Florida Reef Tract Coral Disease Outbreak

Coordination Meeting #2
August 19, 2016
1:00 – 2:30pm

Meeting Summary

Attendees: Anna Toline, Amanda Bourque, Vanessa McDonough, Jeff Miller, Tracy Ziegler, Billy Causey, Joanne Delaney, Bill Goodwin, Lauri MacLaughlin, Kurtis Gregg, Jennifer Koss, Alison Moulding, Ilsa Kuffner, Meghan Balling, Kristi Kerrigan, Kelly Montenero, Francisco Pagan, Mollie Sinnott, Daron Willison, Ana Zangroniz, Karen Bohnsack, Joanna Walczak, Kayleigh Michaelides, Janice Duquesnel, Trudy Ferraro, Paul Rice, Vanessa Brinkhaus, Yasu Kiryu, Jan Landsberg, Cindy Lewis, Erin McDevitt, Rob Ruzicka, Kerry Maxwell, Tom Reinert, Caroline Rogers, Ken Banks, Jamie Monty, Rebecca Ross, Abby Reneger, Josh Voss, Esther Peters, Frank Muller Karger, Dave Vaughan, Dan Clark, Stephanie Clark, Rachel Silverstein, Ed Tichenor, Fran Perchick, Jennifer Stein, Lindsey Precht, Valerie Paul.

Welcome, Roll Call, Meeting Purpose

- Karen Bohnsack welcomed everyone to the call and reviewed the meeting agenda.
- This is the 2nd coordination call for 2016. The agenda includes a report out on disease observations from across the Florida Reef Tract (FRT) since the first call in early July, updates on the status of the current response efforts, information from the two working groups that were created during the July call: one to coordinate coral tissue sample analysis, and one to coordinate sampling efforts under one FKNMS permit, and a brief update on other reef issues, including bleaching and algal blooms.

Update on Florida Reef Tract Disease Observations

- Southeast Florida – *Kristi Kerrigan (DEP CRCP)*
    - Kristi Kerrigan referred to the PDF of photos that was sent to the participants prior to the call, which included two maps of disease observations reported in southeast Florida, including one of all reports received in 2016, and one of reports received since the first coral disease coordination call on July 7th. SEAFAN received 16 disease reports over the past month and a half, including 2 in Palm Beach County with disease affecting *Montastraea cavernosa* (MCAV). Kristi noted a labeling error on two of the pictures included in the PDF: the images of the diseased *Eusmilia fastigiata* (EFAS) and *Pseudodiploria strigosa* (PSTR) were observed in Jupiter in May, although the report was received in July. Karen Bohnsack noted that the PDF would be updated and resent to the group.
    - In Broward County, MCAV was also observed affected with white disease. Other affected species included *Siderastrea siderea* (SSID), *Porites astreoides* (PAST), *Orbicella faveolata* (OFAV), as well as some gorgonians.
    - A total of 9 disease reports were submitted in Miami-Dade County. Affected species included MCAV, SSID, PSTR, *Solenastrea bournoni* (SBOU), *Colpophyllia natans* (CNAT), *Stephanocoenia intersepta* (SINT), as well as rapid tissue loss on *Acropora cervicornis* (ACER).

- Generally, a high proportion of MCAV are affected with white plague; SEAFAN did not receive any new reports of the unknown SSID disease.
- Karen Bohnsack requested additional information from Josh Voss (FAU) regarding his report that no signs of a disease outbreak were observed at St. Lucie Reef as of August 1st, and that they have monitoring sites in Palm Beach County near Breakers Reef. Josh Voss clarified that data from a previous survey in Palm Beach County showed that 9-11% of the 342 MCAV at those sites were bleached, 32-33% showed evidence of white syndromes, and <1% (3 colonies) exhibited black band disease. That site will be revisited next week.
- *Questions/Comments:*
  - In response to an inquiry, Josh clarified that bleaching includes paling and partial bleaching, but does not include active tissue legions or tissue loss. Any colonies with denuded skeleton were categorized separately.
  - Esther Peters (GMU) noted observations of bleaching margins on MCAVs that are slowly losing tissue, without the white active tissue loss generally seen with white plague.
  - Kelly Montenero provided an additional update that a new report was received of the unknown SSID "white blotch" disease in Broward County, along with two other SSID disease reports in Miami-Dade.

- Biscayne National Park – *Vanessa McDonough (BNP)*
  - Vanessa McDonough provided an update on conditions in Biscayne National Park, clarifying that their latest observations are three weeks old since boat failure and bad weather have prevented additional fieldwork. Similar to southeast Florida, in BNP bleaching or disease has been observed on SSID, MCAV, PSTR, CNAT, etc. Quantitative data will be available soon. Disease has been observed both on inshore patch reefs and offshore continuous reefs. Vanessa noted that a National Park Service photographer went out with BNP staff over the past few weeks to document the disease. These photos will be shared with the group when available. BNP staff have also noted an increase in algae cover, with different species observed in different areas.
- FKNMS – *Karen Bohnsack (DEP FCO) on behalf of Cory Walter (Mote Marine Laboratory)*
  - Upper Keys: Generally we are still receiving reports of multiple species affected by a number of diseases. FWC staff conducting monitoring at the Coral Reef Evaluation and Monitoring Project (CREMP) fixed stations noted that at Grecian Rocks they observed what appeared to be white plague, along with the unknown "white blotch" disease, and other indistinguishable white diseases. At least nine species were affected, including 4 species of brain coral (*Colpophyllia natans, Pseudodiploria strigosa, Diploria labyrinthiformis* [DLAB]*, Meandrina meandrites* [MMEA]), as well as *Dichocoenia stokesii* (DSTO)*, Siderastrea siderea, Montastraea cavernosa, Orbicella annularis* (OANN), and *Eusmilia fastigiata*. At Carysfort, the prevalence of "white blotch" disease on SSID was up to 69%. Colonies of all sizes were affected with mortality ranging anywhere between 25% (recently infected colonies) to 95% where the disease was no longer active. FWC staff also noted the disease is migrating south and west as far as Molasses (low prevalence of <1%).
    - Pennekamp staff reported dark spot disease observed on 2-5% of SSID during a survey of Cannon Patch reef.

        - Marine Lab staff also noted disease on several colonies of boulder and brain corals.
        - Derek Manzello (NOAA) has been monitoring Cheeca Rocks throughout the course of the past 2 bleaching seasons and as of mid-July only a couple of colonies were showing signs of stress, but nothing out of the ordinary.
    - Middle Keys: Anecdotally speaking, the Middle Keys has been relatively un-impacted by disease thus far. Keys Marine Lab staff noted a few colonies of *Dendrogyra cylindrus* (DCYL) with "old" white plague disease.
    - Lower Keys: Mote Marine Lab has reported several sites off the Lower Keys and Key West with disease, although most had less than 5 colonies impacted. They are trying to get back to revisit the inshore reef near Cudjoe Key, where they previously reported white disease on 10 – 15 colonies. Mote has also been noticing more black band disease since the last disease call, which they usually see early in the warmer months.
    - *Questions/Comments:*
        - Cindy Lewis amended the report on conditions in the Keys, noting that white plague has been observed on the DCYL in the Middle Keys. FIU also monitors a site near Pennekamp three times per year, which is their highest-density site of DCYL, with over 150 colonies. In April there was a 75% total loss of live tissue over the previous 2 year period. On July 25th this site was visited as part of the DCYL rescue project, but the site was entirely dead. In March white plague was observed at this site affecting DCYL, CNAT, *Pseudodiploria spp*., *Orbicella spp*., DSTO, etc. One huge CNAT on this site that was able to recover from the 2 back-to-back bleaching events is now 100% dead. White plague was noted on this colony in March.
        - Valerie Paul (Smithsonian Institute) highlighted an issue with the aquarium the Smithsonian Institute (SI) maintains in partnership with St. Lucie County. They feature a 3000 gallon coral reef exhibit tank that was originally in Washington, D.C. for many years. Many of the corals in this tank were brought down with the exhibit to St. Lucie County. Last year corals obtained from the Miami dredging project were added to the tank. They were kept in quarantine and appeared healthy before being added to the tank, however the same white disease affecting the reef tract appeared and over the course of a year ran through all the boulder corals in the tank. SI used every aquarium intervention known, including treatment with antibiotics, but nothing worked. Ultimately the disease had to run its course. The same species as others have reported were ultimately affected, including MCAV, *Orbicella spp*., *Psuedodiploria spp*., etc. Both *Acropora* species in the tank were unaffected. Valerie noted that even the apparently healthy tissue was obviously already affected when the corals were added to the tank. Molecular samples were taken and are at Laurie Richardson's lab at FIU. It is unknown if these were analyzed, but they are available for comparison with field samples.
            - In response to an inquiry about the types of interventions tried, Valerie Paul clarified that they mostly tried a range of commonly used aquarium antibiotics recommended by the veterinarian. They also tried removing the dead tissue and leaving the healthy portions. When these corals

were first introduced, they were apparently healthy (e.g., had no white blotches or anything) or they never would have been added to the tank. Even the healthy tissues are probably affected. It is unknown if this is viral or bacterial, but it is clearly waterborne.

- In response to an inquiry about the timeframe in which the disease was observed on the corals, Valerie clarified that the disease was observed within a month of first adding the new corals to the tank. It started as small blotches and progressed slowly, similar to what has been observed in the field. It took months before the corals were completely killed. Some of the corals had been in the tank for 15 years or more. The new corals were added early last year (2015) when corals were being rescued from the Miami dredging project and given away. Valerie will follow-up with the exact dates.

- Esther Peters noted that Kristen Dubé at the Frost Science Museum contacted her about corals they received with white plague signs and inquiring about treatment options. Esther put her in touch with Cheryl Woodley (NOAA) who has had some success with antibiotics. Anyone interested can also reach out to Cheryl for more information.
- Abby Renegar (NSU) noted that last year they switched from using well water to offshore water (taken at high tide from just inside Port Everglades) in the aquarium at Nova Southeastern University. Over several months they started seeing a similar phenomenon with disease including on corals that had been in the tank for years. As opposed to the issue at Florida Aquarium, the issue was not with new corals coming in, but with the water coming in, despite the fact that it had been run through UV sterilizers. The issue is clearly waterborne.
- Lauri MacLaughlin noted that during NCRMP dives off of BPK, Bahia Honda and Key Colony Beach, there was only 1 reported observation of black band disease. Sombrero Reef looked good. Surveys were mostly conducted in midchannel hardbottom, offshore, and intermediate reef. Everything looked good. Any disease that there may have been at these sites is probably just background level. During site visits to Looe Key in early July, Lauri noted several small outbreaks of black band on the forereef (buoy 11 or 12), but it was a small hotspot. The disease margins were narrow at 1/2" or less. The corals otherwise looked healthy at Looe. Water temperatures have also been relatively cool for this time of year: 79 – 82°F at depth.

- Dry Tortugas –
  - *Tracy Ziegler (NPS)*
    - Tracy Ziegler noted that some bleaching and a lot of disease has impacted the Dry Tortugas. Numerous species have shown signs of stress, including SSID, *Pseudodiploria spp*., *Orbicella spp*., etc.
  - *Jeff Miller (NPS)*
    - Jeff Miller noted that NPS staff completed their annual monitoring cruise of Dry Tortugas National Park between July 12 and 21st. A high amount of disease was observed on scleractinian coral species across six sites at North Terrace and Loggerhead Forest reefs. These large, complex reefs generally have 15-30% live

coral cover. Disease prevalence is 7 – 9%, affecting a number of the large reef building species, although 96% of the legions were observed on *Orbicella spp*. This is the largest outbreak of white plague observed at these sites since the 2006 outbreak. A follow-up survey is planned in September.

Update on Current Response Efforts (15)

- Pillar Coral (*Dendrogyra cylindrus*) Rescue – *Cindy Lewis*
    - Cindy Lewis noted that as part of the DCYL rescue effort, a total of 31 sites were visited over the course of one week. Of these, 15 sites were already dead or the corals were too diseased to rescue fragments. Currently 75 healthy fragments from the Upper Keys are being housed at Keys Marine Lab. Mote Marine Lab is conducting a similar rescue effort in the Lower Keys to try and rescue as many different genotypes as possible.
    - *Questions/Comments:*
        - Relevant to Valerie Paul's information about the spread of disease in the aquarium, Cindy noted that although the rescued DCYL fragments look healthy, those are being kept isolated by site for 30 days before being relocated into a group tank. In some instances, after 2 weeks of isolation some of the sites did begin to show signs of white plague. Approximately half of the fragments that showed signs of white plague have been lost. It was suggested that they try a Lugol's dip (15 minute bath) followed by relocation into an isolation tank. This technique seemed to stop the disease from progressing on approximately half of the fragments. Currently a few colonies have remained alive for 3 weeks and are still looking healthy. No antibiotics have been used.
        - Relevant to DCYL, Billy Causey noted that since 1973 he has been tracking several colonies of DCYL in one area of the Keys that have remained healthy. Last year in mid-July these colonies looked good, but this year of the 2 dozen colonies, well over ¾ of them were completely gone. These colonies have survived hurricanes, spread through fragmentation, etc. This is an offshore patch reef system between Big Pine Shoal and Sombrero Reef. Billy has not checked the 5 or 6 colonies at Looe Key. Cindy Lewis noted that she has been monitoring most of these colonies including those at Looe Key for the past two years, and inquired as to the exact location of this site with 2 dozen colonies.
- Coral Tissue Sampling – *Vanessa Brinkhuis (FWRI)*
    - Vanessa Brinkhuis noted that their team spent all of the previous week conducting CREMP monitoring in the Lower Keys. They did not notice any obvious signs of a disease outbreak at those sites at least nothing that was above normal background levels. Temperatures have also been cooler so bleaching observations are less that what was seen during the past 2 years.
    - Based on the last disease call, the CREMP team originally planned to sample at Carysfort since disease reports had been ongoing for that site. This is the northernmost CREMP site and a 20 mile trip from their canal. However, during CREMP sampling at Grecian rocks on July 16th, which is 10 miles south of Carysfort, they observed a large active disease outbreak. Diseases included white plague, "white blotch", and a number of indistinguishable white diseases that were unknown or the disease was too late-stage to identify. They did observe the MCAV disease previously noted by Esther Peters, with a

distinctive, slowly-dying bleaching band that was being colonized by turf algae (vs. sloughing tissue).

- FWRI took pictures and prepared a brief report of what was observed; this was sent to the disease call participant list on 7/19. They decided to sample Grecian Rocks instead of Carysfort because it was closer to the dock where sample processing would take place and it was confirmed to have an active outbreak.
- Sampling took place at Grecian Rocks on July 21 – 22nd. This took quite a bit of time as Vanessa was the only sample collector and the species being sampled have hard, dense skeletons. Only colonies affected with the white blotch disease (with the circular legions) were targeted.
- One apparently healthy reference colony and 3 diseased colonies each of *M. cavernosa, S. siderea, and C. natans* were sampled. Only 2 diseased colonies of *D. Labyrinthiformis* were sampled (mainly because most of the observed colonies were 100% recently dead or had too little tissue remaining).
- For each apparently healthy colony 1 molecular and 1 histology sample was taken. For each diseased colony one molecular and one histology tissue sample was taken from an unaffected portion of the colony and one molecular and one histology tissue sample was taken from the active disease margin. So the total number of tissue samples for MCAV, CNAT and SSID was 14 cores and 10 cores for DLAB.
- In addition to collecting samples, the CREMP team had multiple divers doing prevalence surveys. Eleven random 10x1m transects and two 10x1m coral demographic transects that are normally done within the CREMP stations were completed at Grecian Rocks. For the 11 random transects that were done, the mean disease prevalence (including colonies with white plague, white blotch, unknown white disease, and 100% recently dead colonies) by species is as follows: MMEA = 100%; DLAB = 66.7%; MCAV = 53%; DSTO = 50%; PSTR = 50%; SSID = 42%; CNAT = 33.3%; EFAS = 33.3%; *Siderastrea radians* (SRAD) = 20%; *Agaricia agricites* (AAGR) = 9.8%; PAST = 4.5%. Neither AAGR nor PAST was on the original outbreak report.
- Some transects done near the sand at the bottom of the reef had very high prevalence such as transect #10 where 13 out of 13 SSIDs were diseased with white blotch and 3 out of 4 MCAVs were affected.
- Carysfort reef had corals with active disease as well. Based on random swims it appeared that >50% of *Siderastrea siderea* were affected. Both shallow and deep sites were affected. A total of 13 species were observed with active disease (*Mycetophyllia* species in addition to the above listed species).

Coordination Meeting #1 Follow-Up

- Karen Bohnsack reminded attendees that an outcome from the July meeting was the creation of two working groups that have been coordinating amongst themselves: The FKNMS Permitting Working Group that is organizing sampling efforts for a permit in the Sanctuary, and the Sample Analysis Working Group that is coordinating sampling protocols and analyses.
- Sample Analysis Working Group Report Out – *Vanessa Brinkhuis (FWRI)*
    - The CREMP team did not receive any protocols for molecular sample collection from interested parties. Due to the workload they did not do dark collections, but molecular samples were frozen in liquid nitrogen. All histology and molecular samples were kept

in a dark cooler filled with ambient temperature sea water until they could be processed on shore. The molecular samples were frozen first, then the histology samples were fixed.
    - Fixed samples are currently being processed by the histology department at FWRI and molecular samples are in -80 freezers.
    - The FWRI team has been coordinating with Esther Peters, Jan Landsberg and Yasu Kiryu for histopathology. They have determined processing protocols and what types of stains to use on the slides. The slides will likely not be ready for reading for a couple of months due to the magnitude of slides that will be generated from these samples. Attendees can contact Vanessa Brinkhuis or Jan Landsberg for additional information or questions.
    - If there are any interested parties for the molecular samples they can contact FWRI and coordinate with Kate Lunz or Vanessa Brinkhuis. The samples can be divided as needed and shipped out.
    - *Questions/Comments:*
        - Karen Bohnsack noted that Mauricio Rodriguez-Lanetty (FIU) has offered that his lab can provide 16S amplicon and metagenomic analyses from frozen samples. It would be preferable if samples are snap frozen after collection. Interested parties should follow-up with Mauricio directly. Vanessa Brinkhuis and Kate Lunz offered to contact him directly.
        - Vanessa Brinkhuis clarified that the samples were in the cooler for about an hour before freezing. Cindy Lewis noted that these are still valuable samples and that Mauricio has some funding to process them.
- FKNMS Permitting Group Report Out – *Vanessa Brinkhuis (FWRI)*
    - An FKNMS permit was issued that allowed for the collection of samples from 4 different species including *M. cavernosa, S. siderea, D. labyrinthiformis, and C. natans*.
    - The permit allows a maximum of 35 samples per species; currently slightly less than half of what the permit allows has been sampled.
    - Other sampling efforts on the FKNMS permit include Katie Sutherland who is sampling SSIDs at Looe Key, and Esther Peters who sampled a few diseased MCAV colonies from the NSU tanks that started showing signs of disease.

Other Reef Issues

- Summer 2016 Bleaching Forecast – *Mark Eakin (NOAA)*
    - Karen Bohnsack noted that although Mark Eakin was not able to make the call, previous reports he has provided indicate that the forecast for the summer and fall 2016 in Florida is much less severe than the past few years. It is unlikely that it will be a bad coral bleaching year.
    - Karen reminded the attendees that this forecast has been verified in the field thus far, with previous reports of relatively cool temperatures. Field reports from the Keys indicate that we are not seeing much bleaching thus far; reports have been mostly paling with an average of 1-10% corals affected.
    - Jennifer Stein (TNC) noted that FRRP surveys started at the beginning of the week. The optional disease survey created in 2015 was offered as an addition to the normal survey protocol. This collects additional information about bottom temperature, surface temperature, disease observations, species affected, abundance, etc. Lauri MacLaughlin

updated this survey with additional fields for macroalgae, etc. Phil Kramer also suggested a modification to the protocol whereby additional data should be collected on 100% dead corals with recent mortality. Being able to quantify this would be beneficial. This will be decided and FRRP team leaders notified.

- Florida Reef Tract Macroalgae Reports – *Esther Peters (GMU), Karen Bohnsack (FDEP)*
    - Karen Bohnsack noted that reports have come in of various types of algae on the reef. Photos of these were included in the PDF sent prior to the call.
    - Broward County:
        - Esther Peters noted that during a recent dive at Willy's Way on Broward's 2nd reef, she noticed numerous cyanobacterial strands as mats or tufts on the substrate and on gorgonians in multiple areas. There is a possible interaction with this algae and coral mortality, as *lyngbya* spp. are known to produce cytotoxic compounds. These cyanobacteria may be secreting biotoxins which could be detrimental to corals and other organisms on the reef. Esther noted that she and Jan Landsberg have discussed that this is one issue for which they should look for funding, possibly through the Harmful Algal Bloom grant program. Jan noted that more data is needed, and they are willing to work on this with other partners to help characterize the species of algae and understand if they are producing toxins, etc.
        - Valerie Paul noted that SI has been studying these blooms for 10 years and has published ~20 papers on the toxins they are producing. This can have implications for overall reef health but the timeframe is off as far as these blooms having a direct link to the disease outbreak. The taxonomy has recently been clarified for a lot of these species. Valerie will send out information about the taxonomy and Jan Landsberg will send a paper on the pathology of the cyanobacteria on sea fans. There is a need to assess if toxins have a role as either the secondary or primary initiators, due to the presence of the cyanobacterial toxin microcystin in black band disease. Jan Landsberg noted that they could see if they can detect microcystin in coral tissue using immunohistochemistry, which has been used for testing microcystins in multiple species. This is something that they will try to look at with the coral samples that were already taken.
        - Esther Peters inquired as to what reef managers need in terms of data that would be useful for making decisions or informing state regulators about what can be done to control algal blooms that may be producing toxins that are dangerous to the corals and possibly other reef organisms and human health.
        - Joanna Walczak noted that communicating the severity of the disease and these other episodic events up the chain is an issue that reef managers grapple with. We need to be able to tell decision makers what they can do about these events. The question is whether or not we can trace an event back to a likely cause, or to the combination of conditions that led to the event. This was part of the motivation for the comprehensive conditions report that Esther was contracted to work on. By understanding the contributing conditions, we can narrow down a list of specific things that we can take action on, even if they are hard to do. There are chronic issues in south Florida, and while there may be

underlying episodic triggers these are often interdependent with other uncontrollable factors like rainfall, etc. Teasing out specific actions is a difficult task, and it is hard to get traction from decision makers if they do not feel they can have an impact. Ultimately, we cannot focus on more monitoring; they need to know what they can do. Joanna requested specific input from the disease coordination group that might help with this issue.

- Ken Banks noted that it is important to get to causality. Esther Peters highlighted that until etiology is defined it will be difficult to answer this question. Valerie Paul suggested that the first step is to figure out a positive cause, and noted the coral disease section of ICRS had nice talks, including one by Greta Aeby from the University of Hawaii. She figured out the disease etiology of a pathogen in Palmyra Atoll. It would be beneficial to look closely at her methodology and perhaps follow that.
- Esther Peters noted that this also comes down to funding. Valerie Paul recommended that with a coordinated effort, we might be able to apply for an NSF RAPID grant. Cindy Lewis clarified that Mauricio Rodriguez-Lanetty had an NSF RAPID grant for bleaching work; he still has some funding from that. A second NSF RAPID grant should be pursued for the disease problem.
- Karen Bohnsack suggested a new working group be created to work on the RAPID proposal. Interested parties include: Esther Peters, Valerie Paul, Joanna Walczak, Karen Bohnsack, Vanessa Brinkhuis, Kate Lunz and Jan Landsberg.

o Palm Beach/Miami-Dade:

- Karen Bohnsack noted that there is another macroalgae that has appeared on southeast Florida's reefs. It is a filamentous green algae. Ed Tichenor (Palm Beach County Reef Rescue) tentatively identified this as *Cladophora spp*. based on a similar bloom in 2007. This has been observed inside the reef line from Boca Inlet to Delray in Palm Beach County, and as a mat of semi-attached algae across multiple sites in Miami-Dade, where it has primarily been observed on the 2nd and 3rd reefs (not the first reef or nearshore ridge areas). Ed Tichenor indicated that this may be originating from the Boca Inlet, but that would not account for the situation in Miami-Dade. Karen noted that she found a report on Research Gate that included information about a macroalgae bloom that occurred in spring 2007 comprised of several species, including *Cladophora spp*. forming a thick mat on sand bottom and reef in northern Broward and southern Palm Beach Counties. As of spring 2008 the cause had not been identified. Karen requested that the group keep an eye out for this incident, and reminded the group that they can report algal blooms to SEAFAN and C-OCEAN. If there is interest among the group in investigating this further, an additional working group could be created to tackle this issue.
- Kelly Montenero noted that 6 of the coral disease reports received over the past month and a half mentioned algae, including green water and lyngbya. There have also been 3 separate algal bloom reports, including one each from Palm Beach, Broward and Miami-Dade counties.

Next Steps

- Karen invited participants on the call to share additional information they might have with the group.
- Lauri MacLaughlin noted that it is important to look into freshwater inputs. In spring 2016 while diving at Carysfort FKNMS staff noted unusual freshwater mixing at depth. There should not have been any water coming out of C-111 at this time, so this may be something to look into. Lauri Inquired if there is a way to find out what hydrological processes may be occurring besides stormwater runoff (e.g., water that might be percolating up from the bottom of the ocean). This could be a contributing factor. Billy Causey noted that Gene Shinn has shown connectivity between onshore activities and the outer reefs by way of water flow through the limestone. It's impact and the amount of flow has not been measured. An algal bloom around the mouth at Horseshoe in the 1980s made it look like that was part of a freshwater system. Billy also noted that there are freshwater wells in Biscayne Bay. Karen Bohnsack suggested that potentially the FKNMS Water Quality Protection Program (WQPP) Technical Advisory Committee (TAC) could tackle this question; it is important to understand all of the contributing factors but that may not be a question that the disease coordination group is best suited answer.
- Dan Clark (Cry of the Water) mentioned that Willy's Way in Broward County is virtually a round sinkhole in the middle of the reef. They have asked for years if there was freshwater coming up there. An artesian well was noted offshore there in nautical charts, and the Indians also had a freshwater spring directly inshore from this site at Birch State Park. If anyone looks at groundwater, Willy's Way would be a good site to include.
- Ken Banks noted that a USGS Survey was conducted several years ago for the Southeast Florida Coral Reef Initiative (SEFCRI), but it did not show much.
- Regarding coral disease sampling, Vanessa Brinkhuis noted that tissue samples would ideally be accompanied by a water sample, but they did not have the appropriate filters in stock when they took the tissue samples. This is something that may be interesting for comparison with the molecular samples. Vanessa clarified that if anyone is in the Upper Keys, a sample from Carysfort or Grecian would be appreciated. The CREMP Team will be at Carysfort and may be able to grab a couple 1L samples. Lauri MacLaughlin noted that Margaret Miller's coral spawning team does collect water samples; Lauri will try to get some samples at Horseshoe.

Wrap-Up and Adjourn

- Karen Bohnsack reviewed action items from the call:
    - Karen will send a meeting summary, and an updated version of the PDF of images. She will also send the Dry Tortugas National Park Quick Report once it is updated by Jeff Miller.
    - Karen Bohnsack will send a coordination email to the NSF RAPID Group.
    - Please continue to submit reports to SEAFAN and C-OCEAN (disease, bleaching and algal blooms).
    - A third disease coordination call will be hosted in late September. The date is TBD.