

Quicklook Report:

Coral spawning in the upper Florida Keys, Aug 2013

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Prepared by: Margaret W. Miller, NMFS/SEFSC

Contributing Partners:

Florida Fish and Wildlife Inst (FWRI): Kate Lunz and Karen Neely coordinating a cast of thousands

Florida Aquarium (FIAq): John Than and Rick Klobuchar coordinating a cast of dozens

Coral Restoration Foundation (CRF)

Lauri MacLaughlin (LMac): coordinating with several commercial and volunteer resources

Penn State Univ (PSU): Baums and Chan

Florida Keys National Marine Sanctuary (FKNMS)

Abstract:

SEFSC and partners have been undertaking genet-specific spawning observations of *Acropora palmata* populations in the upper Keys since 2003 during the 'expected' spawning window (nights 2-6 after the full moon in Aug, 22:00-23:00). After three years with little to no spawning in this population, 2013 saw the most complete and genotypically diverse spawn during the decade of record. Despite concerns developed over the past three 'dry' years regarding potential shifts in spawning times (e.g., breakdowns in the corals' biological clocks), field spawning by both *Acropora* spp. occurred exactly within the predicted nights and times. Of a total of twelve *A. palmata* genets under observation on some nights during the window, ten spawned and most spawned on two consecutive nights. All six *A. palmata* genets under observation at Elbow reef spawned synchronously, two nights in a row, which has not been observed before (usually only one or two of these Elbow genets have been observed to spawn on the same night). Partner institutions and boats were also able to document spawning and collect gametes from *Acropora cervicornis* (including outplanted populations at Molasses, some genets within the CRF nursery, and some genets temporarily brought to land tanks for more continuous observation), and *Dendrogyra cylindrus*. Early development of larvae of *Dendrogyra cylindrus* was observed for the first time, though they did not survive to settlement.

Background:

M. Miller (SEFSC) has been observing coral spawning and collecting and rearing spawned coral larvae in the upper Florida Keys since 1994 (under tutelage of A. Szmant Univ of Miami). Spawning observations on *A. palmata* were somewhat spotty during the period from 1994 to 2002 when observations were focused at only two sites (KL Dry Rocks and Horseshoe reef). Starting in 2003, we had tools to genotype colonies and so observations from this point have increasing genotypic resolution. Another complication with the observed record is that some *A. palmata* genets with observed spawning

records have died back and are no longer relevant in the population (e.g., the original area at KL Dry Rocks observed from 1994-98, two patches observed at Little Grecian, several original genets at Sand Is, two of the original eight genets at Elbow). This observational record, though not perfect, may represent one of the longest observational records for *A.palmata* spawning in existence.

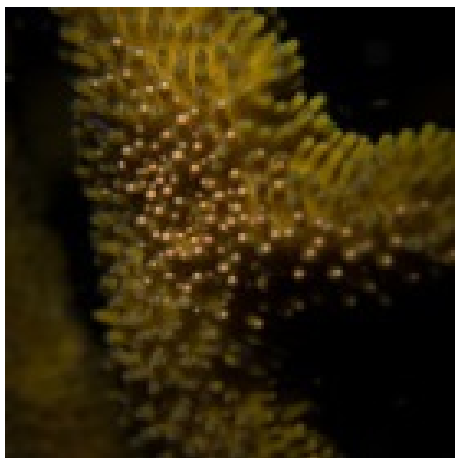
Prior to this year, the previous best *A.palmata* spawning year observed had been 2009, when twelve out of 13 *A.palmata* genets spawned, though many did not spawn on the same night. Since then, almost NO *A.palmata* spawning had been observed in the 2-6 night after full moon window (literally none in 2010 and 2012, only Horseshoe and a bit at Molasses in 2011).

A.cervicornis has been much patchier in distribution during this historical period and had not been the focus of spawning observations in the upper Keys until 2009, when contributing partners (CRF and the Aquanauts group) observed spawning by outplanted *A.cervicornis* (cultured at the CRF field nursery) at Molasses reef. Since that time, growing effort by CRF and FIAq has focused on *A.cervicornis*, especially at the CRF nursery and Molasses reef. Similar to *A.palmata*, virtually no *A.cervicornis* spawning had been observed since 2009.

Initial observation of a single male *Dendrogyra cylindrus* spawning were made by Lauri MacLaughlin at Looe Key back in 2006 and 07. This preliminary report enabled a team from FWRI to document mass spawning by both males and females at Pillar Coral Forest (north Key Largo) for the first time in 2012 during nights 3 and 4 after the full moon.

Montastraea (now *Orbicella*) *faveolata* is much more reliable in spawning during nights 6-8 after the Aug full moon. Our historic observations are not comprehensive, but we have always observed spawning on at least one of two nights of observation at just one or two sites.

2013 Observations



1 *A.palmata* at Molasses setting gamete bundles just prior to spawning. Photo credit: R. Ross (California Academy of Science, working with team FIAq)

Spawning observations by site and species are given in the table. Overall, 10 of 12 *A.palmata* genets under observation spawned, many spawned two nights in a row. The 6 genets under observation at Elbow (the most diverse site) spawned synchronously, two nights in a row. Turtle Rocks *A.palmata* was observed for the first time this year and spawned on night 4 AFM; whereas the wild *A.cervicornis* colonies at this site did not spawn (no observations were made at Turtle Rocks on night 5, when more *A.cerv* spawning was observed). Notably, all *Acropora* spp. spawning observed in the field occurred during the expected time frame of 22:00 to 22:40, despite concerns developed over the past three 'dry' years that internal clocks and timing of spawn release may have undergone compromise.

However, *A.cervicornis* spawning in the land tanks occurred consistently later than the field (~ 1-2 hrs later), possibly due to excess post-sunset light exposure on these colonies.

D.cylindrus followed up its performance in 2012 with significant spawn of both sexes on night 4 AFM after small dribbles on night 3 (none on night 5). These 2 years of observation suggest this species (or at least the colonies at this single site) are very reliable in their spawning, centered on nights 3 and 4. This year, the FWRI/PSU dive team was able to collect a few *D.cylindrus* eggs on night 4, along with dilute sperm solution from the water column. These were left in a small container on a benchtop overnight, the larvae were rinsed out into fresh seawater in the morning and appeared to have full fertilization. By mid-morning (<12 h age) swimming planulae were evident (see video at <http://youtu.be/vcr8QVtj3FA>) whereas this stage takes several days to develop in both *Acropora* and *Montastraea* spp. The larvae are small, but appear to develop very rapidly. Unfortunately, we were not able to carry these few larvae through to settlement. Possibly they were eaten by small critters in the original collection that we were not able to separate from the very small Dc larvae.

Table 1. Spawning observations in the upper Florida Keys by species and site.

Date (AFM)	Site	Team	Species Observed	Action
22 Aug (night 2)	Horseshoe	SEFSC	<i>A.palmata</i>	No spawning signs
23 Aug (night 3)	Sand Island	SEFSC/FKNMS	<i>A.palmata</i>	No spawning signs
	Elbow	SEFSC	<i>A.palmata</i>	No spawning signs
	Turtle Rocks	FWRI	<i>A.palmata</i>	No spawning signs
	Turtle Rocks	FWRI	<i>A.cervicornis</i>	No spawning signs
	CRF Nursery	CRF/FIAq	<i>A.cervicornis</i>	No spawning signs
	Pillar Forest	FWRI/PSU	<i>D.cylindrus</i>	Small dribbles
24 Aug (night 4)	Sand Island	SEFSC/FKNMS	<i>A.palmata</i>	2 of 4 genets spawn
	Elbow	SEFSC	<i>A.palmata</i>	6 of 6 genets spawn
	Turtle Rocks	FWRI	<i>A.palmata</i>	1 of 1 genet spawns
	Turtle Rocks	FWRI	<i>A.cervicornis</i>	No spawning signs
	Horseshoe	LMac	<i>A.palmata</i>	1 of 3 genets spawned
	Horseshoe	LMac	<i>A.cervicornis</i>	No spawning signs
	CRF Nursery	CRF/FIAq	<i>A.cervicornis</i>	Few colonies spawned
	Pillar Forest	FWRI/PSU	<i>D.cylindrus</i>	Many males and females spawned
25 Aug (night 5 AFM)	Sand Island	SEFSC/FKNMS	<i>A.palmata</i>	4 of 4 genets spawn (2 again)
	Elbow	SEFSC	<i>A.palmata</i>	6 of 6 genets spawn again
	Molasses	CRF/FIAq	<i>A.palmata</i>	1 of 1 genet spawned
	Molasses	CRF/FIAq	<i>A.cervicornis</i>	Many colonies spawned
	CRF Nursery	CRF/FIAq	<i>A.cervicornis</i>	Many (at least 6) genets spawned
	Pillar Forest	FWRI	<i>D.cylindrus</i>	No spawning signs
26 Aug (night 6 AFM)	Sand Island	SEFSC	<i>A.palmata</i>	No spawning signs
	Sand Island	SEFSC	<i>O.faveolata</i>	2 (out of ~10) colonies

				spawned
	CRF nursery	CRF/FIAq	<i>A.cervicornis</i>	Few (~2) genets spawned
27 Aug (night 7)	Grecian Rocks	SEFSC	<i>O.faveolata/a nnularis</i>	Many faveolata colonies spawned, but none of the more annularis-looking colonies spawned
	Horeseshoe	LMac	<i>O.faveolata</i>	Many colonies spawned

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