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Evaluation of Biodiversity in Different Land-use Types in a Peatland Area of Sumatra: Establishing Effective Institutions for Biodiversity Conservation

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Biodiversity provides the base of many ecosystem services that benefit human welfare. As natural forests in Sumatra have decreased drastically over the past few decades, peat swamp forest (as well as mountain forest) is becoming the last remaining refuge for sustaining the region's biodiversity. However, such forest is currently being faced with the development of large-scale industrial pulpwood and oil palm plantations. We aim to evaluate the impact of recent land-use changes on biodiversity in a peat swamp area in order to propose proper management guidelines.

We surveyed the differences in species richness and abundance of mammals, birds, earthworms, and termites among several land-use types in the Bukit Batu district of Giam Siak Kecil-Bukit Batu Biosphere Reserve, Riau, from 2010 to 2011. The land-use types we compared were natural forest, industrial acacia plantations, and village areas, including rubber jungles, rubber gardens, oil palm fields, and home gardens. We surveyed ground-dwelling mammals and ground birds by camera trapping, birds by IC sound recorder and point counting, and earthworms and termites by plot sampling.

The species richness and the abundance of mammals and birds were highest in natural forest, which included many endangered species, and were lowest in planted acacia forest. The species richness of birds in the village area was also higher compared to that in the acacia plantation, but the species were mostly common and open-land species.

In contrast, the biomass of termites was not markedly different among habitats, and was only slightly higher in oil palm fields. The biomass and abundance of earthworms were low in natural forest, acacia plantations, rubber jungles, and rubber gardens. The acidic condition of the soil likely inhibited the proliferation of this fauna. However, earthworms were abundant in oil palm fields and home gardens and their presence may gradually enhance peat decomposition.

Based on our results, we propose the following two points for management: 1) Large protected areas and "Hutan Lindung," the remaining natural forest in a concession, should be protected properly. Natural forest contains irreplaceable components that ensure biodiversity. A land

administration policy to connect the remaining reserves with a corridor of secondary forest is also recommended. 2) Rubber gardens, rubber jungles, and forest planted by locals, as proposed by Professor Mizuno, is recommended for the restoration of degraded peatland in the village area. Although the planting of oil palm accelerates the inhabitation of peat soil by earthworms and termites that might eventually cause irreversible changes, rubber jungle tends to maintain its original soil condition.