An exploratory assessment of the inter annual comparative condition of selected members of *Acropora palmata* at Looe Key 2007-2008.

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Interim Report

Thomas R. Cuba, Ph.D.

Introduction:

Members of *Acropora palmata* are known to reproduce both sexually through the release of gametes and the settlement of larvae and asexually through the fragmentation of colonies. In sexual reproduction, the larvae may be dispersed by currents in an unpredictable and uncontrollable manner. At the point of mandatory metamorphosis, the larva may or may not find itself in a suitable habitat. In asexual reproduction by fragmentation, an existing branch is broken off of the parent organism and falls to the substrate. The distance the fragment can travel before coming to rest depends on the energy of the initiating event and the size of the fragment. In the flats of the back reef at Looe Key, Florida Keys, there has been speculation that reproduction is limited to asexual means and that increasing temperatures are becoming deleterious to the population. The data reported on here are exploratory in nature. The report includes data generated from efforts designed to refine methods and set a baseline for future work.

Methods:

The premise being explored is that if an area can be mapped sufficiently that an actual census of all colonies is performed, then in subsequent years the population can be monitored with sufficient detail to generate valuable information on recruits, growth, fragmentation, and death. During 2007 a baseline exploration was undertaken which resulted in the location and photo-documentation of 7 colonies. In 2008, the team revisited the site to test the ability to relocate the previously mapped colonies and to compare the 2007 condition to the 2008 condition. As a result of that effort, a second and more extensive mapping was conducted in 2008.

In 2007, the team simply swam from a known point (Point of Beginning, or POB) to the next visible colony recording the bearing and the range. In 2008 the team located a second POB and set up transects originating radially from this point in ten degree increments using a hand held compass. The precision is sufficient to create a very utilitarian map. Transects were 50 feet in length. These parameters produce transect lines which are only 6 feet apart at their distal end, assuring complete coverage of the area and providing a complete census of the colonies.

Results:

The seven colonies identified in 2007 were successfully relocated in 2008. One of them had been overturned by an unknown force; probably wave action. Specimens which had been documented in 2007 as being partially bleached had fully recovered and exhibited strong growth. All specimens exhibited growth and one new recruit was located in the 2007 transect band. The technique was accepted as successful and another 51 colonies were mapped in 2008 using the radial technique. The colonies were categorized in accordance with an artificial metric encompassing: Single colony, Multiple closely packed colonies, Simple (no or one branch), Complex (multiple branches), Recruit (sexual) and Fragment (asexual), and Undetermined Origin. For purposes of the exploratory work, specimens which may have resulted from a near death of a previous colony due to disease was to be considered as a fragment, ie, not sexual in origin. In reality, none were encountered.

Sixteen of the fifty-one colonies were considered complex making it unrealistic to presume to categorize their origin as sexual or asexual. Thirty-three were categorized as originating from the settlement of larvae (sexual origin). Six were clearly from fragmentation.

Discussion:

Clearly the categorization of young colonies as recruits or fragments is speculative at this point. In the coming years, however, as census level sampling is repeated, the ability to determine the origin will be greatly refined. These data are critical to the understanding of the recruit as an element in population dynamics for this species. Growth and patterns in the distribution of individual colonies will add to our knowledge of the natural history and reproductive capacity.

The following pages contain figures intended to demonstrate the techniques and the inferences made in this exploratory study. The first series (fig 1-16) is of paired images from 2007 and 2008. The second series (fig 17-21) is of specimens suspected of originating through sexual reproduction. The last series is from the fore reef population which will be mapped in 2009.

Map of colonies of *Acropora palmata*, 2008.

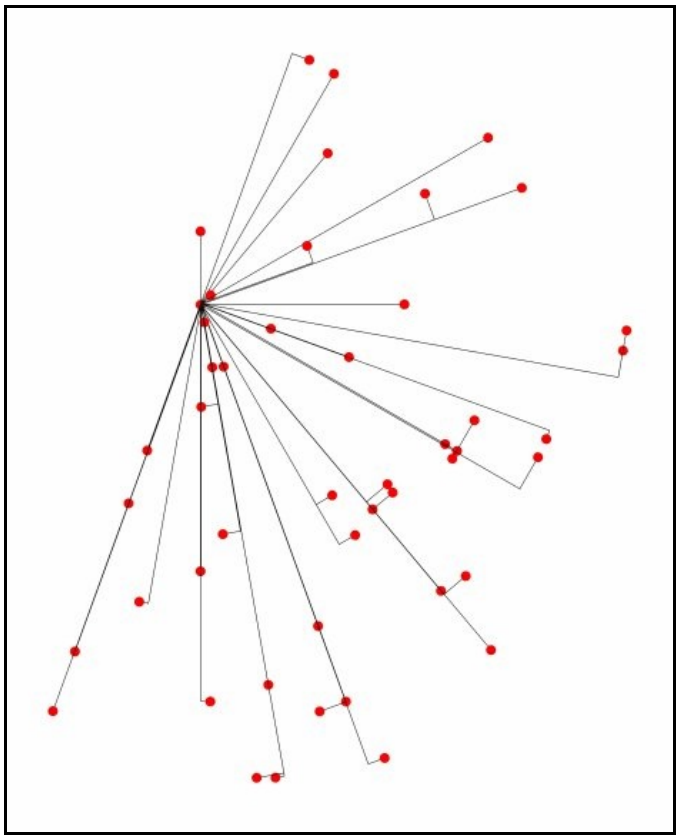

Figure 2. Specimen 1. 2007. Partial Bleaching is evident.

Figure 3. Specimen 1. 2008. Note growth of branches and basal plate.

Figure 4. Specimen 2. 2007.

Figure 4. Specimen 2. 2008. Specimen had been overturned.

Figure 5.. Specimen 4. 2007. Apparently overturned relatively recently.

Figure 6. Specimen 4. 2008. Note changes in the direction of growth of the branches.

Figure 8. Specimen 4. 2007. Side view.

Figure 9. Specimen 4. 2008. Side view. Directional change in growth is more clearly evident.

Figure 10. Specimen 4. 2007. Partial bleaching.

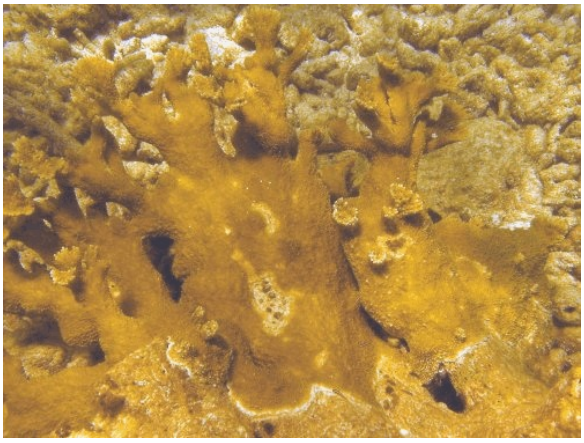

Figure 11. Specimen 4. 2008. Bleaching was not damaging and new branches are forming from basal plate.

Figure 12. Specimen 7. 2007. Probable sexually produced recruit.

Figure 13. Specimen 7. 2008.

Figure 13. Specimen 10. 2007.

Figure 14. Specimen 10. 2008.

Figure 16. Specimen 13. 2007.

Figure 17. Specimen 13. 2008

Figure 18. Specimen 3. Probable sexual recruit.

Figure 19. Specimen 5. Probable sexual recruit.

Figure 20. Specimen 6. Probable sexual recruit.

Figure 21. Specimen 7. Probable sexual recruit.

Figure 22. Specimen 10. Probable sexual recruit.

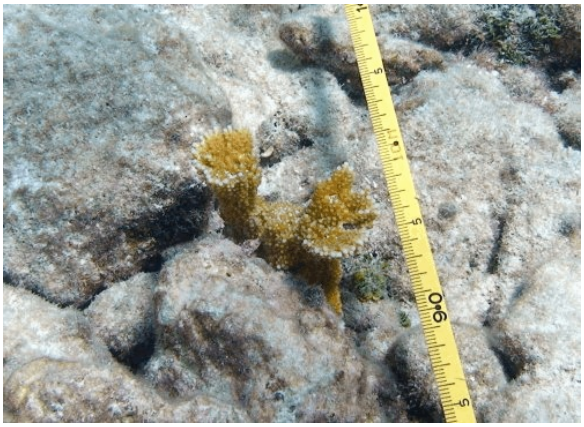

Figure 23. Specimen 15. Probable sexual recruit.

The images on this page were taken from the crest of a spur, at the shallow end. The population is immediately across the reef crest from the population documented in the back reef. The relationship between the two populations has not been established.

Figure 24. Specimen 101. Colony is attached to base rock and is probably a product of sexual reproduction.

Figure 28. Specimen FR02.

Figure 27. Specimen FR03.

Figure 26. Specimen FR04.

Figure 25. Specimen FR05.

Figure 29. Specimen FR06.

Figure 30. Specimen FR07.

Figure 31. Specimen FR08.

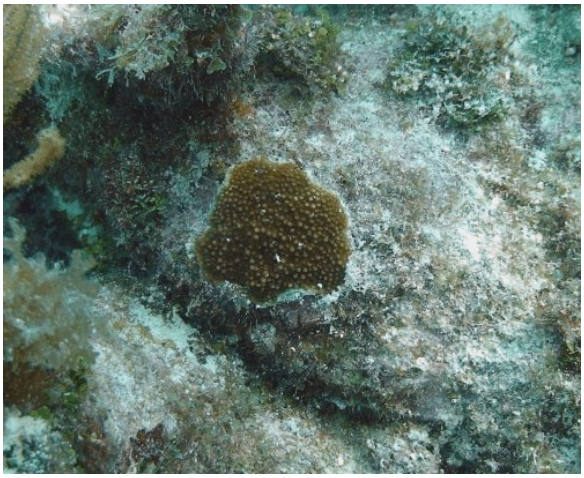

Figure 32. Specimen FR10.

Figure 33. Specimen FR11.

Sexual reproduction as a probable origin in the fore reef is based in part on the substrate to which the colony is attached. Tissue on skeletal remains of branches is much more likely to be remnant tissue from a previously well developed colony. Tissue on bedrock is much more likely to have originated by larval settlement.