

March 23, 2005

**For Immediate Release**

Contact: Marsha Gear, Communications Director, California Sea Grant, 858-534-0581, mgear@ucsd.edu

**Marine Research Funds Awarded**

**Researchers at 11 campuses and marine laboratories throughout California have been awarded funds from California Sea Grant for 14 new research projects beginning in 2005. These projects include topics in fisheries management, aquaculture, coastal processes, new marine products, and human impacts on coastal resources.**

Five of the projects focus on developing scientific data to aid the state in implementing California's Marine Life Protection Act of 1999 and mandated fishery management plans. They are funded by a grant from the *California Department of Fish and Game*. Those projects include:

1. Analyzing long-term changes in fish populations around Santa Cruz Island (Ralph Larson, *San Francisco State University*);
2. Determining the home ranges and habitat preferences of exploited nearshore reef fishes in the Catalina Marine Science Center Marine Life Refuge (Christopher Lowe, *CSU Long Beach*, and Jennifer Caselle, *UC Santa Barbara*);
3. Analyzing life history characteristics of West Coast groundfish to identify those species most likely to benefit from the establishment of marine reserves (Steven Berkeley, *UC Santa Cruz*, and Steve Parker, *Oregon Dept. Fish & Wildlife*);
4. Investigating how the size, type and distribution of sheltering areas influence Spiny lobster density, movement and home range in the Point Loma kelp forest (Kevin Hovel, *San Diego State University*, and Christopher Lowe, *CSU Long Beach*); and
5. Analyzing the population genetics of the commercially important cabezon to determine whether they are a single, genetically homogenous population or are composed of multiple, genetically distinct populations, and whether they should be managed as a single unit or as several demographically independent ones (Royden Nakamura and Francis Villablanca, *California Polytechnic State University*).

**The remaining nine projects are:**


1. At *California State University's Moss Landing Marine Laboratories*, Dave Ebert and Greg Cailliet will study the life histories of sharks, rays, and chimaeras, species common in the bycatch from West Coast groundfishing, to help ensure their sustainable management.
2. At *Pepperdine University*, Karen Martin 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;
3. At *UC Davis*, Laura Rogers-Bennett will use matrix models of red and white abalone populations to evaluate the effectiveness of current management strategies and determine whether population growth is more dependent upon the growth and survivorship of small individuals or the survival of large ones.

At *UCLA*,

4. Keith Stolzenbach and James McWilliams will be refining a regional ocean model developed under an earlier Sea Grant to simulate-and eventually predict-three important water and sediment quality issues in Santa Monica Bay and over the San Pedro Shelf;
5. Richard Zimmer and Cheryl Ann Zimmer are studying the optimal density, spacing and sex ratio of sexually mature abalone to maximize fertilization in different hydrodynamic conditions, which would help government biologists identify natural abalone populations that likely are not reproducing and identify coastal areas best suited for transplanting or out planting adults.

At *UC San Diego*,

6. Kaustuv Roy will quantify the effects of harvesting and recreational shore activities on the rocky intertidal ecosystems of Southern California over the last century;
7. Victor Nizet continues work on a vaccine against the *Streptococcus iniae* infection in fish for use in aquaculture;
8. Robert Shadwick at *Scripps Institution of Oceanography* and Herbert Waite at *UC Santa Barbara* hope to replicate the peptides in elastic fibers they have found in whelk snail egg capsules; these peptides would have broad industrial and biomedical applications, such as creating artificial tendons and ligaments.



9. At **UC Santa Cruz**, Daniel Costa will be evaluating the feeding behavior of California sea lions to determine their impacts on fishery resources.

NOAA's California Sea Grant College Program is a statewide, multi-university program of marine research, extension services, and education activities administered by the University of California. It is headquartered at Scripps Institution of Oceanography at the University of California, San Diego. The National Sea Grant College Program is part of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce.

###

Note to editors/reporters: The following are more complete descriptions of the above projects including contact information for the researchers:

## **California Sea Grant Projects 2005-2006**

### **Coastal Ocean Research**

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

Daniel Costa, UC Santa Cruz, (851) 459-2786, [costa@biology.ucsc.edu](mailto:costa@biology.ucsc.edu)  
R/CZ-192 Mar. 2005-Feb. 2007

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**

Keith Stolzenbach, UCLA, (310) 206-7624, [stolzenb@ucla.edu](mailto:stolzenb@ucla.edu), James McWilliams, UCLA, (310) 206-2829, [jcm@atmos.ucla.edu](mailto:jcm@atmos.ucla.edu)  
R/CZ-193 Mar. 2005-Feb. 2008


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**

Kaustuv Roy, UC San Diego, (858) 822-0559, [kroy@ucsd.edu](mailto:kroy@ucsd.edu)  
R/CZ-194 Mar. 2005-Feb. 2007

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**

Karen Martin, Pepperdine University, (310) 506-4808, kmartin@pepperdine.edu  
R/CZ-195 Mar. 2005-Feb. 2008

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**

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

Victor Nizet, UC San Diego, (858) 534-7408, vnizet@ucsd.edu  
R/A-124 Mar. 2005-Feb. 2008

*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.

\*\*\*

### **Marine Life Protection Act (MLPA)**

The 1999 Marine Life Protection Act (MLPA) 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 research topics of relevance to the act. These projects are being funded by the California Department of Fish and Game and administered by California Sea Grant and USC Sea Grant.

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

Ralph Larson, San Francisco State University, (415) 338-1027, rlars@sfsu.edu  
R/MLPA-01 Mar. 2005-Feb. 2006

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 2005-06. 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**

Christopher Lowe, CSU Long Beach, 562.985.4918, clowe@csulb.edu; Jennifer Caselle, UC Santa Barbara, (805) 893-5144, caselle@lifesci.ucsb.edu  
R/MLPA-02 Jan. 2005-Dec. 2007

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**

Steven Berkeley, UC Santa Cruz, 831.459.3530, stevenab@cats.ucsc.edu; Steve Parker, Oregon Dept. Fish & Wildlife, (541) 867-0300, steve.parker@oregon.state.edu  
R/MLPA-03 Mar. 2005-Feb. 2007

In this project, researchers will identify those species of West Coast groundfish most likely to benefit from the establishment of marine reserves. Recent research conducted by the lead investigator has shown that older black rockfish spawn earlier in the year 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**

Kevin Hovel, San Diego State University, (619) 594-6322, hovel@sciences.sdsu.edu; Christopher Lowe, CSU Long Beach, (562) 985-4918, clowe@csulb.edu  
R/MLPA-04 Jan. 2005-Dec. 2006

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.

\*\*\*

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

Royden Nakamura, California Polytechnic State University, (805) 756-2740, nakamura@calpoly.edu; Francis Villablanca, CPSU, (805) 756-2200, fvillabl@calpoly.edu  
R/MLPA-05 Mar. 2005-Feb. 2006

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.

\*\*\*



## **New Marine Products**

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

Robert Shadwick, UCSD/SIO, (858) 534-7973, rshadwick@ucsd.edu; Herbert Waite, UC Santa Barbara, (805) 893-2817, waite@lifesci.ucsb.edu

R/MP-97 Mar. 2005-Feb. 2008

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.

\*\*\*

## **Fisheries**

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

Richard Zimmer, UCLA, (310) 206-4981, z@biology.ucla.edu; Cheryl Ann Zimmer, UCLA, (310) 825-8561, cazimmer@obee.ucla.edu

R/F-197 Mar. 2005-Feb. 2008

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**

Laura Rogers-Bennett, UC Davis, (707) 875-2035, rogersbennett@ucdavis.edu

R/F-198 Mar. 2005-Feb. 2006

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**

Dave Ebert, Moss Landing Marine Laboratories, (401) 771-4427, debert@mlml.calstate.edu; Greg Cailliet, MLML, (401) 771-4432, cailliet@mlml.calstate.edu

R/F-199 Mar. 2005-Feb. 2007

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 over harvesting, 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.

###