FLORIDA KEYS NATIONAL MARINE SANCTUARY
RESEARCH & EDUCATION PERMITS

GUIDELINES FOR SUBMITTING PERMIT REPORTS
Interim Report & Final Report

Please submit all the requested information electronically (MS Word, rich text format, or PDF) to Brian Keller (Brian.Keller@noaa.gov), Scott Donahue (Scott.Donahue@noaa.gov), and Joanne Delaney (Joanne.Delaney@noaa.gov).

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Permittee name and contact information (affiliation, address, phone, fax, e-mail):

Meaghan Johnson
The Nature Conservancy
PO Box 420237
Summerland Key, FL 33042
(305) 745-8402 x101
(305) 745-8399 fax
meaghan_johnson@tnc.org

Type of report: (contents are the same)
☐ Interim report
☒ Final report

Methodology:
Significant declines in living coral coverage within the Florida Keys National Marine Sanctuary, and worldwide, have occurred in recent decades due to local, regional, and global threats. In particular, the important reef building coral *Acropora cervicornis* has also been in major decline. This project aims to restore degraded reefs in the Upper Keys by transplanting fragments of naturally occurring and wild staghorn coral.

Phase 1:
Approximately 25 staghorn parent coral colonies naturally settled onto a privately owned permitted live rock farm in the Upper Keys. These 25 adult colonies have been clipped using traditional techniques, creating approximately 50 new fragments. Each fragment is cemented to a small cement cast (10cm or less in diameter) and will remain on platforms within the live rock farming site. As these adults and new fragment colonies grow, they will become ready for more clipping to produce more fragments for outplanting. In addition to fragmentation, the genotypic identity of the 25 parent colonies has also been determined. Tissue samples (~1cm2) from each of the 25 parent colonies were collected in vials and preserved in 95% ethanol. The samples were then analyzed by Dr. Iliana Baums at the University of Miami, RSMAS campus.

Three 10cm fragments were also collected from each of the 22 wild colonies sampled within the Upper Keys sub-region. These colonies were fragmented using traditional techniques, epoxyed to the cement casts, and relocated to the coral nursery to create over 300 new fragments. Each of the fragments has been labeled by colony number and fragment number (eg. 1-1, 1-2). The cement blocks on which these staghorn fragments are mounted, have been arranged by number and secured with rebar. This will prevent any storms from disrupting, or tipping over the cement blocks. Tissue samples have also been collected from each of the wild colonies and have been

analyzed by Nikki Fogarty, a graduate student at Florida Sate University. Nikki has analyzed the samples following the methods used by Dr. Illiana Baums.

Phase 2:
Relocation sites have been established within each of the Florida Reef Resilience Program (FRRP) reef zones (inshore, mid-channel, offshore, and reef margin). These sites were chosen based on local knowledge and historical information and vary in depth and distance from shore.

Five EcoReef modules have been deployed at each site, in the sandy areas adjacent to each patch reef and anchored using duck-bill wire anchors (see photo 1). Each EcoReef was labeled with a pre-numbered disk that identified the module on the site. Due to early warm water temperatures, the outplanting of the corals was postponed until November.

Results:

In early November 2006, outplanting of the corals from the coral nursery to the restoration sites began (see photos 3 and 4). Coral fragments that were outplanted were chosen based upon their survivorship history, current growth rates, genetics, and overall health. Between November and January, 70 corals were outplanted to each site. In May, 50 more fragments were outplanted, for a total of 120 corals. Six fragments were placed on each module, for a total of 30 fragments (10 genotypes) per site.

EcoReef modules were chosen as the outplanting module because they: provided an elevated platform that could be easily anchored in sand, the arms offered protection to the corals, and they were uniform in size and shape. After installation, the modules were monitored monthly to insure stability. For the first six months of monitoring, broken arms from the modules were recovered during almost every visit.

Six months after installation (May 2007), rebar was installed in the middle of the inshore and mid-channel EcoReef modules to insure stability due to broken arms. The breakage was likely due to sharks, turtles, or possibly even divers. The offshore and reef margin sites (> 25ft.) had very minimal breakage and did not require extra support.

A year after installation (November 2007), the modules at all of the sites are doing well. After the initial breakage of the arms and installation of the rebar, the modules seem to be well established (see photos 5-8).

Overall, the EcoReef modules proved to be very fragile, both in and out of the water. Of the 30 modules ordered, about 10% were broken beyond repair, and 10% were broken but fixable. Once on the bottom, many arms were broken during the first six months, but seemed to be stable after a year. The modules within the offshore and reef margin sites (deepest sites) have had the least amount of breakage. We would suggest using these modules at deep water sites or grouping them together to prevent extensive breakage.

Graphs and Photos:

Photo 1: Installation of the Ecoreef modules

Photo 2: Assembly of EcoReefs by staff and volunteers

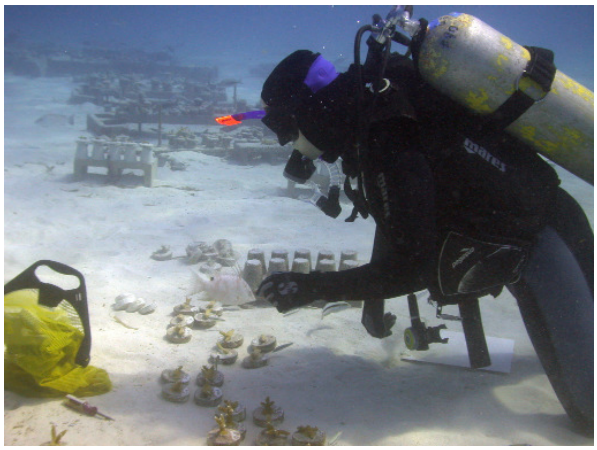

Photo 3: Gathering of corals from the nursery

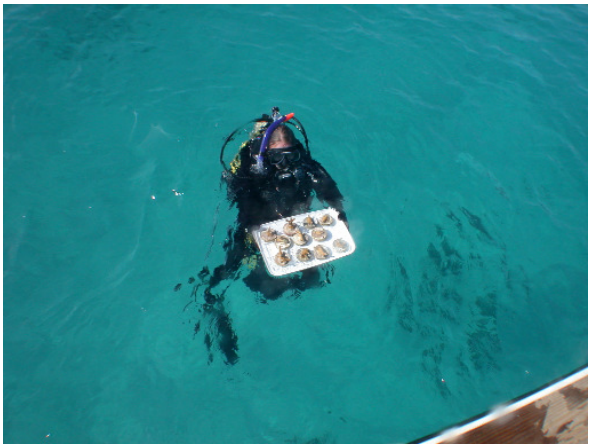

Photo 4: Outplanting of corals to the restoration sites

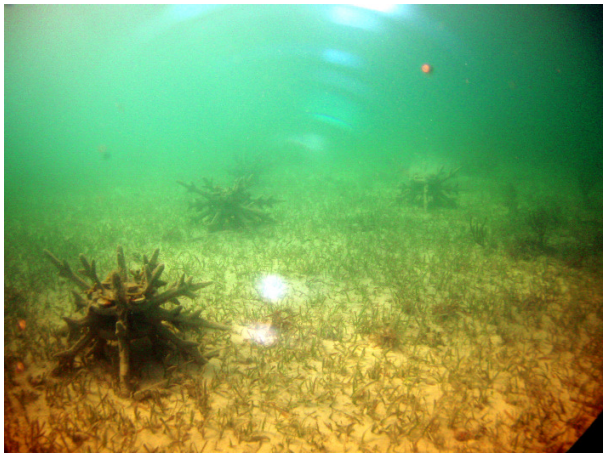

Photo 4: Inshore site February 2008

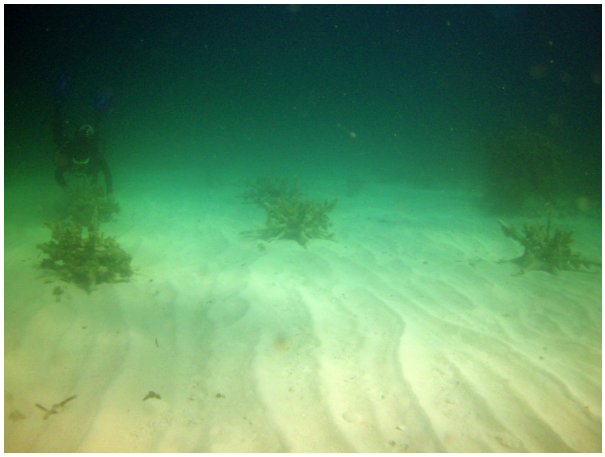

Photo 5: Mid-channel site February 2008

Photo 6: Offshore site February 2008

Photo 7: Reef Margin site February 2008