



FACT SHEET

RED TIDE IN THE NORTHEAST

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P1099
RIU-G-89-001

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April 1989

Red tides are naturally occurring population explosions, called blooms, of reddish-brown phytoplankton (microscopic algae) in the sea — often in coastal waters. Most red tides are harmless, but a few species of phytoplankton cause red tides that are poisonous to marine animals and to humans. Of the more than 60 different species of phytoplankton that cause red tides, only four or five have been identified as toxic.

Red tides are not new. The first of the 10 plagues of Egypt, described in Exodus, may be one of the earliest recorded instances of a red tide ("... and all the waters that were in the river were turned to blood. And the fish that were in the river died; and the river stank ..."). Red tides occur on both sides of the Atlantic, off Florida, and along the Pacific coast into Alaska.

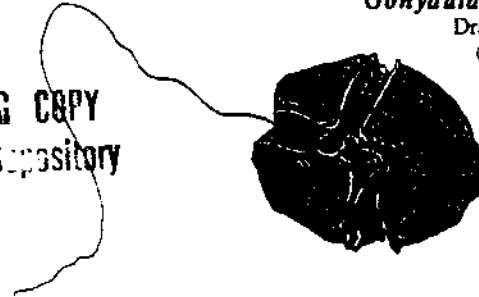
Red tide in New England

The organism that causes toxic red tide in New England is a microscopic one-celled alga called *Gonyaulax tamarensis*. *Gonyaulax* propels itself through the water using two tiny whiplike extensions called flagella. Its life cycle includes a dormant cyst stage that can survive cold winters in bottom sediments. The cysts, which also contain toxin, are the seeds for future blooms. These cysts facilitate the spread of toxic red tides into new areas since they are easily transported by tidal currents, dredge material disposal, and transplanted shellfish.

Gonyaulax toxin (saxitoxin) becomes concentrated in shellfish — clams, quahogs, mussels, scallops, oysters, and other bivalves. These shellfish are "filter feeders" that obtain nourishment by siphoning in water and filtering out the phytoplankton, which are their food. A large oyster can filter up to seven gallons of plankton-bearing water an hour; a clam, half that amount. This means that during a red tide bloom, a

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The New England red tide dinoflagellate,
Gonyaulax tamarensis.
Drawing by D. Beatty
(courtesy of Woods
Hole Sea Grant)



single shellfish could accumulate billions of *Gonyaulax* organisms in just 24 hours. The shellfish themselves are not affected by the toxin.

Non-filter feeders such as finfish, lobsters, crabs, and shrimp are safe to eat even if caught in red tide waters. On the other hand, shellfish may not be safe even before or after a visible red tide occurs. It takes several weeks of flushing with clean water to purge the shellfish of red tide toxin and make them safe to eat.

People who eat shellfish containing *Gonyaulax* toxin may be afflicted with paralytic shellfish poisoning (PSP). PSP can result from eating just a few clams. Saxitoxin attacks the human nervous system within 30 minutes with symptoms that may include numbness of the lips, tingling of the extremities, uncoordinated movements, incoherent speech, a feeling of lightheadedness, and nausea. PSP symptoms may be mistaken for drunkenness. In severe cases, paralysis of the breathing mechanism can cause death within a few hours.

No known antidote exists for saxitoxin. First aid should focus on getting medical attention and alleviating the symptoms of gastrointestinal and respiratory distress. Treatment may include pumping the stomach and inducing vomiting. PSP usually lasts 12 to 24 hours and leaves no apparent effects once the crisis is past. It is an unpleasant and potentially dangerous illness, though rarely fatal in the United States.

Scientists used to believe that humans and birds were the only animals affected by PSP, but recently they have learned that PSP toxins can cause mass fish kills and may affect marine mammals as well.

New England's first major experience with toxic red tide occurred in September 1972, when population blooms of toxic phytoplankton appeared from Maine to Cape Cod. Approximately 30 cases of PSP were reported, with no fatalities. An official ban on shellfish in those areas and the resulting publicity frightened the

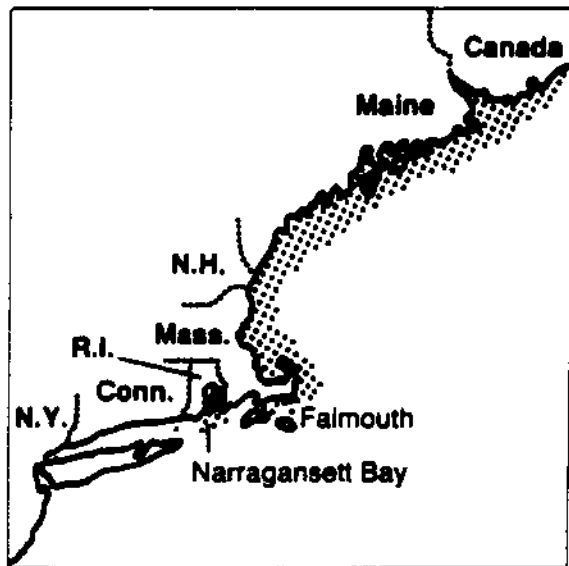
public, so that they not only stopped eating all shellfish, but shunned perfectly safe seafoods as well.

Where and when red tides occur

Red tide can occur any time during the boating season if weather conditions are right. Dry sunny spells following a sudden storm can encourage *Gonyaulax* to multiply, and physical conditions such as winds, tides, and currents can act to contain and concentrate the organisms in one place.

When billions of organisms are present, they may tint the water. A red tide may suddenly appear in localized patches or longshore streamers. A few days or weeks later, the red color disappears. However, it should be noted that water discoloration does not necessarily accompany the presence of toxic phytoplankton blooms. This has been especially true in the Gulf of Maine and off Canada. Some red tide organisms emit a bluish-green bioluminescent light that can make the waves glow at night.

The map below shows the areas of New England's coast where shellfish have been contaminated with PSP toxins. Be alert in those areas.



Know when shellfish are safe

Many monitoring stations along New England's coasts constantly test shellfish and water for the presence of red tide toxins. A strictly enforced public health mechanism prevents shellfish from reaching the market if any toxicity is discovered. When toxicity is found, affected areas are closed to shellfishing.

Notices are posted near the infected beds and in the local press, and shellfish wardens patrol the closed areas.

In spite of these safeguards, recreational boaters risk exposure to PSP toxins if they collect shellfish in remote coves where there is no posting.

When cruising in unfamiliar waters, ask about red tide before gathering shellfish. Even if the water looks clear, shellfish may not be safe to eat. *Gonyaulax* may be present in concentrations too low to turn the water red, yet still high enough to make shellfish toxic. In the Gulf of Maine and Canada, boaters should assume that *all* mussels are contaminated and other shellfish suspect during June, July, and August. Toxic shellfish do not look or taste different from normal shellfish. Cooking will kill bacteria but will **not** destroy the PSP toxin.

Boaters should also be warned that, east of Rhode Island, strictly enforced local shellfish ordinances govern who gets permits and where they may dig. Many cruising boaters digging a bucket of clams have been caught and fined by zealous shellfish wardens in the Northeast.

When in doubt, or when reliable red tide information is not available, don't dig. Buy your shellfish from retail markets, catch finfish, or have a shore dinner in a restaurant.

Important facts to remember about PSP

- Finfish, lobsters, shrimp, and crabs are SAFE to eat even when they are caught in red tide waters.
- Bivalves such as clams, scallops, mussels, and oysters from red tide waters are UNSAFE.
- Cooking DOES NOT destroy the red tide toxin.
- Water that looks clear can still contain enough *Gonyaulax* organisms to make shellfish unsafe.

FOR FURTHER READING

Coleman, Barbara A.; Doetsch, Raymond N.; and Sjoblad, Roy D. "Red tide: A recurrent marine phenomenon." *Sea Frontiers* 32(3):184-192; May-June 1986.

White, Alan W. "... And all the waters ... were turned to blood": Red tide in the Northeast." *Nor'easter* 1(1):26-31; 1989. Copies available from Woods Hole Oceanographic Institution Sea Grant Program, Woods Hole, MA 02543.

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DATE: APR 13 1989