

How do edge effects caused by deforestation affect *Nymphalidae* family butterfly biodiversity in La Selva, Costa Rica?

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Pink Satyr



Paula's Clearwing

Background

- Animals and insects have been shown to demonstrate a slight edge effect due to vegetation and microclimate conditions¹.
- Studies have suggested that species richness was greater at the edge compared to the interior of the forest.
- Microclimate conditions at the edge that included an increase in temperature, locally increased the activity of butterflies².
- This study was conducted near La Selva research station which is one of the most studied tropical locations in the world.
- La Selva has 204 species of butterflies and approximately 80% belong to the *Nymphalidae* family³.

Research Question

What are the patterns of species diversity within the *Nymphalidae* family of butterflies at La Selva moving from a disturbed area or edge to the interior of the forest?

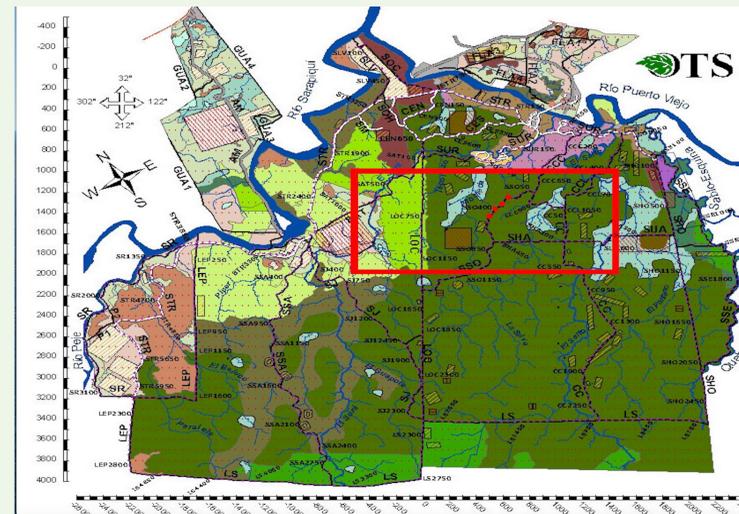


Figure 1. Map of trails near La Selva

Methods

- This study was conducted at La Selva Biological Station in Sarapiquí, Costa Rica.
- Locations were chosen along the trails at the edge, ~150 m into the forest, and ~300 m into the forest. The time spent at each location was consistent and the number of species was observed from the trail within that time frame a few feet off the trail. Binoculars were used to observe the insects from a distance to identify them.
- The locations were sampled in both the morning and the afternoon to remove effects due to the time of day.
- The temperature was recorded at each observation site to compare number of species to temperature.
- The data was analyzed using ANOVA and an estimated means post-hoc.
- The results are outlined in Table 1.

Results

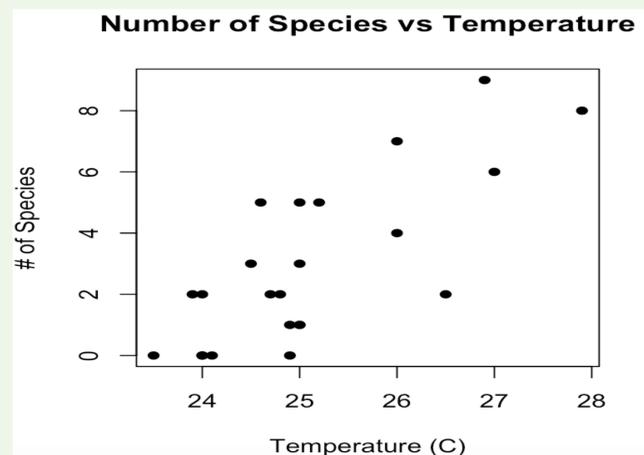


Figure 2. Scatterplot showing the effect of temperature on species

Results Continued

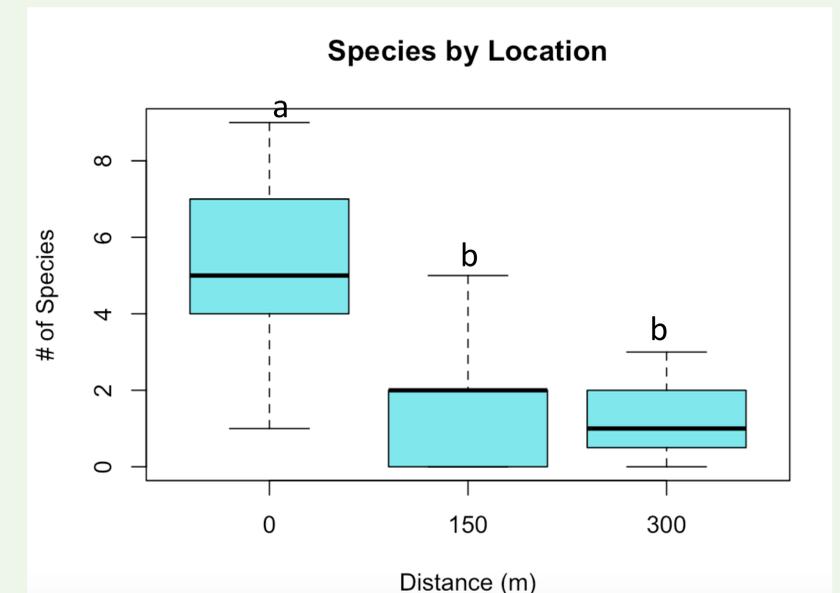


Figure 3. Boxplot comparing the distribution of species observed at each location. Letters denote significant differences between groups performed using an estimated means post-hoc.

Table 1. Table with the results of the ANOVA in R. Significance level of $\alpha = 0.05$.

Variable	F-value	P-value
Distance from Edge (m)	13.542	0.000221
Temperature (° C)	5.928	0.024933

Discussion

- There is significant difference in the number of species present at the different locations with a higher diversity present at the edge compared to the interior of the forest.
- Temperature is a factor that influenced the number of species at each location and is shown to be positively correlated with *Nymphalidae* family diversity.

Conclusion

This study indicates that there is a larger butterfly diversity at the edge of forests that are more disturbed such as new growth forests compared to old growth forests. The butterfly diversity in an area is affected by both the temperature and the distance from the forest edge. This is consistent with findings from other studies and this increase in diversity at the edge could also be attributed to a greater plant diversity at the edge because of more light availability to grow more undergrowth compared with less light available in the interior of the forest for those understory plants.

References:

1. Oye, B. K. (2021). *Changes in the vertical stratification of neotropical nymphalidae at forest edges in relation to light and temperature conditions* (Order No. 28415171). Available from ProQuest Dissertations & Theses Global. (2531152562).
2. Lourenço, G.M., Luna, P., Guevara, R. et al. Temporal shifts in butterfly diversity: responses to natural and anthropic forest transitions. *J Insect Conserv* 24, 353–363 (2020). <https://doi.org/10.1007/s10841-019-00207-0>
3. McDade, L. A., Bawa, K. S., et al. (1994). *La Selva: Ecology and Natural History of a Neotropical Rain Forest*. University of Chicago Press



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