confluence

OREGON SEA GRANT

SUMMER 2012 | VOLUME 1 NUMBER 2

OREGON'S FISHERIES:

Scientists and Fishermen Working Together

FROM THE DIRECTOR

Welcome to the second issue of *Confluence*!

In this issue we focus on fisheries and science. Oregon's coastal history, culture, and economy are shaped by its productive fisheries. Oregon Sea Grant addresses fisheries challenges by integrating the tools of extension, research, and education to improve understanding and management. Our programs are cooperative and interdisciplinary, incorporating experiential knowledge of the fishing community to enhance understanding and science-informed management of sustainable, commercially valuable fish stocks and the ecosystems that support them. By building partnerships, Oregon Sea Grant helps business and communities self-organize, thereby increasing the efficacy of citizen engagement in fisheries-related decision making.

A fundamental ingredient to this process is trust and open dialogue amongst the parties, in particular between scientists and commercial fishers. Talk may be cheap, but getting people to communicate who normally speak different languages is…priceless.

Such is the theme of our lead story, "You Talk and You Change the World." For about a decade, scientists and fishermen on the Oregon coast have been learning how to communicate and work together through a program called SAFE—Scientists and Fishermen Exchange. Begun in 2002 by Oregon Sea Grant in cooperation with the Oregon Department of Fish and Wildlife, SAFE has not only helped ease tensions between scientists and fishermen but has resulted in several mutually beneficial solutions to previously vexing problems—and a series of cooperative research programs.

Talking and working together are also playing a big role in research on the habits and habitats of rockfish (or groundfish) in one of Oregon's two new marine reserves, Redfish Rocks, near Port Orford. There, scientists and fishers are collaborating to figure out how to keep rockfish populations from declining, to prevent a recurrence of the so-called "west coast groundfish disaster" of 2000.

Preventing disaster is also the motivation behind Oregon Sea Grant-funded researcher Lorenzo Ciannelli's work on hypoxia (low oxygen), the phenomenon that causes "dead zones." Ciannelli is one of several Oregon Sea Grant researchers who are studying what causes hypoxia, how it can affect fish and other creatures, and how its effects might be mitigated.

And that's just a start. You'll find a lot more about how strangers are becoming friends—and working to preserve Oregon's fisheries—inside this issue of *Confluence*, and in our online "Web Extras" section, at

seagrant.oregonstate.edu/confluence

Stephen B. Brandt
Director, Oregon Sea Grant

IN THIS ISSUE:

On the cover: Against the backdrop of Newport, Oregon's, fishing fleet, Noelle Yochum talks with fishers Ian Olsen and Will Goold (right) about collecting samples of Dungeness crabs for her research.

CONFLUENCE: *The junction of two or more rivers; an act or process of merging; from the Latin word "confluere," meaning "flow together."* We chose the name *Confluence* to reflect the merging, or flowing together, of Oregon Sea Grant's three "rivers": research, education, and engagement. Integrating the three supports our mission of helping people understand, rationally use, and conserve marine and coastal resources.

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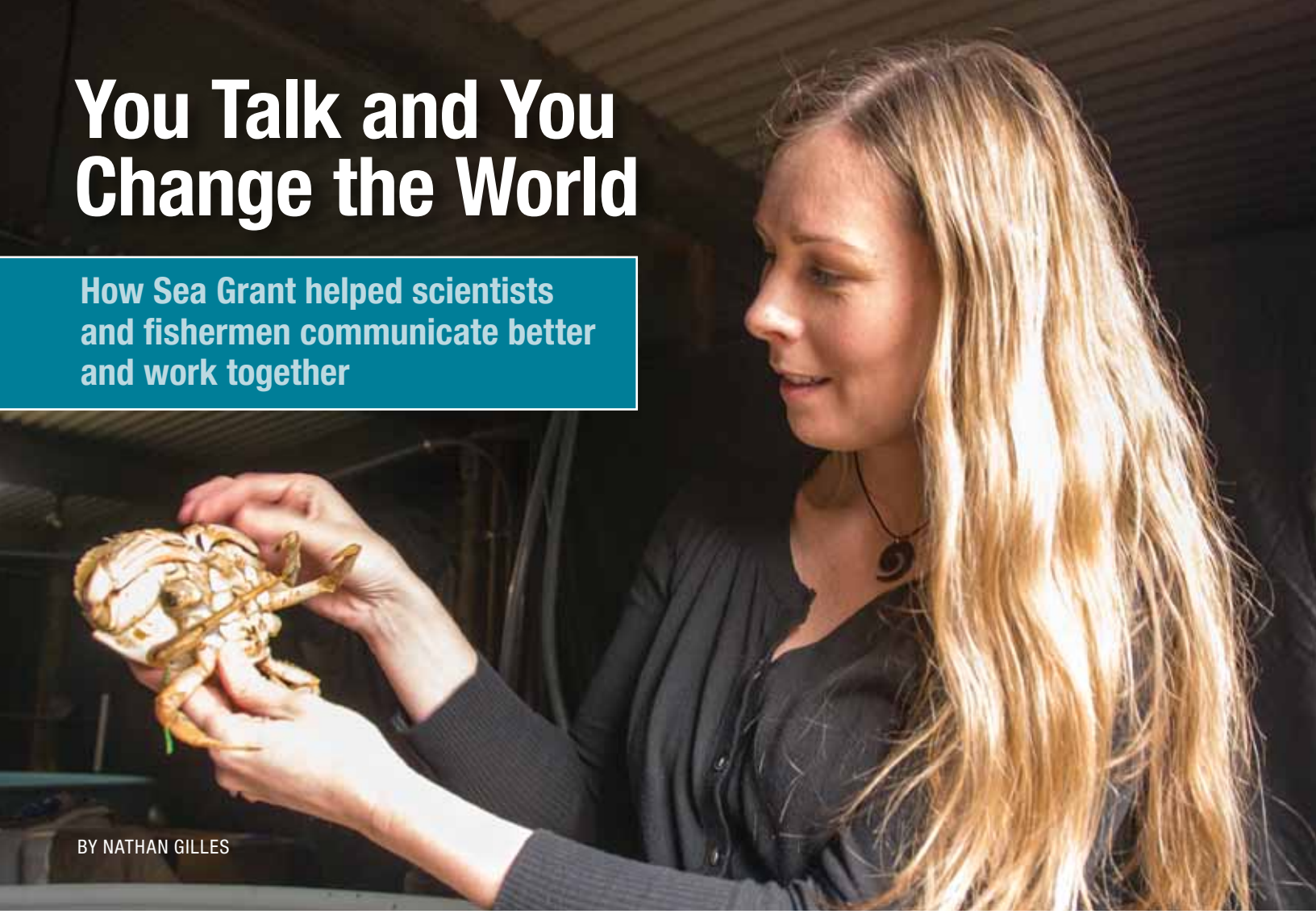
Sea Grant is a unique partnership with public and private sectors, combining research, education, and technology transfer for public service. This national network of universities meets the changing environmental and economic needs of people in our coastal, ocean, and Great Lakes regions.

You Talk and You Change the World

How Sea Grant helped scientists and fishermen communicate better and work together



BY NATHAN GILLES

In a dimly lit lab, **Noelle Yochum** reaches into the dark tank with a dip net and pulls out a squirming Dungeness crab.

Yochum's eyes shine when she explains her research. "It's a female," she says, showing off the creature's pale-colored abdomen. The crab's orange and purple pincers snap sluggishly at the air.

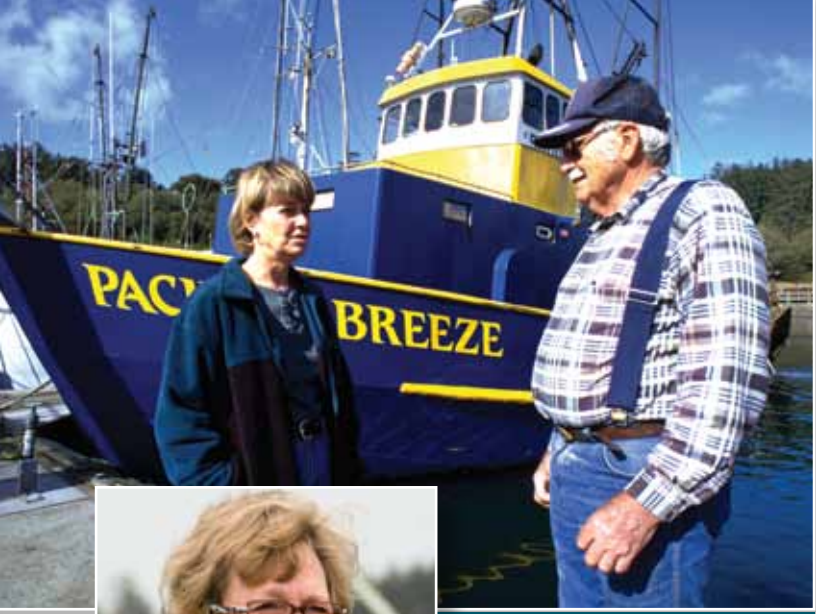
Holding the animal carefully in both hands, the 30-year-old Oregon State University graduate student explains her methodology. "If you take out their walking legs," Yochum says, pulling on one of the crab's legs, "then she should respond and bring those back." Sure enough, the crab pulls her legs back in. Yochum says that, much like a doctor might tap a patient's knee as a measure of health, she, too, is examining involuntary reflexes that will help reveal whether her specimens are healthy or not.

Yochum currently has 12 tanks at three labs run by the National Oceanic and Atmospheric Administration (NOAA) in Newport, Oregon. Comparing her crabs' reflexes against their mortality rate, Yochum hopes to model what happens in the open ocean when fishermen throw back crabs that, by law, can't be sold. The name for these "throw backs" is bycatch, and for Oregon's Dungeness crab fishery—which is healthy but data-deficient—what happens after the unsellable crabs are returned to the ocean is a bit of a mystery. Do they live, or do they die?

"About 40 percent of catch globally is bycatch," says Yochum. "There are a lot of things that are not targeted, so it's important to know how much of that is dying."

With her lab experiments and, later, a tag-and-release program, Yochum hopes to get a quantitative handle on bycatch in Oregon's Dungeness crab fishery. To assist her in doing this she is receiving help from NOAA, the Oregon Department of Fish and Wildlife, OSU, and the Oregon Dungeness Crab Commission, which has a keen interest in her research. The Commission hopes to use Yochum's data to help maintain its prestigious Marine Stewardship Council certification. And, to aid the scientist's ambitious two-year project, the Commission has been connecting Yochum with Oregon crabbers.

The biologist's collaboration with the fishermen, while not unheard of in other fisheries, is still rare. More often, mutual distrust exists between scientists and fishermen. In the past, scientists have said they felt the data they got from fishermen was suspect, while fishermen saw scientists as



Above: Former Oregon Sea Grant Extension agent Ginny Goblirsch started SAFE in 2002.

Left: Goblirsch today.

yet more regulators hoping to cut back their allowed catches. That Yochum is now working so closely with Oregon crabbers is due in large part to an Oregon Sea Grant program called the Scientists and Fishermen Exchange program, or SAFE, which, in demonstrating success, has also shown just how much it was needed.

Ginny Goblirsch and the humble beginnings of SAFE

"The whole idea was to get them [scientists and fishermen] talking with each other," says Virginia "Ginny" Goblirsch, who spearheaded the creation of SAFE in 2002. As Goblirsch explains it, fishermen often distrust scientists because they associate them with regulators. As for scientists, beyond often mistrusting what fishermen tell them, "Sometimes it's kind of intimidating to walk out on the docks," she says. Nonetheless, Goblirsch saw that the two very different groups could benefit from collaborating. It was just a matter of getting them together so that "they would start to know that they have mutual interests and they could learn from each other and help each other out." It also meant keeping them from each other's throats.

From the mid-1990s to the early 2000s, the west coast's commercial groundfish industry had all but vanished. Dwindling stocks forced regulators to cut back on the size of allowable catches, which in turn put many fishermen out of business. The result was what has been called the "West coast groundfish disaster." Regulatory meetings during the disaster were heated. Fishermen blamed scientists for the new regulations, and there were other squabbles. Fishermen had been telling Goblirsch for years that scientists were littering the ocean with their research equipment, which fishermen said destroyed their gear and was potentially life-threatening.

If anyone could bridge the divide between fishermen and scientists, it was Goblirsch.

The 62-year-old Goblirsch is a fixture in the fishing town of Newport, Oregon, and her cramped bedroom office shows it. Among the normal workplace trappings—a full filing cabinet and shelves stacked with books—there is a framed copy of National Fisherman magazine from 2001, in which Goblirsch was named "High Liner of the Year," a huge honor. And there are others. Goblirsch's walls are covered with plaques and framed certificates. Many are from Oregon Sea Grant, where Goblirsch was a driving force from 1987 until she retired in 2003. Others are from National Sea Grant as well as the Newport Chamber of Commerce. One plaque from Oregon Sea Grant reads, The Experienced Faculty Recognition Award. "I call that one the old geezer award," she says, laughing.

Among her many accomplishments, Goblirsch was instrumental in getting NOAA's fleet into Newport's Yaquina Bay. She has also helped her husband, Herb, run their fishing business since they married over 30 years ago. This perhaps explains a little of why Goblirsch has been so successful in her small fishing community. Wearing stylish glasses and a colorful scarf, she has the bearing and demeanor of an urban professional. But Ginny Goblirsch is still a fisherman's wife.

When Goblirsch married Herb—who today looks a little like Ernest Hemingway in his Cuba days—she joined him on his trips to catch albacore, salmon, and Dungeness crab. On their boat, she listened to the endless chatter on Herb's many crackling radios. That's when it hit her. The fishermen she heard over the airwaves were using all kinds of specialized terms. They had numerous details about what type of gear to use and when, what the ocean conditions were like. They even talked about how temperature and time of the month were affecting their catch. And she realized: "It's not as if they're just throwing a hook in the water. These guys really know their stuff." This awareness stayed etched in her mind for years, and, eventually, she would help OSU scientists come to the same realization.

Goblirsch began working with OSU Extension in 1977. She started at the bottom, as a secretary at the Hatfield Marine Science Center. But eventually, as she puts it, "I became more and more interested in the Extension side of the organization, and how it could be used to reach out to the commercial fishing industry." Through pluck and determination, she worked her way up the ladder, eventually becoming chair of Oregon Sea Grant Extension for Lincoln County.

Working with scientists from OSU and the Oregon Department of Fish and Wildlife (ODFW) as well as commercial fishermen, Goblirsch got to know and became friendly with people from both worlds. She saw how much both scientists and fishermen knew about the oceans. She also saw how often they were at odds. So, in April 2002, Goblirsch, along with Dave Sampson of ODFW, decided to try resolving these conflicts and maybe even get the

groups working together.

The first Scientists and Fishermen Exchange (SAFE) meeting was held—as were many future meetings—above Englund Marine & Industrial Supply, a popular fishermen's supply store on the north side of Yaquina Bay. Goblirsch and Sampson kept the group small—fewer than 15 people. The two were also selective in who they chose for that first meeting. As Goblirsch puts it, they picked scientists and fishermen that they thought "were knowledgeable and could listen to others without going on the defensive." Like meetings to come, there was pizza and soda and a topic for discussion. The first topic was fittingly titled, "Possible Collaboration with Fishermen on Research Projects." What happened next would have surprised anyone who had been at those contentious regulatory meetings: the scientists and fishermen actually got along.

Getting scientists and fishermen to talk

Word spread about the meeting, and, says Goblirsch, "what happened was, more fishermen wanted to come and more scientists wanted to come."

Not wanting to exclude anyone, they opened the meetings up to anyone who wanted to attend. The program continued for the next two years, with a meeting about once every four months, but there was a snag. As it turned out, some scientists had a thing or two to learn about communication.

"The first hurdle was that scientists are, well, used to making presentations," says Flaxen Conway, a community outreach specialist for Oregon Sea Grant and also director of the OSU Marine Resource Management program. A trained sociologist, Conway started attending SAFE meetings in late 2004 when Goblirsch called her, requesting her expertise. The program wasn't working out as planned, said Goblirsch. The fishermen were feeling talked down to, and emotional exchanges had left both the scientists and the fishermen with more than a little hurt pride. A straight-to-the-point, no-nonsense person, Conway puts it bluntly, "It [SAFE] kind of turned into a dog-and-pony show. The scientists would come and make a presentation, and the fishermen would just sit there. Well, that's not really an exchange."

Goblirsch and Conway decided to change that.

Sitting down with SAFE members, the fisherman's wife and the sociologist reworked how the meetings were run. What they got through their efforts, says Conway, was an actual exchange between fishermen and scientists. And slowly but surely, this work began to pay off, as the interchange started to show real benefits for both scientists and fishermen. The first to benefit were the scientists, who would learn, as Goblirsch had, that fishermen really know their stuff.

> ...the interchange started to show **real benefits** for both scientists and fishermen. The first to benefit were the **scientists**, who would learn, as Goblirsch had, that **fishermen really know their stuff**.

One of the fishermen chosen by Goblirsch for that first meeting was a Florence, Oregon, crabber named Al Pazar. Raised in western Washington State, the 56-year-old Pazar started fishing when he was just seven. During the school year, Pazar's father was a teacher, but summers were different. During the summer months, the elder Pazar was a fisherman and Al was his deckhand. Al Pazar built his first boat in high school shop, and, at age 19, he started fishing for himself. Today, with graying hair, a mustache, and skin hardened from hundreds of days of intense sunlight and sea spray, Pazar looks like a man who has spent most of his life earning his keep on the open ocean. Over the years, Pazar has fished salmon, albacore, halibut, and Dungeness crab.

He has also, as he puts it, "done quite a bit of research."

Pazar started collaborating with scientists

Crab fisherman and boat owner Al Pazar preparing monitoring sensors to install in his crab pots for a SAFE program. Pazar was one of the first fishermen to get involved in the program. *Photo: Gregg Kleiner*

Photo: Al Pazar

Monitoring sensors are installed in crab pots and dropped at sea.

in the early 1980s, when he participated in a study tracking salmon back to their rivers of origin. By his own estimation, Pazar has worked on a few research projects every year, and since joining SAFE that number has increased to about a half-dozen a year. A self-described science enthusiast, Pazar showed his willingness to bet on his passion when, in April of 2011, he invested in a second boat just for conducting research. But Pazar's enthusiasm for scientific investigation hasn't blinded him to the conflicts that can erupt between fishermen and scientists.

"There is a lot of mistrust around regulations," says Pazar. "And, let's face it, you can't make a living as easy as you used to from the ocean. And people are bitter and blame a lot of it on fish managers and the scientists who get the data for them."

But, he adds, "There are some of us [fishermen] that understand that you still have to get the science, and you have to get it right."

Aside from the extra work it has given him, this "need for good science," as Pazar puts it, is one reason he has continued to go to SAFE meetings. "It's a really great exchange, you know. You have a few slices of pizza and a Pepsi. You talk. And you change the world." And in many ways, Pazar and the scientists he's worked with have changed the world.

Collaborators get on board

The first scientist to collaborate with Pazar through SAFE was OSU associate professor Kipp Shearman. Shearman's research interest is the physics of coastal oceans, a passion that has taken him to places as far away as northwestern Australia. Shearman, who was new at OSU, had just finished a project off of Maine with NOAA. There, Shearman had worked with lobster fishermen who attached temperature sensors to their lobster traps. Collaborating with lobstermen had allowed Shearman to get a greater number of measurements than he could have by chartering his own vessel.

In the fall of 2004, Shearman decided to bring the lessons he learned in Maine to SAFE. "I wanted to transfer this idea to the Dungeness crab fishery here in Oregon," says Shearman. "And the SAFE meeting was a great way to meet fishermen and start to see who was interested in these sorts of collaborations."

> "You still have to get the science, and you have to get it right." — *Al Pazar*

At SAFE Shearman found his collaborator—Al Pazar.

After meeting in the fall of 2004, Shearman and Pazar, with the help of one of Shearman's graduate students, Susan Holmes, set about putting temperature sensors on Pazar's crab pots. In the following year, Holmes took over and expanded the project, receiving Oregon Sea Grant funding for her proposal. With Pazar making the introductions, Holmes traveled Newport's docks looking for crabbers who might want to participate. After Holmes graduated, another of Shearman's graduate students, Jeremy Childress, took control. The young Sea Grant-supported researcher worked closely with Pazar, and together the two expanded the project sill further when, at a SAFE meeting in the fall of 2008, Childress introduced the idea of adding oxygen sensors to the crab pots.

"This definitely was a collaborative process," says Childress about his work with Pazar. Together, the two developed equipment that would be sturdy enough to withstand the corrosive effects of saltwater and would be easy to use. Childress says he would often come up with a design and take it to Pazar, who would then offer suggestions for improvement. And, like Holmes before him, Childress hit the docks to find other fishermen who wanted to participate. In total, the graduate student recruited 10 crabbers to the project.

Pazar and Childress's research continued until December 2010, when it ran out of money. This was potentially a huge setback, and the young researcher feared he would have to give up. After all, Childress had been paying the crabbers about $1,000 per vessel per year to participate—not much, but enough to make taking part worth their while. Without funds, Childress expected an exodus, but he decided to take a gamble. "I asked them [the crabbers] if we were no longer able to pay a stipend, would they still be interested in helping."

To his surprise, every one of the fishermen was willing to continue helping.

Back in her lab, Noelle Yochum places her female crab back in the dark water. "This is just the beginning," explains Yochum. "I'll be doing a catch-and-release program later." Once Yochum is able to establish the relationship between reflexes and mortality, she hopes to have fishermen report back on the crabs they find with her tags.

However, that's off in the future. For

now, she needs to collect specimens and gather data. And for that, she also needs the help of local crabbers, which, thanks to SAFE, she has.

Yochum connected with the Oregon Dungeness Crab Commission through her advisor, OSU associate professor Scott Heppell. Yochum says it was Scott who, at a SAFE meeting in the spring of 2011, first mentioned Yochum's research to the Commission. Having the crabbers support her enterprise, says Yochum, has been amazing.

As he has with other young researchers, Al Pazar is also helping Yochum. Together they have talked about methodology. The specimens in her tanks were caught on one of the crabbers' boats. And Pazar, along with other Commission members, has helped Yochum find still more fishermen who might want to help out. That the Commission is on board with her project and is cooperating with the Oregon Department of Fish and Wildlife and NOAA, Yochum says, "is kind of mind blowing."

The fact that her investigation is a rare meeting point between regulators, researchers, and fishermen is also not lost on her. "I think I hit this wonderful place," she says, "where the managers are interested in me doing the work and fishermen are interested in me doing the work as well. I'm also doing really interesting science. I feel very fortunate, like I hit the jackpot."

Read a longer version of this story at seagrant.oregonstate.edu/confluence/safe

Marine Reserves Create New Opportunities for Research Collaboration

In January of this year, Oregon dedicated its first two **marine reserve** sites—one at Redfish Rocks, near Port Orford; the other at Otter Rock, just north of Newport.

The dedication was the culmination of more than a decade of efforts by local communities, state government, commercial fishermen, and Oregon Sea Grant.

What is a marine reserve? According to Oregon's Ocean Policy Advisory Council (OPAC), a marine reserve is "an area within Oregon's Territorial Sea or adjacent rocky intertidal area that is protected from all extractive activities, including the removal or disturbance of living and non-living marine resources, except as necessary for monitoring or research to evaluate reserve condition, effectiveness, or impact of stressors such as climate change."

Tom Calvanese, a biologist and Oregon State University graduate student, studies the nearly 40 rockfish species that live along the Oregon coast. Rockfish are known for their menacing spines and vibrant colors, but they're also a popular seafood. Rockfish are just one of the many reasons marine reserves are being created.

"We need to understand more about how fish use space, where they go, how much time they spend there, what type of habitats they're likely to be found in," Calvanese says. "We're starting to do more place-based management." Calvanese tracks the fish in and around the reserve by using sophisticated electronic tagging and tracking equipment, funded in part by Oregon Sea Grant.

The goal, Calvanese says, is to understand how much space a rockfish population needs to thrive. The Redfish Rocks reserve is the perfect size—2.5 square miles—for him to study. The waters there are loaded with fish, and now that the reserve has been established, fishing is off limits.

Calvanese conducts much of his research from the deck of a boat piloted by commercial fisherman Jeff Miles. Miles says the cooperation between biologists and fishermen is relatively new.

"The thought of a marine reserve—to have your fishing grounds taken away," Miles says. "My first instinct was just to run and hide from it. The biggest thing is, people don't want to lose their ability to make money."

On the other hand, Miles says, he's seen how overfishing has depleted rockfish populations—a definite money-losing proposition.

That's where Calvanese and other biologists come in, and why there's a partnership among them. Maybe by working together, they can figure out ways to keep rockfish populations from declining.

This unusual alliance between fishermen and scientists is becoming more common on Oregon's coast, thanks in part to Oregon Sea Grant's decades-long efforts to bring the two groups together to benefit from each other's knowledge.

And Calvanese says the help of fisherman like Miles is priceless. "Jeff Miles is making my research possible. We have species we're targeting for this research, and they're not the most commonly encountered species. So in order to capture enough of them to do the research, I need to find them," he said. "I'm in awe of someone who's got that kind of knowledge just from having lived it."

Compiled from reports by the Oregon Ocean Policy Advisory Council, Public Radio International's Living on Earth, *the* Bandon Western World, *and Oregon Sea Grant's blog,* Breaking Waves.

Calvanese's website: **www.fishtracker.org**

Lorenzo Ciannelli and the Flipping Fish

BY NATHAN GILLES

What one Oregon Sea Grant researcher discovered about hypoxia —and why it matters

Lorenzo Ciannelli (left) looks into how the marine community off Oregon's coast has been responding to low oxygen. *Photo courtesy of Lorenzo Ciannelli*

Editor's note: The causes and effects of hypoxia have been confounding marine scientists since the 1970s, when so-called "dead zones" first started appearing in oceans and large lakes. Currently there are more than 400 dead zones worldwide. How did this happen, and how can it be fixed? Nathan Gilles, Oregon Sea Grant's 2011 Science Communication Fellow, spent some time with Sea Grant-funded researcher Lorenzo Ciannelli and uncovered one important piece to the puzzle.

Moving swiftly over the ocean floor, a metal chain attached to a large net hangs between two metal doors. The center of the chain is submerged in the sandy bottom, kicking up sand, rock, and occasionally a bottom-dwelling flat fish as it travels along.

This process, called trawling, is a great way to catch bottom-dwelling creatures, such as the speckled sanddab or English sole.

From his office in Burt Hall, Oregon Sea Grant researcher Lorenzo Ciannelli points to the video on his computer monitor of a recent trawling expedition. Ciannelli is a biologist at OSU's College of Oceanic and Atmospheric Sciences who focuses on ocean fisheries. The video on his computer represents hours of ship time and shows a species affected by hypoxia, English sole, which the researcher is eager to learn more about. As the chain kicks up the sand in the video, the startled fish emerges. Acting quickly, the fish darts for safety. The animal appears to escape unharmed, but the next one isn't so lucky. Ciannelli explains that just behind the chain is a large net that will catch the less-than-energetic fish. When the chain reaches it, the pancake-shaped English sole hits the chain, flipping over it like a hot cake being turned on a griddle.

After capturing the video, students from OSU's Research Experience for Undergraduates program will carefully sift through the frames and count exactly how long it takes each fish to flee from the chain and net. After three years, hundreds of hours at sea, and hundreds of hours of video, Ciannelli and his students have discovered something interesting: the reaction time of each animal is correlated to the amount of dissolved oxygen present in the water—the more oxygen in the water, the faster and longer the fish swim. Likewise, when the water contains very low oxygen, the fish tend to be a little sluggish. When this happens, "Swoosh!" says Ciannelli, moving his hand in a sweeping gesture, "The fish almost immediately fall back [behind the chain]." And when they fall back, the net gets them.

Ciannelli has a keen interest in the biological effects of hypoxia and has been looking into how the marine community off Oregon's coast has been responding to low oxygen.

From 2008 to 2010, Ciannelli examined the larval and juvenile stages of species from plankton to vertebrates and invertebrates, including larval and juvenile flatfish, such as the butter and English sole as well as larval and juvenile anchovies and rockfish. What the biologist found is that creatures that experienced low oxygen not only tended to move more slowly than populations that hadn't experienced low

oxygen, but there also seemed to be fewer of them. Ciannelli observed that populations that encountered low oxygen also tended to have fewer larvae than populations that hadn't faced low oxygen. While he says it is too soon to tell whether the low oxygen levels caused the low larvae counts, he does says that data does suggest some species appear to fare better in lower oxygen environments than others.

For example, Ciannelli says, the English sole (that bottom-dwelling creature whose speed of escape he has worked so hard to measure) is not as abundant in Oregon's coastal waters as it once was, though the researcher says he can't say for certain whether low oxygen levels are the direct cause of the animal's decreased numbers.

Commonly referred to as a flat fish because of the fish's flat body shape, the English sole, like other flat fish including halibut and flounders, has evolved to live comfortably supine on the ocean's floor. When it comes to hypoxia, this evolutionary adaptation works to the animal's disadvantage. The ocean floor naturally tends to be a low-oxygen environment, says Ciannelli. The deeper the water, the less oxygen it often contains.

Turning from his computer, Ciannelli explains his research. Just examining how quickly newly settled juvenile English sole could flee his net was not enough, he says. It might give him a general sense of how much energy the creatures had, but in designing his research, Ciannelli determined something more was needed. The scientist knew measuring just the speed of the flat fish might be criticized for not being rigorous enough. After all, the flight response isn't an aerobic, or oxygen-dependent, reaction but an anaerobic reaction, based on accumulated energy storage. Ciannelli determined that, in much the same way a human can make a quick sprint without taking a breath, a fish could do the same. So he decided to put his juvenile flat fish under the microscope.

On the screen in front of him, Ciannelli cycles through pictures of animals he has taken from the sea back to his lab. There are fish, crabs, and, in one poorly framed picture obviously taken with one free hand, a small, translucent octopus sits in the palm of one of his assistants' hands. Animals not lucky enough to escape Ciannelli's trawl and net, including this octopus, ended up sorted, bagged, frozen on dry ice, and sent back to OSU, where his graduate and undergraduate assistants weighed and measured the creatures.

developed in low-oxygen environments had fewer reserves to draw on than animals that grew up in higher-oxygen environments. This, says Ciannelli, explains why the juvenile English sole he recorded seemed so languid.

Ciannelli had determined two things: there were fewer larvae than usual, and the juvenile fish were not only slower, they were also physiologically different from

What the biologist found is that creatures that experienced **low oxygen** not only tended to move more slowly than populations that hadn't experienced low oxygen, but there also seemed to be fewer of them.

English sole are not as abundant in Oregon's coastal waters as they once were, perhaps because of low oxygen levels on the ocean floor. *Illustration: Dan Leventhal.*

In the lab, Ciannelli discovered that the aquatic animals raised in lower-oxygen environments were physiologically different in a number of ways from fish raised in waters containing higher oxygen levels. By measuring the lipid content of animals caught in his net, Ciannelli noted that juveniles that grew up in more-oxygenated waters had higher lipid counts than ones that grew up in low-oxygen environments. The researcher also noted that animals that spent more time in more-oxygenated waters also had higher levels of triglycerides over sterol lipids, suggesting that animals that

juveniles raised in higher-oxygen environments. For his future research, the biologist says he is in the process of planning a series of controlled laboratory experiments. Ciannelli says this will help him determine how dissolved oxygen, as well as other variables such as water temperature, are affecting fish behavior and physiology.

To learn more about hypoxia and how it affects fish off the Oregon coast and elsewhere, read the Oregon Sea Grant publication Hypoxia: How Is It Affecting Ocean Life, and Why? *at seagrant.oregonstate.edu/sgpubs/hypoxia*

Where Do Fish Go During Floods?

An Oregon Sea Grant researcher discovers the surprising answer

Heavy rains and melting snowpack that flooded western Oregon last winter turned creeks and rivers into broad, brown torrents that might look like bad news for fish. But Guillermo Giannico, an Oregon Sea Grant Extension fisheries specialist, says his research suggests the opposite.

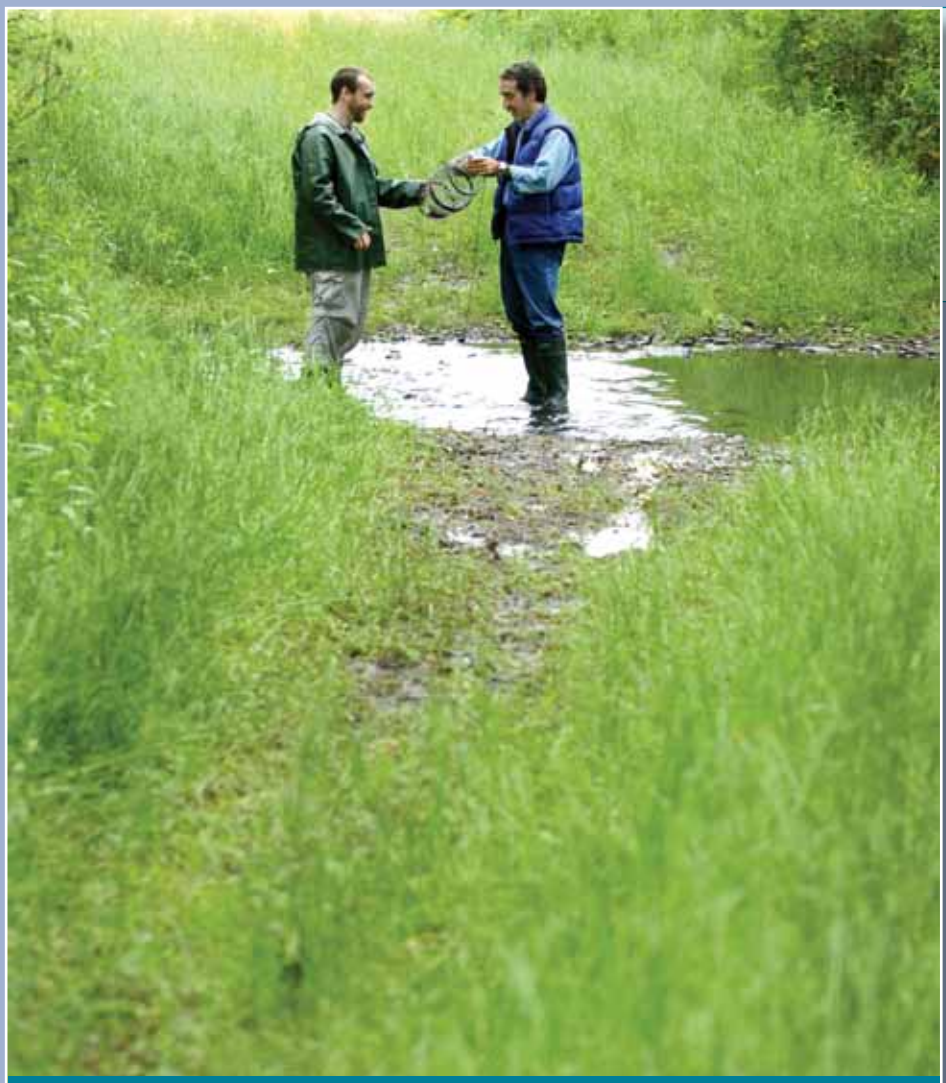
Giannico has conducted studies showing that fish—especially native species—can find refuge and food in in the agricultural ditches and other seasonal waterways that drain the flooded grass-seed fields..

Giannico, who is also a research professor in Oregon State University's Department of Fisheries and Wildlife, says his research grew out of a project by fellow OSU researcher Stan Gregory to map the historic path of the Willamette River. The Willamette and its many tributaries once were more complex, braided streams. Multiple channels dispersed the impact of flooding, but dams, housing developments, and forest transition have since funneled many rivers into single channels that run fast and furious during floods.

Giannico and others wondered how fish adapted to the change. Floods have happened for thousands of years, he said, and fish traditionally escaped high water in the main river stems by moving to off-channel habitat.

It turns out they still do. During seasonal floods, researchers took a look at ditches, low-lying farmland, and other spots that are above water most of the year. To their surprise, they found 14 fish species—11 of them native.

"That's high diversity for this area, more than I would have bet we were going to get," Giannico says.



OSU fisheries ecologist Guillermo Giannico (right) and student Randy Colvin examine the fish and amphibians that take refuge in the flooded channels of grass-seed fields in the Willamette Valley. *Photo: Lynn Ketchum*

> Floods have always been a dynamic part of the system, much the same way that snow is for elk in Yellowstone.

Giannico notes a couple of implications from the findings. Chinook salmon, steelhead, and other native fish, he says, are keenly tuned to changes in light and water temperature, and move to sheltering habitat—even if it turns out to be a flooded grass seed field. Invasive fish, often warm-water species, don't get it. They're unable to respond to the clues. As a result, native fish get a temporary break from predation and competition for food.

"Floods have always been a dynamic part of the system, much the same way that snow is for elk in Yellowstone," says Giannico. "Over time, animals will adapt to get the most out of their habitat. We have found that native fish have adjusted their behavior to use these floodplains, mostly in agricultural lands, to great benefit."

To learn more about Giannico's research, watch "Ditch Fish," a segment of an Oregon Field Guide episode on Oregon Public Broadcasting: www.opb.org/programs/ofg/segments/view/1814

Oregon Sea Grant Food Scientist Helps Revolutionize Oregon Canneries


Mark Whitham

A Coos Bay company called Oregon Seafoods is bringing new jobs to the local economy, and it's doing so in a very innovative way: by packaging and selling west coast salmon and tuna in "retortable pouches."

A retortable pouch resembles a large, silver UPS envelope, and while it is, technically, a type of canning, it is a state-of-the-art, high-tech version of it.

The technical know-how behind Oregon Seafoods' processing came from Mark Whitham, an Oregon Sea Grant food scientist who is revolutionizing Oregon's canning industry.

"Most store-bought tuna," explains Whitham, "is twice cooked. That means they cook all the nutrients and flavor out." Retortable pouches make it possible to cook the product only once, Whitham says, helping it retain all the good fats, juices, and nutrients.

From his food lab at Oregon State University Extension in Astoria, Whitham has been in the vanguard of an Oregon-based canning coup. With over 30 years of experience in food processing, Whitham is a sought-after expert by owners of small canneries hoping to kick-start or upgrade their facilities.

Oregon Seafood's Mike Babcock was one such cannery owner.

Babcock first heard about retortable pouches from others who had worked with Whitham, and he thought, "I wonder if this will work for albacore?" After seeking out Whitham in 2010, Babcock worked with him to investigate what it would take to do pouch canning for Oregon Seafoods.

Since he started shipping products under his Sea Fare Pacific label in October of 2011, Babcock's tuna and salmon are now found in 230 stores in several states, including Market of Choice, New Seasons, Whole Foods, and REI.

> Retortable pouches make it possible to cook the product only once, helping it retain all the good fats, juices, and nutrients.

His Chef's Brand Pacific Caught Wild Albacore won a 2012 Product Innovation Award from the National Restaurant Association.

Whitham also helped Babcock develop four flavors for the Sea Fare Pacific brand: sea salt, salt-free, smoked, and jalapeno.

"He was there when we really needed him," says Babcock. "And I won't forget that."

Oregon Sea Grant Specialist Named to Important Role in Fishery Management

The U.S. Secretary of Commerce has appointed Oregon Sea Grant fisheries specialist Jeff Feldner to the Pacific Fishery Management Council (PFMC) for a three-year term. Feldner, who is based in Newport, is serving as an "at-large" member of the PFMC and does not officially represent Sea Grant nor Oregon State University. The PFMC, one of eight regional councils established by the Magnuson-Stevens Fishery Conservation and Management Act, prepares fishery management plans for marine fish stocks in their regions.

Feldner has been an Oregon commercial fisherman since the 1970s and an Oregon Sea Grant Extension faculty member since 2006.


Jeff Feldner *Photo: Lynn Ketchum*

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Scientists and Fishermen Exchange...

Curious about the circumstance that inspired SAFE? Go to the above website and click on the link to the Oregon Sea Grant publication, *Responses to the West Coast Groundfish Disaster.*

Marine Reserves...

Learn about Tom Calvanese's "Fishtracker" project (www.fishtracker.org), a collaborative effort with commercial fishermen to study the movement patterns of the fishes of Redfish Rocks. Take an ecotour of Redfish Rocks, and check out the "Adopt a Fish" page to learn how you can help.

At *Confluence Online* you'll also find links to YouTube videos produced by the Oregon Department of Fish and Wildlife (with help from Oregon Sea Grant Summer Scholar Nicole Matthias), showing and identifying fish and invertebrate species in Redfish Rocks.

Hypoxia...

At the above website you'll find a link to a "Hypoxia 101" webpage by the US Environmental Protection Agency, complete with illustrations and animations, and a page with a more-scientific explanation by the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO).

There's also a NOAA site that explains "dead zones" and features an episode of a NOAA "Diving Deeper" podcast about hypoxia.

Fish in Grass Fields...

Confluence Online provides links to Oregon Public Broadcasting's Oregon Field Guide episode, "Ditch Fish," and more about Giannico's research in an article in *Oregon's Agricultural Progress*.

Photo: Lynn Ketchum

Seafood Packaging...

Confluence Online has more about how Oregon Sea Grant food scientist Mark Whitham is revolutionizing Oregon's canning industry—and helping to bring jobs back to places like Coos Bay, Warrenton, Westport, and Warm Springs.

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