

The "phantom dinoflagellate": a widespread and significant threat to fisheries

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Amidst reports of a rising frequency and expansion of harmful algal blooms, the discovery of novel algal toxins, and an increase in nuisance bloom-associated fish kills and human illnesses, comes the recent discovery of a very lethal and elusive toxic alga. *Pfiesteria piscimorte* (popularly called the "phantom dinoflagellate" or "killer algae") has an unusual life cycle that includes at least 15 cellular forms. The rapid transformation between cell stages makes it difficult to link to fish kills, and probably delayed its detection until very recently. Its discovery in the Pamlico River in 1988 instigated modifications to fish kill sampling protocols in North Carolina, with the result that *P. piscimorte* was attributed as the cause of at least 25% of NC fish kills documented from 1991-1992, including one kill of over a million menhaden. The dinoflagellate has wide salinity (0 to 35‰) and temperature (4 to 28°C) tolerances, and, within the last year, has been reported in Delaware Bay, South Carolina, and Chesapeake Bay. The growth of *P. piscimorte* is stimulated by high phosphate concentrations, raising the following issue important to fishery management: Are *P. piscimorte*-associated fish kills a recent phenomenon linked to the increased eutrophication of estuaries, or can the dinoflagellate account for a number of "unexplained" fish kills in the past?