Lake 'dead zones' could kill fish and poison drinking water

March 19 2019

Credit: CC0 Public Domain

'Dead zones' could become increasingly common in lakes in future due to climate change, reducing fish numbers and releasing toxic substances into drinking water.

Scientists at the University of Reading have warned that warming of the climate in the years to come will inhibit movement of water within some lakes, due to surface temperature increases and reduction in winter ice cover. This would leave deeper areas of those lakes devoid of oxygen that is essential for supporting ecosystems.

The study looked at water mixing patterns in 635 large lakes around the world and found climate change would disrupt mixing in around 100 of them by the end of the century. Many lakes would mix less frequently, with some experiencing no mixing at all throughout the year.

Dr Iestyn Woolway, lead author of the study in the University of Reading's Department of Meteorology, said: "A lack of oxygen in deep waters can have a detrimental effect on fish habitats and even lead to dead zones that cannot support life. Added to this is the potential for poisonous substances to be released into water we drink by algae that flourish at the surface in the warmer conditions. Analysis of how climate change will affect lakes shows clearly the threat to animals and humans in the not-so-distant future."

The scientists used a model to assess the impact on lake mixing regimes under two climate scenarios projected for the 21st century. The first, 'best case' scenario assumes global greenhouse gas emissions will peak between 2010-2020 and then decline, while the second, worst-case scenario assumes emissions peak around 2080 before declining.

Under the higher temperature rise scenario, around a quarter of lakes currently covered by ice in the winter would become permanently ice-free by 2080-2100. For the most-affected lakes, surface water temperatures were projected to warm by up to 5.5°C.

Lake mixing, which is influenced by water temperatures and wind, is important to transport nutrients up from deep water to support near-surface ecosystems. Some lakes mix a regular number of times each year, while shallower lakes can be mixing constantly and others not at all – producing vertical layers of water at different temperatures and quality.

Lakes with reduced ice cover warm more quickly in the spring, leading

to reduced oxygen levels and potentially harmful algal blooms, which can release phosphorus, ammonium and poisonous metals into the water. Both of which could occur earlier in the year, threatening more fish and humans.

A previous study, led by York University in Toronto and co-authored by Dr Woolway from Reading, found many more lakes worldwide would become ice-free in the winter due to climate change. It concluded that 35,000 more lakes would experience intermittent ice if global temperature rise was limited to 2°C, affecting hundreds of millions of people who live close to them.

Professor Chris Merchant, co-author of the study at the University of Reading and NERC National Centre for Earth Observation, said: "Not all lakes that are projected to see temperature rises will experience a change in mixing regimes, but global warming will affect lakes across the world, and consequently the countless animals, organisms and people that depend on them."

More information: Sapna Sharma et al. Widespread loss of lake ice around the Northern Hemisphere in a warming world, *Nature Climate Change* (2019). DOI: 10.1038/s41558-018-0393-5

Woolway, R I, Merchant, C J (2019). 'Worldwide alteration of lake mixing regimes in response to climate change'. *Nature Geoscience*. DOI: 10.1038/s41561-019-0322-x

Provided by University of Reading