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NEWS RELEASE

For Immediate Release
Dec. 28, 2011

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Washington Sea Grant Funds 11 New Marine Research Projects

Washington Sea Grant (WSG) will fund 11 new research projects from 2012 to 2014, addressing a variety of issues and challenges facing Washington's marine environment. In addition, WSG will continue to fund two ongoing projects and contribute to two new West-Coast-wide social science projects.

The new projects range from studying of the recovery of Elwha River salmon and trout after dam removal to testing the effects of ocean acidification on zooplankton species crucial to the marine food web.

"These projects will explore some of Washington's most critical marine resource concerns," said WSG Director Penny Dalton. "In addition, we have teamed with Sea Grant programs in California and Oregon to fund two social science research projects on issues that are relevant to the entire West Coast."

WSG selects, funds, oversees and manages marine-related projects carried out by academic and research institutions throughout Washington. WSG-supported research complements ongoing outreach activities in a broad range of topic areas, including aquaculture, fisheries, water quality, invasive species, coastal economic development, shoreline land use and marine technology training.

For 2012-2014, WSG has about $2.29 million for research. In January 2011, scientists submitted 66 preliminary proposals seeking more than $13 million collectively over the biennium. The selected projects emerged after a rigorous 10-month review process by peer reviewers, two external scientific panels, the WSG Advisory Committee and organization staff.

New Projects and Lead Researchers

- Troubled Sediments: *Heterosigma* Cyst Formation and Longevity

Rose Ann Cattolico, Professor, University of Washington (UW) Biology Department
Climate change and human activities may contribute to increased occurrence of algal blooms. These toxic events impact the survival of salmon and other parts of the marine food chain and compromise the health of coastal ecosystems. This project will address the longstanding question of why blooms of an algal species differ in intensity, longevity and toxicity. It will also provide tools to commercial aquaculturists for monitoring *Heterosigma akashiwo* cells and cysts.

- Acoustic Propagation Measurement and Modeling in Puget Sound to Support Noise Environmental Impact Efforts
  Peter Dahl, Principal Engineer, UW Applied Physics Laboratory
  As communities seek to expand and upgrade transportation infrastructure, underwater noise from pile driving could pose a threat to killer whales and other wildlife. Developers must establish monitoring plans to ensure that sensitive marine species are not subjected to high underwater noise levels that are considered harmful. Such monitoring plans are based on a simple model for underwater sound transmission that can cover tens of square kilometers and add significantly to the project's cost. This project will undertake a detailed study of sound propagation in Puget Sound waters and evaluate and develop a new and more accurate model. The goal is a more cost-effective means to address underwater noise from marine construction that provides more reliable protection for sensitive marine animals.

- Governing Complex Environmental Commons: Stakeholder Partnerships in Salmon Recovery in Washington, Oregon and California
  Nives Dolsak, Associate Professor, UW School of Marine and Environmental Affairs
  Using decision-making processes for salmon recovery, this project will assess governmental conservation efforts that seek stakeholder collaboration and maximum local involvement. It will examine challenges for such efforts that might leave participants less trusting, less cooperative and less convinced of the need to sacrifice in order to save endangered species. The goal is to improve understanding of governance across complex coastal and marine issues and collaborative governance across different resource management and stakeholder groups.

- Effects of Early Exposure of Pacific Oysters to Ocean Acidification on Subsequent Performance
  Carolyn Friedman, Professor, UW School of Aquatic and Fishery Sciences
  Ocean acidification is already impacting the Pacific Northwest and an increasing number of studies are documenting its negative effects on larval performance of marine shellfish. Poor hatchery performance and low natural recruitment in Pacific oysters may be a direct result of ocean acidification. This project will investigate the effects on later life stages of exposing broodstock and larvae to more corrosive waters. It will also estimate genetic parameters required to implement an effective breeding program for improved tolerance of acidic conditions.

- Using Zebrafish to Assess the Health Effects of Persistent Pollutants in Pacific Salmon
  Evan Gallagher, Associate Professor, UW Environmental and Occupational Health Sciences

Resident Chinook salmon are important seafood for Puget Sound residents, especially tribal communities, but they accumulate polybrominated diphenyl ethers (PBDEs) to a much greater extent than other salmon species. The goal of this project is to use zebrafish as a surrogate model to increase understanding of human health risks associated with consumption of Puget Sound Chinook salmon containing PBDEs.

- Understanding Dormancy Requirements and Germination of *Alexandrium* Cysts and Evaluating Cyst Mapping as a Tool for Early Warning of Harmful Algal Blooms
  Cheryl Greengrove, Associate Professor, Interdisciplinary Arts and Sciences, UW Tacoma
  Harmful algal blooms can contaminate shellfish and result in costly recalls of tainted product from the market, considerably reducing consumer confidence in seafood safety. To address this concern, health authorities in Washington dedicate significant resources to monitoring shellfish toxicity at more than 70 locations in the Sound at roughly two-week intervals. This project will enhance an early warning system for toxic blooms of one common culprit, *Alexandrium catenella,* in Puget Sound. Specifically, it will provide critical information on life-history characteristics of *A. catenella* that will inform a predictive model.

- Local Adaptation in Puget Sound Pacific Cod
  Lorenz Hauser, Associate Professor, UW School of Aquatic and Fishery Sciences
  The abundance of Pacific cod in Puget Sound has been declining for several decades, but the causes of this decline, especially in relation to the relatively abundant northern stocks, are uncertain. Recently the Puget Sound cod population was listed as a species of concern by the National Marine Fisheries Service, in part based on genetic evidence from a previous Sea Grant project demonstrating its long-term isolation from ocean populations. This project will investigate the level of local adaption of Pacific cod stocks in Puget Sound by examining its genetic makeup in combination with captive selection experiments.

- Effects of Ocean Acidification on Trophically Important Crustacean Zooplankton of Washington state
  Julie Keister, Assistant Professor, UW School of Oceanography
  Over the next century, scientists predict that atmospheric carbon dioxide will significantly increase the acidity of global ocean surface water. Coastal upwelling and continued runoff into inland waters may exacerbate the changes in some regions. This shifting ocean chemistry could have broad-ranging effects on the development, growth and survival of organisms and thus on entire marine ecosystems. Yet due to lack of sufficient biological data to inform models, accurate predictions of ecosystem effects are not yet possible. This study will increase understanding of how coastal and inland marine ecosystems are likely to respond by testing the effects of ocean acidification on crustacean zooplankton under realistic current and future conditions.

- Using Microbiota for the Evaluation and Monitoring of Puget Sound Ecosystems
  Elizabeth Nesbitt, Curator, Burke Museum Invertebrate Paleontology Division; Associate Professor, UW Earth and Space Sciences
  The Puget Sound ecosystem is a complex stew of natural and human-produced ingredients. This study will assess the effects of the transfer of these ingredients into

the system by monitoring foraminifera — tiny mineralizing organisms that are a vital link in the food web. Analyses of foraminiferal populations, including species composition, density, diversity and species richness, correlated with sediment parameters, will yield a picture of the effects of inputs such as tides, currents, rivers, stormwater and sewage effluent. The project will develop a new, cost-effective tool for monitoring Puget Sound ecosystems and their response to environmental stresses.

- Recovery of Elwha River Salmon and Trout after Dam Removal: Recolonization and the Awakening of Dormant Life-History Diversity
  Thomas Quinn, Professor, UW School of Aquatic and Fishery Sciences
  Pacific salmon and trout are among the most important fishes in the region and are keystone species for stream and riparian ecosystems. Impassable dams have been an important contributor to reductions in Pacific Northwest salmon populations. For this reason, the response of the Elwha River ecosystem to removal of two dams, which began in fall 2011, is a matter of great scientific and public interest. This study will explore the expansion of salmon and trout populations, their spatial use of the basin and the diversity of their life history traits in the Elwha River system as the dams are removed.

- Effects of Waterfront Stormwater Solution Prototypes on Water Quality Runoff in Penn Cove, Town of Coupeville
  Nancy Rottle, Associate Professor, UW Landscape Architecture
  Untreated runoff is one of the leading causes of degradation to Puget Sound and carries toxic chemicals that threaten aquatic natural resources. Stormwater outfall sites may provide the final opportunity to improve stormwater quality before it enters the Sound. This project will assess the effectiveness of green stormwater infrastructure in reducing the harmful effects of runoff on aquatic resources, including contamination, habitat loss and environmental degradation. The prototype will help coastal communities find ways to address local and regional planning decisions and capture the economic, aesthetic and ecological benefits of alternative stormwater solutions.

Continuing Projects

- Impacts of Armoring on Puget Sound Beaches: Diverse Effects on Diverse Scales
  Megan Dethier, Research Professor, Biology, UW Friday Harbor Laboratories
  Data demonstrating the physical and biological impacts of shoreline armoring on Puget Sound beaches are surprisingly limited. Yet about 30 percent of Puget Sound's shorelines are already armored, and erosion from increased storm activity could heighten the demand for shoreline protection. Extensive armoring may disrupt many processes, resulting in cumulative impacts. This project will continue monitoring of the effects of removal of hard armoring at Seahurst Park in Burien and provide greater understanding of the impacts of shoreline armoring on the physical and ecological dynamics of Puget Sound beaches.

- Partitioning Multiple Pressures Impacting Southern Resident Killer Whales
  Sam Wasser, Research Professor and Director, Center for Conservation Biology, UW Biology Department
  Endangered Southern Resident killer whales are sentinels for the health of the Salish

Sea, important in First Nations folklore, and the basis for a multi-million dollar tourist industry in Washington state and British Columbia. Threats to the recovery of the Puget Sound population include reduced salmon availability for food, toxic contamination and increased vessel traffic. This study will continue efforts to delineate the relative importance of such threats and guide recovery strategies. Researchers use a detection dog aboard a boat to locate floating whale scat and collect and analyze it for stress-induced hormone levels and other data.

West Coast Social Science Projects

- Social and Economic Effects of Individual Fishing Quotas (IFQs) on the West Coast Groundfish Fishery: Solving the Weak Stock/Bycatch Problem
  Christopher Costello, Professor, UC Santa Barbara (regional lead); Trevor Branch, Assistant Professor, UW School of Aquatic and Fishery Sciences (Washington lead)
  Allocation of catch shares among fishermen is an increasingly common approach to fisheries management in the United States. Such quota allocations provide demonstrated economic and ecological benefits, but concern is widespread that they can result in changes that may be socially undesirable or fail to solve other management goals, such as reducing unintended catch (bycatch) of stocks that are prohibited or depleted. The West Coast groundfish fishery currently is moving to an individual fishing quota system and faces a number of bycatch problems. This project will document the socioeconomic effects of the new system and suggest management options for achieving a sustainable ecosystem and vibrant fishing communities.

- Successful Adaptation: Identifying Effective Process and Outcome Characteristics and Practice-Relevant Metrics
  Pamela Matson, Professor, Stanford University (regional lead); Amy Snover, Research Scientist and Co-Director, UW Joint Institute for the Study of the Atmosphere and Ocean, Climate Impacts Group (Washington lead)
  Climate change will have widespread environmental, economic and social impacts, forcing coastal communities to face difficult choices and trade-offs in the decades ahead. Managing the impacts of climate change and sea-level rise on coastal resources is a major concern in all three West Coast states and raises the question, "What would successful adaptation to climate change look like?" This project will engage scientists and coastal practitioners in answering that question. It will explore adaptation outcomes, processes and mechanisms as well as metrics with which to measure success in California, Oregon and Washington coastal communities.

Based at the University of Washington, Washington Sea Grant provides statewide marine research, outreach, and education services. The National Sea Grant College Program is part of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. www.wsg.washington.edu