

National Coral Reef Management Fellows *Newsletter*

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REFLECTIONS POST-TYPHOON MANGKHUT AND SUPER TYPHOON YUTU

Storm events have plagued the tropical Pacific and Atlantic basins throughout time, but in recent years the intensity and frequency of these storms have drastically increased. Below, Coral Management Fellow Malcolm Johnson reflects on his life after powerful back to back typhoons hit the Commonwealth of the Northern Mariana Islands in the Fall of 2018.

Pulling open the door after the roar of sustained winds and deafening percussion of rain has receded, the first glimpse of one's island home in the aftermath of a tropical cyclone can be both tragic and confusing. Trees and electric poles litter the roads amongst palm fronds and breadfruit branches. The power is out and no one is certain when it will be restored. Looking out to sea, the waves are still crashing against the barrier reef while the lagoon's familiar teal is a cloudy brown. Cell service still seems to be working, so family and friends are called while neighbors wander out of their homes to assess the damage for themselves.

In 2018, the Commonwealth of the Northern Mariana Islands (CNMI) was struck by two devastating typhoons only a month apart, amid an already strong storm season. In September, the eye of Typhoon Mangkhut tracked over Rota, with Category 2 winds over 165 km/h. One month later, Super Typhoon Yutu tracked directly over nearby Tinian and Saipan as a Category 5 with sustained winds of 215 km/h, causing extensive damage to critical infrastructure and the destruction of hundreds of homes, leaving many displaced.



Stormy seas of Rota after the passing of Typhoon Mangkhut. [Photo: Malcolm Johnson]

Although recovery efforts prioritize the needs of human communities – such as food, water, and shelter - environmental agencies have the timely task of assessing impacts to the natural environment. Typhoon-force waves cause delicate coral branches to break off and large coral heads to overturn. Additionally, heavy rains throughout the watershed and the uprooting of trees creates substantial soil erosion, smothering entire reef systems in dirt and sand. The result can be consequential for both native marine species that suffer die-offs and invasive species, which can see their populations expand.

In this issue:

REFLECTIONS POST-TYPHOON MANGKHUT AND SUPERTYPHOON YUTU

FELLOW'S FOCUS: RESPONSE AND RECOVERY

WEIRD ENCOUNTERS

The Fellow Newsletter is published by the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program and Nova Southeastern University to relay information related to the fellowship program.



*Unfamiliar clutter on Saipan after Super Typhoon Yutu
[Photo: Jose T. Quan via @ginenmarianas]*

As government offices resume operation and immediate needs to recovery efforts taper off, the CNMI's Bureau of Environmental and Coastal Quality (BECQ) begins gathering water quality samples to determine the impact of the storm-induced LBSPs on the coastal environment. With uninterrupted electricity in the BECQ laboratory, environmental managers are able to begin conducting assessments or triage of both the watershed and coral reefs, taking particular note of heavily damaged areas, incidences of booms in algae and invasives, and locations that could be effectively managed with future conservation efforts. Although the recovery effort is ongoing, BECQ will play a crucial role in the restoration of the natural resources by investigating potential activities to recover corals (i.e., coral nurseries and outplanting) and to protect watersheds (e.g., streambank stabilization, revegetation, etc.).

While the Division of Coastal Resources Management, a branch of BECQ, collaborates with FEMA as one of the primary local partners, employees balance the challenges of helping the community, conserving the natural environment, and adjusting to life post-Super Typhoon Yutu.

The small islands and coastal communities where Coral Fellows live have an intimate relationship with the coral reefs that protect them from future storms. With the potential increase in frequency and intensity of tropical cyclones as a result of climate change, the role of environmental agencies and their employees to manage and conserve coral reefs may be a monumental task, but one that is more imperative than ever before.

FELLOWS' FOCUS: RESPONSE AND RESTORATION

Each issue we explore a cross-jurisdictional topic with management insights from the Fellows. Given the particularly strong storm activity in 2017 and 2018, this edition explores how reef managers may respond to storm events and other disturbances in order to facilitate recovery and restoration. Through discussions, we found each jurisdiction has varying degrees of capacity to conduct coral reef assessments and response, especially in the wake of destructive storms. Please note, all opinions and musings are that of the Fellows and do not necessarily reflect the positions held by any related supervisor, agency, or funding source.

Austen Stovall (USVI): In September 2017, the US Virgin Islands were hit with two category 5 hurricanes within a few weeks of each other. The impact of these storms on the USVI community and ecosystem is still felt more than a year after these storms wreaked havoc. Although the fellowship started 3-4 months after Irma and Maria hit, I could still see the exhaustion in both Virgin Islanders and the surrounding ecosystem. Dives and snorkels on patch reefs exposed fields of *Porites* and *Madracis* corals flattened and large brain and boulder corals completely flipped. I found myself performing minor triage on my recreational snorkels and dives regularly. For various reasons, unlike Puerto Rico and Florida, the USVI did not receive the same mission assignment from FEMA for immediate post-hurricane reef triage. Local agencies attempted to get in the water as soon as possible to assess the damage, but the desire to see under the water was challenged by the need to assess personal damages to homes and families. Additionally, low visibility conditions and highly polluted runoff into the surrounding waters presented hazardous diving conditions. The USVI did receive support about 3-4 weeks post-Maria from the restoration team in Puerto Rico who came and reattached 2,500 corals in St. Thomas. The U.S. National Park Service at Buck Island reattached 43 *A. palmata* fragments a few months after Maria and will track the success of their reattachment, as well as the surrounding reef health over time. The Nature Conservancy (TNC) sustained serious damage to their three boats which limited access to most of their nursery sites. While there was significant loss to coral fragments and structures, two out of five nurseries survived the storm relatively unscathed. The loss from the storms, while substantial, also provided TNC and other managers an opportunity to reassess nursery structures and rebuild with future priorities in mind.

These two storms exposed important vulnerabilities in ecosystem management and disaster response and recovery. As a result, response and restoration have been consciously included in future management priorities. Restoration has been added as a standalone goal in the updated USVI Coral Management Priorities, DPNR/CZM has submitted a Section 6 proposal to restart the *Acropora* monitoring program and enhance UVI nursery operations, and participation will increase in coral restoration related working groups (like the USCRFT and the Coral Restoration Consortium). Additionally, TNC is completing a NOAA CRCP funded grant to install a small-scale demonstration style coral nursery for use by the St. Croix East End Marine Park and TNC plans on continuing to increase restoration operations throughout the Park while monitoring existing outplants and reporting data to the EEMP. Plans to include post-hurricane realistically rapid response in restoration documents are also underway. While Irma and Maria forced many changes upon the USVI community, the storms also served as important catalysts for changes to USVI ecosystem management strategies.

Melissa Gonzalez (Puerto Rico): September 2017 was a devastating time for Puerto Rico and its coral reefs, with Category 5 Hurricane Irma, passing just north of the island, and Hurricane Maria, Category 4, passing right through it. The subsequent effects, which included overturned corals, broken coral fragments, and massive corals washed up on beaches, required a rapid response in order to salvage them. However, the resulting failure of communications infrastructure, delay in obtaining necessary resources and funding, and difficulties in accessing coral reefs all played roles in delaying efforts to evaluate and restore coral reefs.



Massive corals washed up on a beach in Arecibo in northern Puerto Rico.

The first funding for responding to the effects of the hurricanes on coral reefs came from NOAA and the National Fish and Wildlife Foundation (NFWF). NOAA Restoration Center, the Department of Natural and Environmental Resources (DNER), and private organizations such as HJR Reefscaping, and Sea Ventures, among others, worked to evaluate priority reefs to determine the extent of damage from the hurricanes and to conduct triage. Due to the President's Major Disaster Declaration, FEMA was authorized to assist Puerto Rico, and for the first time ever, funded coral reef evaluation and restoration efforts. Five months after Hurricane Maria, FEMA assigned NOAA to expand their efforts in evaluating and restoring corals through coral triage. NOAA, together with other collaborators, evaluated 414,354 m² of coral reefs and determined that a mean of 11% of shallow water corals were negatively impacted in Puerto Rico^[1]. With the funds from FEMA, NOAA, and NFWF, 15,336 corals were reattached through restoration efforts in 57 sites.

If broken coral fragments and overturned corals can be righted and stabilized quickly after an event, the probability of survival is much higher. Knowing this and the factors which limited or delayed the response after the 2017 hurricanes, the DNER made it a priority to create a Rapid Response Protocol in response to coral reef emergencies, such as hurricanes, tsunamis, and swells. In order to collect information from key stakeholders about their response and lessons learned after the 2017 hurricanes, we held a coral reef rapid response workshop with representatives from ten agencies and organizations in attendance. Throughout this workshop, we discussed strengths and weaknesses of this past response and opportunities for future events, and integrated these important factors in the Rapid Response Protocol, not only to document what worked and what didn't work, but also to include options when confronted with unforeseen circumstances, such as the failure of communications infrastructure. Knowing that similar situations will occur in the future, the DNER is emphasizing the use of this Protocol as an important step to provide a quicker and more effective response to Puerto Rico's coral reefs.

1. NOAA. 2018. Status of Puerto Rico's Coral Reefs in the Aftermath of Hurricanes Irma and Maria. Assessment Report submitted by NOAA to the FEMA Natural and Cultural Resources Recovery Support Function.

Mallory Morgan (Guam): The Guam Coral Reef Response Team (GCRRT) is a group of stakeholders who respond to impacts to reefs from storm events and other events. In September 2018, a large tin roof (~20' x 50')

blew off a vendor's building at Family Beach during Typhoon Mangkhut and caused significant damage to Luminao reef. The Department of Agriculture and Guam Environmental Protection Agency helped the owner remove the roof to reduce prolonged damage to the reef. Members of GCRRT then performed restoration by relocating dead fragments away from injured areas, reattaching living fragments with epoxy, and positioning brittle fragments not suited to the epoxy method upright in the sand so living tissue may continue to grow.

Interagency collaboration and in-kind manpower is key to response of impacts to coral reefs on Guam, especially when legislation does not exist to mandate response.

WEIRD ENCOUNTERS – PART 1

We asked fellows about their strangest underwater encounters. Here's what Motu and Maurizio had to say:

Motusaga Vaeso (American Samoa): The weirdest interaction underwater I have had was stumbling across a camouflage grouper, *Epinephelus polyphedadion*, while diving at Fagatele Bay National Marine Sanctuary. I wanted to take a closer photo of an octopus hidden under a table coral and was so focused on this task that I was almost face to face with this fierce looking grouper. It felt like it lasted more than a minute, but it might have been just a couple of seconds that this grouper and I were locked into a staring contest. Most of the groupers I come across are wary of humans, but this particular grouper refused to budge. The look it had was so unnerving and intimidating that I backed away and gave it its space. After that interaction, my respect and fascination for sea creatures increased, namely for this grouper and its whole species.



Maurizio Martinelli (Florida): Although the strangest creatures I encounter underwater are usually my dive buddies, I am sort of in the midst of a weird interaction with a coral right now. A few years ago I took part in an artificial reef project led by my friend and colleague Spencer Arnold of the New Heaven Reef Conservation Program in Koh Tao, Thailand. The project aimed to capture the emotions surrounding the huge challenges of climate change with our most expressive features: the human face. So, Spencer shoved straws way up our noses, smothered our faces in silicone to create casts, filled those casts with concrete, and sunk our likenesses to the depths on artificial reef structures. Over time, corals have been recruiting to these structures and I am thrilled that there is a colony of *Montipora* slowly encrusting its way across my face! Pleased as I am, though, I have to admit it's always a weird feeling to know there is creature happily smothering my face half a world away.



The National Coral Reef Management Fellowship was established in 2003 to respond to the need for additional coral reef management capacity in the U.S. coral reef jurisdictions in the Pacific and Atlantic/Caribbean. The fellowship is a partnership between the National Oceanic and Atmospheric Administration's Coral Reef Conservation Program, the U.S. Department of Interior's Office of Insular Affairs, the U.S. All Islands Coral Reef Committee and the Nova Southeastern University's Halmos College of Natural Sciences and Oceanography. The program's vision is a thriving collaborative fellowship program that builds excellent next generation leaders and capacity for effective local coral reef ecosystem management.

