

# Recurring "Brown Tide" Blooms: New Phenomenon Or Only New To Science?

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In the mid-1980's new and unusual blooms of a small, eucaryotic chrysophyte, *Aureococcus anophagefferens*, appeared in several embayments along the northeast coast of the USA and were particularly harmful to bivalve communities. Extensive monitoring programs have demonstrated the recurrence of these "brown tides" to greater or lesser extents during the summer months almost every year since at certain sites, particularly in Long Island embayments in New York State. Factors determined to be important to bloom formation are: drought conditions elevating salinities, restricted and reduced flushing of waters in embayments, and reduced grazing by herbivores on this toxic microalga. Laboratory and field experiments conducted on the growth physiology of this new species indicated that specific trace element requirements, notably iron and selenium, as well as chelator conditions were necessary for maximum growth. Both field and laboratory studies have revealed that sudden crashes in populations are related to viral infections.

The presence of *A. anophagefferens* in northeast coastal waters unaffected by the "brown tide" blooms has been demonstrated using immunofluorescent detection techniques. This implies that this species has been generally present in coastal embayments and that the blooms were caused by a unique set of environmental events in particular bay systems. In contrast, however, other immunochemical analyses comparing *A. anophagefferens* to other ultraplankton have, along with electron microscope analyses and pigment analyses, demonstrated a close affinity with a ubiquitous, open ocean microalga, *Pelagococcus subviridis*, isolated and identified from many areas in the Pacific Ocean as well as from Norwegian waters. Is it possible that *A. anophagefferens* is an expatriate species only recently introduced into nearshore areas from offshore waters? The "brown tide" phenomenon has been reported also from Laguna Madre, Texas, where blooms of an unidentified algal species similar to *A. anophagefferens* started in 1990 and persisted for years.

The "brown tide" is similar to the "green tides" in Long Island bays during the early fifties in which a lowering of salinity to 13 ‰ selected for two estuarine species. Effluents from duck farms were found to be promoting the blooms with nitrogeous nutrients and were subsequently restricted. Since *A. anophagefferens* is a species not previously known to cause blooms, environmental conditions contributory to the blooming could in part relate to new anthropogenic influences in these bays such as different chelators in detergents mobilizing key iron species or new lawn treatments delivering certain micronutrients. Alternatively, "brown tides" of the past could have remained undocumented due to lack of monitoring records.