

**Fig. S4** Structural equation models on the effects of earthworm and types of deposited compounds (N, Na, PAHs) on fauna-driven (large mesh size litterbags) and microbial-driven decomposition (small mesh size litterbags) in deciduous (upper six graphs) and coniferous forest (lower six graphs). Arrows represent causal pathways. Solid arrows represent marginally significant relationships ( $P \leq 0.1$ ), dashed grey arrows represent non-significant relationships ( $P > 0.1$ ). Red arrows refer to negative effects, green arrows to positive effects. Arrow width represents the standardized path coefficients. Non-standardized path coefficients associated with each solid arrow are shown ( $\dagger$ ) $P \leq 0.1$ , (\*) $P \leq 0.05$ , (\*\*)  $P \leq 0.01$ , (\*\*\*) $P \leq 0.001$ ;  $n = 80$  (2 deposited compounds treatments  $\times$  2 earthworm treatments  $\times$  4 replicates  $\times$  5 sampling times). SIR\_C, microbial biomass in soil underneath coarse litterbags, pH\_C, soil pH underneath coarse litterbags, SIR\_F, microbial biomass in soil underneath fine litterbags, pH\_F, soil pH underneath fine litterbags, M\_loss\_C, fauna-driven litter decomposition (i.e., the difference in mass loss between coarse and fine litterbags), M\_loss\_F, microbe-driven litter mass loss (fine litterbags).