Assessment of *Oculina* Habitat Area of Particular Concern (OHAPC) restoration efforts
Project title*: Can human intervention increase recovery potential of destroyed deep-water coral (Oculina varicosa) habitat and fish populations?*
Funded by: NOAA's National Undersea Research Center (NURC); Cruise #2008-08
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Project Overview
Large areas of the former well-developed and biologically diverse *Oculina varicosa* habitat have been reduced to fine rubble, most likely by persistent trawling. The remaining intact areas of *Oculina* habitat are very small and located at the southern end of the OHAPC. Coral larvae can potentially be transported north to re-colonize the damaged regions by the prevailing flow of the Florida Current. There is however, little evidence of re-colonization on the large rubble areas that are common in the northern OHAPC. The reasons for this are unknown, but assuming that larvae are carried to the site, it is possible that the rubble does not provide appropriate substrate for successful coral recruitment. Continuing illegal trawling might also have interfered with survival of new colonies. Concerns regarding re-colonization potential of the *Oculina* Banks were a major factor in the recent designation of *Oculina varicosa* as a "Species of Concern" by NOAA Fisheries.

The intent of the *Oculina* habitat restoration effort was to determine whether or not human intervention (deployment of artificial substrates) could enhanced recovery of destroyed coral habitat and associated fish populations in the *Oculina* Banks. The first artificial substrates were deployed in 1996 with 56 large concrete structures distributed between the southern and northern extents of the *Oculina* Experimental Closed Area. In 2000 and 2001 the project was expanded by the deployment of a total of 225 large (1m x 1m x 1m) reefballs and 900 small (10" diameter) experimental units. In 2000 the reefballs were placed in replicate variations in cluster size (5, 10, 20 per 500 m^2), and in 2001 half of the clusters (all 20 per 500 m^2) had additional internal complexity to attract small food fish for the larger species.

In April 2008, NOAA's undersea research program (NURC) funded a research cruise to evaluate the efficacy of the recruitment modules. The project used technical divers to conduct detailed surveys of the reefballs, on the premise that the human eye is a much better tool than a Remotely Operated Vehicle (ROV) or submersible-mounted camera, particularly around small targets and limited visibility. The research vessel *Freedom Star* was provided by NASA and the technical divers were certified by NURC as having sufficient credentials and experience.

Cruise Summary
The cruise was scheduled to begin operations on Tuesday April 1st but was delayed by strong winds until Thursday April 3rd, when initial dives were conducted in shallow water to test logistics and equipment. The first deepwater operational dives began on Friday April 4th. During the scheduled 11-day cruise, the technical divers conducted 12 dives at depths between 240 and 290 feet, but the last 2 of these were abandoned because of poor visibility. A total of 7 dives were completed at the Sebastian Pinnacles reefball sites, and of these, only 2 observed reefballs; a cluster of 5 on April 5th and a cluster of 10 on April 6th. The units could not all be thoroughly surveyed due to strong currents but none of those inspected showed coral colonization or enhanced fish abundance. Both of these sets were found on the north-facing

slopes of the ridges, which are not favorable for coral recruitment since they are in the lee of the prevailing north-flowing current. Unfortunately, no clusters were seen on the south slope of the ridges and therefore researchers cannot unequivocally determine whether the modules have served any useful ecological function. Researchers expected to see some indication of enhanced fish abundance purely because of structure effect, even on modules that were sub-optimal for coral settlement so this result was not encouraging. Two dives were spent at Chapman's Reef, where a deepwater Oculina benthic observing system (DOBOS) was deployed from the ship and placed into position by divers. This tripod structure was approximately 2 m tall and supported a passive acoustic fish monitor, a camera and a temperature datalogger. The DOBOS was a collaborative effort between HBOI and NOVA Southeastern University and will stay in place for 6 weeks, gathering continuous *in situ* data on abundance and behavior of reef fish on Chapman's Reef. This area was considered one of the very few (relatively) intact *Oculina* habitats remaining in the reserve; however video footage collected by the divers indicated that the reef was not as healthy as previously thought. This site was surveyed in 2001 using Harbor Branch's *Clelia* submersible and large live colonies were documented by the observers, especially along the crests and flanks of south-facing slopes. Although the bottom time of a technical dive at this depth is limited to approximately 20 minutes, the divers were in the same general area as the *Clelia* dives and we would have expected them to see some large healthy colonies. Video and personal reports indicate that these have been replaced by small fragmented colonies of less than 50 cm in diameter over low relief standing dead coral and rubble. There are no obvious trawl tracks and there is still live coral present at this site but there appears that some kind of physical impact that has impacted this area since the previous survey in 2001. This conclusion is further supported by the observation of three of the Chapman's Reef Recruitment blocks that were deployed in 1998. One of these was intact and covered in a variety of different sized coral colonies, and the other two were completely destroyed with the blocks scattered over a distance of several meters.

Conclusions

Although the NURC divers were excellent; dedicated and professional, this was not the most appropriate method of surveying the recruitment modules. Divers were limited by bottom time and at the mercy of the often very strong currents in this habitat (even with the assistance of scooters) therefore had very limited search and survey capacity.

The reefballs that were located at Sebastian Pinnacles did not support enhanced coral or fish populations, but definitive conclusions can not be drawn because of the small sample size and suboptimal location of those that were observed.

Chapman's Reef, while still considered a 'live' habitat, appears to have been impacted (possibly by trawling); coral and reef fish populations were not as prolific as reported in 2001 and recruitment blocks were completely destroyed. There was also a considerable amount of heavy fishing line observed in this area.