

# SEA STAR



**WASHINGTON SEA GRANT**  
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Even as we at Washington Sea Grant have increasingly had opportunities to see each other and work together in person, it has been far too long since we've been able to bring the whole organization together. This made it an incredibly powerful experience to gather on the beautiful Skokomish lands and waters at the Alderbrook Resort in Union, Washington for a two-day retreat.



This retreat provided a time for us to reflect on where we are as an organization, to learn together, and to assess what we can do better. We acknowledged that we have been through a lot together and individually over the past 2.5 years — and we celebrated having emerged from this time as a stronger and more cohesive team. We reconnected or met each other for the first time in real life, and we got to know each other more deeply through personal (not professional) biographies that we all prepared in advance of the retreat. We also had some bittersweet farewells as we celebrated Nicole Faghin, who recently retired.

We spent most of the first day in a training with Pat Hughes from Trillium Leadership Consulting on the concept of “Gracious Space,” which is a leadership model to foster a safe environment in which members of a group can better collaborate. The tenants of Gracious Space can be applied to our work and daily life, and we identified some specific actions that we can take as an organization to adopt these principles. The second day, we had an insightful presentation on the broader human resources landscape and how it influences factors such as professional development, work satisfaction and retention. We finished with a productive reflection on our progress towards our WSG Diversity, Equity and Inclusion 10-Year Roadmap and identified some gaps in our approach to date. It was great to see some of our newer staff step up into leadership roles in several of these presentations.

My hope is that we all left the retreat reaffirmed in our commitment to the work of Washington Sea Grant — I know that I sure did.

A handwritten signature in black ink that reads "W. Russell Callender". The signature is written in a cursive, slightly slanted style.

W. Russell Callender, Washington Sea Grant Director

Cover: Joe Williams, front, and Darrell Williams with the Swinomish Indian Tribal Community's Fisheries Department dig clams on a beach in Skagit Bay as part of a survey that is conducted to estimate clam biomass. Photo courtesy of the Northwest Indian Fisheries Commission

# MONITORING THE DAMAGE IN THE HEAT WAVE'S WAKE

By Samantha Larson, WSG Science Writer

In June 2021, the peak of an unprecedented heat wave coincided with extremely low tides in the Salish Sea, wreaking havoc on intertidal ecosystems. As a “heat dome” settled above the Pacific Northwest for several days and the temperatures climbed well above 100 degrees Fahrenheit, many scientists, resource managers and members of the public reported significant numbers of dead and dying shellfish on intertidal beaches throughout the region. Species such as cockles; Olympia and Pacific oysters; and varnish, butter, and native littleneck clams — normally buried out of sight — popped to the surface in large numbers. Surfaced clams were observed to be gaping, a sign of stress, or had already died from the effects of the heat. Some Pacific and Olympia oysters initially appeared to survive the heat but died in subsequent days, perhaps weakened by the extreme temperatures and unable to recover.

These observations raised alarm among shellfish growers and marine ecologists, especially given the ecological, cultural and commercial importance of these species. “This is possibly the first documented shellfish mortality event of this magnitude in modern times,” says Teri King, aquaculture and marine water quality specialist at Washington Sea Grant (WSG). “In some places, the effect is similar to a forest fire that has swept through the intertidal at the peak of the heat each day, for six days, killing much in its path.” The aftermath of the heat wave presented a critical opportunity to document and understand these impacts. Given this, WSG stepped in with rapid funding to support two regionwide surveys. The results from one of these studies were published in the journal *Ecology* in June 2022.


“After the heat wave, it quickly became apparent that we should try to capture the impacts before they were literally washed away,” says Wendel Raymond, a researcher at Friday Harbor Laboratories and lead author on the *Ecology* paper. The research team, which included King of WSG, sent out a survey to a network of collaborators across the region — including tribes, state and federal agencies, academia and nonprofits — to assess the post-heat wave condition of nearshore invertebrates across the Salish Sea. Participants were asked to apply a five-point rating system to evaluate the conditions of organisms at a particular location. In total, the researchers gathered 203 observations from 108 unique locations, covering 24 species.

“The strength of this study and what it really highlights is the value of local knowledge and also the importance of understanding natural history,” says co-author P. Sean McDonald, a University of Washington associate teaching professor in environmental studies and aquatic and fishery sciences.

According to the team’s results, an organism’s location and ecology contributed to how it was impacted. For example, intertidal organisms on the outer coast generally fared better than ones on inland beaches because the low tide on the outer coast occurred four hours earlier (when it was cooler). Species found higher in the intertidal were in worse condition than species found lower.

While this study is the first comprehensive report of the impacts of the 2021 heat wave, it is not the only research on the event. The Multi-Agency Rocky Intertidal Network (MARINe) collects long-term monitoring data at sites along the entire west coast of North America. MARINe had completed annual surveys in Washington shortly before the heat wave. After the extreme weather event, WSG funded MARINe to resurvey eight sites within the Salish Sea where the impact was thought to be greatest.

Comparing the pre- and post-heat wave surveys revealed significant shifts in community structure at most sites. This included large declines in rockweed, which is an important component of rocky intertidal communities because its canopy provides shelter for organisms including chitons, snails, crabs, sea stars and other species of algae. “The most heavily impacted areas were those where exceptionally high air temperature was coupled with extremely low, mid-day tides,” says Melissa Miner, a MARINe researcher from the University of California, Santa Cruz.

MARINe will continue to survey these same sites moving forward, which means the researchers will eventually be able to provide a longer-term perspective on the ecosystem recovery from the traumatic event. “As an organization, we are really interested in the long-term trends,” says Pete Raimondi of MARINe, who also works for the University of California, Santa Cruz. “The key thing will be going back over the years to come and seeing where these communities end up.” 

Below: Dead oysters seen along a shoreline in Washington state, following a record heat wave in summer 2021. Photo by Blair Paul.



## Green Mexican-Style Ceviche

Throughout the summer, Washington Sea Grant (WSG) shared recipes to highlight local seafood on our blog — such as this recipe for Mely Martinez’s Green Mexican Ceviche from the food blog [Mexico in my Kitchen](#). Mely’s recipe utilizes barramundi fish, also known as Asian sea bass. If you want to try this recipe with a locally caught fish, WSG recommends using Dover sole, similar in flavor and texture to the barramundi. This great substitute is an underutilized and sustainable fish found in Washington waters. In the U.S., sole is a smart choice due to its responsible harvest under the current regulations and guidelines.

### Ingredients:

1 lb dover sole	½ cup chopped cilantro
½ cup lime juice	1 teaspoon Mexican Oregano
4 medium size tomatillos	8 olives
½ medium size white onion	2 tablespoons olive oil
2 serrano peppers or 1 jalapeño	Salt and pepper to taste
	1 avocado

### Serving:

Corn tostadas or saltine crackers

Slices of radishes or tomatoes for garnish

### Steps:

*Step One:* Remove fish skin with a boning or paring knife. To do this, put your filet on the cutting board with the skin side down, and make a cut to separate a small flap of the skin in one of the corners closest to you. Grab the flap, and slide the knife between the skin and the filet. Make sure to slide the knife all the way under the filet, trying not to leave any of the fish meat on the skin.

*Step Two:* Cut the fish in small ½-in. cubes and place in a glass bowl. Season with salt and add the lime juice. Cover the bowl with plastic wrap and place in the fridge, and marinate for at least 30 minutes. Meanwhile, prepare the rest of the ingredients.

*Step Three:* Finely chop the tomatillos, onion, peppers, and olives. Mix in a large bowl with the cilantro, Mexican oregano, and ground black pepper.

*Step Four:* After 30 minutes, remove fish from the fridge and gently toss with the ingredients into the large bowl. Just before serving, dice the avocado and toss into the ceviche, drizzle the olive oil, and taste to add more salt if needed. Serve in cups or small bowls, garnish with some radish slices or tomato slices. Enjoy!

# “WHAT WE LOVE TO DO”: NOAA SCIENCE CAMP CREATIVELY IMMERSSES KIDS IN MARINE SCIENCE

In the third consecutive summer of pandemic-related closures, NOAA Science Camp brought new programming to the beach during an extreme low tide

By Ashli Blow, WSG  
Communications  
Specialist



There was ample opportunity to view marine creatures during the low tide event at Golden Gardens.

Check out a video about the low tide event on our YouTube page: “Exploring low tide with NOAA Science Camp”

[youtube.com/watch?v=L6tv5Tld-X8](https://youtube.com/watch?v=L6tv5Tld-X8)

When Puget Sound receded during an extreme low tide in June, Maile Sullivan, Washington Sea Grant (WSG) education specialist, and a team from NOAA Science Camp and the Seattle Aquarium put on their boots and headed for the shores of Golden Gardens Park in Seattle.



The low tide had uncovered an array of wild-life that we don’t get to see every day: sea stars, nudibranchs, baby sculpins, anemones. This potential for tide pooling brought many marine enthusiasts to beaches across the state — and this increased foot traffic brought on potential harm for the soft-bodied organisms that were exposed to the air. This prompted NOAA Science Camp to partner with beach naturalists from the Seattle Aquarium to teach people how to responsibly explore creatures in the eelgrass and rocky intertidal area during low tide.

Sullivan has coordinated NOAA Science Camp for nearly 15 years. The camp historically offered two week-long sessions for middle and high schoolers with hands-on learning experiences. Due to the pandemic, WSG couldn’t hold an in-person camp for the third year in a row. This summer, Sullivan seized the opportunity to work with partners like the Seattle Aquarium, whose naturalists regularly teach beach etiquette during low tide events.

That day at Golden Gardens, as beach naturalists gave tours of the tidepools, Sullivan and NOAA scientists took water samples and set up a table with a microscope to show organisms like phytoplankton to people of all ages.

“Since we couldn’t host camp again this summer, WSG was looking for community partners to get out with and share with people why science is cool. We worked together to educate people on what was in the tidepools and show them what they can’t see with the naked eye,” said Sullivan. “By being here, we’re hoping to encourage kids to sign up for camp in the future. In the meantime, we’re getting out into the field, which is what we love to do during the summer.”

The pandemic changed NOAA Science Camp as WSG knew it for two decades and, like many things, in 2020 it went virtual. In addition to hosting a variety of online webinars in partnership with NOAA Live!, Science Camp also worked with scientists to record videos of themselves introducing various at-home hands-on activities, so that the students could then work on science experiments at their own pace. Then, at the end of each week, students had an opportunity to discuss their experiments with the scientists in a live video chat.

In 2021, her team set out to do the same thing, but as the year progressed they became more aware of Zoom burnout. Instead of a live camp held on Zoom, Sullivan’s team developed an asynchronous



curriculum with curated NOAA activities that explored climate change in warming oceans, food habitats in marine mammals, and more. Additionally, Sullivan collaborated with the University of Washington's Disabilities, Opportunities, Interworking, and Technology (DO-IT) Program on a seven-day workshop featuring virtual field trips that took kids on a digital journey of shorelines, tours of NOAA Labs, and a fish collection.

This summer presented unique challenges in programming. Over winter 2021–2022, the omicron variant surged, and video fatigue was worse than ever. Without a clear indication of COVID trends, Sullivan was unable to plan an in-person Science Camp for another year. Sullivan and her team adapted again, this time turning to community partners.

“Before COVID, NOAA Science Camp was a well-oiled machine. But the past couple of years have really given us an opportunity to think about how to reach new audiences, work with new partners, and make our programs more accessible,” Sullivan said.

By working with partners like the Seattle Aquarium, NOAA Science Camp could meet people where they already were going – like Golden Gardens during the low tide. Not only do such outreach events bring visibility to NOAA Science Camp, but both parents and kids get to experience a day of marine magic together.

“We are all very hopeful that our traditional NOAA Science Camp will be back in action next summer,” Sullivan said. “But in the meantime, we are having fun getting our feet wet and exploring our incredible coastline with the community.” 

# MAKE WHALE FOR CHANGE: NEW RESEARCH FOR WHALE WATCHING IN THE

New research finds that rules to protect endangered southern resident killer whales could mean less demand for commercial whale watching — but tour operators have options for making up the difference



By Maddie Hansen,  
WSG Science Communications Fellow

**T**he Salish Sea is a beacon for whale enthusiasts: it is possible to view many types of whales in the stunning landscape including minke whales, gray whales, humpbacks and orcas. As a student studying at the Friday Harbor Labs, I had the chance to see orcas and several porpoises; the first time seeing a whale breach the surface is electrifying, and I will always remember the feeling. Tourists flock from all over the world to pay for this type of experience, especially to see the famous Southern Resident killer whales.

However, the Southern Resident population has been steadily declining, with only 73 individuals estimated left. This trend prompted a state-commissioned task force to address the problem, which led the Washington State Fish and Wildlife Commission to adopt new rules in December 2020 that affect commercial whale-watching companies. Because of these rules, in summer when the whales are more active in the Salish Sea, there are a limited number of boats and limited times that whale watching expeditions can operate in the water. The purpose of these rules is to increase protections for these beloved whales, but the context of Salish Sea whale watching means that the rules may have other effects as well. With funding from Washington Sea Grant, a team of researchers led by Hem Nalini Morzaria-Luna, a marine ecologist with Long Live the Kings, and Melissa Knox, an economist at the University of Washington (UW), studied the potential economic impacts of these rule changes. The researchers found that the rule change could cause a decrease in demand for whale

watching — but it also concluded that whale watching operators have options for maintaining their clients by diversifying the types of whales that they focus on.

“The goal of the project was to measure how much consumers were willing to pay for whale watching based on rule changes,” explains Abby Schamp, a graduate researcher within the UW School of Economics who carried out the study. Because of the difficulty of in-person research during the COVID-19 pandemic, Schamp and her colleagues conducted an online survey to gauge how consumers would react to the rule change. This type of experiment is called “discrete choice” and is used in many different types of research — on everything from clothing to cereal. The team placed an advertisement on Facebook to ask whether users were interested in orcas, which then led respondents from all over the country to the survey, which was filled with questions based on different aspects of whale watching. The survey included a background paragraph on whales in the Salish Sea, whale watching, and the rule changes to provide context.

The survey queried respondents about potential attributes of whale watching, including three key attributes: how close they would be able to get to the whales, how many boats would be in the water, and what types of whales they would see. Of these, viewing distance to whales was the most important to the respondents. The survey results show that a change in distance from 300 yards to 200 yards could yield a predicted seven percent decrease in demand for the industry.

For companies operating in the Salish Sea,

**“The goal of the project was to measure how much consumers were willing to pay for whale watching based on the rule changes.”**

**ABBY SCHAMP,  
UW SCHOOL OF  
ECONOMICS**

# NEW RULES SALISH SEA

this is not ideal. However, the type of whale viewed did not negatively affect the demand, so companies could retain their customers by shifting their focus from the Southern Residents to whales such as humpbacks or the non-endangered Bigg's killer whales. The other good news for whale watching companies is that demand stays constant for the majority of their customers: "Most customers will go whale watching under any attribute circumstances," Schamp says. It's the tourists in the margins that drive the changes in demand.

This research is important because the effects of rule changes on whale watching in general have been fairly uncertain — especially in situations where there are multiple types of whales to view. The Bigg's killer whales and Southern Resident killer whales look very similar to most people — and there are also humpbacks, minke, and porpoises swimming the Salish Sea. Second to viewing distance, the researchers found that patrons tend to care more about the number of boats in proximity to them; most care about one of these attributes enough to pay a higher price.

Not only is this project impactful for people locally, it is also valuable as a framework for future conservation research. Whale watching is a popular and culturally significant activity for those in the Salish Sea and beyond; according to a 2018 report from *Earth Economics*, tours in San Juan County alone generated approximately \$216 million of economic activity.

The Salish Sea is a beautiful region teeming with so much marine life that anyone is sure to enjoy a trip regardless of the rules governing the whale watching industry. I know that each time I have seen a whale — whether from a boat or from shore — I have treasured the experience. 🌿



# WORKING TOGETHER TO MONITOR DUNGENESS CRAB



Researchers from the Washington Department of Fish and Wildlife pull up a crab trap.

**Despite the fact that Dungeness crab is the most profitable commercial fishery in the Washington, until recently there has been no coordinated effort to understand the species' behaviors and population patterns across the state.**

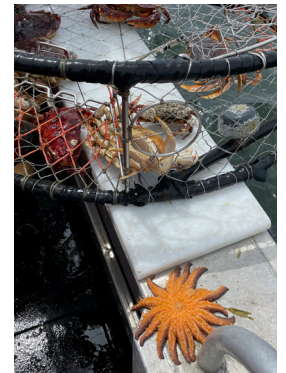
**The Pacific Northwest Crab Research Group connects fisheries management scientists and resource managers, facilitating collaboration and information sharing**

*By Samantha Larson, WSG Science Writer*

“Male Dungeness, 173, 1-2!” After calling out the specs, Emily Buckner — the program coordinator for the Pacific Northwest Crab Research Group (PCRG) — swiftly tosses the wriggling crab overboard and then reaches back into the pot to pull out another. Today, Buckner’s job entails going out with a small team on a Washington Department of Fish and Wildlife research vessel to survey the adult crab population in Hood Canal ahead of the recreational crabbing season. For each crab that they catch, the researchers use visual cues to identify the animal’s gender and species; a caliper to measure the length of the carapace (in millimeters); and then work their fingers underneath the animal’s clawed arm to gently pinch its shell to determine hardness. The hardness measurement that Buckner just called out, 1-2, represents the ideal condition for harvest with a clean and fully hardened shell. A measurement of 1-1 would denote that it’s preparing to molt while a measurement of 3-1 would mean that the shell is very soft, meaning that the crab had molted recently and would not be suitable as a “keeper.”

Despite the fact that Dungeness crab is the most profitable commercial fishery in Washington, until recently there has been no coordinated effort to understand the species’ behaviors and population patterns across the state. Management of the fishery is based on the catch rates from previous seasons — methodology that uses only a single data source — and is shared between multiple state and tribal agencies. Recognizing the knowledge gaps and the number of actors involved in the fishery, in 2018 a consortium of scientists, resource managers and community members formed PCRG, aimed at bringing groups together in a collaborative research effort. Given that its participants come from many different organizations, PCRG saw the importance of having someone at the center of it all to facilitate coordination and planning — Buckner now serves in this role, as PCRG’s sole official staff member.

In this position, Buckner advances PCRG’s goal — to address critical data gaps to promote and support the sustainable management and harvest of Dungeness crab — by coordinating activities, such as writing





proposals and standardizing data collection methods. Washington Sea Grant (WSG) has been behind Buckner's involvement with PCRG from the beginning. In fact, she first worked for the organization as a 2020 WSG Hershman Fellow. Over the course of her Hershman Fellowship, Buckner researched what characteristics were key to other successful collaborations similar to PCRG. "One of the key recommendations I found was having a central node to keep people on task," Buckner explains.

Recognizing the importance of continuity, WSG provided PCRG with a program development grant to keep Buckner's work going after her fellowship ended. Now, PCRG — and Buckner's job — have been permanently incorporated into Puget Sound Restoration Fund. "Washington Sea Grant's role in the Pacific Northwest Crab Research Group was transformational," says Jodie Toft, deputy director of Puget Sound Restoration Fund.

Of course, the science itself has also held the group together. WDFW has been conducting pre-season crab surveys, such as the ones in which Buckner participates, for decades and tribes that manage Dungeness fisheries also conduct their own ongoing pre-season surveys. However, each group conducts these in slightly different fashions, meaning that it's difficult to draw big-picture conclusions from the widely varying data collected. "One of our hopes is that we can get all of the co-managers to do similar types of surveys," Buckner says. "We're trying to create more collaborative datasets that are using a standardized method."

PCRG also aims to collect standardized data earlier in the crab life cycle. Buckner coordinates a statewide larval crab study with participants across Puget Sound and coastal Washington using "light traps" — contraptions that use light to attract and then trap organisms. PCRG is currently focused on using the traps to estimate the number of Dungeness megalope, which is one of the crab's early life stages.

For example, the Port Gamble S'Klallam Tribe collects larval data in north Hood Canal. After having spent the morning surveying the adult crabs on the WDFW boat, Buckner heads over to the Port Gamble

S'Klallam Tribe's site to see the day's light trap catch. The researchers pull the contraption out of the water and begin to sort the peppercorn-sized creatures within. "It can be pretty time-consuming if there are a lot of megalope in there," says Jason Haveman, the shellfish program manager for the Tribe. During the height of the season, there can be as many as 2,500 megalope within this one trap. Today, the count is 155.

It will take these megalope about four years to grow to a size big enough to be caught and kept by a crab fisher. Eventually, collecting this larval data may help the crab fishery managers prepare for what's to come. "If there's a year with low larval supply, that could be bad for future adult abundance — the goal is that we would be able to give fishermen a heads up," Buckner says.

Commercial crabbers in Washington have been caught off guard by changes to the Dungeness populations over the last couple of decades. "The Hood Canal Dungeness population has experienced some big swings — boom and bust cycles — but we don't know why," Haveman says.

In south Puget Sound, the Dungeness fishery has been closed since 2018 due to low population numbers. "The decline in crab in south Sound really worries people. It was a big motivator for starting PCRG," Buckner says. "We want to be able to understand and anticipate." 🌱



Emily Buckner, former WSG Hershman Fellow and current program manager for the Pacific Northwest Crab Research Group.

**Eventually, collecting this larval data may help the crab fishery managers prepare for what's to come.**



A Dungeness crab in the megalope phase.

# FIELD NOTES



Washington Department of Fish and Wildlife recognized WSG Crab Team — including **Kate Little, Emily Grason, Sean McDonald, Jeff Adams, Alex Stote** and **Amy Linhart** — as the organization of the year. In their award announcement, WDFW wrote, “The Crab Team has achieved a much greater scale of monitoring and community outreach than would otherwise be possible and has expanded what we know about native and other non-native organisms that live in salt marshes and pocket estuaries.” Our team is deeply humbled by the award, but we know it takes all of us – WSG, WDFW, and community partners – to respond to our state’s challenge. Also, Crab Team veteran Pete Haase was recognized as volunteer of the year.

WSG is thrilled to welcome several new staff members. **Michelle Lepori-Bui** joined the team as a marine water quality specialist; **Ashli Blow** as a communications specialist; and **Tracey Fugami** as a human resources specialist. **Sam Cheplick** also joined WSG on a limited term as a socioeconomic environmental outreach coordinator. Welcome aboard!



The Washington Coastal Resilience Project released a new report that evaluates the trade-offs associated with four commonly used approaches for preventing damage due to coastal hazards: building hard defensive structures, using soft shore stabilization techniques, using accommodation techniques that decrease the impacts of flooding as it occurs, and removing or avoiding the development of homes and infrastructure from hazardous zones. The report authors were **Ian Miller**, WSG coastal hazards specialist; **Nicole Faghin**, who recently retired as a WSG coastal management specialist; and **Sydney Fishman**, shoreline armoring planning associate at the Washington Department of Ecology.



**Nicole Faghin** retired after serving as a WSG coastal management specialist since 2012. During her time at WSG, Nicole was an invaluable resource to planners, decision-makers and community members as she fostered partnerships and shared information to make Salish Sea coastlines more environmentally-friendly and resilient. She says she is particularly proud of her work with the Washington Coastal Resilience Project and on the WSG Diversity, Equity and Inclusion Roadmap. “I truly think I had the best job ever for the last 10 years,” she says. We will miss you, Nicole, but look forward to hearing of your adventures out on the hiking trails and in your kayak!



The Resilience Action Demonstration Project, completed in early 2022, laid a foundation for a team to help Washington’s coastal communities be better prepared for floods, erosions and other coastal hazards. The two-year, NOAA-funded project was a collaboration between WSG and the Washington State Department of Ecology that piloted a multi-organizational team that provided hands-on assistance to scope projects and secure funding for coastal hazards resilience efforts. **Jackson Blalock**, a community engagement specialist, was the WSG lead on the project. Although the pilot project is complete, the work continues.

This summer, WSG participated in NOAA Sea Grant’s Community Engaged Internship program for undergraduates, designed for students from underrepresented and Indigenous communities. We are so pleased to have **Zachary Levitan** as our first intern through this program. Zachary worked with crab team specialist **Alex Stote**, aquaculture specialist **Nicole Naar** and community engagement specialist **Jackson Blalock** on projects related to Washington’s outer coast.

Congratulations to UW School of Marine and Environmental Affairs graduates **Mitchell Hebbener, Caroline Potter** and **Kelsey Rudes**, who were selected as 2023 Knauss Fellows! They will spend the year working in an executive or legislative office in Washington, DC. We can’t wait to see what you accomplish. Also congratulations to UW School of Aquatic and Fishery Sciences graduate student **Kristin Privitera-Johnson**, who was selected as a 2022 National Marine Fisheries Service-Sea Grant Fellow.

WSG Crab Team out in the field. From left to right: Amy Linhart, Sean McDonald, Alex Stote, Jeff Adams, Emily Grason and Kate Little.



# DEBRIS FROM SHELLFISH AQUACULTURE FINDS NEW LIFE AS CRAB GAUGES

**WSG supported an innovative pilot project repurposing marine debris, transforming it into a useful tool for recreational crabbers**

By Benjamin Haagen,  
WSG Science Communications Fellow

**A**quaculture in the Salish Sea brings both benefits and challenges to coastal communities and ecosystems. The yellow aquaculture rope commonly used in shellfish farming is contributing to a key environmental issue facing the world today: plastics pollution. This issue is being addressed in a novel way by Nicole Baker, founder of Net Your Problem in Ballard, and the lab of Nicole Hoekstra, who is a plastics and composites engineer at Western Washington University: the team is giving new life to the yellow rope that washes ashore by upcycling it into crab gauges.

Plastics pollution is a complex issue that is exacerbated by the material's whole life-cycle, from the production of the material, to the misuse of plastic products, to the lack of proper disposal and removal from the environment. Additionally, plastic materials are typically made using fossil fuels, and roughly 14 million tons of plastic inevitably ends up breaking down in the ocean into smaller and smaller "microplastics" that harm marine life.

Crab gauges are used to measure the width of the carapace (the upper shell) of crabs caught in fishing traps to assess whether they meet size requirements set by the Washington Department of Fish and Wildlife in order to keep the crab. If the captured crab does not meet this size requirement, which is species- and region-specific, it is released. Turning old aquaculture rope into a tool that is essential to a local fishery offers a sense of symmetry: "It's a nice circular design where you've collected debris from a fishing industry and

are putting it back into the same industry," Hoekstra says.

The yellow rope is first collected through community beach clean-ups led by project partners, such as the Twin Harbors Water Keepers in Southwest Washington. The project team began transforming the gathered rope into crab gauges in a pilot project in December 2021. Washington Sea Grant was an early supporter of the pilot project and quickly distributed the gauges to the boating community through outreach events.

Students working with Hoekstra are continuing to expand on the crab gauge project by designing and manufacturing molds for other outreach materials for Washington Sea Grant. Clam gauges, which serve the same purpose and function similarly to crab gauges are being considered for Washington Sea Grant to share at outreach events around Western Washington. Students are also beginning to develop rangefinders for boaters to keep safe distances from whales in the Salish Sea and they recently connected with a start-up company based in Everett to manufacture game boards for a new ecology-focused board game.

This work is also funded by the NOAA Marine Debris Program, headed by Pacific Northwest Regional Coordinator Andrew Mason. 



Before the yellow rope went through the transformation. Photos by Taylor Kelliher.

Below: Aaron Barnett, center, with a team from Western Washington University.





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**SAVE THE DATE**  
**MARCH 6 AND 7, 2023**



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