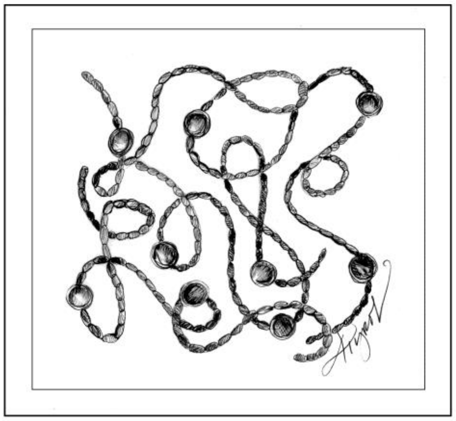
The Outside Story



A Primordial Lake Monster

By: Madeline Bodin

It came from the lake. It is a life form nearly as old as life itself. Living peacefully in the depths for eons, it is awakened by humankind's abuse of the environment. It strikes out with toxins that attack nerves or the liver. Attempts to kill it only make it more toxic.

It sounds like the plot of a 1950s horror movie. But this horror played out in lakes and ponds across Vermont and New Hampshire on hot, sunny days in late summer. This year, a September heat wave extended the season of blue-green algae blooms past Labor Day. In the second week of September there were blooms in Missisquoi Bay, a northern, shallow bay of Lake Champlain, and St. Albans Bay, another lake trouble spot. That same week, blooms were reported in Lake Carmi in Westcott, Vermont, and in Otternick Pond, in Hudson, New Hampshire.

Blue-green algae blooms appear as dense, green clouds in the water, like pea soup or green paint. They're unpleasant to swim through, can smell, and can reduce oxygen in the water. They also produce toxins that can make people sick and, in rare instances, kill dogs that ingest them.

Despite the name, blue-green algae are not algae at all but something even more primordial. Blooms are comprised of masses of cyanobacteria, "among the first forms of life that evolved 3.5 billion years ago," explained James Haney, a biologist who leads a lab at the University of New Hampshire dedicated to studying these organisms.

Cyanobacteria are classified with bacteria because their DNA isn't neatly packaged inside a nucleus like our own, and they are single-celled. However, cyanobacteria differ from most bacteria in their ability to photosynthesize, that is, make their own food from water, carbon dioxide and sunlight (they also need nutrients, just as plants do). Cyan is a blue-green color, but species in this group can also create blooms that are white, red, or brown.

There are thousands of species of cyanobacteria, but scientists are most familiar with the relatively few that form floating colonies under certain conditions and release toxins. These toxins serve the cyanobacteria in many ways, explained Haney, including, in one case, regulating iron. Cyanobacteria tend to release toxins when they die, so killing them with chlorine may temporarily make matters worse. Boiling kills the cyanobacteria, said Haney, but it won't destroy the toxin.

Although it's easy to think of these organisms as a scourge, they're a natural part of the ecosystem and, in most conditions, exist at lower population levels where you won't even notice their presence. Typically, they become a problem in response to pollution.

Andrew Schroth, a geologist at the University of Vermont, is studying the water conditions that produce toxic colonies. "What they've seen in Lake Erie is that the blooms are driven by how much phosphorus comes into the system during spring runoff, from March to June," he explained.

Phosphorus is a pollutant from fertilizers, some detergents, manure, and human waste. It feeds the blooms that form in July and August, when the water gets warm. It can linger in water bodies over time.

The phosphorus trigger works differently in Lake Champlain, Schroth said. There, when water is calm enough, phosphorus is released from the sediment. In shallow water, both phosphorus and light are in reach of the cyanobacteria. Add warm water and you have all the ingredients for a population surge – and a cyanobacteria bloom.

In addition to the immediate harms caused by blooms, there may be other effects. Amanda Murby, a doctoral candidate in Haney's lab, is studying some of New England's less familiar cyanobacteria and how their toxins may accumulate in the bodies of animals up the food chain. In this way, the toxins behave "very much like mercury," said Haney. His lab is studying how the toxins accumulate in loons and is also researching their long-term effects on human health. Schroth, meanwhile, is exploring ways to reduce the phosphorus runoff that causes blooms, which seem likely to increase in the hotter weather and more frequent floods brought on by climate change.

"Cyanobacteria are like bears," he added. "Both are a natural part of the environment, and become a problem when we feed them." Reducing phosphorus runoff may not be an ending worthy of a horror movie, but it would be a satisfying conclusion for a natural system thrown out of balance.

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