

Global COE Program
In Search of Sustainable Humansphere in Asia and Africa
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1. Title: Evaluation of bird diversity with special reference to avian contribution to nutrient cycling in Acacia mangium plantation forests

Study area: Sumatra, Indonesia

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2. Objectives:

A suitable design for landscape structure and management procedures is needed in order to maintain biodiversity. The primary objective of this study is to clarify the differences in bird species diversity between conserved secondary forests and Acacia mangium plantations. Since secondary forests may act as a species source for acacia plantation, I focus on the change of avifauna along the distance of a conserved secondary forest as well as the age of Acacia plantation. I would like to clarify how we should decide the way to manage landscape structure which functions as the bird-diverse habitat. There is also a need to clarify which ecosystem services are provided by conserving biodiversity. I focus on the nutrient cycling, especially nutrient transport within the landscape by means of bird feces. The second objective is to clarify the contribution of the transported bird feces between Acacia plantations and other landscape constituents, in terms of nutrient cycling as Nitrogen and Phosphorus. The ultimate goal of this study is to investigate how we can maintain biodiversity and ecosystem services in Acacia plantations.

3. Results:

We conducted a bird survey in the conserved secondary forest (2,944 ha) and in several Acacia plantation sites, each with a different distance (0.5km, 1-2km, 6-7km, 10-15km) from the nearest conservation area. A similar survey was conducted at an Acacia plantation with a different age (0-1year, 4-5year) but at the same distance from the conserved secondary forest. Three methods were used for the bird survey. (1) Point-count method; we recorded the species during a ten minute period, standing at a specific point and counting the number of individuals within a 25 m radius. We estimated density from the data within 25 m, and species numbers from within and

outside of the 25m radius. (2) Bird calls recording, whenever possible we used an IC-recorder during the point-count to record bird calls for later identification. (3) Infrared rays camera; throughout our stay, we set 4 automatic cameras with an infrared ray sensor at a height of 1~2m. From the point-count census, we have observed 32 bird species in the young Acacia plantation, 36 species in the mature Acacia plantation, and 55 species in the conserved secondary forest. Significant differences in avifauna were observed between the Acacia plantation and the conserved secondary forest, but no differences in the distances of Acacia plantation from the conserved secondary forest. Since the mean of bird occurrence in young Acacia is low (1.44/survey) compared to mature Acacia (3.55/survey) and conserved secondary forest (3.89/survey), relatively high species numbers in young Acacia are the result of counting birds in the mixed-vegetation forest, which exists close to the Acacia plantation. This mixed-vegetation spreads widely in the region, probably providing a good habitat for birds. As an implication for conservation, conserved secondary forests should be in good condition with a large area as has been stated in many previous studies, but the mixed-vegetation may also play an important role in conserving biodiversity. The distance between each area of mixed-vegetation should be 2km but further study is urgently required to clarify the functions of mixed-vegetation.

Bird species that were found at both the Acacia plantation and conservation forest might transport nutrients across the two environments. We set up six 1x5m fecal traps at each of the forest points and collected feces on the traps. The feces was dried; seeds were removed and then identified. As a result, the amount of bird fecal input has a strong relation with bird density. Since the surrounding area is also the habitat for those birds, there might be the transportation of nutrients from the surrounding vegetation.

4. Publication:

Tropics, Conservation Biology