Researchers document ancient and methane-derived carbon in stoneflies

November 10 2016

New research by scientists at the University of Montana's Flathead Lake Biological Station has documented the first example of freshwater consumers using ancient methane-derived carbon and the most extensive example of a methane-derived carbon contribution to a river ecosystem.

The research - conducted by FLBS researchers Amanda DelVecchia and Jack Stanford, along with Xiaomei Xu from the University of California at Irvine - was recently published in the open access journal, *Nature Communications*.

The team's research focused on the Nyack floodplain on the Middle Fork of the Flathead River in Montana; the main stem of the Flathead River in Kalispell, Montana; the Jocko River floodplain near Arlee, Montana; and the Methow River floodplain in Winthrop, Washington. The work helped helps to explain a decades-old question in groundwater ecology: How do thousands of large-bodied stoneflies survive in the barren (carbon-poor) and dark environment of gravel aquifers underlying river floodplains?

The researchers found that up to 67 percent of the carbon in stonefly biomass (body tissue) across entire floodplains came from methane. Furthermore, the methane carbon in the Nyack floodplain ranged from modern to millennial-aged (6,900 years old) to ancient (greater than 50,000 years old).

The millennial-aged methane carbon could have come from organic

matter deposited during the retreat of the last glaciation 7,000-10,000 years ago, or the ancient carbon could have come from a shale methane source, as the Kishenehn shale formation underlies the floodplain. Either methane source was likely consumed by bacteria first before being directly or indirectly consumed by the stoneflies themselves.

River floodplains are some of the most valuable and most threatened ecosystems in the world. The findings of this study advance scientific understanding of the base energy sources in freshwater ecosystems and underscore the value of pristine river floodplains for maintaining biodiversity, productivity and ecosystem services such as maintained water quality.

The researchers continue to research the role of methane in the food web and community ecology of the Nyack aquifer and expect subsequent findings to be published over the next one to two years.

More information: Amanda G. DelVecchia et al. Ancient and methane-derived carbon subsidizes contemporary food webs, *Nature Communications* (2016). DOI: 10.1038/ncomms13163

Provided by University of Montana