River Margin Restoration: a win for insects and not pests

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Background:

- Maintaining or restoring river zones in oil palm plantations represents a promising strategy to support wildlife and ecosystem processes.
- The **Riparian Ecosystem Restoration in Tropical Agriculture Project (RERTA)** is a long-term, large-scale experiment that tests restoration strategies (active and passive) along two replicate riparian zones in oil palm plantations in Riau, Indonesia.

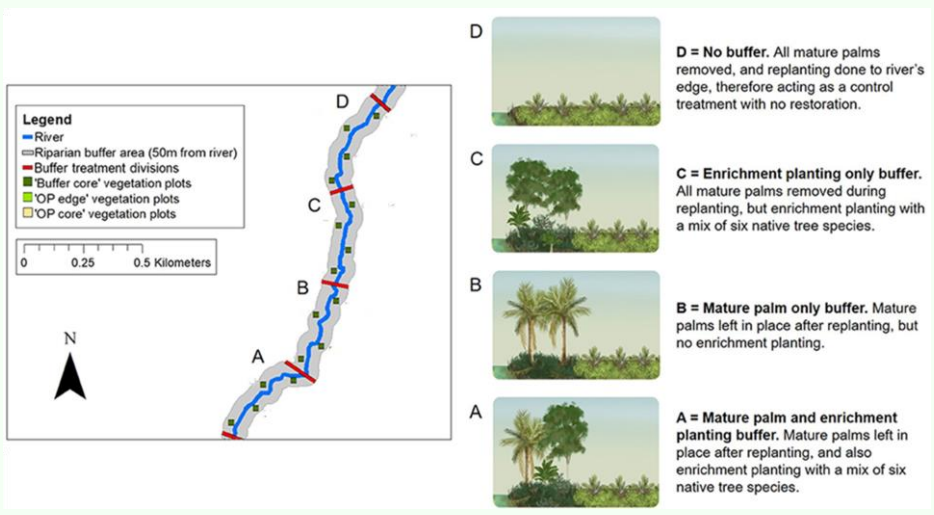


Figure 1: RERTA plot layout at river sites showing treatments (A–D) and 25 x 25 m vegetation plots (green squares)[1]. Treatments were applied to RERTA 1 (2018) and RERTA 2 (2019).

Methods:

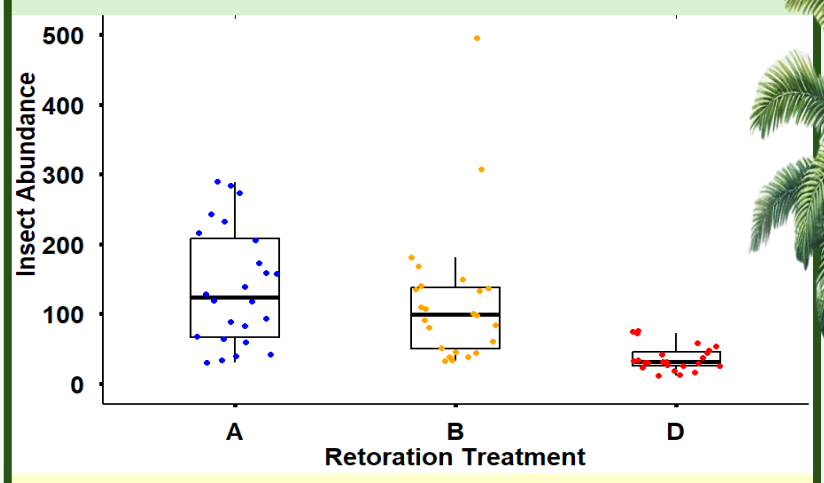
Transect surveys:

- Walked the perimeter of each buffer core's sub-vegetative plot (25 x 25 = 100 m transect) and recorded any butterflies and 3 assassin bug species (*Eocanthecona dichotomus*, *Sycanus* & *Cosmolestes sp.*) seen within a 5m cube.

Tree surveys:

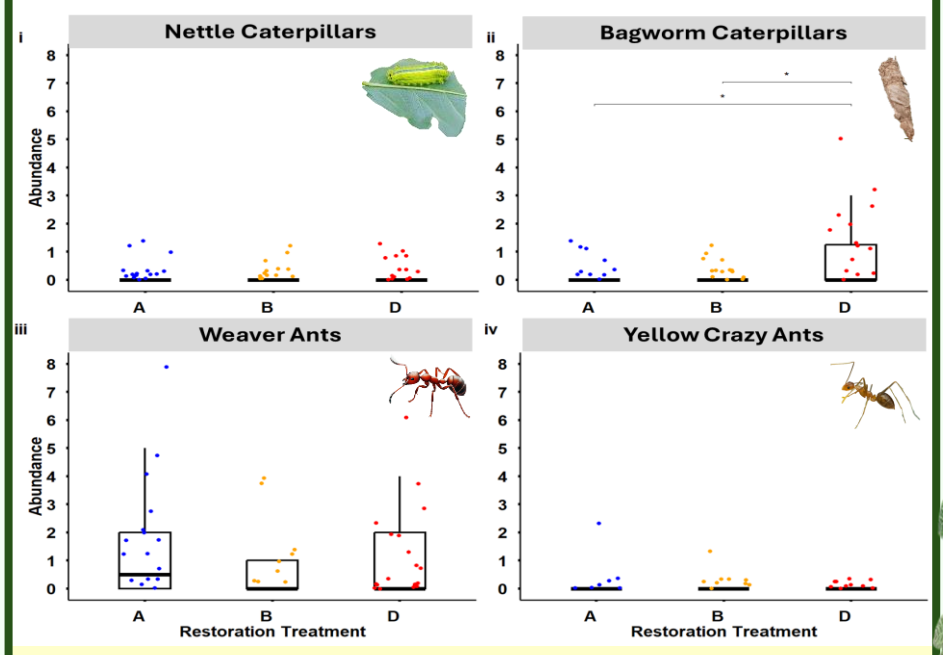
- We cut a single frond from 3 palms, and one branch from the six seedlings species (*Peronema canescens, Shorea leprosula*, *Alstonia scholaris*, *Artocarpus integer*, *Calophyllum inophyllum*, and *Albizia chinensis)* used for enrichment plantings, in each sub-vegetative plot and identified all insects to order level.

Q1) Has the restoration treatment led to differences in insect abundance on palms (A, B, & D)?



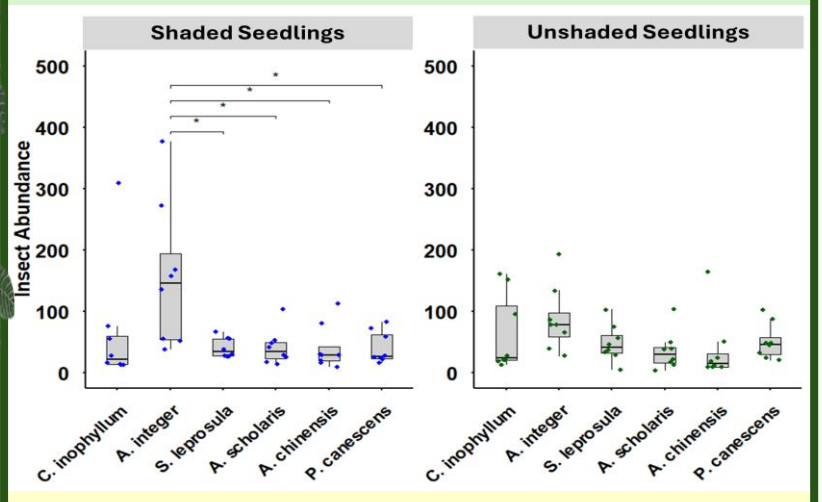
Result: **Insect abundance on oil palm trees significantly differed between treatments** (ANOVA: n = 7680, F = 4.18, df = 2, p = 0.015) with the lowest abundance in D (post hoc Tukey: A – D = p = 0.01).

Q2) Do restoration treatments (A, B & D) affect pest & predator abundance on oil palm trees?

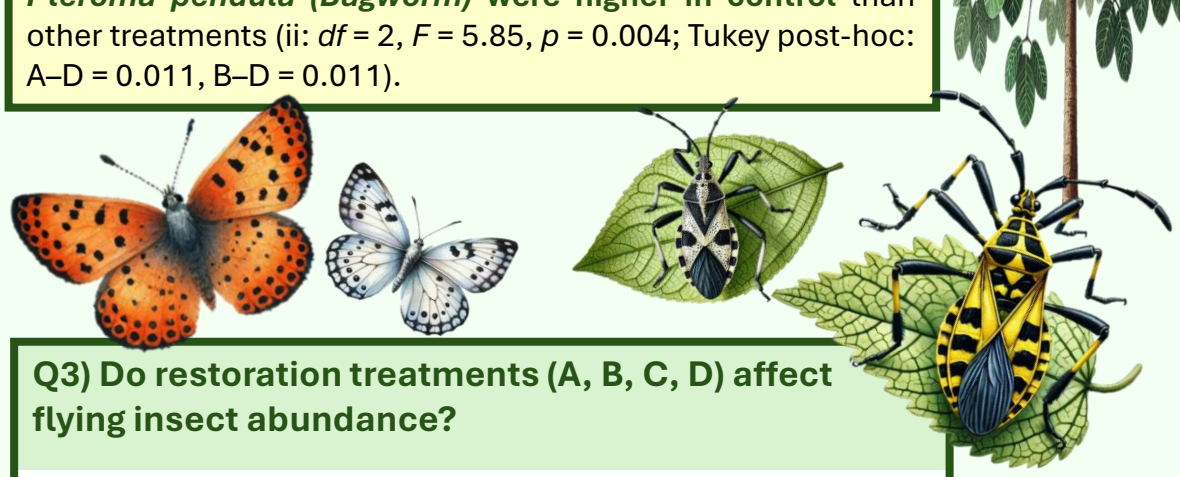


Result: *Darna pallivitta* (Nettle) (ANOVA: df = 2, F = 0.42, p = 0.61), *Oecophylla smaragdina* (Weaver Ants) (df = 2, F = 0.98, p = 0.38), or *Anoplolepis gracilipes* (Yellow Crazy Ant) (df = 2, F = 0.6, p = 0.55) did not differ between treatments, but ***Pteroma pendula (Bagworm)* were higher in control** than other treatments (ii: df = 2, F = 5.85, p = 0.004; Tukey post-hoc: A–D = 0.011, B–D = 0.011).

Q4) Have the restoration treatments led to differences in insect abundance in seedlings (A & C)?



Result: Result: Insect abundance **did not differ between shaded** (treatment A) **and unshaded margins** (treatment C) (ANOVA: n = 5716, F = 0.794, df = 5, p = 0.37) or among seedling species in treatment C. However, in shade, *A. integer* had significantly higher insect abundance compared to *S. leprosula*, *A. scholaris*, *A. chinensis*, and *P. canescens* (Tukey test: p = 0.01 for each), but not with *D. inophyllum* (Tukey test: p = 0.09).



Q3) Do restoration treatments (A, B, C, D) affect flying insect abundance?

Result: Butterfly and assassin bug abundance **did not differ between treatments** (Butterfly: n = 114, $LR\ \chi^2$ = 0.59, df = 3, p > 0.05; Assassin bug: n = 209, $LR\ \chi^2$ = 0.31, df = 3, p > 0.05 (*mean, ◊ median)).

Conclusion: **Restoration increases insect abundance** in river margins **without benefiting pests**. Indeed, Bagworm abundance was lower in restoration treatments, with differences between tree species only in shaded margins. These results suggest restoration benefits insect communities, though further research is needed.

References:

1. Luke, S. H., Advento, A. D., Aryawan, A. A. K., Adhy, D. N., Ashton-Butt, A., Barclay, H., Dewi, J. P., Drewer, J., Dumbrell, A. J., Edi, Eycott, A. E., Harianja, M. F., Hinsch, J. K., Hood, A. S. C., Kurniawan, C., Kurz, D. J., Mann, D. J., Matthews Nicholass, K. J., Naim, M., … Turner, E. C. (2020). Managing Oil Palm Plantations More Sustainably: Large-Scale Experiments Within the Biodiversity and Ecosystem Function in Tropical Agriculture (BEFTA) Programme. *Frontiers in Forests and Global Change*, 2. https://doi.org/10.3389/ffgc.2019.00075
2. OpenAI. (2025). Images generated using DALL·E through ChatGPT. Retrieved from OpenAI's ChatGPT platform.

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