Sea Grant News

Coastal Science Serving California

In this issue...

Sea Grant California

Newsletter of the California Sea Grant College Program
Summer 2007

In Memoriam

California Sea Grant staff were saddened to learn that **Steven A. Berkeley**, an influential fisheries ecologist and passionate marine conservationist, died June 27 of pancreatic cancer at the age of 60. He is credited with discovering the "big, old, fat female" theory, correlating female rockfish age with egg production and quality. Berkeley, an avid outdoorsman, was a research biologist at Long Marine Laboratory at UC Santa Cruz for the past six years. He previously worked in the Department of Fisheries and Wildlife at Oregon State University and at the South Atlantic Fishery Management Council in South Carolina.

In 2002, Berkeley was featured in the PBS documentary, *Empty Oceans, Empty Nets*, which heightened public awareness of the need to protect marine species from over harvesting. His most recent Sea Grant project examined maternal age effects in deep-water rockfishes in the context of identifying which species would be the strongest candidates for marine reserve protection. The American Fisheries Society is planning a scholarship in honor of Berkeley. ■■■

Sea Grant News
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This publication was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration under NOAA Grant #NA04OAR4170038, project number C/P-1, through the California Sea Grant College Program. The views expressed herein do not necessarily reflect the views of any of those organizations.

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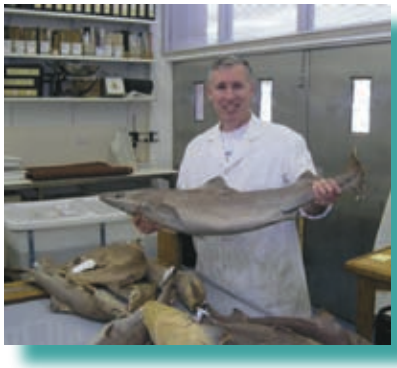
Cover: Morgan Bond, Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO);
(this page) Steven A. Berkeley, courtesy Susan M. Sogard, NMFS.

Identifying Skates from Egg Cases

Moss Landing—To the untrained eye, one species of skate may look pretty much like another. In fact, to the trained eye, they can be pretty hard to distinguish, too. All are earth-toned, flat and kite-shaped. Though different species of adult skates may be a challenge to distinguish, skates begin life encased in a leathery brown capsule—called an egg case—that varies noticeably among species. By characterizing these differences, David Ebert of the Pacific Shark Research Center at Moss Landing Marine Laboratories (MLML) and graduate student Chante Davis have created a key for identifying 10 skate species in the eastern North Pacific that are native to California coasts.

Like their cousins the sharks, skates are important predators that are easily overfished because they produce relatively few offspring and reach sexual maturity relatively late in life. Both adult skates and their egg cases, which females lay on the seafloor, are often accidentally caught by trawlers. Because of the difficulties in identifying skates, there is virtually no species-level data on skate bycatch.

"We hope that with better identification of skates, we can begin to evaluate skate bycatch in commercial fisheries on a species-by-species basis," Ebert said, which will help state and federal fisheries managers develop strategies for sustainable management of these species.

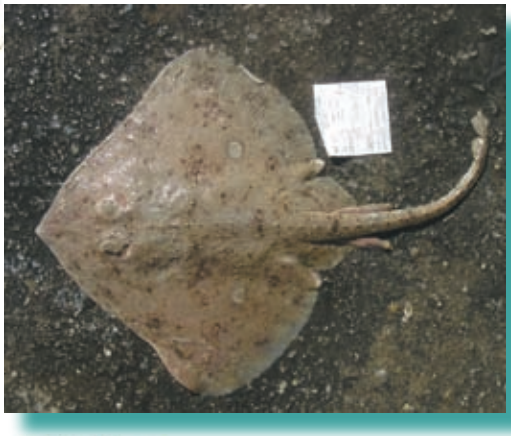


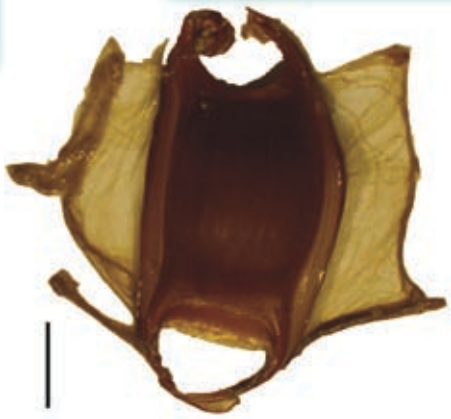
David Ebert. Photos for this story courtesy Pacific Shark Research Center, MLML

Ebert and Davis' article "Descriptions of skate egg cases (Chondrichthyes: Rajiformes: Rajoidei) from the eastern North Pacific" is published in the January 18, 2007 issue of the journal, *Zootaxa*.

For more photos and information on this research, see www.csgc.ucsd.edu/STORIES/SkateEggCases.html. ■■■

Name that skate! Shown above is an adult *Bathyraja abyssicola* and (left) its distinctive egg case. (Below) *Bathyraja kincaidii* and its egg case.





Monitoring Begins at Central Coast Marine Protected Areas

Central Coast, CA—Scientists have been awarded $2 million to begin monitoring the ecological and socioeconomic effects of the recently designated Central Coast marine protected areas (MPAs), which will ban or limit fishing in about 18% of state waters from Point Conception in Santa Barbara County to Pigeon Point in San Mateo County.

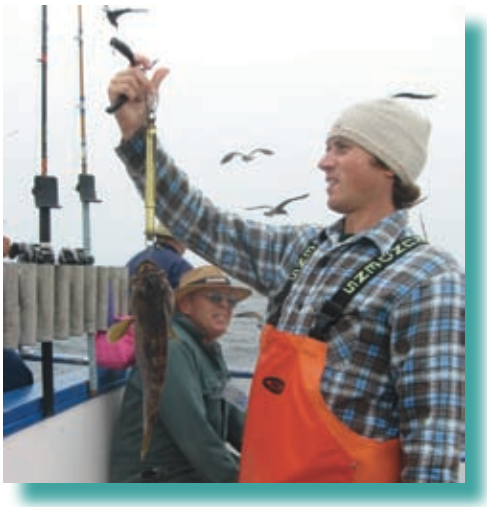
"We are beginning the most comprehensive survey yet of the status of marine resources in the Central Coast region," said the Ocean Protection Council's Christine Blackburn, who is managing the Baseline Data Collection Project, a one-year, state-funded effort to characterize marine life and habitats within and outside the Central Coast's 29 MPAs before new fishing regulations go into effect and then in the first few months following their enforcement.

This "before" snapshot will serve as a reference point for detecting long-term ecological change associated with the Central Coast project. With future monitoring, scientists will be able to evaluate the network's effectiveness in protecting marine habitats, preserving ecosystem integrity, and otherwise meeting the many goals of the state's Marine Life Protection Act (MLPA). "What we learn from this work will help inform management decisions far into the future," Blackburn said.

Administered by California Sea Grant, the Baseline Data Collection Project also initiates another of the act's goals—to monitor the new marine protected areas and to use what is learned to improve marine policies and management and to otherwise inform the ongoing process of establishing marine protected areas along all of the different regions of the coast. The Central Coast was the first region to get MPAs. The next will be the North Central Coast.

"The baseline data will allow us to review how

Continued p. 5



Graduate student doing collaborative research on a commercial fishing vessel. Photo courtesy San Luis Obispo Science and Ecosystem Alliance

Monitoring a rocky intertidal habitat. Photo Tish Conway-Cranos, UCSC

Morro Bay commercial fishing boats. Photo Ashwin Budden, Impact Assessment, Inc.

Central Coast MPAs continued from p. 4

PISCO diver on transect. Photos this page by Steve Lonhart, NOAA's Monterey Bay National Marine Sanctuary

these protected areas are performing and to make adjustments accordingly, as we move forward with the MLPA," said John Ugoretz, who is leading the implementation of the MLPA at the California Department of Fish and Game (CDFG). A main scientific objective is to count and speciate fishes and invertebrates in key areas, and to use this data to compute biological meaningful quantities such as fish density and distribution, species diversity, and relative species abundance.

Manned submersibles will be used to survey the deepest areas, while teams of divers will work the shallower ones. The surveys will be most intense in four key habitat types, identified as priority areas by the science advisory team to the Central Coast project. These are deep rocky habitats, including submarine canyons and cold-water corals; kelp forests; deep soft-bottomed habitat, about which little is known; and the rocky intertidal, which can be surveyed from the shore.

In addition to gathering biological information, scientists also will conduct a baseline socioeconomic study to assess the impacts of the MPAs on commercial and recreational fishers, as well as "nonconsumptive users," such as kayakers, windsurfers and divers.

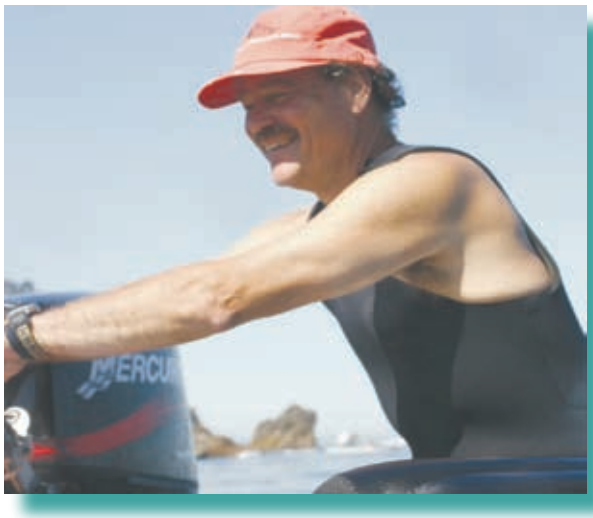
There is also a collaborative fisheries research component of the project that will harness the expertise of commercial and recreational fishers to fill gaps in the other survey methods by counting fishes through trap and hook-and-line surveys.

The lead investigators of the five projects, selected in June through a competitive grant review process, are:

- Peter Raimondi, an ecologist at the University of California, Santa Cruz, who will lead surveys of rocky intertidal habitats.
- Mark Carr, an ecologist at the University of California, Santa Cruz, who will lead diver surveys of kelp forests.
- Rick Starr, a California Sea Grant Marine Advisor, and Mary Yoklavich of NOAA Fisheries, who will use a manned submersible to survey deep-water habitats.
- John S. Petterson and Edward Glazier, both consultants with Impact Assessment, Inc. in La Jolla, who will lead socioeconomic studies, which will be based on a series of interviews with consumptive and nonconsumptive users.
- Dean Wendt, a biologist at Cal Poly San Luis Obispo, and Starr, who will lead the collaborative fisheries research project.

All raw data from these projects will be submitted to the CDFG in the spring of 2008 for analysis by its staff. CDFG also plans to conduct diver and remotely operated vehicle surveys to supplement the outside survey work, Ugoretz said.

The Central Coast MPA Baseline Data Collection Project is a collaboration of the California Coastal Conservancy, Ocean Protection Council, CDFG, and the California Sea Grant Program. Funding was made possible through a one-time appropriation from the state's general fund to the California Coastal Conservancy and Ocean Protection Council.



Mark Carr, UCSC will be leading kelp forest surveys.

New Culturing Techniques for Red Abalone—
Farmers Gain Better, Redder Abalone Shells

Monterey—California abalone growers may soon have the tools they need to farm red algae as a nutritional supplement for abalone, one which will turn animals' shells red and reduce growers' reliance on wild-harvested seaweeds. Currently, most abalone farms in California feed their stock a diet comprised primarily of giant kelp harvested from nearby wild kelp beds, and the result is a dark shell.

As a first step in developing protocols for affordable seaweed aquaculture, seaweed biologist Mike Graham of Moss Landing Marine Laboratories has identified two native red algae species—*Gracilaria pacifica* and *Gracilariopsis andersonii*—that appear suited for commercial farming. Both species are hearty and fast growing. Both can be grown through a technique called rope culture. As the name suggests, rope culture involves growing a crop, be it algae or oysters, on ropes hung vertically in the water.

Working in collaboration with the Monterey Abalone Company, a small abalone farm in Monterey Harbor, Graham is in the process of calculating the percentage of an abalone's diet that needs to contain red algae to color the shell. "Asian markets want red shells for red abalone," Graham explained. This is why countries selling to the premium Asian market—South Africa, Chile and Japan—already add red algae to their stocks' diet.

Graham would also like to determine whether a varied diet that includes red algae can increase abalone growth rates, a pattern that has been observed in farms in Chile and which could offset the costs of rearing algae. "The kelp we feed them is like hay," said Art Seavey, president and co-owner of the Monterey Abalone Company in Monterey Harbor, explaining his interest in farming red algae. "It is high in carbohydrates and low in protein and fat. It just makes sense to me that abalone will be healthier if fed a varied diet."

Dietary studies, Graham said, will determine the number of ropes that need to be put in the harbor to produce sufficient amounts of red algae for the farm's current production level. When this is determined, Graham will work with California Sea Grant Extension Director Paul Olin to adapt the study's results into a manual for farms across the state.

(Above) red algae, *Gracilariopsis andersonii*, grown in shallow water is bleached green by sunlight. Photo courtesy Mike Graham, MLML (Right) Red Abalone. Photo Peter Haaker, CDFG

All of the state's abalone farms cultivate red abalone (*Haliotis rufescens*), the largest of the world's 56 abalone species. So in theory, the entire California abalone industry could benefit by having an inexpensive source of red algae and a manual. Olin said that the study's results might also be of use in "multi-trophic" finfish culture, in which seaweed would be grown near or beneath fish pens to assimilate nitrogen waste produced by fish.

Harvesting wild kelp may not always be permitted, Olin said. For an abalone farm, seaweed aquaculture is a hedge against potential regulatory actions, and it is also a hedge against El Niño events and winter storms, both of which can decimate local kelp beds. ■■■

Isaacs Undergraduate Researchers Announced

By Kara Raynor, Sea Grant Intern

La Jolla—California Sea Grant (CSG) is pleased to announce the six winners of the 2007 John D. Isaacs Marine Undergraduate Research Assistant Program.

The Isaacs scholars, all of whom are undergraduate science majors at California universities, will each receive $2,500 to work over the summer with a researcher from his or her college who is currently receiving CSG support. The National Oceanic & Atmospheric Administration funds the Isaacs Program.

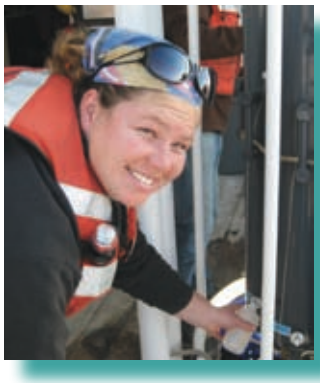
"The experience has been great and the money is the icing on the cake," said Jasmine Ruvalcaba, a senior at California State University, Monterey Bay, majoring in coastal and marine ecology. She will be working with Mike Graham, an assistant professor of marine ecology, who has CSG support to study seaweed aquaculture.

The other winners are:

• Elizabeth Joyce, a senior physics major at Stanford University, who will be working with Alexandria Boehm, an assistant professor of environmental engineering;

• Greer McMichael, a junior biochemistry major at California State University, Long Beach, who will be working with Chris Lowe, an associate professor of marine biology;

• Heather Johnson, of UCLA, who will be working with Cheryl Ann Zimmer, a professor of biology;



Jasmine Ruvalcaba, a 2007 Isaacs scholar, is a senior marine coastal and ecology major at CSUMB. Photo courtesy Jasmine Ruvalcaba

• Tiana Egloff, a junior biology major at UC Santa Barbara, who will be working with Jennifer Caselle, an associate project scientist; and

• A student who has yet to be named at UC San Diego, who will be working with James Leichter, an assistant professor at Scripps Institution of Oceanography.

The Isaacs Program was created in 2006 in memory of John Dove Isaacs, a professor at Scripps Institution of Oceanography and early advocate of the Sea Grant model, to help undergraduates further their interest and participation in marine science.

"I believe participating in research has given me experience beyond that of a normal undergraduate," said Phillip Johnson, a 2007 honors biology graduate from Pepperdine University. Johnson, one of four Isaacs scholars from the 2006 inaugural class, said that his internship gave him an edge over others on his graduate school applications.

"I have always had some sense as to what I wanted to do, but this internship has helped me structure and solidify my goals," said Suzanne Garcia, a senior biology major at UC Santa Cruz. Garcia, another member of the inaugural class, examined the transfer of toxins through the food web around the Santa Cruz Wharf.

Suzanne Garcia, was in the 2006 inaugural class along with Greg Schroeder (below). Schroeder received a conservation biology degree at SJSU in 2005. Photos courtesy Suzanne Garcia and Greg Schroeder

Greg Schroeder, also in the 2006 class, said his research experience as an Isaacs scholar solidified his decision to pursue an advanced degree in marine science. Schroeder is now a graduate student at CSU Monterey Bay studying the biogeography of sub-Antarctic and Antarctic ascidians. ■■■

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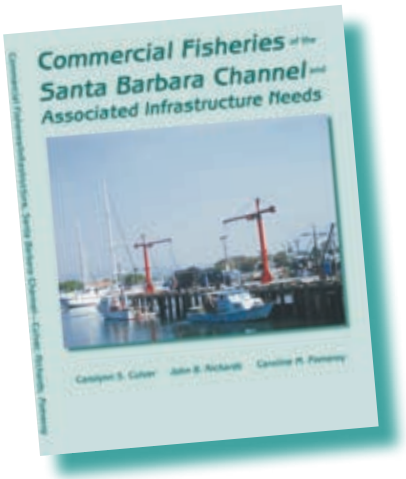
New California Sea Grant Publication

Commercial Fisheries of the Santa Barbara Channel and Associated Infrastructure Needs

by Carolynn S. Culver, John B. Richards and Caroline M. Pomeroy



The authors have compiled and analyzed 25 years of fisheries landings data and compared them to the current status of commercial fisheries at four harbors in the Santa Barbara Channel. Also included in this 108-page book are the results of interviews of more than 80 commercial fishers about past, current and future fishing activities and infrastructure needs, and marketing. Sea Grant Extension Advisors, harbor managers, port commissioners and marine consultants, familiar with facilities and services at commercial fishing harbors in California and other West Coast states, also provided information.

The publication (SG021) is available for $20.00, plus shipping, handling and sales tax. It may be purchased online at: http://anrcatalog.ucdavis.edu/ or by calling 800.994.8849. ■■■