Our World-Underwater Scholarship Society®
National Park Service Internship
2018 Final Report

Susanna Pershern

Shannon Brown

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In Fall 2017, I was working in the Caribbean and attempting to plan my life for the next several years. With both graduate school and internship applications crowding my desktop, I was fortunate enough to have a family member suggest Our World-Underwater Scholarship Society. Having heard of the program only in passing, I was ecstatic to learn about the fantastic internships they offered. When I received the call that I had been chosen as the 2018 OWUSS National Park Service Intern, I was honored and surprised.


Yubee Isaac

As the oldest non-military diving program in the federal government, the National Park Service manages 3.5 million acres of submerged land. This massive feat is accomplished by an extensive network of passionate and talented NPS divers. As the National Park Service intern, I traveled to various National Parks and assisted with their ongoing archaeological, biological, and cultural programs. This unforgettable internship provided me with the magnificent opportunity to gain more diving and field experience, develop my underwater photography skills, and work alongside a group of diverse individuals. Throughout the summer, as a traveling intern, I also learned a lot about traveling logistics, time management, and acclimating to new working environments.

In 11 weeks, I completed 81 scientific dives, visited five National Parks, and meet 100+ NPS employees passionate about their jobs and the ongoing research at their parks. My internship was made possible with the support of the Submerged Resources Center (SRC). Created in the 1980s, this elite group of archaeologists and underwater photographers is responsible for researching the submerged cultural resources of the National Park System. Instead of being assigned to a single park, the SRC travels throughout the park system to provide archaeological and diving assistance when needed. In addition, the SRC collaborates with archaeologists all over the world to increase awareness of maritime archaeology and to protect the remaining marine heritage resources.

My journey began at the headquarters of the SRC in Lakewood, Colorado. During my first week, I discussed logistics with Dave Conlin, Chief of the SRC, and Brett Seymour, the Deputy Chief and A/V specialists for the SRC. As my mentors, they outlined my summer and helped me understand what was expected of me as the 2018 OWUSS NPS Intern.

With Jim Nimz, the SRC dive technician, Brett and I determined what diving equipment I would require for my upcoming travels. They also equipped me with a GoPro and waterproof Olympus camera to document my whirlwind adventure. In addition to being outfitted in exquisite NPS dive gear, I went through a medical test, a swim test, and dive refresher as part of my blue card

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certification. To dive for the National Park Service, divers must obtain a blue card which verifies their health, physical fitness, and diving knowledge. Most of my travels this summer were to warm water environments; however, my first park was Channel Islands National Park. For this reason, I borrowed a drysuit from the SRC and was certified by Brett in the local pool so that I wouldn't freeze in the California waters. While my time in Colorado was short, between the paperwork and diving, I got the opportunity to get to know the other members of the SRC, including Jessica Keller, Matt Hank, Susanna Pershern, and Bert Ho. Their enthusiasm for their job and willingness to welcome me into the SRC family made me even more excited about my upcoming adventures!


Brett Seymour


Merrill McCauley

At Channel Islands National Park (CHIS), located off the coast of California, I participated in a kelp forest monitoring cruise. The Kelp Forest Monitoring (KFM) Program at CHIS is an extremely impressive, complex operation that began in 1982. Each year from May to October, 33 sites are surveyed to collect the size and abundance information of 120+ species of marine fauna (e.g., algae, invertebrates, and fish). The data allows researchers to examine the kelp forest's health and monitor ongoing changes to the environment. The KFM program is the longest established marine inventory and monitoring program within the National Park Service, and over 400+ divers have assisted with the program.

Currently, 20% of CHIS waters are considered state marine protected areas. Throughout the cruise, we traveled to sites with variable protection levels. At our first site (Pedro Reef – Santa Cruz), I was met with a barren, uninhabitable environment as I completed my checkout dive with David Kushner, the Regional Dive Officer and head of the KFM program. Located outside the MPA, overfishing has lead to the lack of kelp at this site. When predators of sea urchins are overfished, their population size increases. As herbivores, urchins consume the kelp that provides food and habitat to other marine organisms.

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Since I had no previous experience in the kelp forest ecosystem, I spent a majority of the cruise learning new protocol and assisting with smaller projects. On several dives, I counted the stipes of 100 giant kelp and performed gorgonian and bat star measurements. During other dives, I acted as a dive buddy for interns who needed to perform fish or benthic surveys. Unique to CHIS, for some of their data collection, in a full-face mask attached to surface supplied air, a diver travels along the transect and at random points calls out the organism covering the substrate. The full-face mask allows the diver to communicate with the surface support person and the need for a slate is eliminated. Such a technique, allows a large subset of data to be collected in a short amount of time.

When I arrived at CHIS, I was intimidated by the amazing, dedicated divers of the KFM program. To collect data vital to the park's records, they perform long dives several times a day often in limited visibility and current. By the end of the KFM trip, I had learned a lot from the spectacular members of the KFM. Not only had I dove in the Pacific Ocean for the first time, but I had learned how to properly use a drysuit and execute survey protocol while wearing one. Since my trip with KFM marked my first research cruise, I also learned a lot about boat safety and topside support, skills that would be of value from the remainder of the summer and the rest of my life. Biscayne National Park (BISC) about an hour south of Miami, Florida was my next destination. While I enjoyed kelp forest diving, I was ready to move from a drysuit to 3mm.

During my two weeks at Biscayne National Park, I got the opportunity to work alongside the cultural and natural resource management department on several projects. For two days, Arclice Marionneaux, an intern at BISC, and I surveyed several archaeological sites within the park's borders. Checked every five years for damage and looting, BISC has over 120 archaeological sites. Most of these sites are known only by GPS coordinates. At each site, we used a previously sketched map to relocate the wreck fragments; then we recorded any visible anthropogenic or environmental impact on the site.

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At BISC, my other diving ventures included removing invasive lionfish, searching for the critically endangered goliath grouper, and assisting with an ongoing marine debris study. Previously, for the marine debris study, transect markers/floats were placed at 12 sites through the park. The natural resource management team at BISC gather marine debris from each site once a year and record the amount and type of marine debris to asses overall accumulation. Every six months, divers clean the markers and replace the damaged floats. With Vanessa McDonough, a biologist at BISC, I helped repair several damaged floats while also spearing the invasive lionfish that were hiding at the site.

On non-diving days, I assisted with turtle nest surveys and buoy maintenance. Every few days, six beaches along Biscayne's keys are checked for loggerhead turtle activity. Loggerhead turtles reproduce every 2-4 years but often nest multiple times throughout the season. With Shelby Moneysmith, Regional Dive Officer and biologist at BISC, we surveyed the beaches for nesting and false crawls. As an endangered species, BISC works to both understand their distribution and protect their habitat from predation and human disturbance. With Terry Helmer, a volunteer at BISC for 31 years, I helped replace buoys along the Heritage Trail. Throughout BISC, there are 40+ mooring buoys to allow visitors to explore their park without damaging the marine habitat below. These buoys, which are replaced every year, get damaged by hurricanes and boat engines. Mostly by freediving to 10-30 ft, I spent the day exploring new habitats, learning about buoy maintenance, and improving my freediving skills.

I worked with a wide variety of individuals at BISC, from the natural resource management head to dedicated volunteers. Every single person took the time to share their story and teach me about their work. I learned new scuba survey techniques, discovered how horrible I am at spearing lionfish, and practiced my freediving skills. Besides my marvelous experiences in the water, Biscayne also taught me practical skills include boat safety, knot tying, and how to troubleshoot when everything seems to go wrong. With endless bug bites and a

stunning scuba boots tan to commemorate my time at BISC, I headed to Kalaupapa National Historical Park, located on Molokai, Hawai'i.

Kalaupapa National Historical Park (KALA) is the most unique place I've ever visited. In the late 1860s, with no known cure to Hansen's Disease (otherwise known as leprosy), the current monarch of Hawai'i exiled thousands to this isolated peninsula. Patients of the colony were treated as prisoners with limited access to resources and reduced contact with the outside world. In 1980, eleven years after the forced isolation policy was abolished, the National Historical Park was established to protect the remaining residents and preserve the history of the peninsula.

Eric Brown, the Park Dive Officer and marine ecologists at KALA, welcomed me with open arms. For the first few days, I assisted with the collection of acoustic receivers around the peninsula. In partnership with the University of Hawai'i, KALA tagged large pelagic fish and sharks with acoustic transmitters. These receivers were used to track the movement pattern of these apex predators. With the study concluded, our job was to roll off the boat at a designated GPS point, descend to approximately 70 ft, and remove the receiver from the ocean floor so they could be reused in later studies.

In KALA's harbor, we practiced the benthos and fish monitoring protocol that the marine team would employ later in the summer to monitor 30 sites around the peninsula. Along each transect, Eric counted the number of fish and estimated their size. Fish density and species richness was determined from this data. As Eric focused on fish counts, Randall, a maintenance mechanic at KALA, and I took turns measuring rugosity with a chain and operating the camera. Photographs taken at every meter were analyzed to determine coral cover and disease prevalence. Though the harbor was relatively barren, I enjoyed learning a new protocol and practicing with Eric and Randall before their busy season kicked-off.

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In addition to diving, I also helped with green sea turtle nesting surveys and monkey seal monitoring. Endemic to these islands, monk seals are an endangered species once almost hunted to extinction. Currently, there are around 1,300 monk seals throughout the Hawaiian islands. Every day, a group from the natural resource management team surveys the peninsula's beaches to check on KALA's population and determined if any new pups were weaned. Once weaned, with the assistant of NOAA, Eric measured the pups, gave them immunization shots, and tagged their flippers so they can continue to monitor the pups as they grow.

Due to Kalaupapa National Historical Park's small size, I truly felt that I made a contribution to the park. I was honored and delighted that I was able to assist with fieldwork that Eric and Randall could not have completed without an additional diver. My time at KALA made me a better diver and researcher. I explored the spectacular habitat both above and below the water while learning the history of those forced into exile. I was quickly welcomed into the loving community, and I look forward to hopefully returning in the future. I waved goodbye to KALA from a tiny propeller plane as I headed to my next park, World War II Valor in the Pacific National Monument (VALR).

Compared to the other parks I visited, VALR was different. Created by executive order in 2008, the monument consists of the USS *Arizona* Memorial, USS *Utah* Memorial, USS *Oklahoma* Memorial, and several other WWII sites under the care of the NPS. When I was seven years old, my family traveled to Hawaii on vacation, and my only memory from the trip was our visit to Pearl Harbor. I was fortunate that this internship allowed me to return and form new memories. Currently, VALR has a small dive team which dives 30 to 120 times per year depending on the needs of the park.

While I was at VALR, I had the outstanding privilege of diving the USS *Arizona* with Scott Pawlowski, curator and park dive officer at VALR. Our main goal was to replace the buoys located on the bow

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and stern. Buoys are changed on both the USS *Arizona* and USS *Utah* every 6-7 weeks. Even after only a few weeks, encrusting organisms quickly dominate the once clean, white buoys.

After changing the buoys, I participated in an orientation dive at the USS *Arizona*. Diving the USS *Arizona* is a surreal experience. This vessel remains the grave for over 900 servicemen who died on December 7, 1941. And while over 1.5 million people visit the memorial each year, I was among the few to have the privilege of diving such a significant landmark of American history. As the silence of the underwater world set in, I thought of the many men who lost their lives that day and the efforts of the NPS and US Navy to protect the USS *Arizona*.

Since I only dove once at VALR, I spent the remaining days lending a hand with current projects. First, I worked to unlock several CDs which contained eyewitness accounts of the attack. Once unlocked, these CDs would be shared with the public and be used to add to the historical record. In addition, I spent time researching waterproof and oleophobic fabrics or coating. The USS *Arizona* went down with about 500,000 gallons of oil and is still leaking about 9 quarts a day. To prevent oil from contaminating the surrounding ecosystem, the SRC hoped to create collection tents that can collect the leaking oil. Previous attempts failed because the underwater environment and oil exposure compromised the material.

Though my time a VALR was short, I appreciate the unique opportunity to visit this monument and observe all the hard work that goes into maintaining these historical sites. In Honolulu, before heading back across the country to my next park, I also had the outstanding opportunity to catch up with Erika Sawicki, the 2017 OWUSS AAUS Intern. Spending time with another OWUSS intern truly made me appreciate how remarkable the OWUSS network is.

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After my time in Hawaii, I returned to Florida to work alongside the South Florida/Caribbean Network (SFCN) Inventory and Monitoring Program. To manage park resources and collect information about ecosystem health over time, the NPS created 32 inventory and monitoring networks. These networks collect and analyze data from the marine and terrestrial ecosystems of over 280 national parks. SFCN focuses on the monitoring of seven parks, and for the next ten days, I would be assisting their marine team as they completed their annual benthic monitoring of Dry Tortugas National Park (DRTO).

DRTO is a 100-square mile National Park located 70 miles west of Key West. While a majority of the park is the ocean, the second largest island in the park supports a breathtaking 19th-century fort called Fort Jefferson. Unlike at other parks where I lived in park housing or a nearby Airbnb, during my time at DRTO, I stayed with the SFCN crew on the 110-foot NPS boat named the MV Fort Jefferson. Every day, we would wake up, load our 29-foot boat, and head out for a day of diving.

Benthic surveys are performed at 14 sites around DRTO; however, due to the patchy reef nature of 11 sites, only three are monitored annually. At each site, two SFCN interns and I would descend to find previously placed metal pins that marked the start and terminal end of a permanent transect. After laying the tape and cleaning the pins, which were covered in encrusting organisms, we would use compass headings to locate the next permanent transect. A team of three SFCN divers would follow behind us. Rob Waara, a marine biologist, would perform a video transect, while Lee Richter, a marine biological technician, and Mike Feeley, a marine ecologist, would count coral colonies, record evidence of disease, and make a detailed species list. Coral colony data was used to determine disease abundance, whereas species lists helped to understand the diversity at each site.

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At each benthic survey site, there is a HOBO (i.e., temperature logger). For the last two days, we collected HOBO loggers from the 11 sites we hadn't previously visited. To do so, 2-3 divers would descend after a buoy with a dive weight was dropped at the corresponding GPS coordinate. The team would search for small floats tied to a pin. Upon finding the pin, we replaced the floats and using a HOBO shuttle, the data from the two loggers at each site would be transferred underwater for future analysis at the surface.

My experience at DRTO was unparalleled to anything I had experienced before. Not only was the underwater environment remarkable and complex, but the SFCN marine group was composed of charismatic individuals who worked extremely hard while managing to fill their day with humor. At most of my stops this summer, my dive buddy changed every day, but at DRTO, I always dove with the same people. I valued this sense of familiarity and cherished the opportunity to work and grow as a unit.

For the final weeks of my internship, I returned to Biscayne National Park to work alongside the SRC and Southeast Archaeological Center (SEAC) as they documented two sites with the help of colleagues from East Carolina University, University of California Santa Cruz, and Cheikh Anta Diop University in Senegal. This archaeological work would not only provide detailed maps of these two previously undocumented sites but also gave the NPS the opportunity to run a field school for their visiting colleagues. With no previous maritime archaeology experience, I loved learning from this impressive group of enthusiastic individuals.

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Susanna Pershern

During the maritime archaeology field school, I not only learned how to accurately sketch wreck fragments underwater, but I acquired new knowledge about mapping and how measurements are used to scale and place objects correctly on a map. I also had the opportunity to help the team jump anomalies. Last year, in association with the Slave Wrecks Project, the NPS dragged a magnetometer around a large portion of BISC's marine habitat in search of the *Guerrero*, a Spanish pirate slave ship. During their search, the SRC and SEAC identified over 1,200 anomalies (i.e., spots where the magnetometer sensed iron). To examine these anomalies, we traveled to their GPS coordinates, dropped a buoy with a weight, and then completed snorkel or diving surveys to determine what triggered the magnetometer. While it seems trivial, jumping anomalies was entertaining. Not only did you get to experience different dive sites around BISC, but there was always the small hope that you would stumble upon an undiscovered wreck.

During a lovely day off, I was fortunate enough to spend time with Ronnie Noonan, the 2018 OWUSS REEF Intern. Based out of Key Largo, Ronnie was able to accompany me as we visited several wrecks along BISC's Heritage Trail. It was delightful to meet another member of the OWUSS family and trade stories about our fabulous summers. For the remainder of my time at BISC, I accompanied Dave Conlin to assist with Youth Diving with a Purpose (YDWP). YDWP is a nonprofit organization that works to teach students about ocean conservation and maritime archaeology. Diving with YDWP was a privilege. It was rewarding to watch a group of passionate instructors excited to share their knowledge teach enthusiastic students.

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After packing my bag and leaving my last National Park of the internship, I traveled to Washington, DC to give two presentations to National Park Service employees at the Department of the Interior. Cliff McCreedy, marine resource management specialist for the NPS, coordinated my presentations and helped me make final edits. Presenting in DC was fulfilling because I not only improved my presentation skills, but I got to reflect on the entire internship. This internship would not have been possible without the National Park Service and sharing my experience was a small way of giving back to all those who had been so supportive.

It's hard to express in words how much this internship meant to me. My summer with the National Park Service was easily the greatest summer of my life! I became a better dive, learned endless new survey and collection methods, meet incredible new connections, became a stronger, more independent person, and made memories that will last a lifetime. Throughout my entire life, I have been passionate about the marine world. This internship gave me the opportunity to grow as a scientist, conservationists, communicator, and person. My next stop is King Abdullah University of Science and Technology (KAUST) in Saudi Arabia where I will be an MSc candidate in the Reef Ecology Lab. I look forward to taking my experiences from this summer and applying what I learned to my future work as a marine biologist. And, I hope that one day in the future I can find a home again with the National Park Service.

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Alexandra Engler