



The Effect of the 2010 Cold Water Event on the Middle Florida Keys Coral Nursery

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Background

Staghorn coral (*Acropora cervicornis*) has drastically declined on Florida and Caribbean reefs since the late 1970's. *In situ* coral nurseries are being used to grow *A. cervicornis* to restore these degraded reefs.

FWC established a nursery in the Middle Florida Keys in 2009 using funding from the American Recovery and Reinvestment Act (ARRA) as part of a collaborative effort led by The Nature Conservancy (TNC) and the National Oceanic and Atmospheric Administration (NOAA). The Middle Keys nursery is part of a system of nurseries established throughout Florida and the Caribbean.

A Middle Keys nursery was selected because we anticipated that Middle Keys *A. cervicornis* may be more resilient to a wide variety of environmental stressors due to their proximity to Florida Bay.

December 2009- *A. cervicornis* fragments were collected throughout the Middle Keys and placed in the nursery (Figures 1 and 2).

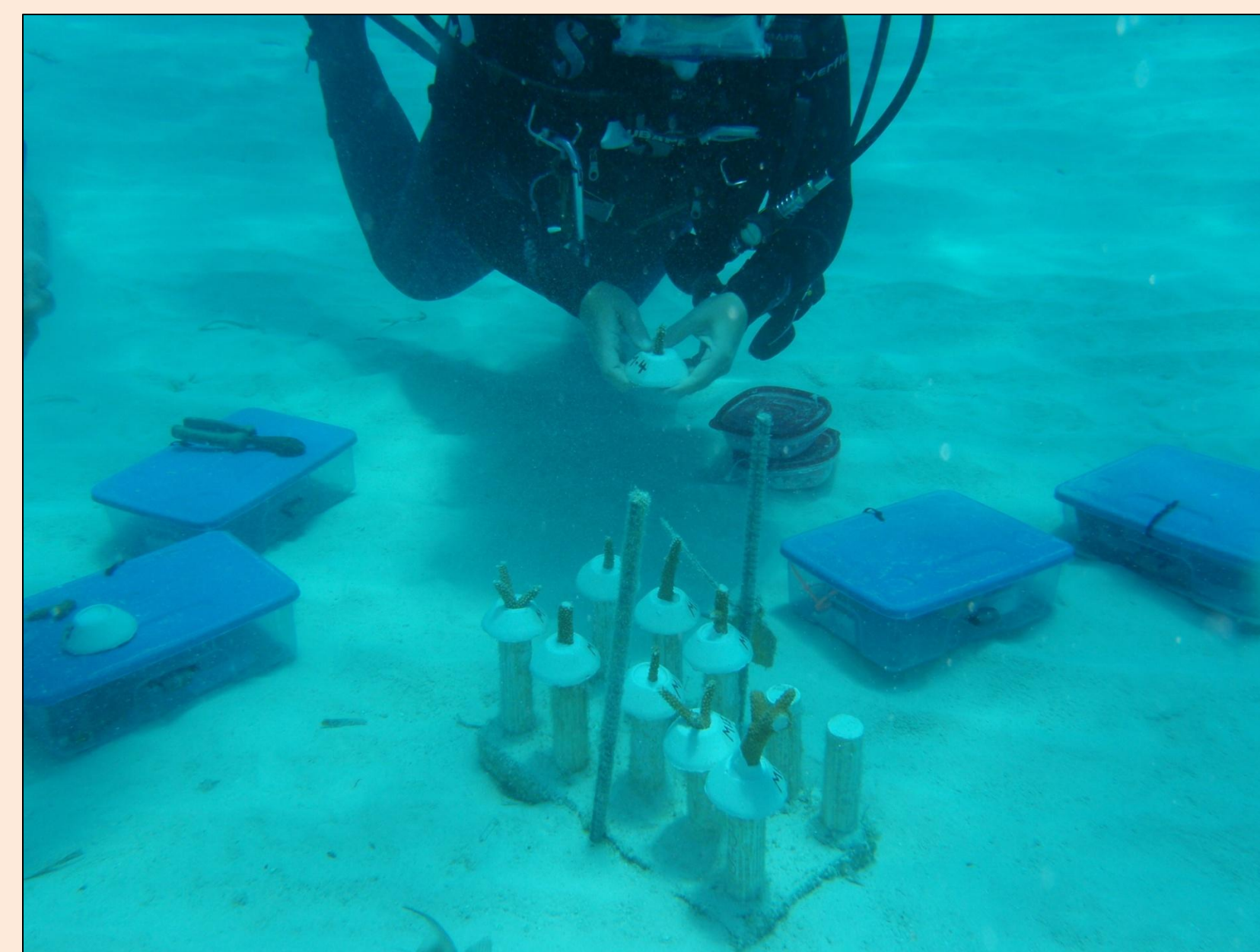
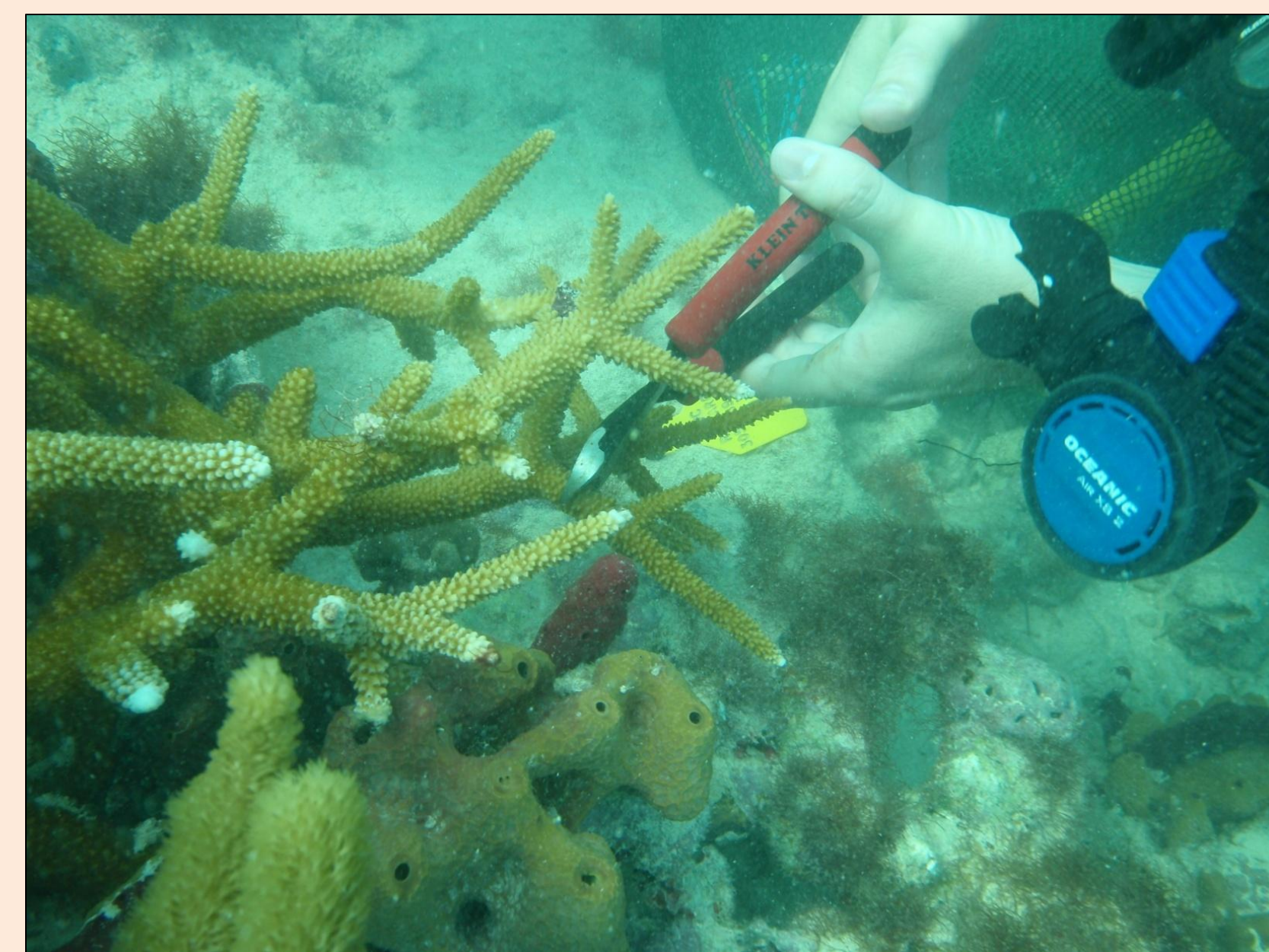


Figure 1. Fragment collection from donor parent colony.

Figure 2. Establishment of fragments in the nursery.

The 2010 Cold Event

January 2010- Atypically cold temperatures were experienced in Keys waters.

Temperatures at the nursery ranged from 13 C to 16 C over a 5 day period (Figure 3).

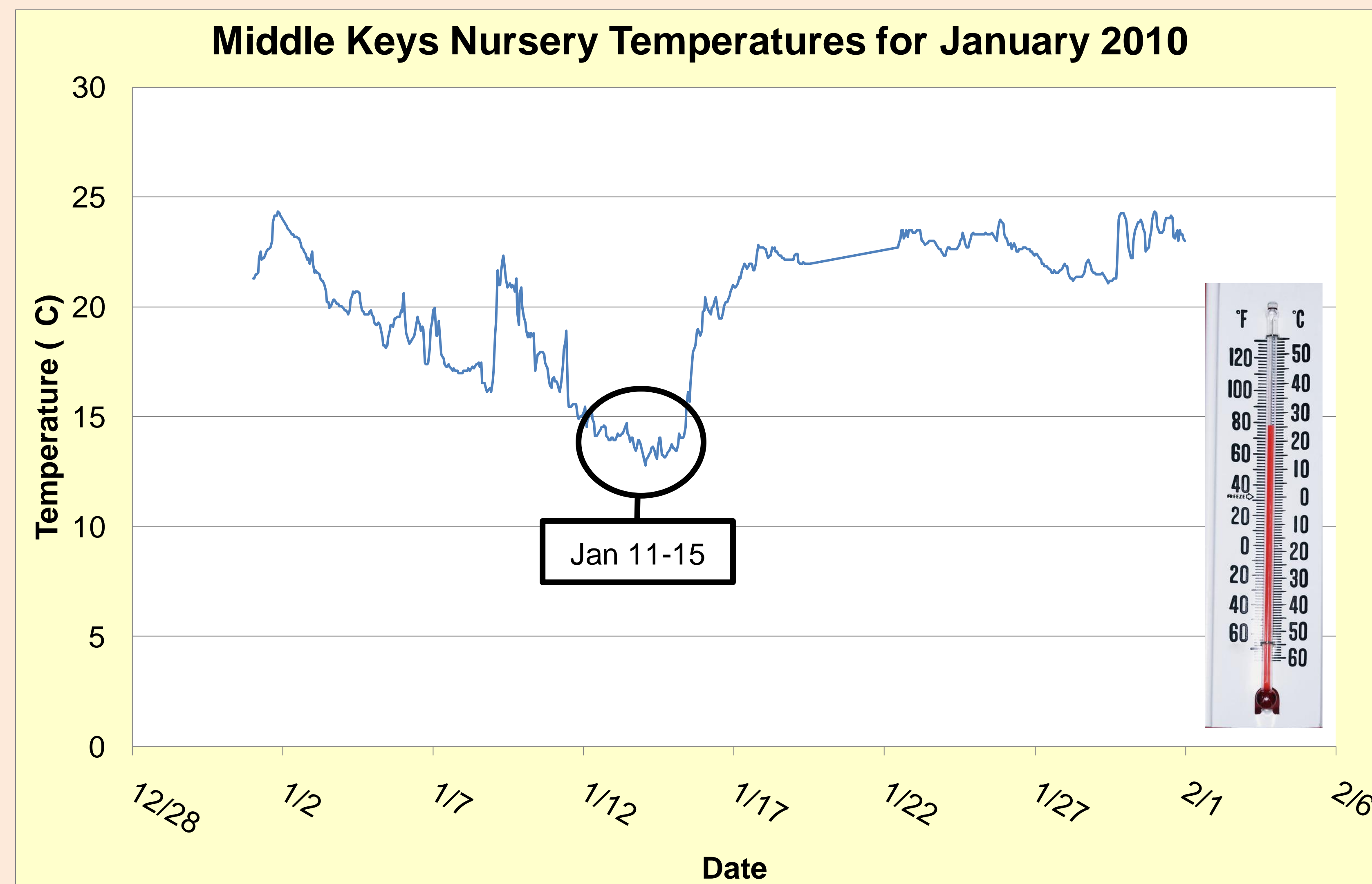


Figure 3. Temperatures recorded in the Middle Keys nursery during January 2010.

What Happened After the Cold Event?

After the cold water event, inspection of the original parent colonies revealed that more than half of the total number of colonies were dead (Figures 4 and 5).

Other large, presumably long-lived coral colonies were also conspicuously affected, underscoring how uncommon this event was. For example after the cold event, a Middle Keys *Montastrea faveolata* colony, with a diameter of 4.2 m and height of 4.3 m, suffered 96% mortality.

At the nursery, no *A. cervicornis* fragments survived (Figure 6 and 7).

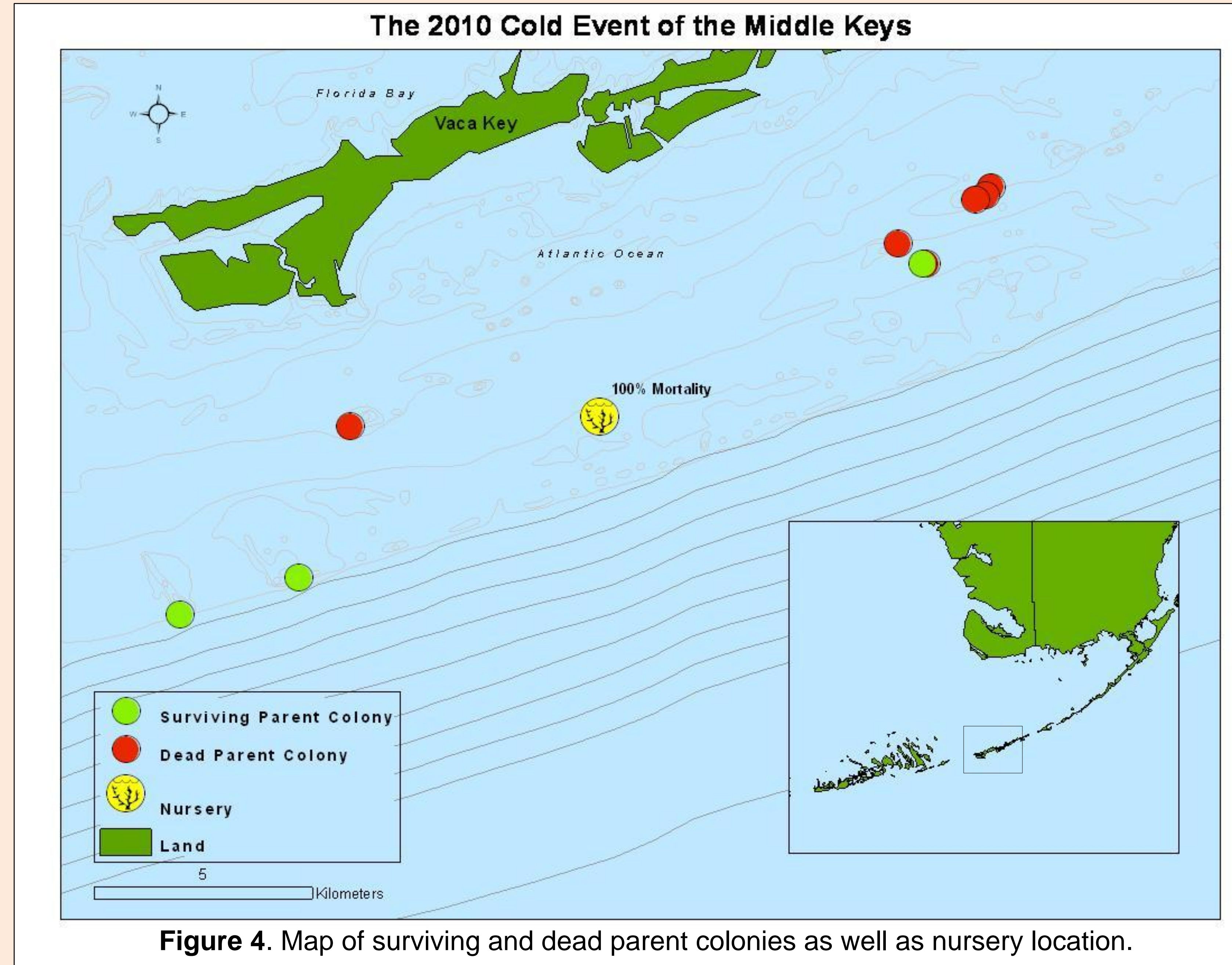


Figure 4. Map of surviving and dead parent colonies as well as nursery location.



Figure 5. A parent colony on the day of fragment collection and after the January cold water event.

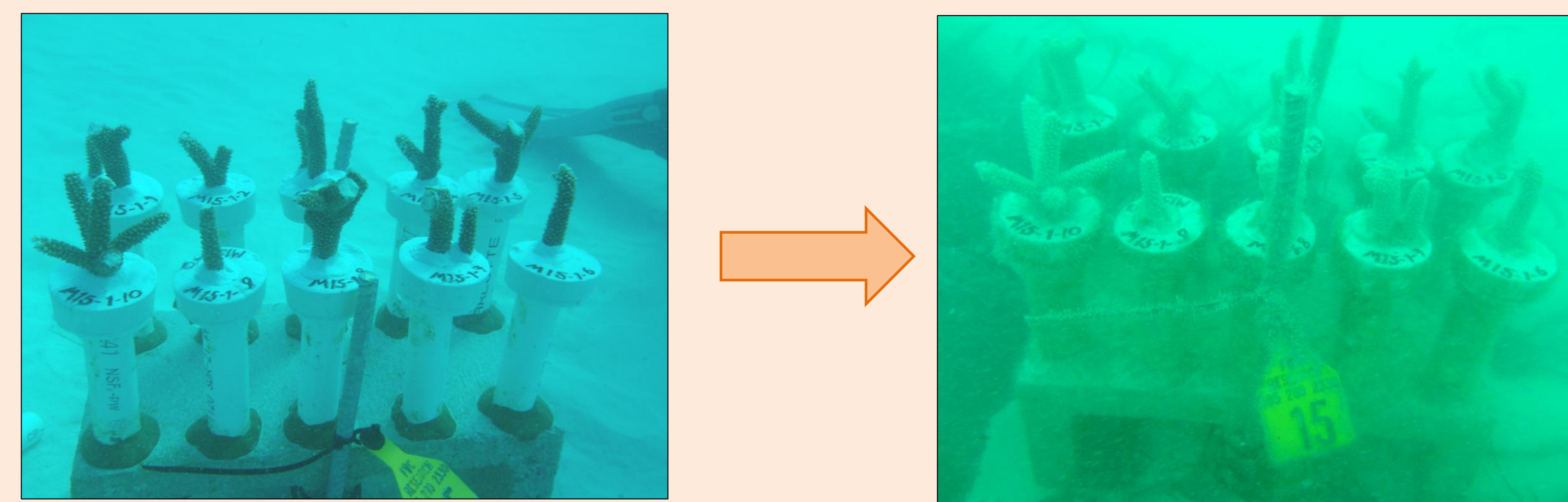


Figure 6. Nursery fragments on the day of fragment collection and after the January cold water event.

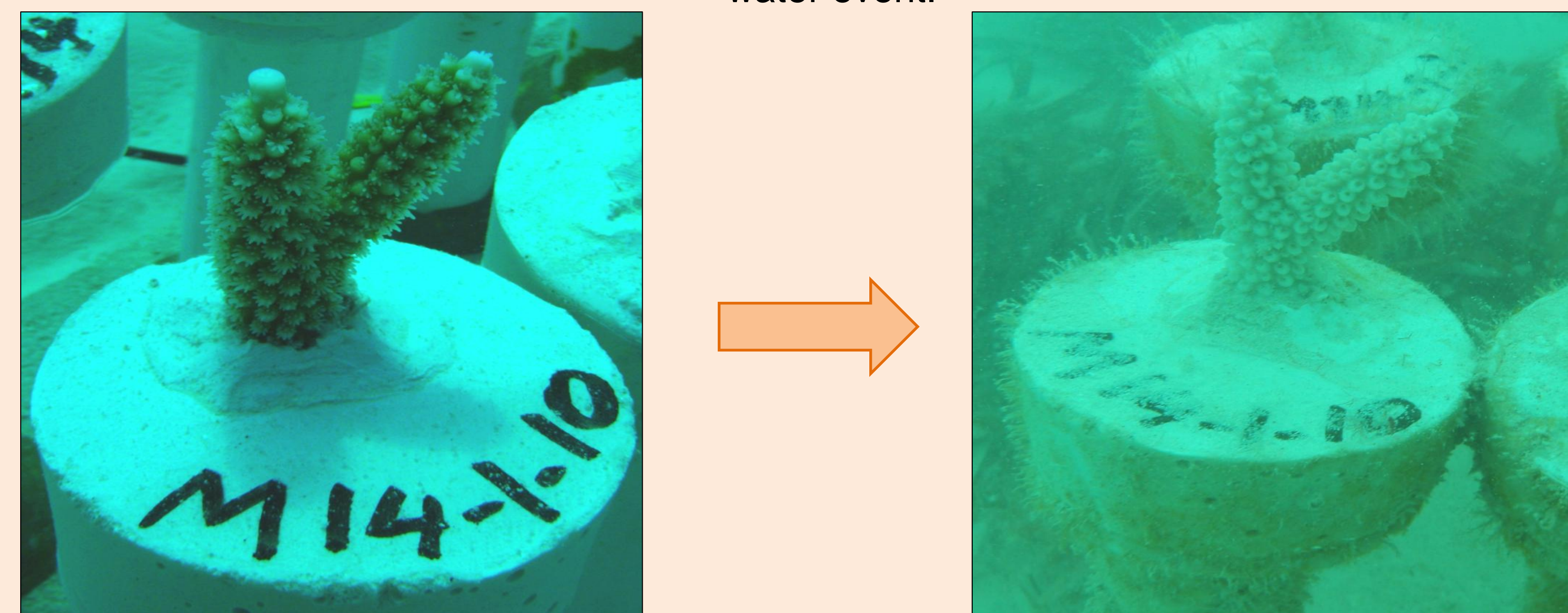


Figure 7. A close-up view of a nursery fragment on the day of fragment collection and after the January cold water event.

Cold Water Culprit

Florida Bay has a very dynamic hydrologic regime and the temperature of its relatively shallow waters decreased rapidly during the cold event. The large passes between the islands of the Middle Keys allowed the cold water to flow over the nursery and surrounding areas (Figure 8), thus, leading to the demise of all the nursery fragments as well as the majority of the parent colonies.

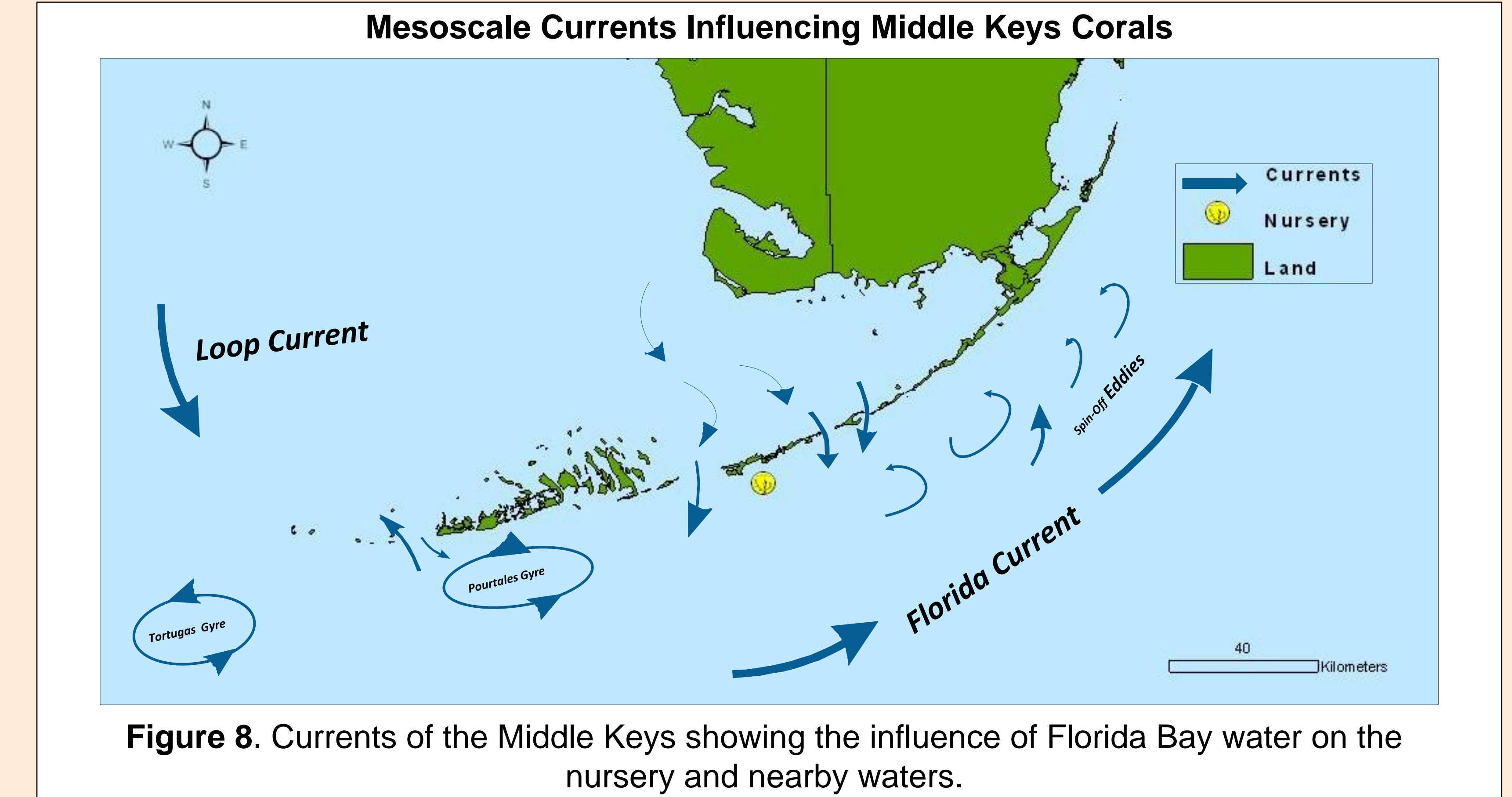


Figure 8. Currents of the Middle Keys showing the influence of Florida Bay water on the nursery and nearby waters.

Starting Over

Spring 2010- The Middle Keys nursery was restocked with 15 genetically distinct *A. cervicornis* fragments from 20 different parent colonies.

Fall 2010- The majority of these fragments have survived the summer water temperature maximum; although, some fragments have been lost or broken.

Growth and survival of these fragments will continue to be monitored with the goal of identifying genotypes best suited for use in comprehensive reef restoration and conservation efforts. Some differences in growth have already been observed among genets after only three months (Figure 9).

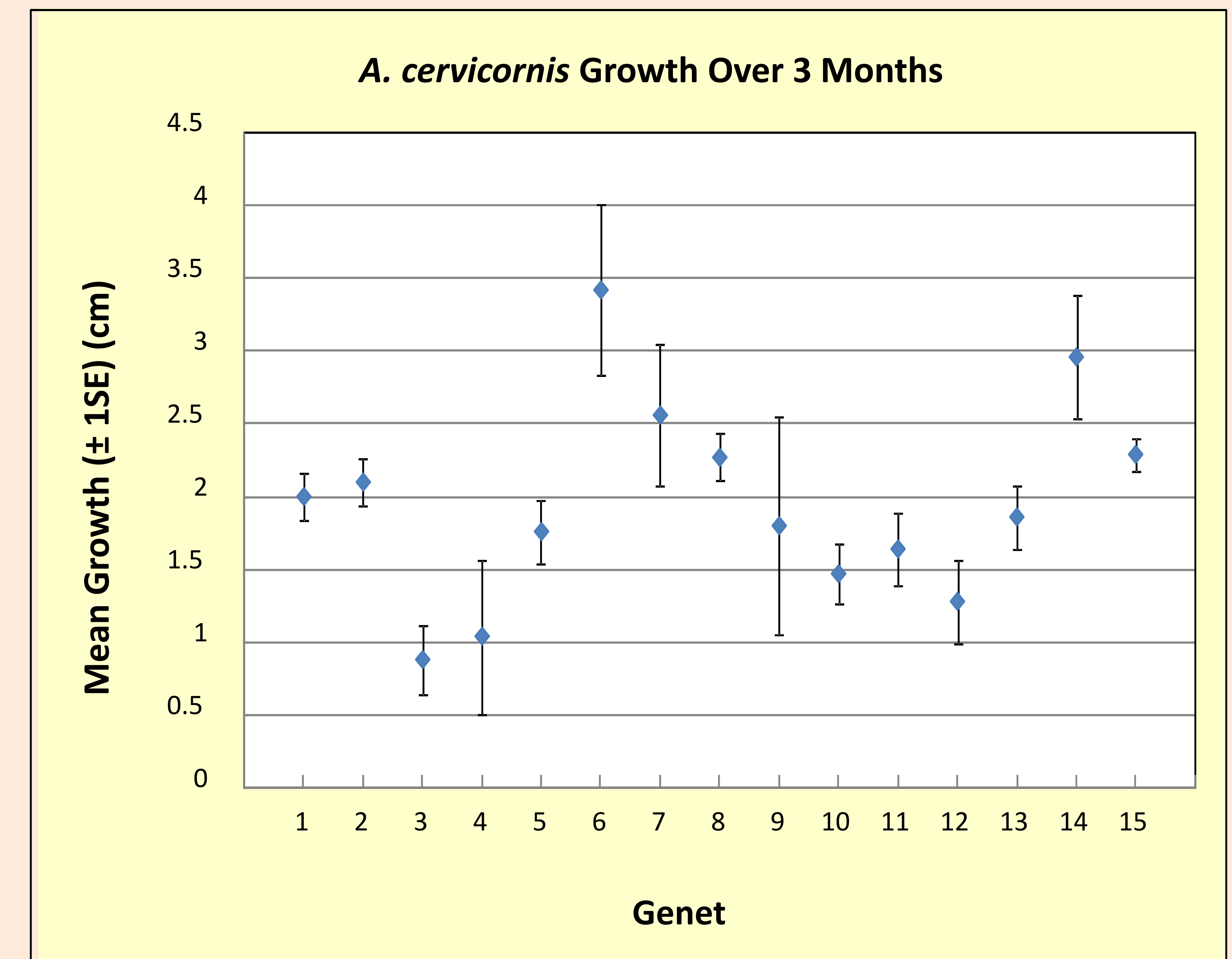


Figure 9. Graph shows average growth of each genet after three months in the nursery.

Acknowledgements

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