Sea Grant News

"Coastal Science Serving California"

In this issue...

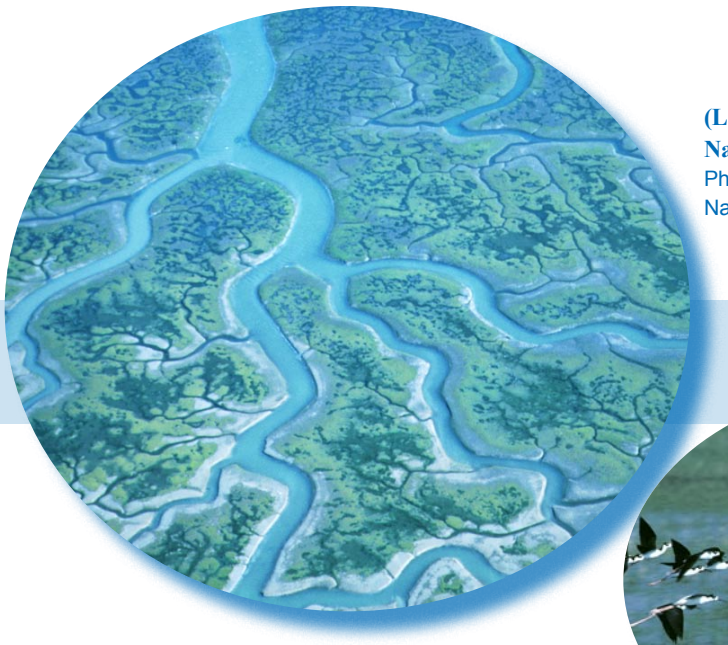
Sea Grant California

Newsletter of the California Sea Grant College Program, Winter 2007

Photo credits:

(Cover) At a Humboldt Bay study site, students assess the effects of grazing on eelgrass growth and animals.
Photo: Laboratories of Frank Shaughnessy and Jeffrey Black, Humboldt State University

(p. 4) White abalone. Photo: http://www.nmfs.noaa.gov/pr/species/invertebrates/whiteabalone.htm



(Left) Aerial view of eelgrass in the Humboldt Bay National Wildlife Refuge; (Below) Brant geese.
Photos: Tupper Ansel Blake, U.S. Fish & Wildlife Service National Image Library

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In Humboldt Bay, Grazing Geese Benefit Eelgrass

On their annual northward migration, tens of thousands of brant geese descend on Humboldt Bay to feed on long, green ends of eelgrass. It might seem the birds and all their hungry bills must have a deleterious impact on eelgrass health. However, this is not the case. Preliminary California Sea Grant research shows that grazing by geese, at its current intensity level, stimulates eelgrass growth.

"We were concerned people might automatically assume anything eating eelgrass must be bad for eelgrass," said botany professor Frank Shaughnessy of Humboldt State University (HSU), explaining his interest in studying the effects of geese on eelgrass ecosystems in Humboldt Bay. "It is not true."

Brant geese eat the innermost, nitrogen-rich leaves. They do not pull the plants out of the ground or eat their shoots. This is why they are not destructive. "They leave the rest of the plant in excellent condition to produce more leaves and shoots," he explained, citing the research results of colleague Jeffrey Black, a wildlife professor also at HSU.

Sea Grant Trainee Adam Frimodig (left) and HSU graduate Student Chris West in a study site demarked by PVC pipes. They are pulling up eelgrass and clipping it at a set height. Photos this story courtesy laboratories of Frank Shaughnessy and Jeffrey Black, HSU

The professors and their graduate students, Sea Grant Trainees Susannah Ferson and Adam Frimodig, theorize that grazing benefits eelgrass by increasing sunlight to the plants and by fertilizing plants with fecal material.

Eelgrass cannot survive in murky water. "Its need for light is its Achilles heel," Shaughnessy said. This is why water quality issues are so important in conserving eelgrass beds.

(Above) HSU undergraduate student Michelle Koury pulls up a trap for collecting fish, shrimp and crabs at the study site. (Right) Sea Grant Trainee Susannah Ferson marks an eelgrass leaf so that a leaf-specific growth rate can be measured later.

Humboldt geese continued p.4

Humboldt geese continued from p.3

Different types of traps were set in study sites to collect different organisms. The PVC pipes are spaced to prevent geese from entering.

"With the grazing, you have given eelgrass more light," he said. "It is going to grow more quickly but now its demand for nitrogen has increased." This is where the fecal material kicks into action. Feces provide nitrogen. "If you don't have fertilizer, you don't get the effect."

The scientists' conclusions are based on a series of field experiments in Humboldt Bay, home to about 45 percent of the state's eelgrass beds. In these, they mimicked the effects of brant geese by clipping eelgrass and depositing fecal material in control sites.

"Eelgrass growth rates did not increase if you only clipped leaves or only added fecal matter," he said. "We had to do both."

The intensity of clipping was based on the current size of the visiting geese population—about 80,000 birds annually. If there were many more geese or a lot fewer, the eelgrass beds could suffer.

A second component of the Sea Grant project was to examine the influence of geese on marine animals. The idea was to look at whether increased eelgrass growth caused by grazing could also be linked to patterns in marine animal ecology.

"The geese increase the productivity of the eelgrass," Shaughnessy said. "Ultimately, this grass is consumed by animals. So, if the geese make the eelgrass grow faster, they are supporting more animals."

Though the concept is solid, in practice it has proven difficult to observe because two other factors appear to swamp the relatively subtle influence of geese—weather and predatory fishes.

"When it is stormy, the bigger fish are gone," he said. "We think ocean currents and waves prevent fishes and their larvae from entering eelgrass beds.

"We saw larger Dungeness crabs in the study sites that received both clipping and fecal material, when the weather was calm and the larger fish predators were absent," he said.

The scientists will soon be sharing their findings with managers to help them improve eelgrass conservation in the region. ■■■

Wanted: Abalone "Fingers" for New Genetic Fingerprinting

California Sea Grant biologist Ronald Burton of Scripps Institution of Oceanography and graduate student Kristen Gruenthal have developed a genetic fingerprint for identifying white abalone. This seems like wonderful news. One problem: "There are essentially no wild samples to be had," Burton said.

White abalone—the first marine invertebrate protected under the Endangered Species Act—have become too rare, even for science. Federal wildlife biologists are now understandably reluctant to issue permits to collect them, even for research, because of fears that this, too, would contribute to the mollusk's downward spiral.

Burton, a member of NOAA's White Abalone Recovery Team, said that initial successes in captive rearing of white abalone have led to recent disappointments as hatchery-raised abalone have been blighted first by a well-known bacterial disease—withering syndrome—and more recently by never-before-seen fungus. Abalone raised to maturity may never be safe for release in the wild.

The prognosis for wild white abalone? "The natural populations are either going to make it on their own or not," Burton said. "We are ready for them if they make a comeback." ■■■

Mystery Deepens on Toxic Algal Blooms—
Bacteria Now Suspect

The mystery deepens on toxic algal blooms—explosions in populations of microorganisms, which may taint seafood or turn the sea muddy red.

According to new results from California Sea Grant researchers, some toxic algal blooms may be, in effect, triggered by bacteria. The bacteria in question are special—not the kind you scrub off your hands. These bloom-relevant species live in association with marine algae.

Nobody knows for sure what the bacteria do for the algae. But it is known that without the bacteria, the algae die. Ongoing California Sea Grant research, led by professor Carl Carrano of San Diego State University, suggests the bacteria may be providing algae with iron.

Most "red ties" are harmless but some produce toxins that taint seafood with potentially deadly toxins. For more information visit http://seafood, ucdavis.edu/Pubs/naural.htm. Photo courtesy Washington Department of Public Health

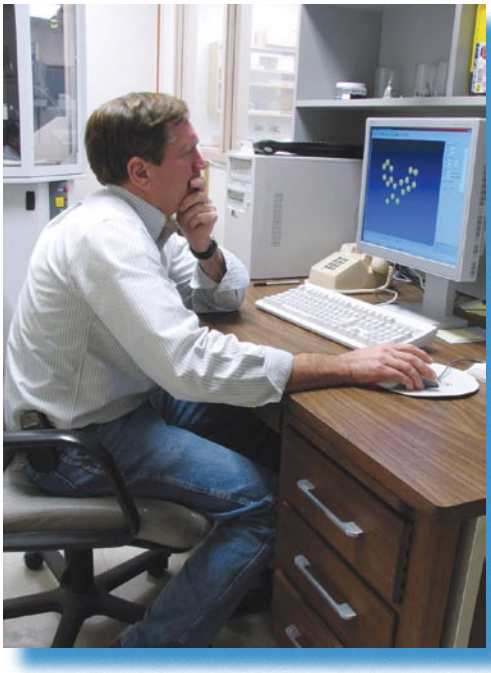
The bacteria under study all produce a compound—the same compound—that changes the form of iron in seawater, Carrano said. The compound (called vibrioferrin) transforms biologically unavailable iron into stable, biologically useful forms.

It is not yet clear on what scale this transformation of iron occurs. Biologically useful iron, though, is a precious commodity in many parts of the ocean. If bacteria have a significant role in bumping up iron sources, they would be key in explaining blooms in areas where iron alone is the limiting factor for growth.

How often this occurs and where remain open questions. Nobody has yet tried to correlate vibrioferrin levels in seawater with harmful algal bloom formation or its intensity. But this may come—and it could lead to a very novel, early algal-bloom warning system.

Carrano and colleagues Frithjof Kuepper and David Green at The Scottish Association for Marine Science in Oban, Scotland, have recently found that vibrioferrin may also help algae and/or bacteria communicate among each other. In their experiments, they have documented that the compound vibrioferrin can bind to boron.

"Natural products containing boron are very rare," Kuepper said. "The most notable bacterial product using boron is a quorum-sensing molecule." Quorum-sensing molecules allow bacteria to coordinate gene expression. They kick into action only when there are a lot of bacteria present.



San Diego State University (SDSU) professor Carl Carrano investigates a possible link between harmful algal blooms and iron compounds made by certain bacteria. Photo courtesy SDSU

"We believe that some toxic algae can effectively wire tap bacteria's communication system," Kuepper said. "The boron compound tells the algae it is OK to grow because there is enough iron."

In this scenario, vibrioferrin first produces iron, then as bacteria populations rise, acts as a signaling compound.

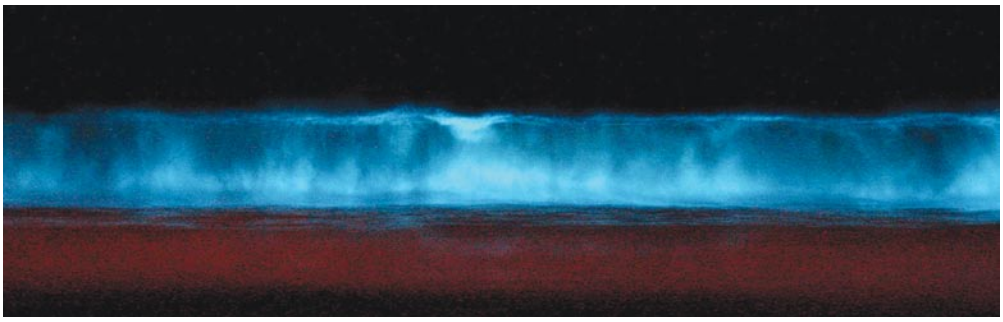
Much needs to be learned before the researchers' ideas exist beyond the realm of speculation. But what they have found so far dovetails nicely with others' findings. Professor Alison Butler of UC Santa Barbara, a former California Sea Grant researcher who led some of the first studies of marine iron-binding compounds, said that it has already been shown that some eukaryotic cells (cells with a nucleus) can reduce iron

Bacteria continued p.6

Bacteria continued from p. 5

from iron-siderophore complexes. (Vibrioferrin is a type of siderophore.)

Professor Mark Wells of the University of Maine in Orono, meanwhile, has published findings showing a link between iron and copper concentrations and the toxin domoic acid—the causative agent of amnesic shellfish poisoning. ■■■



Bioluminescent marine algae light up a breaking wave at midnight in Carlsbad, California. The blue light is a result of a luciferase enzyme. The phenomenon may be related to quorum sensing. Photo www.Flickr.com

John A. Knauss Marine Policy Fellowship Winners Announced

California Sea Grant is pleased to announce two new Knauss Fellows, who join 42 other Knauss winners from other states for a year-long mentoring program in federal marine policy in Washington, D.C.

Stuart Levenbach, who recently earned a doctorate from the Department of Ecology, Evolution and Marine Biology at UC Santa Barbara, has been placed with Republican staff on the Senate's Commerce Committee, which includes Sen. Olympia Snowe of Maine and Sen. Ted Stevens of Alaska.

"I have always been interested in policy," Levenbach said. "But I wanted to earn my stripes as a scientist before I ventured into policy. The fellowship allowed me to enter into the world of policy from a science background.

"I will work on all ocean and climate issues that come before the Commerce Committee," Levenbach said. "I think there will be a lot of fisheries and aquaculture issues, as well as climate issues."

Ryan Wulff, a recent master's graduate from the Marine Biodiversity and Conservation program at Scripps Institution of Oceanography, will be in the fisheries division of NOAA's Office of International Affairs.

Knauss Fellow Stuart Levenbach. Photo L. Levenbach

"The fellowship is a chance to really get hands-on experience at the federal level in marine policy," Wulff said. "It is a chance to see how decisions are being made, who's making them and to be a part of it."

Wulff's first assignment will be to prepare the U.S. position on the Convention on International Trade in Endangered Species for the next round of international deliberations.

The John A. Knauss Marine Policy Fellowship, sponsored by NOAA's National Sea Grant College Program, matches highly qualified graduate students with hosts in legislative or executive branches of federal government in the Washington, D.C., area for a one-year paid fellowship. The program is named after former NOAA administrator John A. Knauss.

To learn more about the experiences of past Knauss Fellows and what they are now doing professionally, visit the California Sea Grant Web page at http://www.csgc.ucsd.edu/. ■■■

Knauss Fellow Ryan Wulff. Photo M. Allen

Calling All California Sea Grant Alums!

California Sea Grant would like to keep track of its "alumni" (former Trainees, State Fellows, Isaacs Scholars, Knauss Fellows and CalFed Fellows) to document how their Sea Grant experience has contributed to their success.

We are preparing for a federal review of our program in 2008, and we want to create a list of "alumni" and where they are now. If you received this newsletter but don't get at least one email from us each year, please contact Marsha Gear, Communications Director for California Sea Grant: mgear@ucsd.edu and include a brief note about your current occupation/title, organization you work for, telephone number and preferred email for contact.

We appreciate your help and send continued best wishes for your success! ■■■

Former California Sea Grant Trainee and Knauss Fellow Amber Mace piloted a one-person submersible for a NOAA/National Geographic Sustainable Seas Expedition. Photo Colene Mace

Smokin'—International Smoked Seafood Conference and Workshop in Alaska

Illustration courtesy Alaska Sea Grant

Has competition got you down? Have regulations tied you in a knot?

The International Smoked Seafood Conference and Smoked Seafood Workshop, co-sponsored by California Sea Grant, March 5–10, 2007 in Anchorage, Alaska will help you (a smoked seafood professional) develop successful products and learn about new equipment and packaging. Don't worry about the cold. The smoke will keep you warm! For more information about the conference and workshop, visit the Alaska Sea Grant meeting page at http://seagrant.uaf.edu/conferences/2007/smokedseafood/index.html. ■■■

Photo courtesy Anchorage Convention & Visitors Bureau

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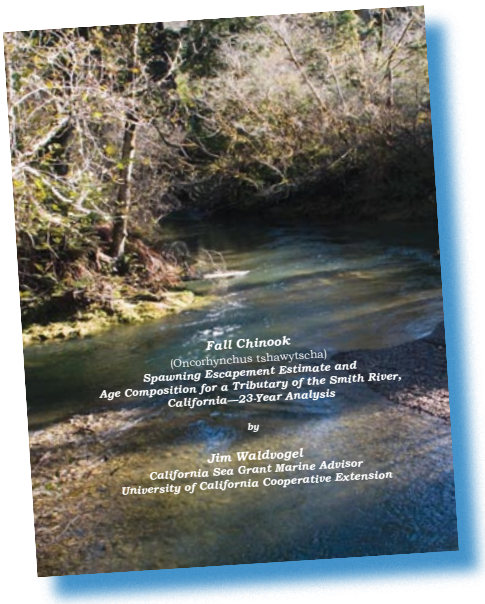
New California Sea Grant Publication

***Fall Chinook* (Oncorhynchus tshawytscha)**
Spawning Escapement Estimate and Age Composition for a Tributary of the Smith River, California—23-Year Analysis

by Jim Waldvogel, California Sea Grant Marine Advisor,
University of California Cooperative Extension, 2006
Publication No. T-060, ISBN 1-888691-16-6



This is the longest known time-series study of native salmon in California. The 32-page book analyzes the 23-year spawning escapement study (1980–2002) of the fall chinook salmon run on the West Branch Mill Creek, a tributary of the Smith River in Northern California. The Smith River is the largest undammed, free-flowing river in California, draining into the Pacific Ocean. It is considered the healthiest river system in California, has "Wild and Scenic River" status, is part of a National Recreation Area, and is managed by the California State Parks/Redwood National Park systems.

Cost: $10.00 includes postage and sales tax.
Checks should be made payable to University of California Regents and send with request to: California Sea Grant Communications, UCSD, Dept. 0232, La Jolla, CA 92093-0232 or fax request with your name and address to: 858-453-2948, and we will ship your order with an invoice.
Questions? Call 858-534-4446. ■ ■ ■