

# Eutrophication makes toxic cyanobacteria more toxic

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This is a satellite image of a *Nodularia* bloom. Credit: SMHI

Continued eutrophication of the Baltic Sea, combined with an ever thinner ozone layer, is favouring the toxic cyanobacterium *Nodularia spumigena*, reveals research from the University of Gothenburg, Sweden.

"There are several species of [cyanobacteria](#), or blue-green algae, that can form surface blooms in the Baltic Sea," explains Malin Mohlin from the University of Gothenburg's Department of Marine Ecology. "Which species ends up dominating a bloom depends partly on how they deal with an increased amount of UV light and a shortage of nutrients. *Nodularia spumigena* is most toxic when there is little nitrogen in the water but sufficient amounts of phosphorus."

As a result, wastewater treatment processes that concentrate on removing nitrogen can make cyanobacterial blooms more toxic. Wastewater therefore needs to be cleared of both nitrogen and phosphorus.

Mohlin's research shows that *Nodularia spumigena* can be expected to be most toxic at the beginning of a bloom in July. At that time there is generally more phosphorus than nitrogen in the water, and the cyanobacteria have not yet to float to the surface but are found deeper in the water where they have not yet been exposed to [UV light](#).

Surface blooms of cyanobacteria, which are a type of [phytoplankton](#), have increased in both frequency and magnitude in the Baltic Sea in recent decades, and researchers are divided on the cause. Some put it down to eutrophication – an excess of [nutrients](#) in the water – caused by human emissions of [nitrogen](#) and [phosphorus](#) over the past 150 years. Others have studied the Baltic Sea's bottom sediment and argue that this is a natural phenomenon that has been ongoing for more than 7,000 years and is due instead to climate variations.

Different species of nitrogen-fixing cyanobacteria bloom at different times. Aphanizomenon species tend to bloom from May to June, but from July to August the toxic species *Nodularia spumigena* normally dominates for as long as the surface water is warm and still.

The toxin it produces is called nodularin and is a hepatotoxin – a toxin that attacks the liver. Livestock and dogs around the Baltic Sea have died after consuming large quantities of toxic water during blooms.

Provided by University of Gothenburg

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