

**Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.**

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**Crabs and HABs**

A Harmful Algal Bloom, or HAB, which began in May and stretches from Alaska to Southern California, appears to be the largest toxic algae bloom scientists have ever seen along the Pacific coast, and possibly anywhere in the world. That's big by any measure. And Monterey Bay appears to be the epicenter for the bloom, where researchers from the Monterey Bay Aquarium Research Institute (MBARI) and UCSC have measured some of the highest concentrations of harmful algae and their toxins ever observed.

Algal blooms, like the weeds in your yard in spring, are a common seasonal occurrence offshore. These microscopic plants, also known as phytoplankton, are at the base of the oceanic food chain. Everything else in the ocean depends on them; without phytoplankton there would be no life in the sea. And while most of them are totally harmless, some have a darker, potentially fatal side.

Analyses of seawater samples over the past six months reveal that a major component of this massive bloom is a single-celled diatom with the innocuous name of *Pseudo-nitzschia*. Harmful algal blooms that include toxic species from this genus have been found in coastal waters around the world.

This tiny little plant produces a neurotoxin, domoic acid, that causes Amnesic Shellfish Poisoning (ASP), and which this month led to the indefinite postponement of the opening of the Dungeness crab season.

In 1987, in what is believed to be the first publicized incident of ASP, three deaths and over 100 confirmed cases of acute poisoning followed the consumption of cultured mussels on Prince Edward Island off the Atlantic coast of Canada.

Consumption of domoic acid contaminated seafood produces gastrointestinal and neurological effects, typically within hours of exposure. Symptoms are not pleasant and include nausea, vomiting, diarrhea and abdominal cramps. In more severe cases, neurological effects include hallucinations, confusion, short-term

memory loss, respiratory difficulties, seizures, coma, and in extreme cases, death. You would like to avoid this.

These diatoms, with their toxins, are filtered out of the seawater during feeding by shellfish or can be consumed by tiny krill or small fish, such as sardines and anchovies. None of these organisms seem to suffer any ill effects, but the toxins cause problems higher in the food chain, with marine mammals and birds being the usual victims.

Domoic acid can over stimulate the nervous system, causing loss of balance, partial paralysis and even death in seals, sea lions, dolphins, pelicans, and other seabirds.

Harmful algal blooms are naturally occurring event, but scientists in recent years have seen an increase in both the frequency and size of these events. With this year's strong El Niño underway, ocean surface temperatures are well above normal, which is believed to be one catalyst for this large bloom. Interestingly, the water offshore in Monterey Bay was significantly warmer than normal last year as well, so we've seen two years of well above average temperatures.

Another factor is higher nutrient concentrations, whether from strong upwelling of nutrient-rich deeper water, or more fertilizers from terrestrial runoff, these fertilizers encourage algal growth.

This year's mega bloom has created an ongoing disaster for commercial and recreational fishers along the entire west coast. Each year California imposes a six-month moratorium on recreational shellfish harvesting from May through October, when the chance of toxic poisoning is highest, particularly in mussels, and enforces strict testing of hauls from commercial fisheries. But this year is far more serious and goes way beyond mussels.

California has closed the anchovy fishery, and both Oregon and Washington have shut down razor clam and crab fisheries. The Washington state Dungeness crab fishery alone is an \$84 million a year industry. California public health officials have warned against consuming recreationally harvested mussels and clams, commercially or recreationally caught anchovies and sardines, or the internal organs of commercially or recreationally caught crab taken from Monterey and Santa Cruz counties.

The opening of both the recreational and commercial Dungeness crab season have been delayed indefinitely, and the normal year round rock crab fishery is now closed.

The big questions are how long these conditions will last, when will crab and other seafood be safe to eat, and are these conditions giving us a glimpse of what a warmer ocean may look like in the future. These are unsettled and unsettling at best.