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Ancient yet tasty – 14C-free sedimentary organic matter is a significant substrate for microorganisms

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Fossil organic matter (OM) is surprisingly often present in modern environments, either being excavated by anthropogenic activities like construction and mining, or introduced by weathering of sedimentary rocks and erosion. Formerly such ancient OM was considered recalcitrant but recent studies have shown it is susceptible to microbial degradation, and therefore can enter soil food webs. We present an example of fossil OM utilisation by soil microbiota at two sites with different times of soil formation in a post-mining area in the western part of the Czech Republic. Overburden remaining after coal mining contains 14C-free aliphatic kerogen and aromatic coal. During ecosystem restoration of spoil heaps, plant derived soil organic matter increases with time since heaping and thus the proportion of fossil OM decreases. We carried out incubations of topsoils (0 – 10 cm) from 12-year and 56-year-old sites and measured 14C content of respired CO_2. In addition, we extracted PLFA markers for a more direct measure of microbial 14C content. We found out that soil microorganisms at the 12-year-old site respired more 14C depleted CO_2 compared to the 56-year-old site. This corroborates our previous findings that soil macrofauna were 14C depleted at young sites relative to old sites. We expect an analogous pattern for the PLFA markers. Overall, our results demonstrate that fossil OM readily sustains heterotrophic microorganisms and enters the decomposer food web. This effect is larger at younger sites that have a smaller proportion of recent plant C inputs.