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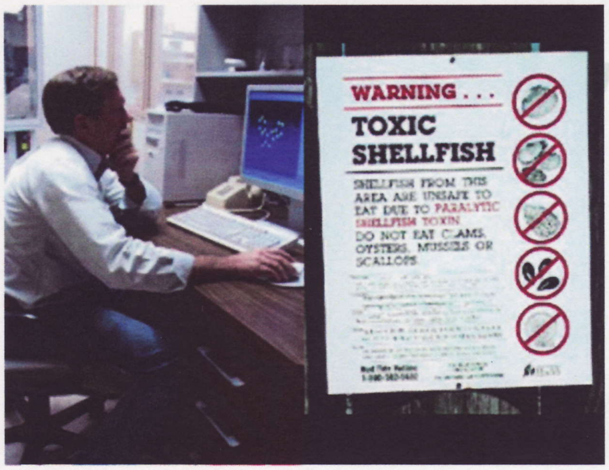

Carl Carrano, left, working at his computer and a sign warning about toxic shellfish.

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News

Tuesday, January 16, 2007

Algae Anxiety

By Lorena Nava

Red tides — they've come to symbolize an ocean gone wrong, creating neurotoxins that poison the bodies and minds of animals that feast on the smaller creatures that consume the dangerous algae.

Photo provided by the Science Education Resource Center.

Carl Carrano, SDSU chemistry department chair, has been studying the red tides through his research supported by California Sea Grant, which is administered through University of California, San Diego and is based at Scripps Institution of Oceanography.

The Algae Factor

While most scientists believe that fertilizer run-off has been the main cause of red tides — creating a "MiracleGro" environment for the algae — Carrano and his team of researchers have been studying the symbiotic relationship between a marine bacteria and the dangerous toxic algae, Gymnodinium catenatum.

Gymnodinium catenatum has made headlines in recent years as it produces a toxin that causes paralytic shellfish poisoning, a severe neurological disease caused by eating contaminated seafood, such as mussels or oysters. Each year, the California Department of Health Services releases a quarantine warning on all sport-harvested shellfish from the California coastline from May 1 through Oct. 31.

According to Carrano and his team's research, the symbiotic marine bacteria transform otherwise useless biological iron compounds into forms that can be used by the toxic algae.

"The marine bacteria we are studying have evolved a complex mechanism for obtaining iron," Carrano said in an interview with California Sea Grant.

The bacteria produce compounds, known as siderophores, which convert inorganic, insoluble forms of iron into soluble, stable and biologically available compounds. The team's hypothesis is that the toxic

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algae utilize the bacteria's process to provide necessary iron compounds.

Preliminary Findings

After eight months of study on their two-year Sea Grant project, Carrano's team has preliminary findings that support their hypothesis. They found that all toxic algae-associated bacteria produce the same siderophore, vibrioferrin.

"No matter where we collect the algae, we find their symbiotic bacteria always produce vibrioferrin," Carrano said. "We would not expect this unless the siderophore was providing some function."

Without these same bacteria, toxic algae will not grow.

"Clearly, the bacteria provide a critical function," Carrano said.

According to the California Sea Grant, Carrano's research is the first to link bacteria and marine siderophores to algal blooms, representing a major discovery in the field.

"To our knowledge, no other group in the world is currently studying or planning to study the role of siderophores in forming harmful algal blooms," Carrano said.

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