

EARTHWORM ACTIVITY IN FOREST AND SAVANNA SOILS NEAR BOA VISTA, RORAIMA, BRAZIL.

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RESUMO — De maio a dezembro de 1992 a atividade das minhocas foi estudada como parte do Programa ECOFIT na região de Surrão a 30km de Boa Vista. Verificou-se a duração e quantificou-se essa atividade através da produção de excrementos na superfície do solo. Estabelecemos três transectos: um com 100m de comprimento na savana, outro com 40m na área de transição e um outro com 100m na floresta. Os animais foram coletados mensalmente ao longo dos transectos de acordo com o método proposto pelo TSBF e os excrementos foram coletados nos quadrados previamente colocados nos transectos. Duas espécies de minhocas foram encontradas nas três áreas: *Pontoscolex roraimensis* e *Pontoscolex corethrurus*. A primeira espécie depositava seus excrementos na superfície do solo. A estação chuvosa que normalmente ocorre de abril a agosto determinou a duração da atividade das duas espécies. Entretanto, 1992 foi atípico e a estação chuvosa só começou em maio. *P. roraimensis* produziu excrementos nas três áreas de maio a agosto entrando então em estivação. Na savana *P. corethrurus* entrou em estivação na mesma época mas permaneceu em atividade até novembro nas duas outras áreas. *P. roraimensis* foi encontrada a até 50m da borda da floresta sempre associada à presença de *Curatella americana* e *Byrsonima* sp, dois arbustos típicos da savana.

Palavras chave: minhocas, atividade de minhocas, Amazônia.

Estudo da atividade das minhocas em solo de floresta e de savana próximo de Boa Vista, Roraima, Brazil.

ABSTRACT — From May to December, 1992 we studied the earthworm activity, as part of the ECOFIT Program at Surrão (30km from Boa Vista), verifying the duration of the activity and quantifying it through the casts deposited on the soil surface. Three transects were established: a 100m long in the savanna, a 40m in the transitional area and 100m long in the forest. Specimens were collected monthly along the transects according to the method proposed by TSBF and the casts were collected from the squares previously placed on the transects. Two earthworm species were found in the three areas: *Pontoscolex roraimensis* and *Pontoscolex corethrurus*. The first species depositing its casts on the soil surface. Rainy season which usually occurs from April to August, determined the duration of activity for the two species (however, 1992 was atypical in that rainy season, only started in May). *P. roraimensis* produced casts in the three areas from May to August followed by aestivation. In the savanna, *P. corethrurus* started aestivation in the same period as *P. roraimensis* but remained active until November in the two other areas. *P. roraimensis* was found up 50m from the forest border, being associated to the presence of *Curatella americana* and *Byrsonima* sp, two typical savanna bushes.

Key-words: earthworms, earthworm activity, Amazonia.

INTRODUCTION

The State of Roraima is mostly covered by a vegetation mosaic of dense tropical rainforest and savanna. A vast contact area between these vegetation types (tran-

sitional area) occurs in the vicinity of the State capital, Boa Vista. Some researchers as AB'SABER (1966; 1973) have shown two interesting aspects of these vegetal formations. The first indicated that the forest seemed to advance onto the savanna, the

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latter representing a relict of a preterit period of dry climate. The other presents evidence that the savannas of Roraima are similar in their floristic composition to others found in other Amazonian localities and Central Brazil.

As a complement to the pedological studies of the ECOFIT Program, which investigates the first aspect through botanical, palinological and pedological studies, we propose to investigate the role of earthworms in the forest-savanna transitional soils, beginning by their activity study.

METHODOLOGY

A transect with 240m in length was established in the study area (Surrão, near Boa Vista), of which 100m were located in the savanna, 40m in the transitional area, and the remaining 100m in the forest. To quantify the activity of the earthworms we followed the method suggested by GUERRA (1988), using 50x50cm squares in the soil surface, eight in the savanna, four in the transitional area and eight in the forest. The casts produced into the squares were collected fortnightly and had their dry weight determined. The animals were quantified by the TSBF method (ANDERSON & INGRAM, 1989), used monthly with the same number of squares as for the casts. The earthworms were separated by species and state of development, counted and weighted.

RESULTS AND DISCUSSION

The study was realized from May to December, 1992. The chosen area is characterized by a tropical climate with a rainy season (from April

through August) and a dry season (September through March), with mean monthly temperature above 15° C. The relief is flat with altitudes between 100 and 130m and the soil is latosol yellow type (IBGE, 1991). The savanna vegetation is dominated by *Curatella americana* and *Byrsonima* sp, both shrubby, and by the grasses *Andropogon angustatus* and *Trachypogon plumosus*. The year of 1992 was atypical because the torrential rains started in May instead of April. Table 1 shows the rainfall and soil moisture data in the study period.

The two earthworm species found along the transect, *Pontoscolex roraimensis* and *Pontoscolex corethrus* (Glossoscolecidae), started their activity after the onset of the rains. The relationship between earthworm activity and rainfall had been observed for other tropical areas by GATES (1961), WATANABE & RUAYSOONGNERN (1984), GUERRA (1988), FRAGOSO & LAVELLE (1987) and GUERRA & SILVA (in press). Table 2 shows the monthly earthworm density and biomass during the study period. *P. corethrus* dominated in density, while *P. roraimensis* dominated in biomass. According to RIGHI (1990), *P. corethrus* is the most common earthworm species in Brazil, which conforms to our observed density data. GUERRA & SILVA (in press) working in three areas in Northeast Brazil (Mata Atlântica) verified that *P. corethrus* occurred in all areas and dominated in density in two areas and in biomass in all. The most part of *P. roraimensis* individuals occurred in the transition area,

Table 1. Rainfall (mm) and soil moisture in forest and savanna during the study period.

Site Month	Forest		Savanna
	Moisture	Rainfall	Moisture
Jan/92	-	0.0	-
Feb	-	74,6	-
Mar	-	24,6	-
Apr	-	96,8	-
May	5,4	118,2	10,5
Jun	10,1	227,5	18,1
Jul	9,0	295,4	15,2
Aug	4,5	155,4	11,9
Sep	1,8	10,6	5,8
Oct	1,6	4,0	3,4
Nov	1,7	21,8	1,8
Dec	-	3,0	-

Table 2. Density(D) in number of individuals/m², biomass(B) in g/m² of fresh weight and casts(C) production in g/m² along the study period.

Site Month	Savanna			Transition			Forest		
	D	B	C	D	B	C	D	B	C
May	7,9	3,7	115,0	13,0	7,5	143,1	15,0	6,2	83,1
Jun	3,5	3,3	50,0	6,5	5,5	60,9	3,9	2,4	62,1
Jul	22,5	8,8	40,7	33,4	12,0	167,1	19,3	12,6	77,2
Aug	7,1	2,7	17,9	43,3	21,1	144,0	26,8	11,8	100,0
Sep	-	-	57,9	3,5	0,3	134,4	12,6	1,5	128,7
Oct	-	-	-	2,4	0,3	-	6,7	0,9	-
Nov	-	-	-	12,1	2,3	-	23,7	5,6	-
Dec	-	-	-	-	-	-	-	-	-

followed by the forested area, and least in the savanna. In the latter its occurrence was restricted to a stretch 50 m distant from the margin of the forest, associated with the presence of *C. americana* and *Byrsonima* sp. Young individuals were observed from July on, in higher numbers than adults in all three areas. *P. corethrurus* presented the same spatial distribution pattern but young individuals predominated all along the study period.

Both *P. roraimensis* and *P. corethrurus* use aestivation strategy to cope with adverse conditions during the dry season, but apparently, *P. corethrurus* produces a great number of cocoons before entering aestivation. Cocoons were abundant along the study period. The higher biomass and density occurred in the transition area and forest (Tab. 2).

Apparently, *P. roraimensis* has narrower tolerance ranges for soil

moisture than *P. corethrurus*, as had been also observed to *Chibui bari* (Glossoscolecidae) in a study in Acre, Western Amazonia (GUERRA, in press). In the present study, as soon as the rains were over, all individuals entered in aestivation in depths around 40-50cm. In the savanna *P. corethrurus* had the same behavior, remaining active in the transition and forest areas through November.

The production of casts on the soil surface, exclusively by *P. roraimensis*, occurred from May to September, reaching 562,8Kg.ha⁻¹.yr⁻¹ in the savanna, 1.299,1Kg.ha⁻¹.yr⁻¹ in the transition and 903,2Kg.ha⁻¹.yr⁻¹ in the forest. This production of casts is low when compared with those of other tropical regions, but we must consider the short time span favorable to activity of this species in this region, which lasts five months at most.

Contrarywise to the observation of GUERRA (in press) for the casts of *C. bari*, which were predominantly claysh, those of *P. roraimensis* were essentially sandy. The earthworm casts were less abundant in the soil surface of the savanna than in the transition area and in the forest, but nevertheless formed the major layer of the superficial strata.

The great quantity of soil circulated by earthworm in the study area possibly contribute in the deposition of a layer of fine sand mixed with clay on the soil surface, specially that of the savanna, forming small islands around the individuals of *C. americana* and *Byrsonima* sp.

Finally, the role of the earthworm in the differentiation of soils in the forest-savanna transition should be better understood with further studies in pedology and earthworm activity.

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