

FLORIDA KEYS NATIONAL MARINE SANCTUARY ADVISORY COUNCIL

MEETING NOTES **Tuesday, August 15, 2023**

Marathon City Council Chambers
Marathon, FL 33050

Attendees:

Council Members:

Citizen at Large – Upper Keys: Kate DeLoach
Citizen at Large – Middle Keys: George Garrett
Citizen at Large – Lower Keys: Mimi Stafford
Boating Industry: Ken Reda
Diving – Upper Keys: Seanna Knight
Diving – Lower Keys: Joe Weatherby (absent)
Fishing – Charter Fishing Flats Guide: Will Benson
Fishing – Charter Sports Fishing: vacant
Fishing – Commercial – Marine/Tropical: Ken Nedimyer
Fishing – Commercial – Shell/Scale: Daniel Padron (absent)
Fishing – Recreational: Karen Angle (absent)
Tourism – Upper Keys: Lisa Mongelia
Tourism – Lower Keys: Andy Newman
Conservation and Environment (seat 1): Ben Daughtry
Conservation and Environment (seat 2): Jerry Lorenz (absent)
Research and Monitoring: Erinn Muller
South Florida Ecosystem Restoration: Kelly Cox
Education and Outreach: Shelly Krueger
Submerged Cultural Resources: Diane Silvia
Elected County Official: Jim Scholl (absent)

Council Alternates (present):

Citizen at Large – Upper Keys: Jessica Dockery
Citizen at Large – Middle Keys: Bobby Dube
Citizen at Large – Lower Keys: Stephen Patten
Diving – Lower Keys: Lucja Rice
Conservation and Environment (seat 2): Caitlin Lusic
Fishing – Charter Fishing Flats Guide: Bob Beighley
Fishing – Commercial – Marine/Tropical: Jeff Turner
Fishing – Recreational: Gary Jennings
Tourism – Lower Keys: Eddie Kertis
Research and Monitoring: Karen Neely

South Florida Ecosystem Restoration: Marisa Carrozzo
Education and Outreach: Dora DeMaria
Submerged Cultural Resources: Sara Ayers-Rigsby

Agency Representatives (present):

Florida DEP: Nick Parr
Florida FWC FWRI: Tom Matthews
NOAA Fisheries: Lauren Waters
NOAA OLE: Officers Justin Powell
National Park Service: Tylan Dean
US Coast Guard: ENS Jordan Haas
US Navy: Wendy Wheatley-Techmer

Municipalities (present):

City of Layton: Councilwoman Cynthia Lewis
City of Key Colony Beach: Vice Mayor Beth Ramsay-Vickrey

I. CALL TO ORDER, ROLL CALL, CHAIRPERSON'S COMMENTS

The meeting was opened with the Pledge of Allegiance and called to order with roll call at 9:01 am. Council chair George Garrett welcomed the council and members of the public.

The chair introduced the agenda for this meeting as well as the notes from the June meeting for council approval, both were motioned, seconded, and subsequently approved. Ken Nedimyer made the motion to approve the June notes with no edits, with a second from Mimi Stafford. Will Benson made the motion to adopt the agenda for this meeting with a second from Gary Jennings.

George thanked the members for their attendance and noted that the council will hold a public comment opportunity at 3:40 pm today.

II. COUNCIL MEMBER RECRUITMENT

Council coordinator Liz Trueblood shared details for the fall 2023 member recruitment. Recruitment opened today for the seats that were not filled earlier this year: Boating industry (alternate), Fishing: Charter Offshore (primary and alternate), Fishing: Commercial Shell/Scale (alternate). These seats will serve through June 2026. Liz asked members to please help share this opportunity with their communities.

Council Discussion / Q&A:

Q: Andy Newman: When will decisions be made on these seats?

A: Recruitment will be open through September 15, 2023, and a meeting of the review committee will be convened within a couple of weeks after the closing date. The review committee uses a rubric to score applicants. Once members are selected, we submit a memo to ONMS Headquarters for vetting and approval, which can take some time. We hope these members will be seated by the December meeting.

III. BUOY WORKING GROUP RECOMMENDATIONS

Working group chairs Will Benson and Lisa Mongelia presented the overall recommendations of the buoy working group (BWG).

Lisa and Will thanked all who participated in the working group, including the FKNMS buoy team who provided subject matter expertise. A number of workshops, breakout sessions, and meetings have occurred to pull these recommendations together; public input was solicited and all the feedback was collated and scored to inform the recommendations. These recommendations are a broad suite, and are not specific to exact GPS locations for proposed new moorings. The SAC will receive final recommendations in written form, along with a draft resolution, before the October meeting.

The BWG Process:

The working group had two objectives: to prioritize strategies and locations and types of buoys to be deployed within FKNMS, and to develop management and financing strategies to support the recommendations. Drivers for this effort included the Restoration Blueprint, budget constraints, increased use and pressure, and degraded ecosystem health, including marine heat waves. The working group recognized that the Restoration Blueprint is not yet finalized, but that there may be things that can begin happening now.

The working group kicked off in April and final recommendations are expected at the October 2023 council meeting. A number of issues were identified by the BWG: impacts from users at reefs, damage to seagrass beds and restoration sites, high density use over sensitive reefs, the need for site-specific considerations, conflict between user groups, and opportunities for improvements in education, law enforcement and awareness of buoy status. These recommendations support conservation as well as public access.

The BWG mission was that the proposed strategies aim to minimize additional staff workload, implementation and management costs by strategically reconfiguring buoy locations to protect reefs, support restoration efforts, and provide improved public access. Several of the recommendations are adaptable and scalable pending evaluation of their effectiveness. Overall

BWG guidelines included: relocating buoys from high density areas on top of reefs to surrounding patch reef and sandy areas, alleviating use pressure at restoration sites, using submerged buoys to support restoration and research, providing dive certification infrastructure away from reefs, and expanding spar buoy use to support information sharing.

The BWG underwent a prioritization process for various actions and strategies. High priorities may be contingent on additional funding first being available; where others may be those activities that are more feasible to implement in the near term. Actions were listed, evaluated through public input, and scored by the group accordingly.

Review Draft Recommendations:

Strategy 1: Develop site plans in collaboration with stakeholders to address site-specific needs.

- This included a list of reefs/areas from the upper to lower Keys. Many of these are zones that are pending a final rule via the Restoration Blueprint.
- Within the site plans, a number of strategies are recommended: including consulting with restoration practitioners on their needs, removing or reducing moorings near sensitive coral and restoration sites, installing anchors for lines to support diver certifications, identifying permitting requirements, funding, and implementation strategies, etc. A final list will appear in the written recommendations.

Strategy 2: Support Restoration

- Request for Transit Only information spar buoys at various restoration sites in the lower, middle and upper Keys, subsurface buoys, and a variety of boundary marking recommendations specific to various reef sites.

Strategy 3: Wildlife Management Areas

- Recommendations for buoy placement or permanent signage at Snipe Key and Pelican Shoal WMAs.
- Pending outcomes of the Restoration Blueprint, additional recommendations may be generated for other zones in the backcountry.

Strategy 4: Education

- Goal to reinforce proper tie up procedures and promote sanctuary regulations and buoy requirements.
- Recommendations include standardized/easy to understand symbology on buoys, ongoing education about proper tie-up, advocating for inclusion of this information in state boater safety courses, leveraging social media and outreach via novel mechanisms such as airlines, and updating charts with buoy GPS locations.

Strategy 5: Collaboration/Financing

- Develop an “adopt-a-buoy” program to garner support from stakeholders for cleaning buoys, reporting missing buoys, and fundraising to support new buoy installations.

- Collaborate with partners and stakeholders to fundraise to support infrastructure installation and maintenance; develop MOAs clarifying roles and responsibilities between the sanctuary and associated partners.

Strategy 6: Logistics

- Consider marking large vessel buoys a different color; locations of these large moorings should also be clearly accessible online and in the app.
- Evaluate the effectiveness of large vessel buoys.
- A high priority recommendation is that the sanctuary evaluates the root causes of mooring buoy failure and considers modifying the design in high incident areas to reduce chronic issues of failure. The FKNMS buoy program can identify specific sites that are regularly missing buoys.

Public input was solicited on these priorities; many different recommendations were generated from those discussions.

Solicit SAC Input

The BWG requests input and questions from the SAC today, so that this can be considered for inclusion in the final draft recommendation that will be presented before the October SAC meeting. In October, the SAC will vote on a resolution to move the recommendations to the sanctuary superintendent for consideration.

Council Discussion / Q&A:

Q: Beth Ramsay-Vickrey: Appreciates the out of the box thinking to educate people flying in. Another priority should be educating people that trailer their own boats in. Consider also targeting the boating campgrounds; add posters and brochures to these locations.

Q: Ken Nedimyer: Worked with the buoy team these past few weeks; and has immense respect for this team - it is hard work. Reiterates that we need more than a large buoy color designation; also need a restricted access color-coded buoy (only allowed to moor at these locations if authorized). At some point, we may need to restrict access to restoration sites to boats that have been cleared to go to those locations. Acknowledged that submerged buoys are also useful, but this should also be considered.

- Will noted that adding buoys at other locations may relieve pressure by providing more opportunities. Similarly, moorings in sandy areas will support dive training away from sensitive areas until those users are qualified.

Q: Karen Neely: When you rent a boat at Pennekamp, you have to take a test - this may be an easy opportunity to add a question. Was surprised not to see Sombrero on this list - this is a very popular place. Curious about the proposal of not having boundary markers at Turtle Rocks?

- Lisa clarified that the idea was to try this as a test to not mark it. Perhaps by not having it so clearly visible, it will be more protected. This could mean no buoys at all - SPA or mooring buoys. This is a proposal for a pilot approach and would be dependent on the outcome of the Restoration Blueprint plans for Turtle Rocks.

Q: Ben Daughtry: Echos comments about Sombrero. This area is being restored and should be on the list. Was a middle Keys representative on the BWG?

- Will: Some folks fell off the initial roster, so Middle Keys was a collaboration between the upper and lower Keys contingents.
- Lisa: The presented locations were noted most often; Sombrero was discussed and can be revisited.
- Will: Reminded that this presentation was just a broad overview; the final recommendations in written form will be much more comprehensive. Other novel approaches have been proposed via this group that were not explicitly discussed today.

Q: Stephen Patten: We have two NGOs associated with FKNMS - the Marine Preservation Society and NMSF. Suggest using these as an immediate mechanism for funding buoys.

- Will: State of Florida does this with FWC's non profit. The mechanics make a lot of sense; the idea today is that the program still needs to be developed and approved, and be implementable. Once we know this is possible, we can turn to partners to begin requesting funding support.
- Sarah Fangman: In recent history, FKNMS has managed the buoy system ourselves. As this BWG has shown, the issues have increased, the age of the system has increased, and the effort required to manage and maintain this buoy system has increased, and fallen behind. In recent years we have fundraised, including with generosity from the TDC (via an infrastructure grant). Two contract companies are out currently to install anchors. Pearl Beach is installing 60 anchors in the lower and middle Keys and Aquanautik is installing 70 in the upper Keys. Some of these are replacing aging infrastructure, some are new locations, and some are subsurface buoys intended for restoration. This was our first foray into having outside help. Now we can look at how to expand this model and bring in more money and more help. The program has historically only been funded by federal appropriations.
- Stephen Patten: Urged that we don't have time to be as cautious as in the past.

Q: Ken Reda: In the process early on there was a belief that more money and more buoys was the solution. More buoys may not be the answer. Need to have funding to maintain the infrastructure. It's beyond more buoys, it's the long term costs associated with keeping up.

- Lisa: With a pilot approach, models that work at specific areas can be expanded to other areas.

Q: Andy Newman: Noted an early pioneer in mooring buoys; this was 40 years ago. We need to get this done.

Q: Bobby Dube: Likes the idea of a red, reserved or research or official use only buoy. This can be deployed when coral restoration work is being done. Could be removed when they are done working.

Q: Kelly Cox: Shared that there is an organization in Dade County called Miami Dade Reef Guard. They are an NGO that partners with the county's mooring buoy program; they provide underwriting and labeling for the mooring buoys there. This could be a model or collaboration opportunity.

- Lisa noted the BWG can reach out to learn more about their program.
- Will: The county and cities may have an opportunity to be involved locally in the Keys as well. As we build momentum, these partners can assist via financing, outreach, etc.
- Will also noted a desire to regularly engage the SAC on this topic. The SAC can provide a lot of guidance moving forward, help evolve, etc.

Q: Eddie Kertis. Regarding maintenance; often the eye-loops are almost shredded. Why don't we have thimbles inside the eye splice? This would extend the life of these lines.

- Ken noted this would sink the line; would need to be countered with a little buoy to keep the line afloat.
- Lisa noted that this had come up in a WG meeting, and could be explored

Q: Jeff Turner: In consideration of this discussion, what are we looking at as the annual budget to do this work? This is a business proposition; we need to determine a target funding goal per year, so we know what to go after - whether public or private.

- Sarah: Doesn't have that number off the top of her head; it's staff time and a bit for equipment. 6 people, supplies, and running a boat.
- Lisa: Working with the team to determine installation and maintenance costs, so that can be rolled up based on a proposed quantity of buoys.
- Will: There may be additional costs associated with various recommendations that change the status quo (e.g., updating tackle/hardware, different color buoys, quantity ordered/economies of scale, more staff needed to implement, consider housing crisis, etc.). There are a lot of good ideas, but it is complicated. The top idea from this group is a recommendation to support financing and partnerships to move these creative ideas forward.

Q: George Garrett: The City of Marathon maintains 226 mooring buoys; they review and maintain them quarterly. They have contract budgets and provide an approximate cost of each

moorings. Note this is an easier place to maintain as the buoys are in one location, but that may help inform the budget question.

- Will: Monroe County and 6 cities are in the mooring buoy business. Once we have a final recommendation, maybe the group could follow-up with partners to discuss how to move forward.
- Andy Newman: What kind of revenue does the City of Marathon get per buoy.
- Lease fee is ~\$300/mo to live on a mooring.
- Lisa noted that at this point we're not suggesting charging people to use moorings.

Q: Justin Powell: Acknowledged challenges with subsurface buoys. Remember that even if something is marked as "do not use," people will use it. Concern about this becoming an enforcement situation. Underwater moorings are helpful from a law enforcement perspective. Regarding smaller spliced eyelets that would not fit on cleats, that is an awesome idea. This would deter from tying directly to boats, and prevent the damage. Would like to sit in on a future discussion.

V. SEAGRASS MONITORING PROGRAM: STATUS AND TRENDS

Dr. Jim Fourqurean of Florida International University gave an overview of the last 25 years of seagrass monitoring in South Florida.

Jim noted that the Water Quality Protection Program (WQPP) was created as part of the sanctuary's designation. Three monitoring components were established as part of the WQPP to measure the status and health of the sanctuary's water quality, coral reefs, and soft-bottom (seagrass and algal) communities. In 1995, 30 sites were selected across FKNMS; ten years ago, 10 additional inshore sites were added. Twice a year, FIU collects data at these sites. Additional sites are located at Dry Tortugas National Park and Florida Bay, which employ the same methodology. They record all the organisms on the bottom by abundance. Even with the simplicity of the sampling design, they've discovered some interesting and complex interactions.

There are seven naturally occurring benthic communities that have been defined for the Florida Keys. These include dense turtle grass, moderate turtle grass, sparse/patchy turtle grass, coral/sponge communities, etc. There is a spatial pattern in the seagrass structure in FKNMS. Dr. Fourqurean published a paper last year that covers additional details of the 25 years of monitoring data. At each site, data are clustered to look at trends over time and between regions. The Keys are metastable; the system is both stable and dynamic. Overall *S. filiforme* (manatee grass) meadows are the most stable. A troubling trend has been observed nearshore where turtle grass is transitioning to shoal weed due to nutrient pollution. This slow eutrophication of the Florida Keys is apparent in the data; nutrient impacts continue even after municipal sewer installation in the Keys. A higher nutrient environment in the backcountry harbors consistent *S.*

filiforme meadows. Nutrient enrichment in nearshore waters drives a change in benthic community composition; there is a shifting dominance between *T. testudinum* (turtle grass) and algae due to interannual variability in nutrient availability and storms. Catastrophic long-lasting loss of seagrass in FKNMS has only been observed after major hurricanes; and this is limited to specific sites. *T. testudinum* is especially vulnerable to hurricanes which can cause blowouts of offshore meadows. Recovery time to climax density takes 10+ years, so repeat hurricanes can prevent this species from reestablishing. Hurricanes in this sense can be even more impactful to seagrasses than long term water quality issues. There is still much to learn about meadow vulnerability and spatial extent of impacts; long term monitoring can help document recovery dynamics.

There is variability in water quality in FKNMS that is not unidirectional. In Florida Bay compared to the sanctuary, the data shows recurring peaks in water column total nitrogen through time. There are also times when total phosphorus peaks. Different parts of the system- including seagrasses in Florida Bay - are phosphorus-limited and thus respond to phosphorus changes; reefs are nitrogen-limited and respond to changes in nitrogen. Seawater N:P (nitrogen:phosphorus) ratio varies. Sometimes it's low and sometimes it's high; and these variations in the N:P ratio tell us if we're nitrogen or phosphorus limited. This interannual flux in nutrient availability corresponds with fluctuations in seagrass biomass. High nitrogen corresponds with more *T. testudinum* biomass; low nitrogen shows less *T. testudinum* biomass from year to year. These pulses line up with rainfall. El Niño years are associated with a lot of rainfall and more nitrogen in the system. This fertilizes the seagrass as it moves out to the reef; thus more grass is observed in wet years. Overall, the abundance of seagrasses in FKNMS is driven by nutrient pulses, and climate oscillations also affect relative nutrient availability in FKNMS though the mechanisms of nutrient delivery are yet unclear (upwelling, runoff etc.).

Current FKNMS Temperature Trends and Impacts on Seagrass: Seagrasses tend to live close to their maximum thermal tolerance. *T. testudinum* is 18-33C, *S. Filiforme* = 18 - 35C. They have high upper tolerances, but temperatures where they live are close to the upper limit quite often.

Temperature loggers have been deployed at the sites since 2002 at the offshore sites, and 2010 at the inshore sites. Data must be retrieved manually from the instruments on the bottom, so unfortunately Jim cannot speak to the specifics with this current heat wave yet. As a whole, temperature at monitoring sites within FKNMS shows temperature is increasing at ~1C per decade (0.09C per year), which is 2-6 times faster than global open ocean temperatures. Interestingly, temperature increase is not dependent on depth. Shallow and deeper sites in our area are heating up almost equally. There is a depth factor to consider when it comes to extremes, deeper sites have a higher minimum and lower maximum temperatures; where shallow water gets colder in the winter and warmer in the summer, but average temperatures between shallow and deep water are rising at the same rate. At Carysfort, they've seen only a

few days above the higher thermal tolerance for *T. testudinum*; but a backcountry site off of Key West shows faster warming (1.3C per decade in ~2.8 m of water). One of the slowest increases in temperature is at Long Key (.07C) but that is still 4x higher than the global average. Overall temperature trends show that seagrass meadows in the Florida Keys are warming rapidly; 2-6x the global sea surface temperature average.

We know averages are going up; also need to question if heat waves are becoming more common. These are defined as at least 5 days above 90th percentile based on the climatological record. Heat wave events occurred at all sites (30+ events in 20 years of record). It's hotter, and heatwaves are happening more frequently. Cold waves are less and less frequent (20+ events in 20 years of record; clustered in specific years 2010-2011 and 2013-2014). During El Niño years, we see more heat waves; La Niña lends to more cold waves coming through.

Temperatures can impact seagrass carbon balance. Recent high temperatures have not affected seagrass abundance yet, but the research predicts we may see seagrass dying in October. Seagrasses make oxygen during the day which is used at night; but we'll see day length decrease in October, so photosynthetic time is reduced which results in less oxygen. When temperature is high, respiration rates are high and oxygen gets used faster. This results in night time hypoxia and resultant die offs. Hot water holds little oxygen, plus shorter days lead to a carbon imbalance. This is setting up to be a bad fall for seagrass.

Jim noted that FDEP/FIU have collaborated to install 4 new telemetered Water Quality Monitoring stations where the old C-Man stations used to be. These provide real time data at Molasses, Sand Key, Sombrero and soon-to-be at Fowey Rocks. These data are collected 1 meter off the bottom. From these data, you can see temperature, salinity, dissolved oxygen, and a number of other parameters over time. These were deployed right before it started getting hot. FIU is working on a data portal to provide more relevant information. Data from the buoys can be accessed here until the new portal is ready: https://cloud.xylem.com/hydrosphere/public-sites?tab=0&customerId=OWA_D4FCEA1762484701A8D1891297DA823F&siteId=DB600sn27061

Council Discussion / Q&A:

Q: Andy Newman: Years ago, there were a number of bird stakes installed to assist with seagrass restoration; can you share results from this work? Also, noted that he is frustrated that there seems to be a disconnect between NOAA agencies; and wished for better collaboration. Referenced the weather data packages from the NOAA weather stations - these are not expensive and simple. Why can't we add these? Sombrero, Alligator and Molasses weather stations are gone.

- Dr. Fourqurean shared that initially the bird stakes were an accidental experiment, done as part of his dissertation. At the time, they were interested in where wading birds were feeding, and stuck a length of PVC with 2x4 every km; and used this to map birds. In doing this they fertilized the grass around the stakes, and discovered that this was due to bird poop fertilizing the nutrient limited environment. This works, but requires birds to poop faster than water exchange would flush the nutrients away. It also potentially changes a low nutrient community to a high nutrient community. 28 years later, these original sites still show signs of fertilization. This has since been further developed, and is now used for restoration.
- With regard to the now-decommissioned NWS weather stations, Jim noted the buoys his team uses were \$200k, and require 1.5 people to maintain these buoys and keep them operational. It is a huge budget. Some of the older weather stations were relocated, but the water quality monitoring component of that was unfortunately never reestablished.
- Nick Parr (DEP) shared that bird stakes are effective when used as a short term restoration technique by DEP to support seagrass recovery. They are typically installed for a short time to jump start restoration and then they are removed.

Q: Erinn Muller: We saw a big slug of water come from Florida Bay to the reef tract, almost to Looe Key. This impacted coral nurseries in the area; had temperature loggers which documented a spike almost to 34C. Don't understand how salinity changed in association with this high temperature water. Any information about this?

- Jim noted that density is determined by temp and salinity; salinity can override temp when over 35ppt. Reverse thermocline is that salty hot water sticking to the bottom. If you force water out, it is heated and becomes a dense water mass. Salinity rarely gets high enough in South FL to impact seagrasses but it does. In Florida Bay in 1978 salinity reached up to 68 ppt. Seagrasses survived because rhizomes underground were buffered from these changes (although the leaves were killed). If conditions are not too salty and hot for too long, seagrass is resilient. Salty water also has less oxygen, so that interaction is also important for driving hypoxia which affects seagrasses.
- Have you seen salinity change at these buoys?
 - We have data from these buoys and satellites that can effectively measure sea surface temperature. It was multiple degrees warmer at Sombrero, not at other stations. This is where the Gulf of Mexico water comes out. Have seen that sheet of water out 100 feet depth off of Sombrero. We know it comes in and out, now we have data to show this happening across multiple time points.

Q: Will Benson: Backcountry fishing guides have experienced hurricanes, heat waves, have not seen seagrass death yet. Hope for rain before Oct - this seagrass is critical to the fishery. Request to elaborate a bit more about the difference in heating trends between the Lower Keys and Upper

Keys. Is Lower Keys heating a little faster? Is there correlation between this and the hydrology and the bays back there?

- Jim: The shallow water in the Lower Keys and Florida Bay are behaving similarly right now. We have more shallow water sites in the Upper Keys than the Lower Keys; there could be a spatial pattern but it's premature to say; they are working through the data right now. Regardless, both areas are seeing increases 2-6x faster than open ocean temperature heating.
- Will noted they also get less rain; could see those bays being saltier, less flushing, persistent algal blooms in Niles Channel, etc. They see water temperatures that seem higher locally. Regarding the localization effect - reference persistent eutrophication in the shallow water - why?
- Jim: We fertilized for 3 years and stopped for 25 years and could still see the fertilizer effect at the bird stakes. Phosphorus from bird guano once in the plants and sediments is immobile. When it comes to nitrogen, there are bacteria to denitrify and get rid of it; but no such thing for phosphorus. There is a long memory in a phosphorus limited environment for phosphorus fertilization. We need patience and to continue to reduce phosphorus inputs into our waters by any means necessary.

Q: Will Benson: Spends time off of Sugarloaf Key; thinking about how we "air condition the ocean." As a kid, there were a lot of sea fans in these basins; something occurred to kill them many years ago. Wondering if shading from sea fans, if reestablished, may help. Any temperature benefits in hard bottom communities that have crossover between these organisms. Can shading help?

- Shading is plausible, but not by sea fans. Because these are submerged in the water, they effectively darken the water and increase light absorbed, this may have the opposite effect and warm the waters further. A mangrove tree over the seagrass however, intercepts light before it gets to the water. On the Great Barrier Reef they are considering cloud seeding the SE Pacific Ocean to reduce thermal forcing over that reef.
- Sarah shared that the FKNMS science team is discussing experimental shading treatments to reduce bleaching severity and increase survivorship. Need to be above water vs. in the water, which will cause water to heat up more, not less.
- Bright white sand heats up more slowly than dark seagrasses. Photons are transferred to long wave radiation which turns to heat. Shading is being explored all over the place.

Q: Will: Regarding prop scarring as a contributor to seagrass scarring, this is another factor in seagrass decline. The impact areas also often have lush seagrass. Does this weigh into the data?

- The seagrass monitoring program was specifically designed to measure water quality; a different design would be needed to evaluate impacts of bottom dredging from prop scarring. Average time to heal a prop scar from a single lower unit is frequently up to 15 years; some never heal, because it creates a flow way to move sediment and it becomes a

permanent cut. In some areas this is a serious problem. Aerial photographs allow you to show where marinas are and where users go to fish based on seagrass scarring.

VI. NEARSHORE COMMUNITY RESEARCH AND MONITORING

Tom Matthews, of the Florida Fish and Wildlife Research Institute, presented on nearshore hard bottom habitat in the Florida Keys, including their ecological importance and sponge restoration efforts.

Nearshore hardbottom is defined as rocky bottom within 2km of the shore in the Florida Keys. This covers about 67k ha, or about 30% of the entire nearshore habitat in the Florida Keys marine ecosystem. Sponges are an important part of this habitat and serve as essential fish habitat; Over 180 species of finfish use hardbottom area; this habitat contributes to fishery populations.

Thirty two hardbottom sites have been sampled in the Florida Keys for a long time. This was set up to compare low, medium and high quality sites (subjectively). High quality sites were the only places with huge populations of fish; the habitat needs to be 80-90% intact to attract fish. Looking at the size and frequency of fish in these communities, we see that these are the juveniles of ecologically and economically important species. These habitats also harbor sea cucumbers, urchins, stone crabs, etc. This is also an important spiny lobster nursery. Lobster larvae preferentially settle into red algae that is abundant in nearshore hardbottom habitat; then they move to sponges and under coral heads as they grow. Spiny lobster prefer loggerhead sponges; larger juvenile lobsters begin using rocky solution holes before they move to reefs as they mature. This transition from sponge habitat to solution holes is important. We can estimate lobster abundance about 18 mo. in advance. There is not a great relationship between lobster and habitat; they seem to be able to live in a lot of places, but a loss of sponge habitat may have an impact on the overall lobster population. Years ago, Everglades National Park and Florida Bay was probably one of the most productive lobster habitats in the world; but researchers now think that has shifted somewhat to the north.

Sponges are critical to the coral reef ecosystem. This habitat is associated with many microorganisms that produce chemical transformations in the water as it is pumped through the sponge tissues. Notably, this is habitat for snapping shrimp and other small organisms which create an important soundscape that attracts juvenile fish. Sound travels, and larval and juvenile organisms drop out of current when they hear it. When sponges die the habitat is silent and juveniles cannot find it.

Causes of sponge die off - in the early 1990s, periodic cyanobacteria blooms caused hypoxia and resulted in sponge death. Sponges are animals, and cannot handle the lack of oxygen that results

from cyanobacteria blooms. Low oxygen conditions, as opposed to the heat and algae, is what led to mortality. Mystery Basin in Everglades National Park/central Florida Bay had a diverse sponge population. In 2012, another cyanobacteria bloom came into effect and caused sponge die offs. These blooms stayed away from nearshore areas, but were prevalent in the basin that doesn't get a lot of recruitment. The big question is whether we can jumpstart recruitment to help restore these areas. We have discovered that sponges can be propagated to do this jumpstart - it works, unless there are repeat disturbances year after year.

Loss of ecosystem function is associated with sponge loss. Sponges take in dissolved inorganic nitrogen and give off CO₂. Dissolved nitrogen is the dinner plate of the ocean - it is energy in these ecosystems. Hardbottom soundscape is incredibly important so there is an effort to look at how sponges colonize to understand how to recover the communities/repopulate them with those noisy organisms. Sponge restoration involves cutting sponges into small pieces, tying them to bricks, and placing them on the bottom to grow. This is laborious but straightforward. Little sponges grow back relatively quickly. Nurseries have been established to grow out these new sponges, and diverse species have been grown successfully in nurseries. Part of this is an experiment; too many sponges in a concentrated configuration = too much food removed from water. Researchers have been working to perfect the mix of species and configuration in nurseries to maximize the density we can have.

Hurricane Irma in 2017 affected the nearshore sponge community. The Burnt Point nursery went dry as a result of high winds, and most nursery sponges were lost. They rebuilt nurseries in 2019; and have since outplanted sponges to restoration sites. 15k were outplanted in the middle Keys. These animals can reproduce almost immediately - the goal to jump start the ecosystem. Unfortunately since then, we've had algae blooms that continue to cause these population crashes due to hypoxia. It's been unsustainable. They moved the nursery to a location without a recorded algae bloom, and there is one there now. One restoration site was in good shape, but now there is a heat wave.

When sponges are exposed to toxic algae, they cover themselves in mucus (basically they are holding their breath); they have a few days or they suffocate due to a lack of oxygen. Moving forward, nurseries will likely be spread out into micro-sites in an effort to avoid large-scale losses. In creating restoration goals, this program looks at data from 2007 as their baseline and as a blueprint for restoration planning.

Council Discussion / Q&A:

Q: How many people work on this?

- 7 or 8. FWC does the research behind restoration. They've developed the techniques and can sometimes provide best management practices for other organizations that want to do this work.
- Ben Daughtry: If the sponges are suffocating and that kills them, what is killing them in Hawk Channel and the deep reef? This is across several species. This is happening on a wide basis right now.
- Unknown. Some species have had widespread die offs, and we don't know what caused it. There is a lot we still don't know even though sponges are a fairly simple organism.

Q: Ben: Regarding lobster. With the loss of hardbottom soundscape, will record catches persist?

- Our larval lobsters come from the Caribbean, if populations in the Caribbean are good, so are ours. Their populations are down 20% and our catch is also down that much since the mid 1990s. Lobsters can live almost anywhere; so they are not a reliable indicator of the ecosystem, but when you lose the habitat, sooner or later they will catch up. It's more fish that require the soundscape.

Q: Karen Neely: Are these blooms predictable? Is there a known environmental driver?

- Hot water causes algae to grow faster; there is an overlap between algae blooms, oxygen loss, etc. We see micro fish kills from oxygen loss right now. We're not able to quantify these well, because they are subtle, and not always reported.

Q: Bobby Dube: What happened to the gloom and doom of the sargassum "blob" that was supposed to hit Florida?

- One nursery was lost due to sargassum that came in, sank, rotted and reduced oxygen.
- Sargassum is still in the Caribbean; the winds changed and it didn't come here.
- Jim: We prepared for a big onslaught but it dissipated a couple months ago. Unknown if it went somewhere else, or what.
- Nick: The satellite photos of the blob were not accurate; this was patchy sargassum higher than we were used to.
- Andy Newman: Brian LaPoint presented on this a couple meetings ago; Andy spoke with him recently. He's unsure what happened to the blob. A lot to do with the winds; sargassum is influenced a lot by winds. There are other places that have been more heavily impacted than they used to be.
- The sargassum story in the Caribbean is real - some places have 5-10x the usual biomass washing up on shore that suffocates the system. High temperatures and eutrophication support algae growth. About half of current movement in the Keys is wind driven; so low winds in July helped to create the doldrum conditions and the heating events too,

Q: Will Benson: Noted Sugar the famous dolphin from Sugarloaf Lodge. She liked to sit at a big loggerhead sponge. When she died, so did the loggerhead sponge shortly thereafter. There are a lot of gamefish here. Any known connectivity between these species?

- Unknown. Loggerheads use organic nitrogen that a large animal puts out, but they are not typically dependent on that.
- Nick: Cannot speak to sponges, but anemones in the Pacific are aerated by clownfish; they grow bigger than they would be able to survive without the fish.

VII. FKNMS TEMPERATURE EVENT BRIEFING

Sarah introduced the presentations planned for this afternoon, including FKNMS staff response activities to the 2023 Heat Stress Event. This is a significant event our marine environment is experiencing so we have planned time this afternoon for information sharing and discussion.

We are currently experiencing a marine heat wave. NOAA produces products via [Coral Reef Watch](#) which provides a bleaching alert system. The Florida Keys are currently in Alert Level 2 which translates to severe bleaching and significant mortality likely; this is early in the year to be at this stage. Sea surface temperatures compared to the last 20 years are quite elevated. We are well above the temperature threshold for bleaching to occur. Degree heating weeks (DHW) are a measure of heat stress over time (very hot water for a short period of time, or less hot over a long period of time); these data also show that 2023 is abnormal and significantly higher than the bleaching threshold. NOAA also has Florida Keys-specific data across 11 reef sites, including the 7 Mission: Iconic Reefs sites. We did have a bit of rain a few weeks ago, and we did see how this helps reduce temperatures. The rest of the summer remains to be seen; additional rain events may help alleviate some of the temperature stress.

Corals are bleaching, and there *are* healthy corals remaining. FKNMS, along with other partners, is currently conducting a synoptic survey on the Shedd research vessel to get a system wide perspective on bleaching. We also plan to conduct a similar survey after the temperature stress (January or February 2024) to understand the outcome of the event. Many partners are working on a response to this event; part of this is to collect corals on land to provide a gene bank of those corals. This has been a major media event, and we continue to provide information to these sources. Another project underway in response to the heat event is an effort to move in-water nursery corals into deeper water where it is cooler. FKNMS has supported this and we are hopeful this will help protect some of these corals. Additionally, we are working with NOAA to identify funding to support these response efforts. Some promising prospects have been identified. NOAA has been working with NFWF and the pre-existing MIR grant to provide emergency funding to individuals who are part of this effort. The state has secured funding, as have NGOs such as the United Way, Marine Preservation Society, etc. FKNMS received funding

to buy temperature buoys that will be installed at the M:IR sites which will provide more water temperature data at depth and at the surface. These will provide real time data so anyone can access it. These will be useful to make decisions about restoration and outplanting timelines in the future. The Marine Preservation Society has hired someone to install anchors for these instruments, so they can be deployed as soon as possible. We are also soliciting participation from the community in reporting information. Mote's [BleachWatch](#) program helps provide eyes on the water and report bleaching observations. [SEAFAN](#) is another mechanism to capture events such as temperature stress, fish kills, etc. The FKNMS BlueStar Program is also providing information to their customers. We are also building the Iconic Reef Guardians Program to engage the public in restoration efforts; we are training those folks to become observers in lieu of nursery tours during this event. We remain hopeful; and despite these challenges, this month we have seen successful coral spawning both in the wild and in the lab.

VIII. SAC MEMBER PANEL: MARINE HEAT WAVE RESPONSE AND OBSERVATIONS

Monitoring:

Dr. Karen Neely and her team have been working on Stony Coral Tissue Loss Disease (SCTLD) over the past several years; they have 14 sites they monitor every 2 months, which helps assess this event. These are snapshots in time. Bleaching observations between July and August include:

- Upper Keys were visited at 5 DHW, which has since increased: at that time, the fore-reefs had some paling, but were mostly fine. Backreefs when last visited had some paling and mortality of branching coral outplants.
- Hen & Chickens was visited 2 weeks ago (at 8 DHW). Saw some paling and bleaching, but no mortality.
- Coffins Patch: unknown what DHW was at this site. Observed some paling/bleaching, no mortality. The pillar coral patch with bleaching and two dead due to this event.
- Marathon patch reefs were visited last week (10 DHW). Over 8 DHW typically results in widespread bleaching and mortality. This is what they observed; everything was partially or totally bleached, as were octocorals. Coral disease is often tied to thermal stress and black band disease was also observed at this site.
- Newfound Harbor was at 12 DHW. Everything was partially or totally bleached; many dead octocorals. 6% dead from bleaching 12% actively dying as a result.
- Cheeca Rocks visited last week (12 DHW at that point in time). Similar to above; everything partially/totally bleached, dead octocorals and dying hard corals. Substantial loss was observed on large boulder corals at this site. 12% of the coral they monitor are dead from this event; 14% actively losing tissue from this event; 8% have black band colonies. To note, bleaching reduces SCTLD incidence This has been shown through time at Cheeca rocks since 2021.

Response:

Ken Nedimyer provided an overview of Reef Renewal's response activities. As of August 1st their Tavernier nursery was doing well; as of yesterday some paling and bleaching, but still in overall good shape. There are limited options to deal with these nursery corals. This includes running corals to shore and participating in a gene bank swap. Reef Renewal thought it was best to leave these corals in the water to see how they fare over the summer. Understanding projected issues, they decided to move a subset of corals to deeper, cooler water, and a site was selected at the edge of the reef in 70 feet of water. A major effort was made to permit these activities within a matter of days to enable this relocation to happen. A team was quickly rallied to support this relocation effort consisting of Reef Renewal staff, local volunteers, tech divers from SFL, Georgia Aquarium volunteers, and several FKNMS staff members. Approximately 100 anchors have been installed and corals are in the process of being relocated. Work in 70 feet of depth is difficult, as was working in substrate with mixed sand and hardbottom. Once the anchors are installed, you need to pull a string of buoys down to depth; which is also a lot of work. A subset of branching species, both staghorn (*A. cervicornis*) and elkhorn (*A. palmata*) were relocated as the top priority. Reef Renewal uses vertical rope nurseries; these are staged and harvested then moved to the new site.

Different genotypes are responding differently to this event. This is expected; and we are essentially looking for the winners in this type of event. Some are being left in place to see which genotypes are survivors in this circumstance. Temperature loggers are deployed at the bottom and every 15 feet. At the bottom it is currently 83-84 degrees; upper depths vary. This is cooler than the regular nursery, which is 87-88 or higher. At the shallow nursery, they have started to see some bleaching. Shade cloths are being installed on upper branches of the nursery structures. Whether this will help remains to be seen. Sexual recruits bred in captivity were provided by Florida Aquarium and Mote, and are clustered by genotype in the nursery. Reef Renewal has left them in the upper part of the water column where temperatures are regularly in the 90s. Some of these corals are doing well, others are not. Those that live will be fragged for outplanting. There can be up to 70 different genotypes represented on one structure. Other corals grown by Mote are mounted a bit differently in the nursery. These are also up higher in the water column to assess how they fare. Thus far, these have not bleached; this may be due to them having clade D symbiont, a type of zooxanthellae that may be more resistant to heat. There is still hope we can find and raise corals that can handle these conditions.

Ben Daughtry updated the council on Aquarium Encounters' participation in the rescue effort. In addition to leaving corals in the water, corals have been brought in due to significant loss in the middle and lower keys systems. AE has converted a system into a new coral handling system (30k gallon system; adding new life support systems) in the hopes the corals can be kept healthy and returned to the environment. AE does not have technical capability to keep corals, so they

have relied on AZA partners who have had success in the SCTL D response effort. This is part of a multi-faceted approach to do whatever necessary to save these corals.

Dr. Cindy Lewis provided an update on Keys Marine Lab's efforts. KML has three separate seawater systems: the original system from 2015, a new FWC coral reef restoration system that came online in 2022, and a new NSF-funded system that went online in April and was deemed safe to hold corals in June. All systems are temperature controlled from a seawater well. Water is being held at 84-85 degrees, and individual tanks can be held cooler if needed. In total, they have 60 saltwater tables which are at 100% capacity, and overall the corals are doing well. More than 5000 coral fragments of multiple species are being held. KML will be an intermediate site for relocating Dry Tortugas NP corals to Mote Marine Lab in Sarasota. This response effort began on July 19th, when the first corals were brought to the facility. Over 55 people transporting or participating in coral triage efforts have passed through the doors since then, and over 40 reporters and 17 different film crews have come to tell the story. Within a couple days, stressed corals brought in were beginning to look better in this facility. CRF's coral bus was used to shuttle corals from the docks to other institutions for longer term holding. These corals will be in KML care for the next several months; the system also has a generator backup system with enough propane to run the lab for two weeks if needed. They also have a backup to this backup system; Monroe County provided a generator at KML before planned electrical work was conducted.

Dr. Erinn Muller provided an update on Mote Marine Lab's efforts over the past few weeks. MML has an international coral gene bank - 200 acres in Sarasota in a Cat 5 resistant building. This is intended to hold species and genetic diversity in a safe haven in the event of a disaster. This event has showcased the purpose of that infrastructure. Have mobilized with a focus on elkhorn and staghorn which are on the brink of functional extinction in the wild. There are only 450 distinct staghorn coral genotypes and only 170 elkhorn. Mote did a gene swap from the Lower Keys to the gene bank; as many genotypes as possible were stored in this safe haven over the matter of a few days. Mote has in-water nurseries and land based nurseries across the Keys. Those in the Marathon and Looe Key areas with bay water influence are severely bleached, but the nurseries in Key Largo are healthy. Over 10,000 corals have been moved from in-water to land nurseries. For the first time they also moved corals up to the Sarasota facility. 25' x 25' tanks have been set up to house corals; working to retrofit these tanks to keep coral healthy has been a big undertaking. Representatives of all genotypes have been kept in the in-water nurseries; as we need to understand what is able to withstand these stressful events. Restoration needs to be done with an understanding that these stressful events will continue to occur. Additional research to make corals heat tolerant and heat resistant while maintaining diversity will help ensure corals are resilient to these and future events. Shading is important to reduce bleaching; it's not to change temperature, but to change light intensity. When corals have higher light intensity, they bleach at lower temperatures. If light intensity is reduced, they can withstand

higher temperatures. Although we have a reduction in SCLTD, we are setting an uptick in black band disease. Mote has recently received funding to treat black band diseased coral; the treatment has been 100% effective on corals treated in the USVI. Novel research from the past few years will help get corals to the other side of this event.

Industries:

Andy Newman does PR for the Monroe County TDC. The TDC understands that this is a serious situation, but that there are also surviving corals. The TDC has created a website (floridakeyscorals.com) to help send some message points about the bleaching event, and to counter misinformation that the entire reef tract was going to be immediately gone. The website includes FAQs about bleaching, water temperatures, bleaching locations and impacts, response efforts underway, and how visitors can assist with this event. This also includes information on Mission: Iconic Reefs and other resources for more information. This is a tool developed for the tourism industry, which has been messaged in social media and teased on the TDC homepage. A few weeks ago, they also began fostering media coverage for Reef Renewal's efforts to move corals to cooler deeper waters. A video news package was produced. TDC has also earmarked \$4M next fiscal year to support these efforts.

Council Discussion / Q&A:

Q: Ken Reda: Thanks Ken Nedimyer for noting the hope in this effort.

- Andy Newman reiterated the importance of balanced messaging.
- Ben Daughtry also noted the doomsday initial reporting; the effort to make sure that people understand the reality and that all hope is not lost is critical.

Q: Stephen Patten: What is the substance being used to treat the black band?

- Erinn: This is a collaborative effort with Ocean Alchemists, who created the antibiotic treatment for SCTLD. This black band treatment is not-antibiotic based, but includes compounds with natural antimicrobial properties.

Q: Will Benson: Also appreciates the optimism. On the other side of the islands, in the backcountry, there have been persistent algae blooms, fish kills, sponge die offs, bleaching of small corals on the flats, etc. This is not over and there are a lot of other persistent problems in the backcountry. We cannot pull the fish and seagrasses out for safe-keeping, but we can hope for rain.

Q: Ken Nedimyer: This is not the first time he's seen bleaching this level. He was diving in 1998 during the first bleaching event; by August 1, 1998, all coral was white. It was deadly and we lost a lot of coral, but we had more to lose at that point. This is still really bad. The lower Keys have been cooked by that hypersaline water from Florida Bay that creates a lens of hot water on

the bottom. We have yet to see what will survive this or not; it will be a few more months until we have a better idea. The upper Keys still look OK in some areas; it depends on what that reef is exposed to. For example, at Horseshoe Reef when the tide goes out a lens of hot water washes up and over the reef, but it mixes with oceanic water by the time it gets offshore, so while Horseshoe is bleached, those offshore reefs look better. The big question is what will it take to motivate the world to understand that this is serious and we need to act? We need to pay attention.

Q: Will Benson met with the Wall Street Journal. Was frustrated that the reporter opined that the science was still out on climate change. When engaging with media folks, we need to ensure they are speaking the truth about these issues.

- Andy Newman responded that he doesn't disagree, but there are prestigious scientists who have not signed on to climate change. Others have stated that this is not a world crisis; it is still a divided issue, as are many issues in our country right now.

Q: Sara Ayers-Rigsby: Acknowledges that climate change is impacting coral reef death, and commends the volunteers who are helping to evacuate corals. We cannot do that for cultural sites. Is there training for volunteers to avoid impacting submerged cultural resources?

- Ken noted they are not working around these resources. Corals are coming out of nurseries which are not near the reef. These are being moved to other offshore nurseries or on to land. Instruction is being given for the job people are doing. Corals are not being removed from the natural reef.
- Sarah Fangman: Part of permitting the new nursery site included an assurance that there were no known cultural resources at that location.

Q: Mimi Stafford: Glad that there is hope, but the reality is that this deterioration has been happening for 60 years. Hoped hers would be the generation to leave the world a better place, but this is the worst she's ever seen. This is coming faster than we've thought - this is happening today. What does it take to get serious and pursue alternative energy and other options. We need to be responsible and try to do the right thing.

- George Garrett: Also noted the complications with sea level rise.
- Erinn Muller: Agree this is happening faster than expected. Restoration Practitioners always think about this in their work. We need to think more about it. Policy change has to happen while we do this restoration. We need the climate situation to be more hospitable to sustain the reefs. There is a lot of work that has been put into thinking about novel interventions. The National Academy of Sciences has a book on novel ways to increase coral resilience to climate change while policies are being put in place. Florida needs to be better at collaborating to move these interventions to a more realistic application. There is a lot of good work going on, but no cohesive effort to integrate these interventions in a targeted way. Hope this event will move that to the forefront of

everyone's mind. Need to think about integrating heat tolerance and resilience into the ecosystem. It is a race against time and happening faster than anticipated. Now that corals are on land, they need to get back to the water eventually. We need coral health vets to assist in this effort; they need to be certified and inspected by a vet before they go out. We have 1000s of corals and 3 coral health vets in the entire nation. This is a unique position in the veterinary science world that couples with coral reef biology and conservation.

Q: Andy Newman: This is a crisis. A month and a half ago, the sanctuary approached the TDC looking for \$250k of TDC funding for novel interventions. Unfortunately this did not qualify for those TDC funds. The Division of Emergency Management did not agree this was a crisis for that funding. Understands that ONMS is at the end of its budget year, but wonders why NOAA headquarters doesn't respond here and provide resources for FKNMS. This feels like FKNMS is responding on their own.

- We knew this would be a hot year, and wished we had more tools in our toolbox to do something. We were looking to see what we can pilot test in the face of the temperature stress that would give us more options for response going forward (e.g., shading). We have found NOAA money from elsewhere to support a few pilot projects. Part of the challenge is that we have limited spending degrees of freedom in the federal system at this time of year. Unfortunately, many of these approaches would have been best started at the beginning of the event. We are working on expanding the number of tools in the tool box for the future, and working to get ahead so we know how we could best do this the next time one of these events happens

IX. BEST PRACTICES FOR COMMUNICATING CLIMATE CHANGE

FKNMS outreach team members Liz Trueblood and Marlies Tumolo shared best practices for communicating climate change with diverse audiences. It is important to know our audiences, and to understand that the way we talk about climate matters. There are various elements that can be used to craft an impactful climate story. Stories with an element of hope are key.

Both Liz and Marlies have been trained by the National Network for Ocean and Climate Change Interpretation (NNOCCI) which seeks to combine climate science with social science, in order to improve public understanding. Based on research in the U.S. and Canada, they've found that 74% of people think climate change is happening right now, but 66% discuss climate change rarely or never. Despite not talking about it much, two in three Americans believe this is an important topic. NNOCCI believes that hope is the key to driving action. With hope, people are more likely to discuss climate change and to think in terms of solutions and action.

Knowing how people think helps us construct and deliver our message for the highest impact. Cultural models are ways of thinking that groups of people have; these are widely shared and deeply ingrained in society. Marlies illustrated this in terms of Google search results for the word “ocean.” It is no accident that the resulting images are similar, they represent a cultural model. Cultural models are essentially cognitive pathways built over a period of time, and then used subconsciously to understand the world around us. We use them without recognizing that we are accessing them. Understanding where people are coming from helps us provide information they need to understand climate change. The default thinking about climate change and CO₂ is riddled with misconceptions. Once we understand those, we can help correct them and improve understanding about the facts. Once understanding takes place, it is easier to move to solutions-oriented thinking.

A video was played that illustrated how better messaging can improve understanding about CO₂ and its role in climate change. This provides a way to organize knowledge, move beyond misconceptions, and think about impacts and consequences.

There are a number of cultural mindsets about social inequities and climate change that currently exist in the U.S. These are categorized into broad categories including: Nature, Science, Health, Government, Economy, Individualism, Otherism and Fatalism. Some cultural mindsets help drive solutions-oriented thinking (green messages), yellow mindsets can sometimes lead to productive thinking, red cultural mindsets do not lead to productive thinking. It is important to frame messaging to solutions-oriented cultural mindsets. For example: Rather than saying that 97% of scientists agree that climate change is happening (a “science” mindset that is not always productive), note that science is innovative and we’ve addressed all kinds of challenges, this is a productive mindset that helps move away from negative thinking. Moving listeners away from fatalism, increases their ability to feel empowered to make change.

Creating a core story of climate change includes a few parts:

- Why does this matter? This ties to values. Don’t assume other people care about the same things you do. There are a few values that have been statistically shown to work for most people most of the time. These include:
 - Protection: We have a duty to safeguard the wellbeing of people and places.
 - Responsible Management: Taking common-sense steps today is in the interests of future generations.
 - Example use of values: Like many people, we at the sanctuary believe in safeguarding people and places from harm - for the well-being of animals and people.
- How does it work? Messaging should include explanatory metaphors and explanatory chains to help people understand how climate change works. This helps avoid people filling in gaps in their knowledge with unproductive mindsets or incorrect information.

- These tools provide examples and help explain concepts so people can remember them. These tools also help link the cause to the effect.
- Explanatory Metaphors: four metaphors have been created and tested to explain climate change.
 - Heat trapping blanket - Warming
 - Regular vs. rampant CO₂ - Natural vs. Man Made contributions
 - Climate's Heart - Ocean Circulation
 - Osteoporosis of the Sea - Ocean Acidification
- Example: heat trapping blanket metaphor: The atmosphere is like a blanket that surrounds the earth. When we burn fossil fuels, like coal, oil and methane gas, we add more carbon dioxide to the atmosphere which thickens the blanket. The thicker the blanket gets, the more heat is trapped underneath. This "blanket effect" leads to warming, which disrupts the climate.
 - This helps explain cause and consequences.
- Example application to FKNMS:
 - For corals, long periods of warmer ocean water can lead to coral bleaching. Corals get their color and most of their food from an algal partner that lives in their tissues. When the water temperature gets too hot, this algal partner produces toxins which harm the coral. Corals expel the algae from their tissues, causing the corals to turn white and lose an important food source. When coral bleaching happens for an extended period of time, corals can get sick and die.
- How do we improve this situation? This relates to finding solutions for the problem.
 - The scale of the solution should match the scale of the problem. We want to urge people to seek out community level solutions.
 - Foster engagement and hope.
 - The ideal example solution is collective, local and already exists.
 - The solution should avoid polarizing language.
 - An example solution in action was presented: So many of us here today are dedicated to working towards addressing these problems before they get too big to handle. Future generations depend on it. It's not just us though – communities across Florida have been asking their leaders to take action. Many communities are harnessing the power of blue carbon storage through the restoration of seagrass and mangrove habitats. Seagrasses store twice as much carbon as forests on land, and mangroves and coastal wetlands store 5 times as much carbon as neighboring tropical hardwood forests. As these plants grow, they absorb rampant carbon dioxide from the atmosphere and store it in the soil as well as their tissues. Supporting restoration efforts in your community can help to reduce rampant carbon dioxide that leads to ocean warming, while also providing many other benefits to our ecosystem.

Liz and Marlies explained that crafting a written story may not always fit with the outreach and conversations of each council member, but noted that these techniques can work in a variety of ways. Each council member has a unique view of our current situation, but each of us has the ability to empower change and understanding in our communities.

Council Discussion / Q&A:

Q: Sarah Fangman: Requested Marlies repeat the common climate communication challenge she had mentioned?

- When people see “crisis,” they often feel overwhelmed and incapable of dealing with it, especially if they are removed from the situation. A lot of the ways that people communicate climate change are ineffective and cause the listener to avoid it vs. sparking action. By using more productive models, we can start to drive change by reminding our listeners that we are in this together and that we are capable of making a difference.

Q: Marissa Carrozzo: As part of the NNOCCI research, did they talk about visuals or infographics as the most effective tools for reaching people? To Erinn’s point that we need to be looking at solutions in the future (policy changes, funding, different frameworks) both for the current crisis and for the long term. Scalability and the enormity of the problem is striking and the level of funding being brought to bear is inadequate to the scale of the problem. From a policy perspective, the SAC and our organizations can help work toward this as a solution.

- There are opportunities for quick visuals on social media; this is an area that needs more work. Think about what mental models are triggered with various visuals. The principles of these written and spoken examples that we discussed often apply to visuals too.

Q: Stephen Patten: Noted the value of asking people to think about what one thing they can do today. This builds enthusiasm, confidence and ownership, that may help people build up to a community solution.

- This is a great point, sometimes people need that relatively easy first step to really feel empowered. Individual solutions are important, but we should also offer an opportunity to scale up. For example, riding a bike to work is an individual solution, but advocating for safer bike lanes and mass transit in your community would be a way to scale that action up to the community level.
- George Garrett: Individually we feel better being able to achieve something. Decisions and action that is needed are national and international. We need to deal with this personally too.

Q: Will Benson: How do you deal with fatalism, when someone says it’s too late? Will has observed this more often in the fishing community this year.

- There is not a cultural model that is productive in the category of fatalism, it can be a very challenging one, especially for people who care about the problem they are seeing. The framework suggests talking about “shared fate” (as seen in the Keys after Hurricane Irma). This could then be transitioned to more productive cultural models such as “problems can be solved” and “we have a civic duty.”
- Stephen Patten mentioned that he focuses on the importance of doing this so grandkids can see the reef; reference back to the responsible management value. This then translates to a productive, solutions oriented mindset. It is important for people to understand a doable thing for them to do immediately.
- Will Benson: Once you empower people, then something else bad happens, it feels like there is only so much you can repeat this message.
- There is research on “ecological grief.” The fishing community is more aware of the impacts, so this may be helpful for that community. Liz and Marlies will email some resources following this meeting. Liz also noted the importance of stepping away and taking a break from this work when you need to. We all slide into that fatalism mindset sometimes, we’re humans with feelings, and we care deeply about these places. It’s natural, even expected, to feel the weight of it all sometimes. She shared that sometimes she just needs to take a break, rest, and try again. It also helps to speak with friends and colleagues who are navigating these issues as well.

Q: How do you address questions about the financial implications of some of the solutions (e.g., switching to toothpaste tablets vs. tubes is a lot more expensive).

- As a community, we want to make the right thing the easier thing to do, and we’re slowly getting there. For example there is a refillery in Key Largo. It’s a little more expensive, as is shopping organically. But is that cost that much more, because there are other costs associated with a lifecycle of the product.
- Marlies noted a community response also alleviates a burden from the individual (e.g., you have to pay more to do this right thing). But if we talk about improved access to local food, responsibility among industries, etc. Scaling up to community level solutions removes some of the pressure from the individual.
- Proven communications are important to help shift more individuals toward collective community action.

X. PUBLIC COMMENT OPPORTUNITY

Andy Newman, TDC: Andy has been especially passionate about an issue, on which a lot of work has been done by FWC and Monroe County to facilitate funding for artificial marine habitat. He feels strongly that this issue needs to come before the SAC. Without knowing what the Restoration Blueprint now has on this topic, \$10M has been allocated to the county for artificial marine habitat. Monroe County is working on hiring an Artificial Marine Habitat

Coordinator. Facilitating this in Monroe County is more important than before. He requested a presentation from Monroe County and FWC at the next SAC meeting; also requested NOAA and FKNMS participate in this effort in some way. Coral restoration is important. Artificial marine habitat to augment can also be an integral facet of Mission: Iconic Reefs.

- Will Benson: Was at the meeting in Key West where they discussed the funding that has been allocated. There is expertise at the state level that is really good. This is intended to be proactive; consider whether this funding can augment or supplement the work ongoing with Mission: Iconic Reefs. Reiterate an ask to invite FWC and the county to give similar presentations on this topic and allow the SAC to weigh in and have a discussion. The sanctuary's position is yet to be determined, but the SAC can consider it and bring our expertise to bear on this issue.

XI. AGENCY REPORTS

Superintendent's Report - Sarah Fangman: FKNMS is interviewing virtual interns for the 23-24 school year to support M:IR and outreach team projects. We are also hiring a couple of full time positions: a buoy position in the upper Keys, and an M:IR Implementation Manager position.

Related to Budget, FKNMS has submitted our budget request. For the first time we were given an opportunity to plan for a budget that is twice what we've gotten in the past. It is encouraging that our program is undertaking an exercise to understand what it really takes to manage these places. Historically, this has been to plan to 103% which really only covers inflation, and usually does not keep up with our costs. This is important because our system needs to advocate for what we really need to manage these places, and that needs to be tied to specifics about what that money would do on behalf of our resources. We are likely to get a continuing resolution, so we probably won't know our budget until the spring.

Restoration Blueprint: We recently completed the last formal briefings with federal and state agency partners. We have tried to craft all of the input into a single, final rule. FKNMS is now going to put forward a final rule which will be run through the NOAA review process. There is no definitive timeline for all this to happen, but we are close to having a decision about how we will move forward.

Florida Department of Environmental Protection - Nick Parr: DEP has been working with a PhD student at Auburn University, Gretchen Luchauer. She is helping managers with the development of an Ocean Climate Change Dashboard for marine sanctuaries, specifically Florida Keys National Marine Sanctuary and Flower Gardens National Marine Sanctuary.

Aquatic Preserves: Coupon Bight AP had an Advisory Committee meeting in July for the updated Management Plan; a non regulatory management plan. Comments have been received, and are being reviewed. Public comment will be solicited at the October SAC meeting. Photos are requested for use in this Management Plan. Please send them to Nicholas.Parr@floridadep.gov. Nick recognized Abbey Townsend who has been working part time for DEP while completing an internship for ICARE. She wrote much of the Management Plan. In June, DEP finished their trap removal effort in Coupon Bight which totaled 1420 lbs of traps, line, debris, and a large metal gas tank. They rescued over 40 crustaceans from ghost fishing.

Lignumvitae Key AP: A partnership with Sea Base and the State Park continues to remove marine debris from the mangrove shorelines. Have collected over 12,000 lbs of debris from the mangroves, including styrofoam and line. The largest item was a 400 lb net that was spotted in Indian Key Channel then washed up on Lignumvitae Key. Benthic seagrass monitoring at 16 sites throughout the aquatic preserve continues under the guidance of Ecosystem Assessment Specialist, Talia Bailey. These methods were modeled after Jim Fourqurean's team to allow comparability between datasets.

Coral Protection and Restoration Program: Managers are working with a network of partners involved in the SCTL D response to expand that team to include other disturbances, including bleaching. The focus is on protecting restoration investments vs. genetic protection, monitoring for resiliency, and adaptation research to learn how we can help corals from similar events in the future. DEP is sending emergency funding to support land-based facilities in caring for corals. The Governor also has grant funding available at ProtectingFloridaTogether.gov. In response to the bleaching event, Florida's Coral Reef managers are working with a network of researchers, conservation and restoration practitioners, aquarists, and engaged citizens that were originally organized to respond to stony coral tissue loss disease (SCTL D). The team was recently expanded to include response to disturbances like coral bleaching; this network is now called the Florida's Coral Reef Resilience Program.

State Parks: Curry Hammock state park has recorded turtle nesting for the first time since Irma in 2017. One hundred and eighty one live hatchlings documented so far. Several successful nests at Bahia Honda State Park as well.

Florida Fish and Wildlife Conservation Commission: FWRI - Tom Matthews: Western Dry Rocks Spawning Aggregation closure has now ended. Saw spawning of mutton and gray snappers. Have had animals return to that site 3 years in a row; other tagged animals were caught after tagging. This is in the right place. WDR is a hub for these species. Depending on the current conditions, larvae can be moved from here to the Gulf of Mexico, to the Great Bahama

Bank, etc. It's not all just moved by the Gulf Stream out of the system. Spawning at the right time ensures larvae go where they need to go. With this closure we can track actual larval dispersal, not just what was modeled.

Q: Will Benson: In the analysis, are you seeing that the timeframe is adequate? Given ocean temperatures is there a change in timing of spawning? Guides have observed permit leaving the flats slightly early. Have there been violations of the closure now that it is marked with buoys?

- Did not see mutton snappers spawning. Saw groups of them getting ready to spawn. Unknown if the currents or something else was not right. Fish live 20 years, one successful spawn is probably a win for some species.
- Fewest fish were there during the last full moon. More fish were observed earlier in the closure. Saw black grouper but those are January spawners - unknown if they should even be in the aggregation. FWC has audio to help them listen year round, which will help answer this question.
- Cannot speak to law enforcement issues with that zone.

Lobster season: New social science research has found that a lot of people coming from out of town for lobster mini-season like the camaraderie of the group activity, in addition to taking lobster.

NOAA National Marine Fisheries Service, Southeast Region - Lauren Waters:

Equity and Environmental Justice: There is currently a request for public input on NOAA Fisheries Southeast Region's strategy to advance equity and environmental justice through the conservation and management of living marine resources. There will be a webinar on August 29th where verbal comments can be submitted. Otherwise written comments may be submitted through Sept. 30th.

Protected Resources Updates: Regarding Rice's Whales in the Gulf of Mexico, the request for comments on the Petition to Establish a Mandatory 10-Knot Speed Limit and Other Vessel-Related Mitigation Measures to Protect those Endangered Whales closed July 6th. We received over 70,000 comments on the petition. We are still sorting and evaluating the comments.

Regarding designating Rice's Whale critical habitat in the Gulf- the request for public comment is open till September 22nd. The specific occupied area proposed for designation as critical habitat contains approximately 28,270 square miles of continental shelf and slope associated waters within the Gulf of Mexico and lies between the 100-400 meter isobaths. Virtual public hearings are scheduled for August 24 and August 30, 2023.

The final rule to designate critical habitat for 5 species of threatened corals was published on August 9 and becomes effective on September 8, 2023. The boundaries of the critical habitat

were modified based on public comment. Most notably for the Keys, the offshore boundary was moved shallower and Keys “back-country” areas where the *Orbicella* species occur were added. Continue to work on proposed rule to designate critical habitat for Nassau Grouper and to list the queen conch as a threatened species. We anticipate a final determination for Nassau group in late 2023 or early 2024, and for queen conch in fall 2023

Fisheries Updates:

- Greater Amberjack in the South Atlantic - the request for comments to change catch levels and management measures closes August 21st. proposed rule would:
 - Increase the acceptable biological catch, annual optimum yield, and annual catch limits;
 - Revise the recreational sector and commercial sector allocations;
 - Reduce the commercial minimum size limit;
 - Increase the commercial trip limit for Season 2 (September through February);
 - Revise the April spawning closure.
- Recreational harvest of South Atlantic golden tilefish closed on July 17 and will reopen on January 1, 2024.
- Recreational harvest of Greater Amberjack in the Gulf of Mexico closes August 25th
- Federally permitted for-hire harvest of Gulf red snapper will close on Aug 25th.
- Recreational harvest of gray triggerfish in the Gulf opened Aug 1 and will close when the annual catch target is projected to be met.
- Recreational harvest of gag in the Gulf will open on September 1 and will close on November 10, unless it is projected that the ACL will be harvested before that date.

Habitat Conservation: At the urging of FDOT, Monroe County and the USACE may reinitiate EFH consultation on the Florida Keys Coastal Storm Risk Management study. The 2021 USACE Chief’s Report included no work below mean high water. Since then, FDOT identified areas along US1 needing subtidal scour protection and asked the County and USACE to amend the Chief’s Report to include these locations. We are working with the County, USACE, and FKNMS to examine the request. HCD is working with the FDOT and the FKNMS on habitat survey protocols needed to support replacing the Long Key Bridge. The goal is to have a single survey that meets EFH, ESA, and FKNMS needs.

We have been contacted by the US Navy regarding a “Reefense” project in Biscayne Bay. No details are available currently, but we have confirmed this project in Biscayne Bay replaces a Reefense project previously proposed in sanctuary waters.

The USACE and Broward County are looking to use the Keys Restoration Fund In-Lieu Fee Program (KRF) to provide seagrass mitigation for the Port Everglades Deepening Project. While the resource agencies support this strategy, it will require amending federal permits for KRF’s

operation. Coastal Resources Group, the not-for-profit organization managing KRF, has begun preparing the request to modify the federal permit.

The Keys Restoration Fund In-Lieu Fee Program (KRF ILF Program) provides the necessary mitigation credits to compensate for for unavoidable impacts to waters of the United States that result from activities authorized under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act.

National Park Service - Tylan Dean: James Krutchfield will be the new DRTO site manager. Lead biologist (DRTO) and marine ecologist (ENP) positions are forthcoming. Repairs are still ongoing at Dry Tortugas NP. Conditions in Florida Bay are being monitored closely. Temperatures are high, but salinity has been lower than average over the last couple of years due to good freshwater inflows. Have seen some sponge die offs, and the beginning of the now normal seasonal cyanobacterial blooms in some of the northern basins. DRTO is grateful to all of the partners assisting with DRTO coral relocation.

USCG - Jordan Haas: Introduced various members of the USCG team. Migrant volume has continued to decrease; USCG was able to participate in mini lobster season, operation dry water, etc. If migrant volume stays low, will push to ensure their subunits across the Keys are meeting requirements for living marine resources qualifications. LMR operations can then increase. Commercial fishing vessel training is also underway.

NAS KW - Wendy Wheatley-Techmer:

- NASKW Security Team held two shoreline cleanups since the last SAC meeting.
- We have had a very busy sea turtle nesting season this year. So far we have had 23 nests, and 13 successful sea turtle nests hatch-- including one green sea turtle nest and 9 false crawls. We are still waiting for about 10 more nests to hatch.
- Shorebird nesting activity is starting to slow down. Currently, there is only one rooftop still active with roseate terns.
- NASKW conducted an annual spill drill at the Sigsbee Marina.
- Previously reported on the Reefense project potentially to occur off of Boca Chica. That project is now exploring other locations.
- Ed Russell has taken over as the Environmental Director at NASKW.

XII. CLOSING REMARKS

Andy Newman: Made a motion for the SAC to invite FWC and Monroe County officials to present in October regarding plans they are developing to execute marine artificial habitat projects in Monroe using \$10M in state funding that has already been committed.

Gary Jennings seconded the motion. Will added that this will be contingent on the County being available, clarified that the motion is to invite them. George noted he will follow-up with FKNMS about this as an agenda item.

Kelly Cox requested that if we have a crisis situation and need time for coral bleaching follow-up, that this be visited at a later date.

Will clarified that the timing of hiring a county administrator for this project is ambitious; the sooner the SAC can weigh in on this topic, the better.

Erinn Muller requested information for the SAC in advance of this topic coming before the SAC. Andy Newman noted that FWC has a variety of documentation.

Sarah shared that when developing agendas we look at the suite of potential topics, then FKNMS will determine how much time we can devote and propose a draft agenda for input from the council chairs.

George thanked the council and members of the public for attending and reiterated our commitment and obligation to protect our resources. He shared that at the end of September he will be traveling to Oswego, NY for the annual SAC chairs meeting with the council chairs from each council around the system. This will be the first in-person meeting in several years, and he will share relevant updates with the council at the October meeting.

Meeting adjourned at 4:40 pm.