

Leaf litter decomposition rates in degraded and fragmented tropical rain forests of Borneo

Abstract

Previously extensive tracts of primary rain forest have been degraded by human activities, and we examined how the effects of forest disturbance arising from habitat fragmentation and commercial selective logging affected ecosystem functioning in these habitats by studying leaf litter decomposition rates in litter bags placed on the forest floor. The rain forests of Borneo are dominated by trees from the family Dipterocarpaceae, and we compared leaf litter decomposition rates of three dipterocarp species at eight forest fragment sites (area 3-3529 ha) that had different histories of disturbance pre-fragmentation: four fragments had been selectively logged prior to fragmentation and four had been formed from previously undisturbed forest. We compared these logged and unlogged forest fragments with sites in continuous forest that had been selectively logged (two sites) and fully protected and undisturbed (two sites). After 120 d, undisturbed continuous forest sites had the fastest rates of decomposition (52% mass loss). Forest fragments formed from unlogged forest (32% mass loss) had faster decomposition rates than logged forest fragments (28% mass loss), but slower rates than continuous logged forest (39% mass loss). Leaves of a light-demanding species (*Parashorea malaanonan*) decomposed faster than those of a shade-tolerant species (*Hopea nervosa*), but decomposition of all three dipterocarp species that we studied responded similarly to logging and fragmentation effects. Reduced decomposition rates in logged and fragmented forest sites may affect nutrient cycling and thus have detrimental consequences for forest regeneration. Conservation management to improve forest quality should be a priority, particularly in logged forest fragments.