

Papahānaumokuākea Marine National Monument
Agency Report to the Reserve Council
June 6 – September 23, 2019

Agency: NOAA/NOS/ONMS/PMNM
Presented by: Athline Clark, Superintendent
Date: October 10, 2019

Agency Accomplishments & Recent Activities

Agency Coordination

US Coast Guard Partners with PMNM on a Flight to Midway

On September 20, NOAA PMNM Superintendent Athline Clark joined ONMS Director John Armor, NOS Acting Administrator Nicole LeBoeuf, and partner agencies on a one-day trip to Midway Atoll. The purpose of the trip was twofold: to talk with partners about how to enhance enforcement capabilities in the region, and build/renew the inter-agency partnership needed to manage Papahānaumokuākea. Discussions also centered around cooperative conservation initiatives between the agencies. Participating agencies included NOAA-NMFS, Office of Law Enforcement, NOAA-NMFS Pacific Islands Regional Office, Hawai‘i Department of Land and Natural Resources, the U.S. Fish and Wildlife Service, and the U.S. Coast Guard, who provided transport via C-130.

PMNM Educator and Native Hawaiian Outreach Associate Participates in Expedition to the Monument

MDC Educator and Native Hawaiian Outreach Associate Malia Evans participated in a 12-day scientific expedition to Papahānaumokuākea in mid-July. The researchers, all women, deployed and retrieved acoustic recorders and receivers from several localities and depths within PMNM. The collaborative mission involved researchers from NMSF/PMNM, HIHWNMS, and Hawai‘i Institute of Marine Biology. Recording underwater “soundscapes” helps scientists study the presence of naturally occurring and human produced sounds and the identification and distribution of marine animals including humpback whales and top predators in the monument. The cruise provided an opportunity for Malia Evans as a native Hawaiian to investigate traditional ecological knowledge through place names and mo‘olelo (history) and to connect more deeply with these ancestral islands while documenting the mission through photos, videos and interviews with her fellow researchers. Contact Malia.Evans@noaa.gov



Left: Researchers (l-r) Brittany Evans, Eden Zang, Paige Wernli and Malia Evans deploy on the Searcher (Photo: R. Navares). Right: The women researchers and Searcher crew head out to retrieve acoustic receivers at Lalo-French Frigate Shoals (Photo: Gillian Wysock).

Constituency Building and Outreach

PMNM Video Exhibit Included in Smithsonian's Renovated Hall of Fossils

On June 4, PMNM staff Randy Kosaki and Kalani Quiocho attended the opening reception for the newly renovated David H. Koch Hall of Fossils in the Smithsonian's National Museum of Natural History. The new \$125 million exhibit was five years in the making and includes Kosaki and Quiocho in a video on PMNM. The video hangs opposite *Tyrannosaurus rex* in the center of the Hall. Contrary to popular opinion, the PMNM display is not in the Hall of Fossils due to Kosaki's advanced age. Rather, the fossil exhibit, entitled, "Deep Time," begins with the dawn of life in the mists of the Precambrian, and finishes in the future, where a half-dozen video vignettes (including PMNM) offer a messages of encouragement and environmental hope. Skillfully woven throughout the displays are messages on mass extinctions, climate change, and present-day environmental issues. Contact: randall.kosaki@noaa.gov.



Randy Kosaki, Siobhan Starrs (Senior Smithsonian Exhibit Developer), Kate Raisz (filmmaker), and Kalani Quiocho in front of *T. rex* in the new Smithsonian exhibit, "Deep Time" (Photo: National Museum of Natural History).

Honolulu Film Premiere Highlights PMNM Scientist Randy Kosaki and His Sister

On June 12, the short film *Three Hearts Home* premiered on the big screen in Honolulu before an audience of approximately 870 people. The film tells the story of PMNM Deputy Superintendent Randy Kosaki (who was adopted at birth) finding his biological mother and sister. Kosaki, who grew up with a great love of diving, eventually forged a career in coral reef conservation science. Later in life, he discovered that unknown to him, his sister Kimi Werner

also grew up with an intense passion for the ocean and diving. Kimi is an internationally renowned skin diver, champion spearfisher, and strong advocate for sustainability and marine conservation. Nature or nurture? Probably a little of both. PMNM's Jenny Crawford and the NOAA Marine Debris Program staffed an outreach booth at the event. On June 16, the film screened at the Maui Film Festival before an audience of over 2,500 people. The eight-minute film can be seen at <https://olukai.com/blogs/news/ohana-is-connection-dr-randy-kosaki-chief-scientist-noaa> . Contact: randall.kosaki@noaa.gov



Left: PMNM scientist Randy Kosaki, and his sister, renowned diver Kimi Werner (Photo: JustinTurkowski). Right: Screening of Three Hearts Home under a full moon at the Maui Film Festival (Photo: Randy Kosaki/NOAA)

Turtle Bay Resort Hosts Eighth Annual North Shore Ocean Fest

On June 1, 2019, Turtle Bay Resort hosted its eighth annual North Shore Ocean Fest, a free event where families can enjoy a fun-filled afternoon of ocean education for all ages. This year, PMNM teamed up with the NOAA Marine Debris Program to educate families on how they help create a zero-waste community and reduce the amount of trash that is going into our ocean.

Contact: jennifer.crawford@noaa.gov

Waikīkī Aquarium Celebrates Dr. Isabella Kauakea Aiona Abbott

On June 2, 2019, Waikīkī Aquarium organized a Limu Ho‘olaule‘a in honor of Dr. Isabella Kauakea Aiona Abbott. Visitors to the aquarium enjoyed a day of celebration for this remarkable woman whose contribution to science and Hawaiian culture has been nothing short of extraordinary. Participants in the event included ONMS-PMNM, University of Hawai‘i at Mānoa, Bishop Museum, State of Hawai‘i Department of Land and Natural Resources, the Waimānalo Limu Hui, and local artists. Contact: jennifer.crawford@noaa.gov



Families and kids stopping by to learn about limu from PMNM staff (Alyssa Miller), in particular the Halymenia Cromwelli or Limu Lepe-o-Hina, that Dr. Isabella Abbott is credited with naming. (Photo: Jenny Crawford)

Pearl Harbor Aviation Museum Hosts Annual Midway Youth Day

On June 4, 2019, Pearl Harbor Aviation Museum hosted their annual Midway Youth Day. The event is open to all students in grades 6-9 and commemorates the Battle of Midway. Students experience history, nature, and culture through STEM activities at the Pearl Harbor Aviation Museum and the NOAA Daniel K. Inouye Regional Center.

Contact: jennifer.crawford@noaa.gov

PMNM Brings The Place To The People At Capitol Hill Ocean Week (CHOW) 2019

From June 4-6, PMNM Native Hawaiian Program Specialist Kalani Quiocho visited Washington D.C. to participate in two panels for CHOW 2019 hosted by the National Marine Sanctuary Foundation: Protected Areas in a Changing Climate & the Margaret Davidson Emerging Leaders. Kalani shared that traditional ecological knowledge (TEK) is just one way that indigenous peoples can contribute to solutions and that TEK is connected to culture and a set of beliefs, ethics, values and principles that have universal value and application. Likewise, cultural ecosystem services (e.g. identity, spirituality, recreation) are challenging to define, monitor and measure, but are valuable and important to consider in management decisions. Through spatial and temporal representations of Hawaiian cosmology and worldview, PMNM is developing innovative ways to incorporate multiple dimensions of Hawaiian culture in management plans, evaluation and best management practices. This is “indigenuity.”

Contact: Kalani.Quiocho@noaa.gov, PMNM Native Hawaiian Program Specialist.

3rd Annual World Oceans Day Celebration at Ko Olina

On Saturday, June 8 World Oceans Day, staff from Papahānaumokuākea Marine National Monument joined other NOAA offices and partners to celebrate World Oceans Day at Ko Olina. The event is a collaboration between NOAA and Ko Olina Resort Association. The event is a free public event. Festivities included ocean education and sustainability activities with a strong career focus, live entertainment, food for purchase and a movie on the beach at Sunset.

Contact: naomi.mcintosh@noaa.gov



Left: Mia Silverberg and Mark Haver, PMNM Hollings Scholar interns celebrate World Oceans Day at Ko Olina
 Right: Marine Debris Removal Team at NOAA's PIFSC receives an award from NOAA's Pacific Islands Region for their efforts to protect our oceans and marine communities by removing marine debris from PMNM (Photos: Honolulu Star Advertiser).

World Oceans Day Event at Mokuapāpapa Discovery Center

On June 8th over 400 participants attended Mokuapāpapa Discovery Center's World Oceans Day event, one of the center's top annual events. The "Be an Ocean Superhero" theme resonated with the very young and not so young as MDC staff and local keiki proudly wore their ocean inspired hats and costumes. Many visitors spent hours in the center, engaged in activities that strengthened their awareness and connection to the ocean. The free hands-on activities included VR exploration of a coral reef ecosystem, "Be the Change" button making, maneuvering submersible ROV's, micro-debris analysis with microscopes, understanding nonpoint source pollution, and art activities featuring healthy coral reefs, airbrush tattoos and sketches of superheroes. Community partners also shared information on Hawaiian canoe carving and paddling, current info on recycling and beautiful marine figurines. The cadre of MDC staff and dedicated volunteers worked to raise public awareness of the issues affecting our oceans and proactive solutions to become agents of change for the better. In the afternoon the Center hosted a screening of the feature film Moananuiākea about the worldwide voyage of the voyaging canoe Hōkūle'a. Contact: malia.evans@noaa.gov



Left: MDC staff Clayton Watkins introduces visitors to submersible ROVs. Right: Andy Collins engages the competitors in the "Ocean Superheroes" costume contest

IRC Summer Internship Symposium

PMNM Hollings Scholars Carina Burroughs, Mark Haver, Mia Silverberg presented at NOAA IRC's annual Summer Intern Symposium. The symposium is an opportunity for the interns to share their experience working with NOAA. Carina's project at the Mokupāpapa Discovery Center focused on sharing the science and stories of PMNM through social media. Mark's internship explored PMNM's 20-year legacy of contribution to science and outreach and Mia's project helped characterize shallow water reef habitats of the NWHI using 3-D reconstruction techniques. Contact: Andy.Collins@noaa.gov, Naomi.McIntosh@noaa.gov, and Randall.Kosaki@noaa.gov.

PMNM Participates At Annual Boys and Girls Club Hawaii 'Ohana Night'

The Boys and Girls Club Hawaii hosted their annual 'Ohana Night at their NFL YET (Youth Education Town) clubhouse in Nānākuli on Friday, July 19, 2019. This event brings families and community of Nānākuli together for a night to celebrate their youths. From a youth showcase to club tours and cultural activities for families, this event is a highlight for the west side of O'ahu every year. PMNM was one of the many community partners present for the evening's activities. Among them, Kamehameha Schools and OHA. About 300 people were in attendance. Contact; Jennifer.Crawford@noaa.gov



Left: Claudia "Lala" Fernandez, BGCH Director of Operations, waits to greet keiki and 'ohana at the registration table. Keiki also got small goody-bags with donated school supplies.

Right: Keiki learn about limu and create their own limu cards with PMNM staffer Jenny Crawford. (Photos: Kekoa Tupua, BGCH Nānākuli Clubhouse Director)

PMNM Engages Students at Mālama Pūpūkea-Waimea Summer program

Mālama Pūpūkea-Waimea (MPW) summer program, Ka Papa Kai, is a marine science, place-and culture-based program that teaches students about marine life and conservation within the Pūpūkea Marine Life Conservation District. PMNM partnered with MPW from July 22-25, to engage students in learning about marine life and conservation in Papahānaumokuākea and, most importantly, how we are all connected by one ocean. Each summer the program takes 25 students from the North Shore communities of O'ahu and immerses them in a week-long outdoor program at Pūpūkea beach – aka Sharks Cove. Contact; Jennifer.Crawford@noaa.gov

Get Into Your Sanctuary Day 2019 Events at Mokupāpapa Discovery Center

Papahānaumokuākea celebrated Get Into Your Sanctuary Day on Friday August 2nd with a fun family day at Mokupāpapa Discovery Center. Despite the threat from two passing tropical storms MDC had almost 600 visitors, including many families. Thirteen partners participated in the event with activities, demonstrations and informational booths. Partners included Destination Hilo with a lei making activity, East Hawai'i Veterans Association, University of Hawai'i Marine Sciences, Hawai'i Volcanoes National Park, State of Hawai'i Department of Land and Natural Resources, Ke Kai Ola - Marine Mammal Center, Recycle Hawai'i, Hawai'i Science and Technology Museum with a robotics activity, and many others. MDC staff hosted several activities including a virtual tour of sanctuary and monument sites with Oculus Go VR goggles, air brush tattoos, an ROV and robotics demonstration, and an activity table scavenger hunt. Several partners helped to promote the event and drive attendance, including the Hilo Herald Tribune and two local radio stations - KWXX and B93/B97. The Hilo Herald Tribune also published a front page followup article about the event on Monday, August 5th. ONMS HQ Education and Outreach staff also attended the event and captured video, 360 imagery, and other images. .Contact andy.collins@noaa.gov



Left: Get into Your Sanctuary Day drew over 500 visitors to MDC. Right: Kūpuna from Alu Like provided beautiful materials and expertise for attendees to craft lei at our GIYS event (Photos: Malia Evans/NOAA).

PMNM Participates at Youth Fishing Clinic Event

The Summer Youth Fishing Clinic at Sand Island Park was held to teach the next generation of fishermen about the joy, techniques, cultural significance, and responsibilities of fishing in our island communities. While there is no recreational fishing in PMNM, it was still a great opportunity to talk about marine debris and how it plagues Papahānaumokuākea as well as our fishing spots here in the main Hawaiian islands.. Kids and parents were engaged, wanting to know more about where the different kinds of marine debris comes from, how it gets moved across the ocean, and how to reduce, reuse, recycle, and refuse. Contact

Jennifer.crawford@noaa.gov

PMNM Joins Partners to Teach About Impacts of Marine Debris

NOAA's Marine Debris Program (MDP), PMNM, and Kōkua Foundation's Plastics Free Hawai'i Program participated in a Girl Scout Father-Daughter Camp at Malaekahana. MDP and PMNM staff shared with the group the impact that marine debris has beyond our beaches in the main Hawaiian Islands and Plastics Free Hawai'i talked about what it means to be plastics free

and to live a zero waste life. After all the ‘trash-talking’, the group went out and did a beach clean-up. Contact Jennifer.crawford@noaa.gov

Papahānaumokuākea Featured at Hanauma Bay

The Hanauma Bay Education Program led by the University of Hawai‘i Sea Grant Program and the City and County of Honolulu Hanauma Bay Nature Preserve, hosts weekly science talks that are free and open to the public. Every month there is a different focus area and for the month of August, the focus was on Papahānaumokuākea. The talks provided an opportunity for the public to learn about work being done in the monument. Topics included the impacts of sea-level rise, seabird translocations, the significance of cultivating land and ocean stewardship through a Native Hawaiian world view, and deep reef exploration. These presentations can be viewed on YouTube at ‘Hanauma Talks’. Contact; Jennifer.Crawford@noaa.gov.



Top left: Dr. Haunani Kane – “Improving our understanding of sea-level rise impacts on Papahānaumokuākea”. Top right: Kanoe Morishige – “‘Āina Momona: healthy communities of people and place” Bottom left: Dr. Lindsay Young – “Operation Island Ark: Saving Seabirds from rising seas”. Bottom Right: Dr. Randy Kosaki – “The Coral Reef ‘Twilight Zone’: A New Frontier for Exploration” (Photos: Gavin Iwai, Outreach Specialist, Hanauma Bay Education Program)

Education

PMNM Educators Participate in Conservation Education Workshop With San Diego Zoo Global Initiative

Education Coordinator Andy Collins and Educator Justin Umholtz attended a four-day intensive science workshop for middle school teachers at Hawai'i Volcanoes National Park. San Diego Zoo Global staff introduced teachers to Open Inquiry models engaging students in conservation science using Hawai'i bird conservation efforts as place-based examples. In addition to gaining teaching tools, the outreach time was invaluable as MDC staff continue to build relationships with local resource management groups and local middle school teachers. Contact: justin.umholtz@noaa.gov

Monk Seal Camp Presentation at Laupahoehoe Public Library

On June 17, Andy Collins gave a presentation about the recent monk seal camp deployment cruise and NOAA monk seal conservation efforts. Twenty library patrons attended the presentation and learned about NOAA's efforts in the Hawaiian Archipelago to monitor and recover populations of endangered Hawaiian monk seals. Andy recently participated in the first leg of the monitoring camp deployment cruise to the Northwestern Hawaiian Islands along with other NOAA staff and monk seal research program volunteers that will be staying on the tiny islands for four months. Contact: andy.collins@noaa.gov

Catching Knowledge On a Wave...

MDC staff Malia Evans and Virginia Branco were hosted at Liquid Robotics engineering facility in Kawaihae (LR) to initiate collaborations with LR staff, Kamehameha Schools STEAM kumu (educator's) and Kawaihae community members. Liquid Robotics is a Boeing Company that developed the autonomous, ocean monitoring Wave Glider. During the visit they learned more about the data collection capabilities of the Wave Glider (WG), LR's wave powered unmanned marine robot. WG's have been gathering real time data on marine conditions in nearby Puako for several years and LR outreach staff have developed ties with the local community to share data. A WG was recently deployed to accompany the traditional voyaging canoe Makali'i on her journey to Papahānaumokuākea as part of a cultural access trip to Mokumanamana. We are hoping to gain knowledge from the Makali'i crew by learning from their TEK observations. A STEAM teacher will keep a journal on the journey into PMNM with the intention of comparing "time-stamped" observations side-by-side with WG data. Our meeting with LR and KS staff and community members will allow us to create a new type of storytelling and documentation for the Wave Glider exhibit at MDC while kickstarting an educational collaboration to connect educator's around the state. Contact: virginia.branco@noaa.gov



MDC staff members Virginia Branco & Malia Evans with Liquid Robotics staff and Kamehameha Schools STEAM educators get behind the latest build of Wave Glider in a newly designed launch stand (Photo: Liquid Robotics).

PMNM Shares the Diversity of NOAA Careers With Recent Local High School Graduates

On July 15, the PMNM Education and Outreach Program and Native Hawaiian Program hosted a mini-career journey for one of the University of Hawai‘i West O‘ahu signature Summer Academy programs, ‘A‘ali‘i Scholars Program. The 3-week summer program is dedicated to local high school graduates wanting to get an early start on their college experience and provides 6 college credits in two courses: Introduction to Native Hawaiian & Indigenous Health & Healing and Introduction to Public Administration. PMNM staff Jenny Crawford and Kalani Quiocho shared about the many NOAA offices and their work; shared their personal journeys through life and career choices; told about how Native Hawaiians have advocated for the protection of Papahānaumokuākea and how management incorporates Native Hawaiian culture; and led the 27 students through a career activity that highlighted the new interpretive materials for 16 diverse careers found throughout the NOAA Pacific Islands Region.

Contacts: kalani.quiocho@noaa.gov and jennifer.crawford@noaa.gov

Ocean Acidification Teacher Workshop

On July 24th, Mokupāpapa Discovery Center hosted an Ocean Acidification Teacher Workshop for 10 Hawai‘i Island teachers. The workshop was funded by a NOAA Ocean Acidification grant received by GFNMS and PMNM in FY18. MDC Education Coordinator Justin Umholtz and MDC Manager Andy Collins taught the workshop with invited guest speakers from NOAA’s Mauna Loa Observatory and the director from the University of Hawai‘i at Hilo Pacific Aquaculture and Coastal Resources Center. Materials covered hands on experiments to learn about ocean acidification in the classroom, and other NOAA created lessons. The Hawai‘i cohort will also be introduced to the San Francisco cohort of teachers who attended a similar workshop last year so they can collaborate and share what they are doing in the classroom. Contact andy.collins@noaa.gov



Local teachers participate in an afternoon of Ocean Acidification activities (Photos: Justin Umholtz/NOAA)

Mokupāpapa Discovery Center (MDC) Report For May 27 – September 15, 2019

Mokupāpapa Discovery Center hosted 17,677 people during this period. Highlights include:

- Hosting 75 high school students from Japan and international students from UCLA Au Pair program who learned about PMNM for the first time.
- Supporting partners in the community at events like Ka ‘Umeke Kā‘eo PCS Hō‘ike, working with Maui Ocean Center to share best practices for maintaining healthy aquarium ecosystems, partnering with Hawai‘i Volcanoes National Park (HVNP) to share marine debris data and information with the community during their monthly lecture series, hosting Zero Waste Hawai‘i monthly meetings, working with Kamehameha Schools Ho‘o Ma Ka‘i Ka‘i summer program
- Celebrating the 77th Anniversary of the Battle of Midway with special exhibits and pop-up displays
- Teaching local students through hands-on activities employing an integration of the Hawaiian practice of kilo (deep observation) and the scientific method as they examined local adaptations to the reef environments of Hawai‘i.
- Working with Fifth graders from Halau Kupukupu summer program participated in a Ship-to-Shore communication with members of *E/V Nautilus* as they finished up the California to Hawai‘i seafloor mapping leg of their 2019 expedition
- MDC held another successful craft night with 67 participants
- MDC’s Third Thursdays by the Bay continues to be a popular draw, attracting over a 100 people for an evening of music, verse, and story from local writer Tom Peek, author and poet Frances Kai-Hwa Wang, author Leomi Bergknut, and musician Patrick Kahakauwila Kamaholelani Landeza
- MDC aquarist Michael Caban is utilizing the basement lab to nurture a coral nursery. Fragments of lobe, rice and finger corals grow under a new motorized track lighting system that mimics weather patterns and moon cycles. The coral plugs will eventually be placed into the main 3500 gallon aquarium



Top left: Circle of Life Summer Camp students participate in a robotics activity (Photo: Clayton Watkins). Top right: Craft Night creations (Photo: Justin Umholtz/NOAA). Bottom left: Coral fragments being grown in MDC basement by MDC Aquarist Michael Caban (Photo: Michael Caban and Malia Evans). Bottom Right: Students practice driving an ROV with Facilities and Events Coordinator Clayton Watkins and virtually experience a tour of Midway Atoll or the life of a monk seal researcher on Pearl and Hermes with Educator Justin Umholtz. (Photos: Justin Umholtz, Clayton Watkins)

Research & Field Operations

New Book on Mesophotic Coral Ecosystems Features ONMS PIR Sites

On June 4, Springer published a new book entitled, “Mesophotic Coral Ecosystems.” Edited by Yossi Loya, Kimberly Puglise (of NCCOS), and Tom Bridge, the book is a part of the series *Coral Reefs of the World*. PMNM scientist Randy Kosaki is a co-author of three chapters, including *Hawaiian Archipelago*, *American Samoa*, and *Fishes: Biodiversity*. In addition to highlighting the discovery of numerous new species and globally significant of endemism in PMNM, the book also features discoveries resulting from exploration of NMSAS by PMNM’s rebreather dive team in 2017. Contact: randall.kosaki@noaa.gov

Biogeography Research Expedition to Papahānaumokuākea Marine National Monument

The NOAA PMNM Biogeography research expedition returned from a 22-day cruise on August 13, 2019. The platform for the cruise was the NOAA Ship *Rainier*. Activity included SCUBA and rebreather dives and snorkeler surveys of reef fish, corals, other invertebrates and algae for population genetics analysis. The cruise supported CCB (rebreather) diver surveys for the

purpose of characterizing mesophotic reefs in the 50-100 M depth range. Fish and benthic surveys were conducted with observations aimed at detecting the presence of alien species in both deep and shallow depths. The cruise also supported SCUBA surveys of coral disease and coral health in the 5-30 m depth range and to monitor reef recovery from a 2014 mass coral bleaching event at Lisianski Island. Researchers surveyed and monitored reefs and associated reef fish, and searched for invasive and alien species. Contact: Jonathan.Martinez@noaa.gov



Left: Field Ops Coordinator Jason Leonard, Right: Chief Scientist Randy Kosaki (Photo: Athline Clark)

Scientists Document Invasive Alga Outbreak and Extensive Hurricane Damage to Reefs

On August 13, scientists aboard NOAA ship Rainier returned to Honolulu after a 22-day expedition to PMNM. As the first coral reef scientists to visit French Frigate Shoals since Hurricane Walaka hit the atoll in October 2018, the benthic team discovered complete devastation of coral reefs along the south-facing side of the atoll. Once beautiful reefs were completely gone, with only a small amount of rubble remaining on the bottom. Diverse, high-biomass fish assemblages associated with these reefs are also gone. Further northwest at Pearl and Hermes Atoll, scientists found large areas of reef covered by thick mats of an unidentified non-native invasive red alga. All native corals and algae under the mats were dead. Scientists self-imposed strict quarantine procedures to prevent the spread of the alga to other atolls or the main Hawaiian Islands. Controlled, replicated bioassays were conducted aboard the ship to identify bleach concentrations and exposure times that would ensure a 100% kill rate. All dive gear, scientific gear, and small boats were disinfected upon leaving the atoll. For more information, contact randall.kosaki@noaa.gov



Mats of invasive red alga completely overgrowing native corals and algae at Pearl and Hermes Atoll. Photo: Taylor Williams/NOAA



Left: Rapture Reef at French Frigate Shoals before Hurricane Walaka (credit: James Watt/NOAA). Right: Rapture Reef at French Frigate Shoals after Hurricane Walaka (Photos: Taylor Williams, University of Hawai'i)

Scientists Discover Numerous New Species of Macroalgae on Deep Reefs of PMNM

On August 13, scientists aboard NOAA ship Rainier returned to Honolulu after a 22-day expedition to PMNM. Using closed-circuit mixed-gas rebreathers to access deep coral reefs at 200-330 ft., PMNM scientists discovered numerous species of multi-colored macroalgae that are completely new to science. Several of the new species are so distinct from any known forms that they likely represent new genera. Collaborators Dr. Alison Sherwood and Dr. Heather Spalding of the University of Hawai'i currently have an \$800k National Science Foundation grant to complete genetic and taxonomic analyses of PMNM's new deep coral reef species. For more information, contact randall.kosaki@noaa.gov.



Left: New species of red algae from Pearl and Hermes Atoll, 300 ft. Right: New species of brown algae (order Sporochnales) from Lisianski Island, 300 feet. This new species is so distinct from any known Sporochnales that it likely represents a new genus.(photo: Heather Spalding, University of Hawai'i/College of Charleston)

PMNM Field Team Provides Support To NOAA's Restoration Center For A New Type of Coral Nursery

On September 13, PMNM Field Team members Keo Lopes and Jason Leonard provided vessel, dive and scientific support to NOAA's Restoration Center. The Center is developing a new type of coral nursery that could help restore damaged reefs using fully formed coral colonies rather than small fragments. PMNM assisted with setting up and placing temperature loggers at the coral nursery and surveying suitable areas for future out planting corals. Temperature data and future biopsies will be used to identify corals that have heat resistance and possible out planting to combat heat stress events. Contact Jason.Leonard@noaa.gov.



NOAA's new Coral Nursery (Credit NOAA)