

# CALIFORNIA SEA GRANT

## Program Directory



2005-2006



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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.

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## Message from the Director...

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This past year has ushered in numerous changes in our nation and in California. Not one to rest on his laurels, the governor has made sweeping changes in our state including how we value and manage our coastal marine resources. He has charged us to respond to federal initiatives in marine science by calling for the development of a California marine resource action plan. This effort, led by new leaders in the California Resources Agency and the California Environmental Protection Agency, has rekindled interest in marine resource conservation and utilization.

A component of this renewed interest in marine resources is the continuing population growth of California on a narrow strip of land bordering the ocean. This growth places the land-water connection under constantly increasing stress. Thus, more than ever, we seek increased knowledge on how to best manage coastal resources in light of the numerous demands placed on them. A further development is a renewed interest by Californians in marine protected areas and reserves. That interest drives an even greater need for good, unbiased information upon which sound ocean management decisions can be made. That is a central tenet of the California Sea Grant mission—to support research and education concerning our marine environment. If we are to have a vibrant and resilient economy and yet conduct commerce in an environmentally responsible manner, we must seek to expand our knowledge and understanding of our environment.

The outreach activities and research projects described in this directory are the current efforts by California Sea Grant to develop a better understanding of our coastal marine environment. I encourage you to explore these projects and outreach activities in more depth, and I invite you to join with California Sea Grant as we move to the future.



*Russell A. Moll  
Director*

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## What is Sea Grant?

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The National Sea Grant College Program, a network of 30 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 principally 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 development 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, the largest of these 30 programs, draws on the talents of scientists and engineers at public and private universities throughout the state. It is administered by the University of California, and based at Scripps Institution of Oceanography in La Jolla.

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. Our 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 projects being funded in 2005 by California Sea Grant. Further information on any of these projects is available by contacting our offices, or visiting the program website—<http://www.csgc.ucsd.edu>.

### Other Web Resources:

National Sea Grant Office      [www.nsgo.seagrants.org/](http://www.nsgo.seagrants.org/)  
News Media Center            [www.seagrantsnews.org/](http://www.seagrantsnews.org/)  
National Sea Grant Library:    [nsgl.gso.url.edu/](http://nsgl.gso.url.edu/)

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## Participating Institutions 2005–2006

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<b>ABN</b>	Advanced BioNutrition Corp. Columbia, Maryland
<b>ABP</b>	Aqua Bounty Pacific, Inc. San Diego, California 92123
<b>BML</b>	Bodega Marine Laboratory Bodega Bay, California 94923
<b>CPSU</b>	California Polytechnic State University San Luis Obispo, California 93407
<b>CSGEP</b>	California Sea Grant Extension Program
<b>CSUF</b>	California State University, Fresno Fresno, California 93740
<b>CSULB</b>	California State University, Long Beach Long Beach, California 90840
<b>HMS</b>	Hopkins Marine Station Pacific Grove, California 93950
<b>HSU</b>	Humboldt State University Arcata, California 95521
<b>MBARI</b>	Monterey Bay Aquarium Research Institute Moss Landing, California 95039-9644
<b>MLML</b>	Moss Landing Marine Laboratories Moss Landing, California 95039
<b>NOAAF</b>	NOAA Fisheries Silver Spring, Maryland 20910
<b>ODFW</b>	Oregon Department Fish & Wildlife Salem, Oregon 97303
<b>PRBOCS</b>	PRBO Conservation Science Stinson Beach, California 94970
<b>PU</b>	Pepperdine University Malibu, California 90263
<b>SIO</b>	Scripps Institution of Oceanography La Jolla, California 92093
<b>SDSU</b>	San Diego State University San Diego, California 92182

<b>SFEP</b>	San Francisco Estuary Project Oakland, California
<b>SFSU</b>	San Francisco State University San Francisco, California 94132
<b>SJSU</b>	San José State University San José, California 95192
<b>TRNERR</b>	Tijuana River National Estuarine Research Reserve Imperial Beach, California 91932
<b>UB</b>	University of Birmingham Birmingham, England
<b>UCD</b>	University of California, Davis Davis, California 95616
<b>UCLA</b>	University of California, Los Angeles Los Angeles, California 90095
<b>UCSB</b>	University of California, Santa Barbara Santa Barbara, California 93106
<b>UCSC</b>	University of California, Santa Cruz Santa Cruz, California 95064
<b>UCSD</b>	University of California, San Diego La Jolla, California 92093
<b>UC-SG</b>	University of California—Sea Grant College La Jolla, California 92093-0232
<b>UW</b>	University of Washington Seattle, Washington 98195



Long Marine Laboratory, UC Santa Cruz.



Pigeon Point Light, north of Santa Cruz, California on Highway 1.

## Coastal Ocean Research

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- **Diablo Canyon Archaeology: Trans-Holocene Faunal Exploitation Along the Central California Coast**

R/CZ-187    Mar. 04–Feb. 06  
Terry Jones, CPSU, 805.756.2523,  
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An anthropologist is radiometrically dating and speciating a collection of bone and shell fragments excavated from Diablo Canyon during construction of a nuclear power plant. The remains are believed to represent one of the longest continuous records of coastal life in western North America. The work will shed light on the extent to which early humans hunted marine mammals, such as sea otters, and the effects of this exploitation on the structure of marine mammal populations and kelp forest communities. The rare window back in time, perhaps as far back as 8000 B.C., will help scientists develop a longer-term perspective and knowledge of the characteristics of past coastal ecosystems and the effects of predators.



Drifters being deployed in the surf.

- **Horizontal Dispersion of Passive Tracers in the Surf Zone**

R/CZ-188    Mar. 04–Feb. 07  
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858.534.0585, rguza@ucsd.edu

A GPS-tracked drifter developed in an earlier Sea Grant project is being used to study the dispersion and eddy-transport of passive tracers in the surf zone. Statistical analyses of this drifter data will answer fundamental questions about surf-zone advection and diffusion. This

information can, among other things, enhance existing coastal circulation models for forecasting surface wave height, pollution transport and larval dispersal.

- **Eelgrass Community Response to Grazing by an Aggressive Herbivore: An Experimental Approach**

R/CZ-189 Mar. 04–Feb. 06  
Frank Shaughnessy, HSU, 707.826.4133,  
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This study seeks to determine whether, or the degree to which, migrating Brant Geese are depleting eelgrass beds in Humboldt Bay—some of the largest intact foraging areas for these geese left in California. The scientists hypothesize that moderate grazing actually maximizes eelgrass growth. A similar relationship between grazing and grass growth is observed in terrestrial ecosystems. The scientists are testing this hypothesis and examining the indirect effects of grazing on abundances of shrimp and juvenile Dungeness crab, both of which are commercially important species.

- **The Invasion and Impacts of Tamarisk in Tijuana Estuary Salt Marshes and Ecosystem Recovery After Its Eradication**

R/CZ-190 Mar. 04–Feb. 06  
Drew Talley, UCD, 530.752.2843,  
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Tamarisk is an invasive Asian tree whose spread through the NOAA Tijuana River National Estuarine Research



Reserve Research Coordinator Jeff Crooks points to tamarisk growing along the banks of the Tijuana River.

Reserve threatens to destroy riparian habitats and salt marsh—critical habitats for federally protected endangered species. In this project, scientists are evaluating the effectiveness of a tamarisk-eradication program led by the Coastal Conservancy and U.S. Fish and Wildlife Service. To do this, they are documenting tamarisk's history, extent and ecological impacts and evaluating the ecological recovery of cleared areas. Isotope analysis will allow them to monitor changes in food-web dynamics associated with the tamarisk invasion and cleanup.

- **Using the 83-Year Record of Sea Surface Temperature at Pacific Grove, California, as a Proxy for Selected Offshore Chemical and Biological Parameters**

R/CZ-191 Mar. 04–Feb. 06  
Laurence Breaker, MLML, 831.771.4498,  
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The scientist is examining whether measurements of surface ocean temperature in Monterey Bay can be used as a proxy for estimating salinity, dissolved carbon dioxide, nitrate and phosphate in the California Current. If water temperatures do indeed co-vary with these parameters, an 83-year record of sea surface temperature at the Hopkins Marine Station (one of the longest on record) could be used to make new inferences on long-term changes in the biology and chemistry of the California Current.

- **Foraging Ecology of the California Sea Lion: Diet, Diving Behavior, Foraging Locations, and Predation Impacts on Fishery Resources**

R/CZ-192 Mar. 05–Feb. 07  
Daniel Costa, UCSC, 851.459.2786,  
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California sea lions (*Zalophus californianus*) feed on many commercially and recreationally targeted fish species. As sea lion populations have increased and regulations on fishing tightened, competition between fishers and sea lions has intensified. To estimate the degree to which sea lions impact fish populations, researchers will capture, tag and track both male and female sea lions in the Channel Islands National Marine Sanctuary and Monterey Bay National Marine Sanctuary. The goal is to investigate a complex array of the animals' foraging and diving behaviors and their at-sea distribution. The data will aid fisheries managers to more accurately estimate levels of predation by sea lions and thus help refine fishery management decisions.



- **Modeling Water and Sediment Quality in the Coastal Ocean**

R/CZ-193 Mar. 05–Feb. 08  
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In an earlier Sea Grant project, researchers developed a Regional Ocean Modeling System to forecast the three-dimensional variability in physical oceanographic and biological parameters along the entire U.S. West Coast. Their goal now is to extend this model so that it is capable of forecasting environmental events on finer spatial and temporal scales in the coastal zone. The model will be programmed to simulate—and eventually predict—three important water and sediment quality issues in Santa Monica Bay and over the San Pedro Shelf: 1) the transport of sewage discharged offshore, 2) the fate of storm water discharged from rivers and storm drains and, 3) the transport of coastal sediments. The investigators are conducting or planning related research for the EPA, U.S. Army Corps of Engineers, State Water Resources Control Board and the sanitation districts of the City of Los Angeles, Los Angeles County and Orange County.

- **Anthropogenic Impacts on Rocky Intertidal Mollusks in Southern California: Compiling Historical Baseline and Quantifying the Extent of the Problem**

R/CZ-194 Mar. 05–Feb. 07  
Kaustuv Roy, UCSD, 858.822.0559,  
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What are the ecological consequences of having millions of people come to Southern California's rocky shores each year? Biologists have shown that trampling, harvesting, shell collecting and other shore activities can result in local extinctions of intertidal marine organisms as well as reductions in the sizes of rocky shore gastropods (many species are much smaller today compared to decades or centuries ago). The project aims to quantify the effects of harvesting and recreational shore activities on rocky intertidal ecosystems of Southern California over the last century. Using museum collections, old government and technical reports and other sources, the biologist will compile a database of historical occurrences and past body sizes of rocky intertidal molluscan species. This database will serve as the baseline for comparing present day patterns. In areas of the coast with sufficient baseline data, the scientist will re-survey areas, recording species

composition and measuring body sizes of key species. Findings will assist in efforts to conserve, monitor and restore these habitats.

- **California Beach Health: Evaluation of Grunion as an Indicator Species**

R/CZ-195 Mar. 05–Feb. 08  
Karen Martin, PU, 310.506.4808,  
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The scientist will monitor the spawning population of California grunion from San Diego to Monterey Bay as part of an effort to evaluate the effects of human activities on sandy beaches. The analysis will involve estimating the number of adult grunion during “runs,” collecting incubating eggs and examining embryos for developmental abnormalities. This data will be compared to a number of potential environmental stressors: beach grooming, beach use, pollution, fishing and other factors. The goal is to see whether grunion can be used to assess environmental conditions at sandy beaches.



## Aquaculture Research and Development



- **Pharmacokinetics and Efficacy of Oxytetracycline in RLP-Infected Abalone**

R/A-122 Mar. 04–Feb. 06  
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The FDA-approved antibiotic oxytetracycline (OTC) is an effective treatment for the abalone disease withering syndrome. Preliminary studies, however, have shown the antibiotic takes months to clear the digestive system, though only a short time to clear the foot muscle. Why the discrepancy? It is believed that OTC may chelate divalent cations in the digestive gland. To test whether chelation does indeed cause retention of OTC, researchers are using micronutrient analysis, via atomic absorption/emission spectrometry, to measure levels of divalent cations (Ca<sup>++</sup>, Mg<sup>++</sup> and Fe<sup>++</sup>) in the digestive system and foot muscle. To further examine the relationship between cations and OTC retention, they will use antigen-based probes to look at the localization of OTC relative to iron deposits in the digestive gland. Findings will help ensure

that farmed abalone products are drug-free. The research also has direct applications for government shellfish biologists interested in rebuilding abalone stocks by “seeding” depleted beds with captive-bred abalone.

- **Understanding the Pathogenesis of *Streptococcus iniae* Infection in Fish and Development of an Effective Vaccine for Use in Aquaculture**

R/A-124 Mar. 05–Feb. 08  
Victor Nizet, UCSD, 858.534.7408, [vnizet@ucsd.edu](mailto:vnizet@ucsd.edu)

*Streptococcus iniae* (SI) causes a fatal meningoencephalitis in commercially important fish species, including striped bass, tilapia and salmon. The lead investigator has identified several SI genes required for fish virulence and has subsequently developed a preliminary vaccine that uses live attenuated mutants. In this project, the scientist will continue to develop this vaccine, working closely with a commercial sea bass farm. Some specific aims: to finish virulence gene characterization in the full panel of attenuated mutants; to use directed mutagenesis to delete key virulence genes; and, to conduct large-scale vaccination trials with selected deletion mutants. The U.S. aquaculture industry stands to benefit greatly if a cost-effective, commercially available vaccine can be developed.

## Fisheries Research and Development



- **Developing New Management Techniques for the Pelagic Gillnet Fishery in the Southern California Bight**

R/F-193 Mar. 04–Feb. 06  
Jeffrey Graham, UCSD/SIO, 858.534.8044,  
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Increased gill netting in the Southern California Bight, as well as continued sport fishing, has raised concerns about the sustainability of thresher shark populations. These concerns are heightened by the fact that the bight is an important nursery for juvenile sharks, which are inadvertently caught in drift gillnets. The project's marine biologists are employing archival tags to record a long-term series of thresher shark movements. The data will help predict shark movement patterns and identify thresher "hot spots." This information could be useful for reducing shark bycatch and will assist NOAA Fisheries with its Highly Migratory Fisheries Management Plan and National Plan of Action for the Conservation and Management of Sharks.

- **Establishing a DNA Sequence Database for the Marine Fish Fauna of California**

R/F-194 Mar. 04–Feb. 06  
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The goal of this project is to develop a mitochondrial gene database for all marine fish species in California, an estimated 800 species. The database will allow scientists to identify species from their eggs and larvae, as well as from headed, gutted or filleted fish specimens. This information will let scientists analyze gut contents of marine animals and seabirds, thus improving marine food web studies. It will also benefit law enforcement by providing a means of distinguishing legal and illegal takes. The database will be archived at GenBank and made available to the public in a searchable, on-line format. To date, the biologists have acquired sequence data for about 200 fish species.

- **Marine Bird–Fishery Interactions in California: Modeling Prey Consumption**

R/F-195 Mar. 04–Feb. 06  
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Using 30 years of data collected around the Farallon Islands, ornithologists are studying the dietary habits of a diving seabird called the murre. The bird—the Northern Hemisphere's counterpart to the penguin—feeds on krill as well as squid, juvenile rockfish, juvenile hake and juvenile salmon, all of which are fished commercially. The research aims to estimate the amount of food needed to sustain murre populations. Findings will help state and federal agencies implement fisheries management plans that maintain sufficient reserves for sustaining marine ecosystems, including sea birds.

- **Restoration of the Endangered White Abalone, *Haliotis sorenseni*: Resource Assessment, Genetics, Disease, and Culture of Captive Abalone**

R/F-196 Mar. 04–Feb. 07  
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Once a valuable fishery, white abalone in 2002 became the first marine invertebrate placed on the federal Endangered Species list. This project seeks to gather



basic natural history, genetic and disease susceptibility data that will serve as the scientific underpinning for developing and implementing a recovery plan. Specific goals include: conducting field surveys to determine how many white abalone are left in Southern California and where they live, collecting brood stocks for captive breeding programs, and conducting lab experiments to find how temperature and feeding regimes influence key stages in the animal's life history. The scientists will also study the susceptibility of white abalone to withering syndrome and evaluate treatment protocols suitable for captive-rearing programs. Findings will help ensure that released abalone will not infect remnant wild populations.

- **Enhancement of Fertilization Success in Abalone: Increasing Effectiveness of Transplanting and Outplanting Recovery Strategies**

R/F-197 Mar. 05–Feb. 08  
 Richard Zimmer, UCLA, 310.206.4981,  
 z@biology.ucla.edu; Cheryl Ann Zimmer, UCLA,  
 310.825.8561, cazimmer@obee.ucla.edu

In many areas of California, the density of sexually mature abalone is too sparse to support successful fertilization. For this reason, many natural abalone populations may be unable to recover despite conservation efforts and strict fisheries regulations. The biologists will determine the optimal adult density, spacing and sex ratio to maximize fertilization for a given flow regime. Their research will involve laboratory studies of the kinetics of abalone fertilization in laminar shear flows. Field experiments will be conducted to test laboratory predictions. Findings will help government biologists identify natural abalone populations that likely are not reproducing. It will also help them identify coastal areas whose hydrodynamics are suited for transplanting or outplanting adults.

- **Using Matrix Models to Evaluate Abalone Conservation and Fishery Management Strategies: A Prospective Elasticity Analysis**

R/F-198 Mar. 05–Feb. 06  
 Laura Rogers-Bennett, UCD, 707.875.2035,  
 rogersbennett@ucdavis.edu

Matrix models of red and white abalone populations will be used to examine various options for managing and restoring these molluscs. In particular, the models will provide a means for exploring the effectiveness of current red abalone management strategies by evaluating whether these strategies are targeting size classes with the most influence on population growth. An example of the type of question to be addressed for white abalone: Is population growth more sensitive to changes in the growth and survivorship of small individuals or to the survival of large ones? This type of sensitivity analysis redirected loggerhead sea turtle conservation efforts away from head starting hatchlings to emphasizing the need for turtle exclusion devices on fishing nets. The goal for these sensitivity analyses will be to provide similar insights for abalone populations in California.



- **Life History Studies of California Chondrichthyans: Determining Essential Biological Information for Effective Management of Bycatch Fisheries**

R/F-199 Mar. 05–Feb. 07  
 Dave Ebert, MLML, 401.771.4427,  
 debert@mml.calstate.edu; Greg Cailliet, MLML,  
 401.771.4432, cailliet@mml.calstate.edu

In recent years, landings of chondrichthyans (including sharks, rays, and chimaeras) in California have risen to an all time high—both as targeted takes and bycatch. The

increase in exploitation is alarming, however, because it is occurring in the absence of basic biological information on these animals. In an effort to prevent overharvesting, biologists will collect baseline biological information on the age and growth, reproduction, feeding, and distribution of species common in the bycatch from West Coast groundfishing. In addition, caudal thorns from skates will be investigated as a novel technique for aging these fish. Skates will also be tagged and recaptured to study movement patterns, estimate growth rates and validate age estimates. This kind of basic life history information can help ensure the sustainable management of chondrichthyans in California and elsewhere.

## New Marine Products Research and Development

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- **Marine Bio-Nanotechnology: High-Performance Materials from Sponge Silicatein**

R/MP-95      Mar. 04–Feb. 07  
Daniel Morse, UCSB, 805.893.8982,  
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Marine sponges produce tiny, intricate silicon dioxide structures called spicules. In previous Sea Grant research, the lead investigator of this project discovered that the principal protein responsible for directing silicon dioxide nanofabrication—the process of building at the molecular or atomic scale—also directs the nanofabrication of titanium dioxide. Titanium dioxide is extremely efficient at converting light to electricity and thus has wide use in electronics. A goal of this project is to characterize the molecular mechanisms by which the protein silicatein controls the nanostructure of titanium dioxide. The results of the work will be shared with DuPont, Dow Corning Corporation and Amgen Inc. to assist in the design of new semiconductors, optoelectronic and medical devices.



- **Antibiotic Drug Discovery from the New Marine Actinomycete Genus *Marinomyces***

R/MP-96      Mar. 04–Feb. 07  
William Fenical, UCSD/SIO, 858.534.2133,  
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858.534.7322, pjensen@ucsd.edu

The lead investigator recently discovered a new genus of bacteria living in deep-sea sediments. These bacteria are

remarkably similar to *actinomycetes*—soil bacteria that have been the source of dozens of antibiotics, including streptomycin, erythromycin and the tetracyclines. Tests have shown that 35 percent of these new species produce compounds with a high level of antibiotic activity. Fully 80 percent produce molecules that inhibit colon cancer. More importantly, chemical analyses have shown the presence of never-before-seen molecules. During the course of this Sea Grant project, chemists will continue to develop culturing techniques for these bacteria. They will also continue to search for new species of *marinomycetes* and to assay their metabolites for antimicrobial and anticancer activity.

- **Studies on the Rapid Self-Assembly of Elastic Tensile Fibers From a Natural Protein Polymer Found in Marine Snails**

R/MP-97 Mar. 05–Feb. 08  
Robert Shadwick, UCSD/SIO, 858.534.7973,  
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The egg capsules of marine whelk snails contain a protein polymer that can “self-assemble” and “self-heal.” Building on previous California Sea Grant research, biologists will characterize the molecular basis for the protein’s novel elastic properties. They will also complete ongoing amino acid sequencing of the protein and cDNA, to begin the process of designing peptides with commercial use. Fabrication of new tensile materials has broad industrial and biomedical applications in, for example, improving materials for artificial tendons and ligaments.



## Marine Affairs



Rosy rockfish (*Sebastes rosaceus*).

- **A Historical Analysis of the Collapse of Pacific Groundfish: U.S. Fisheries Science, Development and Management, 1945–1995**

R/MA-44 Mar. 04–Feb. 07  
Naomi Oreskes/UCSD, 858.534.4695,  
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In 2000, landings of West Coast ground fish plummeted, prompting the Secretary of Commerce to declare the fishery a disaster. Just a decade earlier, the fishery was considered a success story. What went wrong? Historians are examining documents, including those from the Pacific Fishery Management Council and the California Department of Fish and Game, to reconstruct a history of the factors that influenced the fishery’s management. This analysis aims to help scientists develop more effective fisheries policies. It will also shed light on how policy is developed in the face of uncertainty. In the first year, archival records at the Food and Agriculture Organization of the United Nations in Rome were examined to understand more fully the rationale for adopting the concept of “maximum sustainable yield” as the basis for fisheries policy.

## Rapid Response

- **Rapid Response**  
R.A. Moll/UC-SG

Conditions in the marine sphere can change rapidly because of both human and natural causes, and problems that need immediate attention can arise unexpectedly. The rapid response project allows prompt support for short-term, marine-related research, outreach, and education projects.

## Marine Life Protection Act

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The 1999 Marine Life Protection Act mandated that the state design and manage an improved network of marine protected areas to, among other things, protect marine life and habitats, marine ecosystems and marine natural heritage. The following research projects address topics of relevance to the act, and are being funded by the California Department of Fish and Game and administered by California Sea Grant and USC Sea Grant.



Santa Cruz Island.

- **Temporal Variation in Fish Communities off Santa Cruz Island, California**

R/MLPA-01 Mar. 05–Feb. 06

Ralph Larson/SFSU, 415.338.1027, rlars@sfsu.edu

The goal of this project is to evaluate long-term changes in Southern California fish populations by extending an existing data series collected at Santa Cruz Island between the early 1970s and 1996. A preliminary analysis of the data showed that warming of ocean waters and loss of kelp was associated with changes in fish populations. It now appears that ocean temperatures in the region have returned to a cooler climate regime. Biologists will take advantage of this temperature shift and resample sites around Santa Cruz Island in 2004–05. This fieldwork will let scientists document the effects of cooler water and presence (or absence) of kelp on fish populations. Sampling will be based on underwater videography. The investigator will collaborate directly with the Channel Islands National Park. Findings will be of relevance to the California Department of Fish and Game's nearshore fishery management plans.

- **The Effects of Habitat Composition, Quality, and Breaks on Home Ranges of Exploited Nearshore Reef Fishes**

R/MLPA-02 Jan. 05–Dec. 07

Christopher Lowe/CSULB, 562.985.4918,  
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By acoustically tagging and tracking fishes, biologists will determine the home ranges and fine-scale habitat preferences of adult ocean whitefish and barred sand bass in the Catalina Marine Science Center Marine Life Refuge. The relationship between habitat quality and home range size will be investigated using tracking data and benthic habitat maps. Fish will also be translocated to adjacent areas to test the fidelity of fishes to their home ranges and to assess the degree to which different species (e.g., kelp bass, sandbass, whitefish and sheephead) will cross expanses of sand to return to their original home range.

Findings have application in designing marine reserves of sufficient size and habitat quality to ensure the protection of reproductive adults. The research will also assist in identifying essential fish habitats for nearshore reef fishes.

- **Using Life History Characteristics to Determine Optimum Placement of Marine Reserves**

R/MLPA-03 Mar. 05–Feb. 07

Steven Berkeley/UCSC, 831.459.3530,  
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Researchers will identify those species of West Coast groundfish most likely to benefit from the establishment of marine reserves. The lead investigator has recently shown that older black rockfish spawn earlier in the year



Black rockfish (*Sebastes melanops*)

than younger ones. The larvae from older females were also shown to be more likely to survive. Because marine reserves can potentially protect larger, older individuals, it is critical to identify those species, such as black rockfish, that exhibit age-related patterns in reproductive output and larval quality. The identification of these species can help resource managers select sites for marine reserves and identify essential fish habitats.

- **Shelter Use, Movement, and Home Range of Spiny Lobsters in San Diego County**

R/MLPA-04 Jan. 05–Dec. 06  
Kevin Hovel/SDSU, 619.594.6322,  
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California spiny lobsters are an important predator within kelp forests and rocky shorelines in Southern California and also a valuable commercial and recreational fishery. About 500,000 pounds, worth an estimated \$5 million, are landed annually. This project addresses one of the priorities of the Marine Life Protection Act: to assess the home ranges of recreationally and commercially exploited mobile invertebrate species. Through surveys and sonic tagging, biologists will investigate how the size, type and distribution of sheltering areas influence lobster density, movement and home range in the Point Loma kelp forest, a prime lobster fishing area in San Diego County. Findings will be shared with the California Department of Fish and Game.

- **Population Genetics of the Commercially Important Cabezon**

R/MLPA-05 Mar. 05–Feb. 06  
Royden Nakamura/CPSU, 805.756.2740,  
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Are cabezon a single, genetically homogenous population or are they composed of multiple, genetically distinct populations? The question will be answered using two different methodologies and two spatial scales. A coast-wide study will look at mtDNA in the fish. A second study will look at microsatellite data from cabezon from three California “ichthyoprovinces,” zoogeographically defined by biologists in 1978. The goal is to address whether cabezon—one of the top 10 nearshore fish landed commercially in California and a popular sport fish—should be managed as a single unit or as several demographically independent ones.

## Special Competitions

### Aquatic Nuisance Species

- **West Coast Ballast Outreach Project**

A/EA-3 Oct. 01–June. 05  
Jodi Cassell, CSGEP, 650.871.7559,  
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The California Sea Grant Extension Program began the West Coast Ballast Outreach Project in 1999 to address concerns that ballast water discharges were introducing foreign marine species into the state’s coastal and estuarine ecosystems. The program continues with its goal of reducing the risk of invasions from ballast water through a unique partnership with those maritime industries that might bear the brunt of regulatory actions on ballast water. This year the project will coordinate activities related to the management of ballast water and educate stakeholders on ballast water issues. By pooling resources and facilitating industry participation, the program hopes to help industry find solutions for dealing with aquatic nuisance species in ballast water.

- **Controlling *Undaria* and Invasive Kelps Through Management of the Gametophyte**

R/CZ-184 July 03–June 05  
David Chapman, UCSB, 805.893.7545,  
chapman@lifesci.ucsb.edu

*Undaria pinnatifida*, an edible brown macroalgae known as “wakame” in Japan and “miyeuk” in Korea, was introduced to the Los Angeles harbor in 2000 and to Santa Barbara and Monterey harbors in 2001. To help resource managers contain this invader, a biologist is studying the kelp’s gametophyte (sexually reproductive) stage to find the extent to which gametophytes persist as perennials through parthenogenetic (a type of asexual) self-replication. The biologist is currently conducting laboratory experiments to see if *Undaria* has the potential to outcompete native kelps or to hybridize with other kelps.

Experiments suggest *Undaria* gametophytes can affect the growth of juvenile *Egregia* (a native kelp) sporophytes. *Undaria* gametophytes have also been shown to have a long-term viability and parthenogenetic replication, which strongly indicates the kelp can maintain a permanent seed stock at invasion sites. This finding is supported by the regular re-growth of populations at eradication sites.



- **Determination of Chinese Mitten Crab, *Eriocheir sinensis*, Year Class Strength Through Investigation of Their Reproductive Life History**

R/CZ-185 July 03–June 05

Brian Tsukimura, CSUF, 559.278.4244,  
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First discovered in San Francisco Bay in 1992, Chinese mitten crabs—so named for their furry claws—have spread throughout the estuary, disrupting fish salvage devices at water intakes and aqueduct operations. Project scientists are studying the degree to which water temperature and other environmental parameters affect mitten crab reproduction and development. To do this, the researchers are testing the thermal tolerances of young mitten crabs, as well as assessing year-class strength as a function of water temperature. The data will be used to make recommendations on how to monitor and control mitten crabs in the Bay-Delta and elsewhere. In the first year, researchers found a correlation between water temperature and year-class abundance. Cold bay temperatures seem to reduce larval survival, and thus are associated with low year-class strength three to four years later.

- **A Multi-State Approach to Understanding the Invasion Ecology of Exotic Crayfish in Northern and Southern California**

R/CZ-186 July 03–June 05

Lee Kats, PU, 310.506.4310,  
lee.kats@pepperdine.edu; Jay Brewster, PU,  
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Two exotic species of crayfish are endangering the survival of native crayfish and amphibians in California. One is the signal crayfish, *Pacifasticus leniusculus*, which was introduced to Northern California through bait buckets. The other is the East Coast red swamp crayfish, *Procambarus clarkii*, which was introduced to Southern California via bait buckets and aquaculture. This project examines environmental and man-made factors influencing the species' spread, including the effects of physical barriers (e.g., waterfalls and culverts). Scientists are also looking at the degree to which ecological communities recover after the removal of exotic crayfish.

## Marine Environmental Biotechnology Program

- **Use of cDNA Microarrays to Isolate Differentially Expressed Genes in White Spot Virus Infected Shrimp (*Penaeus stylirostris*)**

R/A-121 June 03–May 05

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Between 1992 and 1998, the shrimp aquaculture industry lost an estimated \$4 billion to \$6 billion because of a shrimp viral infection known as white spot disease. The goal of this project is to use cDNA microarray analysis to compare gene expression profiles in hemocytes and hepatopancreas tissues of healthy and infected shrimp. In the first year of the project, a number of genes involved in immunity to the disease (e.g., C-type lectin, low-density lipoprotein receptor and serine protease) were identified. Further characterization of these genes will lead to a better understanding of the molecular mechanisms of viral pathogenesis in shrimp and other invertebrates and potentially to therapies for white spot disease.

## Education

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- **Sea Grant Trainees**

E/G-2

R.A. Moll/UC-SG

Sea Grant's commitment to furthering marine-oriented education is met by the Sea Grant trainee project. Graduate students participate in research and work on problems relating to marine resources while fulfilling thesis requirements. This experience prepares them to enter positions in the academic community, government, and industry.



Sea Grant trainees Darin Topping and Maelanie Galima taking blood samples from a California sheephead.

- **California Sea Grant State Fellowship Program**

E/G-9

R.A. Moll/UC-SG

The State Fellowship Program, modeled after the federal Knauss Marine Policy Fellowship, provides graduate students with training in the development and implementation of policy. Fellows are assigned to a state agency, legislative committee, or office concerned with marine resource issues.

- **John D. Isaacs Memorial Sea Grant Scholarship**

E/UG-4

R.A. Moll/UC-SG

The John D. Isaacs Memorial Sea Grant Scholarship was established in 1981 to recognize excellence in research by high school students, to encourage interest in marine science at the high school level, and to encourage pursuit of scholastic excellence in higher education. Each year a California high school junior or senior, who presents an outstanding marine science project at the California State Science Fair, receives a scholarship to study at a college or university in California.

The winner in 2004 was Aaron Goldin, a junior at San Dieguito Academy High School in Encinitas. At age 16, Goldin is the youngest Isaacs scholar to date. However, his scholarship will not become effective until his entry into college in fall 2005.

## California Sea Grant Committees

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The state of California interacts with California Sea Grant through the Resources Agency Sea Grant Advisory Panel. The panel prioritizes California Sea Grant research in terms of the needs of the agency.

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