

**Papahānaumokuākea Marine National Monument**  
**Agency Report to the Reserve Advisory Council**  
January 14, 2017 – April 14, 2017

**Agency:** NOAA/NOS/ONMS/PMNM  
**Presented by:** Athline Clark, Superintendent  
**Date:** May 4, 2017

**Agency Accomplishments & Recent Activities**

***Agency Coordination***

**MMB Holds Ad Hoc Meeting Regarding Management Planning (AC-2.2)**

On January 19, the Monument Management Board (MMB) held an ad hoc meeting to begin management planning to include the monument expansion area and potentially sanctuary designation. Members discussed desired goals of the plan, what documents will inform the scoping and planning processes, and planning design and project management. PMNM Deputy Superintendent David Swatland gave a presentation on the National Marine Sanctuaries Act and the sanctuary designation process. The MMB will continue working on the management plan at a series of ad hoc meetings over the next six to eight months in preparation for likely public scoping meetings in November 2017. For more information, contact [Athline.Clark@noaa.gov](mailto:Athline.Clark@noaa.gov).

**NMSF Board of Trustee Visits Mokuāpapa Discovery Center**

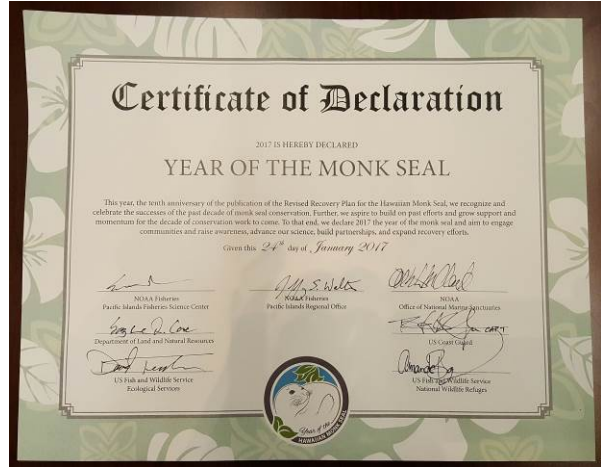
On January 21, James Crowley, the Vice Chair of the Board of Trustees for the National Marine Sanctuary Foundation (NMSF) visited the Mokuāpapa Discovery Center in Hilo to learn about PMNM programs and experience the exhibits. Mr. Crowley is the first NMSF Trustee to visit our discovery center, which is operated in a partnership with the NMSF. For more information, contact [Athline.Clark@noaa.gov](mailto:Athline.Clark@noaa.gov)

**Monument Communications Team Holds First Two Quarterly Meetings of 2017 (CBO-1.2, AC-2.2)**

On January 23, the Monument Communications Team (MCT) met at the IRC for its first quarterly meeting of 2017. The MCT discussed communications planning for the management planning process, updates to PMNM social media and website, ideas for a communications forum for the Hawai'i Conservation Congress, and more. On April 12, the MCT met again at the IRC for updates on the Battle of Midway 75 Year Commemoration activities by USFWS External Affairs Officer Megan Nagel, management planning process from PMNM Planning and Evaluation Specialist Alyssa Miller and USFWS Ocean Conservation Planner Mike Marxen, Year of the Monk Seal activities by ONMS Senior Advisor for Regional and International Programs and Policy Naomi McIntosh, and the Communications Forum at the Hawai'i Conservation Conference by PMNM Communications Manager Toni Parras. MCT representatives from NOAA, USFWS, State Department of Land and Natural Resources and OHA participated. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).

**Hawaiian Monk Seal Population on the Rise: Year of the Monk Seal Declared (AC-2, TES-1.5, CBO-2.3, 3.1)**

On January 24, NOAA held a press event at the Waikīkī Aquarium to announce that the population of the critically endangered Hawaiian monk seal has gone up for three years in a row, with approximately 1,400 seals now found throughout the archipelago. In the NWHI alone there are over 1,100, which just a few years ago was the number of the entire population. The event was held to thank all the partners and to kick off the Year of the Monk Seal and keep the awareness campaign going. For more information, contact [Athline.Clark@noaa.gov](mailto:Athline.Clark@noaa.gov).



*PMNM partners including the U.S. Coast Guard, FWS, the State of Hawai‘i, ONMS and NOAA Fisheries attend the announcement of the Year of the Monk Seal. (Credit: Jolene Lau/NOAA)*

**PMNM Agencies Organize and Host NWHI Resource Monitor Training (AC-1.1, CO-2.2, CFO-2.2)**  
 ONMS and NMFS staff assisted the U.S. Fish & Wildlife Service in organizing and hosting a three-day Resource Monitor training at NOAA’s IRC facility on Ford Island on March 29-31. The training was designed to implement consistent resource monitor protocols for agency staff selected to monitor natural and cultural resources during permitted activities in the NWHI. By also increasing the number of available Resource Monitors, the training will help reduce the need for permittees to take resource monitors not connected with their activity along, improving the effectiveness and efficiency of scarce access opportunities. The training included discussions on quarantine protocols, permit conditions, and threats to wildlife, as well as a field exercise and water safety instruction. ONMS personnel assisted in the training planning and instruction, and had three staff complete the training. For more information, contact [David.Swatland@noaa.gov](mailto:David.Swatland@noaa.gov).

**PMNM Monument Management Board Holds Second Quarterly Meeting of 2017 (AC-2.2)**

On April 12, PMNM’s Management Board met at the U.S. Fish & Wildlife Service office in the Federal Building in Honolulu. The primary topic was following up on discussions and action items from the recent MMB strategic planning meeting, including a review of products and timelines, and development of a management planning meeting schedule for the remainder of FY17. Other topics included revisiting the way forward towards completion of the 2017 Co-Manager’s permit, reviewing the recently completed resource monitor training, discussion of current and future international collaboration opportunities, and a briefing from NMFS scientist Dr. Erin Oleson on the upcoming Hawai‘i cetacean survey. For more information, contact [Athline.Clark@noaa.gov](mailto:Athline.Clark@noaa.gov).

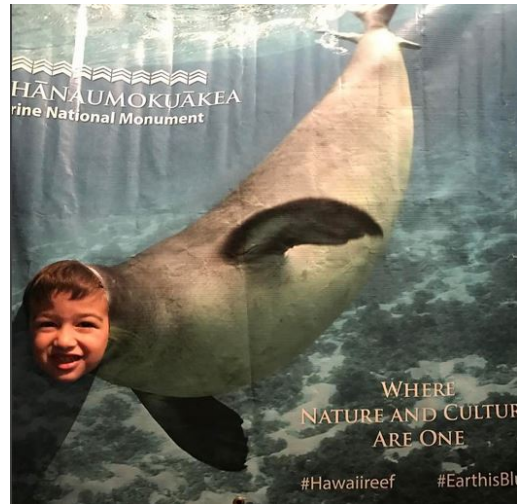
***Constituency Building & Outreach***

**PMNM Scientist Presents to ARCS Foundation (CBO-2.3, 3.1, MCS-3.4)**

On January 26, PMNM Deputy Superintendent Randy Kosaki gave a presentation to the Achievement Rewards for College Scientists (ARCS) Foundation senior members, graduate student ARCS scholars and Chaminade University undergraduate students. The presentation on PMNM’s exploration of mesophotic (deep) reefs using closed-circuit rebreathers was attended by approximately 50 people. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov).

**PMNM Participates in Bishop Museum’s *Fall in Love with Science* Event** (CBO-2.3, 3.1, NHCH-5.1, MD-3)

On February 12, PMNM staff hosted a booth at the Bishop Museum’s *Fall in Love with Science* event, attended by an estimated 2,500 people. Activities included a spin-the-wheel game featuring PMNM’s unique animals and features, button making, photo booth, and an albatross marine debris learning activity. Several PMNM staff from ONMS and FWS facilitated. PMNM Native Hawaiian Specialist Kalani Quiocho also engaged with visitors at the Journey’s exhibit featuring the NWHI. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).



*Left: Native Hawaiian Specialist Kalani Quiocho shares about the NWHI with visitors at the Journey’s exhibit at Bishop Museum. (Credit: Toni Parras/NOAA) Right: A visitor enjoys the PMNM photobooth. (Credit: Juan Schultz, Bishop Museum visitor)*

**PMNM Participates in Sea Life Park’s Keiki Fun Day** (CBO-2.3, 3.1, NHCH-5.1)

On March 5, PMNM staff hosted a booth at Sea Life Park’s *Keiki Fun Sunday*. Staff engaged with visitors on PMNM and played an interactive spin-the-wheel game where visitors learned about some of the unique animals and features of the Monument. A newly-developed hidden picture activity highlighting these creatures was shared, as were posters showcasing the deep-sea features and creatures of the Monument. Kids (and adults) were also given the opportunity to build a sea creature that they learned about. Approximately 300 people visited the PMNM booth. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).

**PMNM Participates in the Waikī Aquarium’s 113<sup>th</sup> Birthday Event Focusing on NWHI** (CBO-2.3, 3.1, 3.3, MCS-3.4, TES-1.5, MH-2.1 & 2.2)

On March 26, PMNM staff participated in the Waikī Aquarium’s 113<sup>th</sup> Birthday Event focusing on the NWHI. PMNM Communications Manager Toni Parras coordinated with staff from different agencies to host several booths highlighting work in the Monument. The ONMS-PMNM booth consisted a spin-the-wheel game featuring PMNM’s unique animals and features, marine creature clay-making activity, two new educational activity sheets (PMNM Hidden Picture and PMNM Map Maze), photo booth, and maritime archaeology shipwreck scavenger hunt. The FWS booth consisted of an albatross scavenger hunt and marine debris activity. HIHWNMS featured hat-making and another spin-the-wheel game about Humpback whales. NOAA Fisheries hosted a mock monk seal field camp and video. Visitors who completed one of the scavenger hunts or educational activity sheets could enter a raffle to win a PMNM bag, T-shirt or notecard – all three were popular items. Approximately 1,600 people attended the event. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).





*Left: PMNM Planning and Evaluation Specialist Nicole Evans teaches kids about the NWHI. Right: PMNM Education Specialist Kainoa Kaulukukui-Narikawa facilitates the Shipwreck Scavenger hunt activity. (Credits: Toni Parras/NOAA)*

#### **PMNM Staff Present Science Talk at the Maui Ocean Center (CBO-2.3, 3.1, 3.3, MCS-3.4)**

On March 30, PMNM scientist Randy Kosaki gave a public presentation at the Maui Ocean Center on deep coral reef research in the Northwestern Hawaiian Islands. Over 100 people attended the talk. Additionally, Kosaki engaged in discussions with Maui Ocean Center leadership on partnering with PMNM on live aquarium displays featuring the NWHI, and educational partnerships to promote ONMS. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov).

#### **PMNM Participates in Hawai'i State Science & Engineering Fair (CBO-2.3, 3.1, 3.3, MCS-3.4)**

On April 11, PMNM staff joined with staff from other NOAA line offices to serve as judges for the 60<sup>th</sup> annual Hawai'i State Science & Engineering Fair held at the Hawai'i Convention Center on O'ahu. Hundreds of public and private middle and high school students participated in the event, hosted annually by the Hawai'i Academy of Science. Project topics ranged from renewal energy to algal blooms to fishing to microplastics. PMNM staff from different programs served as judges. In the afternoon, NOAA staff conducted an interactive educational game for over a hundred students while projects were being judged. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).

#### **PMNM Participates in Marine Debris Media Event (CBO-2.3, AC-2, MD-3)**

On April 13, PMNM partners held a special event to highlight the removal of an estimated 100,000 lbs of plastic debris and derelict fishing nets from the Northwestern Hawaiian Islands. The debris was removed from the beaches and reefs of Midway and Kure atolls by NOAA, USFWS, and State of Hawai'i teams over the past six years and stored at Midway until it could be removed to Honolulu. This debris removal represents a collaborative partnership between the U.S. Fish and Wildlife Service, State of Hawai'i Department of Land and Natural Resources, NOAA's Pacific Islands Fisheries Science Center, NOAA's Marine Debris Program, NOAA's Office of National Marine Sanctuaries, and Papahānaumokuākea Marine National Monument. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).



*NOAA Deputy Superintendent for PMNM addresses the press during a media event to raise awareness about marine debris. (Credit: Toni Parras/NOAA)*

#### Media Clips:

- KITV: <http://www.kitv.com/story/32029261/noaa-removes-debris-from-papahnaumokukeamarine-national-monument> and
- Hawaii News Now: <http://www.hawaiinewsnow.com/story/35148633/tons-of-marine-debris-removed-from-northwestern-hawaiian-islands>
- Civil Beat: <http://www.civilbeat.org/2017/04/100000-pounds-of-debris-hauled-out-of-papahanaumokuakea/>

#### *Education*

##### **PMNM Presents at Nā Kama Kai Ocean Safety & Conservation Clinics (OEL-1.1, 1.3, NHCH-5.1, TES-1.5)**

On January 8, February 12, March 12, and April 1 and 9, PMNM staff presented at the Nā Kama Kai Community Ocean Safety & Conservation clinic at Hale‘iwa Beach Park, Waikīkī Beach Nā Kama Kai, and Ahupua‘a O Kahana State Park, respectively. These clinics are planned for the second Sunday of each month and are hosted at different beach communities around the island of O‘ahu. Clinics aim to help youth nurture a love of the ocean and a sense of responsibility for the environment. During the day participants rotate through various stations including Polynesian navigation ocean safety, stand up paddle boarding, canoe paddling, swimming, stewardship and conversation, and more. Approximately 300 children ages 2-17 participated in total. For more information, visit [www.nakamakai.org](http://www.nakamakai.org) or contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).

##### **PMNM and Partners Host Field Trip at James Campbell National Wildlife Refuge (OEL-1.1, 1.3, NHCH-5.1, TES-1.5)**

On January 17, PMNM staff and partners hosted a field trip for 43 Hau‘ula Elementary Pūnana Leo o Ko‘olau Loa 3-6 grade students and 3 teachers at James Campbell National Wildlife Refuge. JCNWR is one of the few scattered remnants of natural wetlands that still exist on O‘ahu. During the first half of the field trip, students learned about the importance and the management of the refuge. Students were given a guided tour of the wetlands area by FWS Education Specialist Amy Olliffe, FWS Intern Ty Spangler and NPS Planner Meredith Speicher. During the wetlands tour students observed and learned about both the endemic endangered bird species for which the refuge was established, and the migrant shorebirds and waterfowl that arrive in the winter. Afterwards, students participated in three rotation stations. During one rotation, University of Hawai‘i-Mānoa Post-Doctoral bee researcher Jason Graham taught students about

the endangered endemic Hawaiian yellow-faced bees (*Hylaeus mana*) that nest near the shoreline on the refuge. At another station, students were led in a marine debris clean-up and discussion by PMNM Education Specialist Kainoa Kaulukukui-Narikawa and Bahamas Plastic Movement Founder and Director Kristal Ambrose. During a third rotation, FWS intern Kristy Lapenda taught students about microplastics and led them in a sand sieve activity. Within the next month, Education Specialist Kainoa Kaulukukui-Narikawa will teach a series of follow-up Navigating Change lessons with these students. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).



*Hau‘ula Elementary Pūnana Leo o Ko‘olau Loa students listen to an introduction to James Campbell National Wildlife Refuge. (Credit: Kainoa Kaulukukui-Narikawa/NOAA)*

### **PMNM Teaches Monk Seal Lesson to Hahaione Elementary Students Refuge (OEL-1.1, 1.3, NHCH-5.1, TES-1.5)**

On February 1, PMNM staff and partners taught Hahaione Elementary 4th graders a lesson on the Hawaiian monk seal and the researchers that study this endemic, endangered mammal that largely reside within PMNM's boundaries. Students and teachers rotated between three stations. At one, students switched between four Hawaiian monk seal stations including crittercam behavioral observation with FWS intern Kristy Lapenda, scat and spew analysis with FWS intern Keely Hassett, anatomy exploration with FWS Education Specialist Amy Olliffe, and tracking and tagging practice with NMFS Biological Technician Brenda Becker. At another station, FWS Volunteer Barb Mayer gave a comprehensive account of the challenges and rewards of working for 4 months as a Hawaiian monk seal researcher stationed at a remote PMNM field camp. At another station, PMNM Education Specialist Kainoa Kaulukukui-Narikawa led students through a marine debris obstacle relay where students raced to disentangle a “juvenile Hawaiian monk seal.” Approximately 130 students and 5 teachers were in attendance. In two weeks PMNM will present a two-part marine debris lesson. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).

### **PMNM Hosts Navigating Change Program at Camp Mokule‘ia (OEL-1.1, 1.3, NHCH-5.1, AS-9, MD-3)**

On February 9 and 10, the Navigating Change program at Camp Mokule‘ia hosted 70 fourth grade students and 15 chaperones from Waialua Elementary School. The Navigating Change overnight camp is



designed to be a culminating experience for schools using the Navigating Change Teachers Guide. Navigating Change hopes to change behaviors by rooting students in indigenous Hawaiian cultural knowledge, creating an awareness of ecological problems and demonstrating how daily decisions can help resolve those problems. Camp Mokule‘ia Program Directors and PMNM Education Specialist Kainoa Kaulukukui-Narikawa led students through a series of educational activities over two days, including: a marine debris clean-up and sort; an albatross lesson and bolus examination; a plankton and sand lesson; a night sky observation that included constellation and star identification; a lesson on the Hawaiian star compass, celestial navigation and wayfinding; an invasive plant removal and native plant out-planting; and various other PMNM-centered educational games. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).

#### **PMNM Staff Participates in Kaua‘i Teacher Institute Day Refuge (CBO-2.3, 3.1, OEL-1.1, 1.3, NHCH-5.1)**

On February 17, the Hawai‘i State Teachers Association held a meeting for all Department of Education teachers on the island of Kaua‘i. As part of the meeting, organizations that provide educational resources and/or services to teachers, such as Papahānaumokuākea Marine National Monument, set up information tables to share more about their education programs. It was a great way for PMNM staff to share print materials, curriculum and services offered such as mentoring students on science and senior projects. Kaua‘i PMNM staff collaborated with HIHWNMS staff on a joint display and interacted with approximately 80 teachers. For more information, contact [Yumi.Yasutake@noaa.gov](mailto:Yumi.Yasutake@noaa.gov).

#### **PMNM Teaches Students about Papahānaumokuākea during Career Day (CBO-2.3, 3.1)**

On March 1, PMNM staff participated for the first time in Niu Valley Middle School Career Day, which brought together professionals from various sectors to introduce seventh grade students to different career choices. PMNM Communications Manager Toni Parras and Education Specialist Kainoa Kaulukukui-Narikawa hosted three sessions and gave a brief introduction about the Monument, followed by the different schooling and skills requirements for different types of jobs (scientist, research diver, marine archaeologist, education and communication staff, etc.). Approximately 75 students and two teachers attended. For more information, contact [Toni.Parras@noaa.gov](mailto:Toni.Parras@noaa.gov).

#### **PMNM Staff and Partners Take Wai‘anae Intermediate Students on Field Trip to Ka‘ena (OEL-1.3, NHCH-5.1, TES-1.5)**

On February 18, PMNM staff and partners facilitated a Nā Hopena A‘o (HĀ) Community Day at Ka‘ena Point Natural Area Reserve for Wai‘anae Intermediate students. Nā Hopena A‘o (“HĀ”) is framework of learner outcomes constructed by the Hawai‘i Department of Education that is anchored in Hawaiian values, language, culture and history. While the group hiked the Keawa‘ula trail to Ka‘ena Point NAR, student leaders facilitated a discussion about the importance of Ka‘ena. Within the Ka‘ena Point NAR, students rotated among three 40-minute stations. At a station led by FWS Education Specialist Amy Oliffe and FWS Intern Kristy Lapenta, students learned about the fauna of Ka‘ena point and observed whales off-shore, Hawaiian monk seals hauled out along the shoreline, and many seabird species including the Laysan albatross. At another station led by DLNR O‘ahu Outreach and Education Specialist Kekai Mar and DLNR Restoration Manager David Anderson, students learned about the unique dune ecosystem of Ka‘ena. They identified many rare native plant species and helped remove invasive plants from within key Shearwater nesting areas. At a third station led by PMNM Education Specialist Kainoa Kaulukukui-Narikawa and Wai‘anae Intermediate School Science Coach Kekaha Spencer, students learned about the geology and the Hawaiian cultural significance of Ka‘ena Point. Approximately 30 students and eight adults participated. On Saturday May 6, there will be another HĀ Community Day at Ka‘ena Point NAR for educators from across the state. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov) or visit <http://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/HawaiianEducation/Pages/HA.aspx>.



*Left: The six outcomes of the Nā Hopena A'o ("HĀ") framework. Right: Wai'anae Intermediate Students gather within Ka'ena Natural Area Reserve. (Credit: Kainoa Kaulukukui-Narikawa/NOAA)*

**PMNM Teaches Two-Part Marine Debris Lesson to Haha'ione Elementary Students (OEL-1.3, TES-1.5, MD-3)**

From February 21-24, PMNM staff and partners taught Haha'ione Elementary fourth graders a two-part lesson on marine debris and its effects on wildlife. During the first lesson, students were introduced to the issue of marine debris, why it's a problem, and its biological impacts. After an informational video and a presentation, students rotated among four interactive stations. At one station, FWS Education Specialist Amy Olliffe led students in a discussion about some of the negative consequences of plastic ingestion by wildlife. At another station, FWS Volunteer Barbara Mayer showed a video about the effects of plastic ingestion by albatross, and also showed students bolus specimens. At a third station, FWS Intern Kristy Lapenta showed students examples of animal entanglement. At a fourth station, PMNM Education Specialist Kainoa Kaulukukui-Narikawa showed students examples of marine organism attachment on floating marine debris and led a discussion about invasive species. During part two of the lesson students learned about seabirds and then completed an albatross bolus dissection and data analysis. Approximately 130 students and five teachers were in attendance. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).





Left: Hahaione Elementary students examine bolus content. Right: Hahaione Elementary students work together to separate fishing line found in their bolus. (Credits: Amy Olliffe/FWS)

### **PMNM Presents at McKinley High School (OEL-1.3)**

On March 7-8, PMNM staff taught McKinley High School students enrolled in the Modeling Our World math course. Students were introduced to PMNM and learned how marine debris negatively affects sea birds. After learning about the habitat, diet and life cycle of the Laysan albatross, students completed a bolus dissection and analysis, and were encouraged to use statistical modeling to represent the data they collected. This activity helped students see the real world benefits of the application of mathematical concepts. PMNM Education Specialist Kainoa Kaulukukui-Narikawa, HIIWNMS Education Coordinator Patty Miller and FWS Education Specialist Amy Olliffe facilitated the lesson for 45 students. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).

### **PMNM Presents at Hau'ula Elementary School and Pūnana Leo o Ko'olau Loa (OEL-1.3, TES-1.5)**

On five days between January 26 and April 4, PMNM staff visited Hau'ula Elementary School to teach a two-part series of lessons adapted from the *Winged Ambassadors – Ocean Literacy through the Eyes of Albatross Curriculum*. Each of the Hau'ula Elementary fourth through sixth grade classes and the Pūnana Leo o Ko'olau Loa third through sixth grade classes were taught the two-part lesson series. In the first lesson, students learned about PMNM and the life stages of the Laysan albatross, then participated in a wildlife monitoring activity where they recorded observational data on the developmental stages of Laysan albatross chicks. In the second lesson, students learned about how marine debris affects sea birds, and completed a bolus dissection, categorized the contents on their boluses, and recorded data. Students also discussed the possible implications of marine debris on other sea creatures and brainstormed ways in which they can help alleviate the problem. As an added bonus, each student was gifted a copy of *Albatross of Kauai, the Story of Kaloakulua* by author Susan Dierker. PMNM Education Specialist Kainoa Kaulukukui-Narikawa, FWS Education Specialist Amy Olliffe and FWS Volunteer Barbara Mayer facilitated the lesson series for approximately 175 students and 10 teachers. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).

### **PMNM Facilitates Beach Clean-Up and Limu Investigation (OEL-1.3)**

On March 9, PMNM staff helped facilitate a beach clean-up and limu investigation at Hau'ula Beach Park for Pūnana Leo o Ko'olau Loa third to sixth grade students. Limu is the Hawaiian term for algae or seaweed. Over 40 species of limu were collected and identified from the nearshore reef shelf. Students will press the specimens to create their own Hau'ula herbarium. Students also collected marine debris on the shoreline and discussed the implications of marine debris on the environment. Students made pledges to help decrease the potential amount of plastic marine debris by following the "4 Rs": Refuse, Reduce, Reuse and Recycle. PMNM Education Specialist Kainoa Kaulukukui-Narikawa helped facilitate the lesson for 46 students. For more information, contact [Kainoa.Kaulukukui@noaa.gov](mailto:Kainoa.Kaulukukui@noaa.gov).

**Mokupāpapa Discovery Center (MDC) Highlights** (MCS-3.4; CBO-3.1; OEL-1.6)

Since January 14, the Mokupāpapa Discovery Center has welcomed 16,245 visitors. MDC staff also participated in numerous outreach, educational and community support activities, highlighted below.

- Visitors to MDC hailed from at least 24 states and nine countries, including Canada, Japan, China, Australia, France, Italy, Germany, the Czech Republic, Switzerland, United Kingdom and Finland
- The Center hosted 25 Japanese Educational Tour Operators for a full introduction to the resources and educational opportunities at MDC; continued hosting Japanese language immersion high school students



*Japanese students make gotaku fish prints and learn about the NWHI. (Credits: Justin Umholtz/NOAA)*

- MDC staff gave a tour to ONMS Director John Armor, ONMS Communications Director Matt Stout, and members of the National Marine Sanctuary Foundation
- Events included Downtown Improvement Association (DIA) meetings, a realty company's client appreciation evening, the Ke Kai Ola (Kona-based Marine Mammal Center/Monk Seal Hospital) monthly volunteer meeting, MDC's Third Thursday lectures, Relay for Life Captain's meeting, and a Destination Hilo sponsored First Friday performance



*Left: La'ie Elementary students draw their chosen skull and work on hypothesis and questions related to structure and function. Right: Arc of Hilo-Pahoia participant making his 3-D squid project after learning about squid anatomy and their importance as prey for many NWHI animals. (Credits: Justin Umholtz/NOAA)*





*UHC students explore Onekahakaha tide pools and practice their science observation and data collection skills. (Credits: Justin Umholtz/NOAA)*

- Bonnie Kahapea-Tanner, the director of Kanehunamoku Voyaging Academy, premiered their documentary *Voyage into the Depths of Kanaloa* to an audience of 85 people
- The Waikīkī Aquarium and the Hawai‘i Institute of Marine Biology partnered with MDC to provide teachers with professional development training themed “2017 Exploring the Deep Ocean with NOAA”
- MDC educators partnered with The Marine Mammal Center (TMMC) (Ke Kai Ola Hawaiian Monk Seal Hospital in Kona is part of TMMC) for various educational lessons
- On March 5, MDC hosted over 250 people for the memorial and life celebration of Fred Koehnen, Jr., whose generosity and community spirit led to MDC’s new home in a beautiful, historical landmark building
- MDC partnered with Hawai‘i Science and Technology Museum and the Imiloa Astronomy Center for a “Science is Everywhere” spring break science camp located at the Imiloa Center. “Science is Everywhere” Camp Article: (<http://hawaiitribune-herald.com/news/community/imiloa-friends-team-stem-education>)

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

#### **Seawater Acidification Characterized around a PMNM Atoll (MCS-1.2, 1.3, 3.4, AC-3.2)**

On January 27, the journal *Aquatic Geochemistry* published a paper on seawater acidification around French Frigate Shoals in the NWHI. Observations of CO<sub>2</sub> levels and pH noted distinct daily cycles in nearshore waters, driven by reef metabolic processes including photosynthesis and carbonate accretion during daylight hours, and respiration at night. An alkalinity “halo” was detectable tens of kilometers offshore, indicating that the large carbonate mass of a coral atoll can affect the chemistry of the surrounding ocean. Co-authors include collaborators from NOAA’s Pacific Marine Environmental Laboratory (PMEL), Hawai‘i Pacific University (HPU), and PMNM scientist Randy Kosaki. The lead author, Andrea Kealoha, collected these data for her master’s thesis while on PMNM cruises aboard NOAA ship *Hi‘ialakai*. The article, “Spatiotemporal Assessment of CO<sub>2</sub>-Carbonic Acid System Dynamics in a Pristine Coral Reef Ecosystem, French Frigate Shoals, Northwestern Hawaiian Islands,” can be accessed at <http://link.springer.com/article/10.1007/s10498-017-9310-1>. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov).



**Medical Study of PMNM Deep Rebreather Team Featured in Alert Diver Magazine (CBO-3.1, MCS-3.4)**

The winter 2017 issue of Alert Diver, the Divers Alert Network (DAN) quarterly magazine, features an article on a medical study conducted during a PMNM technical diving cruise to the NWHI. The divers conducted research dives as deep as 300 feet, and upon surfacing each day, they in turn became the subjects of a research project to understand the effects of extreme dive exposures on human physiology. Formation of gas bubbles in the bloodstream on ascent from deep dives is known to cause decompression sickness (DCS) or "the bends." Dr. Neal Pollock, Research Director for DAN, conducted ultrasound imaging of the divers' hearts after ascent from deep dives. Bubbles in the bloodstream were readily visible in the scans. The algorithms used in dive computers are based on mathematical models that have undergone only limited testing on humans, and studies such as this will inform the development of safer, improved decompression models. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov) or read the article online at [http://www.alertdiver.com/deep\\_reefs\\_deep\\_divers](http://www.alertdiver.com/deep_reefs_deep_divers).



*Photo in Alert Diver features PMNM rebreather diver Brian Hawk as he photographically documents benthic algae and coral. (Credit: Richard Pyle/Bishop Museum)*

**PMNM Divers conduct Deep Reef Research in American Samoa (MCS-1.4, AC-3.2)**

From February 13-27, PMNM researcher divers conducted a series of mixed-gas technical Closed Circuit Rebreather (CCR) SCUBA surveys on deep corals reefs off Tutuila Island in American Samoa in order to understand what species of corals and fish exist there. NOAA and Bishop Museum divers using Megalodon and Poseidon SE7EN CCRs surveyed reefs between 150-330 feet, a depth range where very few surveys have been conducted on this remote island. These operations could not have been accomplished without the logistical and hospitable support from NMSAS staff. Divers photographed and sampled corals and reef fish and observed several new records of fish previously unknown from this area. In addition, several new black coral and gorgonian species including possible species which may be new to science were collected. Work is being done to taxonomically identify these species and publish the findings in peer-reviewed scientific literature to make it broadly available. This deep reef research was done in support of the NMSAS and data from these dives will be shared with the site to increase their understanding of Sanctuary resources. For more information, contact [Jason.Leonard@noaa.gov](mailto:Jason.Leonard@noaa.gov).



*Left: PMNM rebreather diver conducts fish survey on deep reefs in American Samoa. (Credit: Richard Pyle/Bishop Museum) Right: PMNM and Bishop Museum divers process invertebrate samples. (Credits Jason Leonard/NOAA)*

#### **PMNM Scientists Publish Study on Deep Reef Fish Assemblages of the NWHI (MCS-1.1, 1.2, AC-3.2)**

On March 15, the scientific journal *Coral Reefs* published an article by PMNM scientists Atsuko Fukunaga and Randy Kosaki on the mesophotic (deep) coral reef fish communities of the NWHI. Using technical diving, trimix gas, and closed-circuit rebreathers, PMNM divers documented clear changes in community structure along the south-to-north latitudinal gradient of the Monument, and also found changes in structure with increasing depth from 30 to 100 m. The most striking pattern was the steady increase in endemism with increasing latitude. At Kure Atoll, the northernmost of the Hawaiian Islands, levels of endemism in the fish communities exceeded 90%. The article, entitled “Changes in mesophotic reef fish assemblages along depth and geographical gradients in the Northwestern Hawaiian Islands,” is available online at <https://link.springer.com/article/10.1007%2Fs00338-017-1569-6>. For more information, contact [Randall.Kosaki@noaa.gov](mailto:Randall.Kosaki@noaa.gov).

#### **PMNM Dive Team Recognized for Safe Advancements in Deep Technical CCR Diving (MCS-1.6)**

On April 4, the PMNM Field Team was recognized for safe advancement in deep technical diving for NOAA during the Unit Diving Supervisor Workshop. The PMNM Dive Team has been using advanced Closed Circuit Rebreathers (CCRs) since 2012 to extend working depths for NOAA’s Diving Program. This has allowed for the research, exploration and characterization of unexplored and understudied deep reef areas between 150 and 330 feet. This has led to the discovery of new records, completely new ecosystems and numerous species that are new to science. For more information, contact [Jason.Leonard@noaa.gov](mailto:Jason.Leonard@noaa.gov).



*Left: PMNM UDS Jason Leonard holds the NDP team achievement award with famed cave and rebreather diver Jill Heinerth (left) and NOAA Diving Program Manager Greg McFall (right). (Credit: Andy David/NOAA) Center: PMNM Dive Team award. (Credit: Jason Leonard/NOAA) Right: PMNM CCR decompression stop with safety divers. (Credit: Rich Pyle/Bishop Museum)*

### **PMNM Participates in the 2017 Unit Diving Supervisors Workshop (MCS-1.6)**

From March 31 to April 5, PMNM's Unit Diving Supervisor (UDS) Jason Leonard participated in the 2017 UDS Workshop in St. Petersburg, Florida. Approximately 30 NOAA UDSs from around the nation participated along with the NOAA Diving Program and the NOAA Diving Control and Safety Board. NOAA UDSs are essential to keeping the diving program running safely. The workshop provided diving checkout training, visual cylinder inspection classes, discussion on NOAA Diving rules and regulations, and visioning for the future of the dive program. PMNM's UDS provided a presentation of Closed Circuit Rebreather expeditions that the Monument has accomplished along with a poster of current projects. The highlight of the workshop was the signing of the new NOAA Diving Safety Manual by Admiral David Score, which combined both the Scientific and Working Components of NOAA diving. For more information, contact [Jason.Leonard@noaa.gov](mailto:Jason.Leonard@noaa.gov).



*Left: Admiral Score signing new dive manual. (Credit: Jason Leonard/NOAA) Right: Scuba Cylinder Training. (Credit: Jason Leonard/NOAA)*



## **Staff Changes**

### New Hires:

Caroline Jackson, Administrative Assistant II

Stephen Matadobra, Science Operation Associate

Kaliko High, Mokupāpapa Discovery Center Education Specialist

### Departures:

Tiane McNeil, Administrative Assistant II

## **Calendar**

- Hanauma Bay Lecture Series – Hanauma Bay, Oahu.
  - (Every Thursday evening during the month of May).
- Manu O Ku Festival – Coronation Grounds of the ‘Iolani Palace, Oahu.
  - (May 20, 2017 11am-3pm).
- Battle of Midway Reception – Pacific Aviation Museum, Pearl Harbor
  - May 31, 2017 5-7pm
- North Shore Ocean Fest, World Oceans Day. Turtle Bay Resort, Oahu.
  - (June 3, 2017).
- World Ocean’s Day Celebration – Ko Olina Resort, Oahu.
  - June 10, 2017 4-9pm