

CALIFORNIA SEA GRANT

Program Directory

2003-2004



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The views expressed herein do not
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organizations.

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...

The world in which we live continues to change at an ever-increasing pace. This evolving world includes our environment and the way we serve as stewards of environmental resources. California Sea Grant continues to adapt with these changes. Toward this end, you will find that this Program Directory provides a new and expanded approach to describing the program.

One of my highest priorities in serving as director of California Sea Grant is to make the distinction between research and outreach more seamless, promoting what I call the research–outreach continuum. California Sea Grant disseminates results from research to help others reach a deeper understanding of the marine environment. However, the knowledge derived from that research can and does serve far more individuals than those of the research community. We strive to make research results the underpinnings of an informed public so that together we can make sound decisions about the environment.

As you look through this directory you will note many new names and contact points are itemized in the following pages. We have not gone out and greatly increased the number of staff since the 2002–2003 edition. Rather, personnel who contribute to the successes of California Sea Grant have now been included. This not only acknowledges their importance, but also provides a comprehensive listing of all persons who work in conjunction with the program. Our readers will now have an easier way to locate those who work in all areas of California Sea Grant, and it will help us further the dialogue that is an essential component of the research–outreach continuum.

The projects and activities described in this directory are the latest contributions supported by California Sea Grant. I encourage you to learn about our efforts and begin or continue a working relationship towards our common goal of a better future.



*Russell A. Moll
Director*

D. John Faulkner 1942–2002...As this directory was about to go to press, we were shocked and saddened to learn of the death of our long-time CSG researcher and renowned colleague. His contributions to our program and to the scientific community on a whole were many and far-reaching. He will be missed by us all.

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What is Sea Grant?

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 nine marine advisors and specialists 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 2003 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>.

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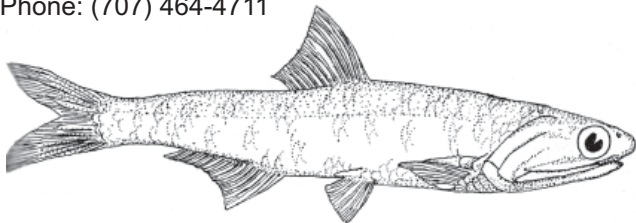
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Coastal Ocean Research



- **Observation of Physical Fluxes Between an Estuary and the Ocean**

R/CZ-170

Mar. 01–Feb. 04

M.T. Stacey, T.M. Powell/UCB

As a transition zone separating freshwater and marine ecosystems, estuaries provide a unique and crucial role in maintaining the overall health of the coastal marine environment. In this project, scientists are studying the relative importance of tidal currents, winds, freshwater flows and water densities in driving fluxes of salt, heat and suspended solids in San Francisco Bay. The findings from this project will shed light on the connection between biological and physical processes in the estuary and will help in efforts to quantify the movement of contaminated sediments from the bay to the ocean.

- **Modeling of Water and Sediment Quality in Impacted Coastal Embayments**

R/CZ-171

Mar. 01–Feb. 04

K.D. Stolzenbach, J.C. McWilliams/UCLA

In this project, scientists are developing a high-resolution computer model of the 3D flow patterns in the Santa Monica and Monterey bays. The model will be used to produce a series of simulations showing what happens when pollutants from sewage discharges, pollution leaks or runoff enter the bays. A second goal is to figure out how waves and bottom currents move sediments along the seabed, a question of immediate relevance for understanding the transit route of beach sand, and the

complex cycling of contaminants, such as DDT, in sediments.

- **Exploring the 1990s: Investigation into Factors Controlling Siliceous Microplankton Distribution in the Santa Barbara Channel**

R/CZ-172 Oct. 01–Feb. 03
E.L. Venrick, C.B. Lange, /UCSD, SIO

Radiolarian and diatom skeletons in seafloor sediments can be used to make inferences about past ocean climate, particularly how water temperatures have changed through time. The mechanisms through which changing physical oceanographic conditions alter siliceous microorganism production, however, is not well understood. The purpose of this project is to elucidate the cause-and-effect relationship between these organisms and ocean currents and water temperatures. To do this, researchers are analyzing 10 years of ocean data collected in the Santa Barbara Channel, and comparing it to radiolarian and diatom data from sediment trap samples. What is learned will assist in interpreting the wealth of sediment data, unique to the Santa Barbara basin.

- **Ecological Impacts of Beach Grooming on Exposed Sandy Beaches**

R/CZ-174 Mar. 01–Feb. 03
J.E. Dugan, H.M. Page, A.M. Wenner/UCSB

Kelp and phytoplankton washed ashore by tides and waves support a rich diversity of shore life. Along many of the most popular sandy beaches in California, however, local municipalities regularly rake up litter and kelp, a process called beach grooming. This project seeks to evaluate the ecological consequences of beach grooming on plants and animals that live and forage in areas that are regularly raked. The biologists preliminary findings show that removing kelp can reduce invertebrate populations and thus may reduce foraging opportunities for shorebirds. The information gathered from this project will help guide and improve beach maintenance practices in the state.

- **Dynamics and Ecosystem Threats of Bidirectional Cordgrass Hybridization in San Francisco Bay**

R/CZ-176 Mar. 01–Feb. 04
D.R. Strong/UCD

To the distress of wildlife managers, hybrid cordgrasses have invaded—and are now destroying—restored wetland areas in south San Francisco Bay. Whereas native cordgrasses inhabit a narrow band above tidally exposed mudflats, these hybrids, crosses between native cordgrasses and exotic *Spartina alterniflora*, usurp much larger tracts of land. As a result, species that provide food and shelter for many animals, including some protected under the Endangered Species Act, are displaced. The towering grasses also block access to the shore and clog flood-control channels. This project seeks to explain why non-native hybrids so facilely out-compete indigenous species. Preliminary findings suggest that hybrids release vastly more pollen, effectively preventing pure species from reproducing.



Spartina alterniflora hybrids found in fragment marshes in highly urbanized areas, such as San Francisco's India Basin.

- **The San Diego–La Jolla Ecological Reserve: Implications for the Design and Management of Marine Reserves**

R/CZ-177 Mar. 01–Feb. 04
P.K. Dayton, E. Sala/UCSD, SIO

For marine reserves to be effective at protecting species and preserving biodiversity, their locations must be carefully selected and guided by scientifically sound principles. In this project, researchers are trying to

understand how to design a good reserve by studying key biological elements at the San Diego–La Jolla Ecological Reserve—a small, well-protected intertidal and subtidal reserve. The goal is to identify the sources, mortality and survival rates of key kelp forest animals. Through a series of dive surveys conducted in part by volunteer divers, scientists will attempt to quantify the degree to which animals in the reserve are protected and their populations enhanced. There is a paucity of this kind of data, though it is precisely what is needed as resource agencies work to put together a network of protected areas along the coast.

- **Bacterial and Protozoal Contamination of Nearshore Marine Environments in California, with Ecologically Sustainable Management Recommendations**

R/CZ-180 Mar. 02–Feb. 05
E. Atwill, P.A. Conrad/UCD

To isolate mammalian sources of dangerous pathogens, such as *Cryptosporidium parvum*, scientists are measuring contamination in native bivalves near human sewage and agricultural outflows and, for comparison, in low-risk sites along the coast. Contamination levels will be monitored before and after heavy rains when pathogen transport from nonpoint sources, such as urban storm drains and cattle herds, is at a peak. As genetic tests identify sources of contamination, a variety of mitigation strategies will be tested. These include designing and planting vegetative buffer strips that may be able to trap, and thus reduce, microbial contamination.

- **Climatological and Near-Real-Time Satellite-Observed Ocean Fronts along the California Coast**

R/CZ-181 Mar. 02–Feb. 05
W. Broenkow, L.C. Breaker, T.P. Mavor/SJSU/MLML

Scientists are mapping the locations of ocean fronts on a monthly basis using infrared satellite images from GOES-10. Unlike polar-orbiting satellites, which pass across the coast twice daily, GOES-10 scans the coast 48 times a day, increasing the likelihood of obtaining clear, unobstructed views of often fog-socked coastal waters. Ocean fronts represent narrow bands along which there are extreme gradients in water velocity, water temperature and salinity. As convergence zones, fronts also congregate phytoplankton and thus are habitat boundaries for many species of fish.

- **Nitromusk Compounds: Are They Bio-Available and Do They Compromise Toxin Defense Systems?**

R/CZ-182 Mar. 02–Feb. 05
D. Epel, R.G. Luthy/SU, HMS

Synthetic musks in perfumes, detergents and fabric softeners have been found in high levels in freshwater organisms. In this project, researchers are characterizing the degree of contamination from these pollutants in marine sediments and organisms, work that will determine the pervasiveness and accumulation of these chemicals in the marine food chain. Research will also focus on understanding the effects of these chemicals in compromising the cellular defense mechanisms of organisms to these pollutants. The project's findings will provide new assays for evaluating the effects of low concentrations of chemicals and insights into sediment chemistry.

- **Effects of the San Diego–La Jolla Marine Reserve on the Abundance, Diversity, and Population Structure of Reef Fishes**

R/CZ-183 Mar. 02–Feb. 05
P. Hastings, P.K. Dayton/UCSD, SIO

Through a series of bi-monthly dive surveys, scientists are inventorying fish size, abundance and diversity within and around the San Diego–La Jolla Ecological Reserve, a 30-year-old reserve. The data gathered in this project will provide the first detailed inventory of fish resources in the area. This information, as baseline data, can be used to quantify long-term changes in the marine environment caused by El Niño events and global climate shifts. The results from this study will also provide insights into designing marine reserves and evaluating their effectiveness, and will complement similar studies in other parts of the state. Preliminary surveys suggest that some species, such as kelp bass, are more abundant, and perhaps larger, within the reserve.

Aquaculture Research and Development

- **Development of a Recirculation System and Diet for the Culture of California Halibut (*Paralichthys californicus*)**

R/A-116 Mar. 01–Feb. 04
R.H. Piedrahita, D.E. Conklin/UCD

The main focus of this project is to develop commercially viable diets and aquaculture techniques for California halibut. Mariculture techniques for this species would not only create new opportunities within the nation's broad goal of farming marine finfish, but would also advance technologies for restocking wild populations. During this project, scientists will design and build a recirculation system tailored to the halibut's rate of oxygen consumption, ammonia output, and nutritional needs. Halibut, the scientists have found, are tolerant to crowding, easy to handle and have low feed-conversion rates. Among their successes, the scientists have been able to rear halibut larvae and wean young fish to dry feed.



- **Characterizing the Role of Environmental Stressors in the Development of Withering Syndrome in Red Abalone**

R/A-117 Mar. 01–Feb. 03
R.A. Tjeerdema, C.S. Friedman, M.R. Viant/UCD/UW

For reasons not yet fully understood, abalone may harbor the bacterium that causes withering abalone syndrome without developing clinical signs of disease. It has long been believed that changes in the marine environment may trigger disease in animals that already harbor the bacterium. In this project, researchers are examining the role of ocean water temperatures and food intake in the development of withering syndrome. Their preliminary findings suggest that warm water events, as observed during El Niño, can stimulate pathogenesis in infected animals, whereas reductions in food intake does not.

- **Creation of a Molluscan Cell Line**

R/A-119 Mar. 02–Feb. 05
J.C. Burns, C.S. Friedman/UCSD/UW

A team of shellfish biologists, pathologists and industry specialists are working on developing a molluscan cell line, a continuously dividing cell similar to a renegade cancer cell. Such a cell line would be of immediate benefit in the diagnosis, detection and culture of shellfish pathogens and, potentially, in genetically engineering a disease-resistant oyster. Previous Sea Grant research has confirmed the feasibility of shuttling foreign genes into oyster cells and having these genes expressed. This project is focusing on using a naturally occurring cancer cell as the basis for developing a cell line. If successful, this would be the first cell line of a marine invertebrate.

- **Meiosis in Tetraploid Pacific Oysters, Their Triploid Mothers, and Diploid Grandmothers**

R/A-120 Mar. 02–Feb. 05
D. Hedgecock/UCD

Triploid oysters, which have three sets of chromosomes in each cell instead of the normal two, have become the backbone of the West Coast's cultured oyster industry. Preferred over diploids for their fast-growth and year-round marketability, triploids are now produced by crossing normal diploid females with tetraploid males. In this project, geneticists seek to understand meiosis in tetraploid males which, unlike triploid males, are fertile. The work has applications in maintaining the health of oyster brood stock used to produce coveted triploid oyster seed and could help lead to genetic improvements in commercial oysters throughout the world.

Fisheries Research and Development



- **Pelagic Fish Egg Abundance and Mortality Estimation by CUFES and Real-Time Machine Vision**

R/F-180 Mar. 00–Feb. 03
D.M. Checkley, M.M. Trivedi/UCSD, SIO

Currently, biologists estimate pelagic fish egg abundance by peering through a microscope and manually counting eggs in water samples. In this project, scientists continue their efforts to automate a manual fish-egg counter, the Continuous Underwater Fish Egg Sampler. As part of this effort, scientists are writing programs that make it possible for a computer to recognize aspherical eggs of anchovy, sardine, mackerel and menhaden from video images of water samples. The focus of the project is on

identifying sardine eggs to estimate rates of egg mortality—a statistic used to estimate the stock's biomass off California and the distribution of spawning adults. Fisheries managers in California and Spain have expressed interest in the project's results.

- **Assessment of the Reproductive Potential of Nearshore Rockfish and the Impact of Environmental Conditions**

R/F-183 Mar. 01–Feb. 04
P.M. Collins/UCSB

Under the Marine Life Management Act of 1998, the state is charged with ensuring the conservation, sustainable use and restoration of California's living marine resources. Special emphasis is given to the management of nearshore rockfish species—slow-growing, long-lived species that have been subjected to intense fishing pressure, directly or through incidental takes. To better understand the reproductive physiology of these live-bearing fish, researchers are conducting a series of longitudinal and cross-sectional analyses of rockfish ovaries to document embryo development. A second goal is to quantify periods of oocyte and embryonic attrition to better evaluate how rockfish respond to changes in food intake, water temperature and pollution. By identifying when and how often rockfish reproduce, fisheries biologists will be better able to estimate rockfish recruitment and thus better able to manage these fish.

- **Quantifying and Minimizing Risk that Hatchery-Enhancement Will Reduce Genetic Diversity of White Seabass**

R/F-184 Mar. 01–Feb. 04
D. Hedgecock/UCD

Releasing hatchery-raised fish has become an increasingly popular approach for attempting to boost overfished or depleted fish stocks. The genetic ramifications of stock enhancement, however, have not been completely addressed, and there are concerns that mass releases of fish, if they survive, could have unintended effects on wild stocks. The purpose of this project is to compute the genetic effects of releasing captive-bred white seabass on wild white seabass, a popular sport fish in California. To do this, scientists must estimate the proportion of white seabass of hatchery origin in the wild, among other things. A major goal is to help the hatchery develop a breeding strategy to minimize the rate of inbreeding of released fish. To do this, scientists are closely examining whether many or a few brood

adults contribute to each generation of hatchery releases. Preliminary findings suggest relatively few brood adults successfully reproduce during spawning events, suggesting that new breeding strategies may be needed.

- **Migratory Movements of Pacific Bluefin Tuna off California**

R/F-185 Mar. 01–Feb. 03
B.A. Block, C. Farwell/SU/MBARI

In this project, 3- and 4-year old bluefin tuna are being tagged and tracked off California. The goal is to be able to reconstruct the spacial and temporal structure of the Pacific bluefin population. A second, closely related goal, is to examine whether bluefin, a species prized by sushi connoisseurs, congregate along oceanic fronts, areas in which there are abrupt changes in water temperature and salinity. As the tagging data is recovered and analyzed, the scientists will be able to reproduce the bluefin's migratory patterns across the Pacific and within the Exclusive Economic Zone off California. Key questions being addressed: How long do bluefin reside off California? When do the fish arrive from the Eastern Pacific? When do they return to the Western Pacific to spawn? Not only will the project provide basic biological information on this economically important species, but it will provide a framework for future management of Pacific bluefin tuna in the economic zones of the United States and Mexico. About 85 bluefin will be tagged.

- **Assessing the Impacts of Climate Change on the California Squid Fishery: An Integrated Ecosystem Approach**

R/F-186 Mar. 01–Feb. 03
B.B. Marinovic, D.A. Croll, M. Mangel/UCSC

Climate change has profound implications for fish resources in the state. Persistent shifts in wind patterns, for example, can subdue or intensify upwelling of colder, oxygen-rich water along the coast, leading to wild swings in populations of krill, a staple for the California market squid. To better predict the economic consequences of climate change on fish resources, scientists are developing a model that links physical oceanographic conditions to patterns of upwelling and krill populations. From this, the distribution and abundance of squid can be estimated. Besides being one of the most valuable commercial fisheries in the state, market squid is an ideal study species, since squid mature, spawn and die in a single year. The scientists are collaborating with biologists at the California Department of Fish and Game.

The group's research findings will be used to estimate variations in stock size associated with changing oceanic conditions.

- **California's Dungeness Crab: Conserving the Resource and Increasing the Net Economic Value of the Fishery**

R/F-187 Mar. 01–Feb. 04
D.G. Hankin, S.C. Hackett, C.M. Dewees/HSU/UCD

Reductions in salmon and groundfish stocks have shifted fishing pressure to Dungeness crab populations. This concentration of fishing effort is expected to intensify as the state implements its Nearshore Fisheries Management Plan. In this project, biologists are tagging and recapturing Dungeness crab to estimate natural mortality rates of sublegal males, an important statistic for fisheries management. At present, about 80 percent of crab are caught during the fishing season's first six weeks, a classic example of a derby fishery that results in downward pressure on ex-vessel crab prices. Economists will seek to quantify the degree to which spreading landings out over a more protracted period would increase the fishery's value.

- **Conservation Genetics of California Abalone: Developing Tools for Management**

R/F-189 Mar. 02–Feb. 04
R.S. Burton/UCSD, SIO

Abalone, once a seemingly inexhaustible marine resource, have become so scarce in Southern California that it is now extremely difficult to determine whether populations are experiencing any recruitment. One species, the white abalone, teeters on the brink of extinction and has recently become the first marine invertebrate on the federal Endangered Species list. Overfishing, disease, habitat loss, poaching and failed fisheries management have all contributed to the abalone's downward spiral. In response, the California Department of Fish and Game and the National Marine Fisheries Service are actively implementing more aggressive strategies for protecting and rebuilding stocks. Besides increasing protection of natural populations, the agencies are considering relocating adult abalone, to increase their local abundance and fertilization success, and considering captive breeding and "outplanting" programs. In this project, scientists are developing genetic tools that will make it possible to evaluate the success of stock enhancement and translocation programs. In

addition, they are developing genetic markers that will aid regulatory agencies in identifying levels of genetic variability in wild abalone, information that could be used to ensure enhancement efforts do not erode genetic diversity of remnant wild abalone stocks.

- **Bomb Carbon in the Yelloweye Rockfish, *Sebastes ruberrimus*, as a Chronological Benchmark for Age Validation of Commercially Important Fishes**

R/F-190 Mar. 02–Feb. 04
G.M. Cailliet, K.H. Coale/SJSU/MLML

Nuclear testing in the 1950s and 1960s doubled the amount of radioactive carbon, C14, in the atmosphere. Carbon-14 is measurable in corals and also in ear bones of fishes, in structures called otoliths. Otoliths grow in annual layers and thus are commonly used to age fish. The goal of this project is to establish the amount of radiocarbon in otoliths from fish of known ages. By measuring radiocarbon levels in fish of different ages, it is possible to create a radiocarbon chronometer that can be used to validate the ages of rockfish. The scientists have analyzed 43 yelloweye (*Sebastes ruberrimus*) otoliths and have now established a radiocarbon history for yelloweye off southeast Alaska. In future work, they will compare age estimates from traditional otolith ring counting to those from bomb-carbon residues in other rockfish stocks.

- **Pattern and Association in Pelagic Zooplankton and Fish and Their Use in Resource Assessment**

R/F-191 Mar. 02–Feb. 05
D.M. Checkley, J.R. Hunter/UCSD, SIO

The wet-fish fishery, which includes sardine, anchovy, mackerel and squid, is the backbone of Southern California's fishing industry. This project looks at how changes in zooplankton abundance and distribution affect where adult fish go to spawn. The results of this study will shed light on the connection between environmental factors and stock size, information that can be included in science-based management of these commercially vital stocks. Scientists are now coalescing and collecting data on fish eggs, zooplankton, and adult fish abundance and distribution, as well as information on ocean water temperatures and current speeds.

- **Catch and Release of California Sheephead: Physiological and Behavioral Stress Effects and Post-Release Survivorship**

R/F-192 Mar. 02–Feb. 04
C. Lowe, K.M. Kelley/CSULB

Sheephead are the most popular fish in Southern California's booming live fish market. Landings have risen more than 90 percent in the last seven years. To prevent overharvesting, both recreational and commercial fishermen must release sheephead less than 12 inches long. There are concerns, however, that the process of being caught, handled and then released may increase a sheephead's chances of early death or slow its rate of growth. Internal organs, for instance, may be ruptured as a fish is hauled up from deep water. By tagging and tracking fish, biologists seek to evaluate mortality rates in released sheephead caught by hook-and-line and in traps. To study stress levels in the fish, they are analyzing blood hormone, lactate, blood acidity and glucose levels, and monitoring fish behavior, using acoustic telemetry, after fish are released. This research has direct applications for improving the management of sheephead, and can be folded into species-by-species management plans mandated under the Marine Life Management Act.



New Marine Products Research and Development

- **The Biomedical Potential of California Marine Organisms**

R/MP-87 Mar. 00–Feb. 04
D.J. Faulkner/UCSD, SIO

Most studies of metabolites from marine organisms have focused on tropical animals. Or, if temperate life was being studied, the emphasis was on finding novel molecular structures. In contrast, the goal of this project is to assess the biomedical potential of soft-bodied, sessile, marine invertebrates—sponges, tunicates, and nudibranchs native to temperate waters of California. Extracts from these organisms are being tested as potential pharmaceuticals for treating cancer, AIDS, and infectious diseases. About 86 marine specimens have been collected from the Channel Islands. Crude methanol extracts have been screened in cytotoxicity, HIV-1 integrase, antibacterial and anti-fungal assays. Four sponges and a tunicate were ranked as being candidates for further study. Bristol-Myers Squibb has expressed interest in the cytotoxic material being isolated from this work.

- **Investigation of Anti-Cancer Compounds in the Marine Bryozoan, *Bugula pacifica***

R/MP-88 Mar. 01–Feb. 03
M. Haygood/UCSD, SIO

Bacterial symbionts in the moss-like bryozoan *Bugula neritina* produce the anticancer compound Bryostatin 1, now in clinical trials for human use. In this project, marine biologists are examining symbiotic bacteria living in two relatives of the bryozoan, *B. pacifica* and *B. simplex*, in the hopes of finding, isolating, and testing other novel bioactive compounds.

- **Marine Natural Materials: Novel Biological Elastomers from Marine Invertebrates**

R/MP-91 Mar. 01–Feb. 04
R.E. Shadwick, H. Waite/UCSD, SIO/UCSB

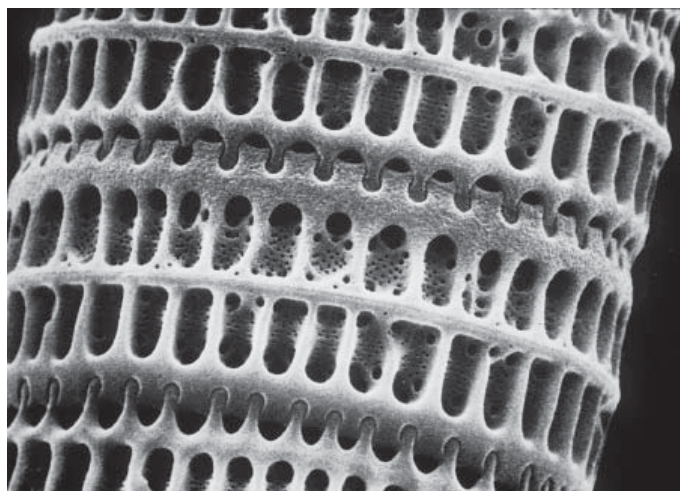
In work that has applications to engineering human tissue and building new industrial materials, biologists are characterizing protein polymers, primarily elastomers, with intriguing mechanical properties. More specifically, they will provide a detailed molecular and mechanical

description of biopolymers from egg capsules of marine snails. These capsules show intriguing self-healing and energy-absorbing properties, making them of potential use in treating injured tendons and ligaments. The project also advances techniques for encapsulating pharmaceutical agents for targeted drug delivery, an area of intense interest within the U.S. pharmaceutical industry.

- **New High-Performance Nanocomposite Materials from Marine Biomineralization: Biotechnological and Interdisciplinary Approach**

R/MP-92 Mar. 01–Feb. 04
D.E. Morse/UCSB

The glass-like skeletons of California's marine sponges are made up of an intricate array of microscopic silica needles. In collaboration with industry partners, including Dow Corning Corp., scientists are characterizing the proteins, genes and molecular mechanisms controlling the synthesis of these silica nanocomposites, the goal being to develop a new class of high-performance materials for micro-electronics, biochips and packaging materials. In the first year of their project, scientists discovered that the proteins in sponges that direct the polymerization of silica compounds also catalyze and direct the production of titanium oxide, a material in solar cells, industrial photo-catalysts, electronic devices and health-care products. This environmentally harmless protein is the first enzyme found to control the nano-structure of this important industrial compound.



Electron micrograph of genetically-controlled nanoscale architecture of the silicon dioxide wall of the marine diatom *Paralia sulcata*, 30 μm in diameter.

- **Novel, Post-Translationally Modified Peptide Antibiotics from Solitary Tunicates (“Sea Squirts”)**

R/MP-93 Mar. 01–Feb. 04
R.I. Lehrer, S.W. Taylor, V.D. Vacquier,
D.J. Faulkner/UCLA/UCSD, SIO

With their eye on finding new treatments for bacterial infections, scientists are characterizing peptides extracted from sea squirts (*Styela clava*, *S. plicata* and *Ciona intestinalis*) commonly found growing on docks and marinas in Southern California. These peptides have been shown to have broad-spectrum antimicrobial activity, especially against methicillin-resistant Staphylococci. The scientists are also studying the mechanisms by which these peptides work. As these mechanisms are elucidated, scientists will be better positioned to use these naturally occurring peptides as a template for designing new drugs.

- **Molecular Approaches in Marine Pharmacology**

R/MP-94 Mar. 02–Feb. 05
A. Butler/UCSB

Halogenated compounds in seaweeds show anti-inflammatory, antimicrobial and anticancer activity in laboratory tests. More extensive testing necessary for drug development, however, is hampered by an inability to amass sufficient quantities of these compounds, which often are found in very low concentrations in seaweeds. If scientists understood how these compounds were made, (e.g., their biogenics), it might be possible to mass produce them. This ability would open doors for actually developing commercially viable drugs from marine natural products. The goal of this project is to investigate the feasibility of reproducing the biogenics of halogenated compounds in seaweeds. The overall objectives are to clone, express, and study the reactivity of the halogenating enzymes from key marine algae species. So far, the scientists have been able to coax enzymes into making halogenated products.

Ocean Engineering and Instrumentation



- **Mitigation of Coastal Bluff Instability in San Diego County, California**

R/OE-37 Mar. 01–Feb. 04
S.A. Ashford/UCSD

Although there are many engineering solutions for slowing coastal bluff erosion—seawalls, cement slopes and revetment—their long-term effectiveness and environmental consequences have often gone unstudied. The goal of this project is to evaluate the technical merit, cost and environmental impacts of a variety of erosion-control and bluff-stabilization strategies in highly urbanized areas of northern San Diego County. The analysis will lead to a set of recommendations on how to best minimize bluff collapses. The GIS mapping and soft-copy photogrammetry techniques used in this project have broad applications in measuring coastal erosion rates all along the West Coast.

Marine Affairs

- **Building Marine Policy Analysis Capabilities in California**

R/MA-41 Mar. 01–Feb. 04
J.E. Wilen, L.W. Botsford/UCD

The goal of this project is to help government agencies better predict the consequences of new or proposed regulations on the fishing industry and fish resources. To this end, scientists and graduate students are developing new techniques for incorporating socioeconomic data into fisheries management models. An example of the new approach: scientists and students are developing a model of the red sea urchin fishery, using information from commercial divers' log books. This direct data from harvesters is used to follow divers' decision-making process—when, where, and how long to fish. As the model is developed, it can provide forecasts of how no-fishing areas, limited-entry policies, or changes in minimum-size restrictions would alter urchin populations and the fishing industry.

- **Empirical Evaluation of Regional Scale Marine Reserves and the Groundfish Trawl Fishery with Geographical Information Systems, Analysis of Covariance and Bioeconomic Modeling**

R/MA-42 Mar. 02–Feb. 05
M. Dalton, S. Ralston/CSUMB

With the number of overfished groundfish species continuing to climb, the Pacific Fisheries Management Council has been forced to implement drastic regulatory actions. One potential management action would be to establish permanent no-fishing areas off the West Coast. To evaluate what the economic and ecological implications would be for the state's trawl fleet, an economist and a groundfish ecologist are looking at how reserves would reallocate fishing effort in open waters and, in turn, how a reallocation of effort would affect fish resources. Their statistical model combines information from log books, landings tickets and oceanographic data for fishing grounds north of Point Conception. Changes in effort will be calculated for 100 square-mile blocks. The scientists will also examine the often-quoted, but less substantiated claim, that banning fishing in some areas would eventually lead to increased harvests.

Rapid Response

- **Rapid Response**

R.A. Moll/UC-SG

Because conditions in the marine sphere can change rapidly as a result of both human and natural causes, 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 as needs arise.

Special Competitions

Aquatic Nuisance Species



- **West Coast Ballast Outreach Project**

A/EA-3
J. Cassell/CSGEP

Oct. 01–Sept. 03

The California Sea Grant Extension Program began the West Coast Ballast Outreach Project in 1999 to address concerns that ballast water discharges could be introducing foreign marine species into the state's coastal and estuarine ecosystems. The program is continuing with its goal of reducing the risk of invasions from ballast water through a committed partnership with the maritime industries that would bear the brunt of regulatory actions

on ballast water discharges. The program will continue to coordinate activities pertaining to the management of ballast water on the West Coast and will continue to educate stakeholders and increase awareness of ballast water issues. By pooling resources and promoting industry participation, the program ultimately hopes to help industry find solutions for dealing with aquatic nuisance species in ballast water.

Marine Biotechnology

- **Molecular and Bioassay-based Investigation of Bivalves as Transmission Vectors of Protozoal Encephalitis in Southern Sea Otters**

R/CZ-169 Jul. 01–Jun. 03
P.A. Conrad, I.A. Gardner, M.A. Miller,
K.D. Arkush/UCD/BML

Offering a partial explanation to a mysterious decline in sea otters in California, scientists working on this project have found that 42 percent of live otters and 62 percent of dead ones carry antibodies to the *Toxoplasma gondii* parasite, a protozoan whose eggs are excreted in cat feces. The scientists are identifying the risk factors for infection and will share their findings with wildlife biologists and veterinarians involved with caring for the federally protected marine mammal. Results from the project have shown that otters near fresh-water flows—storm drains and river mouths—are three times more likely to be infected with *T. gondii*, further supporting the theory that the parasite comes from a land-based source—cats.



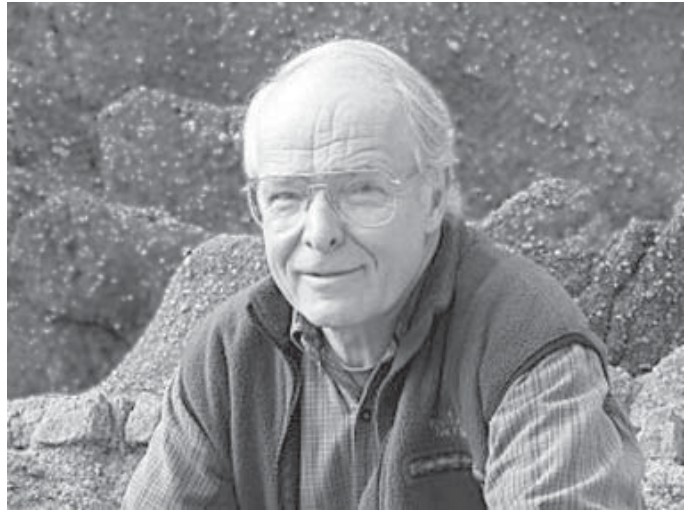
UC Davis researchers Pat Conrad (left) and Melissa Miller examine a scan of the lungs from a deceased sea otter.

- **Physiological Adaptation and Invasion Success: A Comparison of Native and Invasive Species of Bay Mussels (*Mytilus trossulus* and *M. gallo-provincialis*) in the Central California Hybrid Zone**

R/CZ-179

Oct. 01–Sept. 03

G.N. Somero/SU, HMS



George Somero, director, Hopkins Marine Station.

What makes some exotic species such successful invaders, capable of out-competing all native species in their path? The project seeks to address the question for two species of mussels, a native one and an exotic one from the Mediterranean Sea. Though the two look identical and would thus on first blush seem to have similar fitness levels, the exotic species has almost completely displaced native mussels from San Diego to Monterey Bay. North of Monterey, interestingly, the native mussel maintains a healthy presence, at least in some areas. In this project, marine biologists are trying to pinpoint the environmental conditions, principally water temperature and salinity, that seem to be favoring the survival of the indigenous species in northern waters. So far, the hypothesis is that the native mussels are more adept at surviving seasonal deluges of fresh water from rain and runoff, and for this reason, salinity concentrations along the coast may explain the observed ranges of the two species.

Education

- **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.

- **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. Interns are assigned to a state agency, legislative committee, or office concerned with marine resource issues. The 2002–2003 State Fellows are Dr. Christine Blackburn at the California Resources Agency; Nick Haring at the California Coastal Commission; and Edward R. Salinas at the California Resources Agency Office of the Secretary, Science Advisor to CALFED Bay–Delta Program.

- **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 2002 was Shara Cohn, a senior at Mira Loma High School in Sacramento.

California Sea Grant Committees

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This board represents the marine community of the state of California and advises the president of the University of California, and the director of the California Sea Grant College Program on research, education, and outreach activities of the program.

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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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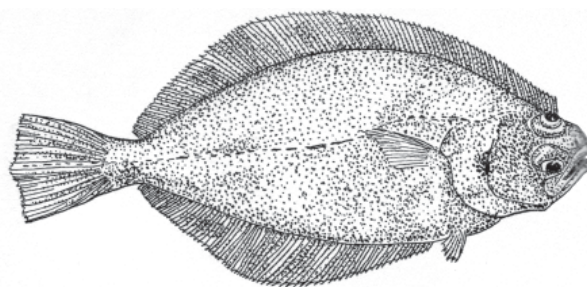
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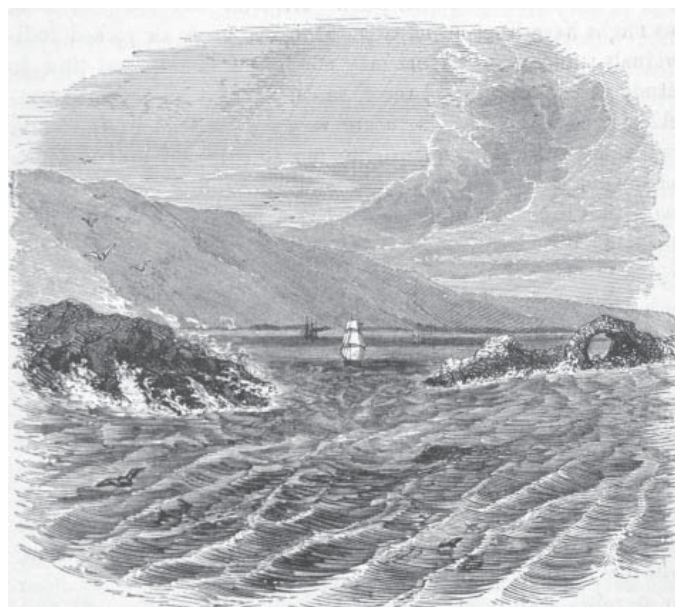
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View of the entrance to the Golden Gate. In: "The Annals of San Francisco", Frank Soule, John Gihon, and James Nesbit. 1855. Page 151. D. Appleton & Company, New York. F869.S3.S7.

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