

Habitat, not resource availability, limits consumer production in lake ecosystems

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Abstract

Food web productivity in lakes can be limited by dissolved organic carbon (DOC), which reduces fish production by limiting the abundance of their zoobenthic prey. We demonstrate that in a set of 10 small, north temperate lakes spanning a wide DOC gradient, these negative effects of high DOC concentrations on zoobenthos production are driven primarily by availability of warm, well-oxygenated habitat, rather than by light limitation of benthic primary production as previously proposed. There was no significant effect of benthic primary production on zoobenthos production after controlling for oxygen, even though stable isotope analysis indicated that zoobenthos do use this resource. Mean whole-lake zoobenthos production was lower in high-DOC lakes with reduced availability of oxygenated habitat, as was fish biomass. These insights improve understanding of lake food webs and inform management in the face of spatial variability and ongoing temporal change in lake DOC concentrations.