

Diversity of soil ants in Los Tuxtlas, Veracruz, Mexico: land use effects mediated by the amount of forested area

Patricia Rojas, Antonio Angeles, José Amador, Lizbeth Hernández
Soil Biology Department, Institute of Ecology A.C.
Xalapa, Ver. MEXICO

Introduction

In Mexico the main threat to biodiversity is the extensive logging of forests to implant agriculture fields. At the local level however, differences in agricultural practices determine the amount of remaining forests.

At the regional scale three main types of land use are recognized in Los Tuxtlas Region:

- 1) Few agricultural parcels are located adjacent to an important area of preserved forest (non-indigenous farmers).
- 2) An intermediate amount of agricultural parcels (annual crops, agroforestry plantations and pastures) are established within a matrix of forest (indigenous farmers).
- 3) Most of the area is occupied by agricultural parcels and only few patches of forest remain.

In such landscape it is expected a higher ant diversity in agroecosystems located near or inside the forested matrix. To test this hypotheses a study of soil ant diversity was conducted in Los Tuxtlas Biosphere Reserve.

Methods

The study was performed in the southern part of the Biosphere Reserve of Los Tuxtlas, in three localities that differed by the amount of forested surface at the landscape level:

1. López Mateos (LM): 75% of forest surface
2. San Fernando (SF): 50%
3. Venustiano Carranza (VC): 25%

In each locality four land use systems (LUS) were studied:

1. Tropical rain forests (TF)
2. Agroforestry plantations (A)
3. Pastures (P)
4. Annual crops (C).

In each LUS five sites at least 100 m apart were selected and in each one five sampling points were established.

3 localities x 4 LUS x 5 sites = 60 sampling points

In each sampling point the following ant sampling protocol was implemented:

a) Leaf litter ants
Five samples of 1m² leaf litter were taken at intervals of 10 m along a 40 m transect and processed in mini-Winkler bags during 24 h.
Total number of samples: 300

b) Foraging ants
Three pitfall traps with ethanol 80% were placed along the transect at intervals of 10 m during 24 h.
Total number of samples: 180

c) Subterranean ants:
A soil monolith (25 x 25 x 30 cm) were excavated and ants captured by hand.
Total number of samples: 60
TOTAL NUMBER OF SAMPLES: 540

Ants were separated, dry mounted and identified at species or morphospecies level.



López Mateos



San Fernando



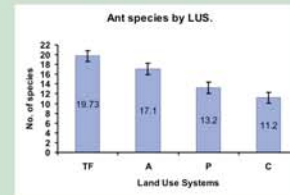
Venustiano Carranza

Results

Species richness

A total of 138 soil ant species belonged to 48 genera were found. The more diverse and abundant genera are shown below.

Genus	No. of species	Frequency in Winkler samples (%)
<i>Pheidole</i>	15	90
<i>Strumigenys</i>	11	80
<i>Solenopsis</i>	8	92
<i>Hypoponera</i>	8	84



Species richness by LUS

As expected, forests had the highest total species richness (87 species) followed by agroforestry plantations (85). Annual crops and pastures presented the lowest, similar values (60 and 61 species respectively).

Average species richness of forests (TF) was significantly different from pastures (P) and crops (C), but not from agroforestry plantations (A). Agroforestry plantations differed from crops; annual crops and pastures, on the other hand did not differ each one from the other (ANOVA: GL=3,56; F=9,94; P=0,00001; Tukey HSD test of multiple ranks).



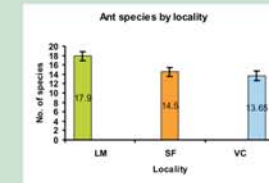
Cluster Analysis

The 60 sampling points were separated according to Presence/absence of the 138 ant species (Bray-Curtis index; UPGMA method for clustering).

Two main groups were separated:

Group 1 (in green) included all forest sites, the majority of agroforestry plantations, 3 pastures and only one crop.

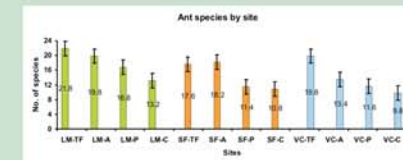
Group 2 (in yellow) grouped 14 of 15 crops sites, the majority of pastures and several agroforestry plantations



Species richness by locality

Total and average species richness was significantly higher in LM than in both SF and VC localities. No significant differences were observed between the last two localities.

(ANOVA: GL=2,57; F=5,14; P=0,009; Tukey HSD test of multiple ranks).



Species richness by LUS and by locality

In LM there were not significant differences between the four LUS. Contrastingly in SF and VC forests were significantly different from crops and pastures

Conclusions

- The more forested locality (LM) harbored the richest ant fauna.
- In the three localities forests had the higher amount of species, followed by agroforestry plantations.
- The amount of forested area influenced the richness of the managed ecosystems.
- In spite of the amount of forested area, forest and agroforestry plantations harbored similar ant communities.

This study form part of the "Conservation and Sustainable Management of Below-Ground Biodiversity, BGBD" project (TSBF/PNUMA/GEF).