

# Off California, Many Common Fish Now Spawn Earlier



Credit: NOAA Southwest Fisheries Science Center




Pacific jack mackerel, a species spawning earlier off California.

toral student at Scripps Institution of Oceanography at UC San Diego.

“But, it’s likely related to temperature.”

“Many marine organisms use temperature as a cue for when to initiate spawning, so the idea that changes in seasonal temperatures would affect spawning time shouldn’t come as too much of a surprise,” she says. “Similar patterns of earlier reproduction have been observed in many terrestrial ecosystems and have been frequently attributed to climate change, in general, and the earlier arrival of spring more specifically.”

Sea surface temperatures off California are now reaching their seasonal peak about 25 days earlier today than in the early 1950s. Compellingly, the fish species that are spawning earlier are doing so by, on average, 29 days. 

**O**n land, shifts in animal migrations, breeding cycles and home ranges are among the most compelling pieces of evidence for ecosystem restructuring under climate change.

New findings from California Sea Grant show that life history characteristics of marine species in the California Current ecosystem are also in a state of flux.

In particular, California Sea Grant researchers report that 18 of the region’s 43 most abundant fish species are now spawning between 14 days and 62 days earlier than in the early 1950s.

Some of the earlier-spawning species include: jack mackerel, chub mackerel, hake, Señoritas, medusafish and the aurora, split-

Changes in the thermal structure of the ocean off California appear to be altering the reproductive cycles of fish in the California Current ecosystem.

nose and short-belly rockfishes.

Eight species are also spawning later, between 15 days and 35 days later. Among these are chilipepper rockfish, blacksmith, two species of flatfishes and three species of mid-water fishes.

The findings are based on counts of fish larvae in water samples collected during the California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruises, which began in the early 1950s.

“We don’t know why there is this trend toward earlier spawning,” says California Sea Grant Trainee Rebecca Asch, a doc-

new  
director  
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Inside:

Volunteers Assist with Restoration  
Black Abalone Hideouts  
Satellite Tracking of Seabirds

# Coastal Sage Scrub Restoration on a Budget

## Mix volunteers, mulching and native planting

Based on her first year of results, she recommends the following to stretch restoration dollars:

**Mulch with the debris from the pulled-up weeds.** Her experiments show that a thick layer of dead plant material will shade

**Plant native species after a major weed pull.** “If you don’t get native plants in the ground, the weeds will just come back after the first rain,” says Talley, who is adjunct faculty at both the University of San Diego and UC San Diego.

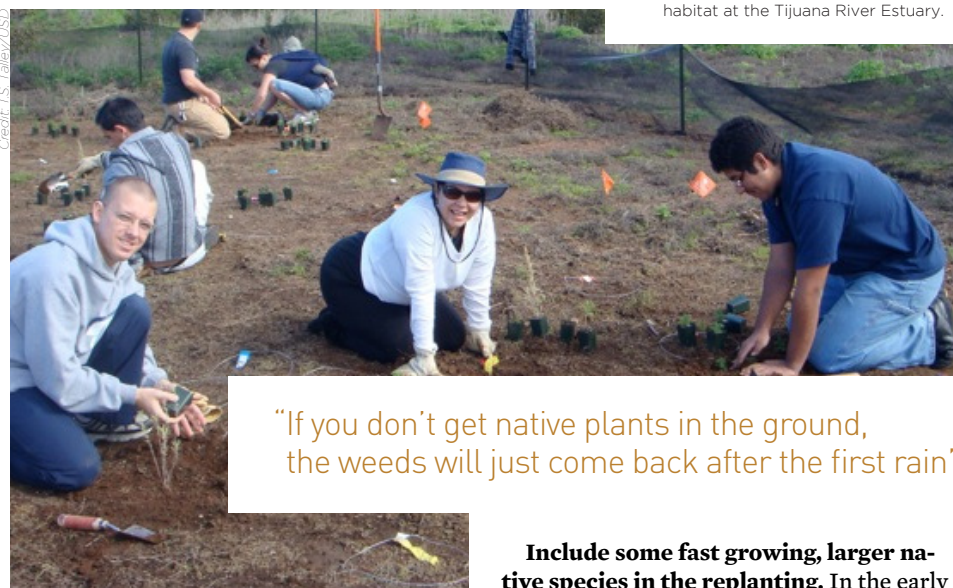
Community volunteers and student interns re-vegetate a coastal sage scrub habitat at the Tijuana River Estuary.



High school intern Amina Ture (right) mentors a volunteer from the community.

**SAN DIEGO** – What are some strategies for inexpensively restoring coastal sage scrub habitats in Southern California overrun by exotics such as ice plants, chrysanthemums, smotherweed and tamarisk?

California Sea Grant researcher Theresa Sinicrope Talley is conducting a series of field experiments at NOAA’s Tijuana River National Estuarine Research Reserve in southern San Diego County to help guide managers on some do’s and don’ts following invasive species eradication.



“If you don’t get native plants in the ground, the weeds will just come back after the first rain”

out seeds (even those from the weeds) and prevent re-invasions from the virtually endless supply of non-native seeds from landscaped yards. For larger plants such as tamarisk, wood chippers can be used to shred debris. For smaller plants, the dead material can be placed on the ground in thick layers.

High school interns Daisy Mercado (left) and Joel Urbina measure newly planted native plants at a restoration site at the Tijuana River Estuary.

**Include some fast growing, larger native species in the replanting.** In the early stages of habitat recovery, establishing a base of primary productivity is critical, she says. The return of native biomass is associated with lower rates of re-invasion, faster recovery of soil communities, and greater numbers of insects and spiders, upon which many bird species feed. For high marsh habitats (which transition to sage scrub), some large native plants to consider are alkali heath and coastal goldenbush. In coastal sage scrub, California sagebrush and four-wing saltbush were observed to quickly add biomass.

**Include a diversity of native species in the replanting.** Plots with greater plant diversity have more abundant and diverse insect and spider communities, and faster decomposition rates. Talley thinks it likely that the positive effects of plant diversity will increase as the restoration sites mature.





California Sea Grant has named James Eckman, a biological oceanographer and longtime senior science administrator at the Office of Naval Research (ONR) in Arlington, Va., as its new director.

Eckman will be a familiar face to many in the oceanographic community in California, as he has led ONR's flagship Marine Mammals and Biological Oceanography Program and its predecessors for the last 13 years. These programs have, among other things, funded studies of the behavioral and physiological effects of sound on marine mammals, including the SOCAL-10 Project.

"Jim brings a fine mix of stellar leadership skills and excellent research credentials that will enable Sea Grant to continue its upward momentum," says Scripps Director Tony Haymet. "We look forward to a new era with Jim at the helm."



California Sea Grant Director Jim Eckman

# New Director of California Sea Grant Appointed

## James Eckman Joins Scripps



An avid outdoorsman, baseball and blues fan, Eckman has also led ONR's participation in the federal, multi-agency National Oceanographic Partnership Program, which coordinates the nation's oceanographic research and education programs and promotes partnerships among academia, business and federal agencies.

"Jim's personal research and management experience, and his interest in education and outreach make him an excellent fit for the California Sea Grant directorship position," says Scripps professor Ron Burton,

who was chair of the search committee. "We are delighted to have him."

Before his tenure with the Navy, Eckman was a professor at the Skidaway Institute of Oceanography in Savannah, Georgia (1984-97), and held adjunct faculty positions at University of Georgia in Athens (1988-99) and University of South Carolina

in Columbia (1985-99). Much of his research activities during this time focused on benthic ecology and its relationship to the physical environment, particularly boundary layer flows and sediment transport.

"I genuinely miss an academic environment and the stimulation of day-to-day contact with research, students, and scientific colleagues," Eckman says. "I have a sincere wish to apply my skills to research that can solve serious societal problems related to our oceans."

Eckman, 58, earned his doctorate in oceanography in 1982 from the University of Washington, Seattle, and then spent two years as a postdoctoral researcher at the State University of New York, Stony Brook, where he studied bay scallop recruitment and survival, with support from New York Sea Grant. For the last 25 years, he has participated in kelp ecology studies on the West Coast with colleagues at the University of Washington.

His first day at the helm of California Sea Grant was Jan. 3, 2011. 🐟

Jim Eckman and son Nick Eckman (right).



# A Decade of Cooling in Monterey and Humboldt Bays

## Scientists to Look at Effects on Fish Populations

**MOSS LANDING** — If you think global warming means it's getting warmer everywhere, think again.

In Monterey and Humboldt bays, sea surface temperatures have dropped about one degree Celsius in the last decade, says physical oceanographer Larry Breaker of Moss Landing Marine Laboratories.

"The million dollar question is: Why is this happening?" he says.

The leading theory is that warming inland, in places like the Central Valley, is intensifying the atmospheric pressure gradient that drives upwelling friendly winds.


More upwelling means that more cold water is being brought to the surface from depth — hence cooler surface waters. Breaker is now examining whether the path of cold upwelled water can be tracked from the upwelling centers off headlands into the

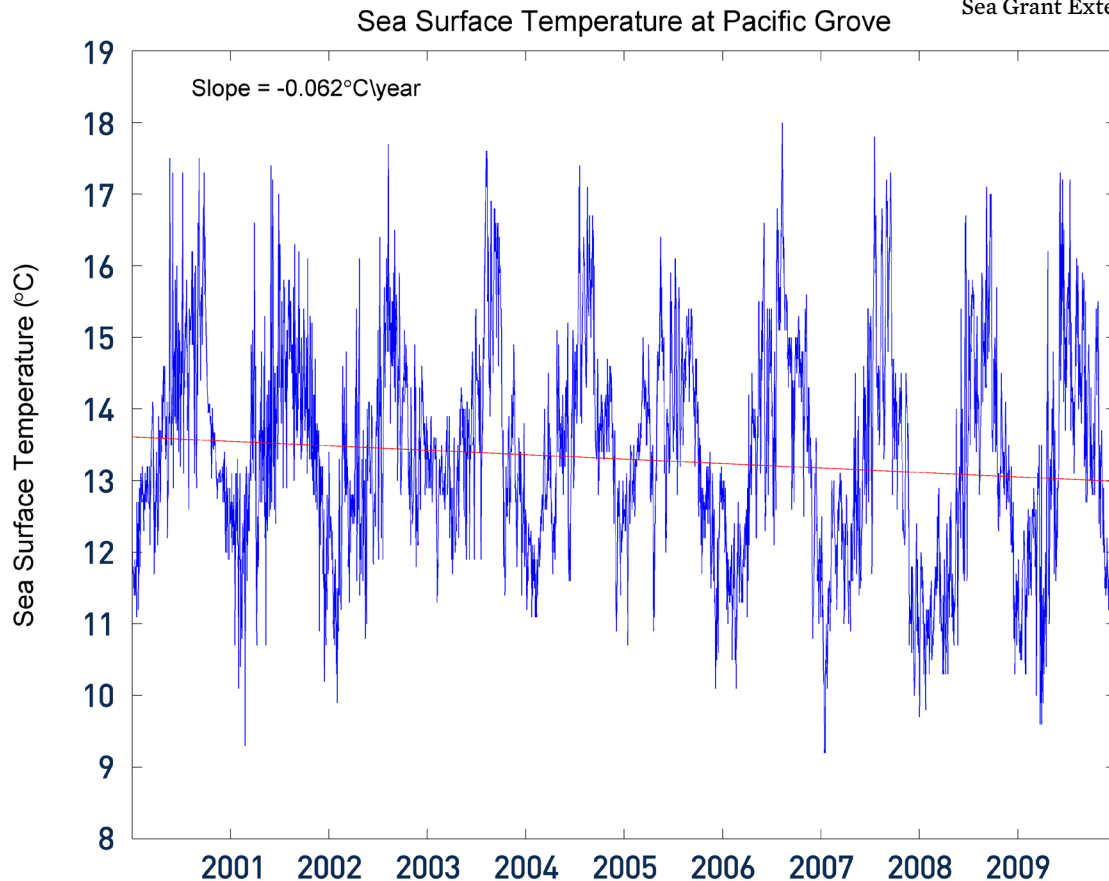
bays. California Sea Grant is also funding him to document whether assemblages of fish populations mirror temperature changes.

Theoretically, cooling should lead to an increase in the numbers of more northern fish species, while warming would be expected to favor an abundance of more southern ones, all other things being equal.

"We don't know if this is occurring," says Rick Starr, interim director of the California Sea Grant Extension Program and a collaborator on the research project.

He and his graduate student are mining landings data, scuba survey data and sport fishing tournament records in fish populations in Monterey Bay.

"We are looking to learn whether the cooling is part of a paradigm shift or a paradox," Starr explains. 



The sea surface temperature record at Pacific Grove in Monterey Bay shows seasonal variations in temperature (squiggly blue lines) superimposed on an overall cooling trend since 2000 (red line).



# Deep Crevices May Protect Black Abalone from Disease

**SANTA BARBARA** – It is well recognized that warmer than normal water temperatures can stress an abalone's immune system, exacerbating its vulnerability to illnesses such as the wasting disease known as withering syndrome.

For the endangered black abalone, warming has yet another undesired side effect. According to new California Sea Grant research, it cripples the animal's ability to

Dorsal view of a black abalone shell. The shell is typically 10-14 centimeters.

cope gracefully with exposure to air during low tides. As a result, higher elevation rocky intertidal habitat becomes a relatively high-stress environment for the mollusk, while deep crevices that are only rarely or briefly exposed serve as safe havens.

"Abalone in marginal habitats experience the full force of day-time and night-time temperature

extremes and end up becoming the Typhoid Mary of withering syndrome," says Tal Ben-Horin, a doctoral student in marine science at UC Santa Barbara who has been conducting laboratory experiments on the link between temperature extremes and disease transmission.

Findings can help identify critical habitats for the black abalone and were recently shared with NOAA Fisheries, which is developing a recovery plan for the species. ✓



Credit: D. Cavalier/WWPmedia



Credit: T. Ben-Horin/UCSB

Black abalone in a deep crevice on San Nicolas Island off Santa Barbara. Sea Grant research suggests this type of habitat is critical for black abalone recovery.

## \$2 Million to Fight Invasive Species

**N**OAA has awarded \$2 million to the Sea Grant programs to battle the worst of America's invasive species.

Oregon Sea Grant's Sam Chan, an invasive species educator, will lead the West Coast programs in improving methods for predicting non-native invasions and quantifying the economic value of early detection and rapid response.

California Sea Grant Marine Advisor Carrie Culver will focus on managing the risk of non-native quagga mussels invading West Coast waters through long-distance water tunnels.

To learn more about this project visit the NOAA website at

<http://www.noaa.gov/>. ✓



Credit: Oregon Sea Grant

Oregon Sea Grant's Sam Chan at Devils Lake.



Credit: M. Baird/Millipedia Commons

Sooty shearwaters are oceanic birds known for their effortless flight and ability to skim above the sea surface.

**S**atellite technologies, similar to those used by cell phone companies, are enabling scientists to track the sooty shearwater seabird species. The data help to identify critical at-sea habitats for marine life and can further ecosystem-based management of the forage species on which seabirds and other marine predators rely.

Scientists James Harvey and Josh Adams of the Moss Landing Marine Laboratories are using the tracking data to test their hypothesis that the seabirds move based on feeding opportunities within the California Current system.



Credit: J. Adams/USFWS

Sooty shearwaters live in a sort of endless summer, crossing hemispheres to avoid winter and feed on high-calorie forage fishes in highly productive waters such as the California Current.

# Satellite Tracking Leads to Compilation of Important Conservation Data



Credit: J. Polken/Website: [www.pbase.com/fnhln](http://www.pbase.com/fnhln)



With their tracking data, the scientists determined common feeding “hotspots,” discovered when the birds visited particular locations, and characterized movement patterns.

They found that these “hotspots” tend to vary from year to year. In addition, the birds (when within 200 nautical miles of the coast) spent only about a quarter of their time in NOAA’s National Marine Sanctuaries. This is important information as it lets managers assess the degree to which existing sanctuaries may protect critical seabird habitats.

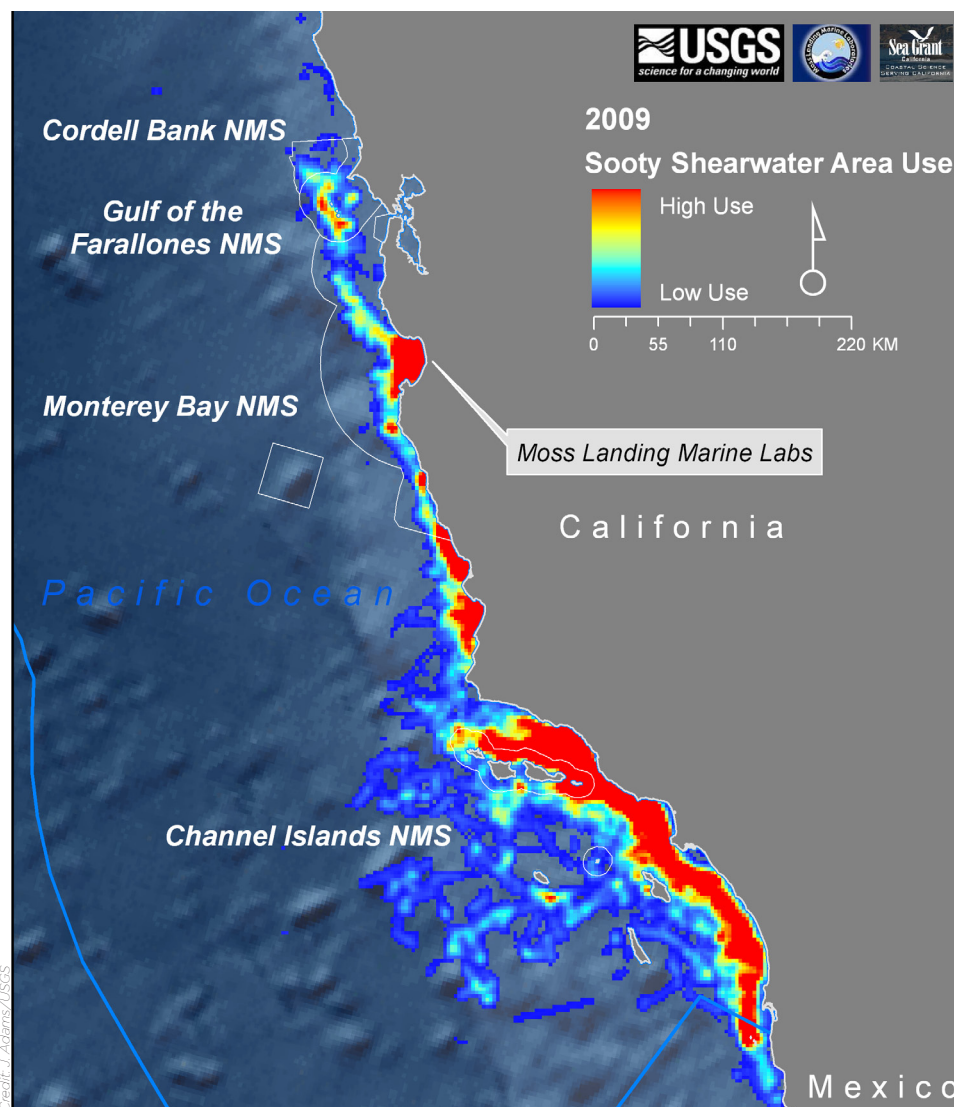
Having developed an algorithm for filtering and analyzing the raw position data, the scientists will now be able to broaden their research to include other species of seabirds and evaluate the overall effects that certain types of fishing have on these birds as a whole.

For many years, environmental researchers have worried that intense harvesting of forage species might reduce food resources for marine predators. With these findings, management practices can be enhanced to ensure that enough forage species are left for the seabirds and other marine predators.

To read more about this project and to download a free summary of its main findings, visit us online at:

[www.csgc.ucsd.edu/BOOKSTORE/  
project\\_profiles\\_10.html](http://www.csgc.ucsd.edu/BOOKSTORE/project_profiles_10.html)

Sooty shearwaters travel in huge flocks of hundreds to millions. Because of this, scientists can effectively follow thousands of birds by tagging and tracking just one.



Red areas show foraging hotspots in 2009.

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This publication was supported by NOAA Sea Grant, part of the U.S. Department of Commerce, under grant #NA100AR4170060, project No. C/P-1. The views expressed herein do not necessarily reflect the views of any of those organizations. This document is available in PDF on the California Sea Grant website: [www.csgc.ucsd.edu](http://www.csgc.ucsd.edu).

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**SEA GRANT NEWS**  
*Coastal Science Serving California*



WASHINGTON, D.C. – Five California Sea Grant nominees have been awarded prestigious John A. Knauss Marine Policy Fellowships, sponsored by NOAA Sea Grant, and will soon head to the nation's capital for yearlong assignments in the legislative and executive branches of government.

The five fellowship recipients, all of whom hold either masters or doctorate degrees in marine science or policy from the University of California system, are:

- Kristin Carden, placed in NOAA's Program Coordination Office

- Katie Cramer, placed with majority members of the Senate Subcommittee on Oceans, Atmosphere, Fisheries, and Coast Guard

- Ayana Johnson, Fishery Management Specialist, Office of the Assistant Administrator, NOAA Fisheries

- Amanda Keledjian, Special Assistant to the Director and Deputy of the Office of Protected Resources, NOAA Fisheries

- Nicole Teutschel, Sen. Maria Cantwell (Wash.)

These five join 38 other outstanding recent graduates from across the country, nominated by other programs within the Sea Grant network.

For more information on the marine policy fellowship program, visit:  
<http://www.seagrant.noaa.gov/knauss/>.

# 2011 Knauss Fellows Announced