

Connecting the Currents of Conservation

HPU professor, students study ocean to protect it

BY CHRIS AGUINALDO

HAWAI'I HAS NO SHORTAGE OF BEACHES.

Before humans set foot upon its pristine sands, marine life and far-flying birds were there first. Waves carried seeds and plants from shore to shore. Earth's ancient network brought life to the islands. Before modern technology, the world was and continues to be connected by the ocean.

However, technology has changed the ocean, too—and one innovation, in particular.

“Plastic,” said David Hyrenbach, Ph.D.

The Hawai'i Pacific University Assistant Professor of Oceanography was recently interviewed on CNN on the second anniversary of the 2011 Japan tsunami and spoke of the effects of marine debris on seabirds. Last year, he was also featured on NBC Nightly News reports investigating similar debris. Millions of viewers of CNN, NBC and many other news outlets saw these stories.

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Besides the obvious problem of blemishing beaches—like the heavily littered Kamilo Beach on the southern tip of the Big Island where the news crew visited—the waste can affect the marine ecosystem in other ways. Hyrenbach was filmed showing assorted bottle caps, a toy figure, what appears to be piping, and much more debris recovered from albatross stomachs, following necropsies at the



CHRIS AGUINALDO PHOTO

HPU Assistant Professor of Oceanography David Hyrenbach, Ph.D., and graduate student John A. Johnson conduct a necropsy of a sooty shearwater at the Oceanic Institute.

Oceanic Institute, a research and teaching affiliate of HPU.

The irony isn't lost upon him, how plastic toy soldiers once used for imaginary battles may have led to the death of the seabirds. But looking at what birds have consumed can give some understanding of how much foreign material might be in the ocean, Hyrenbach explained. Other marine predators, like tuna and mahi-mahi, may also ingest this material—with serious implications in the food chain, leading to humans.

In other lab drawers, Hyrenbach has items that he and his students have removed from seabirds—including lighters, toothbrushes, other toys and more.

“Plastic lasts for a long, long time. The ocean currents and wind move the material around. On top of that, the birds go very, very far,” he said. “Some material that enters the ocean can end up in a bird years from now in a totally different part of the world.”

“Eventually, some bird who may be breeding thousands of kilometers away from us ends up eating this piece of plastic,” he said. “Some of the smaller plastic debris, like airgun pellets and broken fragments, can be ingested by



KAY KASAMOTO PHOTO

Samples of debris collected during the Sea Education Association Plastics at SEA expedition in fall 2012, which HPU graduate student Zora McGinnis was crew member of. The expedition documented more than 70,000 pieces of plastic during a trip from San Diego to Honolulu.

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migrating sub-Antarctic shearwater species and travel to New Zealand, Chile and even Tasmania.”

Because plastic is so persistent in the marine environment, it is essential to accurately gauge how much is in the ocean and where is it being concentrated by the currents. Organizations, such as the Sea Education Association (SEA), conduct research expeditions to examine the effects of plastic marine debris in the ocean ecosystem. Last fall, one of Hyrenbach’s marine science graduate students, Zora McGinnis, embarked on a 39-day voyage from San Diego to Honolulu.

McGinnis was part of the Plastics at SEA expedition aboard the SSV Robert C. Seamans, a 134-foot brigantine-rigged sailing oceanographic research vessel. Their trip included observing floating plastic concentrations in the region known as the “Great Pacific Garbage Patch.”

While the crew was focused on marine debris in general, McGinnis conducted her own project, a visual plastic survey.

“I’m using a model that David and his former student perfected for marine debris that can correct for everything that I’m not seeing,” said McGinnis.

“The methods we use to quantify the abundance of floating plastic are adopted from marine mammal survey methods,” explained Hyrenbach. “We determine how the type of object—size and color—and the ocean conditions—wind intensity and cloud cover—influence the observer’s ability to detect the floating debris. My previous graduate student, Andrew Titmus (MS Marine Science ’10), used this method successfully in a previous cruise to the area of the ‘Garbage Patch.’”

When the ship docked in Honolulu, McGinnis helped the crew move

recovered debris from the ship, which included tires, Styrofoam pieces, ice trays, buoys and more. The expedition documented more than 70,000 pieces of plastic.

McGinnis, under the guidance of Hyrenbach, is also investigating plastic ingestion by small pelagic fish, like myctophids and flying fish, and large predatory fish, such as tuna and mahi-mahi. She’s hoping her experience can help people understand how their garbage can cause problems thousands of miles away.

“You’re out there, standing on deck... beautiful day. You look out and it’s pristine, and you’re about as far from anywhere as you can get. And all of a sudden, something big floats by,” she said.

McGinnis held a soccer ball on the deck of the ship, wondering how it ended up in the middle of the Pacific. Yet she’s also concerned about what can’t be seen, those tiny pieces of plastic that are being ingested by marine life.

“That’s what’s out there, and it’s our fault. There’s nobody who can say plastic is occurring naturally in the ocean,” McGinnis said.

While all of this sounds grim, Hyrenbach remains optimistic of the future and the critical role science has in conservation. He points to his students in Pelagicos, HPU’s pelagic (sea) ecology laboratory, who are conducting and sharing valuable research about the ocean and marine life.

Hyrenbach—a 2007 Pew Marine Conservation Fellow—is also continuing his own research, which has conservation applications such as identifying



HPU graduate student Zora McGinnis holds a soccer ball and vials filled with tiny plastic fragments collected during the Sea Education Association Plastics at SEA expedition in fall 2012.

CHRIS AGUIÑALDO PHOTO

important habitats for the development of marine protected areas, and studying far-ranging species as biological indicators of marine pollution.

Hyrenbach was also recently awarded the Hawaii Audubon Society Program Research Award, recognizing work that has had a major effect on conservation. He plans to use the award to pursue shearwater population studies done by undergraduates on O’ahu.

His work on conservation of Hawaiian seabirds also includes partnerships with researchers and educators from the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and other key partners in marine science.

While he and his students are continuing their work, there’s a lot that regular people can do to help the environment, he said emphatically.

“Stay positive,” Hyrenbach said. “Realize we have a lot of power as consumers in what you buy and we should use it for good.”

This could be as simple as buying products in recyclable containers or supporting businesses that use ecological packaging and have readily available recyclable collection stations.

We also have power through the ability to vote and inform our community and leaders about sustainability and the environment. “Our issues need to be at the forefront of our policies and discussed” with lawmakers, he said.

Continue to learn and educate about conservation, he added. Hyrenbach is a strong supporter of educating younger children about math and science. Pelagicos recently contributed materials to a high-tech science instruction package focused on teaching children about seabirds and the environments they encounter. “Winged Ambassadors” is made up of lessons and activities that meet science and math standards for elementary and high school students, with contributions from HPU, NOAA, USGS and managed by Oikonos, a nonprofit organization working to increase ecosystem knowledge.

The last thing that can help steer us toward a better future isn’t something everyone can do, Hyrenbach admits. But for those who truly want to make a difference in a world that will need novel solutions from highly-trained, analytical thinkers, here’s his suggestion: “Consider a career in science. Any science.”

He explained that with future environmental concerns, we need experts ready to study the world, draw meaningful conclusions and find answers. For those who want a vital career doing important work like helping to manage natural resources or setting up marine protected areas—science is where they should be.

After making the decision to pursue science, McGinness adds that finding the right mentor is the most important thing. Hyrenbach “has been really helpful,” she said. “I am here because of David. I couldn’t find any other graduate professors also doing [this kind of work on] marine debris.”

Marine Turtle Biological Stranding Associate Devon Francke (MS Marine Science ’11) of the NOAA Pacific Islands Fisheries Science Center, Marine Turtle Research Program, agreed it was Hyrenbach who drew him to HPU, after looking at other graduate institutions.

“I saw what he did, thinking this could be a good match. I ended up contacting him,” Francke said. “David was very encouraging. He was always there to help, too. He always made the time to be in the field helping, not just me but all the other students, too.”

The work was rigorous. Francke recalled that Hyrenbach did not make things easy. “He showed us you must think on a deeper level. You have to be able to analyze the situation, come up with possible solutions on your own.”

Hyrenbach was very impressed when Francke came up with a method to video record turtles while collecting other data, which turned out to be useful to explain certain behaviors. Hyrenbach said he felt a deep sense of pride when he started learning new things from Francke.



PHOTO BY DAVID HYRENBACH, PH.D.

Devon Francke (MS Marine Science ’11) with a turtle before releasing it back into the water in June 2010, during his graduate studies at HPU. He is now a Marine Turtle Biological Stranding Associate with the NOAA Pacific Islands Fisheries Science Center, Marine Turtle Research Program.

The feeling is mutual. Francke is grateful for Hyrenbach’s dedication to students and for his work in conservation.

“He is there as your mentor and guide through the process. He was there to work with you and make sure you understood,” Francke said. “It was definitely the correct decision to come here and work with him.”

 **View a video of the Plastics at SEA return with Zora McGinnis at www.hpu.edu/hputoday** 