Lakeside

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# Toxic Cyanobacteria in New Hampshire's Lakes and Ponds

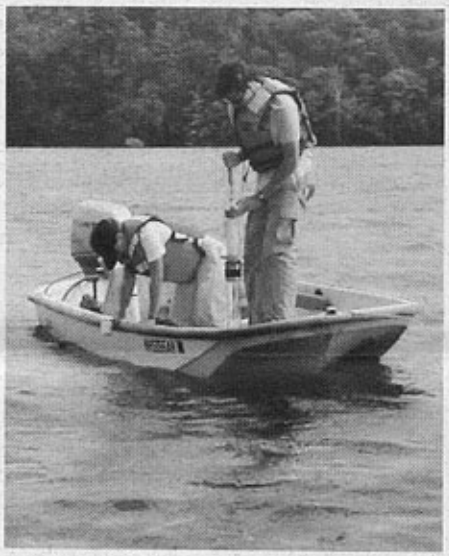
*James F. Haney, Chairman of the Zoology Dept., UNH, and John J. Sasner, Professor Emeritus of Zoology, UNH*

*Responding to several incidents of toxic algae blooms on NH lakes and ponds last summer, we asked Drs. Haney and Sasner to update us on their research.*

New Hampshire's lakes and ponds contain many organisms that can impact water quality. In recent years blooms of blue-green bacteria, called cyanobacteria (formerly "blue-green algae"), have emerged as an important factor impacting the quality of lake water used for drinking or recreation, because these cyanobacteria produce toxic substances called biotoxins.

*Anabaena* and *Aphanizomenon*, cyanobacteria present in many NH lakes, produce neurotoxins that disrupt nerve transmissions causing paralysis. Surprisingly, the *Aphanizomenon* toxin, neosaxitoxin, is identical to the red tide toxin responsible for closing shellfish beds in coastal waters of the Northeast and for the deaths of marine mammals. UNH biologists, Drs. Ikawa and Sasner, first isolated and identified this biotoxin from a toxic strain of *Aphanizomenon* found in a small pond near Durham, NH.

Worldwide, there have been numerous incidents of deaths of domestic animals and wildlife by cyanobacteria toxins in lakes and occasionally the deaths of humans. For example, cyanobacteria nerve toxins are suspected in the 2002 death of a Wisconsin teenager who accidentally swallowed lake water while swimming in a small golf course pond.



*UNH Field Limnology students sample for benthic biotoxins in Sturtevant Bay (Squam Lake).*

Also of great concern are the liver toxins, called microcystins (MC), produced by cyanobacteria commonly found in the lakes and ponds of NH and worldwide. A recent survey showed MC in all of the more than 80 NH lakes tested. Fortunately,

*Toxic — to page 3*

# Lead Sinker Bill Passes NH Senate

*This proposed bill would help protect loons by banning the use and sale of small lead fishing tackle in NH.*

A 14-year study completed by the Loon Preservation Committee and Tufts University indicates that lead poisoning from the ingestion of lead sinkers and jigs is by far the largest single cause of known adult loon mortality in New Hampshire, despite current laws banning the use of small lead sinkers and jigs.

The NH Legislature enacted a law — effective January 1, 2000 — that prohibited the use in freshwater lakes or ponds of lead sinkers weighing one ounce or less and lead jigs less than one inch long. Despite this ban, data from 2000–2002 show that nearly 53% of adult loon mortality was attributable to lead poisoning through the ingestion of lead sinkers or jigs and contributed to a 6.3% decline of loon populations in New Hampshire.

To help protect the threatened birds, Senator Carl Johnson has proposed legislation that would (1) expand the

*Lead Sinker — to page 5*

*Toxic — from page 1*

average concentrations in the water column were generally below the World Health Organization (WHO) guideline of 1.0 microgram MC per liter for drinking water. In reports submitted by the UNH Center for Freshwater Biology (CFB) to the Environmental Protection Agency and the United States Geological Survey, two cautionary points were stressed.

(1) Much of the MC appears to reside in the tiniest sized organisms in the plankton community known as picoplankton. These are less than 2 micrometers in diameter (more than 1000 individuals could span the head of a pin!) and little is known about their biology. We are currently investigating the types of toxins produced by these "invisible" lake inhabitants and plan to culture them to determine their identity. Of special concern is the possibility for contamination of drinking water. We need to determine whether the smallest of these forms might pass through the filters used for treating normal drinking water.

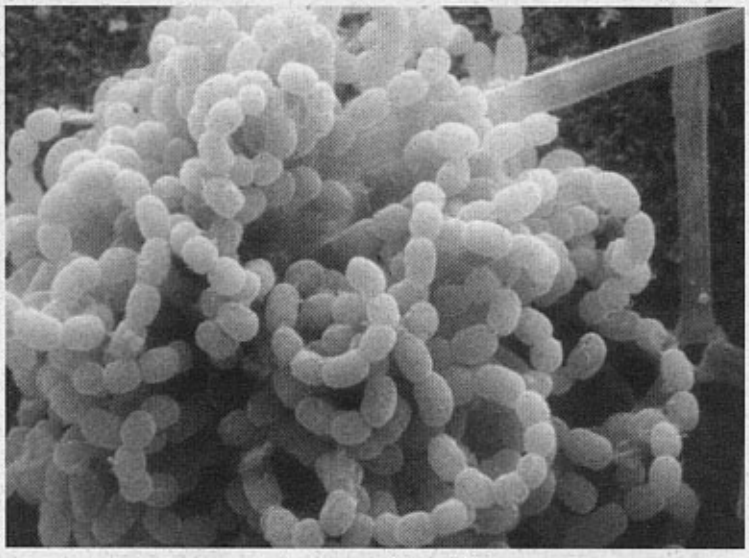
(2) We also discovered MC in the bottom sediments or benthos of our lakes, 10–20 times that found in the lake water. These benthic toxins are produced by cyanobacteria species that overwinter in the benthos, obtaining nutrients from the phosphorus rich sediments. Models produced in our study predict that in many NH lakes, calm and sunny weather could cause these deep-water cells and colonies to suddenly rise up into surface waters and accumulate as "scum" in lake embayments at concentrations that could be dangerous if ingested by humans or domestic animals.

Cooperative efforts between the UNH Center for Freshwater Biology and the NH Department of Environmental Services (DES) have addressed public health issues, and New Hampshire is among the first states to warn against swimming in water in which cyanobacteria scum has been observed. The public is also encouraged to send samples of suspected toxic scum to DES for analysis.

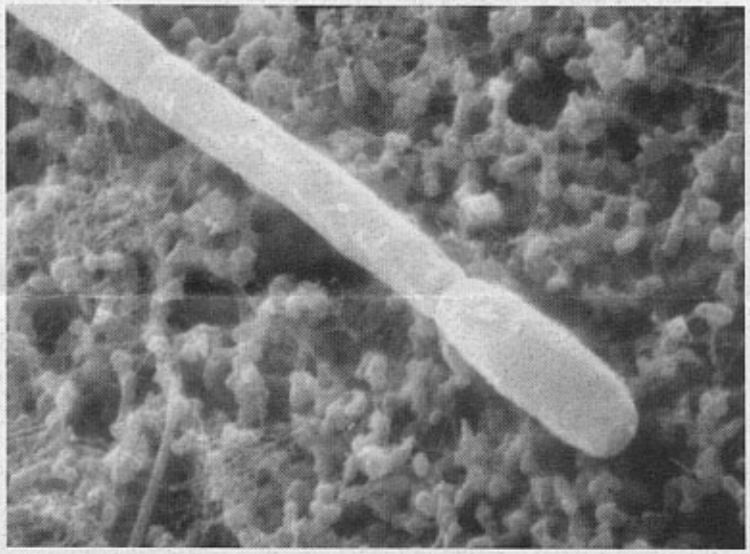
Additional information on this subject can be obtained from Internet searches of "cyanobacteria toxins" and from the CFB (cfb.unh.edu) and DES websites (www.des.state.nh.us).

*Drs. Haney and Sasner conduct their research through the UNH Center for Freshwater Biology.* ■

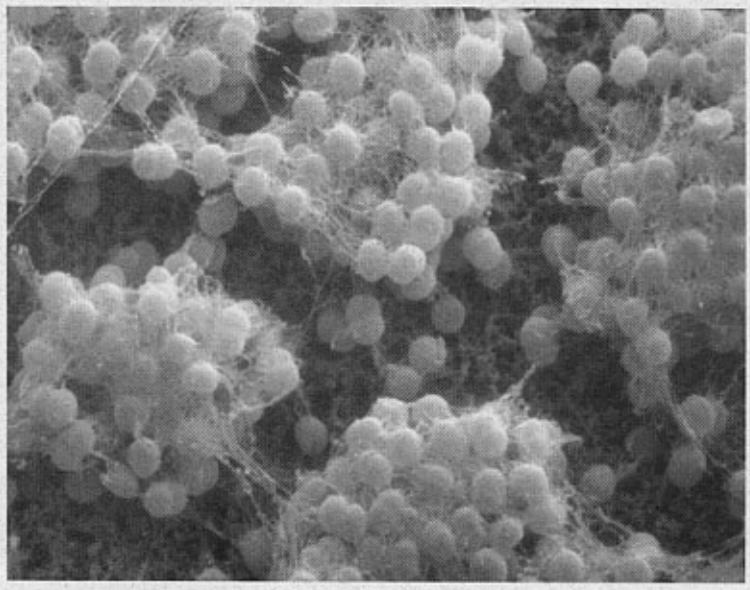
*Microphotographs of three cyanobacteria found in New Hampshire's lakes and ponds (greatly magnified).*



*Anabaena "Annie"*



*Aphanizomenon "Phannie"*



*Microcystis "Mike"*