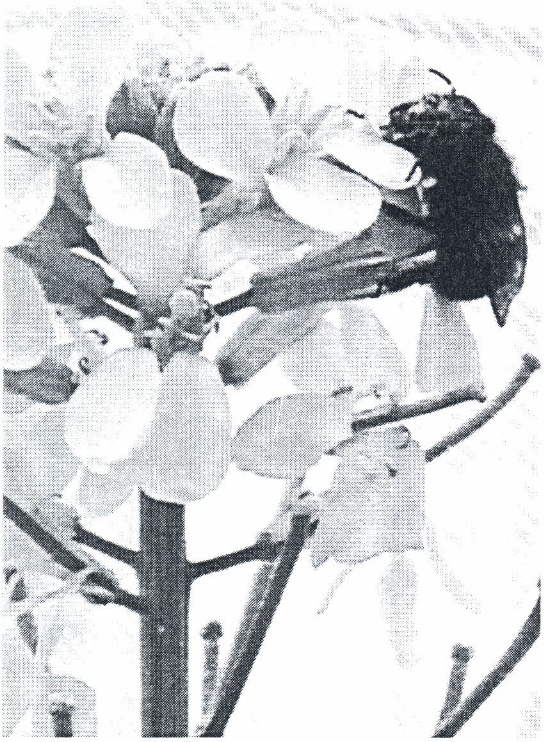
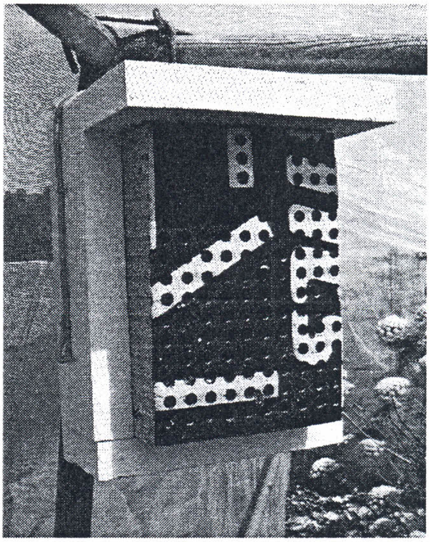
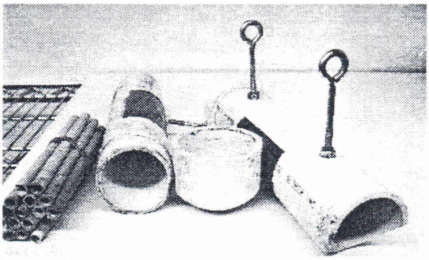
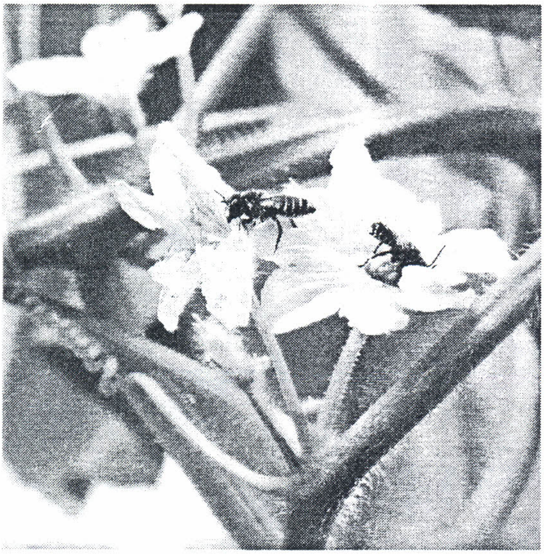
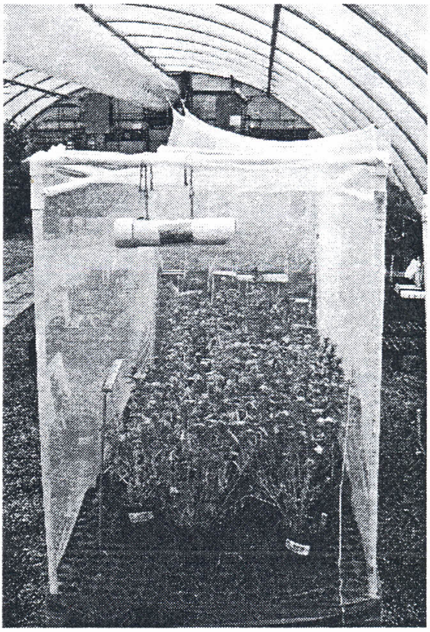
9th International Pollination Symposium on Plant-Pollinator Relationships—Diversity in Action











Program and Abstracts

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 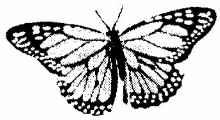  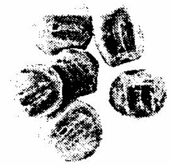 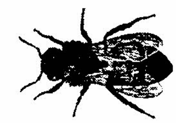

Reduced Impact Logging and Its Effects on the Pollination of Amazonian Trees

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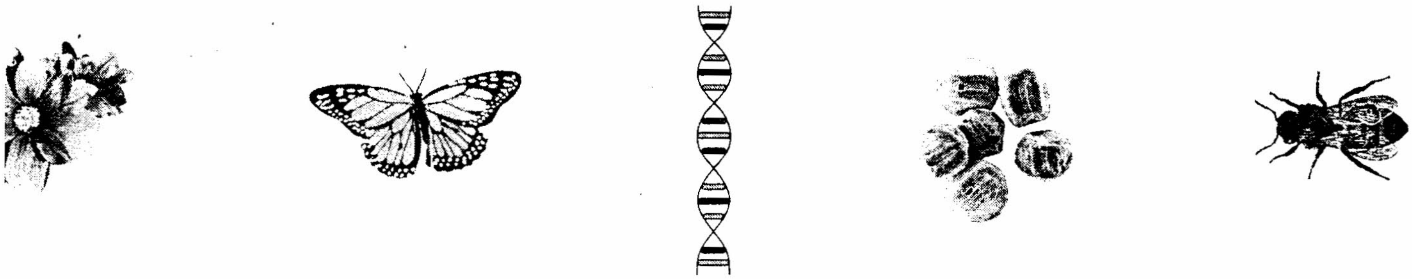
In the last three decades, the Brazilian Amazon (4.9×10^{-1} km^2) has lost approximately 17% of its forest cover due to the expansion of logging activities, cattle ranching, and agricultural systems [1]. Habitat loss and forest fragmentation affect pollen flow because they reduce the number of pollen donors and possibly the amount of compatible pollen, which may lead to low fruit set and genetic drift [2, 3]. These processes may also result in the decline of pollinator populations, threatening the connectivity of remnant trees in fragments [4]. We studied the effect of reduced impact logging (RIL) policies on the pollination efficiency and pollinator groups of *Jacaranda copaia* (Aubl.) D. Don (Bignoniaceae), *Dipteryx odorata* (Aubl.) Willd. (Leguminosae–Papilionoideae), *Carapa guianensis* Aubl. (Meliaceae), *Symphonia globulifera* L.f. (Clusiaceae), and *Bagassa guianensis* Aubl. (Moraceae) (Figure 1). These species are hardwood trees that (except *J. copaia*) are used in the forestry industry for timber and/or plywood.

Our research was conducted in the Western Amazon (Tapajós National Forest) under two systems of forest management: non-logged forest (NLF) and logged forest (LF) subject to RIL. For each study species, we determined the pollen deposition rate (PDR = average number of pollen grains deposited per sample stigma) and percentage of pistil fertilization (PPF = % of sample pistils fertilized). These data were compared between logging treatments using ANOVA. Pollinator activity (species, behavior, and visitation rate) was monitored during the main flowering period of *J. copaia*, *D. odorata*, and *S. globulifera* in six-hour schedules, totaling at least 48 hours per species. The pollinators were grouped into nine groups: 1) Small- to middle-sized bees (> 2.5 cm); 2) Large bees (≥ 2.5 cm); 3) Wasps; 4) Dipterans; 5) Lepidoterans; 6) Beetles; 7) Passeriformes; 8) Hummingbirds; 9) Other birds.

Pollen deposition rate was different between the two logging treatments when all the species were analyzed together. Separately, the PDR of *D. odorata* was significantly higher in the logged forest ($F_{1,11} = 4.96$; $p = 0.05$), whereas *S. globulifera* showed the opposite response with significantly lower PDR at the logged site ($F_{1,13} = 4.59$; $p = 0.05$). For the remaining species, no significant difference was detected (Figure 2). Concerning PPF, over all species it was significantly lower in the LF than the NLF ($F_{1,4} = 5.74$; $p = 0.018$), but single species analyses were not significant. In terms of pollinator activity, *J. copaia* was visited by small bees (e.g., *Centris, Euglossa*), *D. odorata* by large bees (e.g., *Epicharis, Bombus*, and *Eulaema*), and *S. globulifera* mainly by perching birds. Also, *C. guianensis* was visited by microlepidopterans and stingless bees, while *B. guianensis* presented strong evidence of wind pollination. *J. copaia*, *S. globulifera*, and especially *D. odorata*, showed qualitative differences in the frequency and composition of pollinator groups between logging treatments, which may affect pollination efficiency. In LF, secondary pollinators



to *J. copaia* (i.e., hummingbirds and lepidopterans) and *S. globulifera* (i.e, other birds) declined, whereas in *D. odorata*, large bee visits disappeared after logging while hummingbird visits increased. In conclusion, RIL, despite lower visual impacts on the forest, affects pollination dynamics, changing the composition of pollinator guilds, as well as the pollination and fertilization of surviving trees.

References

[1] Lentini, M. et al. (2005) *Fatos Florestais da Amazônia 2005.* Imazon, Belém.

[2] Cascante, A., et al. (2002) *Conserv. Biol.* 16:136–147.

[3] Ghazoul, J., et al. (2001) *Plant Ecol.* 153:335–345.

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[5] This study was part of Dendrogene project: Genetic Conservation in Managed Forests in Amazonia, carried out by Embrapa Eastern Amazon and institutional partners, through Brazilian Cooperation Agency (ABC) and Department for International Development (DFID).

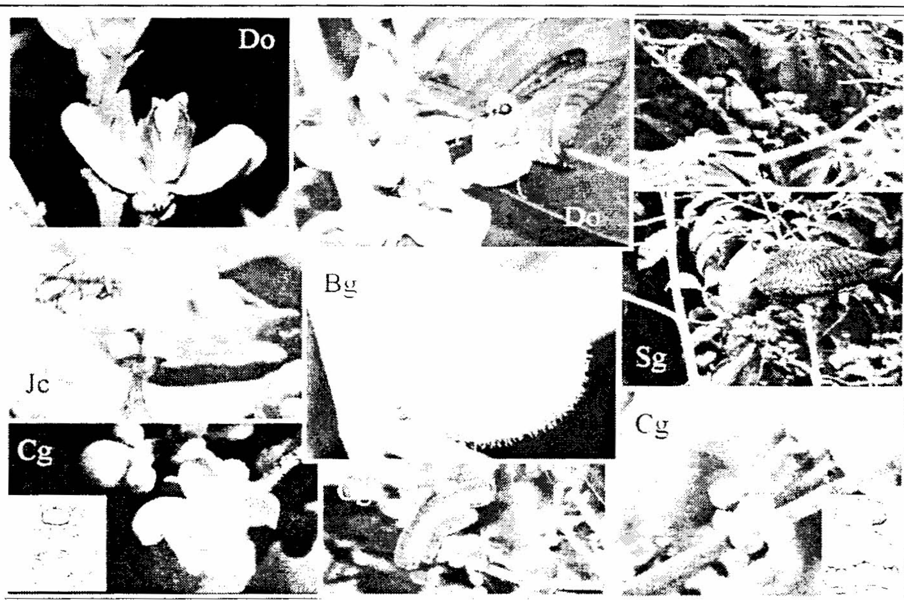

Figure 1. Flowers and pollinators of *Dipteryx odorata* (Do), *Jacaranda copaia* (Jc), *Symphonia globulifera* (Sg), *Bagassa guianensis* (Bg), and *Carapa guianensis* (Cg) at the Tapajós National Forest, Brazil.

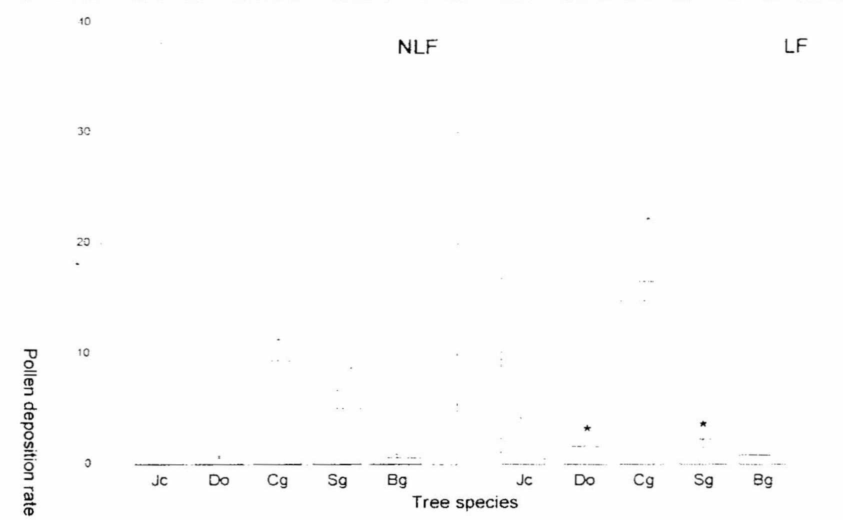

Figure 2. Pollen deposition rate of *Jacaranda copaia* (Jc), *Dipteryx odorata* (Do), *Carapa guianensis* (Cg), *Symphonia globulifera* (Sg), and *Bagassa guianensis* (Bg) in non-logged (NLF) and logged forest (LF) at the Tapajós National Forest, Brazil.