identify additional areas that were potential spawning sites for grouper aggregations, primarily black and yellowfin groupers. Thirdly, we wanted to deploy split beam sonar to characterize the habitat and the biomass (target strength) associated with this habitat. Increased numbers of groupers associated with spawning aggregations should show up as more dominant signals in the sonar returns. Low-light cameras deployed with hydrophone arrays will be used to record overnight activity on these sites and potentially capture grouper spawning (as done for mutton snapper). The hydrophones should capture any courtship/spawning sounds they make. Finally, we planned to deploy acoustic digital spectrum recorders (DSR) capable of staying deployed for a year. These data will be analyzed to determine if there are periodicities in sound production that may be associated with spawning rhythms. These passive acoustic data could also be leveraged with ongoing work by FWC, which has deployed VR2 receivers to record the movements of acoustically tagged fishes (likely spawners at Riley's Hump). DSRs deployed alongside a VR2 could possibly allow for the identification of an individual fish within a group of fish making sounds, but would not interfere with the listening abilities of the VR2s. Movement patterns of individual fish can also be compared to the distribution of sound levels at different locations. Additionally, data from the DSR can provide information on vessel traffic at Riley's Hump, which is part of the TSER, a transit only no fishing MPA.

Significance: This project is significant from a Sanctuary management standpoint because we are trying to assess the fisheries resources of the Riley's Hump area of the Tortugas South Ecological Reserve. This project has the potential to add to the mounting body of scientific evidence that over-exploited species like black grouper may indeed recover. Our recent documentation of mutton snapper spawning re-occurring after years of overexploitation should further justify and advance the use of marine protected areas as a viable management tool to protect both coral reefs and associated fishes. There is a growing body of scientific literature documenting multispecies aggregation sites in other areas (e.g., Belize; Grammanik Bank, USVI). These examples emphasize the potential of this work for other US reefs. Riley's Hump appears to be an such an area, as we have seen other species exhibiting apparent pre-spawning behavior

(ocean triggerfish, horse-eye jack), as well as other species in abundances greater than you would expect normally (black grouper, dog snapper). Documentation of the recovery of exploited species and the re-occurrence of spawning behavior in previously exploited populations benefits coral reef ecosystems by showing the effectiveness and utility of using MPAs as a management tool to protect these ecosystem components.

Documentation of the effectiveness of MPAs is relevant to the fisheries management community (SAFMC, GMFMC, CFMC) as well as to the Florida Keys National Marine Sanctuary. Data from this project is relevant to the SEDAR process (data previously used to develop fishery independent index of abundance for mutton snapper SEDAR). This project will utilize cost effective emerging remote technologies to accomplish research and management goals. This technique will be transferable to other spawning aggregations in U. S. waters and beyond. The presence of grouper aggregations forming in the reserve would provide added justification for the designation, creation and continued existence of the Tortugas South Ecological Reserve.

Description of accomplishments & results: Our first 3-day research cruise was planned for January 2010, but due to the previously referenced budget/acquisition problems, did not occur until April 29-May 1, 2010. During this cruise we deployed three digital spectrum recorders, passive acoustic recording devices capable of recording for more than a year, at programmable intervals (i.e., 1 minute every hour, etc.). DSRs were deployed at originally planned stations where previous dive surveys had noted increased numbers of groupers, making them likely spawning aggregation sites. Fish census transects and cylinder point counts were done at each of these stations as well.

Additionally, at two stations we deployed cameras in housings for overnight recording of any fish activity near the DSRs. After the first day of dive operations we conducted active acoustic split beam sonar transects from 1630-1900 hrs, completing two complete mappings of the Station 12-12A complex. On April 30 we rode out to our dive sites, assessed the weather, and called off dive ops for the day, as seas were in excess of 5 ft and winds were 20-25 knots. We were unable to complete sonar transects that night either. On the morning of May 1 the weather had abated enough to allow us to recover the two cameras deployed the first day. While some cruise time was lost to weather, we were able to accomplish three key goals of this research: 1) deployment of long term passive acoustic recorders on all three key stations; 2) completion of fish counts (transects and pt. counts) within proximity of recorders; and 3) deployment and recovery of overnight cameras in order to obtain any relevant fish behavior footage.

Our second cruise, originally planned for February 2010, was conducted June 27-28, 2010. Weather was treacherous on this cruise, and we made only one dive before calling off dive operations on day 1. We drove out to the dive site on the second morning, and the weather was no better, with the forecast not improving, so I cancelled the cruise and we went home.

The third and final cruise, originally planned for either March or April 2010, was delayed until January 2011. We opted not to conduct it during the summer of 2010 as this would have been temporally inconsistent with grouper spawning season. Results of this cruise are given in the annual progress report from year 2, FY2011.

The acoustic data from the two DSRS deployed from April-June 2010 have been preliminarily analyzed, and no instances of sounds associated with spawning serranids have been identified. The data will be combined with data to be retrieved in summer 2012 and analyzed in totality when obtained. We suspect the inability to get the equipment deployed during peak spawning season was consequential for year one results. We are hoping to see more conclusive results when we retrieve the DSRS that were successfully deployed over-winter in July 2012. Final data analyses and a final report on this project will be completed by Nov 30, 2012

How project supports goals & objectives of CRCP:

This research supports CRCP Fishing Impacts Goal and Performance Measure (FIG-PM) F1 PM1.1 and FIG-PMs F2 PM2.1 and PM 2.2. This project, and the partnership with NCCOS, FWC and FKNMS to monitor the living marine resources of the TSER and TNER valuable marine protected areas in the southeastern U.S. will contribute toward an overall goal of 85% of all jurisdictions monitored by the year 2012, as well as ensuring that 100% of coral reef regions have improved coral reef living marine resources by 2015. The active acoustic technology we will be using (split beam sonar) is an exciting tool to assess the recovery of exploited fish stocks and characterize both the coral reef habitat as well as the associated fish community.

How project supports management of coral reef resources (please include how research plans, progress and accomplishments are articulated to managers):

Research plans are articulated to managers in the proposal development process, as the management community are partners in this project. Progress and accomplishments are provided in annual reports and at appropriate meeting venues, whenever possible.

List of project Partners and their roles:

NCCOS, CCFHR, Dr. Chris Taylor – co-PI
University of South Florida, Dept. of Marine Science, Dr. Jim Locasio – co-PI
FKNMS – assist in planning/research priorities

Communications, media exposure, capacity building, education and outreach activities: None

Submissions to CoRIS: None

Publications during FY2010 (including reports, tech Memos, etc): None yet, final report planned for CY 2013 upon completion of two year project and comprehensive analysis of data.

Presentations at professional meetings (oral/posters/moderator/editorial responsibilities etc.): None currently planned.

Setbacks or challenges encountered in FY10: Late arrival of budget, difficulties with both local procurement staff and ERAD procurement staff.

Comments on future direction of project (outyear plans and notes on how project (or future projects) will align with new CRCP priorities going forward): Work continues on analysis of first year of data collection, and recording devices are currently deployed collecting year two data, scheduled retrieval in July 2012.

Image/Photo



Co-PI Jim Locascio, USF, and Ken Brennan, NMFS Beaufort Laboratory, deploy underwater cameras with hydrophones at selected stations to study acoustics of grouper spawning aggregations. (Photo courtesy Mike Judge, NMFS, SEFSC, Miami Laboratory).



Digital Spectrum Recorder deployed to collect passive acoustic data for up to a year in attempt to document spawning activity in groupers.