



# Sea Star

## WSG-Funded Researcher Takes on Willapa's Troublesome Oyster Drills

**A deeper understanding of these non-native mollusks leads to their undoing**

*By Carolyn White*

Located on Washington's ocean coast, due north of the Columbia River, Willapa Bay is the number-one oyster producer in the U.S. and among the top five oyster producers worldwide. The bay is also noteworthy for its large populations of oyster drills — non-native marine snails that feed on oyster flesh. Well established in Willapa Bay, oyster drills can cause substantial damage to the resource and to the shellfish growers and others who earn their livelihoods from farmed oyster sales.

To make a meal out of an oyster, an oyster drill uses its raspy tongue (called a radula), which works like a rat-tail file to make a small hole in the oyster's shell. Next, the drill secretes digestive enzymes into the hole, through which the snail sucks up the partially liquified flesh. An adult oyster drill is capable of consuming up to three small oysters per week.

Two kinds of oyster drill exist in Willapa Bay: the eastern oyster drill (*Urosalpinx cinerea*) and the Japanese oyster drill (*Ocenebrellus inornatus*). Both species were inadvertently introduced along with imported oysters, brought into the state to replace

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Jennifer Ruesink, in the oyster beds of Willapa Bay at low tide





the over-harvested native Olympia oyster. Some native snail species — whelks, for instance — drill similar holes in shelled prey but appear not to be a threat to oysters.

Jennifer Ruesink, an Associate Professor in the UW's Department of Biology, has been examining the impacts and dynamics of the Eastern and Japanese oyster drills in Willapa Bay. With financial support from Washington Sea Grant, she and her research helpers painstakingly collected and marked thousands of oyster drills with color-coded vinyl tags, over a period of two years. The tagged drills were released and, later, recaptured, enabling Ruesink to glean important information about the growth, survival and reproductive rates of these snails.

Ruesink explains that, while basic life history information about the two oyster drill species was already known, the "transition probabilities" had not been established. These numbers tell scientists how many drills at one stage in the life cycle will develop (or "transition") into the next life stage. "Knowing those transition probabilities is essential for the rational management of pest species," she says.

The collected data on drills were entered into population models to help identify vulnerabilities at various stages of the oyster drills' life cycles. In the process, Ruesink and her team learned that while the Japanese oyster drill was historically considered to be the more

harmful invader, it actually had a much lower survival rate — less than 10 percent annually — than that of the Eastern oyster drill — around 30 percent. Ruesink suggests the low survival rates may be due to predation by native red rock crabs.

"Crabs are a fairly major selective force for snails," the WSG-funded researcher says. "If you look back in the fossil record, you can see that as crabs evolved, the shells of snails became thicker, probably in self-defense."

Because the introduced snails don't have an "evolutionary history" with the native crab species in Willapa Bay, they may be particularly vulnerable to predation pressure.

In addition to gaining important information about adult survival rates, Ruesink's research is also shedding light on oyster drill eradication methods. "It turns out that destroying the oyster drills' egg capsules is much more effective than removing the adults," she says. "So it's important to time any control measures to the drills' egg-laying cycle — typically from April to July.

"The drills lay their eggs in the cracks and crevices in clusters of oyster shells," says Ruesink. "A screwdriver works really well for getting at the egg capsules, even in these tight spaces."

Ruesink has been sharing her preliminary findings with oyster growers, who have been quick to adopt her suggested control methods. Now, when the growers visit their oyster beds, they take with them buckets, screwdrivers and a better understanding of the coastal environment in which they work.

Two oyster drill species — Japanese (left) and eastern (right) — poised for a photograph



# Guest Editorial: Solutions Come of Science-Fishing Teamwork

Continuing with our series of guest submissions, and keeping with this issue's theme of WSG-sponsored research, Sea Star presents the following editorial, which originally appeared March 11, 2006, in the *Anchorage Daily News*. Interested in being considered for a future editorial? Contact David G. Gordon at 206.685.8191 or [davidg@u.washington.edu](mailto:davidg@u.washington.edu).

*By Thorn Smith, Executive Director North Pacific Longline Association, Seattle*

As long as men have set sail to reap the bounty of the sea, seabirds have flocked toward their boats looking for an easy meal. All too often, these birds became unwitting victims of the fishermen's hooks and lines.

But now, these accidental seabird deaths have been significantly reduced, thanks to the fishing industry and scientists putting their heads together. This process of collaborative research points the way toward addressing other issues facing our fishing fleets.

Alaska's frigid waters produce more than half the nation's seafood and provide ideal habitat for millions of seabirds. In years past, some 15,000 seabirds were killed annually in commercial fishing operations off Alaska. They were mostly northern fulmars and gulls that scavenged after baited hooks intended for cod, sablefish and halibut.

The taking of two short-tailed albatrosses in 1995 brought the issue to the front burner. Once thought to be extinct, the species now numbers some 2,000 birds that nest on an active volcanic island off Japan and spend half the year feeding in Alaska waters.

Although no interactions with the endangered species had been documented since 1998, the longline fishermen knew it was time to be proactive. I sat some of my top skippers down with Ed Melvin, a seabird expert with Washington Sea Grant Program.

Melvin and my skippers had many ideas for avoiding seabirds: weighted lines that quickly sank out of harm's way, a means to set gear underwater and colored streamer lines that scared away the birds. They were all interesting ideas, but the scientists demanded proof, so Melvin and his researchers went to sea.

Using eight vessels that set nearly 8 million hooks over two seasons, the methods were tried and the results painstakingly documented. Not all the ideas

worked, and some proved either too costly or cumbersome. However, the use of paired streamer lines was simple and so effective that we asked for them to be required by regulation.

Now all the bigger longline vessels use paired streamer lines and accidental seabird deaths have been reduced by 80 percent.

Reaching this goal involved a lot of people, including our longliners, members of the Fishing Vessel Owners Association, scientists with the National Marine Fisheries Service and dozens of fishery observers who provided the raw data, to name but a few. This research also required financial support from NMFS, the U.S. Fish and Wildlife Service, and Sea Grant.

More important, the success of the seabird avoidance project demonstrates the value of collaborative research in addressing issues facing the fishing industry. By combining the ingenuity and know-how of fishing captains with the scientists' demand for rigorous proof, we achieve practical solutions that actually work.

And since both sides played parts in finding solutions, it's a slam-dunk for policymakers to adopt their recommendations. There's little wonder that others are now applying this win-win approach to problem solving.

Leaders in Alaska's fishing industry recognize the need for stewardship of the resource. We've taken steps to regulate catches, minimize bycatch and protect habitat and are now proactively addressing wider ecosystem issues such as migratory seabirds.

In part, that is why the Bering Sea longline cod fishery recently received certification of the Marine Stewardship Council as a sustainable fishery.

Working together, industry and scientists can maintain a sustainable fishery that provides a source of healthful seafood and protects our broad national interests in a healthy ocean.



Thorn Smith



**WSG Marine Fisheries Specialist Ed Melvin** will make two presentations in Alaska this winter about his groundbreaking research on reducing seabird bycatch in the Alaska fishery. He will also receive an award for that research. In January, Melvin will deliver a talk about his Alaska trawl mitigation research at the North Pacific Research Board's Marine Science Symposium. In February, he and **Marine Field Specialist Kim Dietrich** will make a presentation on their Alaska

integrated-weight longline research at the meeting of the Pacific Seabird Group (PSG). Melvin will also be receiving the PSG's Special Achievement Award for his work on seabird mitigation and conservation. His research has led to methods that have reduced seabird bycatch by almost 80 percent in the Alaska longline fishery.

**WSG** has submitted its omnibus proposal to the National Sea Grant Office, which formally

submitted it to NOAA for approval and funding. "The proposal charts the course of upcoming WSG activities, taking into account input from staff, stakeholders, researchers, an advisory committee and other Sea Grant programs and plans," says **Michelle Wainstein, WSG's Regional Research Coordinator**. It is over 700 pages long and includes the planned scope of work for WSG management and outreach programs for the next four years, proposals for competitively

funded research projects (see cover story) and an implementation plan for the first two years of the grant period.

**Marine Advisory Services Program Leader Pete Granger** has been appointed to a national team that will develop a technical training program for educators who help farmers and fishermen improve their businesses. The Business Plan Development Team meets in December in San Antonio, Texas, to begin work on an

## WSG Selects a Roster of New Research Projects for



Assembled to assess the scientific merits of this year's proposals, WSG's Scientific Review Panel included senior scientists, research program administrators and directors from The University of Alaska, Woods Hole Oceanographic Institute, Hatfield Marine Science Center, Hawaii Institute of Marine Biology and other renowned facilities of research and learning.

by *Stephanie Cartier*

**W**hether it's building salmon-friendly seawalls, unlocking the secrets of life in deep-sea environments or examining the sounds of vessel traffic in Puget Sound's orca habitat, Washington Sea Grant research covers a lot of ground – and water.

Every two to three years, the program funds an array of research projects that will further our understanding and improve the management of the marine and coastal resources of our state and the nation.

The process of selecting new research projects begins with a self-appraisal of past and current WSG projects. WSG staff and advisors look at marine-related issues facing the state and the region, as well as opportunities for putting the program's motto — "Knowledge for use in the marine environment" — to good use.

Insights and ideas from this assessment are reflected in a call for preproposals, announced in print, through mailings and on the WSG Web site. Researchers are encouraged to submit summary

descriptions, from which outside advisors, selected peers and WSG staff can glean details of proposed projects. After this initial phase, a percentage of researchers is asked to submit full proposals, with in-depth descriptions of project need, implementation and evaluation of impacts.

"Typically, funding requests exceed the biennial budgets for the program," says WSG's Director, Penny Dalton. "This past year, we received 75 pre-proposals, requesting about three times the funds we had available. We ultimately narrowed that cache to a total of 45 projects for consideration."

Each of those 45 projects was closely assessed by two to four experts from around the world. The proposals and initial reviews were then turned over to WSG's Scientific Review Panel (a group of scientists from academic institutions and resource agencies throughout the U.S.). Members of this panel reviewed the proposals, ranking each one for its scientific merit, innovativeness, timeliness and importance to regional marine resource issues. Other criteria included the qualifications of principal investigators, opportunities for partnerships with other groups and organizations, and conformity with National Sea Grant and Washington Sea Grant goals.

This round of decision-making narrowed the list of research proposals to 32 that the Scientific Review Panel recommended for funding. The Washington Sea Grant Advisory Committee, composed of individuals from government agencies, academia, industry and environmental groups, then examined these proposals. Through this extensive review and comment process, the field was finally narrowed to 14 projects for inclusion in the WSG Omnibus Proposal, submitted to NOAA (See Sea Star's "Field Notes" section for more information on this).

online business-planning curriculum. The final Web-based product will help educators deliver effective business-plan training to agricultural producers and fish harvesters. The effort is part of the U.S. Department of Labor's Trade Adjustment Assistance (TAA) and Intensive Technical Assistance (ITA) programs. Granger and Washington Sea Grant deliver ITA services to fishermen in the Pacific Northwest.

**WSG Science Writer**  
**David G. Gordon** was chosen to judge the Most Beautiful Oyster contest at November's Oyster New Years event, hosted by Elliott's Oyster House in Seattle. "It was a tough task, choosing the best from a bevy of beautiful bivalves" says Gordon. The grower of the winning oyster received a \$500 check. After the contest, when no one was looking, Gordon ate the champion — a plump Pacific oyster from the beds of Penn Cove Shellfish, LLC.

#### SEA GRANT PUBLICATIONS

Many marine-related publications are available from Washington Sea Grant.

To order publications: Washington Sea Grant Publications, University of Washington, 3716 Brooklyn Ave. N.E., Seattle, WA 98105. 206.543.0555. Fax 206.685.0380. [sgpubs@u.washington.edu](mailto:sgpubs@u.washington.edu), [wsg.washington.edu](http://wsg.washington.edu).

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Most bylined articles were written by WSG Communications interns. To participate in this and other Communications projects, contact David G. Gordon at [davidg@u.washington.edu](mailto:davidg@u.washington.edu) or 206.685.8191.

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"Each year the competition for funding becomes more intense," says Dalton. "It can be gut-wrenching to choose among so many excellent projects."

"This year, we also tried to capitalize on opportunities to leverage capital from other federal and university sources and national initiatives," says Dalton. "We wound up finding alternative funding for a few projects that we might otherwise have been forced to reject. Still, we won't know our final suite of projects until the federal funding process is completed for the year."

As this issue of Sea Star goes to press, Congress is still deliberating on the federal budget, which is expected to be approved in February or March 2007.

All of the research projects in this round of funding fall within five critical program areas — Living Marine Resources, Ecosystem Health, New Technologies to Enhance Ocean Productivity, Economic and Community Development, and Education, Training and Public Information. Select examples from the new batch of projects are presented below.

## Spotlight on Four New WSG-Funded Research Projects for 2007

### Re-Colonization of the Upper Cedar River by Anadromous Salmonids

**Thomas Quinn, UW School of Aquatic & Fishery Sciences**

Recent dam modifications have allowed coho and chinook salmon to re-colonize the upper Cedar River watershed. For the past three years, data have been collected on all salmon entering the watershed. From this and other data, project team members will explore the origins of the fish populations — whether they are returning generations or a constant influx of strays from populations below the dams — and how traits such as body size and spawning date affect the reproductive success in this re-colonization event. The results will shed light on the factors spelling success or failure in salmon re-colonization efforts.

### Glass Sponge Reef Habitat in the Pacific Northwest

**Paul Johnson, UW School of Oceanography**

Glass sponge reefs have recently been discovered in deep waters near Grays Canyon off the Washington coast. Little is known of these habitats, long inaccessible to humans. This project will use sophisticated imaging technologies to create maps and oceanographic profiles of the sponge reefs and their non-sponge inhabitants, which can include commercially important shrimp and rockfish. Areas that have been damaged by commercial trawl fishing will also be identified and compared to pristine areas of the reefs.

### Integrating Intertidal Habitat into Seattle Waterfront Seawalls

**Charles Simenstad, Jeffrey Cordell and Jason Toft, UW School of Aquatic & Fishery Sciences**

What are the ecological benefits of incorporating complex intertidal habitats into vertical seawalls along the Seattle shoreline? This nearshore environment will be enhanced with several different designs of specially constructed habitat test panels and troughs to increase its complexity and monitored for benefits to fish, marine invertebrates and plants. Project results will help guide the upcoming reconstruction of the Seattle seawall and similar structures in the aquatic environment.

### Habitat Modification Due to Sediment Gravity Flows — Elwha Dam Removal Baseline Study

**Andrea Ogston and Charles Nittrouer, UW School of Oceanography**

This project will conduct baseline studies prior to the removal of the Elwha River dams on Washington's Olympic Peninsula. The dam removal provides a special opportunity to explore the sediment-transport mechanisms and seabed deposits resulting from concentrated flows of water and sediment from rivers. Researchers with this project will undertake a combination of high-resolution seabed mapping, water-column profiling, time-series instrument deployment and seabed sampling as a baseline study, and will repeat these studies throughout the dam removal

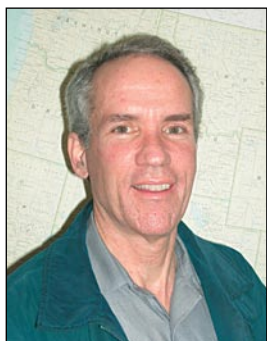
period. By evaluating the pathways that sediment takes to reach the seabed, researchers will have a better understanding of the fate of nutrients and other chemicals bound to the sediment — an understanding that will help evaluate the impact of dam removal in the marine environment.

# "Good Morning, Grays Harbor," Says WSG's Steve Harbell

When residents of Pacific and Grays Harbor counties aren't meeting with Steve Harbell face-to-face, they're likely to hear WSG's Marine Field Agent on their radios. His two-minute audio features are broadcast each weekday on KSWW Radio in Aberdeen, covering an array of hot topics, including bull kelp, ocean currents, safety at sea and marine weather. Each program reaches an estimated 10,000 people on the Olympic Peninsula.

In 1992, when Harbell became director for WSU Extension in Pacific County, he took over the responsibility for the KSWW programs from Pat BoyEs (now Program Director of 4-H in Puyallup), who had been doing them for several years. As a result, Harbell's segments address more than marine themes, periodically covering horticulture, food safety, nutrition and other terrestrial topics.

"I do a total of 261 programs a year," says Harbell. "In addition to the daily programs, I've been a guest several times on KBKW News/Talk Radio, also in Aberdeen, talking about fisheries management, aquaculture, oceanography and other marine subjects."



Radio contact is invaluable for reaching a large coastal population that's sometimes spread over many miles of remote terrain. Most people within earshot of his shows have strong connections with the ocean... and an appreciation for Harbell, on-air or in-person.

Radio Script #5481

FOR: Monday, July 10, 2006

## The Sardines are Back

Pacific sardines have made an amazing comeback over the past decade, and now provide a substantial commercial fishery off the Washington coast. During the 1930's, sardines were the largest commercial fishery in the country with landings of over 440 million pounds a year. Many of these were processed in Monterey California's famous cannery row. But then in the 1940's the sardine catch declined dramatically, thought at the time to be caused by overfishing.

However, new evidence has shown that both sardine and anchovy populations respond to long-term ocean changes over a period of decades, so as ocean conditions change, the numbers of these fish either decline or increase. About fifteen years ago, the sardine population increased dramatically, and for the last seven years, these fish have been harvested all along the west coast, with an annual harvest of nearly 220 million pounds.

About half that total harvest is caught in Oregon and Washington as the fish move north from their spawning and nursery grounds in California. Purse seine fishing boats catch schools of fish that are located at sea by airplane. Sardines caught here are larger than in California, so they're perfect for use in the Japanese longline tuna fishery. With a high oil content, they're also valuable for processing into fish oil, or for direct use by consumers.

So don't be surprised if you see a new fish on the menu – the sardines are back. This has been Steve Harbell with Washington State University Extension and Washington Sea Grant in Grays Harbor and Pacific Counties, helping you put knowledge to work.

## Hood Canal Council Honors WSG's McNeal and King



Award recipient Janis McNeal (right), with coworker Teri King (left)

WSG Program Assistant Janis McNeal received an Achievement Award in November from the Hood Canal Coordinating Council (HCCC). McNeal went above and beyond the call of duty to protect Hood Canal last year by delivering fine-mesh kitchen sink screens to almost 2,000 property owners along Hood Canal. Delivery sometimes included kayaking to secluded properties on weekends. The screens help lessen Hood Canal's dissolved oxygen problem by capturing about 3 percent of the nitrogen that may otherwise enter Hood Canal. The HCCC award commended McNeal and WSG's Water Quality Specialist Teri King for continuing "to think 'outside the box' to find new ways to reach under-served populations." The HCCC includes tribes, county governments and state and federal agencies serving the Hood Canal area. Washington State Sen. Tim Sheldon (35th District) presented the Achievement Awards on November 17, 2006, at the Alderbrook Resort and Spa.



# New Sea Grant Staff Bring Expertise, Insights and Energy

**M**arine Water Quality Specialist Jeff Adams has been a student of the oceans, estuaries, lakes, rivers and streams for nearly two decades. “A young lifetime before that, I was tipping boats, testing ice, splashing mud puddles, and otherwise intimidating myself with water in all its forms,” he says. In 1992, he left his western Illinois home to attend the University of Washington, where he earned a BS in Biological Oceanography and an MS in Biological Assessment from the School of Aquatic & Fishery Sciences.

Prior to joining the WSG team, Adams served as Director of Aquatic Programs for the Xerces Society, dedicated to preserving biological diversity through invertebrate conservation. He also trained instructors in Oregon Trout’s Salmon Watch, an outdoor salmon and watershed education program for middle and high school students.

“In my spare time, I can be found playing with aquatic invertebrates, traveling, star-gazing, rock-hounding, hiking, biking, canoeing, mountaineering, scuba diving, hunting, fishing, singing and celebrating life” with his wife Alejandra and son Carlos. In his new position at WSG’s field office in Bremerton, he may get to put those diverse interests and skills to good use.

To learn about upcoming opportunities and get involved in future projects in the Bremerton office, contact Adams at 360.337.4864 or [jaws@u.washington.edu](mailto:jaws@u.washington.edu).

**W**SG’s new Associate Director is already somewhat of a familiar figure on the UW campus. Raechel Waters has spent the past year completing her post-doctoral studies with School of Oceanography Associate Professor Daniel Grunbaum, characterizing the swimming behavior of microzooplankton in the San Juan Islands.

“My primary research interest is in microscale plankton ecology, that is, deciphering interactions at the base of the ocean food web, at scales that are



relevant to the microscopic participants,” Waters says.

Waters has a PhD in Biological Oceanography from Flinders University in Adelaide, Australia. She spent two years as a program manager for the South Australian Primary Health Care Research, Evaluation and Development Program and, before that, as a Protist Field Biologist for the Australian Antarctic Division.

Research aside, Waters is especially proud of her experiences in undergraduate teaching. “It’s an activity I value and welcome the opportunity to continue,” she offers.

As part of her WSG appointment, Waters will co-teach a course on

“The Changing Oceans: historical case studies of research on the ancient oceans, deep-sea exploration, climate change and the oceans, and human impacts on marine life.”

“For this class, students will consider societal factors affecting progress in marine science, changing popular attitudes toward the oceans, and key current policy implications of marine science,” says Waters.

Waters was born in Australia but spent most of her childhood and undergraduate years in the United Kingdom. She returned to Australia in 1994, spent a year pursuing a post-doc in France, and then travelled to Seattle in 2005 to begin her work with Grunbaum.

This peripatetic scientist is currently involved in organizing local scavenger hunts, intended to raise awareness of reducing personal environmental impacts and to generate funds for climate change mitigation projects. In her off hours, she enjoys the surfeit of outdoor activities available in Washington state.

“I am very excited to join the Washington Sea Grant team and to make a contribution in a state that is clearly passionate about its rich and diverse marine resources,” she says.

Waters can be reached at [rlwaters@u.washington.edu](mailto:rlwaters@u.washington.edu) or 206.685.8209.



Left: Jeff Adams,  
Marine Water Quality Specialist  
in Kitsap County.  
Below: Raechel Waters,  
WSG Associate Director

# 2007 Calendar Salutes Salmon



A salmon leaps from the page of this year's Washington Sea Grant wall calendar. Our perennial favorite, Joel Nakamura, designed this fish-intensive masterpiece to commemorate Sea Grant's work with salmon and other living icons of Puget Sound and the Pacific Ocean coast.

Art critics have called Nakamura's style "folk art with a bizarre urban edge; very sophisticated symbology rendered in a primitive technique." We call it a great way to show our appreciation for salmon — and for you, the loyal readers of *Sea Star*. To obtain your free copy, contact WSG Publications at 206.543.0555 or [sgpubs@u.washington.edu](mailto:sgpubs@u.washington.edu).

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