# CALIFORNIA SEA GRANT
PROGRAM DIRECTORY 2016

CALIFORNIA SEA GRANT COLLEGE PROGRAM

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https://caseagrant.ucsd.edu/

Sea Grant is a unique partnership of public and private sectors, combining research, education, and outreach for public service. It is a national network of universities meeting changing environmental and economic needs of people in our coastal, ocean, and Great Lakes regions.
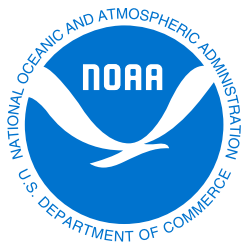
Introduction

The National Sea Grant College Program, a network of 33 university-based programs, is dedicated to enhancing the understanding, conservation, and sustainable use of the nation's coastal and marine resources. It has facilities and staff in every coastal and Great Lakes state, with activities funded by the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce. Matching funds come from the individual states, and additional support from a variety of private sources.

The Sea Grant programs of today focus on making this country a world leader in marine research and the sustainable use of marine and coastal resources. To this end, they produce and make available a wealth of information on these topics, from school curriculum materials to the most advanced scientific research.

California Sea Grant College Program draws on the talents of scientists and engineers at public and private universities throughout the state. It is administered by Scripps Institution of Oceanography in La Jolla, a part of the University of California San Diego.

California Sea Grant contributes to the growing body of knowledge about coastal and marine resources and helps solve contemporary marine-related problems through its sponsored research. It supports graduate education by funding trainees who work with marine scientists and engineers on a diversity of subject areas. Through its outreach and communications components, developments in information and technology are transferred to stakeholders. Its Extension personnel play a major role in the link between university, industry and the public.

The research funded is selected on the basis of competitive, peer-reviewed proposals and addresses a wide range of problems and opportunities.

This Program Directory provides summaries of the research and education projects funded in 2016 by California Sea Grant. Further information on any of these projects is available through the program Web site (https://caseagrant.ucsd.edu/) and from the principal investigators and researchers, for whom contact information is listed.

Our Vision

The California Sea Grant College Program envisions a future in which people live in balance with coastal and marine resources, noting that the well being of California is closely tied to its human and natural resources. We envision an educated and engaged public that makes decisions based on sound, scientific information, resulting in sustainable, thriving human and natural communities.

Our Mission

CASG's mission is to provide integrated research, extension, outreach, and education to help Californians balance diverse coastal and marine interests and adapt to changing conditions and needs. We accomplish this by collaborating with a network of local, state, tribal, regional, national and international partners. California is large and diverse both geographically and in terms of its population. In addition to more than 37 million residents, California draws millions of visitors and tourists from around the world each year.

PROGRAM DIRECTORY 2016

CALIFORNIA SEA GRANT

CORE FUNDS

Trainees are with HCME 23, 24, 26, 27, 28A, SSFS-04A

Effects of climate change induced ocean acidification and hypoxia on reproduction of rockfishes
R/HCME-20A
Giacomo Bernardi, UC Santa Cruz, 831-459-5124, bernardi@ucsd.edu
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Cheryl Logan, CSU Monterey Bay, 831-582-4698, clogan@csumb.edu
Susan Sogard, National Marine Fisheries Service, susan.sogard@noaa.gov

Climate change is expected to increase exposure of nearshore California Current organisms to ocean acidification and hypoxia (sublethal to lethal levels of dissolved oxygen). These nearshore habitats are critical nursery grounds for many economically important species. This project will use laboratory experiments to test the effects of ocean acidification and hypoxia, separately (year 1) and combined (year 2), on blue, gopher and rosy rockfish – specifically pregnant females, their developing embryos, and post-parturition larvae. Response variables will include reproductive traits, physiological traits and gene expression. This study will establish baseline effects of low pH and low DO on early life stages of economically valuable rockfish. Results will be shared with state and federal resource agencies, the West Coast Ocean Acidification and Hypoxia Science Panel, news and institutional media, and the Teaching Enhancement Program at Moss Landing Marine Laboratories.

Octopus predatory behavior, spatial ecology, and their impact on abalone populations
R/HCME-21
Ed Parnell, UC San Diego SIO, 858-822-2701, eparnell@ucsd.edu
Paul Dayton, UC San Diego SIO, 858-534-6740, pdayton@ucsd.edu
Jennifer Hofmeister, UC Berkeley, 510-642-1391, jenkkhof@berkeley.edu
Octopuses are one of the most common and important predators in benthic coastal ecosystems. Their prey includes recovering and endangered abalone populations in southern California. This project will address knowledge gaps in octopus movement and feeding behavior, specifically whether they can discover and exploit new food sources, whether they return to an area after translocation, and their preferred habitats and movements in the La Jolla kelp forest. Results will inform the NMFS White Abalone Management Plan, the CDFW Abalone Recovery and Management Plan, and commercial trapping fisheries that experience catch loss to octopuses. The investigators will also provide digital media and themed programs on the project to the

Birch Aquarium at Scripps and run a workshop for the Expanding Your Horizons conference to encourage women in STEM.

Filling the "white zone": New methods for interpolating seafloor attributes in California's critical unmapped nearshore habitats
R/HCME-22
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Mark Carr, UC Santa Cruz, 831-459-3958, mhcarr@ucsc.edu

The lack of seafloor habitat data and maps in the shallow nearshore zone, or "white zone," is a serious impediment to science and management of this ecologically and economically important environment. A completed map could inform diverse issues included MPA design, identifying essential habitat, estimating land-based impacts and stock assessments. This project will compile the best available substrate and shoreline data and use it to interpolate the characteristics of California's white zone. Characteristics will include substrate type (rock vs. sediment), relief, depth and rugiosity. The project will also evaluate the accuracy of the maps for use in habitat-species density models. Substrate maps resulting from this project will be available to resource managers and the public on Marine BIOs, and a project video will be shared at the Seymour Discovery Center at UC Santa Cruz.

Understanding the role of oyster mariculture on ecosystem health in coastal California: water quality in Drakes Estero before and after oyster mariculture
R/HCME-23
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Oyster aquaculture is well established on the U.S. Pacific coast. Oysters are widely regarded as ecosystem engineers due to their high capacity for filter feeding, which impacts water quality, but the consequences of oyster introduction and removal are poorly understood. This project will observe biogeochemical and ecological impacts of removal of over 5 million cultured oysters from Drakes Estero, CA, a low-inflow estuary within the Point Reyes National Seashore. The project will measure changes in water quality, nutrients, primary producers and general ecosystem health, including the presence of harmful or nuisance algae. Results will be shared through publications and through outreach activities at the annual SFSU open house and workshops for high school teachers.

Integrating Survey-Based Habitat Models into the California Swordfish Fishery Dynamic

Management Tool

R/SSFS-04A

Sara Maxwell, Old Dominion University, 757-683-3425, smaxwell@odu.edu

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Elizabeth Becker, UC Santa Cruz

Kylie Scales, UC Santa Cruz, 831-648-8516, kscales@ucsc.edu

The risk of bycatch of dolphins and whales in the drift gillnet fishery has resulted in closures and regulatory changes to the swordfish fishery by the Pacific Fishery Management Council. This project will use cetacean sighting data from shipboard surveys to develop models that estimate the probability of cetacean presence given environmental conditions, as well as subsequent potential for bycatch in drift gillnet fishing. Cetaceans will be incorporated into the existing EcoCast bycatch modeling framework that includes other protected species such as leatherback sea turtles, and which includes a mobile application to record and display sightings. The results will provide maps in near real time of where bycatch of multiple species is likely to occur in the future, using both fishery independent and dependent data. Investigators will hold a fishermen's workshop to discuss potential improvements to the EcoCast app and expand its voluntary use by fishermen. Investigators intend to adapt the resulting models to inform possible changes in commercial fishing gear and potential hard-capped species in the future.

Impact of Neonicotinoid Pesticides on Estuaries and Coastal Streams

R/HCME-24

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Jay Means, UC Santa Barbara, jmeans@bren.ucsb.edu

Erik Muller, UC Santa Barbara, erik.muller@lifesci.ucsb.edu

Michelle Hladik, U.S. Geological Survey, mhladik@usgs.gov

Jill Murray, City of Santa Barbara, 805-897-1911, jmurray@santabarbaraca.gov

Neonicotinoids are the most widely used pesticides worldwide – used in agriculture, pest control, professional landscaping, home garden care and pet treatments – and have been linked to declines in pollinator populations. This project will provide data to the City of Santa Barbara and state and federal agencies on the potential ecological impacts of neonicotinoid pesticides in urban and agricultural runoff to coastal streams and estuaries. Investigators will monitor urban creeks, agricultural runoff and receiving estuaries for toxicity before, during and after rain events. They will also conduct laboratory exposure experiments on aquatic insects and marine amphipods to predict long-term population impacts and develop a Dynamic Energy Budget model to predict population level impacts. Project results will be presented by the project trainee, the City of Santa Barbara, UCSB's Environmental Media and Outreach Center, and through peer-reviewed journals.

Species Distribution Models for Management of Fisheries and MPAs: innovative approaches to cost-effective data collection in California
R/HCME-25A

Jennifer Caselle, UC Santa Barbara
Richard Starr, CA Sea Grant MLML

As marine resource managers continue to adopt ecosystem-based approaches, there is a growing need to acquire reliable spatial information on species distributions. This project will develop and apply advanced species distribution models (SDMs) while simultaneously testing new monitoring methods for coastal waters in southern California. The models will couple highly resolved maps with *in situ* survey data of marine species. The surveys will be conducted through both traditional SCUBA and through newly designed stereo-video drop cameras to evaluate the level of correspondence between the two methods as well as cost effectiveness and the potential for citizen science application. Results will be shared through peer-reviewed scientific publications and the Ocean Science Trust website.

Nearshore Nonlinear Internal Waves: Propagation, Transport, Mixing and Controls on Larvae, Phytoplankton, and Nutrients
R/HCME-26

Falk Feddersen, UC San Diego, Scripps Institution of Oceanography
Nearshore waters (depth < 15 m) are of critical ecological and economic importance. Nonlinear internal waves (NLIW) transport and mix nutrients, phytoplankton, and larvae in the nearshore, but their propagation and transformation from 15 m depth to the shoreline is poorly understood. This project will track NLIW from 7-15m depth to the shoreline, characterizing their transformation, mixing efficiency, heat flux, and variations in frequency and magnitude. Results will address unresolved questions about internal wave propagation and transformation across the nearshore region and characterize their impact on cross-shelf transport (larvae, nutrients, pathogens) and mixing. Project results will be shared with state and local agencies managing coastal ecosystems and marine protected areas.

Behavioral-physical regulation of nearshore retention and cross-shelf transport of fish larvae in a network of marine reserves
R/HCME-27

Steven Morgan, UC Davis BML, 707-875-1920, sgmorgan@ucdavis.edu
John Largier, UC Davis BML, 707-875-1930, jlargier@ucdavis.edu
Our limited understanding of larval connectivity between Marine Protected Areas (MPA) was perhaps the biggest impediment to designing the California's MPA network to fulfill the Marine Life Protect Act. This project will determine the extent to which interspecific differences in larval behavior affect cross-shelf transport of a diverse assemblage of ecologically, commercially and recreationally important fishes across an upwelling cell (Point Arena) where the potential for

offshore transport is greatest. The results may help assist in forecasting fishery harvests, modeling marine populations and evaluating the effectiveness of MPA networks. Results will be transferred to the Monitoring Enterprise of the Ocean Science Trust and shared through NMFS and the Bodega Marine Lab website and visitor video display.

Deciphering the Soundscapes of the Coastal Shelf: Using Passive Acoustics for Assessing Fish Dynamics in Southern California Kelp Forests
R/HCME-28A

Ana Širović, UC San Diego SIO, 858-534-8036, asirovic@ucsd.edu
Jules Jaffe, UC San Diego SIO, 858-534-6101, jjaffe@ucsd.edu
Ed Parnell, UC San Diego SIO, 858.822.270, eparnell@ucsd.edu

Passive acoustics are a relatively new and cost-effective method for monitoring animal activities and diversity, as well as other environmental features. This project will develop and test a new acoustic-optical protocol to evaluate habitat occupancy in the southern California kelp forest, developing metrics for linking local soundscape and species activity and presence. It will also create a baseline catalog of acoustical signals for a subset of species that are important in the kelp ecosystem, which will be made available on Širović's lab page. If successful, the acoustic protocol developed will reduce the cost and increase the precision of underwater animal surveys.

Evaluating potential cascading impacts of sea star wasting disease on top-down grazer regulation in kelp forests
R/HCME-19PD
7/1/15 – 6/30/16

Todd Anderson, San Diego State University, 619-594-0995, tanderson@mail.sdsu.edu

Previous studies in California have documented significant correlations between predator densities, increased herbivore (i.e. grazer) abundance, and subsequent decreases in macroalgal or seagrass abundance. Since 2013, sea star wasting disease along the California coast has reduced the main predators of *Chlorostoma* species, herbivorous ocean gastropods. This project will investigate the potential of *Chlorostoma* spp. to impact kelp forest and macroalgal abundance in areas with and without sea star wasting disease, by characterizing their abundance, diet, energy allocation, habitat use and predator density. PhD student Lynne Wetmore, SDSU, will conduct field sampling. Results will be shared through peer reviewed publication and professional conferences, and may be used to inform management of California's kelp forest ecosystems.

Development of a strategic plan for aquaculture research and education at the California State University

W15-70PD

9/1/15 – 12/31/15

Michael Graham, San Jose State University, 831.771.4481, mgraham@mlml.calstate.edu

James T. Harvey, Moss Landing Marine Laboratory

Scott Hamilton, Moss Landing Marine Laboratory

Jason Smith, Moss Landing Marine Laboratory

Matthew Edwards, San Diego State University

Michael Lee, CSU East Bay

The California State University system is proposing to establish a new Center for Aquaculture based at Moss Landing Marine Laboratories, designed to train a technical workforce to support California's emerging aquaculture industry. This project will host a two-day workshop at MLML in January 2016 to develop a strategic plan for aquaculture research and education, with participants from 23 campuses, regulator agencies and industry. The resulting draft strategic plan will be shared in a white paper for further refinement through 2016.

Consequences of El Niño on estuarine acidification impacts on native and commercial oysters

Ted Grosholz, UC Davis

Ann Russell, UC Davis

R/HCME-30PD

1/1/16 – 6/30/16

Estuarine ecosystems important to native and cultured oyster species are particularly sensitive to sea level rise, rising temperatures and ocean acidification. The project will monitor changes in Tomales Bay water conditions, which are likely to be significantly influenced by runoff from anticipated El Niño storms following years of severe drought. This monitoring will further inform an ongoing project ([R/HCME-02](#)) to quantify the consequences of terrestrial and marine controls over estuarine acidification for the restoration and health of both native Olympia oysters (Ostrea lurida) and commercial Pacific oysters (Crassostrea gigas). Results will determine whether pH or other factors are more important in explaining patterns observed in the field. Findings will be shared with native oyster restoration groups and local shellfish producers at annual stakeholder meetings to be convened by the researchers, and through outreach materials through the UC Agriculture and Natural Resources Cooperative Extension.

Western Society of Naturalists Annual Meeting

Gretchen Hofmann, UC Santa Barbara, 805-893-6175, hofmann@lifesci.ucsb.edu

W15-72PD

11/5/15-11/7/15

The Western Society of Naturalists is a scientific society with a strong focus on ecology, evolution, natural history, and marine biology. This project will support a workshop and two

symposia at the 2015 Annual WSN Meeting in Sacramento. Specifically, Sea Grant funds will support training junior scientists through a student workshop ("Linking Science and Policy: Practical Skills for Early Career Scientists"), student symposium ("Critical Issues and Innovative Approaches in Marine Policy Along the Northeast Pacific") and the WSN presidential symposium ("Global Change Marine Ecology").

Hydrologic and geomorphic changes to southern California estuaries and lagoons during episodic events associated with the 2015-2016 El Niño: Insight to potential future response to sea level rise

Eric Stein, Southern California Coastal Water Research Project, 714-755-3233, erics@sccwrp.org
Sarah Giddings, UC San Diego SIO
R/HCME-29PD
11/1/15-10/31/16

Sea level rise and increased storm severity is expected to impact coastal lagoons and estuaries, but the magnitude and pattern of response at specific locations is uncertain. The predicted 2015-2016 El Niño along the Pacific Coast provides an invaluable opportunity to observe and document lagoon response, particularly of berms that control mouth dynamics, to large storm events. This project will examine how responses in these two classes of estuaries – those with permanently vs. intermittently open mouths – are affected by factors such as angle of wave attack, watershed size, and lagoon morphology. Results will inform sea level rise planning efforts and help calibrate models, and will be shared through peer-reviewed publication, the California State Coastal Conservancy, the Tijuana NERR, and researcher partners including California Sea Grant Extension.

The impact of sea-level rise on coastal erosion: using the coming 2015-2016 El Nino as a surrogate for 50-100 years of expected sea-level rise in central California.

Edward Keller, UC Santa Barbara, 805-893-4207, keller@geol.ucsb.edu

Climate change is expected to bring sea levels is increased coastal erosion of beaches and sea cliffs, putting California's coastal residents and properties at risk. This project will quantify the extent of coastal change in beaches and sea cliffs as a result of both the expected El Niño storms during the winter of 2015- 2016 and the rise in sea level as a result of El Niño. Investigators will use high-resolution airborne LiDAR (Light Detection and Ranging) data from 2006 and 2009-2011, as well as new terrestrial LiDAR data, to measure erosion from beaches and sea cliffs, develop a slope change model for sea cliffs, and to anticipate future erosion impacts. The temporal window provided by the El Niño event, while comparatively short, will provide an important surrogate for what sea level is likely to resemble in future decades. Project results will assist predictions of what will occur as sea level rises 20 or more centimeters during the 21st century along the coastline of California.