Sea Grant
Oregon

Oregon Sea Grant

Program Guide
2008–2010

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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.

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For more than 35 years, Oregon Sea Grant has been a leader in addressing the most important coastal and ocean issues facing Oregon and the Pacific Northwest. The Act of Congress that established the National Sea Grant College Program in 1966 outlined our mission:

> **"... increase the understanding, assessment, development, utilization and conservation of the nation's ocean and coastal resources."**

Our philosophy: to make a difference by conducting and funding important work that would not happen without us.

From fisheries resilience to climate change, from marine biotechnology to alternative energy sources, Sea Grant supports pioneering, university-based research into critical questions about the natural and human environment. The program's Extension, communications, and education experts work to deliver that information to those who can use and benefit from it, including coastal communities, resource managers, teachers and their students, and the public at large.

Administration

The Administration office conducts the biennial competitive grants program, from request for proposals to oversight of funded projects. Through its program development funds, Sea Grant also provides rapid response to emerging problems and opportunities that arise outside the scope of the biennial competition.

In addition, Administration oversees fellowships and internships that provide undergraduate and graduate students with opportunities to develop a working knowledge of coastal and marine issues, management, and policy through assignment to an external organization or agency. Administration also accepts and screens applicants for fellowships offered through the National Sea Grant Office. The director of Oregon Sea Grant oversees all administrative activities in the program.

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Research and Education

Ongoing changes and challenges continue to confront communities, managers, and living resources on the coast of Oregon and throughout the region. Sea Grant provides competitive, peer-reviewed grants that allow top ocean and coastal researchers to apply their skills to these challenges. Urgent issues, such as dead zones, crises in Pacific Northwest fisheries, and the increasing threat posed by aquatic invasive species, help drive Sea Grant's research priorities. At the same time, new groups such as public educators and coastal businesses are turning to Sea Grant for help. To do the most good, we use our limited resources with care. We strive to balance systematic decision-making and well-informed risk-taking.

Economic Leadership

Biotechnology

Toward Biological Control of Toxic Algal Blooms: Genetic Characterization of Toxin-producing Cyanobacteria and Their Infecting Viruses in the Klamath River System (R/BT-44)

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Recent toxic algal blooms in reservoirs behind Klamath River dams have heightened concerns regarding the health of a stressed river with at-risk Chinook salmon runs. Apart from preventing recreational and ceremonial water use for months at a time and potentially contaminating drinking water, toxic blooms significantly affect river life and can poison a range of animals, including fish.

Current studies around the world suggest the need to map the genes of the toxic bloom's cyanobacteria to study bloom dynamics, with a view to bloom control. No such genotypic (DNA sequence) information is available for the Klamath blooms, and very little for any bacterial bloom populations in the western U.S. These cyanobacteria have a worldwide distribution, but there is significant variation between strains that can affect ecological, physiological, and toxin-producing properties.

By genetically characterizing the Klamath toxic bloom cyanobacteria, Dr. Dreher and his team will learn how closely related the endemic strains are to toxin-producing strains that have been extensively studied in other locations. This will help determine how much of the published information on bloom growth dynamics and toxin production from those studies can be applied to understanding the Klamath River blooms and to assessing management options. Dreher's genotype studies will also allow development of methods for monitoring the blooms and will begin to assess the feasibility of biological control with specific viruses to keep the Klamath toxic bloom cyanobacteria in check.

Fisheries

Predicting the Effects of *Ceratomyxa shasta* on Klamath River Fall Chinook Salmon: Understanding the Balance Between Host Resistance and Parasite Pathogenesis (R/RCF-24)

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Salmon losses in the Klamath River basin have had devastating impacts on coastal economies and tribal communities along the river. The effects of declining salmon runs throughout the region have been felt for several decades, but the reduction of the commercial catch by 90 percent in 2006 was a direct result of the weak returns of Chinook salmon to the Klamath River. Losses to

coastal communities and the salmon troll industry were estimated to be $28 million in 2006 alone.

Infection by microbial parasites such as *Ceratomyxa shasta* has, in large part, been responsible for the declining numbers of juvenile Klamath River fall Chinook salmon. In 2004, approximately 45 percent of juvenile Klamath River salmon migrating toward the ocean were reported to have severe *C. shasta* infections. Yet we have only a limited understanding of how *C. shasta* infects fish, the conditions under which severe disease develops, and how the parasite lifecycle is perpetuated.

Dr. Bartholomew's laboratory has played a major role in addressing myxozoan disease problems in the Klamath River basin. Her team will work to understand how the parasite causes infection and disease in Chinook salmon.

Interannual and Geographic Trends in Catches of Albacore along the West Coast of North America (R/RCF-25)

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Albacore tuna along the west coast of the United States is a very valuable and productive fishery that is still open access. Little is known about how large-scale ocean events affect tuna catch rates, north/south distributions, and seasonality. To study such variations in the fishery, Dr. Pearcy's team will utilize an exceptionally long and accurate time series of data—1961–2006, from the Southwest Fisheries Science Center—that has not yet been analyzed. This research will provide information to managers and fishers on how large-scale ocean events affect catches. It will examine possible differences between southern and northern portions of the west coast fishery, based on catch distributions and how they are linked to catches farther offshore. Regional variations in the north/south distribution, and the month of the commencement and termination of the fishery, will be correlated with major changes in ocean climate, such as sea-surface temperature.

Catch and Release Survival in the Live Fish Fishery: Can Release of Pregnant Females Be a Conservation Tool? (R/RCF-26)

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The live fish fishery in southern Oregon has increased dramatically in recent years, but the ecology and long-term sustainability of our near-shore fish stocks has not been well studied. Live fishing for near-shore rockfishes ("sea bass"), kelp greenling ("sea trout"), cabezon, and other species uses hook-and-line gear to capture fish alive for transport to high-end restaurant markets. Live fishing is a "clean" fishery with little bycatch and high price per pound. As a precautionary measure to contribute to annual replenishment of stocks, fishers in the Port Orford area have proposed to release female rockfish that are obviously carrying offspring (rockfish give birth to live young, rather than laying eggs). Similar measures have contributed to productivity and conservation in lobster fisheries in New England and crab fisheries on the west coast, and this would seem to be an obvious, and simple, conservation method. However, rockfish that are caught and brought to the surface may suffer gas bladder expansion and other potentially fatal injuries, which would make their release ineffectual. This project proposes to investigate the potential survival of released female rockfish and estimate the contribution that they could make to near-shore populations.

Dr. Heppell will collaborate with fishers and the Port Orford Ocean Resources Team and Port Liaison Project throughout the research project to assess and design a study, and offer training workshops for fishers participating in the project.

Integrating Invasion Ecology and Dune Geomorphology to Project Coastal Vulnerability in Oregon and Washington (R/CNH-15)

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Over the past century, coastal dunes in the Pacific Northwest have changed dramatically due to the intentional planting of two nonnative beach grass species, *Ammophila arenaria* (European) and *A. breviligulata* (American). These grasses have created large continuous dunes, which stabilize sand and promote wetland and forest expansion. Long-term data show that European beach grass has rapidly displaced the American beach grass throughout Washington and northern Oregon, but that American beach grass still dominates in southern Oregon. Because European beach grass accumulates less sand than American beach grass, its presence could have important implications for dune structure. The long, uninterrupted nature of the dunes suggests they may provide protection to coastal communities from storm waves and the rare but catastrophic threat of tsunamis. Although the protection may limit loss of human life and economic damage, surprisingly little is known about the relationships between the two beach grass invasions, dune structure, and coastal vulnerability.

Dr. Hacker's team aims to improve our understanding of the role of dunes created and maintained by invasive grasses as protection from coastal waves. Moreover, they hope to use this information to forecast future vulnerabilities, such as dune erosion and tidal inundation, under future climate change and invasion scenarios.

Effects of Hypoxia on Ichthyoplankton and Micronekton Communities off the Oregon Coast (R/ECO-23)

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This project aims to understand how hypoxia, known commonly as *dead zones*, affects fish in early life stages. Dr. Ciannelli's team will research the effect of coastal hypoxia on fish distribution, feeding, growth, and reaction behavior. The study will observe three fish communities: plankton, pelagic, and benthic. For each, the team will investigate patterns in vertical and horizontal distribution, diet, feeding level and body condition, and escape response, in relation to oxygen concentration as well as other environmental variables such as depth, temperature, salinity, and sediment type. The research effort will be focused on the most common and abundant taxa of fish early-life stages (for example, English, butter, and slender sole; sanddab; rockfishes; anchovies; and sculpins), representative of the range of life-history characteristics of the majority of fish species found off the Oregon coast.

This will be the first study to explicitly address the impact of nearshore hypoxia on larval and juvenile fish-stages off the U.S. west coast. Ciannelli hopes the study will increase our understanding of how hypoxic events affect coastal renewable resources, which in turn may lead to improved decision-making among resource managers, government agencies, and coastal communities.

Fishermen in Ocean Observing Research (R/HBT-11)

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Commercial crab fishermen spend many days at sea each year. Their crab pots, each clearly positioned using GPS, cover much of Oregon's coastal ocean from the near shore to the shelf break. Incorporating ocean observation gathered from instruments attached to crab pots has the potential to substantially increase the data available to the Oregon Coastal Ocean Observing System (OrCOOS) program and ocean researchers.

This project will investigate the use of environmental sensors on crab pots for ocean research and monitoring applications, to determine whether variability in crab catches can be related to observed variations in ocean conditions such as water temperature, stratification, salinity, and dissolved oxygen. The project will also help determine whether sensors deployed on crab pots can provide fine-scale oceanographic data that can be integrated formally into the OrCOOS program.

In collaboration with commercial crab fishermen, Dr. Shearman's team will make observations of near-surface and bottom temperatures throughout Oregon's coastal ocean. Approximately 60 crab pots, deployed by commercial fishermen, will be equipped with temperature sensors.

Spatial coverage will be determined by the distribution of crab pots and fishing strategies, but in general, observations will cover from the near shore (5 m depth) to the shelf break (200 m depth) and on the order of hundreds of kilometers along shore. Several sensors are currently deployed by crab fishermen from Newport, Oregon. Dr. Shearman's team will expand the participation to other ports along the Oregon coast,

such as Coos Bay, Port Orford, Garibaldi, and Astoria. The temperature, salinity, and dissolved oxygen data will be compared with supplementary data sources, such as surface wind stress, sea surface temperature, surface heat flux products, and nearby current measurements, to better understand physical processes influencing the coastal ocean. The combined environmental and crab harvest data will be used to examine the relationships between the crab fishery and the shelf environment.

Coastal Hazards

Impacts of Climate Change on Coastal Flood Risk Assessments (R/CNH-16)

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Recent natural disasters such as Hurricane Katrina and the Indian Ocean Tsunami have focused public attention on the catastrophic consequences of major coastal flooding events. The magnitude of these events, and the scale of human suffering associated with them, suggest an urgent need to reevaluate current risk-assessment procedures to ensure the safety of both coastal populations and infrastructure. Unfortunately, current risk-assessment practices are unsatisfactory in that they do not adequately account for the impacts associated with climate change and variability, leaving coastal communities overly vulnerable.

Ruggiero will use coastal models to determine wave run-up and coastal change in order to predict the frequency with which coastal properties are affected under various climate-change scenarios. The primary goal of the proposed work is to develop testing methods for directly assessing the effects of climate change on the probability of coastal change and flood hazards and the associated potential for damage to infrastructure. Applying these testing methods to coastal communities in the Pacific Northwest will provide a scientific basis for sound decision-making.

Localized Extreme Tsunami Run-up (R/CNH-17)

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Tsunami field surveys often report significant variability in tsunami effects along a relatively short coastal span. Local bathymetry (submerged landforms) transforms incident tsunamis into complex wave patterns and induces variability in coastal effects. Accurate prediction methods for extreme wave activity are needed so as to provide coastal officials and citizens with the prediction tools to determine the extreme effects of tsunamis on critical buildings and infrastructures such as tsunami shelters, coastal nuclear power plants, liquefied natural gas terminals, and ports.

Dr. Yeh will strive to address these issues through a combination of laboratory and numerical experiments and theoretical analyses. Laboratory experiments will be performed in a precisely controlled wave basin designed to measure both wave and velocity fields. The wave basin is equipped with a directional wavemaker capable of generating arbitrary-shaped, multi-directional waves. These experiments will be complemented by extensive numerical simulations using "TsunamiClaw," an extension of CLAWPACK, a software package for solving general systems of conservation laws. This numerical code is based on fully nonlinear non-dispersive shallow-water theory. Since this theory is used in the most widely used numerical codes for tsunami prediction, results from the proposed research will make it possible to directly evaluate and improve the models in practice, which in turn will aid in the development of practical engineering tools for the quantitative prediction of tsunami effects, both near and on shore.

Deepening Engagement at Live Animal Exhibits (R/IEd-10)

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Touch tanks, or pools containing marine and aquatic animals, are a pervasive component of public aquariums, zoos, and science centers. Research has demonstrated that touch tank exhibits may be among the most popular and memorable exhibits in aquariums. Behind their popularity as teaching tools seems to be a general belief that the emotional experience of touching an animal will help create conservation awareness. Public aquariums of almost every size employ touch tanks in both formal and informal educational efforts and spend significant amounts of financial and person-hour effort to maintain and staff these extremely popular exhibits and program elements.

Despite the ubiquitous nature of touch tanks, their educational value has not been well documented. With the well-being of live animal specimens as an ongoing concern in aquariums and similar institu-

tions, educators and exhibit designers need to assess the extent to which the learning benefits of touch tanks and similar exhibits outweigh the potential harm to the animals within the exhibit.

Dr. Rowe's study will strive to better understand visitor experiences at aquarium touch tanks and more closely examine variables that may influence those experiences. The findings from this research may help shape best practices in live-animal exhibit design and the interpretation and educational value of interaction with live animals, and will enhance our understanding of how informal experiences can mediate public science learning.

Sea Grant Professorship (E/UEd-03)

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Oregon Sea Grant is dedicating special funding over a five-year period to establish a Sea Grant professorship at Oregon State University. This tenured, senior faculty member will use the theme of ocean and coastal science to establish a regional or national focal point for research and teaching in free-choice learning. Most of what we know we learn outside the classroom, and we continue to learn throughout our lives by free choice. As a nation, we have made and continue to make a substantial investment in providing learning opportunities for the public in a wide variety of venues such as museums, aquaria, and interpretive centers. At the same time, an enormous quantity of printed material, videos, films, and other media is produced and distributed annually for the purpose of public education. Yet there is relatively little effort underway to advance the art and science of public education through research and teaching in such free-choice learning. This professorship will augment that effort significantly.

Extension

Oregon Sea Grant Extension brings the vast resources of research and higher education to bear on real-world issues facing coastal residents, businesses, communities, and the environment. Sea Grant Extension agents, often based at offices of the OSU Extension Service, deliver assistance and informal education on local issues and needs in areas ranging from watershed restoration and invasive species to fisheries and seafood. Specialists and educators, located on campus and off, specialize in such subjects as ornamental fish health, coastal hazards, and free-choice learning, and they develop and deliver educational programs to specific groups.

Extension faculty, all of whom are affiliated with OSU academic departments, collaborate with researchers, agency staff, and others to apply research, models, and tools that encourage science-based solutions to problems.

For up-to-date information about individual agents, specialists, and educators and their projects and fields of expertise, see http://seagrant.oregonstate.edu/extension.html.

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Extension Agents, Specialists, and Educators

Sea Grant Extension (SGE) agents have their headquarters in county offices of the Oregon State University Extension Service. At the same time, they are affiliated with academic departments on the OSU campus. Each agent is responsible for developing and delivering outreach and informal education programs that meet local needs and issues. Agents also share their areas of expertise with statewide clientele.

Sea Grant Extension specialists and educators, many of whom operate from the Corvallis campus of OSU, focus on topical issues of importance to the state or region. They provide support to SGE agents,

conduct academic research, and develop practical, specialized information for use by industry, agencies, and the public.

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Projects and specialties: water-quality monitoring, wetland restoration, and beach-bacteria monitoring; staff chair for OSU Extension Service in Curry County

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Projects and specialties: community economic development; communities managing change; human dimensions of wave energy

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Projects and specialties: coastal hazards education, including earthquakes and tsunamis, safe coastal development, and storm-resilient watersheds

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Projects and specialties: cooperative fisheries research; communication between fishers and scientists; marine vessel safety; and fishing families and communities

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Projects and specialties: marine science educational programs at OSU's Hatfield Marine Science Center

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Projects and specialties: ornamental aquatic animal health and husbandry in aquarium or pond environment; educational programming for wholesalers, retailers, and hobbyists in the aquarium industry

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Projects and specialties: free-choice learning for youth and adult audiences; family science literacy and identity

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Projects and specialties: collaborative research between fishers and scientists; selective harvest technology; fisheries management; fishers' ecological knowledge; fish behavior; essential fish habitat

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Projects and specialties: design and coordinate seminar demonstrations and workshops that focus on seafood product and market development; manage product development educational projects; provide fee-based product development services to seafood businesses

Doug Sokell

Communications

The purpose of Sea Grant Communications is to get research-based information about the ocean and coast to people who can use it. The professionals in Communications use every tool at their disposal—from print to audio and video to the Internet—to reach many different users with information about important issues and scientific developments that concern ocean and coastal resources and the creatures and people who depend on them. The Communications staff also supports researchers, Sea Grant Extension faculty, the HMSC Visitor Center, and the rest of the program in meeting Sea Grant's mission. In addition, we cooperate on projects with our communication colleagues at the university, in the national Sea Grant network, and in the National Oceanic and Atmospheric Administration.

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HMSC Visitor Center

People of all ages have a chance to learn more about the ocean and coastal environment when they spend time at the Visitor Center at the Oregon State University Hatfield Marine Science Center. The exhibits and programs at the center explain how scientific research, much of it based at the HMSC's own laboratories, enhances our ability to interpret the natural patterns that shape our world and enables us to better appreciate, manage, and sustain coastal and marine resources. Among the activities offered are classes, nature walks, lectures, seminars, and summer programs for the entire family.

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Advisory Council

Oregon Sea Grant's Advisory Council helps ensure that research and outreach programs address the real needs of Oregon and its coastal communities, businesses, and policy-makers. Appointed to three-year terms, council members meet periodically to help set program priorities, offer advice on specific plans and research proposals, and counsel the program's administrative staff.

Xanthippe Augerot
Former Director of Science Programs, The Wild Salmon Center

Kirk Beiningen
Retired, Oregon Department of Fish and Wildlife

Anne Berblinger
Retired, Economic Development Administration, U.S. Department of Commerce; small-farm owner

Ralph Brown
Former Curry County Commissioner; commercial fisher; former member, Pacific Fishery Management Council

Ellie Dumdi
Former Lane County Commissioner

Nancy Leonard
Waldport City Manager; former member, Oregon Land Conservation and Development Commission; former member, Oregon Water Resources Commission; former member, Ocean Policy Advisory Council

Mikell O'Mealy
Oregon Department of Environmental Quality

Allan Rumbaugh
Former General Manager, International Port of Coos Bay

William Schreiber

Commercial charter boat captain; Port Commissioner, Port of Garibaldi; former owner, Smith's Pacific Shrimp Processing Company of Tillamook, Oregon; former owner, FV *Captain Ryan*

Merritt Tuttle

Retired, National Marine Fisheries Service

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