LBA–ESECAFLOR Artificially Induced Drought in Caxiuanã Reserve, Eastern Amazonia: Soil Properties and Litter Spider Fauna

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ABSTRACT: A review is presented of soil properties and litter fauna of an experimental site in the Caxiuanã forest, eastern Amazonia, as a contribution to the Large-Scale Biosphere–Atmosphere Experiment in Amazonia (LBA). This study's main scientific goal is to compare some biogeochemical soil properties of an undisturbed forest ecosystem with those of an experimental (1 ha) plot in which rainfall was artificially excluded to simulate drought [the Efeitos da Seca da Floresta (ESECAFLOR) experiment]. A second scientific objective is to investigate the space variability of soil profile characteristics in the experimental sites, particularly organic carbon concentration, moisture, and texture. It is expected that such soil property variability influences greatly the distribution of several biological species such as spiders. To investigate such effects in the litter spider community, we applied percentual complementarity and Simpson diversity index to available data. Our results suggest that a faunal transition was under way in the treatment plot, shifting from a rich and even community to a less diverse one.

KEYWORDS: Soil properties; Organic carbon; Fauna of litter

1. Introduction

As presented by Avissar et al. (Avissar et al. 2002), the Large-Scale Biosphere–Atmosphere Experiment in Amazonia (LBA) is an ongoing international research initiative led by Brazil, which was initiated in the mid-1990s. It was designed to create the new knowledge needed to understand the climatological, ecological, biochemical, and hydrological functioning of Amazonia; the impact of land use change on these functions; and the interaction between Amazonia and the Earth system. As a contribution to the LBA, the biochemical cycling of carbon, water energy, aerosols, and trace gases in the Amazon basin have been investigated in the European Studies on Trace Bases and Atmospheric Chemistry (EUSTACH) as presented by Andreae et al. (Andreae et al. 2002). One of the major subjects of the LBA–EUSTACH project was to better understand the energy, water, and carbon budgets in Amazonia, particularly whether the high rates of CO_2 uptake previously measured over short periods at the Manaus and Rondônia, Brazil, sites were a general and persistent characteristic of Amazon biosphere–atmosphere interaction (Andreae et al. 2002).

Therefore, a network of experimental sites was established in different regions of Amazonia, for example, in the Caxiuanã Reserve. The National Forest of Caxiuanã is located approximately 350 km to the west of Belém, Brazil. The forest is extensive (33 000 ha) and undisturbed, and consists of dense lowland firm earth forest (Andreae et al. 2002). The Efeitos da Seca da Floresta (ESECAFLOR) experiment is one of the LBA scientific projects that aims to assess the impact of drought on water and carbon dioxide from the Caxiuanã rain forest. The three main goals of ESECAFLOR were (i) to investigated the impact of soil drought on water and CO_2 fluxes by excluding ~50% of the rainwater from the soil for some years (simulating an extreme El Niño event); (ii) to link changes in rainfall and soil moisture to stomata conductance in a combined model that is parameterized for a normal seasonal cycle and conditions of further-reduced rainfall; and (iii) to characterize the spectral reflectance signatures of a drought and nondrought canopy in order to identify drought forests using remote sensing for the purpose of modeling forest–atmosphere exchanges.

The ESECAFLOR experiment imposition of drought has been carried out by establishing two 1-ha plots, which have been selected and carefully matched for basal area and species composition. An artificial soil drought has been imposed on one of these plots, and the second plot has remained as a control. In the former plot, rain has been prevented from reaching the soil by supporting panels and gutters. Surface runoff into the plot has been eliminated by choosing a site located on flat ground and by a sinking polythene wall within a trench in the direction of flow.

As is well known, the water supply is a key factor controlling the nature and diversity of life processes in the forest litter, their community dynamics, and cycling of carbon and soil minerals. This is performed in several ways such as the nutrients cycling by means of fragmentation and the ingesting of soil debris, which decompose and mineralize the litter content (Höfer et al. 2001) affecting the soil structure and better differentiating their physical characteristics and organic matter.

As a consequence, there is an increase in soil activity, which influences the plant growth. Due to the great biodiversity, particularly concerning the animals and microbes that depend on the litter and soil properties, it is necessary to choose some specific taxonomic groups that present ecological diversity to perform an investigation about the consequences of the imposed drought upon the fauna (Di Castri et al. 1992). Therefore, our research was directed to the study of the litter spider fauna and aimed to obtain experimental evidence concerning the soil organic matter decomposition change and its relationship with fauna modification, emphasizing its ecological, biological, and climatological implications. Adis et al. (Adis et al. 1987), in their study about implications of irregular rain regime patterns on insect distribution in a tropical rainforest, observed that during dry periods the occurrence of arthropods in the soil is less than that compared with rainy periods.

The aim of our investigation is to improve the understanding of spider community shifts under dramatic drought conditions in a tropical rainforest, a subject related with global climatic change research (Davidson and Artaxo 2004). Concurrent with the tracking of physicochemical changes in the study area, we also tracked changes in incidence and abundance of litter spiders, which play important roles in the maintenance of the ecological balance in terrestrial ecosystems. The spiders are one of the major components of predatory fauna, capturing a substantial fraction of the insects in lower trophy levels (Wise 1993). Bultman and Uetz (Bultman and Uetz 1982) stressed that the soil and litter fauna are responsible for the regulation of organic decomposition processes by acting on energy flows and nutrient cycles. According to Höfer et al. (Höfer et al. 1996), the litter constitutes the basis of the food chain in forested ecosystems. Litter spiders integrate the soil macrofauna and are considered the most important predators in this habitat (Wolters 2000; Lavelle and Spain 2001). The most frequent diet items are the phytophagic or decomposer mesofauna components, such as Collembola and Acari (Foelix 1996; Lavelle and Spain 2001).

2. Materials and methods

2.1. Site description

The Ferreira Penna Scientific Station is located in the Caxiuanã national forest, in Melgaço, Brazil, which is 350 km west from Belém, Para, Brazil. The region is covered by terra firma forest, one of the most representative natural ecosystems in the Amazon region. The soil is classified as a Yellow Latosol (Oxisol in U.S. Department of Agriculture soil taxonomy), but has a laterite layer approximately 2–4 m below the surface. It varies from well drained to very well drained, with a texture variation from sandy to clayey (Ruivo and Cunha 2003). The mean annual rainfall is 2500 mm; the canopy height is 35 m with an aboveground biomass of 200 m^3 ha^{-1} (Lisboa and Ferraz 1999). The region is a tropical rain forest with a climate with only two months of precipitation below 60 mm (October and November). The mean annual temperature is 26°C (Sudam 1973).

The control (site A) and treatment (site B) plots are at 25-m elevation and have a sandy texture. The long time measurements of soil properties began in 2001, while the faunistic inventory began in 2002.

2.2. Sampling and field processing

Before the control and treatment plots (1 ha) were demarcated and prepared for the water exclusion experiment, the following pretreatment, "calibration" measurements were made in the soil of both plots. Soil samples in all sites were taken using an auger at depths 0–20, 20–40, 40–60, 60–190, 190–260, 260–400, and 400–500 cm. The soil morphological characteristics of texture, structure, porosity, color, and drainage all were made in the field. The soils were pulverized to < 200 mesh and analyzed for physicochemical parameters. The occurrence of fungi and bacteria were detected in the soil under 0–5-cm depth.

2.3. Physicochemical and micromorphological analysis

Soil pH in water and organic carbon (OC) were determined by potentiometry and the Walkley–Black method, respectively. The standard Kjeldahl method and colorimetric method were followed to measure nitrogen and phosphorus. The concentrations of Ca, Mg, and Al were determined by atomic absorption spectrometry. The granular fractionation of soil into silt, clay, and sand fractions was determined by the gravimetric method. Soil samples were studied for their micromineralogy and micromorphology using scanning electron microscopy. Carbon contents (kg C kg^{-1} soil) were converted to mass carbon per volumetric unit of soil (kg C m^{-2}) using bulk density values and layers thickness.

2.4. Microbiology analysis

The number of bacteria and fungi was determined for the former's units of colonies, using the "pour plate" technique of counting in Petri dishes with assistance from the Colonies Counter CP-602. The predominant colonies were isolated and then microscopic preparations were made to study morphological characters in optical microscopy.

2.5. Litter spider fauna

Four expeditions were made to the study area in the second year after the ESECAFLOR experiment started, two during the dry season and two during the rainy season. In each expedition, 20 litter samples were collected from treatment and control plots, totaling 160 samples. Each sample comprised litter and superficial soil from a 1-m^2 area, and the material retained on a 0.5-mm sieve was collected. Another four soil samples (10 cm in diameter × 10 cm deep) were collected simultaneously in order to measure the soil residual humidity. The animals in each litter sample were segregated by Winkler extractors. The adult spiders were sorted and identified by species or morph species. The vouchers were deposited in the Arachnida collection of Museu Paraense Emílio Goeldi (MPEG).

2.6. Statistical methodology

The comparison of the fauna composition among the sampling sites was made by percentage complementarily (Colwell and Coddington 1994). The observed diversity in each plot was described by the Simpson's index (Moreno 2001). Both calculations were made using the computer program "EstimateS" 5.0 (Colwell 1997).

The difference between the spider abundances among samples was tested by the Mann–Whitney *U* test using SYSTAT 10.2 (Wilkinson 1990). The correlation between soil residual humidity and litter spider abundance was tested by linear regression, also in SYSTAT 10.2.

3. Results

3.1. Soil chemical and textural composition

The observation and sample were made from 0–500-cm depth (Table 1). The soils, classified as Yellow Latosol, presented in A, B, and C horizons, are very well drained. The variation in the physical and chemical properties between sites A and B was small. The clay concentration of sites A and B varied from 160 to 373 g kg^{-1} and from 76 to 260 g kg^{-1}, respectively. The highest concentrations of OC (9.55 g kg^{-1}) and N (0.40 g kg^{-1}) are in the topsoil in site A. In site B the highest

Table 1. Granulometric and chemical analysis of soil at sites A and B localized in Scientific Station Ferreira Penna. (The observations are the mean values of the four profiles.)

Profile (cm)	Site A								Site B							
	Sand	Silty	Clay	N	C	P	S	CEC	Sand	Silty	Clay	N	C	P	S	CEC
	g kg^{-1}				Mg dm^{-3}		cmol$_c$ dm^{-3}		g kg^{-1}				Mg dm^{-3}		cmol$_c$ dm^{-3}	
0–20	740	100	160	0.40	9.55	5.05	0.80	4.50	836	67	97	0.33	4.47	8.49	0.83	5.28
20–40	675	102	223	0.39	6.20	2.46	0.67	4.24	727	100	173	0.30	3.73	3.42	0.85	5.11
40–60	708	50	242	0.38	3.25	2.22	0.64	3.10	720	80	200	0.36	2.05	0.91	0.74	3.83
60–190	565	62	373	0.37	2.78	1.64	0.70	2.26	648	92	260	0.32	2.40	0.79	0.64	3.24
190–260	642	93	265	0.32	1.68	0.87	0.58	2.30	666	85	249	0.30	2.58	1.76	0.74	2.47
260–400	735	80	185	0.31	3.02	0.98	0.70	2.87	745	75	190	0.28	3.22	1.78	0.70	2.36
400–500+	652	106	242	0.36	2.50	1.35	0.70	1.53	857	67	76	0.52	3.10	1.06	0.71	1.51

concentrations are S (0.83 cmolc dm^{-3}) and CEC (5.28 cmolc dm^{-3}). The highest P concentration (8.40 mg dm^{-3}) was found in the topsoil of site B.

3.2. Soil micromorphology

Figures 1a and 1d show scanning electron microscopic images of the investigated soils. The mineralogy was similar for all soils and consists predominantly of kaolinite in the clay fraction and quartz in the sand fraction, showing connection between macropores and organic matter. The soil in sites A and B are macro-aggregated, and show large pores and a higher porosity, probably due to the presence of the organic matter and sandy texture (Figures 1a and 1c). The soil in the depths shows small pores, many micro-aggregates, and has clay texture and moderate porosity (Figures 1b and 1d).

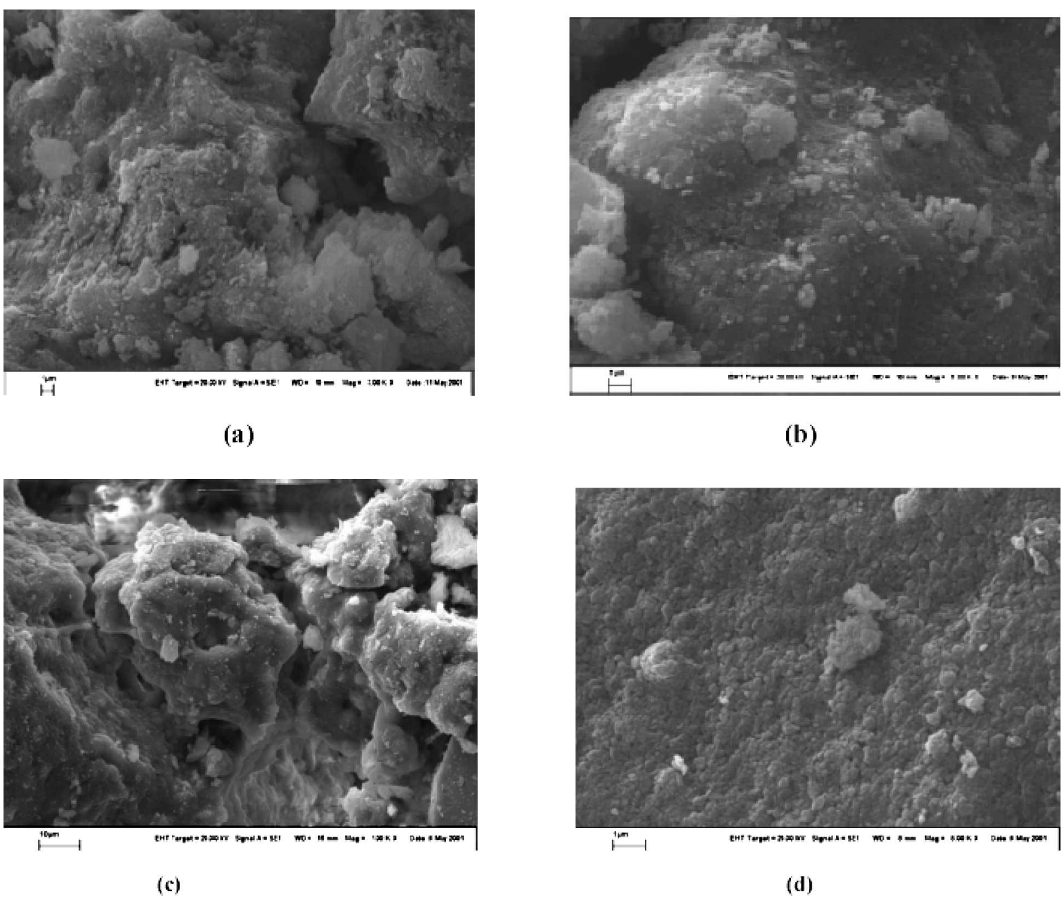

Figure 1. Scanning electronic microscopic image of the topsoil: (a) sandy soil, macro-aggregation, more large pores, good porosity, and kaulinitic; (b) clayey soil, small macro-aggregation, good porosity, and kaulinitic; (c) sandy soil, macro-aggregation, more large pores, good porosity, and kaulinitic; and (d) clayey soil, micro-aggregation, more small pores, moderated porosity, and kaulinitic.

3.3. Soil correlations

In sites A and B, OC was significantly positively correlated with all chemical characteristics except for pH, where a nonsignificant relation was observed (Tables 2 and 3). In the A and B sites, OC was significantly negatively correlated with all characteristics, except for the coarse sand content where a significantly positive correlation was observed. The positive correlations between OC, acidity, and pH are due to the fact that the soil organic matter is the dominant source of acidity in highly weathered tropical soils. Organic carbon and exchangeable phosphorus were found. For sites A and B, all chemical characteristics were positively correlated to nitrogen, except for pH.

3.4. Relationship of soil properties with microbial community

Total bacteria and fungi ranged from 14.8 to 46.0 × 10^6 cells per gram of soil and 2.2 to 4.8 × 10^6 cells per gram of soil, respectively, and bacteria predominated in all sites, but according to statistical analyses, the sites did not have significant differences for fungus and bacteria (Table 4).

3.5. Litter spider fauna

In the control and treatment plots, a total of 374 adults (among 1126 individuals) belonging to 86 species were collected. The percentage complementarity between the samples of both plots was 63%, which means that the spider composition in these site overlaps is only 37%.

The summary values of the observed diversity are depicted in Table 5. The largest number of adults and species, as well as the largest number of rare species

Table 2. Correlation coefficients from chemical and textural characteristics in site A. Here, $H^+ + Al^{3+}$: hydrogen + aluminum; Al^{+3}: exchangeable aluminum; OC: organic carbon; N: nitrogen; C/N: carbon/nitrogen ratio; Ca^{2+}: exchangeable calcium; Mg^{2+}: exchangeable magnesium; P: phosphorus; FS: fine sandy; CS: coarse sandy; SIL: silt; and CL: clay.

	pH_{H2O}	H^++Al^{3+}	Al^{3+}	OC	N	C/N	Ca^{2+}	Mg^{2+}	P	FS	TS	SIL	CL
pH_{H2O}	1												
H^++Al^{3+}	0,45[a]	1											
Al^{3+}	−0,29[a]	0,73[b]	1										
C	0,19[a]	0,88[b]	0,80[b]	1									
N	−0,02[a]	0,77[b]	0,84[b]	0,98[b]	1								
C/N	0,28[a]	0,94[b]	0,79[b]	0,99[b]	0,94[b]	1							
Ca^{2+}	0,55[c]	0,98[b]	0,63[b]	0,77[b]	0,63[b]	0,85[b]	1						
Mg^{2+}	0,48[a]	0,95[b]	0,66[b]	0,71[b]	0,58[c]	0,80[b]	0,99[b]	1					
P	0,37[a]	0,99[b]	0,77[b]	0,84[b]	0,74[b]	0,90[b]	0,98[b]	0,98[b]	1				
FS	−0,03[a]	−0,67[b]	−0,70[b]	−0,94[b]	−0,97[b]	−0,88[b]	−0,51[c]	−0,43[a]	−0,60[b]	1			
TS	0,17[a]	0,96[b]	0,90[b]	0,90[b]	0,85[b]	0,94[b]	0,90[b]	0,90[b]	0,97[b]	−0,72[b]	1		
SIL	−0,09[a]	−0,48[a]	−0,45[a]	−0,11[a]	−0,02[a]	−0,22[a]	−0,60[b]	−0,71[b]	−0,60[b]	−0,21[a]	−0,53[c]	1	
CL	−0,23[a]	−0,97[b]	−0,86[b]	−0,88[b]	−0,82[b]	−0,93[b]	−0,93[b]	−0,93[b]	−0,99[b]	0,68[b]	−0,99[b]	0,56[c]	1

[a] Not significant.
[b] Significant at the 1% level.
[c] Significant at the 5% level.

Table 3. Correlation coefficients from chemical and textural characteristics in site B. Abbreviations are the same as in Table 2.

	pH_{H2O}	$H^{+}+Al^{3+}$	Al^{3+}	OC	N	C/N	Ca^{2+}	Mg^{2+}	P	FS	TS	SIL	CL
pH_{H2O}	1												
$H^{+}+Al^{3+}$	0,22[a]	1											
Al^{3+}	0,39[a]	0,87[b]	1										
C	0,43[a]	0,96[b]	0,95[b]	1									
N	−0,11[a]	0,93[b]	0,67[b]	0,80[b]	1								
C/N	0,48[a]	0,94[b]	0,96[b]	0,99[b]	0,75[b]	1							
Ca^{2+}	0,58[c]	0,89[b]	0,96[b]	0,98[b]	0,66[b]	0,99[b]	1						
Mg^{2+}	0,56[c]	0,90[b]	0,96[b]	0,98[b]	0,68[b]	0,99[b]	0,99[b]	1					
P	0,26[a]	0,98[b]	0,95[b]	0,98[b]	0,86[b]	0,97[b]	0,93[b]	0,94[b]	1				
FS	−0,16[a]	−0,73[b]	−0,94[b]	−0,80[b]	−0,56[c]	−0,82[b]	−0,81[b]	−0,81[b]	−0,85[b]	1			
TS	0,83[b]	0,46[a]	0,76[b]	0,68[b]	0,10[a]	0,73[b]	0,82[b]	0,80[b]	0,58[c]	−0,66[b]	1		
SIL	−0,94[b]	−0,38[a]	−0,64[b]	−0,61[b]	−0,02[a]	−0,66[b]	−0,76[b]	−0,74[b]	−0,47[a]	0,49[c]	−0,97[b]	1	
CL	−0,97[b]	−0,07[a]	−0,34[a]	−0,31[a]	0,29[a]	−0,37[a]	−0,49[c]	−0,47[a]	−0,15[a]	0,18[a]	−0,86[b]	0,94[b]	1

[a] Not significant.
[b] Significant at the 1% level.
[c] Significant at the 5% level.

(singletons and doubletons), occurred in the treatment plot (B). However, the control plot (A) presented the largest value of Simpson's index, indicating greater evenness in the sampled spider community in this plot. When considering all individuals collected, the treatment plot showed a higher value of relative abundance (721 specimens collected) than the control plot (405 individuals collected) (Figure 2). This difference is significant at $P < 0.05$ (Figure 3). The abundance of litter spiders is negatively correlated with moisture (Figure 3). Thus, the overall abundance decreases when soil residual humidity increases and vice versa.

4. Discussion

Average C stock for sites A and B and a comparison with results found in two other sites in Para are shown in Table 6. This response must be due to the different soil type occurring in Caxiuanã, which presents strong porosity. This may be due to the strong porosity of the Caxiuanã forest soil as the micromorphology can be know indirectly the volume of the pore of soil analysis visual in microscopy.

Micromorphological analysis can be used as a tool to deduce soil formation, natural transformation, and human-induced processes (Ruivo and Cunha 2003).

Table 4. The occurrence of fungi and bacteria in the soil under 0–5-cm depth in sites A and B in January 2000 and November 2002 (mean values × 10^6 cells per gram of soil). Mean values using the same characters are not different among them by the Tukey test with 5% significance.

	Fungi	Bacteria	Total	Fungi	Bacteria	Total
Sites	Jan 2000	Jan 2000	Jan 2000	Nov 2002	Nov 2002	Nov 2002
A	4.8a	46.0a	**50.8**	5.6a	1.9a	**7.5**
B	3.5a	14.8b	**18.3**	1.8b	1.8a	**3.7**

Table 5. Observed diversity of litter spiders in two sites of the ESECAFLOR experiment at the Ferreira Penna Scientific Station, Pará, Brazil.

Diversity observed	Control site	Treatment site
Number of samples	80	80
Number of individuals	405	721
Number of species	47	62
Number of adults	128	246
Simpson's index	28.12	20.97

The characterization of the soil pore system and the types of soil structure is very important. The pores are large and the structure blocks in the A and B sites, whereas micro-aggregation, small and the structure dense takes place in depth of the soil. The volume of air in the soil is variable within a site and is likely to vary considerably between sites, with soil type and with soil moisture status. The configuration of the pores in sites A and B influences water and CO_2 movement, biologic activity, and aeration of the soil. The conservation of the structure of the aggregation is responsible for maintaining high levels of soil organic matter and available nutrients in the soils (Ruivo and Cunha 2003; Glaser et al. 2003). The values of C stocks calculated for Caxiuanã are lower than those found in Paragominas, Brazil, by Trumbore et al. (Trumbore et al. 1995) and in the secondary forest in Igarape-Açu, Brazil, by Sommer et al. (Sommer et al. 2000). Large

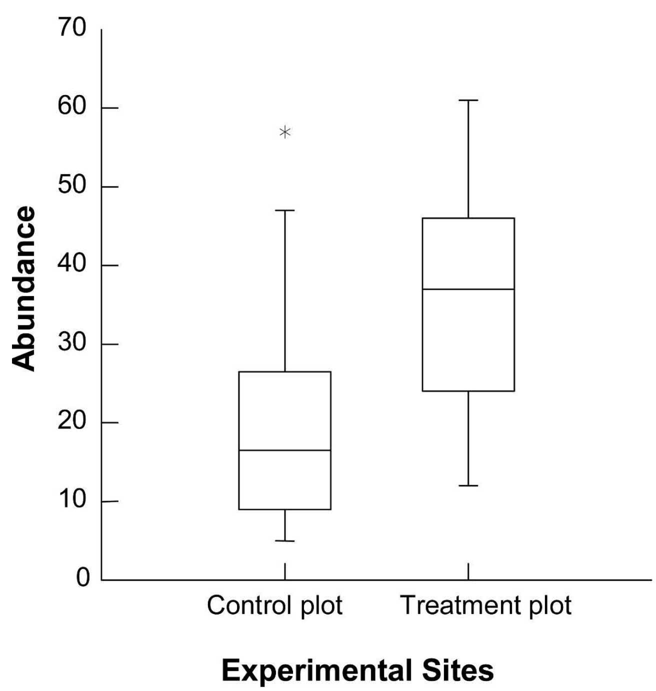

Figure 2. Abundance of litter spiders in the sites of the ESECAFLOR experiment at Ferreira Penna Scientific Station, Pará, Brazil (Mann–Whitney, $U = 87.500$, $P = 0.0023$).

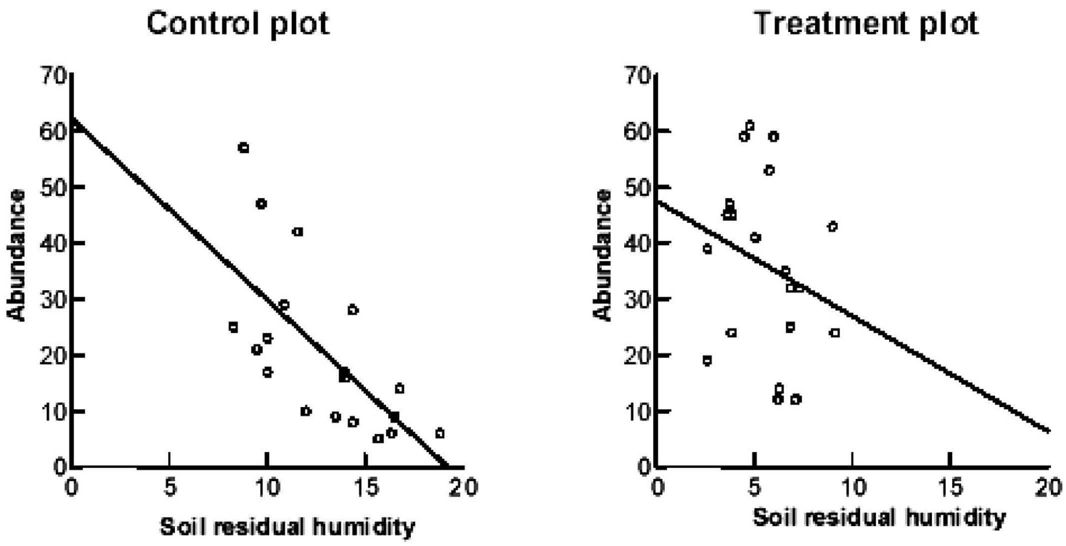

Figure 3. Relation between litter spider abundance and soil residual humidity in two sites the ESECAFLOR experiment at the Ferreira Penna Scientific Station, Pará, Brazil (linear regression: R^2 = 0.382, coefficient: −0.631, P = 0.001).

amounts of nonconsumed organic matter accumulated in the soil stimulate microbial activity, but these inputs may lead to accelerated mineralization of substances that are less resistant to degradation, and to enrichment of stable humic fractions and aromatic constituents (Zech et al. 1997).

In soils of the ESECAFLOR experiment the values of OC decreased gradually in depth at sites A and B. Ruivo et al. (Ruivo et al. 2004) attributed this to the drainage variation of these soils. Martins and Cerri (Martins and Cerri 1986) also found a discontinuity in the carbon distribution along the soil profile to be related to the drainage conditions in soils of a forest ecosystem in the Amazon region. A more uniform distribution of OC in the soil profile of A site also indicates better conditions of carbon cycling in the ecosystem.

The aim of this study, developed in Floresta Nacional de Caxiuanã, was to determine the total bacteria and fungi and to measure the relationship between this community and some soil physicochemical properties (C, N, P, Ca, Mg, K, Na, Al, pH, moisture, and clay) in order to obtain a preliminary survey of microflora in a

Table 6. Average C stock (kg C m^{-2}) for sites A and B and a comparison with results found in two other sites in Para by Trumbore et al. (Trumbore et al. 1995) in Prago-minas and Sommer et al. (Sommer et al. 2000) in Igarape-Acu.

Depth	A	B	Trumbore et al. (1995)	Sommer et al. (2000)
0–1 m	7.8	6.0	10.2	9.0
1–3 m	4.9	3.8	6.6	5.3
Total	12.7	9.8	16.8	14.3

natural upland forest in relation to soil properties. There was a negative linear relationship between the amount of micro-organisms and the soil respiration and a positive linear relationship between soil micro-organisms and soil moisture (Busetti et al. 2002). Soil is the foundation of the entire biosphere. In a biological and biochemical way, soil represents the most important complex interface for the global interchange of matter in energy (Filip 1995).

The largest values of species richness of the litter spider community were obtained in the treatment plot. However, the species richness is only one of the biological diversity components and must be correlated with diversity indexes that incorporate information from faunal uniformity (Moreno 2001). If only the species richness is considered as the measure of diversity, the litter spider community in the treatment plot must be regarded as more diverse than the one in the control plot.

Nevertheless, Simpson's index was higher in the control plot (28.12) than in the treatment plot (20.97). As this index is strongly influenced by the abundance of frequent species (Moreno 2001), the result suggests that the relative abundances in each plot are not evenly distributed and that some species are dominant in the treatment plot.

The greater abundance and richness of spider species in the treatment plot could be related to a putative reduction of the predatory pressure of vertebrates such as lizards, frogs, and birds (Wise 1993; Foelix 1996). In this case, these predators of spiders and other soil invertebrates would be more sensitive to the simulated climatic changes than their prey. It is also possible that the experiment is conditioning the increase of populations of spider prey, such as collembolan, mites, millipedes, and small insects. The test of this hypothesis will require a sampling design capable of recording the fluctuation in both predator and prey populations. On the other hand, the negative correlation between soil moisture and abundance of litter spiders seems to be a general trend at Ferreira Penna Scientific Station. Such a pattern was also observed in a larger sampling design, which included two plots located in the "Igapó" forest (J. A. P. Barreiros and A. B. Bonaldo 2004, unpublished data). This vegetative type is a kind of wet forest and is usually flooded in the rainy season (Lisboa et al. 1997). It is possible that the litter environment became hostile to small spiders, especially to the active running, as soil moisture accumulates.

5. Conclusions

Our dataset depicted some degree of variation in the soil texture, drainage, and porosity as well as in the distribution of organic carbon at different depths in the soil profile through the sites analyzed, but this variability is not explained by the conditions established in the experiment. Additional samplings may indicate that such variation in the monitored parameters is just a reflection of the great soil diversity in Caxiuanã. The data on litter spiders, while prejudiced by the lack of treatment replications, suggest that the samplings were done during a faunal transition in the treatment plot. If the experiment continues, it is possible that the complementariness between the plots will increase and the diversity patterns on both plots will reach a larger degree of divergence, with few abundant species in the treatment plot, in contrast to a rich and even community in the control plot.

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