

Conversion of peat swamp forest to oil palm cultivation reduces the diversity and abundance of macrofungi

ABSTRACT

Deforestation of tropical peat swamp forests is rapidly taking place across Southeast Asia to make way for agricultural expansion. Within forest ecosystems, macrofungi play a vital role, including wood decomposition and nutrient cycles. To reveal the effects of deforestation and land cover conversion on macrofungi in Southeast Asian tropical forests we assessed the relationship between environmental variables such as air temperature, relative air humidity, soil pH, soil moisture, canopy cover, canopy closure, habitat type (i.e., peat swamp forest, large-scale plantation, monoculture smallholding, and polyculture smallholding) and available substrata with macrofungal species richness and abundance. We sample macrofungi across four habitats on Peninsula Malaysia including peat swamp forest, large-scale plantations, monoculture smallholding and polyculture smallholding. We found that substrate richness had a positive effect on macrofungal morphospecies richness, while soil pH and air temperature had a negative effect. For macrofungal abundance, canopy closure and soil moisture had negative effects, whereas substrate richness and relative air humidity had positive effects. Our data showed considerable variation in functional group responses to environmental variables. The abundance of wood-inhabiting fungi was driven primarily by substrate richness, while relative air humidity, soil moisture, and habitat type play minor roles. The abundance of terricolous saprotrophic fungi was determined principally by habitat type, substrate richness, and relative air humidity. Macrofungal community structure was mainly influenced by substrate richness, followed by microclimates and soil characteristics. Our results can provide critical ecological data to support conservation stakeholders conserve macrofungi in natural and agricultural peatlands. Our study suggests that the expansion of oil palm monocultures, to the detriment of peat swamp forests, is likely to have negative effects on macrofungal biodiversity and further agricultural expansion should be prevented.

Keyword: Environmental driver; Large-scale plantation; Macrofungal morphospecies richness; Oil palm; Peat swamp forest; Smallholding