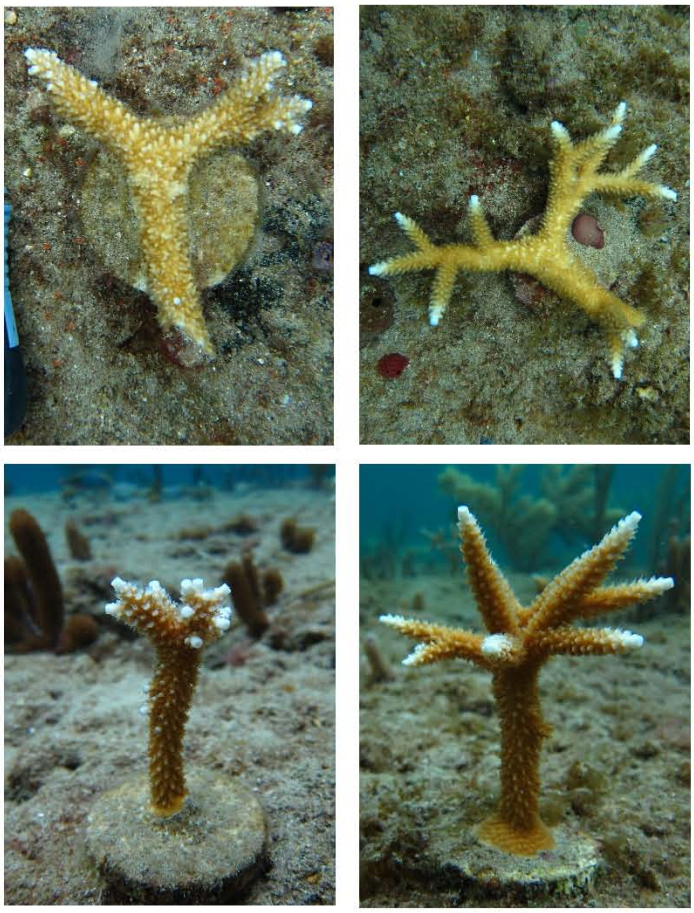
LAUDERDALE-BY-THE-SEA
STAGHORN CORAL OUTPLANTING PROGRAM
SECOND REPORT: OCTOBER 2015



Submitted by:

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Submitted to:

Town of Lauderdale-By-The-Sea
October 2015

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STAGHORN CORAL OUTPLANTING PROGRAM
INITIAL REPORT: JUNE 2015

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June 2015

Outplant Locations

During December 2014 and February/March 2015, 12 locations on the nearshore ridge habitat offshore the Town of Lauderdale-By-The-Sea were evaluated for potential staghorn coral, *Acropora cervicornis,* outplant sites. Of these 12, four sites were chosen and were named Staghorn City, Aruba's, South Commercial and Snorkel Trail (Figure 1 and Table 1). All of the sites are within 700 m of the beach in less than 7 m of water.

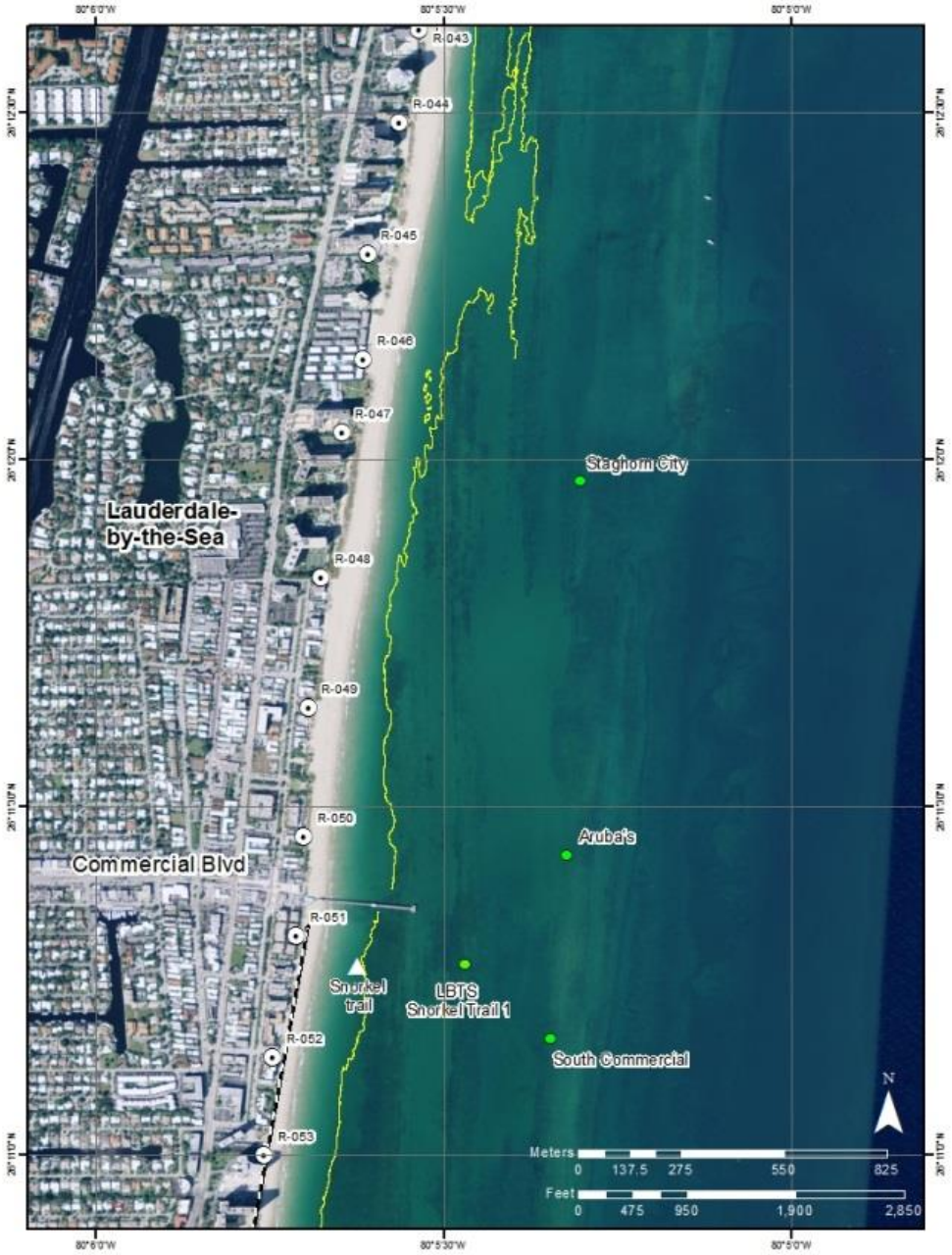

Figure 1. Map of the four (green dots) staghorn coral outplant sites.

Table 1. Locations of the four staghorn coral outplant sites.

Site	Latitude (N)	Longitude (W)
Staghorn City	26° 11.970’	80° 05.303’
Aruba’s	26° 11.422’	80° 05.323’
South Commercial	26° 11.167’	80° 05.346’
Snorkel Trail	26° 11.278’	80° 05.455’

Outplant Methods and Design

During March and April 2015, a total of 1020 staghorn corals were outplanted in total to the four sites. Two layout designs were established for coral outplanting, a colony size and technique design and a colony density design. Table 2 list the outplant design and numbers of corals outplanted for each site

Table 2. The outplant design and number of outplanted coral for each site.

Site	Outplant Design	Number of Corals
Staghorn City	Size and Technique and Density	135 and 301
Aruba’s	Size and Technique	135
South Commercial	Size and Technique	135
Snorkel Trail	Density	314

The colony size and technique design was established to investigate a possible relationship between the initial size of the outplant colony and attachment technique when predicting success. The outplanted corals were grouped into three size (linear tissue extension) classes: small (5-10cm), medium (10-30cm) and large (30-50cm). Colonies within each of these size classes were outplanted using nail and cable tie, a puck with epoxy or directly to the reef substrate with epoxy. Figure 2 shows examples of the size classes and techniques.

The colony size and technique design was installed at three sites (Table 2). Each site included 135 outplanted corals. At these sites corals were outplanted in three groupings referred to as arrays. Within each array 45 corals were outplanted in a random pattern as seen in Figure 3. Each array was approximately 50 m^2 and arrays were separated by approximately 10 m.

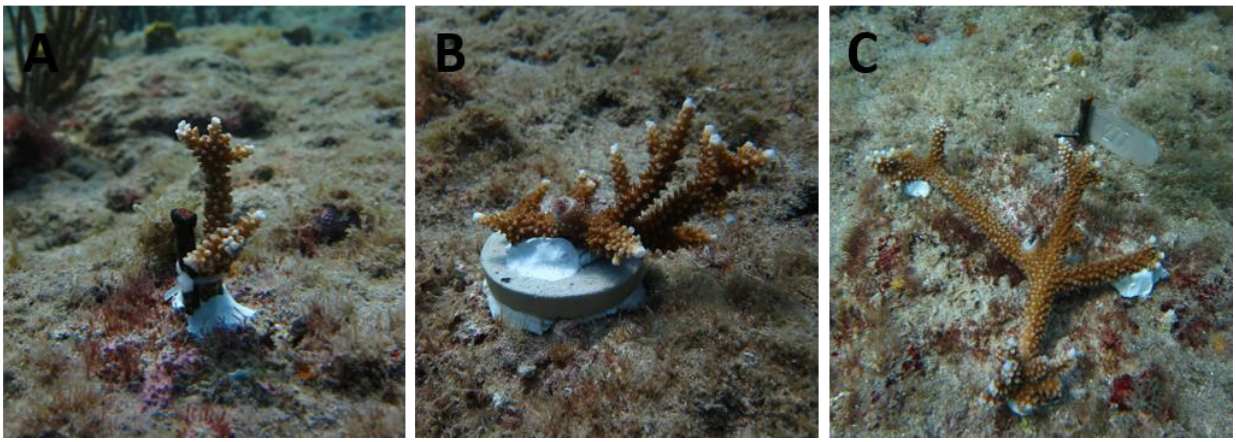

Figure 2. Example of an outplanted colony in the small size class attached with nail and epoxy (A), medium colony epoxied to a puck which is epoxied to the reef (B), and a large colony epoxied directly to the reef (C).

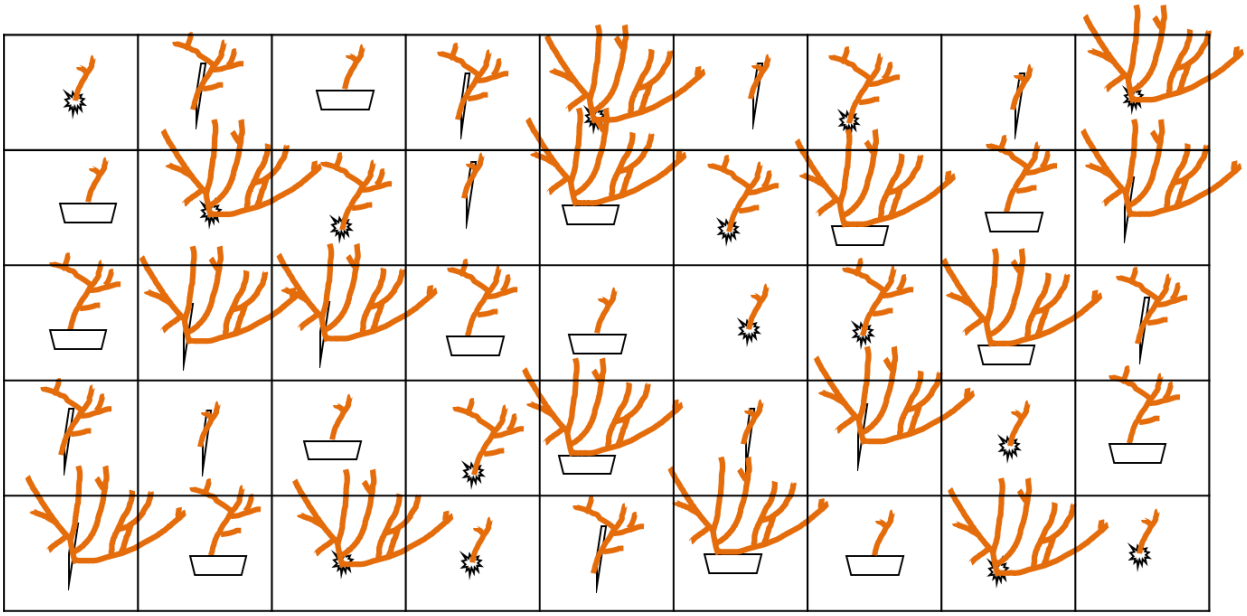

Figure 3. An example an array of 45 corals illustrating the random placement of the outplant colonies by colony size and attachment-technique.

The colony density design was chosen to evaluate survivorship and growth of corals outplanted very close (less than 30 cm) to each other in a high density array (Figure 4). For this design corals of varying sizes were outplanted and were dependent upon what was available in the nursery. Eleven different colony genotypes were included in the design to examine differential survivorship and growth within the high density arrays. The high density arrays were installed at two sites (Table 2), and at each size approximately 300 corals were outplanted.

Figure 4. Researchers attaching outplanted corals to a closely spaced, high density array.

Corals at the high density sites were arranged in a grid set-up so that the fate of the individual genotypes could be monitored. A different genotype was outplanted into each grid, and each grid was approximately t 2 m by 2 m. The total area of each high density array was approximately 24m^2.

Documentation

The entire effort was documented through still images and video which included the entire process of choosing the outplant sites, removing corals from the nursery, transporting corals to the outplant sites, outplanting the corals and monitoring the corals. These images and video will be used as a staghorn coral restoration outreach tool. Figure 5 provides examples of images documenting the process.

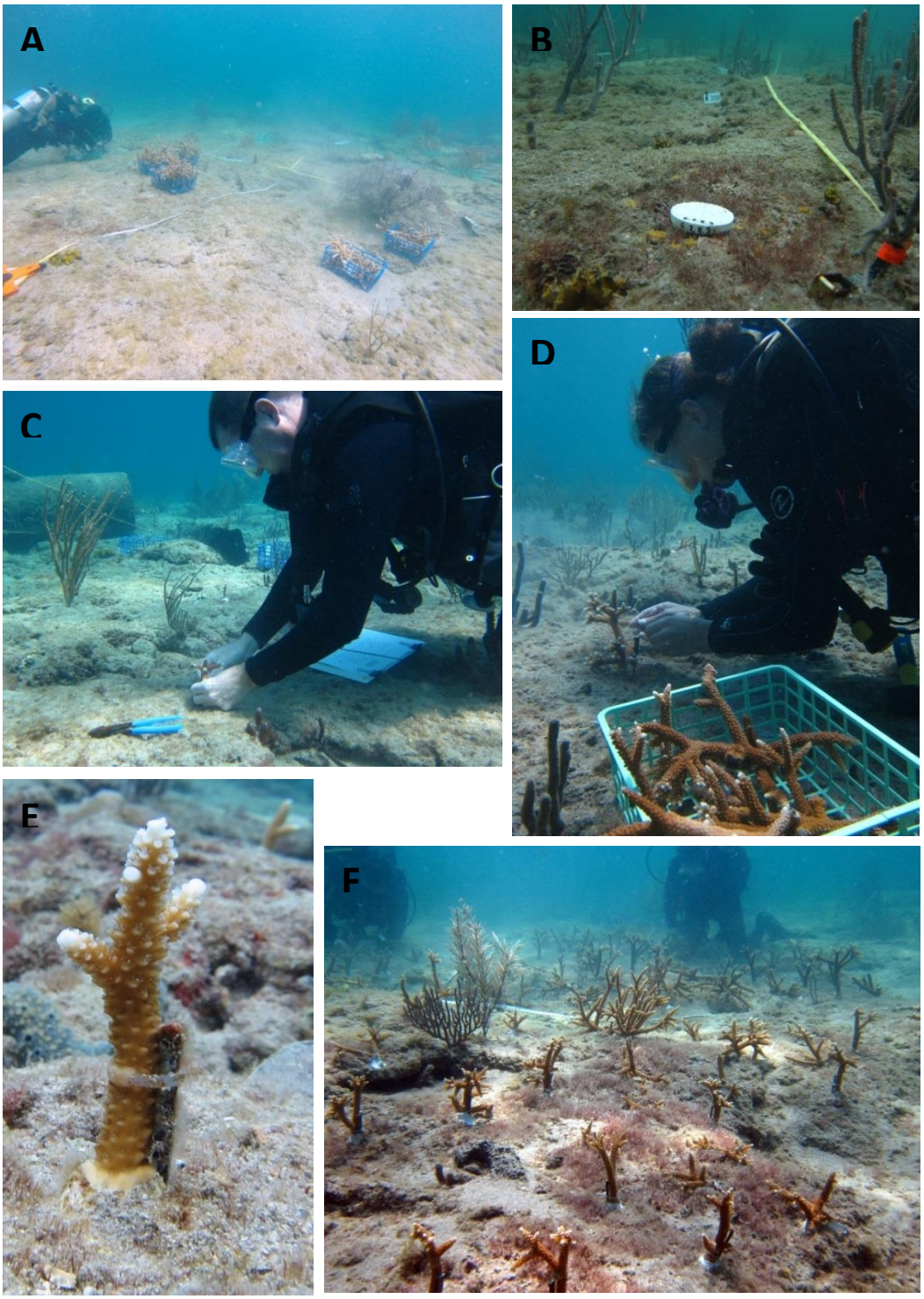

Figure 5. Examples of images taken during the outplanting process: images A and B are site set-up, C and D are outplanting corals, E is an outplanted coral after one month showing growth over epoxy and cable ties, and F is post outplanting at a high density site.

Outplant Colony Monitoring

Completed outplant sites were visited during subsequent outplanting efforts, and all sites were visited one month post-outplanting to document colony survival, attachment success and health. For the corals outplanted in the colony size and technique design, survival was very high (99%, 399 of the 405 colonies) following one month and corals were beginning to over grow the attachment materials. All colony mortality occurred within the small or medium colony size classes. The epoxy technique had the greatest mortality with three corals, followed by puck with two corals and the nail and epoxy technique lost one coral. There was no observed colony mortality at Staghorn City, one colony died at Aruba's, and 5 colonies died at the South Commercial site. Across all the size and technique design sites there were no colonies missing and no predation or disease observed.

Both the Staghorn City (98%) and Snorkel Trail (94%) high density sites had high survival one month post outplanting. Similar to the size and technique design sites, the corals at the high density sites were beginning to overgrow the attachment materials and attach to the reef substrate. Two corals were reported as attached but completely dead. The remaining corals not counted were reported as missing. Missing corals may be due to poor attachment or dislodgment caused an unknown event. Partial colony mortally from predation by fireworms was seen on several corals (Figure 6). No disease was observed. All sites will be visited again in August to record survival and condition data four - five months post outplanting.

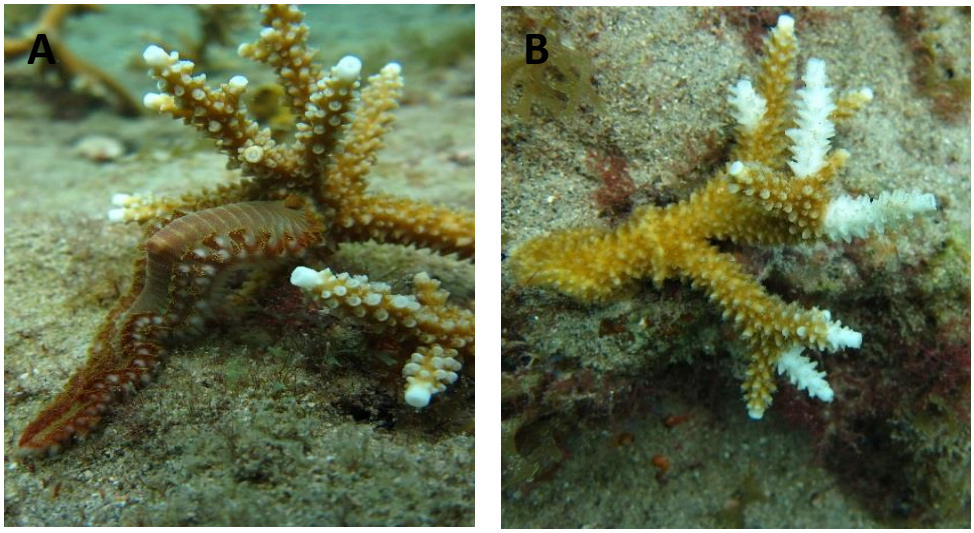

Figure 6. Outplanted coral with a fireworm actively feeding on a branch (A) and white branch tips indicating mortality following fireworm predation (B).