

LETTER

Response of plankton to nutrients, planktivory and terrestrial organic matter: a model analysis of whole-lake experiments

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Abstract

Terrestrial organic matter can be assimilated by aquatic consumers but implications for biomass and production are unresolved. An ecosystem model was fit to estimate effects of phosphorus (P) load, planktivory, and supply rate of terrestrial particulate organic carbon (TPOC) on phytoplankton and zooplankton in five whole-lake experiments. Phytoplankton biomass increased with P load and planktivory and decreased with TPOC supply rate. Zooplankton biomass increased with P load and responded weakly to planktivory and TPOC supply rate. Zooplankton allochthony (proportion of carbon from terrestrial sources) decreased with P load and planktivory and increased with TPOC supply rate. Lakes with low allochthony (< 0.3) had wide ranges of phytoplankton and zooplankton biomass and production, depending on P load and planktivory. Lakes with high allochthony (> 0.3) had low biomass and production of both phytoplankton and zooplankton. In summary, terrestrial OC inhibits primary production and is a relatively low-quality food source for zooplankton.

Keywords

Allochthony, carbon, lake, phosphorus, phytoplankton, planktivory, production, zooplankton.

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