

Warmer, wetter winters bring risks to river insects

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Professor Steve Ormerod. Credit: Cardiff University

Research by Cardiff University has shown that the warmer, wetter winters in the U.K. caused by climate change are likely to impact the stability of insect populations in streams.

The research, spanning four decades, has demonstrated that stream insects are affected by warmer, wetter winters caused by fluctuating [climate](#) over the Atlantic Ocean. The consequences are felt by insect populations even in the smallest Welsh river sources.

The paper, "Climatic effects on the synchrony and stability of temperate headwater invertebrates over four decades," has been [published](#) in *Global Change Biology*.

"U.K. winters are becoming warmer and wetter on average, and we wanted to understand how this might impact our rivers. Streams and rivers are profoundly affected by climate through changes in global air temperatures and precipitation which affect flow patterns and [water temperature](#).

"Over the years, we've noticed increasingly that changes in our rivers also track global climatic patterns over the Atlantic and these provide important clues about [climate change](#)," said Professor Steve Ormerod, the Water Research Institute at Cardiff University.

The research is based on samples from the Llyn Brianne Stream Observatory in Central Wales, which is one of the longest-running catchment projects anywhere in the world. The headwaters that form the Llyn Brianne Stream Observatory were first sampled in 1981, allowing scientists to investigate changes to streams and rivers for over forty years.

By tracking changes in the water quality, flow patterns, temperature and river species since the 1980s, the researchers have been able to track how climate changes are impacting Welsh waters. But their work also highlights how climatic fluctuations in other areas—including the Atlantic Ocean—impacts U.K. river quality and wildlife.

"The North Atlantic Oscillation is a large area of atmospheric pressure over the North Atlantic region. Depending on air pressure at sea, the North Atlantic Oscillation brings either cold, dry winters to north west Europe or warm, [wet winters](#)—increasing temperatures in upland Wales on average by up to 3°C and rainfall by up to 40%.

"These changes are very similar to the likely scale of climate change, so they provide valuable insight into the [effects of global warming](#). But the more surprising finding was how much these changes affected stream insects over the years of the study.

"Warm, wet winters led to bigger changes in insect populations that were synchronized across the 10 streams we investigated. These effects meant that the species composition was less similar and more unstable between warmer years—which are becoming more frequent as the climate changes," said Dr. Stefano Larsen, of the Fondazione Edmund Mach in Italy.

"It's remarkable that variations among some of the smallest animals in some of the smallest streams in upland Wales are linked to [climatic conditions](#) generated thousands of kilometers away over the Atlantic Ocean. Our long-term study shows those effects clearly while warning us of what could become significant climate change patterns.

"But this work also reveals some positive actions to reduce climate change effects, for example, by protecting and restoring biodiversity, and by managing upland landscapes for example to reduce flood impacts," Professor Ormerod added.

More information: Stefano Larsen et al, Climatic effects on the synchrony and stability of temperate headwater invertebrates over four decades, *Global Change Biology* (2023). [DOI: 10.1111/gcb.17017](https://doi.org/10.1111/gcb.17017)

Provided by Cardiff University

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