

Earthworm Communities from Los Tuxtlas Reserve: Influence of Land use Systems and Landscape changes



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Introduction:

It is widely known that human perturbation modifies earthworm communities, both at the functional (i.e. ecological categories, abundance) and species level. In the tropics, one of the main effects of Land Use Changes over earthworm communities is the elimination of native species and the facilitation of exotic invasions. Few studies, however, have addressed to what extent the impact of Land Use Systems (LUS) is mediated by Landscape Level changes of the Vegetation Matrix (VM).

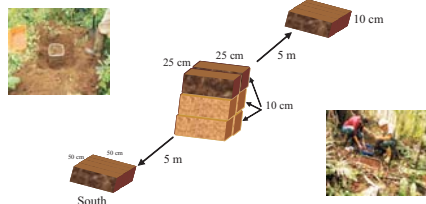
In this study we tested the general hypothesis that a landscape vegetation matrix dominated by tropical rain forests (FVM) will buffer the impact of LUS over native earthworm species.

Earthworm field sampling:

In each repetition three handsorted monoliths were made:

- One carefully revised and vertical stratified monolith of 25x25x30 cm (species richness, abundance and biomass).
- Two fast revised and vertical unstratified monoliths of 50x50x20 cm (species richness)

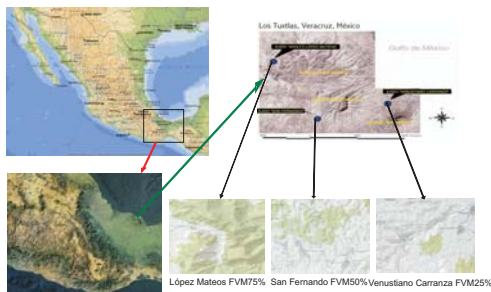
The three monoliths were set along a transect of 10 m, at distances of 5 m.



In each region four LUS were sampled during years 2002-2004. Eight- nine repetitions per LUS were made accordingly to the following design:

Study Area:

The study was conducted at Los Tuxtlas Biosphere Reserve, located in southeastern Mexico. This tropical reserve was formerly covered by tropical rain forests; nowadays, however it is a mosaic of forests and agroecosystems. Their volcanic origin deeply determine the topography (altitudes from 0 to 1800 m), kind of soils (andosols) and vegetation (a mixture of tropical, cloudy and pine-oak forests).



Landscapes and land use Systems:

In the southern part of the Reserve three regions with a different Forested Vegetation Matrix (different amount of forested area) were selected:

- López Mateos region with a FVM of 75%
- San Fernando region with a FVM of 50%
- Venustiano Carranza region with a FVM of 25%

LUS	López Mateos LM: 75%	Tree Plantations	Pastures Annual	Crops
López Mateos LM: 75%	8	8	8	8
San Fernando SF: 50%	8	8	9	8
Venustiano Carranza VC: 25%	8	8	8	8

Results

Thirteen earthworm species were found all over the three VM regions and the four LUS (97 monoliths revised). The community was mainly composed by endogeic polyhumics (11); the other species were two epigeics and one endogeic mesohumic. Native and exotic species were almost equally represented.

7 Natives

Diplostrema sp.nov. Pol
Kaxdrilus parvus Pol
Kaxdrilus sylvicola Ep
Lavellodrilus parvus Pol
Phenicochrilus taste Pol
Ramiellonasp.nov.15 Pol
Ramiellonasp.nov.18 Pol

The most common species was the exotic *P. corethrurus*, present in 69/97= 71% of sampling sites.

6 Exotics

Dichogaster affinis Pol
Dichogaster bolau Ep Pol
Dichogaster saliens Pol
Drawida bahamensis Pol
Perisoclex brachycystis Ep
Pontosoclex corethrurus Mes



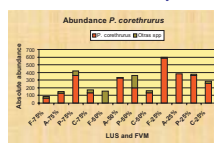
Other important species were:

K. sylvicola (n): 19/97= 20%
Ramiellona spn. 15 (n): 16/97= 16.5%
D. bolau (e): 16/97= 16%
P. brachycystis (e): 15/97= 15.5%
P. taste (n): 14/97= 14%

Lavellodrilus parvus

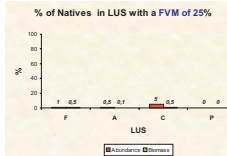
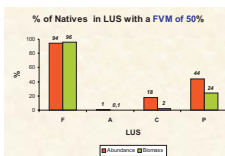
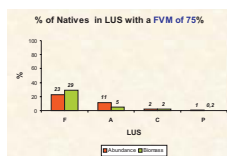


Kaxdrilus sylvicola



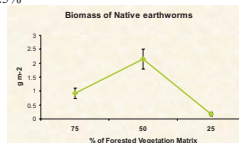
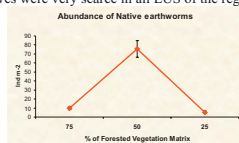
F= Tropical in forests
A=Agroecosystems
P=Pastures
C=Annual Crops

The percentage refers to the amount of Forest Vegetation Matrix



Native species were more abundant in tropical forests (TRF) and pastures (P) of regions with a forested vegetation matrix (FVM) of 75% and 50%, in the same FVM's natives were almost absent from agroecosystems (A) and annual crops (C).

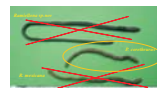
As expected natives were very scarce in all LUS of the region with a FVM of 25%



Considering all LUS together, the region with a FVM of 50% harbor much more natives, followed by the region with a FVM of 70%.

CONCLUSIONS

- At the landscape level, the amount of forested vegetation matrix (FVM) influences the amount of native earthworm species, independently of the land use systems.
- This effect is more evident in the FVM of 25%
- In the region with a FVM of 50%, other variables (as local management of LUS, parcel history) should also have determined the high amount of natives and low exotic invasions. This in turn prevented the invasion of *Pontosoclex corethrurus* within the tropical rain forests.
- Predominance of *P. corethrurus* in almost all LUS of the three FVM (excepting forests and pastures of FVM 50%), could be related to the absence of two native mesohumic species, which are relative abundant in tropical forests of other regions of Los Tuxtlas.



Functional replacement of mesohumic native earthworms by the exotic glossoscolecid *Pontosoclex corethrurus*