Impacts of nutrients and grazing mortality on the abundance of Aureococcus anophagefferens during a New York brown tide bloom

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ABSTRACT: Although nutrients and grazing both contribute to the formation of harmful algal blooms, research on these events has rarely considered both factors simultaneously. To ascertain the impact of nutrients and grazing on brown tides of *Aureococcus anophagefferens*, nutrient bioassays were conducted in parallel with dilution-style microzooplankton grazing experiments during an intense bloom that occurred throughout Great South Bay (GSB), New York, in fall of 1999. During the study, *Aureococcus* represented between 25 and 85% of phytoplankton biomass and attained peak cell densities > X 10^3 cells ml^{-1}. Concentrations of dissolved organic carbon (DOC) and nitrogen (DON) in GSB were high (mean = 430 μM and 32 μM, respectively) during the bloom, while dissolved inorganic nitrogen (DIN) levels were low (mean = 2.5 μM). Although the experimental additions of nitrogen (nitrate or urea) typically enhanced the growth rates of the non-brown tide phytoplankton community, such additions often had no impact on, or decreased, growth rates of *Aureococcus* relative to unamended control treatments. These observations suggest that growth of non-brown tide phytoplankton depended on ambient N supply rates, while *Aureococcus* experienced nutrient replete growth. Dilution experiments indicated that microzooplankton grazing rates on *A. anophagefferens* were significantly lower than those on other algal populations. This reduced grazing pressure contributed toward higher net growth rates for *Aureococcus* relative to non-brown tide phytoplankton. In sum, these results demonstrate that both top-down (low grazing mortality rates) and bottom-up (a high DOC/DON, low DIN nutrient regime) factors can contribute to the proliferation of brown tide blooms in New York waters.

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