WASHINGTON SEA GRANT

SEA STAR

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Restoring tradition, place and connection through a clam garden

The Swinomish Indian Tribal Community's clam garden reclaims an ancient Indigenous practice on ancestral land

By Samantha Larson, WSG Science Writer

From one set of hands to another, each rock was passed down the human chain from the beach to the sea. Some of the rocks could be held in one palm and easily passed. Others were the size of small boulders, requiring strong posture and extra exertion to settle the rocks into their place in the wall. Together, the Swinomish Indian Tribal Community and guests created history on the beach. In two-days, about 60 people worked to build a wall in the intertidal to become the first modern-day clam garden in the U.S.

After years of research and planning, the Swinomish Indian Tribal Community laid the first rocks of their clam garden on Kiket Island in August 2022. On the first day, Swinomish Tribal members worked to assemble the wall's foundation. On day two, the Tribe invited members of their broader community to participate in the effort, including funders and partners, such as Washington Sea Grant (WSG). "Gathering like this is important to us," said the late Larry Campbell (wanaseah), a Swinomish tribal Elder and community health specialist. "I want to thank each and every one of you that is here to witness our work. We hope we can all develop this process so that it can become a model for the rest of the world."

Clam gardening is an Indigenous practice among Northwest coastal communities for more than 4,000 years in which habitat modifications sustainably increase shellfish production and speciesdiversity. As the oceans continue to warm and grow more acidic, clam gardens have the potential to mitigate stressors in the salt water, and strengthen community resilience by securing connections and bolstering access to traditional foods that are vulnerable to these environmental changes. The clam garden's rock wall will create an intertidal terrace in which marine life can find nutrients and shelter. "Ecological studies have documented significantly higher densities of native littleneck and butter clams in historic clam gardens compared to unmodified beaches," explained Courtney Greiner, a marine ecologist for the Swinomish Tribe.

Cover and below: The Swinomish Indian Tribal Community and guests building the clam garden wall. Photos courtesy of the Northwest Indian Fisheries Commission.

Despite thousands of years of care and observation, social factors including colonialism, forced assimilation and shoreline development threatened these and other cultural practices, with impacts on communities and coastal landscapes over the past century. While there were once hundreds of clam gardens along the coasts from modern-day Alaska to Washington, over the years many of them fell fallow as Indigenous caretakers were displaced or their cultural and spiritual practices were banned.

For many members of the Swinomish Tribe, building a clam garden not only revives a traditional practice innovated by their ancestors, but is also a powerful process of healing from the social and cultural harms of the past hundred and fifty years. Kiket Island, where the clam garden is now located, was part of the land reserved by the Swinomish people when they signed the 1885 Treaty of Point Elliott. However, the uplands fell into non-native ownership and Tribal members were aggressively deterred from accessing Kiket's shores. "I used to come out here to dig clams in the 1980s," one Swinomish Tribal member recalled. "They had guns and big dogs and chased us away all the time."

In 2010, the Swinomish Tribe worked with the Washington State Parks and Recreation Commission to jointly acquire the upland area — what's now known as Kukutali Preserve. The stewardship of Kiket Island is once again in the hands of Tribal members.

When the Tribe began to consider building a clam garden, the area became one of several locations under consideration. With funding and research support from WSG, the Tribe's Fisheries Department and Community Environmental Health Program gathered guidance from Indigenous knowledge holders and clam garden researchers to help determine which site would maximize the ecological and socio-cultural benefits of the clam garden. "The Swinomish Indian Tribal Community

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Are moon jellies eating up all the zooplankton?

By Andrea Richter-Sanchez, WSG Science Communications Fellow

Have you ever seen a jellyfish floating in Puget Sound? Chances are, it was a moon jellyfish. Moon jellies, or *Aurelia labiata* have had large blooms in the past several years.

Moon jelly aggregations normally form in the summer in Puget Sound. However, researchers started to notice an intensification of the blooms after the marine heat wave in 2015-2016. The heat wave not only coincided with more aggregations, but the aggregations persisted for a longer period of time. Moon jellies are carnivorous, and eat tiny zooplankton including the larvae of mollusks, crustaceans and small fishes. Researchers wondered whether the increase in moon jelly abundance is altering the ecosystem as the "jellies" gobble up the zooplankton in Puget Sound. With funding from Washington Sea Grant, Haila Schultz — a doctoral student in oceanography at the University of Washington (UW) — set out to study these potential impacts.

To start off the project, Schultz collaborated with Rus Higley, director of Highline College's Marine Science and Technology (MaST) center. Schultz used the center's water tanks for the lab component of her research. Each water tank was set up to have a different number of moon jellies inside. They put the same amount of zooplankton, a primary food source for moon jellies, in each tank. They chose copepods, which are a type of zooplankton that are prevalent in Puget Sound. In each tank, the moon jellies ate copepods for a total of two hours. The water was then drained from the tanks in order to collect the remaining copepods. Results showed that in the tanks with a lot of moon jellies, up to 75% of copepods were consumed.

After completing the preliminary lab work, Schultz was ready to go into the field to test whether her lab results would mimic what happens in the real world. In addition to Schultz's advisor, Julie Keister, who is an affiliate at the UW School of Oceanography and program manager at NOAA, both Correigh Greene from NOAA Northwest Fisheries Science Center and Kathryn Sobocinski from Western Washington University were collaborators who helped design the project. The field work was completed in two embayments with moon jellies: Quartermaster Harbor in Vashon Island and Sinclair inlet near Bremerton. They also took samples in inlets with no moon jellies: Budd inlet and Eld inlet. They dropped a CTD — an instrument that

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As dense aggregations of moon jellyfish form in Puget Sound, researchers study the ecosystem-wide impacts

Moon jellyfish *Aurelia labiata.* Photo: Shutterstock.

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demonstrated a model to integrate social and ecological information with Indigenous knowledge," said Melissa Poe, a social scientist at WSG who collaborated on the project. "This is a practical and transferable tool for other place-based restoration decisions that centers community priorities and leadership, which in this case includes increasing access to ceremonial and subsistence foods, as well as sharing knowledge across generations within the community, among other goals."

This collaborative approach that embraces Indigenous knowledge and priorities was important to many Tribal members and can be a model for other efforts. "We are working to blend the Western science and the Tribal science," said Campbell. "The tribes don't need to be isolated. They need to be part of the bigger questions and the bigger work."

In late 2021, the Swinomish Tribe received funding from the NOAA Saltonstall-Kennedy Competitive Grants Program and from the Northwest Climate Adaptation Science Center to begin building the clam garden. It began the following August with a delivery of 35 tons of rocks onto Kiket's shores. All of the rocks had been collected from the Swinomish's ancestral territory. "It was important to us that the rocks come from our ancestral territory. This was much bigger than the reservation — the reservation was where we were moved once everything was stolen from us," said Swinomish Vice Chair Alana Quintasket (siwəlcəʔ). "This is about restoring our relationships with faith, and with place."

After the work of moving the rocks that day, the people gathered in a circle to share their reflections on the experience. The feelings of hope, inspiration and connection were palpable. Members of Malahat First Nation were present, in part to learn about the process as they consider restoring a clam garden of their own. "There are no words for what's going on today. This is only the beginning," said George Harry, Malahat Chief. "The knowledge is coming back. The language is coming back. Everybody left their hearts on the beach, and our ancestors are watching us."

In the time since the August event, Swinomish members and their community have continued to build and tend to the clam garden, and it has continued to be a space for community and connection. Many Swinomish members are hopeful this arc of repairing and rebuilding will extend well into the future. For example, the Swinomish Tribe plans to host a Salish Summit to gather Indigenous aquaculture practitioners from across the Pacific Basin. The Summit is part of the Indigenous Aquaculture Collaborative, a community of practice that is coordinated by Melissa Poe of WSG.

"What you accomplished today is something that's going to be here for generations. For thousands of years. You created history," said Steve Edwards, Chairman and member of the Swinomish Tribe. "Something was taken away, many generations ago, and you've restored it."

Photo courtesy of the Northwest Indian Fisheries Commission.

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Newly expanded an on the Half Shell' te oyster in the Pacific Northwest

Generations of oyster farmers have weathered many challenges to continue the harvest. Their stories are braided together with significant history that have defined the modern-day Pacific Northwest: early harvesting practices of Native Americans, the arrival of white settlers intent on capitalizing on the rich natural resources, World War II and its effects on Japanese Americans, the Fish Wars of the 1970s that led to the landmark court cases that affirmed rights held by treaty tribes in Washington.

The second edition of *Heaven on the Half Shell*, released by University of Washington Press in April 2023, offers a thoroughly researched and richly illustrated history of those significant events noted above and many more that tell the story of the Pacific Northwest's beloved bivalve, the oyster. Starting with the earliest evidence of sea gardens and clam beds from 11,500 years ago, this book covers the history of oyster cultivation through contemporary aquaculture in coastal Washington, Oregon, British Columbia, northern California, and southeastern Alaska. The book was produced in partnership with Washington Sea Grant (WSG).

WSG and WestWinds Press published the first edition in 2001. "It all started when oyster farmer Bruce Brenner came to us with his father's scrapbooks," says co-author David George Gordon, who served as WSG science writer from 1998 to 2012. The scrapbooks contained newspaper clippings and other tidbits assembled during Earl R. Brenner's 60-plus-year career as an oyster grower with the J.J. Brenner Oyster Company, which is the oldest continuously operating oyster enterprise on Puget Sound.

"As we studied the Brenner scrapbooks, we became painfully aware of how much of the oyster industry's

Co-authors MaryAnn Barron Wagner, David George Gordon and Samantha Larson.

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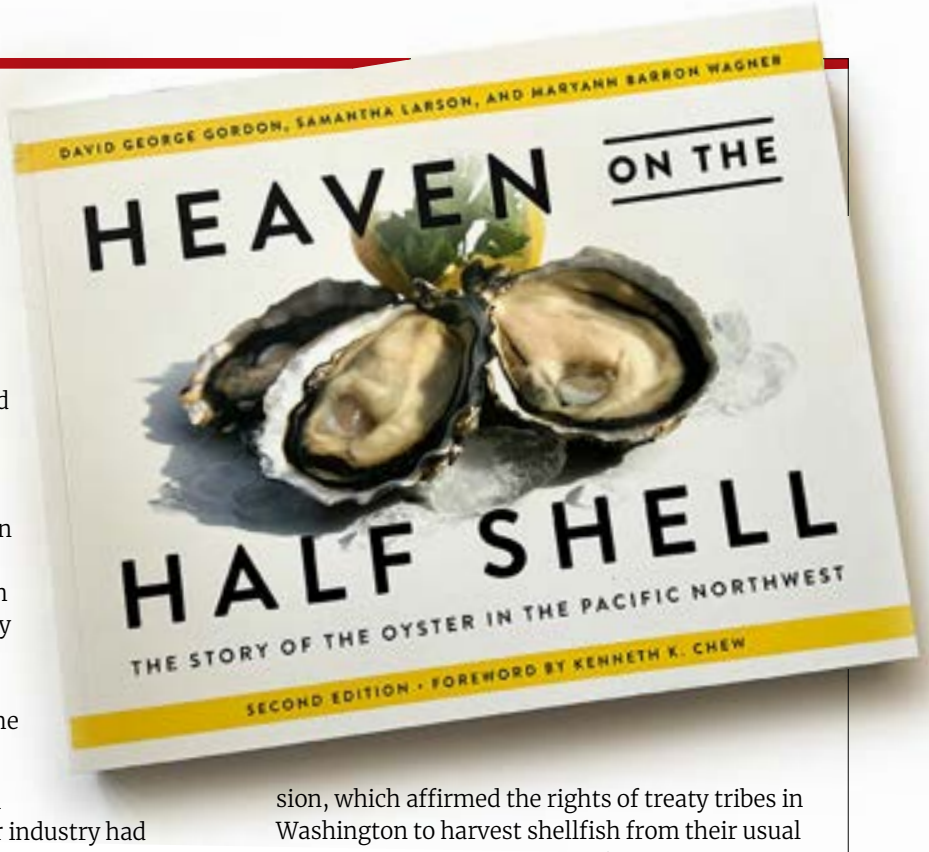

The second edition of this classic text is now available in bookstores

Norio Mitsuoka farming oysters circa 1937 in Nemah, Washington. Photo courtesy of the Densho Digital Repository.

record of achievements had already been lost, largely due to neglect. Many of the industry’s most distinguished historians, the sons and daughters of the pioneering oyster farmers, had passed away in recent years,” Gordon says. Gordon and the other co-authors of the first edition — Nancy E. Blanton and Terry Y. Nosho — vowed to do everything in their power to record that history. And so, the first book was born.

Nearly 20 years later, Gordon realized how much the oyster industry had changed since the book’s first publication. Emerging issues, such as ocean acidification and heat waves, now threaten growers’ crops. At the same time, some of the hurdles faced by the previous generation had been overcome: for example, getting invasive spartina under control, and meeting the rising demand for oysters on the half shell through the development of triploid oysters, and growing techniques, such as flipped oysters.

One of the recipes included in the book is for teak smoked Sequim Bay oysters with lavender, provided by Jamestown Seafoods of the Jamestown S’Klallam Tribe. Photo by Meera Rajagopalan.

Gordon partnered with Samantha Larson, the current WSG science writer, and Mary-Ann Barron Wagner, assistant director of communications at WSG, to bring the book up to speed in a second edition. Crafting a new edition presented the opportunity to expand upon important history that wasn’t fully covered in the first book, and also allowed the authors to include more expertise, quotes, anecdotes, and photos of women and people of color throughout the text.

“We greatly expanded and centralized our telling of Native American history,” says Larson. “We added context about the Chinook, Chehalis, Shoalwater Bay, and other Tribes and how those people relied on the fruits of Willapa Bay and Puget Sound since time immemorial.” The new edition also covers the landmark 1994 Rafeedie Decision, which affirmed the rights of treaty tribes in Washington to harvest shellfish from their usual and accustomed areas. The Rafeedie Decision subsequently led to settlements through which tribes bought and leased tidelands — which contributed to many tribes in the state owning and operating commercial shellfish farms today.

The second edition is about twice the length with double the number of photos from the first edition, and is chock-full of new “oysterabilia.” In addition, the authors worked with Pacific Northwest chefs and foodies to find interesting and delicious ways to prepare oysters.

“Overall, the book shares 22 recipes, embracing both traditional and contemporary ways of preparing oysters,” says Wagner. “The recipes include styles of cooking oysters that have gone out of fashion but still taste good and are worthy of remembering.” For example, the book includes a mid-century recipe for pan seared roasted oysters by Aunt Gert of Hoquiam, and an 1885 recipe for native Olympia oysters from the very first Northwest cookbook. Modern recipes include contributions from celebrity chefs such as Ethan Stowell and Renee Erickson as well as innovative contributions from tribal communities, shellfish growers and restauranteurs.

Heaven on the Half Shell tells a story of place, people, nature and food, and illustrates how those elements have changed and shaped the industry over time. If there is a theme of the book, it’s the adaptability and evolution of the people who farm, harvest, sell and eat a much beloved shellfish — with an emphasis on eat! After all, as the traditional Native American saying goes, when the tide is out, the table is set.

Blue futures: WSG funds co projects with the Makah Tri

By incorporating people, culture and Indigenous knowledge systems, these three projects model the use of interdisciplinary approaches to inform marine resource management

By Olivia Horwedel, WSG Science Communications Fellow

Deep blue ocean waters push against rocky shorelines and coastal forests. Eagles soar overhead. In the distance, whales surface, taking a moment to breathe as they navigate through the ocean's waters. This incredibly unique landscape, situated at the Northwest tip of Washington state, is the home of the Makah Tribe.

This rich environment has sustained Makah communities since time immemorial, providing an abundance of marine resources that support cultural practices, ecosystems, and feeding the community. In recent years, however, human-caused forces such as habitat degradation, overfishing and a warming climate increasingly threaten these precious resources. Research is needed in order to better understand how to protect these valuable ecosystems that sustain culturally important species, as well as communities.

Washington Sea Grant (WSG) recently funded three research projects to address the ecological and cultural needs of the Makah Tribe. WSG is pleased to work alongside the Tribe in an effort to understand the current plights that these marine ecosystems are enduring, while also utilizing collaborative methods and diverse approaches to research that highlight the intersections between ecology and Indigenous Knowledge Systems. Ecological research is often focused on natural sciences, lacking the incorporation of people and culture or the dynamic relationships that communities share with their natural surroundings. The value of research that incorporates these intricate connections — and utilizes other knowledge systems outside of Western science to create meaningful management strategies that ensure ecological conservation and cultural preservation — is becoming increasingly recognized. These three projects model this interdisciplinary approach.

Two of the projects are being led by Adrianne Akmajian, who is the marine ecologist for the Makah Tribe. The third project is led by Jonathan Scordino, the Makah Tribe's marine mammal biologist.

Harmful algal blooms and Makah fisheries

Akmajian's research addresses relationships within coastal ecosystems, focusing on culturally significant species to the Makah Tribe. Her first WSG project explores how toxins from harmful algal blooms make their way through the food web and how these toxins accumulate in nearshore and offshore environments. An important aspect of Makah culture is the ability to consume fish and shellfish, however, harmful algal blooms can cause harm to both marine species and humans that consume them. Akmajian and her team collected several samples from whale scat to test for domoic acid and saxitoxin concentrations, both of which are harmful toxins that are byproducts from an algal bloom. Gray whales are a culturally important species to the Makah Nation, and can be found on the Tribe's usual and accustomed fishing grounds. The nearshore whales may be helpful indicators of toxins in the food web as they are in environments adjacent to the shellfish that people rely on.

While this study is still ongoing, the team's most recent findings indicate that the levels of domoic acid found in the whale scat were well below the regulatory limit for human consumption of shellfish, however several scats had high saxitoxin levels near or above the human regulatory limit. Overall, the domoic acid found in the scat

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was low enough to not cause any health risks for whales and similarly domoic acid did not appear at harmful levels in nearby shellfish. However, the high saxitoxin concentrations in whale scat mirrored the nearby shellfish populations and time periods where shellfish harvest was closed due to toxins.

Akmajian finds that the benefits of this study are twofold: "Tracking toxins through fisheries as well as in marine mammals provides useful information on ecosystem health as well as human health." Based on this and previous studies, toxins are not currently high enough to warrant regular testing in fish. However, there are years with really big blooms; these years, testing and monitoring toxins in fish should occur to protect the health of people who eat that fish, including tribal members. When addressing the impacts of toxins on whales, testing should be more frequent, given that they feed close to shore. More nearshore saxitoxin blooms could impact marine mammals, and these studies could assist in monitoring for health impacts and whale strandings.

Competing for salmon

Akmajian is also interested in how interactions between different species can shape management plans to protect endangered and culturally important species, such as Chinook salmon and Southern Resident killer whales. To study this, WSG funded a collaborative project between the Makah Tribe and Western Washington University to research the predation of seals and sea lions on salmon

> "The value of research that incorporates these intricate connections — and utilizes other knowledge systems outside of Western science to create meaningful management strategies that ensure ecological conservation and cultural preservation — is becoming increasingly recognized."

along the northern coast of Washington. The samples were collected in the winter and spring: this is when salmon and orcas are found in the area, and also overlaps with the season for Tribal salmon fisheries.

Akmajian and her team collected scat from harbor seals and Steller sea lions, analyzing the fish contents in their scat for species and size to better understand how their diet compares with the Southern Resident killer whales. Southern Resident killer whales are an endangered species that primarily feeds on Chinook salmon, which are also endangered. If there is a large amount of overlap between the seal, sea lion and killer whale diet, it could suggest there is competition between these animals. This study helps illuminate the overlap in diets, and provides a better understanding of the threats Southern Resident killer whales face.

One aspect of this project that is particularly unique is the comparison of diets between male and female pinnipeds. "Many previous studies have shown that male and female harbor seals have differences in their diet, so we were really interested to see how the diets between male and female Steller sea lions might impact salmon populations," Akmajian says. Modeling is still underway, but their analyses currently contradict the previous studies, showing no significant differences in the diets between male and female sea lions. Based on the results thus far, there does not seem to be as much direct competi-

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tion between the Steller sea lions and killer whales, because these animals eat different sizes of salmon.

This research has helped inform how best to protect iconic species within Washington state, which provide cultural benefits to Native communities in the region. "Salmon has always been an important subsistence and commercial fishery for the Makah Tribe," Akmajian says. "This study has helped illuminate what competition there might be in these fisheries, as well as the competition for salmon between pinnipeds and the endangered Southern Resident killer whales."

The importance of Two-Eyed Seeing

While Akmajian's research is underway, Jonathan Scordino and a team of researchers including Liz Allyn of the Makah Tribe, Robert Jones of the Northwest Indian Fisheries Commission, and Tim Essington of the University of Washington, have received WSG funding for a project that evaluates pinniped predation on salmon through the incorporation of Indigenous Knowledge Systems.

By adopting a Two-Eyed Seeing approach, Scordino is able to bridge Indigenous and Western knowledge sources to evaluate the benefits and risks of Tribal pinniped hunting as a salmon recovery management strategy. Two-Eyed Seeing, or *Etuaptmumk*, is a concept created by Mi'kmaq elder Albert Marshall. This approach intentionally and respectfully weaves together one eye that sees the benefits of Western methods with the other eye that sees the benefits of Indigenous Knowledge sources. Using both eyes together benefits all. "Our team chose to use a Two-Eyed Seeing approach to ensure that our research was holistic and incorporated all sources of knowledge for our complicated ecosystem modeling study," Scordino says.

Research is a critical step in creating management strategies that conserve beloved environments. Ecological research that takes an intersectional approach is imperative to creating management strategies that conserve the environment, while also ensuring that community needs are addressed throughout the process. By bringing together various knowledge systems, collaborators and cultures, people can unite forces and learn from one another as well as the ecosystems around us. The incorporation of Indigenous Knowledge is necessary in ecological research and conservation management strategies, especially when Native Nations are often the most impacted by environmental injustices and the loss of culturally significant species. Indigenous-centered, ecological research benefits not only the beautiful marine ecosystems of Washington, but also the people that rely on them.

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collects data on temperature, fluorescence, oxygen, pH, and salinity — in the water to sample the water chemistry inside and outside the aggregations. Nutrients were also measured from all the water samples collected.

Zooplankton are a crucial component in aquatic food webs because they control phytoplankton populations, and they transfer energy from primary producers such as phytoplankton to higher trophic levels like fish. Schultz found that there were significantly fewer copepods in areas with moon jellies, which confirms what her previous lab work found. This coincided with increased phytoplankton in areas with moon jellies, indicating a possible trophic cascade where increased jellyfish predation on zooplankton led to decreased zooplankton predation on phytoplankton. The jellyfish inlets also had different phytoplankton communities and higher levels of nitrate and nitrite than the non-jellyfish inlets. They speculate that the differences in nutrients could be due to the nitrogenous waste that is released into the water by jellyfish. Bacteria then converts that waste into nitrite and nitrate — two essential nutrients for phytoplankton.

Schultz wanted to test the influence that other environmental factors may have on copepod densities and compare those to moon jelly aggregation effects. She did this by setting up a model that included different environmental factors such as temperature and chlorophyll, both proxies for phytoplankton. The results showed that moon jelly abundance was still the number one variable to affect copepod densities.

What is causing this increase in jellyfish? "This phenomenon appears to be happening all over the world, but its cause and magnitude is still a debate among scientists," Schultz says. One theory has to do with urban development. When moon jellies are in the polyp stage, they have to attach to a structure to reproduce. Evidence has shown that they prefer man-made structures like piers and docks. As we change the marine landscape by adding more structures, we are increasing their reproduction rates.

Schultz's work will be added to NOAA's Atlantis Ecosystem model for Puget Sound. At the NOAA Northwest Fisheries Science Center, researchers Hem Nalini Morzaria-Luna and Isaac Kaplan will be using the results of this project to update the jellyfish parameter in the Atlantis Ecosystem Model. This research will improve the jellyfish parameters of that model and be used to determine how fish populations are affected by these blooms and what kind of impacts moon jellies may have on food web dynamics in Puget Sound.

"Jellyfish are not necessarily bad, but we want to keep an eye on them to see what their potential effects could be," Schultz says.

Closeup view of moon jellyfish (*Aurelia labiata*) drifting with the current. Photo: Shutterstock.

FIELD NOTES

WSG is thrilled to welcome several new staff members: Brandii O'Reagan, fisheries specialist; Chandler Countryman, resilience and adaptation specialist; Lisa Watkins, community science specialist for Crab Team; Michele Blanchflower, fiscal specialist supervisor; Robert Maw, fisheries specialist; and Sydney Fishman, coastal management specialist. Welcome aboard!

Jenna Keeton

The Columbia River Crab Fishermen's Association presented the "Black Hat Award" to Jenna Keeton, WSG fisheries specialist, for her skillful approach to supporting stakeholder engagement in the Crabber-Towboat Lane Agreement group. Since the early 1990s, WSG has facilitated regular meetings between crabbers and towboat operators as they negotiate how to share the ocean space, enabling the groups to modify their agreements as needed. In spring 2022, the U.S. Coast Guard expressed interest in federalizing the towlanes, meaning that the crabbers and towboat operators would lose the ability to quickly adapt the towlane locations as local issues came up. In response, Keeton planned, coordinated, advertised and hosted five meetings for Coast Guard officials, crab fishers, towboat operators, bar pilots, fisheries managers and others. Ultimately, the Coast Guard proposed to place a wide fairway around the existing towlanes to allow for location flexibility in the future.

Two projects led by WSG were selected to receive a total of $1.59 million through the Puget Sound National Estuary Program's Habitat Strategic Initiative, a partnership between Washington Department of Fish and Wildlife and Washington Department of Natural Resources. Ian Miller, WSG coastal hazards specialist, will lead a project to refine previously conducted sea level rise vulnerability assessments for about 111,000 parcels in Puget Sound. The funding will also be used to make these results more easily accessible to users to inform adaptation planning actions. Emily Grason, program manager for the WSG Crab Team, will lead a project to maintain Crab Team's critically important core early detection and monitoring network, enhance Crab Team's capacity to provide expertise to partners, and launch a new early detection program area focused on shoreline surveys for crab molts. In addition, WSG is a partner on a third project led by the UW School of Aquatic and Fishery Sciences.

Washington CoastSavers, WSG and other partners were selected to receive $299,965 in funding through the Bipartisan Infrastructure Law to lead collaborative marine debris efforts in coastal Washington. The funding will support three long-standing annual beach cleanup events attended by hundreds of volunteers at nearly 50 beaches with the support of partners including Olympic Coast National Marine Sanctuary, Olympic National Park, Washington State Parks, Lions Clubs International and Washington Surfrider. In addition, the funding will enable the partners to work with the Quinault Indian Nation to expand cleanup and outreach education efforts, and contribute large marine debris data to MyCoast, a Washington Department of Natural Resources database, to understand the scope of the issue, encourage stewardship and provide an informed assessment to be used in future removal efforts. Michelle Lepori-Bui, marine water quality specialist, will serve as the WSG project lead.

Michelle Lepori-Bui

Volunteers at last year's Washington Coast Cleanup. Photo courtesy of Washington CoastSavers.

WSG published its 2024—2027 Strategic Plan. This document will shape the activities, choices and direction of WSG for the next four years within these four program areas: Environmental Literacy and Workforce Development, Resilient Communities and Economies, Healthy Coastal Ecosystems, and Sustainable Fisheries and Aquaculture. These program areas also directly align with the priorities identified by the NOAA National Sea Grant College Program. Some of the areas of work that have risen to the top of WSG's priorities are building resilience to coastal hazards, climate and ocean change; longstanding support for sustainable fisheries and aquaculture; and science and social science to support decision-making that protects and enhances ecological health and human well-being. In tandem with continuing to support work in the inland waters of Puget Sound, the Strategic Plan highlights increasing capacity to address the distinctive needs on the Pacific coast.

The Washington Seaweed Knowledge Symposium was held in December 2022, hosted by the Washington Seaweed Collaborative — a group coordinated by Meg Chadsey, WSG carbon specialist. The event addressed four key goals: developing a deeper understanding of the local seaweed community's interests and concerns, equipping that community to make responsible decisions around seaweed farming, understanding the gaps between the current state of knowledge and aspiration goals for seaweed farming, and inspiring participants to work together to address information gaps and policy questions. Speakers represented a broad range of expertise, from the science of how toxins accumulate in seaweed, to the status of kelp conservation efforts, to the limitations of growing seaweed for the sake of carbon sequestration. In addition to all of Meg's hard work, the Symposium was possible thanks to the help of Nicole Naar, WSG social science and education specialist, Teri King, WSG aquaculture and marine water quality specialist, and many others.

For the first time in three years, the annual Conference for Shellfish Growers convened in person in Union, Washington this past March. Organized by Teri King, WSG aquaculture and marine water quality specialist, the two-day conference gathered shellfish producers, researchers, students and managers from across the region to discuss pressing issues and relevant research on aquaculture. Sessions covered wide-ranging, relevant topics, from addressing the impacts of heat waves and harmful algal blooms, to shellfish permitting and applying for H2-A guest workers.

In addition to director Russell Callender (see the Q&A with him in this issue), two other WSG staff retired this spring: Sarah Fisken, fisheries specialist and Eileen Putnam, administrative assistant. Each in their own way had a positive and lasting impact on WSG's programs and culture. We will miss them but are thrilled for their next adventures!

Russell Callender shares about his career, passions and what lies ahead

Having served as director of Washington Sea Grant since 2018, Callender retired in April 2023

"Ever since I was a teenager, my passion was for conservation," says Russell Callender. He kept his love for preserving the environment close to heart throughout his career, which involved twists and turns from academic research to climbing the ranks of government, and becoming an executive leader at the National Oceanic and Atmospheric Administration (NOAA). In 2018, Callender moved from one Washington to the other to serve as the director for Washington Sea Grant (WSG), bringing with him decades of experience in marine science, environmental policy and program administration.

Callender in He'eia, Hawai'i helping to restore an ancient fishpond with the Indigenous Aquaculture Collaborative.

In his time at WSG, Callender led the organization through structural changes and elevated program priorities, such as expanding capacity on the coast, building resilience, and diversity, equity and inclusion. Callender retired on April 7. In his last month at WSG, we had the chance to talk with him about the arc of his career, proudest accomplishments, and hopes for the future.

How did you start out your career in the marine sciences?

I started off wanting to be an academic scientist. I was a geologist. During my Ph.D., I had the opportunity to go in small submarines offshore of Louisiana to study the chemosynthetic organisms that were living off of oil and gas seepage. I loved getting out there and seeing the immensity of the oceans. When you get even a little offshore, the water is blue, blue, blue. Dropping down literally to the bottom of the ocean, in the dark, and being able to see a world that hardly anybody has really been able to see was mind-blowing. Once, we went to a brine pool, which is basically a dense, incredibly salty pocket of water that looks like a lake on the bottom of the ocean. Landing the submarine on the lake and seeing ripples come out, it was amazing. We were literally floating on a lake on the bottom of the sea.

What led you out of academic research and into marine policy?

I had the opportunity to do the Knauss Marine Policy Fellowship through Texas Sea Grant, which took me to Washington, D.C. I ended up working for the Oceanographer of the Navy's Office. It opened my eyes to mission-focused science: I realized there was a big world of applied science. I also learned a lot about the politics of science — how science isn't always as pure as you think it is, it's driven a lot by political agendas.

I then got a junior staff position at NOAA. Part of what I did there was support the National Sea Grant Program. From there, I had the opportunity to move to be the deputy director of Virginia Sea Grant. I learned how to manage a science portfolio. I learned how to supervise. I learned how to run research competitions, and to manage an advisory committee. I wrote my first strategic plan. It was a really good foundation.

You ended up as an executive leader at the NOAA National Ocean Service. How did you get there?

I got a position back at NOAA and, as I interacted with senior leaders in the agency, I started to think: I could do that. I ended up getting the opportunity to run one of the coastal labs of the NOAA Ocean Service, which I did for about seven years. It was probably the best job of my life — I got paid to go scuba diving! And I learned how to build partnerships with other agencies, manage contracts, manage larger organizations, and how to lead and change those organizations.

Fast forward, I became the deputy of the parent organization that had all seven of the coastal labs. Ultimately, I moved up to be the assistant administrator of the Ocean Service, which was as high as I could go in government without being in a politically-appointed position. This meant managing multiple programs, each of which were about 200 to 300 people. I got to work on diverse things like mapping the ocean floor, collecting observations for the integrated ocean observing system, managing the country's coastal zone program. I liked being focused on issues that made a difference — projects that preserved large swaths of ocean and incredible habitats or built relationships with other countries.

What made you decide to pivot your career and come to WSG?

I was leading a big, big program. I was working all the time, and I was traveling a lot. My whole life became about work. And I didn't do a great job with other things. I was married and had a daughter . . . my wife got really sick and ultimately she passed away. My mom had been living with us, and she passed away before my wife. All of a sudden I was living in a huge house alone with a disabled daughter. Wondering, what the heck do I do now.

And then I had a medical crisis of my own. It really made me question what I was doing. I had done some things that I think made a big difference to the planet while I was in the Ocean Service. But it came at a big cost.

I'd always kind of kept an eye on WSG. I saw the announcement for the director position and realized, well, I love the oceans, I love mountains — I was a rock climber for 30-plus years and had climbed all over the US and in Europe — and I thought, I should apply for that. I ended up coming here and really got to reset my life. I think the hallmark of my career at every step along the way was taking chances. Taking the chance to go to the Oceanographer's Office. Taking the chance to run a coastal lab. Taking a chance to run all of the National Ocean Service's coastal labs. Taking the chance to be the director of a big organization. And then, taking that leap to head west to a better, more balanced life.

What excited you about the work of WSG?

I was excited by the diversity of ecosystems here. I knew there were challenges around ocean acidification and water quality concerns. I was really intrigued by trying to figure out how to work with tribes. Once I started here, it was amazing to get to learn from people who have lived and breathed in this space for millennia. I remember sitting on the beach with Ed Johnstone from the Quinault Indian Nation. Over a several-hour conversation, he spoke about the vulnerability of his tribe to tsunamis to issues like marine debris, warming seas, ocean acidification, and coastal erosion. He talked about the arrival of white colonists as if it were yesterday. It really made me shift my thinking about the importance of long-term relationships and long-term stewardship.

I had no idea that I would be able to be exposed to that kind of complexity. I had no idea how I would be exposed to the shellfish growing community, and to learn about their lives and challenges. Or to have heart-to-heart conversations with commercial fishermen about the passion they feel for ocean conservation and for the next generation. I got a much deeper understanding of this area and the people who live and work here, what drives them.

One of your passions is supporting coastal resilience. Can you describe your work in this area?

The planet is changing. We've got rising seas that are causing high tide events to push water onshore in places where there are homes, businesses and critical infrastructure like hospitals or schools. A warming planet means the atmosphere can hold more moisture, so we're getting more intense rain events. We're getting wild weather swings. When I was at NOAA, it seemed like the focus of coastal resilience was on restoring habitat, and I felt like there was a gap in terms of building resilience for people and communities. What about helping people understand the risks they will be facing, and how they can make changes to minimize those risks? If they get hammered by a flood or major storm, how can they recover more quickly?

At WSG, I put together a coastal resilience strategy and worked to get the entire Sea Grant Association to approve it. I developed budget priorities for the entire National Sea Grant Program that included resilience and DEIJA. I was able to talk about why this is important with the key Congressional staff. Moving things forward politically takes a long time; it might be ten years before this pays off. In the meantime, right now each Sea Grant program is going to get $125,000 tacked onto their base budget for coastal resilience for at least a six-year period. That's not a ton of money, but I think I've helped to set the groundwork for more. There's an unparalleled amount of money available through Congress right now to support a broad swath of coastal resilience activities. I'm hoping that through these opportunities we can collectively figure out how to better support people on the coast and the needs they have.

Callender • continued on last page

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You really elevated diversity, equity and inclusion (DEI) initiatives at WSG and recently the UW recognized you and others for accomplishments in DEI. Tell us about your approach and philosophy to this work.

I grew up in the south. And I saw so many instances of abhorrent behavior and racial injustice. I didn't understand it and was disgusted by it. And then, I became a father to a daughter with a cognitive disability, which really taught me about what inclusion means. When I interviewed at WSG and I asked about the DEI space, people lit up and I was like, this is the right spot. Once I got here, I realized how little I knew about the depth of issues of race and gender and inclusion and equality and social justice — but, through my position as a director, I realized I could be an enabler. I could support my team here to do more. As a leader, it's about giving people the opportunity and the space to change the organization and to change thinking and behaviors. I'm humbled by this work every day.

What is one of your proudest accomplishments from your time at WSG?

Moving rocks. In early 2020, I went to He'eia in Hawaii to help restore an 800-year-old fishpond through the Indigenous Aquaculture Collaborative Network. When I was at NOAA, I had actually worked to get that area recognized as a national estuarine research reserve — conserved, hopefully, for all time. The area goes from the mountains to the streams to the fishponds to the reefs. To be able to run that initiative through the political system and advocate for it on Capitol Hill and then get the head of NOAA to approve it — and then, down the road, to be able to get in the mud and move rocks to support Indigenous-led stewardship . . . it was rewarding on a spiritual level.

What are you most looking forward to in retirement?

When I moved to Washington, an old friend from when I was running that coastal science lab joined me for the drive across the country. We had a lot of time for conversation . . . and we changed to being more than friends. On Valentine's Day of 2020, we got engaged on a white sandy beach in Hawaii (I was hedging my bets...). And then the pandemic hit and it took us three tries to get married. So, part of my motivation for wanting to leave the workplace right now is to explore this new life and new relationship with a lovely woman. We're going to hike, we're going to cycle, we're going to garden, we're going to play in and under the saltwater. I'm looking forward to just enjoying life and passing the mantle of science and conservation to the next generation.