

Florida Reef Tract Coral Disease Outbreak

Coordination Meeting #7

April 21, 2017

1:00 PM – 3:00 PM

Meeting Summary

Attendees: Amanda Bourque, Tracy Ziegler, Bill Goodwin, Lauri MacLaughlin, Lew Gramar, Jocelyn Karazsia, Margaret Miller, Alison Moulding, Pamela Fletcher, Cheryl Woodley, Katharine Richgels, Meghan Balling, David Cox, Kristi Kerrigan, Kelly Montenero, Francisco Pagan, Daron Willison, Aubree Zenone, Karen Bohnsack, Joanna Walczak, Janice Duquesnel, Vanessa Brinkhaus, Lindsay Huebner, Jan Landsberg, Kate Lunz, Erin McDevitt, Brian Reckenbeil, Kathy Fitzpatrick, Sara Thanner, Dave Gilliam, Nicole Hayes, Lystina Kabay, Charles Walton, Esther Peters, Ana Zangroniz, Kayla Ripple, Erinn Mueller, Dan Clark, Stephanie Clark, Ed Tichenor, Jennifer Stein

Welcome, Roll Call, Meeting Purpose

- Karen Bohnsack welcomed attendees to the call and reviewed the agenda and attachments sent prior to the meeting.
- The agenda includes abridged reports on recent disease observations, including a quick update on pillar coral status; a presentation on the 2016 data from the Southeast Florida Coral Reef Evaluation and Monitoring Project; updates on ongoing response (including coordination with the USGS National Wildlife Health Center, and disease outbreak investigations); and the status of the NSF RAPID grant proposal.
- Attachments include: Meeting agenda, PDF of recent photos, maps showing the progression of disease at the pillar coral sites since the 2013-2014 baseline surveys, and a summary of the disease status at Conch Reef.

Update on Florida Reef Tract Disease Observations

- Instead of the usual around-the-region updates, Karen Bohnsack asked attendees to only share any major updates on disease observations such as: the identification of disease-free sites (particularly off the southeast Florida mainland), new observations of resistant or apparently- unaffected species, information on changes in the disease boundary (especially in the Keys), or any other, as-of-yet-unreported observations.
- Biscayne National Park (BNP) – *Karen Bohnsack (DEP) on behalf of Vanessa McDonough (BNP)*
 - o Karen Bohnsack reminded attendees that during the last call there was an inquiry regarding observations of remaining living colonies of *Eusmilia fastigiata* (EFAS), especially in the Miami-Broward region. Since then, BNP staff made a special effort to locate living EFAS, but have not been successful.
 - o BNP staff also noted a new observation along the reef crest in 25-50 feet water of abundant lesions on small *Porites* colonies (see photos in the PDF document).
 - Margaret Miller clarified that the photo looks like fish bites, and is likely not from disease.
 - Vanessa Brinkhuis noted that in a good picture it's possible to see scrapes on the skeleton from such fish bites.

- While disease is still readily observable in BNP, all disease observations appear to be older infections; it does not appear to be spreading or causing new infections or tissue loss. Any remaining non-diseased corals are in good condition; particularly *Mycetophyllia* spp.
- Florida Keys – Karen Bohnsack (DEP) on behalf of Cory Walter (Mote Marine Laboratory)
 - Mote has not received any “new area of disease” reports south or west of what we previously identified as the likely boundary area.
 - New information was also received from Ken Nedimeyer (Coral Restoration Foundation): During recent dives around Key Largo, in addition to the usual disease impacts observed affecting most large coral heads of most species he has reported that there were still corals at Carysfort (from various species) that are still alive with no apparent signs of disease.
 - Karen Bohnsack reminded attendees that during the last call, Cory Walter requested input on the mottled discoloration of *Siderastrea siderea* (SSID) observed at an inshore patch reef near Summerland Key (p. 21 of the call #6 photo PDF).
 - There has been some speculation that this may be an early stage of the white blotch-type lesions affecting these corals. Esther Peters noted that this is the type of colony that must be sampled to provide the best chance of identifying any pathogen(s).
 - Mote has been seeing more of the SSID's looking "stressed" over that last few weeks; Mote and the Florida Fish and Wildlife Research Institute (FWRI) may attempt to coordinate sample collection under the existing FKNMS permit.
 - Vanessa Brinkhuis noted that when white blotch is observed in the field, colonies with lesions have paling/mottling, with a small area in the center where the lesions start. The mortality spreads outwards, resulting in the blotch-like lesions. Right now, we have numerous disease samples; any future disease collections should target these early lesions in the paling areas for histology.
 - Vanessa noted that current efforts are focused on obtaining reference samples, but if the mottling is still being observed they can try to coordinate to obtain samples of these early lesions.
- Dry Tortugas
 - N/A

Pillar Coral (*Dendrogyra cylindrus*) Status Update – Karen Bohnsack (DEP) on behalf of Karen Neely (FKCC)

- Karen Bohnsack referred to the PDF provided ahead of the call by Karen Neely, which shows the progression of DCYL disease from the 2013-14 baseline surveys into 2016 and 2017, and reminded attendees about the update from the last call: During late-February, every known DCYL site from Biscayne National park through the 7-mile bridge was visited, a total of approximately 55 sites. At the time, Conch Reef in the Upper Keys (around Tavernier/Plantation) had very active disease, but 10 miles further south, Crocker Reef had a noticeable change in conditions from predominantly diseased to predominantly healthy, where colonies of many species, including DCYL, *Dichocoenia stokesii* (DSTO) and brain corals had no apparent disease lesions. This provided an initial indication of the current southern boundary of the disease outbreak area.

- Since the last call, Karen Neely and Mote visited additional known DCYL sites from the 7-mile bridge south/west to the Sambos region. Disease at these sites was only observed to be at background levels. The remaining southern sites will also be revisited as logistics allow, but there is currently no funding or capacity to revisit the upper Keys colonies. It is unknown what, if any, change has occurred at the boundary sites.

Southeast Florida Coral Reef Evaluation and Monitoring Project (SECREMP) 2016 Data Presentation
(*Skype Webinar*) – Nicole Hayes (NSU)

- Nicole Hayes presented an update on the 2016 SECREMP benthic monitoring data.
- *Please note, this presentation included summary information from data that have not yet gone through the entire formal data review and management process.*
- Goal: The goal of SECREMP is to provide local, state, and federal resource managers with an annual report on the status and conditions of the SEFL reef system, including information on the temporal changes in the resources. This is a long term monitoring project, not an event monitoring project.
- Survey Design: SECREMP sites are located in all four southeast Florida counties (Martin, Palm Beach, Broward, and Miami-Dade), and include sites on the inner, middle, and outer reef.
 - o There are a total of 22 permanent sites, each of which has four stations that are each 22 m long. These stations are marked by square steel pins on either end, between which a fiberglass tape is affixed.
 - o A still image transect is taken on the east side of the tape, and a belt transect is conducted at each station to collect demographic data on stony corals, octocorals, and giant barrel sponges.
 - o A 1 m stony coral belt transect is also collected at each station. All stony corals ≥ 4 cm are identified to species and the following information collected: maximum height and diameter, % recent and old mortality, number of tissue isolates, and conditions affecting the corals (disease, bleaching, and overgrowth). Corals < 4 cm are noted, as well as *Diadema* spp. presence.
- Stony coral demographic data results:
 - o The top 5 stony coral species, by abundance, for the entire region include: *Porites astreoides* (PAST), *Montastraea cavernosa* (MCAV), *Siderastrea siderea* (SSID), *Siderastrea siderea* (SINT), and *Agaricia* spp. (AAGR). From 2013-2015, these species maintained the same order by abundance. In 2016, although the top five species were the same, their order changed: SSID surpassed MCAV in abundance, and AAGR passed SINT in abundance.
 - o MCAV abundance across all sites stayed relatively stable between 450-500 corals, until 2016 when over 200 corals were lost.
 - This loss of colonies was not consistent across all species: PAST actually increased in 2016. Therefore, the mortality event may be affecting certain species more than others.
 - Unfortunately, the gains do not compensate for the losses. Across all stony corals, a total decline of ~400 colonies occurred within these transects between 2015 and 2016, which is the most loss since the SECREMP project was initiated.
 - o DSTO and *Meandrina meandrites* (MMEA):

- Drastic declines were also observed in these species. Density is stable between 2013 and 2014, some initial loss was observed in 2015, and more drastic losses were captured in 2016 when both species suffered almost a complete loss across the SECREMP sites (only 8 and 5 colonies remain, respectively).
 - MCAV and SSID:
 - MCAV did not suffer much initial loss between 2014 and 2015, as was observed with DSTO and MMEA. However, between 2015 and 2016, this species suffered just under a 50% loss over the course of one year.
 - SSID suffered a steady loss between the years versus the drastic declines seen with other species between 2015 and 2016.
 - In summary: These data indicate that the mortality event affected certain species more than others, but there was also a difference in when and how drastically the affected species were impacted, and when they saw full colony mortality.
- Data were also broken down into size class by abundance.
 - Size classes = Small (4-10 cm), medium (11-30 cm), medium-large (31-50 cm), large (51-100 cm) and x-large (>100 cm).
 - MCAV size class distribution: Data indicate that the medium size class suffered the largest loss between 2015 and 2016 (~50% decrease). Therefore, there is a change in the size class distribution between 2015 and 2016; this will be further investigated.
 - SSID size class distribution: Mortality appears independent of size class.
 - MMEA size class distribution: The small size class saw a reduction in abundance by ~67% between 2014 and 2015; between 2015 and 2016 all other size classes (medium, medium-high, and large) were lost, so that only a small number of MMEA colonies, all <10 cm, remain at the SECREMP sites.
 - DSTO size class distribution: As with SSID, the loss of DSTO colonies appears independent of size class.
- Partial Mortality Measurements:
 - At any given year, a percentage of corals at these sites have some amount of partial mortality. In 2013, the proportion of corals with some amount of mortality = 71% (n = 2335). This increased over the next two years and peaked at 86% in 2015 (2014 = 81% [n = 2440]; 2015 = 86% [n = 2494]. Partial mortality dropped to 79% in 2016 (n = 2067), but this could be driven by full colony mortality (<400 colonies were lost between 2015 and 2016).
- Disease Prevalence:
 - Disease prevalence saw a small increase between 2013 and 2014, was relatively stable between 2014 and 2015, then increased even more in 2016.
 - In looking at all diseases compared to only white plague-type diseases, only white plague-type diseases saw a large increase in disease prevalence between 2013 and 2016; the prevalence of other diseases remained relatively constant.
- Summary:
 - A reduction in stony coral abundance occurred from 2013 to 2016. Percent reduction included: SSID (28%), MCAV (49%), DSTO (89%), MMEA (95%) within the sample sites.
 - SSID and DSTO may have suffered mortality independent of size class.
 - MCAV and MMEA displayed possible changes in size class distribution.

- There is a possible time lag effect in when and how seriously different species/size classes saw full colony mortality.
- Total regional partial mortality (including recent and old mortality): 2013 (71%); 2015 (86%); 2016 (79%).
- Data have shown severe total and partial mortality, as well as increased disease prevalence.
- The 2017 data collection will be vital to see if the mortality event is still occurring, if we still have elevated levels of disease, or if loss of corals is slowing down.
- *Reminder: This presentation included summary data that has not yet gone through the formal NSU/FWC data management process.*
- Nicole thanked all the many partners who have participated in or supported the SECREMP project.
- Questions/Comments:
 - Esther Peters (GMU) asked for clarification regarding the quality control checks the data are still undergoing, and when the final report might be available.
 - Nicole clarified that they have gone through internal NSU QA/QC checks, but FWC has a separate data management process which must be completed before the data can be considered final. The figures shared in the presentation are not the formal data and figures that will be present in the report.
 - The full comprehensive report will be available at the end of October. This will be posted on the FDEP website and available to the public.
 - Esther Peters inquired if there are plans to communicate this information via press releases.
 - Nicole noted that they will publish the data, but have not considered how the report would be communicated to the public otherwise.
 - Esther iterated the importance of this story getting out to the public [further discussed during the Communications topic on the agenda].
 - The final report will be circulated to the coral disease call list when available.

Update on Current Response Efforts

- Coordination with USGS National Wildlife Health Center (NWHC) – *Katie Richgels (USGS)*
 - Katie Richgels is the Research Branch Chief at USGS NWHC, which is a nationally focused wildlife disease research center. They do diagnostics and epidemiological response, as well as basic wildlife disease research. While coral is somewhat new, they have worked on major disease outbreaks all over the country, including white-nose syndrome, west Nile virus, plague, etc. They have been involved in most of the major terrestrial wildlife diseases for over 40 years. As Branch Chief, Katie manages researchers with strong quantitative skills; they also have an advanced experimental facility to conduct wildlife transmission experiments.
 - The NWHC was brought into the coral disease work through one of the NWHC researchers, Thierry Work, and are trying to provide support.
 - One of the current projects the NWHC is working on is that Thierry Work (who has done extensive coral work in Hawaii) is collaborating with Dan Walsh (based in NWHC HQ) to look at surveillance design. Given the low cover on the Florida Reef Tract, statistically it can be hard to pick up on a disease signal. To that end, the NWHC has an open

opportunity for an NSF-funded graduate student to spend up to a year with the NWHC to work on this modeling effort to assess surveillance design strategies, and how to better pick up on a disease signal in data collection efforts. They are hopeful the NSF position will also be able to analyze spatial patterns in other long term data sets that might be able to explain some of the factors that potentially contributed to the disease outbreak.

- Katie requested that if anyone knows an NSF graduate student who might be interested in assisting with this project to please contact her (krichgels@usgs.gov) or Dan Walsh (dwalsh@usgs.gov). The position will be open through June.
- Questions/Comments:
 - Dave Gilliam (NSU) asked for clarification as to whether long term data sets generally are being looked at, or only those associated with the disease outbreak event in Florida.
 - Katie clarified that they are currently looking at the CREMP/SECREMP datasets. They have a matrix of the other data sets that are available in Florida so can incorporate others as well. The NWHC would like to spend time looking at this so it can be useful to the disease response effort, but they are limited in capacity and thus seeking support from an NSF graduate research fellow.
 - In response to an inquiry as to whether the FRRP data will also be incorporated into this epidemiological analysis, Katie clarified that, yes, they also have this dataset. The long-term goal would be to incorporate all of these datasets into a spatial modeling framework, but this is a multi-year process. They are still in the data exploration phase. Other than Thierry, they are not coral experts so there is a learning curve.
 - Margaret Miller (NOAA) and Vanessa Brinkhuis (FWC) highlighted the importance of bringing additional Florida partners into these conversations, especially the major data collectors who are most familiar with the data sets and monitoring methodology.
 - Katie noted that they are happy to collaborate with these groups.
 - Karen reminded the group that collaboration with the NWHC initially began with a formal request for assistance from the State of Florida, and Esther Peters and Jan Landsberg were looped in for their sample analysis expertise. As these projects develop we will continue to keep the group updated and are happy to bring in additional expertise. Karen requested assistance identifying these key partners to engage as the surveillance project moves forward.
 - Vanessa reiterated the importance of involving Dave Gilliam and the FWC CREMP team in this process as they best know the types of data and their limitations.
 - Karen agreed to the importance of including these partners and will figure out the best way to engage them moving forward.
 - Katie clarified that although they've received the data, they have not done anything with it yet, and encouraged anyone who wants to be involved to participate.

- Lauri Maclaughlin highlighted the SCREAM dataset from the Keys; this should be included in the analysis.
 - Karen noted that this has not come up yet, and requested Lauri send a quick summary or the dataset itself.
 - Lauri suggested that Mark Chiappone and Steve Miller be looped in to better discuss that dataset. She will send points of contact and a brief description of the types of data collected during the SCREAM surveys. This was a 16-year dataset which wrapped up in 2015.
 - Esther clarified that they have previously tried to contact Mark and Steve for those data, but is unsure of where that request stands. Agreed this discussion needed to happen – we need people who understand the analyses to be involved.
- Coral Disease Outbreak Investigations:
 - *Vanessa Brinkhuis (FWC) – FWC Reference Sampling*
 - Vanessa noted that they have sampled the upper Keys and Broward County. The biggest hurdle now is the need for reference samples for comparison. FWC will be in Martin County next week to collect MCAV and SSID samples for molecular and histology from a site that appears healthy (the old SECREMP MC3 site). They will also sample a few patch reefs in the Middle Keys – targeting 5 species. These data will hopefully fill some information gaps and provide a means of comparison for the histology and molecular work.
 - Jan and Yasu are currently reading the Broward County slides collected last November. They also received SSID samples from Conch Reef. These will be processed with the reference samples.
 - *Karen Bohnsack (DEP) on behalf of Mauricio Rodriguez-Lanetty (FIU) – Conch Reef*
 - Mauricio Rodriguez-Lanetty’s lab completed their sampling goals and disease prevalence surveys at Conch Reef. He sent histology samples to FWC and is working with Julie Meyer to conduct metagenomic analyses.
 - An updated disease prevalence report from Conch Reef (from surveys completed in mid-March) will be sent with the follow-up information from this call.
- Communications – *Karen Bohnsack (DEP)*
 - Florida is hosting the next meeting of the U.S. Coral Reef Task Force (USCRTF) from August 7 – 11th. Established in 1998 to lead U.S. efforts to preserve and protect coral reef ecosystems, the USCRTF includes leaders from 12 Federal agencies, seven U.S. states/territories/commonwealths, and three Freely Associated States.
 - This disease event and the coordination and response efforts that this group has undertaken will be highlighted to this high-level audience during the Florida meeting. Additional details will be shared as they become available.
 - Regarding communications, in highlighting the disease event to this audience, we expect to draw some public and media attention. DEP is working with a sub-committee that is involved in USCRTF planning to discuss strategies for best communicating coral disease information to these broader audiences.
 - The goal is to have some shorter communications pieces ready to circulate prior to the USCRTF meeting.

- SEFCRI TAC – *Francisco Pagan (DEP)*
 - o Francisco noted that coral disease was a topic discussed among the Technical Advisory Committee (TAC) of the Southeast Florida Coral Reef Initiative (SEFCRI) during their bi-annual meeting. They received presentations on the overall status of the disease and response efforts, the 2016 SECREMP preliminary data analysis (as shared during this call), and a presentation by Rob Van Woesik. This raised awareness among the group about the disease issue and generated initial technical conversations.
- Field-Based Disease Interventions:
 - o Karen reminded the group about a discussion that was initiated during the previous call regarding disease interventions and field-based trials, and noted that a field interventions subgroup is planning to get together to discuss this concept in more detail. Additional information and updates will follow on future calls.

Working Group Updates

- NSF RAPID Grant Proposal – *Val Paul (Smithsonian Institution)*
 - o The NSF RAPID proposal was selected for funding. This project will investigate the transmission, infectiousness and pathogen-host specificity of the disease(s) among the affected coral species; they will also attempt to identify potential pathogen(s) responsible for the disease outbreak, as well as protective microorganisms that may inhibit the growth of the presumed pathogens.
 - o Val Paul is working with Greta Abby and Blake Ushijima to work out the details. They are targeting the month of July for Greta to be here in Florida working on this project.
 - o Val and Greta will likely reach out to partners for assistance obtaining samples, etc. Additional details will follow.

Other Reef Issues

- N/A

Wrap-Up and Adjourn

- Karen Bohnsack provided reminders and reviewed action items from the call:
 - o The date of the next call will be Friday, June 9th from 1:00 – 3:00 PM. A calendar invite will be sent.
 - o Karen will send a follow-up email with notes from today’s call, a final meeting summary from the last call, the photo PDF from the last call (which includes an image of potentially early stage white blotch affecting SSID), and the updated report from the disease assessment at Conch Reef.
 - o Remember to submit coral disease reports to SEAFAN and C-OCEAN
 - o The final SECREMP 2016 report will be circulated in October.
- Other potential follow-up items:
 - o Continue to watch for potentially early stage disease on SSIDs in the lower Keys; if necessary coordinate with Mote/FWC to obtain samples.
 - o Anyone interested in the NWHC NSF graduate research position, please contact Katie Richgels (krichgels@usgs.gov) or Dan Walsh (dwalsh@usgs.gov).

- A separate conversation will be set up between data collectors and the NWHC regarding surveillance design, as appropriate – details TBD.