

# Climate change is putting wildlife at risk in the world's oldest lake

December 20 2018, by Charlotte Anscombe

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Climate change and human disturbance are putting wildlife in the world's oldest and deepest lake at risk, according to a new study by the University of Nottingham and University College London.

Lake Baikal in Siberia is the world's oldest and deepest lake, holding one fifth of the world's unfrozen freshwater. With 75 percent of its species found nowhere else in the world, the lake was designated a World Heritage Site in 1996 as the 'most outstanding example of a freshwater ecosystem.'

The study, published in *PLOS ONE*, finds that microscopic algae known as diatoms, that are unique to the lake, have been declining rapidly as the lake gets warmer. These 'algae' are at the bottom of the food chain and provide essential food and nutrients to other organisms such as plankton, fish and the world's only true freshwater seal.

In turn, these species are being replaced by other diatoms more commonly found elsewhere in the world that are lighter and have faster growth rates. This is causing a shift in feeding patterns, and possibly the lake's natural cycle of energy, nutrients and chemicals, which could have a severe impact on its biodiversity.

Dr. Sarah Roberts, a former Ph.D. student at the University of Nottingham (now a post-doctoral researcher at the Canada Centre for Inland Waters) said: "The results from this study reveal how Lake Baikal has responded to human pressures in the 20th and 21st Century. By analysing the diatoms, we have been able to reconstruct how they have changed over the last 40 years. This information can then be used to assess the impact of global climate change and local catchment disturbance on the lake during the 20th and 21st Century."

Scientists have become increasingly concerned by the threats posed to Lake Baikal by human activity and climate change. Previous research has shown that [anthropogenic climate change](#) over recent decades has increased temperatures in the lake and reduced seasonal ice-cover duration. At the same time un-treated sewage waste from settlements has negatively impacted near-shore regions, leading to localised instances of

eutrophication – overly enriched nutrients in the [water](#)—and the emergence of thick mats of green filamentous algae.

However, one surprising finding of the current study was that while the whole of the lake is responding to anthropogenic climate warming through shorter duration of seasonal ice cover, diatom responses were restricted to the south basin, with little evidence of change so far in the north of the lake. The study also showed that whilst the shoreline of Lake Baikal is suffering from the effects of nutrient pollution, there is currently no evidence of this pollution impacting diatoms off-shore in the deeper open waters.

Dr. George Swann from the University of Nottingham's School of Geography said: "Our research contributes to understanding how this ecologically sensitive lake is responding to [climate change](#) and the shift towards warmer conditions. The implications of our findings are that endemic diatom species in the south basin of Lake Baikal are in decline at the expense of cosmopolitan diatom species which thrive in the warmer surface waters and increased period of stratification that now occur within the lake. At the moment, these changes are confined to the south basin of Lake Baikal, but additional monitoring is required to assess the impact of further warming in the lake as well as its impact on other aquatic wildlife such as the world's only true freshwater seal, found in Lake Baikal (*Pusa sibirica*)."

Professor Anson Mackay from the Department of Geography at University College London added: "Whilst there is currently no clear evidence for eutrophication (water quality deterioration) in the deep, open waters of Lake Baikal, we know that increased nutrient inputs are having negative impacts in areas along Lake Baikal's shoreline from inadequate sewage treatment plants. We also know that these shoreline regions can act as early indicators of future wide-spread change. As such, urgent action is vital to prevent anthropogenic pollution extending

into the open waters of the lake and negatively impacting the [lake's](#) unique biodiversity."

Dr. Elena Vologina from the Institute of Earth's Crust, Siberian Branch of the Russian Academy of Sciences, Irkutsk said "Diatoms are exceptional indicators of changing environmental conditions. The conclusions of our paper, obtained from the analyses of sediment archives, are confirmed by sediment trap experiments which reveal that increased water temperatures over the last two decades have caused alterations in the amount and composition of diatoms in Lake Baikal."

Provided by University of Nottingham

Citation: Climate change is putting wildlife at risk in the world's oldest lake (2018, December 20) retrieved 19 April 2024 from <https://phys.org/news/2018-12-climate-wildlife-world-oldest-lake.html>

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