

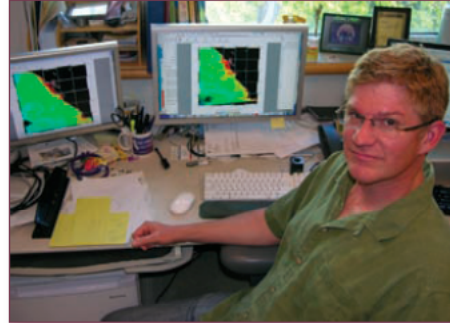
## Forecasting TOXIC ALGAL BLOOMS in California

SANTA CRUZ, CA – After years of studying and monitoring harmful algal blooms in California's coastal waters, a team of researchers are ready to begin forecasting when toxin-producing algae will strike next.

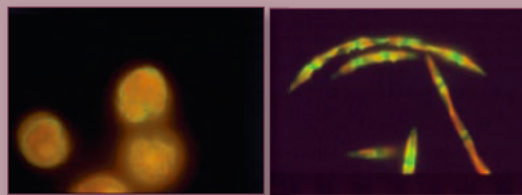
UC Santa Cruz ocean sciences professor Raphael Kudela is leading the project, recently awarded a \$720,000 grant from the Ocean Protection Council and California Sea Grant.

The first predictions will be for diatoms of the genus *Pseudo-nitzschia*, which produce domoic acid, the neurotoxin that builds up in shellfish and small fishes and can cause amnesic shellfish poisoning. Although state monitoring and quarantines protect consumers from tainted seafood, seabirds and marine mammals often are poisoned and can suffer massive die-offs.

UC Santa Cruz researchers and the California Department of Public Health (CDPH) have already built and validated a computer model for predicting the environmental conditions in Monterey Bay favorable to *Pseudo-nitzschia*. A similar model exists for coastal waters off Santa Barbara.



Raphael Kudela, ocean sciences professor at UC Santa Cruz.



Fluorescence microscopic images of the harmful algae *Alexandrium fundyense* (left), which produces the toxin responsible for paralytic shellfish poisoning and *Pseudo-nitzschia multiseries* (right), which produces the toxin causing amnesic shellfish poisoning.

Kudela's team will expand these existing models to cover the entire coast and develop forecasting capabilities for the algae that produce saxitoxins, responsible for paralytic shellfish poisoning. His collaborators include scientists at CDPH, UCLA, Jet Propulsion Laboratory, University of Southern California, Southern California Coastal Water Research Project, and Central and Northern California Ocean Observing System.

"We are at the point now where we'd like to take these research projects and turn them into something that's useful for the state and the public," Kudela explains. "We aim to develop a web-based tool to provide real-time updates for state agencies and wildlife managers. It will give them a heads up so they know what

to expect and how to prioritize their monitoring efforts."

An unusual event this winter underscores the potential for modeling to improve protection of public health. The annual quarantine on recreational shellfish harvesting had just been lifted when the model for Monterey Bay showed a new episode of domoic acid production.

"Right after the annual closure was lifted, the model actually picked up an unusual event where the mussels got toxic again," Kudela says. "We alerted the state and they closed harvesting again. So that's where we're headed, and ultimately we'll have a web site where you can go and get that kind of information."

Modeling may also help explain shifts in where and when algal blooms are occurring.

This summer both Monterey Bay and the Santa Barbara area experienced an atypically prolonged bloom of *Pseudo-nitzschia*, with toxin levels exceeding the regulatory limit.

"Santa Barbara has become a real hot spot and it never used to be," he says.

"We are seeing bigger blooms, blooms at unusual times of the year, and in places we haven't seen them before."