North County News

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Red tide: Tiny plants swim, adapt to changes

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Like The Blob, it rises up from the deep and spreads slowly over the surface of the ocean — a rust-red slick that sometimes kills fish by the thousands.

It's the red tide, and when it blooms, people are warned against eating clams, mussels and scallops. That's because these seafood animals are filter-feeders that strain out plankton from the ocean currents — and red tide is sometimes composed of plankton that can be very toxic.

The plankton that makes up a red tide is actually a microscopic single-celled plant, called a phytoplankton — and more specifically called a dinoflagellate. "Dino" (two) and "flagellate" (tail) partially describes the organism.

BARBARA PREZELIN

Dr. Barbara Prezelin has been studying dinoflagellates for years in her laboratory at UCSB, and as she watches the tiny plants move like whirling space machines under a microscope, she says that it is difficult for many people to conceive of two-tailed plants that swim. Her comment is an understatement, because nothing under the magnifying lens looks very plantlike.

Dr. Prezelin said that dinoflagellates are among the most adaptable organisms in the sea — good at living inside of an animal cell without getting eaten, or instantly taking advantage of optimum growing conditions.

Dr. Prezelin, a native Oregonian whose background includes a doctorate in marine biology from Scripps (and marriage to underwater photographer/Cousteau cameraman Louis Prezelin), has been studying dinoflagellates at UCSB since 1975.

Two other labs

She said that while there are not "a whole lot of people in the world" studying dinoflagellates, there are two other major labs on the UCSB campus working on them — those of Drs. Beatrice Sweeney and Robert Trench.

She said the simple, single-celled planktonic plants provide one of the best insights into oceanic photosynthesis — that process by which light is converted into life.

Dr. Prezelin said that the reason the red tide is red is because the color of light in the ocean is mainly blue and green, and the contrasting orange pigment of the phytoplankton thus provides the best absorption of light energy.

Adjust to light

The dinoflagellates adjust their photosynthetic processes very quickly to the hour of the day and available light, which is why they are among the most successful organisms in the sea, she said. The reason the red tide blooms in the summer months is not so much from heat, but from light, and the tiny plankton makes use of such light as soon as it can.

"During the night they meet in deep water, then they all swim upward," said Dr. Prezelin. "By mid-day or late afternoon, they form a layer very near the surface, and before the day is over they begin to swim back down."

Dinoflagellate blooms occur mainly in the summer months, when light is most abundant. When there is such a bloom, Dr. Prezelin and her team of researchers head to sea, to look for "fronts" — where two currents meet — because dinoflagellates travel in the currents. There is a "persistent front" between Port Hueneme and Santa Cruz Island, said Dr. Prezelin, where it is cold on the northern side and warm on the southern.

Local species

The main species at the local front is Gymnodinium splendens, a type of plankton essential for anchovy spawning. The anchovy larva feeds on the plankton, and female anchovies will not spawn until they've reached an aggregation of this particular plankton.

"It's a two-way street," said Dr. Prezelin. "The fisheries people want to know what the dinoflagellate scientists find out, to learn about the anchovies, and the dinoflagellate scientists want to know what the fishery biologists find out, to learn about dinoflagellates."

Santa Barbara does not have some of the serious red tide problems of other coastal areas, said Dr. Prezelin, because the two main species of dinoflagellates off the South Coast (Gonyaulax polyedra and Gymnodinium splendens) are not toxic. However, because there are over a hundred other species of dinoflagellates floating around, people are cautioned not to eat clams, mussels, and oysters as a precautionary "safety valve."

The toxic dinoflagellates are stored in the tissues of the clam, mussel or scallop eating the planktonic organism, said Dr. Prezelin, and until the poison filters out of its system, the animal stays toxic. How long the filtering process takes, she said, was still subject of a major study.

Major culprit

Among the toxic dinoflagellates, a major culprit is Gymnodinium breve — which creates the notorious red tide of the East Coast. Dr. Prezelin said she had to wear a gas mask when she studied the organism at Scripps Institute, to avoid breathing its vapors.

The massive fish kills associated with red tides, said Dr. Prezelin, resulted not so much because of the toxicity of the plankton, but because large masses of dead plankton produce a bacteria that uses up oxygen in the water. When oxygen levels become low enough, the fish simply suffocate.

Dr. Prezelin said that dinoflagellate blooms were a major evidence of their excellent ability to adapt to sea conditions, and she described other means by which the microscopic animals survive. The bioluminescence of the local Gonyaulax polyedra, she said, was a mechanism that scared off predators. The iridescence that swimmers or boaters see in the ocean after dark is from this particular species of dinoflagellate.

The maximum depth in which dinoflagellates can survive, said Prezelin, is about 100 meters (or 300 feet). However, this summer Dr. Prezelin will study collections made in the Santa Barbara Channel at 600 feet, to see if there are dinoflagellates at that depth.

"They are so adaptable," she said, "that they'll probably be doing just fine."

News-Press photo by Bob Ponce

RED TIDE is becoming better understood through plankton studies being done by graduate researchers Allen Matlick and Nan Sterman in a UCSB laboratory.