



Net ecosystem production in clear-water and brown-water lakes

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We studied 15 lakes in northern Sweden with respect to primary production and respiration in benthic and pelagic habitats. The lakes were characterized by different concentrations of colored dissolved organic carbon (DOC) of terrestrial origin, forming a gradient ranging from clear-water to brown-water lakes. Primary production decreased and respiration increased on a whole-lake scale along the gradient of increasing DOC. Thus, the lakes became more net heterotrophic, i.e. had lower net ecosystem production (NEP = gross primary production – community respiration), with increasing terrestrial DOC and this change coincided with increasing partial pressure of carbon dioxide ($p\text{CO}_2$) in the surface waters. The single most important process for the increasing net heterotrophy along the DOC gradient was pelagic respiration of terrestrial organic carbon. In spite of high metabolic activity in the benthic habitat, benthic primary production and benthic respiration decreased simultaneously with increasing DOC, showing that the benthic habitat was in metabolic balance throughout the gradient. Therefore, the net heterotrophic states of the lakes depended on the terrestrial DOC export to lakes and the concomitant respiration of terrestrial organic carbon in the pelagic habitat.