Sea Grant Oregon
confluence
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Coastal students learn how to conduct research aboard OSU ship

By Tiffany Woods

Students on the Oregon coast are getting a taste of what it's like to conduct research at sea, thanks to a series of daylong cruises funded by Oregon Sea Grant.

The first trip took place in April, and nine more outings are scheduled in June and September – all of which will depart from and return to Newport. By the end, 100 high school and community college students and nine of their teachers will have boarded Oregon State University's 84-foot *Pacific Storm* to learn how scientists from OSU collect plankton, identify organisms in seafloor sediment, track whales and detect green sturgeon.

"The goal is to get students involved in real-world research, with the idea that people learn best by doing," said Tracy Crews, who manages Oregon Sea Grant's marine education program and is organizing the trips.

The cruises are part of Oregon Sea Grant's efforts to increase students' interest in science, technology, engineering and math and prepare them for jobs in these fields.

"Some of the concepts we teach are obscure and hard to wrap your brain around until you're out there doing it," Crews said. "So going out to sea and collecting data and interacting with researchers helps solidify the concept. Plus, we're hoping to inspire the next generation of marine scientists."

During April's sailing, for example, five students from Toledo High School tested two sensors that measure the salinity and temperature of the water at various depths. They had spent several months assembling and fine-tuning the devices in class.

A camera-equipped drone snapped this aerial photo of Oregon State University's Pacific Storm research ship during an educational cruise for high school students. (Photo by Chuck Getter)

"It was exciting to see how they're deployed," said student Dana Nyberg. "We know what they're used for but had only tested what they did in the bay. So to take them out to sea was super exciting."

Five other students who are learning to fly drones at Career Tech High School in Lincoln City were also on the cruise. They watched OSU research assistant Todd Chandler, OSU graduate student Dawn Barlow and the ship's captain try to track a gray whale to photograph it with a camera-equipped drone overhead. It was part of research by Leigh Torres, a marine mammals specialist with Oregon Sea Grant, that aims to understand the health and habitat of gray

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Jennifer Fisher (left), a research assistant at Oregon State University, shows Jason Miranda, a student at Career Tech High School in Lincoln City, how to collect water samples to monitor for harmful algal blooms. (Photo by Tracy Crews)

whales.

"It was cool seeing them work as a team," said student Jason Miranda. "Their communication is great, how they talk to each other, give each other directions to where the whale is. They have to be quick. They have a time window to get the photo and get out."

OSU research assistant Jennifer Fisher showed the students how to collect plankton with two large nets. They later examined the tiny sea life, which included crab larvae, under a microscope.

The students also learned what it's like to work on a ship. Nyberg, who has watched boats go in and out of her local bay, left with a new appreciation of what their crews do – from piloting boats at night to watching out for crab pots to braving storms.

"It opened my eyes and gave me a bigger mindset in terms of what they have to go through," Nyberg said.

The students also learned about seasickness.

"It was pretty choppy when we started out," Crews said. "Many students had never been out on the ocean and several learned first-hand how it can affect you physically."

During cruises this summer, students will help OSU professor Sarah Henkel detect tagged green sturgeon moving through a future wave energy test site. They'll also learn how to collect sediment from the seafloor at the site to see what organisms live in it. In addition, students will continue to assist Torres' team with the whale monitoring and Fisher with her plankton sampling. The students will come from schools in Newport, Tillamook, Toledo and Lincoln City.

This is the second year that faculty with Oregon Sea Grant have led cruises for students and educators. In 2016, Crews and Torres led a three-day expedition aboard the OSU-operated *Oceanus*. Oregon Sea Grant will lead a similar trip on the *Oceanus* this September.

Aquarium tanks at marine education center in Newport get facelift

By Tiffany Woods

Contractors replaced the 21-year-old metal supports, then sculpted artificial rockwork around and under the tanks.

When Kelly Reesman set foot in the Oregon Sea Grant-operated marine education center in Newport, her eyes landed on a large aquarium jutting out from a floor-to-ceiling rock. "Oh, you got a new octopus tank," she said to the greeter.

It had been a year since the tourist from La Pine had last seen the facility, which is known as the Visitor Center and is part of the 49-acre Hatfield Marine Science Center. Reesman was pleasantly surprised to see the remodeled exhibit. It now sports cave-like, concrete rockwork, a raised tank and rustic pilings and planks, which make the tank look like it's under a pier.

The updated octopus lair is part of a larger, three-month overhaul of rusting tank stands that wrapped up this spring. Contractors replaced the 21-year-old metal supports, then sculpted artificial rockwork around and under the tanks. They modeled the rocks after real formations in the Newport area. In the process, aquariums were emptied and hundreds of animals, including rockfish, pipefish and ratfish, were temporarily relocated.

Oregon Sea Grant used the renovation

as an opportunity to remove some exhibits, add others (including marine-inspired art), paint walls and redesign the layout using a theme based on habitats such as a kelp forest. More displays are in the works, but the idea is that as visitors walk past the tanks, they'll move from shore to shallow water to deep sea. The exhibits will describe research taking place in those environments.

For example, a new exhibit in the estuary-themed area explains how scientists are breeding oysters with improved genetics.

Although new exhibits will be added, visitors can still enjoy the perennial favorites, including the indoor tidepool, where they can touch sea anemones, and the tsunami flume, where they can crash waves against Lego structures.

"My kids love this place," said Wendy Connerly, of Philomath, who has visited the center with her husband and seven children on multiple occasions. "I love this place because I can sit down and see my kids. It's a safe environment. The kids can explore on their own."

While Connerly's children explored, Tonya Adams watched her son and daughter create waves in a tank that simulates beach erosion. "I love how much the kids can touch and play with everything," Adams said. "And they're having fun learning."

Last year, about 150,000 people passed through the doors of the Visitor Center, which is staffed by Oregon Sea Grant employees and more than 60 volunteers. Wanting to know the economic impact of the center and all those visitors, Oregon Sea Grant commissioned an analysis in 2017 by Bruce Sorte, an economist with the Oregon State University Extension Service. He estimated that the Visitor Center, which costs $460,000 a year to operate, annually supports $7.6 million in income for Oregonians, $13.2 million in sales for businesses in Oregon, and 156 jobs throughout the state.

These figures include the salaries paid to employees at the center; the multiplier effect of those salaries; the amount of money visitors spend on food and lodging; and the household expenditures of Oregon Sea Grant employees and people who supply goods and services linked to the center, which is funded by the federal government, OSU and donations.

New concrete rockwork surrounds a tank at the Oregon Sea Grant-operated public education wing of the Hatfield Marine Science Center in Newport. (Photo by Tiffany Woods)

"Since 1965, the Visitor Center has been teaching children and adults about marine science through fun, hands-on exhibits," said Shelby Walker, the director of Oregon Sea Grant. "Although you can't put a price tag on the value of that experience, as Bruce's analysis shows, we can estimate the important economic contribution of the Visitor Center to Lincoln County and the state."

"I love how much the kids can touch and play with everything. And they're having fun learning."

Beaverton resident Walter Bates knows about the value of the center. Born in 1967, he's been visiting it since he was a kid. Over spring break, he was there with his wife and daughter. "We really enjoy it. It's always been a favorite spot, and now it's even nicer," he said of the renovation.

Newberg residents Vasilisa Melnikova, 9, and her father, Slava Melnikov, watch pipefish at the Visitor Center. (Photo by Tiffany Woods)

Researcher studies how underwater noise pollution affects whales' health

By Cassandra Profita, Oregon Public Broadcasting

Whales depend on sound to communicate, navigate and find food. So, what happens to their health when we fill their habitat with noisy ship traffic?

Leigh Torres, a marine mammals specialist with Oregon Sea Grant and the Oregon State University Extension Service, is leading an ambitious new research project to find out, using drones and a variety of other tools to do health check-ups.

She and her team are making regular trips to the ocean off Newport. The area is prime feeding ground for gray whales and also sees plenty of noisy ships and fishing vessels going in and out of Yaquina Bay.

"These gray whales here live in a really urban environment," she said. "So, they're constantly exposed to a lot of vessel traffic."

Torres said it's clear from underwater recordings that human noise can drown out whale calls, and research shows that whales living in noisier environments can have higher stress levels.

"We want to know if there are long-term consequences to their health and physiology," Torres said.

Finding the whales off the Oregon coast is the easy part of this research project. When the whales are feeding nearshore it's not uncommon for Torres and her team to see many whales at one time – sometimes surrounding the boat.

The ultimate goal is to use the photos, drone videos and poop samples to build ongoing health records for each individual whale.

Leigh Torres uses a drone with a camera to spot whales. (Photo by Stephen Ward)

The team uses an underwater microphone to record the noise that the whales are hearing. Then they snap pictures to figure out which whale they're looking at, checking for unique markings so they can track each whale over time. They also fly a drone overhead.

"We fly the drone over the animal to get information on length and girth – its body condition, essentially," Torres said. "So we would expect that an animal that's fat would have a lower stress level than an animal that's skinny."

Then Torres waits for the whale to poop so she can scoop a fecal sample out of the water. The poop contains hormones that tell her what the whale's stress level is. It also offers genetic information and confirms the sex of the whale.

The ultimate goal is to use the photos, drone videos and poop samples to build ongoing health records for each individual whale. She keeps files and even a sort of whale Facebook to help her identify which whale is which and how fat and healthy they are.

"So, we're able to identify individuals over and over again," she said. "Once we can link all of our information, we can look for changes in body condition as well as maybe changes in stress or reproductive hormone levels."

Eventually, she hopes to be able to tell whether whales living with more human noise are skinnier, having fewer babies or showing more signs of stress than whales in quieter areas.

"There have been studies showing humans that live in noisy environments are more prone to higher rates of cancer and disease," she said. "And studies have shown

animals that live closer to highways have higher stress levels."

Since the 1990s, researchers have suspected that our noise pollution could threaten whale survival, Torres said, but the closest they've come to proving it was in the days after 9/11 when shipping traffic was shut down. Researchers collected whale poop samples during the shutdown and found that their stress levels plummeted to levels they hadn't seen before.

"The stress levels dropped far below what they thought was the baseline," Torres said. "Then they went back up when shipping traffic resumed. That was our first jaw-dropping moment where we realized that noise is impacting the physiology of those whales."

A longer version of this story originally appeared on OPB's website. The above is reprinted with permission.

Researchers use simulations to help communities plan for tsunami

By Tiffany Woods

Researchers at Oregon State University have used computer and real-life simulations to help the the coastal towns of Seaside and Newport prepare for a possible tsunami.

With funding from Oregon Sea Grant and the National Science Foundation (NSF), the researchers created a computer model to simulate how a partial or total failure of the roads and 10 bridges in Seaside during a tsunami-triggering earthquake might hinder people's ability to flee to higher ground ahead of an encroaching wave. They experimented with scenarios using different percentages of cars and pedestrians and found that not all of the bridges impacted the mortality rate equally.

The researchers identified four bridges and one road as resulting in the greatest number of people being engulfed by a tsunami, should the bridges and road become partially or fully impassable. The finding was based on the starting points of 4,500 imaginary people and the routes they chose in the simulation and not on the structural integrity of the infrastructure.

"If we change the population distribution and other parameters, it may end up with a different road segment or bridge being the most vulnerable link," said OSU civil engineer Haizhong Wang, who worked on the project with OSU civil engineer Dan Cox and OSU sociologist Lori Cramer. "What is important is that this simulation supports evidence-driven decision-making, and not necessarily that it shows which bridge caused the highest fatality."

A sign directs people to higher ground on Newport's Safe Haven Hill, a destination of tsunami evacuation drills funded by Oregon Sea Grant. (Photo by Tiffany Woods)

Without assigning specific dollar amounts, the researchers simulated how the mortality rate might change depending on how different amounts of resources were allocated to make those four bridges and the road more likely to withstand an earthquake. They found that a bridge on Broadway Street should have the highest priority for

Researchers wanted to know if tsunami evacuation signs, like this one on Safe Haven Hill, were helpful to people who were unfamiliar with the area. (Photo by Tiffany Woods)

retrofitting. The finding was based on the fact that it was the most traversed bridge in their simulation; it was not related to the bridge's construction or age. The researchers also found that different ways of spending resources can greatly affect the mortality rate.

"As an alternative, investing resources in building highly resistant shelter structures inside the inundation zone might be more economical than spending greater amounts of resources on retrofitting bridges or transportation links," they wrote in the journal *Natural Hazards*.

As part of the same project, the scientists turned their attention south to the town of Newport, where they studied the actions and decisions of more than 70 real-life people who participated in six mock tsunami evacuations.

"We noticed that people who had practiced an evacuation before… chose the shortest route and chose it faster…"

Before beginning, volunteers downloaded on their mobile phones an app called Strava, which is commonly used by runners to track their routes and speed. Starting at either the Hatfield Marine Science Center or trailheads throughout the 500-acre South Beach State Park, participants were told a massive earthquake had just hit and that they had 30 minutes to flee by foot to higher ground before a tsunami washed ashore. Those who worked at Hatfield knew where to go because the center's employees walk designated evacuation routes every year as a practice drill.

"We noticed that people who had practiced an evacuation before – like the people at Hatfield – chose the shortest route and chose it faster, whereas people who hadn't done a drill before made decisions that increased their chance of not reaching safety," Cramer said.

She added that people who had never practiced an evacuation in the area said that the drills taught them to be more observant of potential routes and think about what they would do in the case of a real tsunami.

In some drills, people were handed envelopes with role-playing instructions to simulate real-life scenarios. In one situation, participants pretended to be children who had the option of finding their parents at the park's visitor center or heading to a hill.

After each drill, participants debriefed with the researchers, discussed their actions and answered a survey. Researchers wanted to know how effective tsunami evacuation signage is for people who are unfamiliar with the area. They also wanted to learn how having participated in a previous drill affected route choice and evacuation speed.

The researchers also used a computer model to show how people might walk or drive to higher ground from the park and Hatfield. They aim to compare the real-life drills with the computer-simulated ones to understand how realistic the latter are.

Although Oregon Sea Grant's funding has ended, leveraged funding from NSF is allowing the team to continue its work.

"The Sea Grant funding played a key role in leveraging the NSF funding," Cox said.

Additional reporting by Gregg Kleiner.

Collaboration with fishermen leads to ocean-forecasting website

By Tiffany Woods

Commercial fishermen can now check forecasts for ocean conditions off the Pacific Northwest coastline with an easy-to-use, interactive, online map.

The tool is at nvs.nanoos.org/Seacast on the website of the Northwest Association of Networked Ocean Observing Systems (NANOOS), a partnership of entities that gather and disseminate data on the ocean. The new site is the culmination of multiple

years of research based on conversations with fishermen that aimed to make ocean forecasts as accessible as weather forecasts.

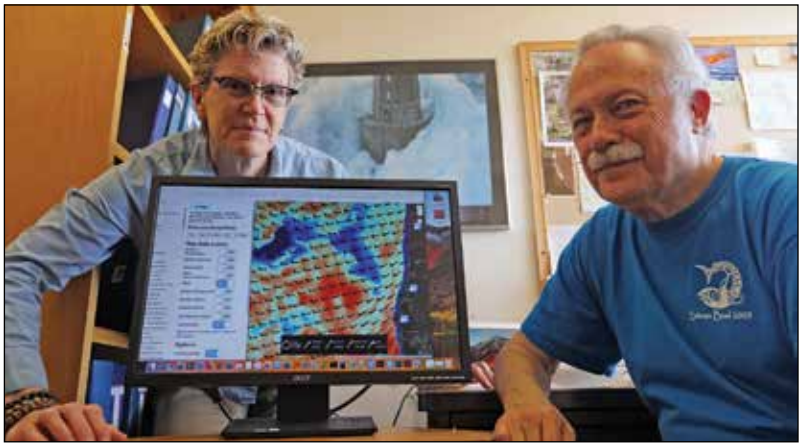
Talks started in 2012 when Colin Duncan, an Oregon State University graduate student, asked fishermen about their needs regarding ocean forecasts. He also met with NANOOS scientists to learn about their work. His research, which was published in his thesis, laid the foundation for the creation of Seacast.org, an experimental site that displays forecasts for sea conditions such as wave height and surface currents.

After Duncan graduated, OSU undergraduate computer science students added more features to the site that fishermen requested. Then in 2016, Oregon Sea Grant provided funding that allowed OSU graduate student Jessica Kuonen to advance the project under the guidance of Flaxen Conway, a community outreach specialist with Oregon Sea Grant. The funding also allowed researchers to leverage money from Oregon Space Grant and the National Science Foundation.

Kuonen and the computer science team met on several occasions with fishermen to get their input on Seacast.org. Based on fishermen's requests, the Web developers made the site easier to use and added fields that included bottom temperature and salinity. They also added a feature that allows users to see various forecasts for ocean conditions precisely where they click their cursor on the map.

In 2018, the data and design from Seacast.org found a new home on the NANOOS website. Seacast.org will eventually be taken offline as more fishermen get accustomed to the NANOOS site, said Ted Strub, an oceanographer at OSU who was the lead on the project.

"Without more funding, Seacast.org can't be maintained," he said. "It was always the plan for the experimental site to be transitioned to a more permanent site. We just didn't know who would actually do that. It is a measure of her forward vision that Jan Newton, the executive director of NANOOS, was willing to use her resources to support the conversion of the experimental site to the more operational system."



Flaxen Conway (left) and Ted Strub show off Seacast.org, a website for fishermen. It displays forecasts for ocean conditions such as surface temperature, salinity and wave height. (Photo by Tiffany Woods)

Lessons learned from the years of work informed the creation of the new tool on the NANOOS site, Strub said. Those lessons included the results of Kuonen's research. Kuonen aimed to understand how fishermen use ocean forecasts to make decisions, why scientists provide the data they do in forecasts, and how both groups perceive risk and uncertainty regarding ocean conditions.

Kuonen, who graduated in marine resource management in 2018, interviewed 11 captains, four fishermen's wives and one industry representative. She also spoke with 17 scientists and managers from academic institutions and government agencies that provide weather forecasts and oceanographic data. Results indicated that more useful forecasts for ocean conditions could be created if data providers and the fishermen who use that information were to work together.

"The future of enhancing the usefulness of ocean condition forecasts ultimately lies with the data provider and end-user communities and their willingness to cooperate," she wrote in her thesis. "The genesis for this type of engagement could be cooperative research, where fishermen collect observations from the ocean environment and provide feedback to help validate and improve the models."

Results indicated that more useful forecasts for ocean conditions could be created if data providers and the fishermen who use that information were to work together.

SCHOLARS CORNER

Study: Prozac causes risky behavior in shore crabs

By John Kirkland, PSU Media and Public Relations, with additional reporting by Rick Cooper

Oregon shore crabs exhibit risky behavior when they're exposed to the antidepressant Prozac, making it easier for predators to catch them, according to a study from Portland State University (PSU).

The study, which was published in the journal *Ecology and Evolution*, was led by Joey Peters, who was an Oregon Sea Grant-funded Malouf Scholar at the time. His team's findings illustrate how pharmaceuticals in the environment could pose a risk to animals' survival.

The Oregon shore crab forages mostly at night, but researchers found that fluoxetine increased their foraging during the day, making them more vulnerable to predators. (Photo by Jerry Kirkhart via Flickr CC By 2.0)

Peters wrote in a blog post that he came up with the idea for the research while visiting the estuaries of Netarts, Nehalem and Yaquina Bays, where he noticed an abundance of shore crabs living in the mud or under rocks. Knowing that seawater in such areas had shown traces of such substances as caffeine and prescription medicines, Peters speculated that the crabs may also be exposed to human-produced contaminants from upstream.

"If these crabs are in contaminated estuaries," Peters wondered, "how would their behavior change, and how would this influence food web dynamics?"

Peters decided to focus his research on a single contaminant, Prozac, because "its psychoactive properties made it more likely that the crabs' behavior would be altered, even at low levels, with persistent exposure," he wrote.

In a laboratory, the PSU team exposed Oregon shore crabs to traces of fluoxetine, the active ingredient in Prozac. They found that the crabs increased their foraging behavior, showing less concern for predators than they normally would. They even did so during the day, when they would normally be in hiding.

They also fought more with members of their own species, often either killing their foe or getting killed in the process.

"The changes we observed in their behaviors may mean that crabs living in harbors and estuaries contaminated with fluoxetine are at greater risk of predation and mortality," said co-author Elise Granek, a marine biologist in PSU's Environmental Science and Management department.

Peters concluded that, because growing human populations in coastal zones means a likely increase in the use of antidepressants such as fluoxetine, leading to higher concentrations of such drugs in the marine environment, such pharmaceuticals "warrant consideration as an important anthropogenic stressor in need of further research."

Peters is pursuing a doctorate in ecology, evolution and marine biology at the University of California, Santa Barbara. His research is focused on how consumer-derived nutrients affect kelp production and species interactions.

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Director of Oregon Sea Grant: Shelby Walker | **Editor**: Tiffany Woods | **Designer**: Rick Cooper

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