Pollution is driving force behind growth of nuisance algal scums, study finds

February 27 2015, by Emma Thorne

Potentially toxic microbes which pose a threat to our drinking water have undergone a dramatic population explosion over the last 200 years as a result of pollution, research involving experts from The University of Nottingham has found.

The study, published in the journal *Ecology Letters*, looked at more than 100 lakes in lowland and alpine areas of North America and Europe and found that populations of cyanobacteria—also known as blue-green algae—have significantly increased since the 1800s.

The research, conducted in collaboration with academics at McGill University in Canada and other collaborators, is the first study to show that a rise in the algae's available nutrient sources nitrogen and phosphorus—commonly resulting from industrial fertilisers and sewage discharge—is the biggest potential culprit responsible for the increase in

such a large number of lakes, across such a large geographical area. The study also found that climate change can exacerbate this problem, with water management challenges likely to increase in a future warmer world.

Water contamination

Most municipal water treatment plants do not regularly look for cyanobacterial toxins in the water supply. However, municipalities with a known history of blooms typical monitor their surface water supplies for cyanobacteria. When detected, the cells can be removed by adding chemicals that bind them together, so they can be separated out. Although this removes the cells, the cells may already have broken down releasing toxins into the water.

In addition, environmental costs associated with this alga were estimated to exceed $100 million per year in both the UK and Australia.

PhD researchers Heather Moorhouse and Mark Stevenson, based in the School of Geography at Nottingham's University Park Campus in the UK, and Dr Suzanne McGowan, Head of the School of Geography at University of Nottingham Malaysia Campus, took sample cores of sediment from lakes located in the major lake districts of the British Isles including the English Lake District, the West Midland Meres, Scottish lochs and upland lakes in Northern Ireland and analysed them for pigments left behind by blue-green algae.

These pigments remain stable over thousands of years and act as biomarkers revealing the past levels of algae found in the water during the course of decades.

Rapid increase

The analysis showed that during the last 200 years, more than half of the lakes (58 per cent) had seen significant increases in concentrations of blue-green algae pigments, whereas only three per cent showed a significant decrease in the presence of the microorganism.

Lowland lakes in agricultural catchments typical of those found in the UK were found to be especially susceptible to cyanobacteria increases.

The study also found that since 1945 the incidence of blue-green algae has increased more rapidly than the growth of other types of water-borne algae.

More significant increases were observed in the more temperate lowlands (61 per cent in North America and 70 Per cent in Europe) which were closer to areas of agricultural activity than in alpine areas (36 per cent).

Analysis of the trends in blue-green algae spanning 10 countries across three continents showed that growth was mainly regulated by a change in the amount of nutrients—phosphorus and nitrogen—found within the lakes.

The research underlines the importance of further study into how to more carefully control the inputs of nitrogen and phosphorus-rich pollutants and ways of monitoring the resulting toxins in our drinking water. It also demonstrates that effective catchment nutrient control initiated by legislation such as the EU Water Framework Directive is important to the safety of our water supplies in the future.

Provided by University of Nottingham

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