



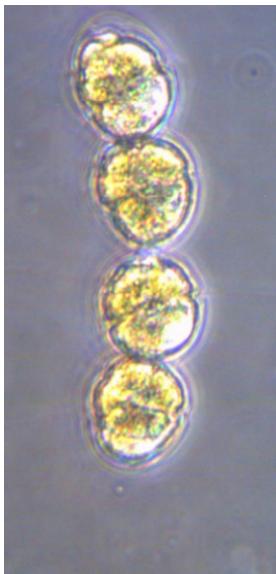
FACT SHEET

Office of Water Resources

September 2016

Rust Tide (*Cochlodinium polykrikoides* blooms)

Rust tide is caused by the accumulation of a large population of a naturally occurring type of microscopic, single-celled phytoplankton called *Cochlodinium polykrikoides* (Figure 1). *Cochlodinium* is a planktonic dinoflagellate typically present in RI coastal and estuarine waters in low numbers during the warm summer and early fall months. Occasionally, as happened in Narragansett Bay, some salt ponds and RI coastal waters during the late summer of 2016, *Cochlodinium* abundance can increase to levels of 5-10 million *Cochlodinium* cells per liter. *Cochlodinium* has red photosynthetic pigments and when present at elevated abundance (millions of cells per liter) it causes rust-red colored patches visible on the water surface (Figure 2). This rust tide is not toxic to humans and should not be confused with “red tide” that has led to shellfish closures in other New England states.



*Figure 1: Image of *Cochlodinium polykrikoides*, the organism causing rust tide. Each cell is ~45 micrometers in diameter. This 4-cell chain was isolated from Ninigret Pond, RI on 30 August 2016. (Photo: David Borkman)*



*Figure 2: Red water patch caused by rust tide bloom of *Cochlodinium polykrikoides* on Ninigret Pond 30 August 2016. (Photo: David Borkman)*

Is this organism new to RI waters?

Cochlodinium polykrikoides is not new or recently introduced to RI waters. It has been in RI waters for at least 37 years, and likely longer. A *Cochlodinium* bloom in Pettaquamscutt Cove (Narrow River) was recorded in 1980 and a water discoloring *Cochlodinium* bloom was reported in Pt. Judith Pond in 1997. However, the late summer 2016 bloom is the largest, most visible and most widespread *Cochlodinium* bloom known for RI waters.

Where and when is rust tide likely to occur?

Cochlodinium is a marine organism; it may be found in the marine (saltwater) and estuarine waters of RI having a salinity of greater than ~15 ppt. It *cannot* survive in freshwater. It is a warm water marine species and requires water warmer than ~50°F (10°C) and grows best in very warm water of ~80°F (26°C). It is typically at maximum abundance in late summer and early autumn when the waters of Narragansett Bay are near their warmest water temperature.

What caused the 2016 rust tide?

The complete set of physical, chemical and biological factors that contribute to *Cochlodinium* rust tide bloom formation are not fully known. *Cochlodinium* maximum growth rate occurs in warm water, so the warm water (nearly 80°F) temperatures observed during summer of 2016 likely contributed. It is a relatively slow growing phytoplankton species so factors that reduce the population mortality rate also may have contributed to bloom formation. Predation on *Cochlodinium* cells by the usual marine predators (copepods, larval fish, and shellfish) appears to be reduced, perhaps by the hydrogen-peroxide like toxin on the cell surface. The rust tide occurred during a time of drought conditions in the region and river flow in the Narragansett Bay watershed was reduced to record low levels. This reduced the rate of estuarine circulation and increased the residence time, or length of time a parcel of water remains in the Bay. This may have allowed *Cochlodinium* cells to grow and accumulate in the same water mass until the population reached the water-discoloring abundance levels observed during late August and September of 2016. The suite of environmental conditions that triggered the 2016 rust tide appear to be regional as similar *Cochlodinium* rust tides were observed from Long Island, NY (Peconic Bay), Buzzards Bay (MA) and in RI waters.

Are there potentially harmful effects of a rust tide?

While rust tide blooms are not toxic to humans, there is potential for harmful impacts of a severe *Cochlodinium* rust tide. *Cochlodinium* may harm fish and shellfish because it produces a hydrogen peroxide-like compound that can damage their gill tissue. Fish generally can avoid the bloom patches by swimming away from them. Aquaculturists should be aware of the potential harm (gill damage) that a *Cochlodinium* rust tide can cause when caged fish and shellfish are exposed to concentrated patches of *Cochlodinium*. Juvenile fish and shellfish seem especially susceptible to gill damage from rust tide blooms. A potentially harmful secondary effect of a rust tide is reduced dissolved oxygen levels in the water if the abundant *Cochlodinium* cells die suddenly, sink to the bottom and are consumed by bacteria which may take up available oxygen.

Are fish and shellfish safe to eat during a rust tide?

Yes, fish and shellfish are safe to eat during a rust tide. The rust tide organism does not produce a toxin that can harm humans, even if the organism was ingested. *Cochlodinium* is not toxic to humans, and fish and shellfish exposed to a *Cochlodinium* rust tide are safe for human consumption.

Where can I find more information or report a bloom?

More information can be found at:

<http://www.dem.ri.gov/> or <http://www.health.ri.gov/>

To report a suspicious algae bloom, contact RIDEM at (401)222-4700