In computer models and observations, researchers see potential for significant 'red tide' season

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The end of April usually brings the first signs of harmful algae in New England waters, and this year, researchers from the Woods Hole Oceanographic Institution (WHOI) and North Carolina State University (NC State) are preparing for a potentially big bloom.

A combination of abundant beds of algal seeds and excess winter precipitation have set the stage for a harmful algal bloom similar to the historic “red tide” of 2005, according to researchers from WHOI and NC State. The 2005 bloom shut down shellfish beds from the Bay of Fundy to Martha’s Vineyard for several months and caused an estimated $50 million in losses to the Massachusetts shellfish industry alone. The weather patterns over the next few weeks will determine whether this year’s algal growth approaches the troubles of 2005.

The research team—led by WHOI senior scientists Don Anderson and Dennis McGillicuddy and physical oceanographer Ruoying He of NC State—is several years into the development of a computer model to predict the intensity and location of blooms the toxic algae Alexandrium fundyense in the Gulf of Maine. Though the scientists are reluctant to make an official “forecast” until they can further test their models, colleagues in coastal management and fisheries believe the seasonal forecasting model can already serve as a useful tool for preparing the seafood industry for contingencies.

“With advance warning of a potentially troublesome year for algae, shellfish farmers and fishermen might shift the timing of their harvest or postpone plans for expansion of aquaculture beds,” said Anderson, director of the WHOI Coastal Ocean Institute. “Restaurants might make contingency plans for supplies of seafood during the summer, and state agencies can ensure they have adequate staff for the significant monitoring efforts that might be required to protect public health and the shellfish industry.”

Seeds or “cysts” of A. fundyense naturally germinate and turn into swimming cells that rise from the seafloor around April 1 of each year. By the end of April, cells usually begin to appear in large numbers in the waters off coastal Maine. The algae are notorious for producing a toxin that accumulates in clams, mussels, and other shellfish and can cause paralytic shellfish poisoning (PSP) in humans who consume them.

According to a seafloor survey conducted in the fall of 2007 by Anderson’s team, the number of Alexandrium cysts—the dormant, seed-like stage of the algae’s life-cycle—is more than 30 percent higher than what was observed in the sediments prior to the historic bloom of 2005. The seed beds were especially rich in mid-coast Maine, origin of many of the cells that affect western Maine, New Hampshire, and Massachusetts.

Other environmental factors then determine the extent to which the blooms spread down the New England coast. Much of the Northeastern United States was hit with record- or above-average rain and snowfall this winter, which will provide an extra pulse of fresh water and nutrients into coastal waters this spring. The blend of nutrients and fresh water into salty sea water can improve growing conditions for the algae.

“Our hypothesis is that cyst abundance and the weather determines the bloom season,” said McGillicuddy, a biological oceanographer in the

WHOI Department of Applied Ocean Physics and Engineering. “Will the conditions this spring lead to an extensive bloom along the New England coast" The wind patterns of the next few weeks will determine that.”

The research team has run its computer model through four scenarios, using the predominant wind patterns from each year since 2004. Toxicity levels during those years have ranged from little to nothing in the western Gulf of Maine (2004 and 2007), to extremely high levels (2005 and 2006). Blooms were worst for scenarios in which the spring weather was dominated by strong northeast winds, which tend to drive Alexandrium cells toward the southern New England coast. When southwesterlies dominated, the algae tend to stay offshore. Even when there are a lot of cells and toxicity, the effect can be confined to offshore waters.

Anderson, McGillicuddy and He distribute observations and data-driven models once per week with more than 80 coastal resource and fisheries managers in six states and at the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, and the Food and Drug Administration (which oversees food safety).

McGillicuddy and more than a dozen students, technicians, and biologists will depart from Woods Hole on April 28 on the research vessel Oceanus on the first of four expeditions to take stock of this year’s bloom and to study the causes of several recent blooms in the historically fertile fishing grounds around Georges Bank. Biologists and oceanographers were surprised by the substantial scale and persistence of Alexandrium blooms discovered on Georges Bank last year.

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Center for Oceans and Human Health). Additional work examining other species of toxic algae in the Gulf and on Georges Bank is supported by the NOAA Oceans and Human Health Initiative (OHHI).

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