

SEA GRANT NEWS

“Coastal Science Serving California”

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Cover Credits—Dan Cartamil; Hunter Lenihan; Joanna Grebel; Kiyono Katsumata
Below—Sea Grant Trainee, Tal Ben-Horin; Dr. Carolyn Friedman;
Photos Hunter Lenihan; University of Washington, Seattle



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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
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Monitoring Thresher Shark Fishing in Ensenada

To gather the binational data needed to protect thresher sharks from overfishing, Sea Grant biologists recently established what amounts to a mini observer program for the drift gillnet thresher shark fishery in Ensenada, Mexico.

The observer program, a collaboration among UC San Diego and Mexican researchers and Mexican fishermen, puts marine biology graduate students on local fishing vessels to record the number and weight of thresher sharks caught.

The observers, masters students in marine biology at CICESE university in Ensenada, also record where the fish were landed, the set-depth of the nets, net size and mesh size. Bycatch is also recorded.

Sea Grant funding will provide two years of support for about 30 to 50 percent observer coverage of the Ensenada fleet, which is the center of the drift gillnet fishery in northern Baja

California. Like the fleet's counterpart in California, the Ensenada fleet targets swordfish and thresher shark. Like the California fleet, it has shrunk in recent years and is facing tighter regulatory action.

Sea Grant Trainee Dan Cartamil, who helped to organize the observer program with his thesis adviser and lead investigator on the grant, Jeffrey Graham, a research biologist at Scripps Institution of Oceanography, said the project was a first step toward the ultimate goal of having a binational management strategy for the thresher shark fishery.

"To do this, we have to get a handle on the magnitude of the Mexican fleet," Cartamil, a doctoral student at Scripps, said. U.S. fisheries management plans do not take into account any landings in Mexico because they don't have the data. "This project will fill that gap."

"We know that if their fishery is not sustainable, then ours prob-



Sharks, like the thresher shark above, are vulnerable to overharvesting. Photo Michael Leonard (mleonard@maine.rr.com)

ably is not," said Santa-Barbara based gillnetter Gary Burke. "It's the same group of fish basically."

Besides providing data to fisheries managers, California fishermen hope the observer program will also "level the playing field."

"We have had mandatory 25 percent observer coverage for 17 years," Burke said. "We have pingers on our nets and submerge our nets to reduce interactions with sea turtles." There are also seasonal and spatial closures and restrictions on net size. "We catch one sea turtle and they close the whole fishery."

"We don't play on a level playing field," said Steve Fosmark, a drift gillnetter based in Morro Bay. "We are heavily regulated and they aren't, but their catch still ends up in our markets."



A tagged thresher shark after release. Photo Scripps Shark Lab



Disease-Resistant Black Abalone Discovered

Efforts to save black abalone may hinge on discovery of disease-resistant specimens on San Nicolas Island and the ability to breed these for outplanting in Southern California.



Biologists have discovered that black abalone on San Nicolas Island in the Santa Barbara Channel are resistant to the deadly bacterial disease known as withering syndrome. The discovery may help save these now rare intertidal mollusks from extinction, as scientists hope to soon breed these animals in captivity for release in the wild.

San Nicolas Island has been the site of several severe outbreaks of withering syndrome,



Dr. Carolyn Friedman. Photo University of Washington, Seattle

said Carolyn Friedman, a professor at the School of Aquatic and Fishery Sciences at the University of Washington in Seattle, explaining the island abalones' hardiness. They are the descendants of that one percent of the population that survived.

Friedman and her colleague on the California Sea Grant project, professor Steven Roberts, also at the University of Washington, are now trying to identify which genes are responsible for resistance and the mechanisms by which this resistance is conferred. This work includes studying differences in gene expression between island black abalone and those from Carmel in Monterey, as the animals are subjected to high loads of the withering syndrome pathogen.

"The hypothesis is that these resistant populations have been subject to intense selective pressure," Roberts said. "The animals we have tested from Carmel have had little or no

withering syndrome selective pressure."

Withering syndrome, which causes severe atrophy of the animal's foot muscle and is caused by a water-borne pathogen excreted in abalone feces, occurs in relatively warm water, such as those found in the Santa Barbara Channel. Until recently, waters off the more northerly Carmel have been too cold to trigger outbreaks. As a result, abalone in Carmel have little natural protection against the disease.

Although harvesting black abalone is now banned, ecologist Hunter Lenihan, a professor at the Donald Bren School of Environmental Science and Management at UC Santa Barbara, believes the species will have difficulty recovering on their own. Poaching remains an issue, disease another, he said. The species has become so rare it is now a candidate for protection under the federal Endangered Species Act.

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Going, going, gone ... Three pictures from the same location on Santa Cruz Island in 1986 (far left), 1988 (center) and 1999 (immediate left) clearly show the dramatic loss of black abalone populations that has occurred throughout California, due to overharvesting and the deadly withering syndrome disease. Photos courtesy Brian Tissot, Washington State University, Vancouver

With California Sea Grant support, Lenihan and graduate students are trying to identify the conditions necessary to spawn black abalone in a laboratory setting. The goal is to be able to breed disease-resistant animals for release in the wild.

Captive breeding would seem a relatively simple task given that red abalone are already farmed commercially. This is not the case, however, as black abalone are an intertidal species, red abalone a subtidal one. Black abalone reproduction seems to require a complex set of conditions that may depend on winds, waves and sea level, Lenihan said.

“The females are strong,” Lenihan said. “We have gotten them to spawn. The problem is the males. To get the males to spawn, we are going to have to play the right music and find the right wine.” ■ ■ ■



(Left) Sea Grant Trainee Tal Ben-Horin prepares a black abalone for spawning in the wet lab at UC Santa Barbara. Photo Hunter Lenihan

(Right) A female black abalone's gonads are inspected in preparation for a spawning trial. Photo Hunter Lenihan



Eight Distinct Populations of Cabezon Discovered

New results of a California Sea Grant/California Department of Fish and Game study strongly suggest that West Coast cabezon are composed of at least eight genetically distinct populations. Six of these are in California in the areas around Fort Bragg, Half Moon Bay, Morro Bay, Santa Barbara/Ventura, the Channel Islands and San Diego. One population was identified in southern Oregon near Coos Bay and one in Puget Sound in Washington.

Cal Poly San Luis Obispo biology professor Francis Villablanca, who led the genetic analysis, bases this conclusion on the frequency distribution of different genotypes along the West Coast. This clearly showed a characteristic clustering of certain genotypes in eight geographic provinces (see map of these regions).

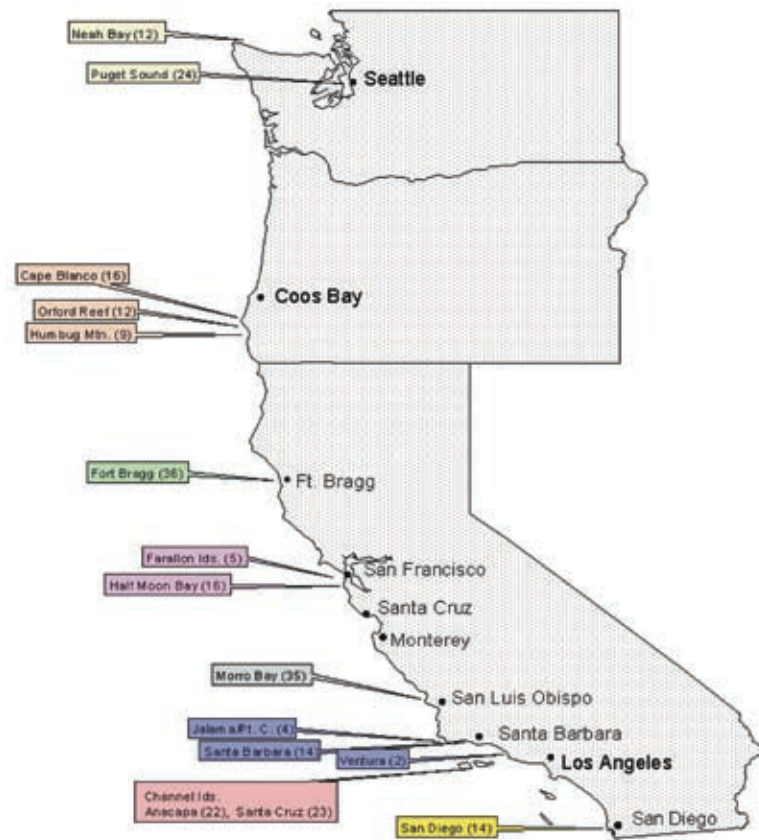
“What we don’t know is why we see this pattern,” Villablanca said. “We don’t know if certain

genotypes have been maintained because they confer some adaptive advantage or whether it is

just genetic drift, in which genotypes are lost due to the size of the local breeding population.”

A microsatellite analysis of nuclear DNA will help researchers determine which has occurred. The study reported here was based on an analysis of mitochondrial DNA samples taken from 244 cabezon along the West Coast.

Cabezon is a valuable component of the lucrative nearshore, live finfish fishery, in which fish are caught and sold live, often to Asian markets and restaurants.



The color-coding shows the locations of the eight cabezon populations. Credit Cal Poly San Luis Obispo



Cabezon, *Scorpaenichthys marmoratus*. Photo Margaret Webb

CALFED Science Fellowships Announced

A toxicologist who thinks endocrine disrupting contamination might be impairing fish health in the San Francisco Bay-Delta and an ecologist who believes nutrient pollution may be making the region more vulnerable to non-native species invasions are among this year's recipients of CALFED Science Fellowships.

Others receiving the fellowship include a wetland ecologist who hypothesizes that freshwater marshes in the Bay-Delta will be casualties of climate change and a river ecologist who links natural river flows to the maintenance of riparian forest habitat.

"My research will provide critical insights into fish productivity and water quality, since both are linked to tidal wetland health," said **Lisa Schile**, a fellowship recipient and doctoral student in the Department of Environmental Science, Policy and Management at UC Berkeley, who will be studying the effects of higher salinity levels and higher sea-level changes associated with global warming scenarios—on Bay-Delta wetland habitats.

Heidi Weiskel, another fellowship recipient and doctoral student in ecology in the Department of Environmental Science and Policy at UC Davis, will be



CALFED Fellow Lisa Schile. Photo John Callaway

studying whether nutrient pollution is facilitating invasive species success. "If it does, we will know that limiting nutrient pollution can be a tool for controlling invasive species," she said. "We could go after what is making habitats friendlier for them."

"We hope to be able to identify dynamic floodplain areas where forests can regenerate," said John Stella, a professor at the SUNY College of Environmental Science and Forestry, who will be the academic mentor for fellow Alex Fremier. "This will allow managers to prioritize conservation of these areas." Stella and Fremier, a postdoctoral researcher at SUNY, will be collaborating with The Nature Conservancy on the project.

Each of the six selected fel-

lows will receive up to three years' support to conduct research of relevance to maintaining reliable water supplies and improving ecosystem health in the Bay-Delta and Central Valley. Annual stipends are \$25,000 for doctoral students and \$45,000 for postdoctoral researchers.

Support for the projects comes from the CALFED Bay-Delta Program, a collaboration of 25 state and federal agencies with management or regulatory responsibilities in the San Francisco Bay-Delta and Central Valley, through its science program.

"We are excited about tapping the expertise of young scientists," said Shauna Oh, the program manager at California Sea Grant who oversees the fellowship program on behalf

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of the CALFED Science Program. “It is exciting to see them have the opportunity to address pressing issues in the Bay-Delta.”

The other winners for 2007 are:

Susanne Brander, a doctoral student in the Department of Environmental Toxicology at UC Davis; she hopes to identify specific endocrine disrupting chemicals causing the most harm to target fish species such as silversides, salmon and Delta smelt.

Alex Fremier, a postdoctoral researcher at the Department of Forest and Natural Resources Management at the SUNY College of Environmental Science and Forestry in Syracuse; his project will hopefully improve the long-term prospects for restoring and protecting one of the signature species of the Central Valley’s riparian ecosystem—the Fremont cottonwood.

Sara Hughes, a doctoral student at the Bren School of Environmental Science and Management

at UC Santa Barbara; she will examine the policies and practices influencing how water is used in the Bay-Delta, especially as it relates to the Environmental Water Account, which attempts to maintain a store of water to release as needed to maintain target fish populations.

Susan Lang, a postdoctoral researcher in the Geosciences Research Division of Scripps Institution of Oceanography in La Jolla; she will develop novel isotopic biomarkers to identify sources of organic carbon supporting zooplankton in Suisun Bay. The findings have implications for explaining the decline of pelagic fish species in the region.

For information on how to apply for a CALFED Science Fellowship or to read project summaries of new and ongoing research by CALFED Science Fellows, see “education” at www.csgc.ucsd.edu/. ■ ■ ■