

# NJ Sea Grant Extension Program

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# BROWN TIDE

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# BULLETIN

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Single-celled microscopic plant-like algae, floating or suspended in the water, are known collectively as phytoplankton. They constitute a major group of primary producers, forming the basis of most marine food chains. In certain environmental situations, some species undergo "blooms", that is, rapid proliferation and concentration of cells; which may cause water discoloration and resultant nuisance conditions. One species of marine phytoplankton, the minute (cells just larger than bacteria) *Aureococcus anophagefferens*, may attain such densities that water turns brown, resulting in what are commonly called **brown tides**. Since 1985, brown tides have occurred in the Peconic Bays of eastern Long Island, New York, and initially in Narragansett Bay, Rhode Island. The presence of *Aureococcus anophagefferens* in New Jersey was first detected in 1988 in lower Barnagat Bay; however brown tides were not detected until 1995 in adjacent Little Egg Harbor. Brown tides have occurred subsequently in this area in 1997 and 1999.



Island. The Jersey was first tide blooms were Brown tides have

During the summer's intense bloom conditions, densities of the brown tide organism can approach two million cells per milliliter. One milliliter is equal to about 20 drops of seawater. The densely packed algae block sunlight, reduce light penetration into the water, and affect the entire ecosystem. Eelgrass beds that serve as spawning and nursery grounds for shellfish and finfish have been adversely affected by the decreased light penetration, partly due to the brown tide blooms. For example, the scallop population in the Peconic Estuary in Long Island, New York, worth \$2 million annually, was virtually eradicated to a dockside value of a few thousand dollars. In New Jersey, the hard clam experienced reduced growth. Oysters and possibly blue mussels have also been impacted to varying degrees by brown tide. Long-term impacts on these shellfish are not yet known. While **brown tide is not known to be a health threat to humans**, its presence can negatively impact recreation, like swimming, fishing, and boating, because of the unpleasant aesthetics it creates.



What causes brown tide? There are a number of hypotheses, which are not mutually exclusive. One includes long-term changes in land and water use practices, resulting in increased availability of some nutrients. These nutrients, including iron and organic nitrogen, may favor the growth of this alga over other phytoplankton species. Another hypothesis is that cell toxicity reduces the rate of removal of these cells by grazers relative to other phytoplankton species. Scientists studying brown tides all agree that a better understanding of the multiple interactive causes and more research are needed in order to help lessen their negative impact on our ecosystems in the future.

# BROWN TIDE HARMS MARINE LIFE BY:



**Reducing shellfish growth.** A toxic or inhibitory substance on the cell surface of *Aureococcus anophagefferens* apparently reduces the feeding response of some shellfish (e.g. hard clams) on contact with these algal blooms. This can lead to slow or no growth.



**Reducing habitat.** When high concentrations of *Aureococcus anophagefferens* turn the water an opaque brown, there is loss of light for photosynthesis in the bottom dwelling-eelgrass. Eelgrass is a nursery habitat and refuge from predators for many important fisheries species, such as the juvenile bay scallop fishery in New York. This kind of habitat reduction could slow the recovery of scallop populations.



**Reducing a key link in the food web.** When brown tide cells reach concentrations of about half a million per milliliter, both protozoan grazing rates and their population concentrations are reduced. It's possible that juvenile fish will have their growth rates reduced and/or higher mortality rates because of reduced food availability.

To report Brown Tide incidents, call:

**NJDEP 24-HOUR HOTLINE  
609-292-7172**

For more information on Brown Tides and Harmful Algal Blooms, visit the following web sites:

[http://www.whoi.edu/science/  
\(search: Brown Tides\)http://](http://www.whoi.edu/science/(search:BrownTides)http://)

[http://research.nwfsc.noaa.gov/ec/  
tox/introduction\\_page.htm](http://research.nwfsc.noaa.gov/ec/tox/introduction_page.htm)

[http://www.cop.noaa.gov/  
projects.HAB.htm](http://www.cop.noaa.gov/projects.HAB.htm)

## New Jersey Impacts:

The brown tide species lives best in bays with high salinities and water temperatures between 68 and 77 degrees. The brown tide organism has been found from the Hudson-Raritan estuary to Cape May. The worst bloom conditions to-date have apparently occurred from Barnegat Bay to Great Bay, similar to major blooms that occurred in Long Island, New York.

The current (1999) brown tide ranges from about Seaside Heights in the northern part of Barnegat Bay to Great Bay in the south. Unconfirmed observation suggest it also extends south to Reed Bay below Great Bay. It is most intense in the southern half of Barnegat Bay and in Great Bay.

Important aquaculture facilities for hard clams are located in Barnegat Bay. Brown tides in this area have negatively impacted cultured hard clams and presumably could impact natural shellfish populations as well.

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