UPWELLING

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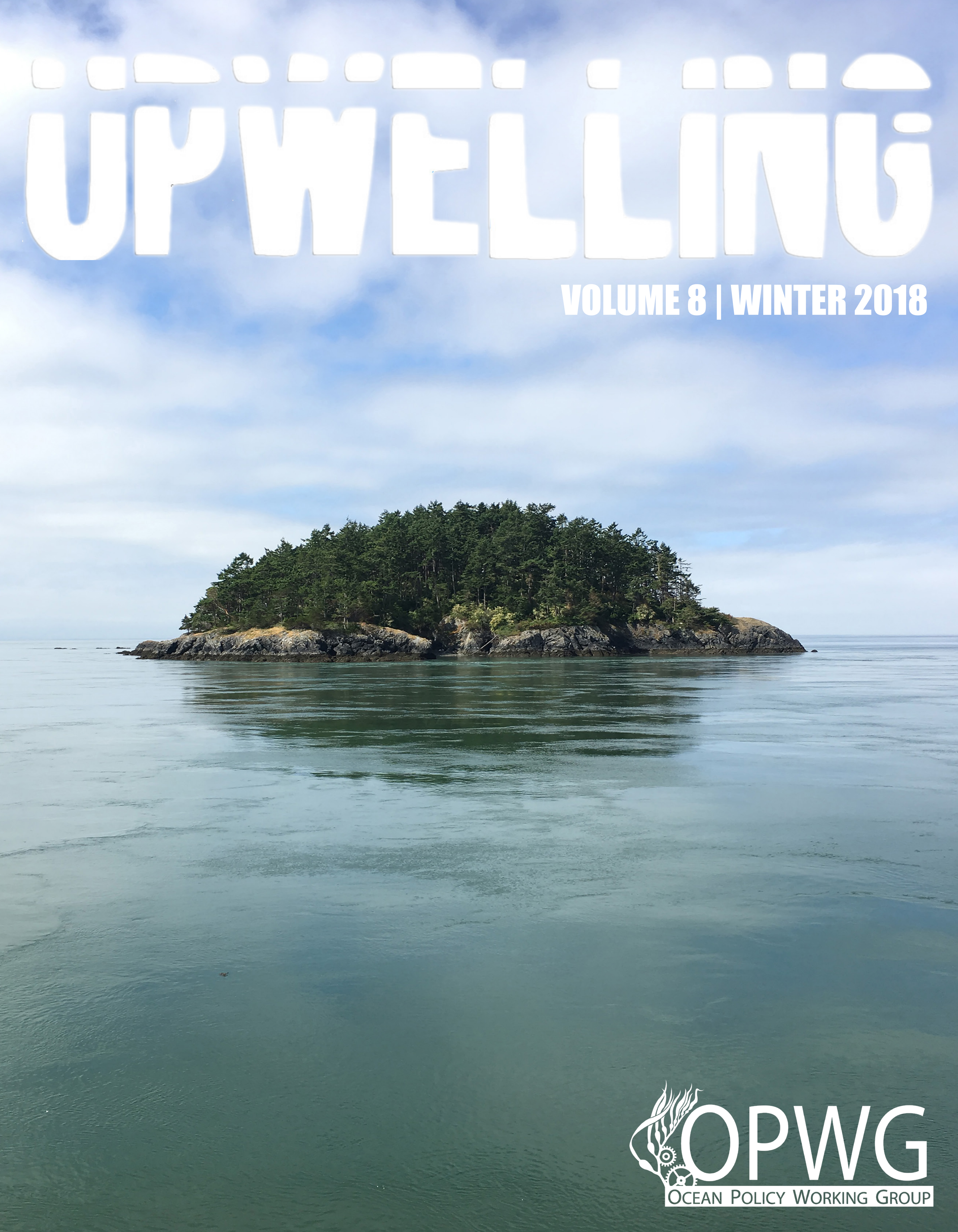

OPWG
OCEAN POLICY WORKING GROUP

Cover: Patrick McCabe, MEM-CEM '19 | Deception Island, WA.
Inside Cover: Kelly Dobroski, MEM-CEM '19| Marineland, FL.

In this edition

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Duke University
Ocean Policy Working Group
dukeOPWG@gmail.com

The Ocean Policy Working Group (OPWG) is a student organization at Duke University designed to facilitate cross-disciplinary discussions on human interactions with the ocean. Throughout the academic year, the OPWG hosts a variety of events with the purpose of exposing the Duke community to pertinent issues in our oceans. This working group strives to be a hub for ocean resources.

A Note from the Editor:

The eighth volume of UPWELLING showcases work from Duke University students, incorporating position pieces and artwork from the creative minds of undergraduate and graduate students alike.

Dive in and experience how the oceans have impacted the lives of our students. I hope these pieces encourage you to spend more time in the sea and inspire you to do more for the benefit of our oceans.

A warm thank you to the Nicholas School of the Environment, the Graduate and Professional Student Council, and the Duke University Center for International Studies for their continued support of the Ocean Policy Working Group and UPWELLING.

Sincerely,

Kelly Dobroski
OPWG Publication Coordinator
MEM-CEM '19

What's swimming in the Scottish Seas?: Cetacean Research and Rescue Unit

Claire Atkins-Davis, MEM-CEM '19

The Cetacean Research and Rescue Unit (CCRU) is a small non-profit research organization based in northeast Scotland. It was established in 1994 with a mission dedicated to the welfare, conservation and protection of whales, dolphins and porpoises (cetaceans); completed through scientific investigation, environmental education, and the provision of a 24-hour veterinary service for sick, injured and stranded individuals. As a research assistant, I worked to support the efforts of the CCRU director, Dr. Kevin Robinson. We performed boat and land-based surveys, as weather permitted, to conduct behavioral analyses in order to understand social structure, population dynamics, reproductive success rates and habitat suitability for cetacean species in the Moray Firth.

Behavior analyses were conducted though surface observations, as well as underwater footage from multiple GoPro camera angles. Because whales are air-breathing mammals, they must eventually return to the ocean surface for oxygen; most observations are made when the animal surfaces. Surface analyses are important to understand respiratory rates and dive patterns for specific species, which aids in understanding movement patterns and areas of abundance and density. Understanding where the animals go and what they are doing in these areas aids in the conservation of the species. Since cetaceans come to the surface to breathe, much of their activity and behavior occurs underwater, making it difficult to study. Pairing surface observations with footage of underwater behavior allows researchers to understand more of the whole picture.

Photo identification of catalogued individuals within the population was part of the methodology to understand social structure and genetic relatability. The research efforts were done to establish conservation and management strategies for marine species in the Moray Firth, including Bottlenose dolphin (*Tursiops truncatus*), Minke whale (*Balaenoptera acutorostrata*), Harbor porpoise (*Phocoena phocoena*), Humpback whale (*Megaptera novaeangliae*), and Orca whale (*Orcinus orca*).

Another interesting aspect of this position was marine mammal stranding response. In order to accurately perform health assessments of stranded marine mammals, we received a Marine Mammal Medic certification through British Marine Divers. The certification process focused on classroom lectures that were broken up into different topics. The lecture topics included marine mammal biology, species identification, physiology, first aid, and rescue techniques. After lectures, there were practical trainings that included re-floatation of seals, dolphins and large whales. Each practical session included hands-on training where we handled life-size water filled models, of proper weight, to practice lifting and first aid techniques. The exercises were performed several times and each participant played given roles in each scenario.

After receiving the certification, we would respond to reported stranded cetacean and pinniped species. During a proper health assessment, the team would decide the next course of action. Depending on condition of the animal, we would either attempt re-floatation, or if possible, transport the animal to a facility for intense veterinary care. Re-floatation is only completed after proper assessment and if the team believes the stranded mammal will survive once returned to its habitat.

Our team also received a grant to conduct a new project to collect baseline DNA data to determine genetic relations and reproductive health among Basking sharks (*Cetorhinus maximus*). **[continued page 5]**

[from page 4] The abundance and density of this species had never been documented. Therefore, due to this lack of information about species presence in the Moray Firth, a collection of baseline data was recommended. The CRRU team is continuing this ongoing research effort. This was a very exciting and unique experience, and I enjoyed learning about different approaches to marine mammal conservation and ocean ecosystem management. ■

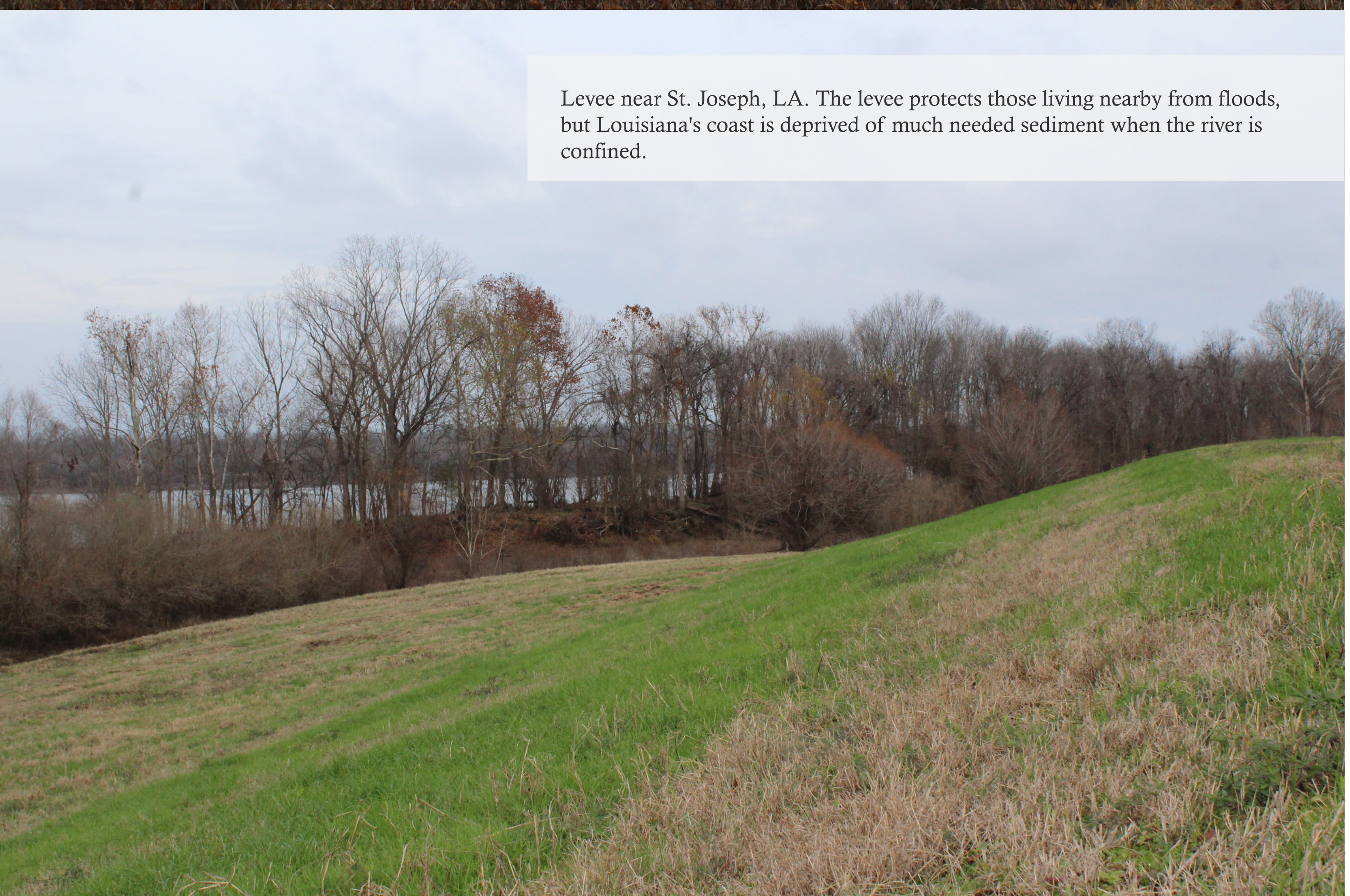
(Left) Wikipedia (https://en.wikipedia.org/wiki/Moray_Firth)
Topographic map of Scotland, noting Moray Firth

(Top Right) Claire Atkins-Davis, MEM-CEM '19
Surface Surveys in the Moray Firth.

(Bottom Right) Meghan Rickard, MEM-CEM '15
Breaching Humpback whale in Stellwagen Bank National Marine Sanctuary, Massachusetts Bay.

Photos: Thomas Lutken, MEM-EEP '19
Mississippi River near St. Joseph, LA. Pictured river height is approximately thirty feet below flood levels from 2011.

Levee near St. Joseph, LA. The levee protects those living nearby from floods, but Louisiana's coast is deprived of much needed sediment when the river is confined.



Louisiana Sinking

Thomas Lutken, MEM-EEP '19

Growing up near the Mississippi River, I took the long, green hill for granted. It takes barely two minutes to cross, a disturbingly short amount of time to traverse the defense separating me and my family from a force that could wipe us off the map.

In 2011, heavy spring rains across the Midwest had swelled the river. Standing atop the levee, my familiar forest was now covered with angry, red-brown water ripping past the trees. I took a canoe with me, hoping to paddle between those treetops, but the sight of the flood quickly extinguished that idea. At my feet, a football sized blob of fire ants floated past. The ants could simply move, but when the river floods, we humans rely on a thousand-mile anthill to protect ourselves.

It was a few years later when I learned this protection came with a price. Downstream, coastal Louisiana was rapidly disappearing; over 16 square miles of marshes and wetlands were lost each year since 1985, according to the U. S. Geological survey.[1] Every month, an area the size of Duke's West Campus erodes away.

There are three distinct problems; rising seas, sinking sediment, and no new deposition. Climate change drives the first, but more local factors control the second and third. Subsidence, or compacting of sediments, lowers the existing land and occurs naturally (though there is some evidence that oil extraction can accelerate this sinking process).[2] We inadvertently created the third; levees protect people upstream from floods, but they also stop the Mississippi River from naturally replenishing the coast of Louisiana.

Draining 31 different states from the Appalachians to the Rockies, the Mississippi carries millions of tons of sediment downstream. During spring floods, this sediment dropped out, creating much of southern Louisiana. Now, it flows into the Gulf of Mexico, making massive gyres of turbid ocean water, instead of replenishing marshes along the coast.

This spring, I stood atop another levee, this time in New Orleans. Well, really the same levee, just a four hundred mile walk downstream. Even without satellites or survey equipment, it was clear the Big Easy would be underwater without the levee.

More than Jazz and Mardi Gras are in peril; barges bigger than my high school floated by oil tankers bound for Baton Rouge refineries. Louisiana's commercial fishing harvest exceeded a billion pounds in 2016, and that catch depends on a healthy coastal habitat.[3] Protecting this place means more than preserving a culture; the regional economy and environment depend on this river.

Solutions exist; a controlled release of the river below New Orleans would relieve pressure on those in the city and produce new land to help protect against storm surges.[4] Coupled with more conventional approaches, like wetland restoration and seawalls, Louisiana is working hard to prevent further losses, but we must act quickly to preserve our coast. ■

> *"Every month, an area the size of Duke's West Campus erodes away.*

1. Couvillion, Brady R., John A. Barras, Gregory D. Steyer, William Sleavin, Michelle Fischer, Holly Beck, Nadine Trahan, Brad Griffin, and David Heckman. "Land area change in coastal Louisiana from 1932 to 2010." (2011).
2. Kolker, Alexander S., Mead A. Allison, and Sultan Hameed. "An evaluation of subsidence rates and sea-level variability in the northern Gulf of Mexico." Geophysical Research Letters38, no. 21 (2011).
3. Annual Landings, NOAA National Marine Fisheries Service. "2016 Commercial Fisheries statistics." www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index
4. McMann, B., Mike Schulze, Heather Sprague, and Kerri Smyth. (2017). "2017 Coastal Master Plan: Appendix A: Project Definition." (pp.1- 119). Baton Rouge, Louisiana: Coastal Protection and Restoration Authority.

Méduse Méditative

Alexie Rudman, MEM-CEM '19
Acrylic

Sea Nettle

Alexie Rudman, MEM-CEM '19
New England Aquarium

"THEY ARE MESMERIZING. I was inspired to paint this jellyfish [pictured left] after a visit to the New England Aquarium, where in a square tank tucked away on the back wall of the basement, these nettles [pictured right] suspended themselves against the deep blue. The way their tentacles curl and their bodies morph silently, like ink drops in water, is hypnotizing.

Bison, Sharks and Students, Oh My!

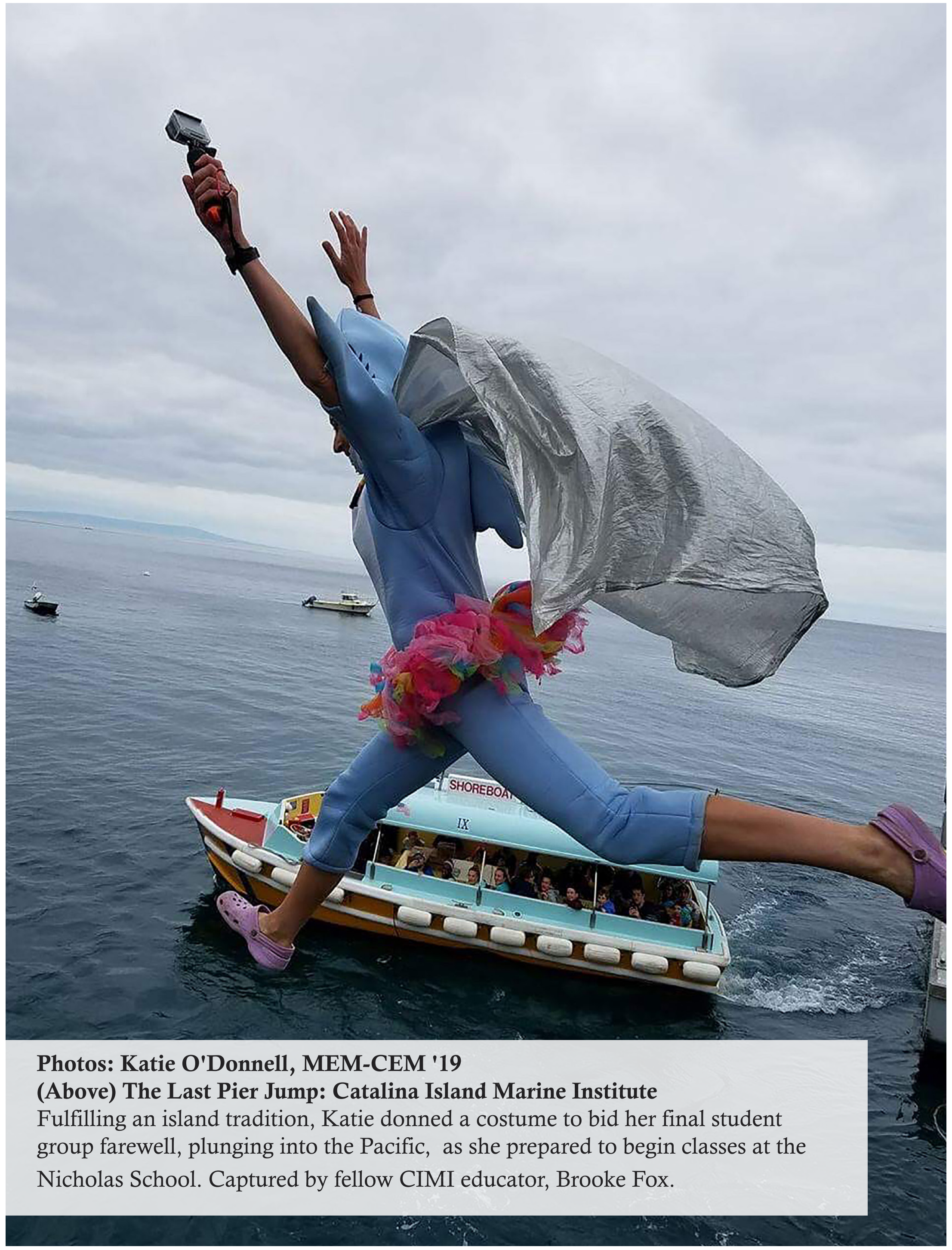
Katie O'Donnell, MEM-CEM '19

One of the most challenging tasks is to articulate what being an environmental educator means. Superficially, it is teaching students about science and the various types of environments through hands-on experiences. It is coordinating teaching and lab schedules. It is taking a group of kids into the ocean for the first time. It is taking them on a hike in the back yards that they did not know existed. It is chasing a bison off of a beach. It is talking down anxiety attacks. It is learning 20 new names every three days. It is coordinating activities, making announcements and being the question master for over 200 students at a time. It can be overwhelming, but it is also incredibly rewarding.

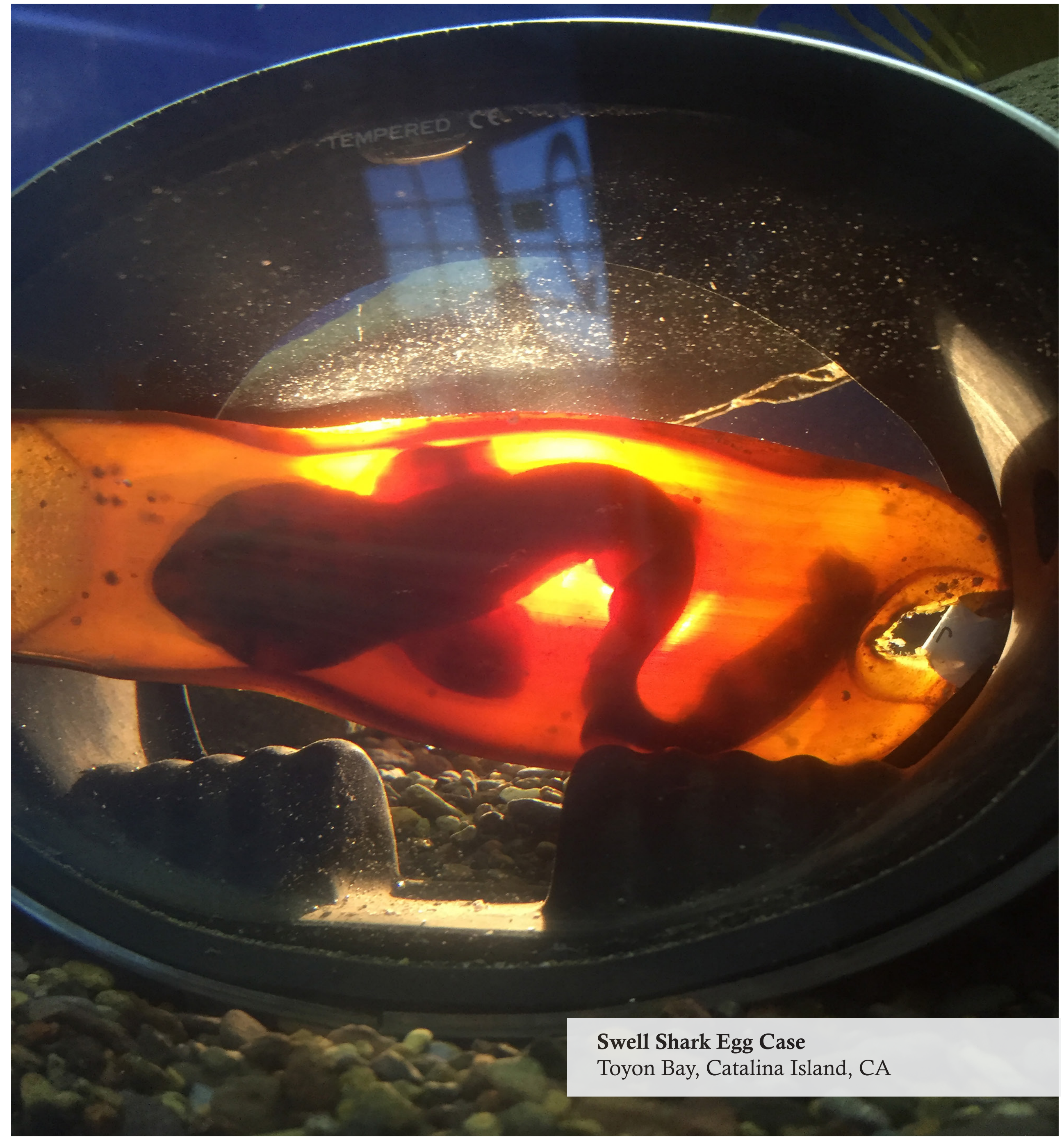
With one week's notice, I packed up my life and headed off to an island I knew of, but could not imagine what it was actually about until I got there. Working on Catalina Island was one of the most interesting and rewarding experiences I had as an outdoor educator. The unique challenge is not simply living on an island; it is living in the more isolating interior of the island where bison, leopard sharks, and Catalina Island foxes run (or swim) amuck.

The history of the island is fascinating and provides a learning experience for students unlike any other. In the interior of the island, there is often no cell service and limited wifi (cue horrified looks from every high school student that steps off the boat). The night skies are much clearer than the Los Angeles glow of light pollution that can be seen in the distance, which provides stargazing and teaching opportunities.

As certified lifeguards, assisted by buoyant wetsuits, instructors teach all students, even those classified as 'non-swimmers,' how to snorkel and swim in the ocean for the first time, while also teaching them about the ocean itself. Lab activities can include investigating plankton under microscopes, dissecting squid, discussing issues that oceans are challenged with and touching **[continued page 11]**



Photos: Katie O'Donnell, MEM-CEM '19
(Above) The Last Pier Jump: Catalina Island Marine Institute
Fulfilling an island tradition, Katie donned a costume to bid her final student group farewell, plunging into the Pacific, as she prepared to begin classes at the Nicholas School. Captured by fellow CIMI educator, Brooke Fox.



Swell Shark Egg Case
Toyon Bay, Catalina Island, CA

[from page 10] sharks and rays.

One of the most memorable snorkel trips I led was with a group of 16 sixth-grade students from Arizona that came during February of 2016. It was chilly, which makes motivating students to put on dripping wetsuits more challenging than usual. After explaining all the ins and outs of snorkeling, and addressing *all* of their concerns, we finally made it out in the water-however, not terribly far this time.

There were no animals to be found on that sandy bottom during our brief snorkel, but we kicked around in the crystal-clear water, talked about sand composition, beach formation, and water visibility.

Upon returning to the shore, my students were already excited for their next opportunity to snorkel. Their positive energy and optimistic attitudes were contagious. With such a complicated job that requires an instructor to wear so many hats simultaneously, it was a welcome reminder that I was there to share my passion about the ocean at whatever capacity that I could. ■

Human-Wildlife Interactions: OBX and Fisheries Observer Program

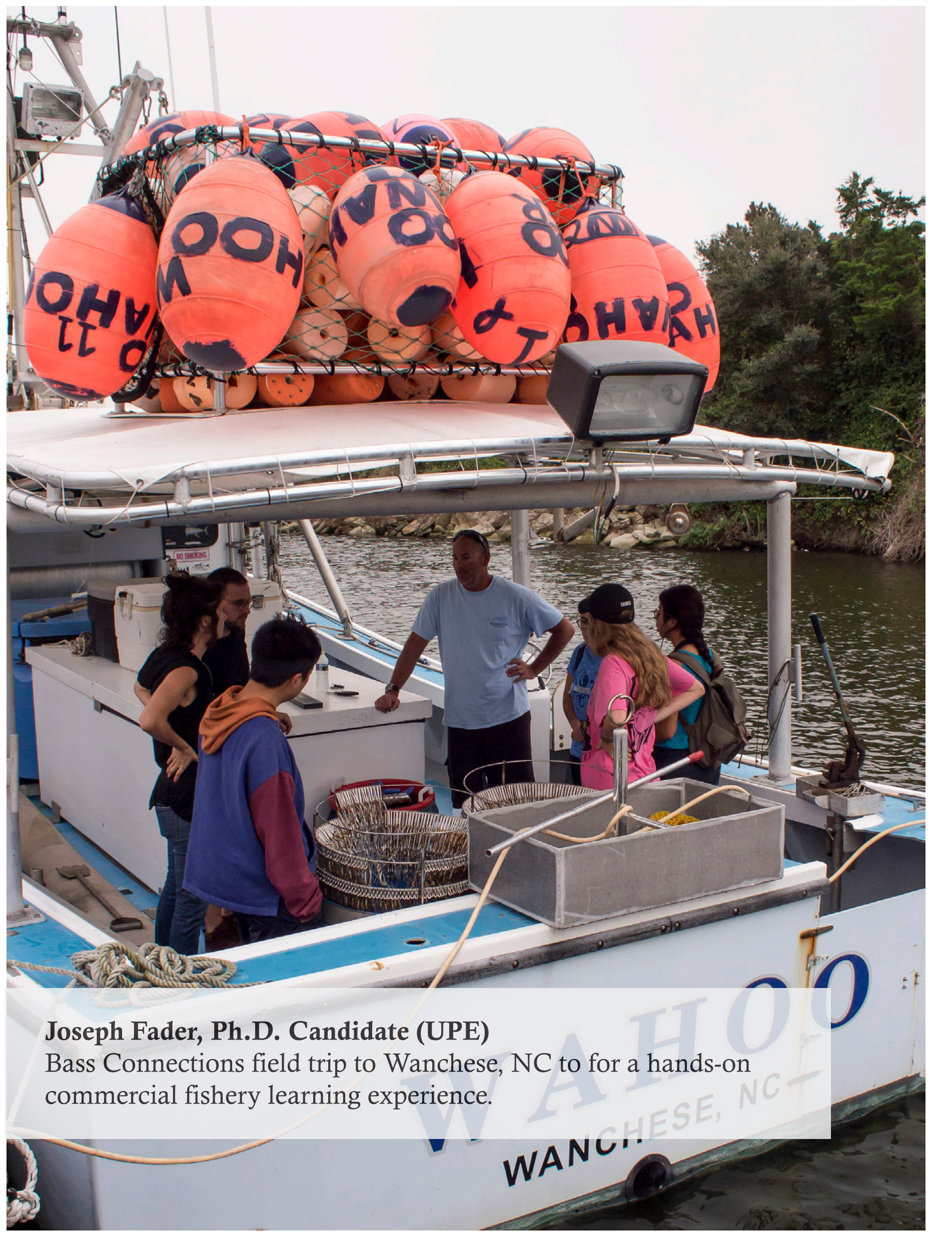
Samantha McLendon, B.S. '18

During a recent trip to the Outer Banks, our Bass Connections team had the chance to tour an active longline vessel and talk with a longline fisherman about his experiences in the industry. Although our team is studying the human-wildlife interactions of fisheries, specifically issues of bycatch and depredation, we took this opportunity to have an informal conversation with the fisherman about longline fishing in general. One of the topics we discussed of particular interest was his opinion of the observer program.

The NOAA Fisheries National Observer Program began over forty years ago, and aims to place qualified, unbiased observers on commercial fishing vessels in the United States in order to gather data on things such as bycatch, depredation, and any breach of regulations. Since fishermen are likely to show bias in self-reporting (i.e., not reporting bycatch of endangered species or admitting to rules they break at sea) the observer program has become the primary source of data about fisheries and has important applications for supporting science, conservation, and management. The data collected through the fisheries observer program is also used to help assess populations, set quotas, and enforce regulations. Observers can spend anywhere in the range of several days to several months aboard vessels, and NOAA notes that the work can be intense and conditions uncomfortable. NOAA's website also reports that observers are trained biological scientists.

To me it seems that some kind of third-party observer program is absolutely crucial to collecting unbiased data on depredation and bycatch. However, our conversation definitely elucidated some issues and drawbacks with the program, as well as giving valuable insight into how fishermen might view these observers.

From his experience, many observers are recent **[continued page 13]**



Joseph Fader, Ph.D. Candidate (UPE)
Bass Connections field trip to Wanchese, NC to for a hands-on commercial fishery learning experience.

[from page 12] college graduates and come in withvery negative opinions of the fishing industry and the fishermen themselves. This says to me that some observers may not be unbiased, but actually biased against fishermen. Although compliance with regulations and accurate reports of bycatch are important goals, biases against fishermen might be just as important and as harmful as overlooking regulation violations. The fisherman we spoke with seemed to think that the training program painted fishermen in this negative light.

One of the instructors of this course was kind enough to share some of his experiences as a fisheries observer with me to provide an alternative perspective on some of these ideas. He worked on pelagic longline vessels in Hawaii and trawl vessels in the Western Gulf of Alaska and Bering Sea; he reported overall very positive interactions with the fishermen he observed. He also felt he was able to build personal relationships on many of his observation trips. This viewpoint of positive and collaborative relationships makes me think that perhaps negative biases and hostility between fisheries and observers are more of a rarity than the norm. However, it is difficult to draw a broad conclusion from only two viewpoints.

Another qualm that we heard about the observer program from the fishermen's perspective is lack of experience at sea. The fisherman we spoke with expressed that some observers are not in good shape and not used to living at sea. Some become seasick for extensive portions of the trip. With extremely close living quarters, constant sickness can be extremely inconvenient and unpleasant for the fishermen. This kind of negative interaction, as well as feeling like they are being pre-judged by observers, could strain relationships between fishermen and regulatory organizations. This could cause backlash and more problems with compliance and honest reporting, which threaten to make the observer program counter-productive.

However, from the observer's perspective, training was about as thorough as it could be while still being practical. NOAA provides a 3-week rigorous training program for observers which covers fisheries biology, fish identification, sampling skills, and boat safety. He explained there is extensive hands-on practice with boat safety as well as wet labs to practice fish identification. Granted, all of this training does not provide actual acclimation to life on a boat, which seems to be at the root of the problem from the fishermen's perspective.

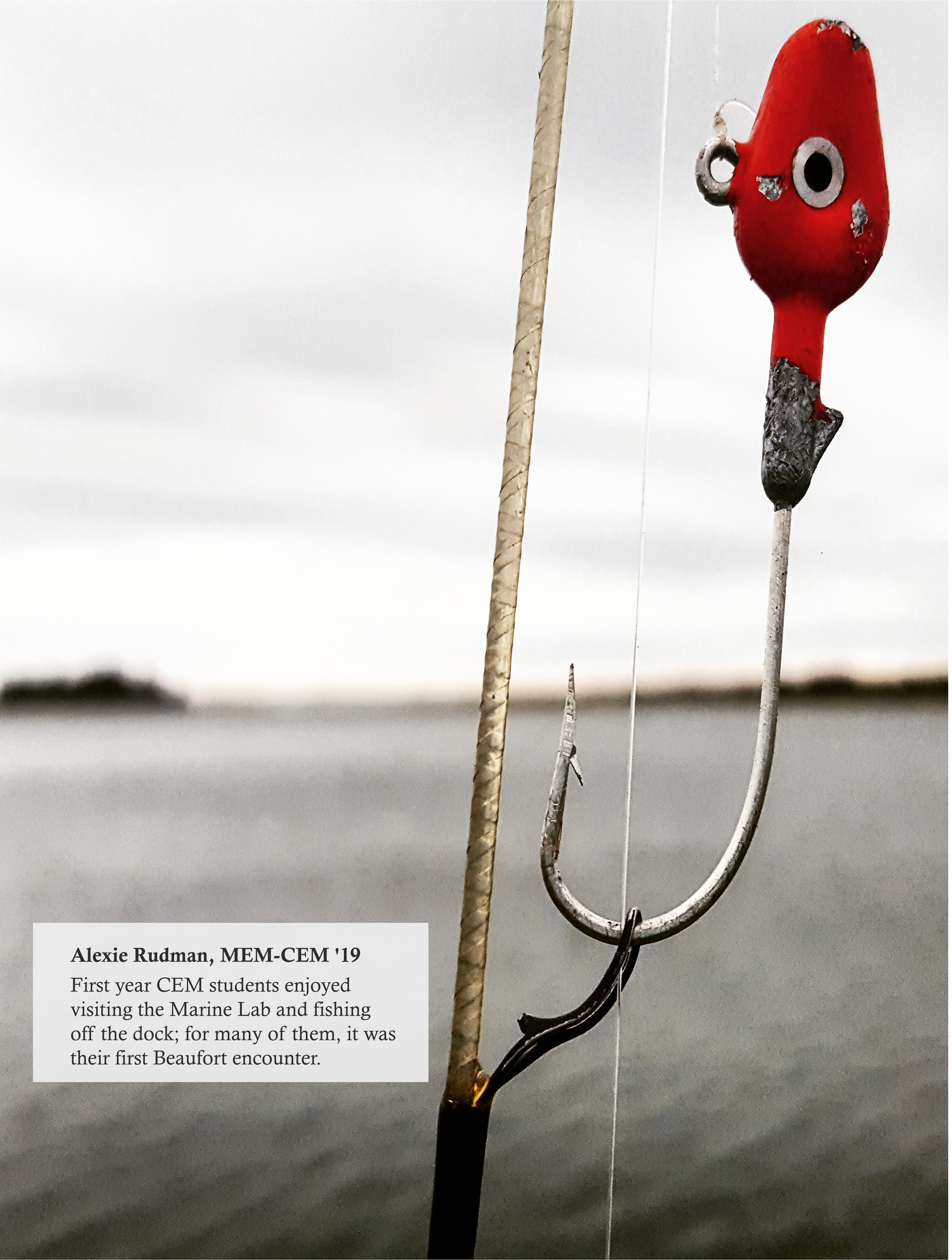
In terms of requirements to be hired as an observer, a candidate needs a bachelor's degree in marine biology or a similar field, and undergoes a series of interviews to assess overall ability. There is no formal requirement for having spent time at sea, which could potentially help decrease some of the aforementioned uncomfortable situations if instituted. However, this could also decrease the pool of potential applicants.

With regard to the fisherman's concern that training paints fishermen in a negative light, this seems to me to be a misconception that likely came from personal biases of some specific observers. The training regimen itself does not seem to suggest negative feelings toward fishermen.

Fine-tuning the productivity and efficacy of the observer program is a complicated problem. I have also heard mention of observers who generate false data and ignore transgressions, indicating that bias exists both for and against fishermen. Additionally, only about 20% of vessels get observers, so even if all observers are completely unbiased, we may not have a representative sample of data that is applicable across all vessels and fisheries. Ultimately, though, the observer program fills a hole in fisheries data that could not be filled otherwise.

The instructor who commented on his observer experience emphasizesd that adequate funding could achieve solutions to many of the potential conflicts and shortcomings by enabling attraction of the best possible candidates and training them in a comprehensive manner. Having prepared and open-minded observers is the best way to foster positive relationships with fishermen and achieve unbiased data collection. ■

To learn more about Bass Connections programs and opportunities at Duke, visit: https://bassconnections.duke.edu/



Alexie Rudman, MEM-CEM '19
First year CEM students enjoyed visiting the Marine Lab and fishing off the dock; for many of them, it was their first Beaufort encounter.

Submit to UPWELLING

UPWELLING is a biannual journal that allows the Duke community to share their thoughts, opinions and research pertaining to the oceans and ocean policy. We are interested in any ocean-related work, including short research articles, OpEds, photographs, maps and other creative content. Content is fairly flexible, and topics may include a summer internship experience, a conference that you attended, the research that you are currently involved in, or other experiences. We welcome work from Duke University students in any department, researchers, faculty, alumni and professors.

Please send submissions to dukeOPWG@gmail.com.

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