The role of fossil organic matter in the ecosystem development of post-mining sites revealed by isotope analyses

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Sediments rich in kerogen ($\sim$19 Ma old, 14C-free) are present in the overburden at post-mining area in Western Bohemia, near Sokolov city, the Czech Republic. There are two successional chronosequences, an alder reclamation and spontaneous succession, consisting of sites that differ in time since heaping.

Both chronosequences accumulate recent organic matter over time, although the process is initially faster at reclamation. We hypothesized that (i) radiocarbon age of soil organic matter would be decreasing with time since spoil heaping; (ii) the detrital food web would show the assimilation of fossil carbon by heterotrophic organisms in the initial stages of succession when fossil organic matter is the predominant source of carbon; (iii) the isotopic track of fossil organic matter in the detrital food web would be more prominent at sites with lower vegetation cover and litter production.

Nitrogen isotopic ratios of soils were high at the young sites and the decrease in δ15N was correlated with the increase in content of recent organic carbon. Nitrogen isotopic ratios of soil detritivores equalled to that of tree leaves at reclamation but were higher at successional sites. Possibly, other food sources were used apart from tree leaves litter at the latter. Interestingly, soil animals but not primary producers were 14C depleted in the youngest relative to the oldest sites. The depletion in 14C of detritivores relative to primary producers was likely due to the geophagy behaviour of the millipedes at the young sites where fossil organic matter is the largest carbon pool.