

**Papahānaumokuākea Marine National Monument**  
**Agency Report to the Reserve Advisory Council**  
September 5, 2018 – February 15, 2019

**Agency:** NOAA/NOS/ONMS/ONMS/PMNM

**Presented by:** Athline Clark, Superintendent

**Date:** March 20, 2019

**Agency Accomplishments & Recent Activities**

**Agency Coordination**

**ONMS/PMNM Hosts Pacific Island Region Vessel Operations Coordinator Meeting**

On September 20 and 21, the ONMS Vessel Operations Coordinators (VOCs) from the Pacific Island Region meet at the Inouye Regional Center in Honolulu. LTJG Sara Thompson (HIHWNMS), LTJG Lauren Jarlenski (NMSAS), and LTJG Terril Efird (ONMS/PMNM) discussed various topics including common challenges to operating and maintaining vessels in remote areas, standardizing safety protocols, and sharing resources. The VOCs were joined by OMNS Vessel Program Coordinator Dana Wilkes, who highlighted the importance of Optimal Zone Planning and guided a discussion of Winter Yard Package planning and execution. The two-day meeting resulted in a multitude of tangible action items that the VOCs will be bringing back to their respective sites. For more information, contact [Terril.Efird@noaa.gov](mailto:Terril.Efird@noaa.gov).



*Left: Vessel Operations Coordinators (left to right): LTJG Terril Efird (ONMS/PMNM), LTJG Sara Thompson (HIHWNMS), LTJG Lauren Jarlenski (NMSAS) meet at IRC. (Credit: Kahi Fujii/NOAA). Right: ONMS/PMNM Research Vessel Hihimanu (R-3602) in the IRC boatyard. (Credit: Terril Efird/ NOAA)*

**MDC and Humpback Whales (HIHWNMS) work to deepen collaborations**

On October 11, 2018 Allen Tom and HIHWNMS staff Patty Miller, Amy Elderege and Rusty Sagawinit (Kupu Intern) visited MDC for a day of collaboration, experience sharing, and exhibit visioning. Staff discussed volunteer programming, potential exhibits for the Kīhei Visitor Center (including fish pond restoration), education lessons, cultural integration into interpretive programming, and generally committed to continuing and improving efforts to promote and educate on PIR ONMS sites. For more information, contact [Justin.Umholtz@noaa.gov](mailto:Justin.Umholtz@noaa.gov).

**ONMS/PMNM participates in International Emergency Managers Conference**

On October 22-24, ONMS/PMNM Field Operations Coordinator Jason Leonard attended the International Association of Emergency Managers Annual Conference in Grand Rapids Michigan as part of the emergency preparedness work in the Pacific Islands. Federal and state agencies, the private sector, NGOs and universities, and included presentations and discussions on topics attended the conference across the emergency management spectrum. In addition, Jason attended an Emergency Management & Homeland Security Expo to learn about the latest in disaster preparedness and homeland security. Information gained from attendance at this event will help ONMS/PMNM prepare for and support natural disasters and other emergency incidents in the Monument and at ONMS facilities in Hawai‘i. For more information, contact: [Jason.Leonard@noaa.gov](mailto:Jason.Leonard@noaa.gov)

### **ONMS/PMNM Supports the Revival of Mokauea during Annual Inreach Experience**

On November 2, ONMS/PMNM staff conducted a service learning visit to Mokauea, a culturally significant island located near downtown Honolulu in the Ke'ehi lagoon. Like the islands of Papahānaumokuākea, Mokauea is small yet steeped in rich history, with stories of migrations from Mokauea to Kuaihelani (Midway Atoll) and royal decrees acknowledging the sanctity of the area by the Kamehameha dynasty of the Kingdom of Hawai'i. The ONMS/PMNM staff were hosted by Kēhaulani Kupihea, program director of the Mokauea Fishermen's Association and former ONMS/PMNM employee. This grassroots organization is dedicated to the care of the natural and cultural heritage of Mokauea. An amazing storyteller, Kēhaulani provided background about the site, after which staff participated in Hawaiian protocol and assisted with marine debris removal. ONMS/PMNM's annual in-reach efforts aim to reinforce traditional ways of developing relationships with place and people of place. For more information, contact: [Kalani.Quiocho@noaa.gov](mailto:Kalani.Quiocho@noaa.gov)



*ONMS/PMNM staff learn about Mokauea while participating in Hawaiian customary practices and assisting with marine debris removal. (Credit: Kahi Fujii/NOAA)*

### **ONMS/PMNM participates in UHMS/NOAA Physicians in Dive Medicine Course**

On October 15<sup>th</sup>-26<sup>th</sup>, ONMS/PMNM Science Operations Associate Stephen Matadobra assisted and attended a course taught by the Undersea and Hyperbaric Medical Society in partnership with the NOAA Dive Center in Seattle Washington. The course included physicians and lecturers from around the globe. Participants received training on how to recognize and treat dive medical emergencies, including hands on experience in operations, diving, chamber operations and logistical concerns when conducting a myriad of diving operations as well as the most up to date information on the treatment and pathophysiology of decompression sickness. Matadobra assisted in hyperbaric chamber operations and attended the course to expand ONMS/PMNM's redundancy in remote diving operations.

Attendance in the course qualifies physicians to be international diving medical physicians and oversee diving operations as well as treat diving casualties. For more information, contact: [Stephen.Matadobra@noaa.gov](mailto:Stephen.Matadobra@noaa.gov)



*Shutting the chamber door before pressurization with students to an equivalent pressure of 130ft sea water. (Credit: NOAA/Stephen Matadobra)*

### **A learning exchange between ONMS/PMNM and Juan Fernández Islands, Chile**

From December 10-14, one of the oldest and one of newest large-scale MPAs participated in a learning exchange in Hawai‘i. In partnership with Conservation International’s Center for Oceans and the Big Ocean network of large-scale marine managed areas, ONMS/PMNM hosted six prestigious delegates, including the mayor, from Robinson Crusoe Island and Alejandro Selkirk Island in the Juan Fernández Archipelago off the coast of Chile. They were accompanied by representatives from the nonprofit organization Oceana and the Catholic University of the North in Chile. The exchange included energetic meetings at the NOAA Inouye Regional Center in Honolulu, lively MPA diagnostic workshops and inspiring engagements with local communities associated with the NOAA He‘eia National Estuarine Research Reserve on O‘ahu. The delegates learned about local perspectives on land-sea relationships, large-scale focus, and other aspects of ONMS/PMNM management such as our research, education, regulatory framework, management planning and co-management. Leading with place-based values and principles, ONMS/PMNM forged powerful relationships for collective ocean stewardship. For more information, contact: Kalani Quiocho, [kalani.quiocho@noaa.gov](mailto:kalani.quiocho@noaa.gov)



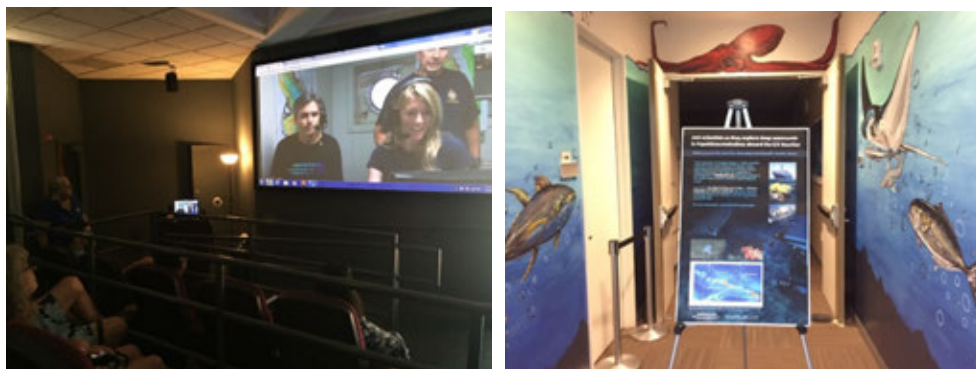


*Top left: The ONMS/PMNM staff facilitated a guided tour at the Honolulu Fish Auction, the only fish auction between Tokyo and Maine, to learn about the commercial long-line fishing industry. Top right: Keoni Kuoha with the nonprofit organization Papahāna Kuaola, and former ONMS/PMNM employee, shows the traditional boundaries of He'eia, site of the National Estuarine Research Reserve on the island of O'ahu. Lower left: ONMS/PMNM Field Team discusses the fieldwork and advanced technologies used to conduct research, monitoring and resource protection projects in the Monument to the Chilean delegation. (Credits: Kalani Quicho) Lower right: Delegation members and PMNM staff and partners. (Credit: Lucy Kaneshiro)*

### ***Constituency Building & Outreach***

#### **ONMS/PMNM supports E/V Nautilus outreach from Papahānaumokuākea**

From September 15-October 1, scientists were in Papahānaumokuākea aboard the Exploration Vessel (E/V) *Nautilus* exploring deep seamounts in the expanded portion of the Monument. ONMS/PMNM staff helped to support the various education and outreach efforts during the expedition. Live Ship-to-Shore interactions featuring ONMS/PMNM Education Associate Justin Umholtz were held at Maui Ocean Center and NOAA's IRC on O'ahu, as well as 16 schools and science centers throughout Hawai'i. All in, approximately 450 people participated. In addition, live streaming was ongoing at Maui Ocean Center, the Waikīkī Aquarium, and NOAA's Mokuapāpapa Discovery Center, and social media posts were made daily. For more information, contact [sarah.marquis@noaa.gov](mailto:sarah.marquis@noaa.gov).



*ONMS/PMNM supported live ship-to-shore interactions with the E/V Nautilus at Maui Ocean Center (left) and NOAA's IRC (right). (Credits: Toni Parras/NOAA)*

#### **ONMS/PMNM Participates in Ocean Acidification Teacher Workshop at Greater Farallones NMS**

On October 13, ONMS/PMNM and GFNMS held a teacher workshop on ocean acidification at the GFNMS Crissy Field offices in San Francisco. The two sites were awarded an ocean acidification grant in FY18 to develop an educator toolkit and hold teacher workshops on ocean acidification. ONMS/PMNM Mokuapāpapa Discovery Center Manager Andy Collins travelled to San Francisco and co-lead the first workshop. Seventeen math, science and environment High School teachers and three informal educators from the greater San Francisco area participated in the day long workshop and were shown the lesson plans developed, introduced to community resources, and conducted hands-on demonstrations from the tool kit such as ocean chemistry experiments. The next step is to host a similar teacher workshop in Hawai'i in FY19. For more information, contact [Andy.Collins@noaa.gov](mailto:Andy.Collins@noaa.gov).



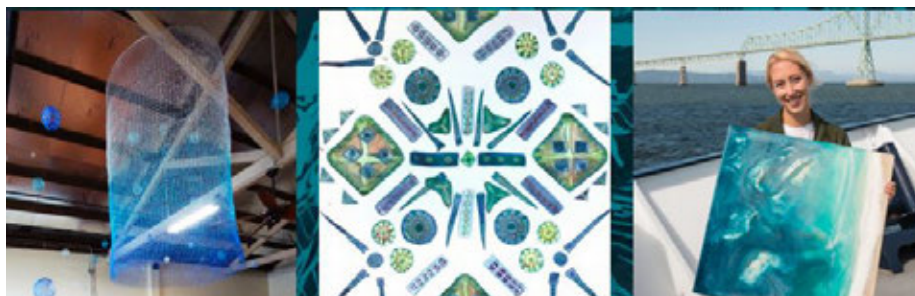
*GFNMS Visitor Center manager Justin Holl prepares the teachers for a plankton tow activity as part of the ocean acidification workshop. (Credit: Andy Collins/NOAA)*

### **Papahānaumokuākea Presence at the Waimea Ocean Film Festival**

The annual Waimea Ocean Film Festival on Hawai‘i Island January 1 – 9 prominently featured Papahānaumokuākea this year with two films from the Monument, an exhibit at Kahilu Theater in Waimea, and three presentations. The films “Albatross” by Chris Jordan and “Midway Edge of Tomorrow” were shown several times during the week long festival and three public talks and presentations were given by monument staff to festival participants. An exhibit on Papahānaumokuākea was hosted at the Kahilu Theater for the month of January in combination with talks on Polynesian voyaging and the Hōkūle‘a Worldwide Voyage. In addition, the beautiful program booklet for the festival featured Mokupāpapa Discovery Center. This booklet has a print run of 10,000 and is distributed around the world. Over 60 films were featured during the 2019 festival and you can find out more here: <https://www.waimeaoceanfilm.org/>. For more information, contact: [Andy.Collins@NOAA.gov](mailto:Andy.Collins@NOAA.gov).

### **Science at Sea art exhibit at Mokupāpapa Discovery Center**

Dec 7, 2018 through March 21, 2019, Mokupāpapa Discovery Center in Hilo will display artwork from the Schmidt Ocean Institute’s Artist-at-Sea program. The exhibit features more than 50 pieces of artwork made from and inspired by local artists who participated on science expeditions aboard *Falkor*, the institute’s research vessel. Artwork includes watercolor paintings, drawings, photography, fiber art, resin art, and data visualizations. For more information, contact: [Andy.Collins@NOAA.gov](mailto:Andy.Collins@NOAA.gov).



*Highlights from the Science at Sea art exhibit (Credit: Andy Collins/NOAA)*

## ***Education***

### **Language Arts Ninth-graders Visit Kaua‘i Office**

On October 31, over 20 ninth-graders from the Hawaii Technology Academy language arts class interviewed Program Specialist Jean Souza as a class assignment. The interview exposed the students to the unique programs and activities offered by HIHWNMS on Kaua‘i. Class discussions focused on whale behavior, career choices, preparedness, and volunteerism. For more information, contact: [Jean.Souza@noaa.gov](mailto:Jean.Souza@noaa.gov)



*HIHWNMS Program Specialist Jean Souza listens to a question posed by a Hawaii Technology Academy student at the Kaua‘i Sanctuary Office. (Credit: J. Fordyce/HTA)*

### **ONMS/PMNM engages future natural resource managers at Waipahu High School**

On December 19, ONMS/PMNM Native Hawaiian Program Specialist Kalani Quiocho visited Waipahu High School’s Academy of Natural Resources. He shared about the Hawaiian expansion period (circa 1400-1700 AD) that led to a diversification in food production in Hawai‘i. These techniques improved over time and allowed Native Hawaiians to cultivate sweet potato on one of the small and seemingly inhospitable islands of Papahānaumokuākea. Truly a model of ingenuity and resilience for our communities today, especially our youth. The academy has around 300 students between the 9th-12th grades and was created to prepare all students to become environmentally conscious citizens who practice good environmental stewardship throughout their lifetime and become contributors to a sustainable world. The academy offers three pathways for the students to choose from: Natural Resources Production, Environmental Resource Management, and Biotechnology. For more information, contact Kalani Quiocho, [kalani.quiocho@noaa.gov](mailto:kalani.quiocho@noaa.gov).

### **Mokupāpapa Discovery Center (MDC) Report for September 5, 2018 – February 15, 2019**

Mokupāpapa Discovery Center hosted 19, 712 people during this time. Highlights include:

- A mutually supportive educational collaboration between ONMS/PMNM and the National Park Service (NPS) concluded on September 21, 2018
- Monthly craft nights highlighting species found in PMNM
- On Friday, November 2, MDC participated in Hilo’s 18th annual Black and White Night, a gigantic multi-block party during which businesses stay open late with free music and live entertainment with over 1,500 in attendance throughout the night.
- On Saturday, November 3, MDC hosted a Robotics Expo and Science Day in partnership with the Hawai‘i Science and Technology Museum (HSTM), at which there were 479 attendees.
- Third Thursday by the Bay Lecture Series continued monthly
- On Wednesday, December 12th Mokupāpapa Discovery Center welcomed its 800,000th visitor

- MDC remained open during the Federal Government partial shutdown in January due to the partnership with the National Marine Sanctuary Foundation. From January 1-27, 4492 people visited MDC
- MDC staff attends M.A.T.E. ROV robotic teacher training
- A generator back-up system was installed to better prepare MDC for electrical outages, emergencies and severe weather events
- On January 11th MDC hosted a screening of the film “Albatross” by Chris Jordan



*From left to right: 25 foot by 25 foot Mars map used for robot build activity; A drone bot with a protected polycarbonate cage used for search and rescue, tunnels, and confined spaces; STEM camp kids making their Rollercoaster track for marbles. (Credit: Clayton Watkins/NOAA)*



*From left: MDC staffer greets Black and White Night visitors; the Big Island Bee Keepers Honey Tasting Competition was sweet!; a live hula performance from Na Hoaloha and Mikioi Band drew in the crowd(Credits: Andy Collins/NOAA)*



*Families love painting/glazing their own PMNM-themed ornaments, custom crafted by Kīlauea Pottery. (Credit: Clayton Watkins/NOAA)*



*Mokupāpapa greets its 800k visitor from Webster, NY. From left: MDC Volunteer Pat Richardson, Richard and Joyce Henzel, MDC Manager Andy Collins. Credit: Virginia Branco*

### ***Research & Field Operations***

#### **E/V *Nautilus* Completes the “Enigmatic Seamounts” Expedition in PMNM**

From September 15 to October 1, scientists aboard the Ocean Exploration Trust (OET) ship E/V *Nautilus* mapped and explored ten seamounts north of Lalo (French Frigate Shoals) and ‘Ōnū‘nui/’Ōnū‘iki (Gardner Pinnacles) within the expanded boundary of Papahānaumokuākea Marine National Monument. NMSF/ONMS/PMNM Education Associate Justin Umholtz served as Resource Monitor and on-board educator, providing narration during live streaming of Remotely Operated Vehicle (ROV) dives, hosting multiple ship-to-shore classroom and partner interactions, and delivering presentations on PMNM for the OET crew. Live streaming was ongoing for the duration of the cruise at NOAA’s Mokupāpapa Discovery Center, University of Hawai‘i (Mānoa and Hilo campuses), the Waikīkī Aquarium, and Maui Ocean Center, and ongoing updates were posted daily on social media. OET expedition Leader Allison Fundis reported the following summary of accomplishments:



- Traveled 2,944 linear nautical miles (5,452 kilometers)...and mapped most of that!
- Fully mapped 10 seamounts and acquired partial coverage of an additional 2 seamounts
- Completed 11 ROV dives at 10 seamounts
- Collected 51 rock samples (~900 lbs), 44 biological samples, and 22 water samples
- Deployed NASA's Underwater Gripper on 3 dives and the MIT 360° Camera on 2 dives
- Had 1.5 million minutes of live stream viewed by an international audience
- Fielded 4,544 questions posted to the website during the ROV dives, and
- Conducted 69 ship-to-shore interactions reaching more than 2400 students and members of the public in 15 U.S. states, American Samoa, and Mexico.
- Had thousands of stories globally, including a video of a gulper eel that went viral, with more than 2 million views in the first week!

Media coverage on the expedition abounded, with thousands of stories globally, including a video of a gulper eel that went viral. For more information, contact [Justin.Umholtz@noaa.gov](mailto:Justin.Umholtz@noaa.gov).

#### News Clips:

Washington Post: [Watch scientists delight over rare footage of a freakishly cute eel](#)

National Geographic: [Watch a Gulper Eel Inflate and Deflate Itself, Shocking Scientists](#)

Hawaii News Now: [Researchers share jaw-dropping video of bizarre gulper eel](#)

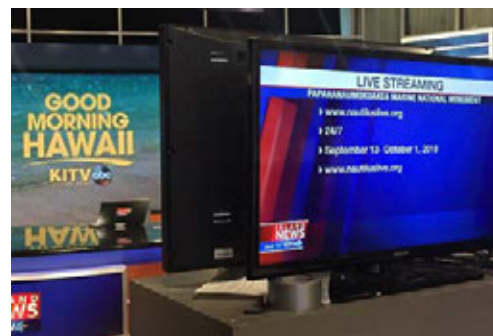
Big Island News: <http://bigislandnow.com/2018/09/14/nautilus-to-explore-papahānaumokuākea-seamounts/>

Maui Now: <http://mauinow.com/2018/09/15/scientists-to-live-stream-their-deep-sea-expedition/>

KHON: <https://www.khon2.com/news/local-news/wake-up-2day/exploring-the-deep-blue/1444943609>

Hawai'i Public Radio: [https://cpa.ds.npr.org/khpr/audio/2018/09/CC\\_ChrisKelley091118.mp3](https://cpa.ds.npr.org/khpr/audio/2018/09/CC_ChrisKelley091118.mp3),

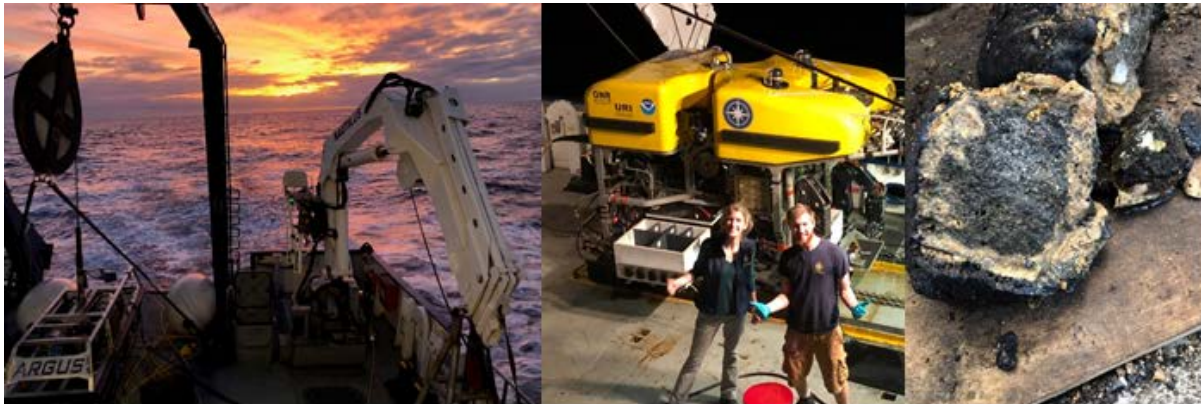
<http://www.hpr2.org/post/research-expedition-prepares-depart-seamount-mapping-mission>



*Dr. Chris Kelley (right) appears on Good Morning Hawaii to promote the Nautilus expedition to Papahānaumokuākea. (Credits: Toni Parras/NOAA)*



*Dr. Chris Kelley appears on Hawaii Public Radio and KHON TV to promote the Nautilus expedition to Papahānaumokuākea. (Credits: Toni Parras/NOAA)*



*Left: The final sunset as the E/V Nautilus heads east to Honolulu. Center: Team members celebrate the last ROV dive of the expedition. Right: Rock samples showing the outer manganese crust, some alteration, and an inner basalt core that will hopefully allow for accurate radiometric dating. (Credits: Justin Umholtz/NOAA)*

### **Researchers return from brief expedition in Main Hawaiian Islands**

From September 13-16, NOAA Ship *Hi 'ialakai* cruise HA-18-02 supported two days of dive operations in the main Hawaiian Islands for ONMS/PMNM scientists and partner researchers. The cruise was scheduled to sail on August 23, but a series of mechanical issues (failed auxiliary seawater pump, holes in ballast tanks, failed food reefer) reduced a 25-day cruise to just four days at sea. By the time the *Hi 'ialakai* was fit to depart, there was not enough time to make the round trip to the closest atoll of PMNM. Thus, a continuous nineteen-year annual coral reef monitoring time series ended. By the time ONMS/PMNM's only FY19 cruise sails next summer, it will have been two years since ONMS/PMNM staff set foot (fin?) in the Monument they manage. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov).

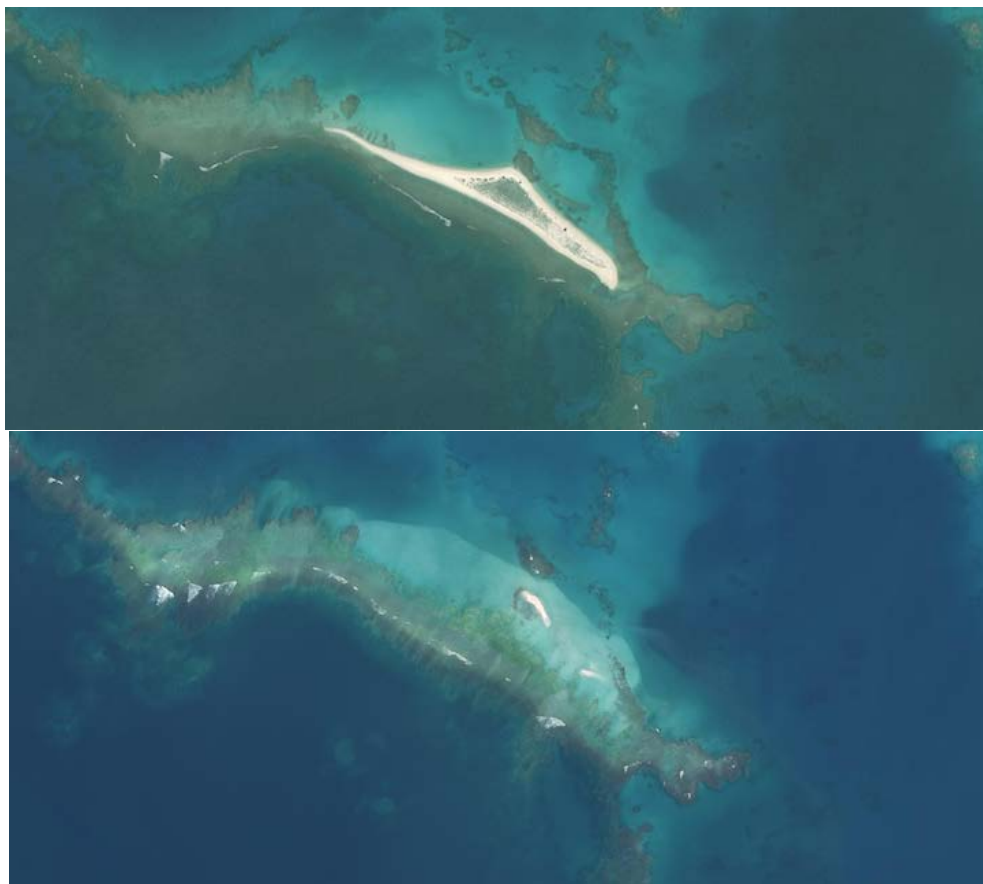


*ONMS/PMNM Chief Scientist Randy Kosaki conducts a fish transect on a closed-circuit rebreather at 240 ft. off Ni 'ihau, Hawai 'i. The dramatically shortened cruise was not able to access the NWHI. (Credit: Rich Pyle/Bishop Museum)*

### **Hurricane Walaka Hits French Frigate Shoals, Washing Away East Island**

On October 4, 2018, Hurricane Walaka passed 60 nautical miles west of French Frigate Shoals. A category 5 storm at its peak, Walaka was the strongest storm ever recorded in Hawaiian waters. Satellite images obtained on October 18 showed that East Island, a low-lying, vegetated sand island at French Frigate Shoals was almost completely washed away overnight. Fifty percent of threatened green sea turtles in Hawai 'i nested on East Island and 30

percent of endangered Hawaiian monk seal pups born each year were pupped on East Island. Impacts to wildlife from losing this island are unknown, but are potentially severe. While the existence, strength, or track of any give hurricane cannot be directly attributed to climate change, the overall pattern of increased frequency and severity of major storms is likely driven by rising sea surface temperatures. Hawai'i had two other near-misses by major hurricanes this year. As ONMS/PMNM was unable to conduct a research expedition to the NWHI this year, and the next cruise is planned for late July 2019, *in situ* hurricane damage assessments cannot be conducted until that time. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov).



*Above: East Island on May 4, 2018 (before Hurricane Walaka). Below: East Island on October 18, 2018 (after Hurricane Walaka). (Credits: USFWS)*

#### **ONMS/PMNM Flyover of French Frigate Shoals to assess damage from Hurricane Walaka**

On October 22, ONMS/PMNM staff joined USCG and USFWS on Coast Guard flight to assess the damage caused by Hurricane Walaka. From the aerial observations, NOAA Corps Officer LTJG Terril Efird and ONMS/PMNM Field Logistics Technician Keo Lopes viewed substantial damage to the support structures on Tern Island and inundation of the runway with sand. Other changes in the environment were noticeable, such as the redistribution of sand and the elimination of some sand spits, which are important habitat for the critically endangered Hawaiian monk seal, nesting spots for threatened green sea turtles, and nesting grounds for many migratory and resident seabirds. For more information, contact [Keolohilani.Lopes@noaa.gov](mailto:Keolohilani.Lopes@noaa.gov).



*Above: LTJG Terril Efird (second from left) takes a series of images from the USCG C-130 used to create a 3D image (right), which can be used to quantify storm damage. (Credits: Keo Lopes, top; Terril Efird, images; rendering Keo Lopes, bottom).*

### **Papahānaumokuākea and Partners Host Science Symposium**

More than 200 researchers, managers, and stakeholders gathered in Honolulu on November 19-20 for the Symposium on Science in Support of Archipelagic Management. The two-day event included presentations on terrestrial and marine ecosystems, natural and cultural resources, protected species research, conservation genetics, climate change, and innovative research techniques. Forty-six speakers delivered presentations on work carried out in Papahānaumokuākea Marine National Monument and other Pacific Ocean archipelagos. Speakers addressed work in the Hawaiian Archipelago, Samoan Archipelago, Galapagos Archipelago, Marianas Archipelago and the Pacific Remote Islands. The symposium was convened and hosted by PMNM co-managers, NOAA Pacific Islands Fisheries Science Center, NOAA Pacific Islands Regional Office, and Hawai‘i Institute of Marine Biology. This is the latest in a series of science symposia held over the years featuring research in Papahānaumokuākea. Almost 40 years of science and research have been an integral part of managing the site. For more information, contact: [randall.kosaki@noaa.gov](mailto:randall.kosaki@noaa.gov).



*Left: More than 200 attended the symposium in Honolulu, with 46 speakers (Credit: Sarah Marquis/NOAA); right: Keynote speaker Michael Seki at the science symposium. (Credit: Kahi Fujii/NOAA)*

### **Ecological statistics workshop hosted by Papahānaumokuākea Marine National Monument**

Papahānaumokuākea Marine National Monument hosted a 2-week intensive workshop on ecological multivariate statistics from November 26 to December 4, led by ecological statisticians Drs. Adam Smith and Marti Anderson

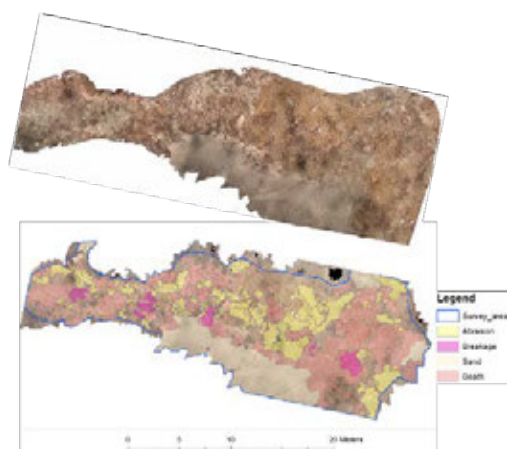
from Massey University in New Zealand. Participants included scientists from PMNM, NOAA Fisheries, US Fish and Wildlife Service, University of Hawaii, University of Alaska, Moss Landing Marine Laboratories and Georgia Aquarium. They learned various techniques for visualization and analysis of ecological data available in the software PRIMER and PERMANOVA+ add-on. The participants also had the opportunity to work closely with the instructors while analyzing their own data using the newly-learned techniques on the last day of the workshop. ONMS/PMNM routinely uses PRIMER and PERMANOVA+ to analyze ecological data collected from the Monument. For more information, contact: [atsuko.fukunaga@noaa.gov](mailto:atsuko.fukunaga@noaa.gov) or [terril.efird@noaa.gov](mailto:terril.efird@noaa.gov).



*Participants of the second week of the workshop (Credit: Heather Spalding)*

### **ONMS/PMNM Scientists and Hollings Scholar Publish Paper on 3D Photogrammetry of Coral Reefs**

ONMS/PMNM's 2018 Hollings Scholar, Brianna Craig (University of Hawai'i at Hilo) was a co-author on a peer-reviewed publication, "*Integrating Three-Dimensional Benthic Habitat Characterization Techniques into Ecological Monitoring of Coral Reefs*," in the *Journal of Marine Science and Engineering*. ONMS/PMNM has used this technique to document changes in benthic structural complexity in the wake of a 2014 mass coral-bleaching event, and to document reef damage following a weather buoy grounding in 2015. Metrics extracted from 3D models of benthic structure can be used as explanatory variables when assessing the structure of fish assemblages. Brianna Craig's Hollings internship with ONMS/PMNM involved this type of 3D image analysis. First author on the paper was ONMS/PMNM's ecological statistician, Atsuko Fukunaga. Other co-authors also included John Burns (Univ. of Hawai'i at Hilo) and Randy Kosaki (ONMS/PMNM). The article, published on January 28, 2019, can be accessed online at <http://www.mdpi.com/2077-1312/7/2/27/pdf>. For more information, contact: [atsuko.fukunaga@noaa.gov](mailto:atsuko.fukunaga@noaa.gov).



*Caption: 2D representation of an annotated orthophotomosaic of damage to the reef resulting from a 2015 weather buoy grounding at Lisianski Island, NWHI. (Credit: John Burns/Univ. of Hawai'i at Hilo)*

**Staff Changes:**New Staff

Malia Evans, Education Specialist at Mokupāpapa Discovery Center

Jennifer Crawford, Education Specialist Oahu

Nikki Mew, Administrative Assistant I

Departures

Caroline Jackson, Administrative Assistant I

**Calendar:**

- **Schmidt Ocean Institute Artist at Sea Exhibition Closing Celebration**  
Thursday, March 21, 2019, 6:00-8:00 PM at Mokupāpapa Discovery Center, Hilo
- **Moloka'i Earth Day**  
Friday, April 19, 2019, 5:00 pm to 9:00 pm at Mitchell Pau'ole Center in Kaunakakai
- **Earth Day Aloha 'Āina Festival**  
Saturday, April 20, 2019, 10:00 am to 3:00 pm at the Honolulu Zoo
- **Mauka to Makai (Earth Day)**  
Saturday, April 20, 2019, 9:00 am to 2:00 pm at the Waikīkī Aquarium