

INVENTORY OF A MESOTROPHIC *CALLISTHENE* CERRADÃO IN THE PANTANAL OF MATO GROSSO, BRAZIL

V. L. M. S. GUARIM†, E. C. C. MORAES*, G. T. PRANCE‡
& J. A. RATTER§

This study treats some structural aspects of a population of *Callisthene fasciculata* (Spr.) Mart. growing on a ridge in the Pantanal of Poconé, in Mato Grosso State, Brazil. The project was carried out in 1ha of cerradão (savanna forest) at Fazenda Retiro Campo Largo, Poconé. *Callisthene fasciculata* is a common species in the cerradão. Formations of *C. fasciculata*, regionally denominated 'carvoeiro' and/or 'carvoal', occur frequently. This species is of economic importance because of its use for fence posts, charcoal and firewood. Data on its population structure were analysed and are presented based on the circumference class categories at breast height (cbh) and variation in height. The 869 individual trees in the sample hectare included 17 families and 33 species, and were dominated by the 229 individuals of *C. fasciculata*.

Keywords. *Callisthene fasciculata*, carvoeiro, cerradão, Pantanal, population structure.

INTRODUCTION

The Pantanal do Mato Grosso is a huge, low-lying floodplain covering an area of some 140,000km² in the basin of the Rio Paraguai. It consists of a mosaic of lakes, permanent swamps, seasonal swamps, and vast extensions of seasonally inundated grassy campos dotted with patches of slightly elevated ground (c.1–2m above the level of the campos) bearing forest and cerrado vegetation. These elevations, called cordilheiras, are not normally subject to inundation, and it is on them that the vegetation described in this communication grows. The Pantanal is a remarkable mixture of wet and dry vegetation and forms an area where four of the most important phytogeographic provinces of the South American continent meet: Amazon forest, cerrado, chaco and Atlantic Forest (Eiten, 1972). Prance (1989) in a study of South American phytochoria, considered the Pantanal as a vegetational mosaic formation.

There have been surprisingly few studies of the vegetation of the Pantanal considering its size and importance. Hoehne (1923), described the Pantanal briefly in a study of the vegetation of the State of Mato Grosso, and pointed out the diverse types of

* Programa POLONOROESTE – Ecologia Vegetal – Convênio CNPq/UFMT.

† Departamento de Botânica e Ecologia, Instituto de Biociências, Universidade Federal de Mato Grosso, 78.060–900, Cuiabá, Mato Grosso, Brazil.

‡ Corresponding author. School of Plant Sciences, University of Reading, Whiteknights, PO Box 221, Reading, RG6 6AS, UK.

§ Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, UK.

vegetation and the difficulty in distinguishing clearly between them. Veloso (1947) emphasized the diversity of the region, attempted to define the vegetational types in relation to water, and listed the species composition of each type, later intensifying his regional analysis of the vegetation and separating the qualitative variables of the environment (Veloso, 1972). Prance & Schaller (1982) gave a list of species of an area of the Pantanal and referred them to the following vegetation types: various types of flooded vegetation, gallery forest, semideciduous forest, and cerrado (Brazilian savanna). They also considered the distribution of endemic species. Pott *et al.* (1986) provided a habitat list of 601 species for Fazenda Nhumirim, a 4300ha ranch and research station lying in the south Pantanal, while Ratter *et al.* (1988) published surveys of cerrado and mesophilous forest in the same area and also near Poconé. Dubs (1992, 1994) also published detailed studies of cerrado and mesophilous forest in the south Pantanal, to the level of even dissecting out root systems on a cordilheira.

Ratter (1971) and Ratter *et al.* (1973, 1977) distinguished two principal types of cerradão¹, each with a distinct floristic composition. These were mesotrophic and dystrophic cerradões, the former on soils of higher pH and richer in nutrients, particularly calcium and magnesium, and the latter on poor dystrophic soil, low in nutrients and high in aluminium. These authors regarded *Callisthene fasciculata* and *Magonia pubescens* as indicator species of mesotrophic soils, and *Emmotum nitens*, *Scerolobium paniculatum* and *Hirtella glandulosa* as dystrophic indicators – in fact in Ratter *et al.* (1973) the terms used for mesotrophic and dystrophic cerradão were *Magonia pubescens/Callisthene fasciculata* cerradão and *Hirtella glandulosa* cerradão respectively. Prance & Schaller (1982) mentioned *C. fasciculata* as a species found in their study area in the south Pantanal, while Ratter *et al.* (1988) recorded it as an important species of an area of mesotrophic cerradão in the Pantanal of Poconé. In the latter region it frequently forms populations given the vernacular name of ‘carvoeiro’ or ‘carvoal’. Carvoeiro means ‘charcoal giver’ in Portuguese and Van den Berg (1986) mentioned the species as of economic potential especially for high-quality charcoal and firewood. Its hard timber is resistant to rot and thus is of great value as fence posts.

Callisthene fasciculata is an important and sometimes dominant species of the non-flooded ‘islands’ carrying arboreal vegetation, the so-called ‘cordilheiras’, in the Pantanal of Poconé, and as such it is important to study its part in community dynamics. Such research is relevant to the maintenance and conservation of the vegetation of which it forms a part. The present study considers aspects of the population structure of *C. fasciculata* with the objective of understanding the population dynamics of the woody vegetation of a cordilheira. Because the species is frequently used as an important indicator species of mesotrophic cerradão it seems particularly appropriate as a focus for such studies.

¹ Cerradão is the augmentative of cerrado, and is the name given to a dense savanna woodland; its plural is cerradões.

MATERIALS AND METHODS

Study area

This work was carried out at Fazenda Retiro Campo Largo on the Transpantaneira highway, near Poconé, Mato Grosso, situated at $16^{\circ}40'S$, $56^{\circ}45'W$ on private property (Fig. 1). The climate of the region, in the Köppen system, is CW Ometto (1981), which is hot and semihumid with a dry season of 4–5 months. The more important properties of the surface horizons of the soils are shown in Table 1. The dominant soils are dystrophic quartzite, red and yellow sand and hydromorphic podsol. Both types of soil are covered with cerrado or cerradão vegetation. The study area was a 'cordilheira' as defined by Amaral (1987) with long narrow slopes slightly elevated above the general landscape of the plain and bearing arboreal vegetation.

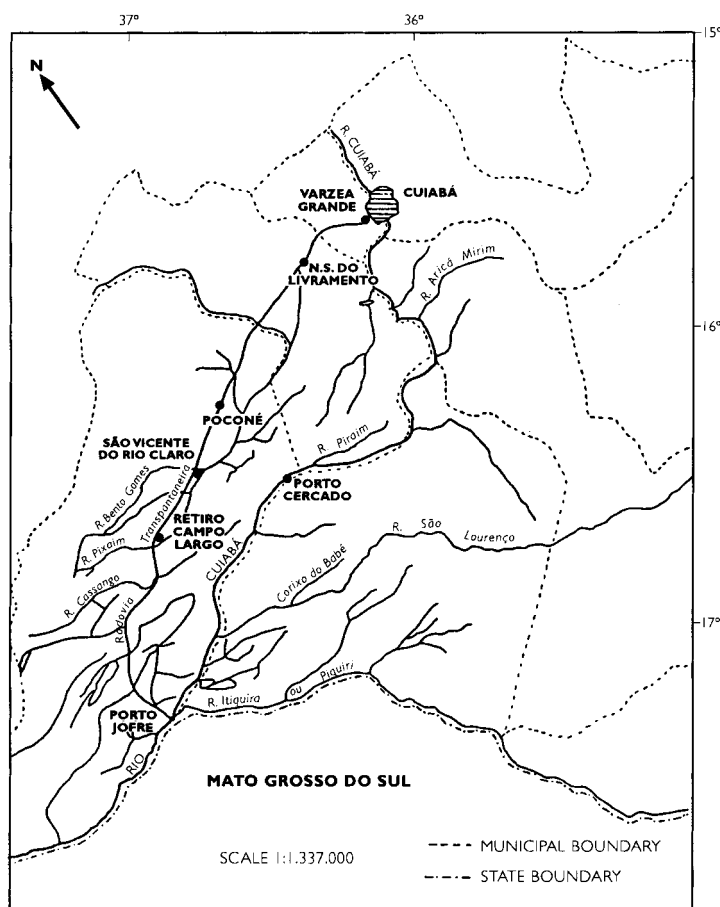


FIG. 1. Map of study area on the Transpantaneira highway, Poconé, Mato Grosso.

TABLE 1. Analytical data for surface horizons (0–20cm) of soils

Characteristics	Samples		
	A ₁	A ₂	A ₃
pH	5.8	5.7	5.8
P (ppm)	1.2	2.4	2.0
K (ppm)	64	84	118
C (%)	1.0	1.2	1.1
Ca + Mg (M.eg./100g)	2.4	7.3	5.4
Al (M.eg/100g)	5.7	1.8	2.2
Sand (%)	18	38	49
Silt (%)	30	30	21
Clay (%)	52	32	30

Analysis carried out by the Laboratory for the Analysis Chemistry and Physics of the Empresa de Pesquisa Agropecuária do Estado de Mato Grosso – EMPA/MT.

Method

An area of 1ha was subdivided into 10 × 10m plots. All individual trees of 10cm circumference or more at breast height (cbh) were measured. The trees were labelled and numbered and their height, local names and phenology were noted. Herbarium voucher specimens were collected and deposited in the herbarium of the Universidade Federal de Mato Grosso (UFMT).

The normal phytosociological parameters were calculated: frequency (F), relative frequency (RF), density (D), relative density (RD), dominance (DOM), relative dominance (R DOM), and importance value index (IVI) = RF + RD + R DOM.

RESULTS

The total number of individual trees found on the plot was 869 (= absolute density) while that of *C. fasciculata* was 229, giving a relative density of 26.35%. Absolute dominance (= basal area, all species) was 4.74m²/ha and the basal area of *C. fasciculata* was 1.11m²/ha, giving it a relative dominance of 23.44%. Absolute frequency was 61% and the relative frequency of *C. fasciculata* 12.8%. Importance value indices are given for all species in Table 2; that for *C. fasciculata* is 62.63, by far the highest for any species in the community. Figure 2 shows the number of individuals found in each family: a total of 869 belonging to 33 species, 28 genera, and 17 families.

A histogram of circumferences (Fig. 3) shows that the majority of individuals (54) were in the smallest class (10–19.9cm), and the histogram of heights (Fig. 4) shows that a large number of individuals were small, concentrating in the 6–7m class, where 44 individuals were found. Figure 3 shows a marked reduction in the circumference classes above 30–39.9cm, probably indicating that individuals of greater girth have at some time been felled because they have great economic value in the region.

TABLE 2. Importance Value Index (IVI) of the species in an area of 1ha of a 'cordilheira' of the Pantanal of Poconé

	Family	IVI
<i>Callisthene fasciculata</i> (C.K. Spreng.) Mart.	<i>Vochysiaceae</i>	62.63
<i>Magonia pubescens</i> A. St. Hil.	<i>Sapindaceae</i>	23.27
<i>Aspidosperma cylindrocarpon</i> Müll. Arg.	<i>Apocynaceae</i>	20.76
<i>Myracrodruon urundeuva</i> Fr. Allem.	<i>Anacardiaceae</i>	20.51
<i>Pseudobombax marginatum</i> (A. St. Hil., A. Juss. & Cambess.) Robyns	<i>Bombacaceae</i>	20.50
<i>Astronium fraxinifolium</i> Schott	<i>Anacardiaceae</i>	18.95
<i>Anadenanthera</i> sp.	<i>Leguminosae, Mim.</i>	16.26
<i>Tabebuia aurea</i> Benth. & Hook.	<i>Bignoniaceae</i>	15.74
<i>Tabebuia impetiginosa</i> (Mart.) Standl.	<i>Bignoniaceae</i>	15.34
<i>Lafoensia pacari</i> A. St. Hil.	<i>Lythraceae</i>	14.32
<i>Dipteryx alata</i> Vogel	<i>Leguminosae, Pap.</i>	12.03
<i>Terminalia brasiliensis</i> Eichler	<i>Combretaceae</i>	8.96
<i>Dilodendron bipinnatum</i> Radlk.	<i>Sapindaceae</i>	6.40
<i>Machaerium hirtum</i> (Vell.) Steff.	<i>Leguminosae, Pap.</i>	5.85
<i>Anadenanthera colubrina</i> (Vell.) Brenan	<i>Leguminosae, Mim.</i>	4.94
<i>Hymenaea stigonocarpa</i> Mart. ex Hayne	<i>Leguminosae, Caes.</i>	4.32
<i>Linociera hassleriana</i> (Chodat) Hassler	<i>Oleaceae</i>	3.97
<i>Luehea paniculata</i> Mart.	<i>Tiliaceae</i>	3.72
<i>Tabebuia roseo-alba</i> (Ridley) Sandw.	<i>Bignoniaceae</i>	3.52
<i>Sclerolobium paniculatum</i> Vogel	<i>Leguminosae, Caes.</i>	3.04
<i>Cordia glabrata</i> (Mart.) A. DC.	<i>Boraginaceae</i>	2.73
<i>Curatella americana</i> L.	<i>Dilleniaceae</i>	2.22
<i>Aspidosperma tomentosum</i> Mart.	<i>Apocynaceae</i>	2.00
<i>Cordia</i> sp.	<i>Boraginaceae</i>	1.83
<i>Hymenaea courbaril</i> L.	<i>Leguminosae, Caes.</i>	1.15
<i>Rhamnidium elaeocarpum</i> Reiss.	<i>Rhamnaceae</i>	1.00
<i>Jacaranda cuspidifolia</i> Mart.	<i>Bignoniaceae</i>	0.70
<i>Aspidosperma</i> sp.	<i>Apocynaceae</i>	0.46
<i>Genipa americana</i> L.	<i>Rubiaceae</i>	0.44
<i>Byrsonima sericea</i> A. DC.	<i>Malpighiaceae</i>	0.42
<i>Faramea</i> sp.	<i>Rubiaceae</i>	0.33
<i>Acacia</i> sp.	<i>Leguminosae, Mim.</i>	0.33
<i>Casearia sylvestris</i> Sw.	<i>Flacourtiaceae</i>	0.33

DISCUSSION

The importance of *C. fasciculata* in mesotrophic areas of cerrado has been stressed in various papers, e.g. Ratter (1971), Ratter *et al.* (1973, 1977), and it is an indicator species for this type of vegetation. The data obtained in this study confirm the importance and abundance of this species in mesotrophic cerrado. *Magonia pubescens*, with an importance value of 23.27, is also an important component of this vegetation, confirming the opinion of Ratter (1971) and Ratter *et al.* (1973, 1977),

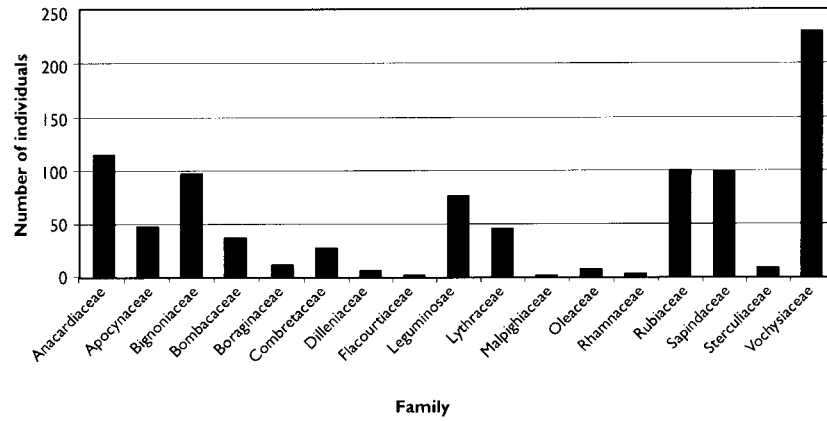


FIG. 2. Distribution of number of individual trees per family in 1ha of cerrado.

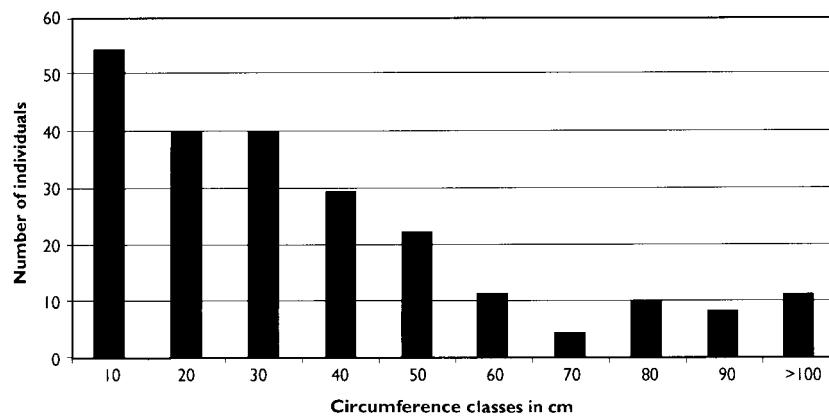


FIG. 3. Circumference classes of trees of *Callisthene fasciculata* in 1ha study plot.

who pointed out both the importance and abundance of this species in mesotrophic cerrado.

There is a very close resemblance in floristic composition between our area and that studied by Ratter *et al.* (1988) situated in the Pantanal of Poconé about 25km distant. At least 13, and probably 15, of the 18 species recorded by Ratter *et al.* (1988), who used a smaller sampling area and a larger cbh qualifying size than ourselves, are in common with our study area. All of these are indicators of mesotrophic soils. Cerradão of the type we have studied is undoubtedly widespread in the Pantanal of Poconé where the cordilheiras are extremely important for sheltering wildlife, particularly during the rainy season when much of the rest of the area is inundated. Like so much of the Central West of Brazil, cordilheiras are extremely endangered by agricultural development and it is particularly important that studies

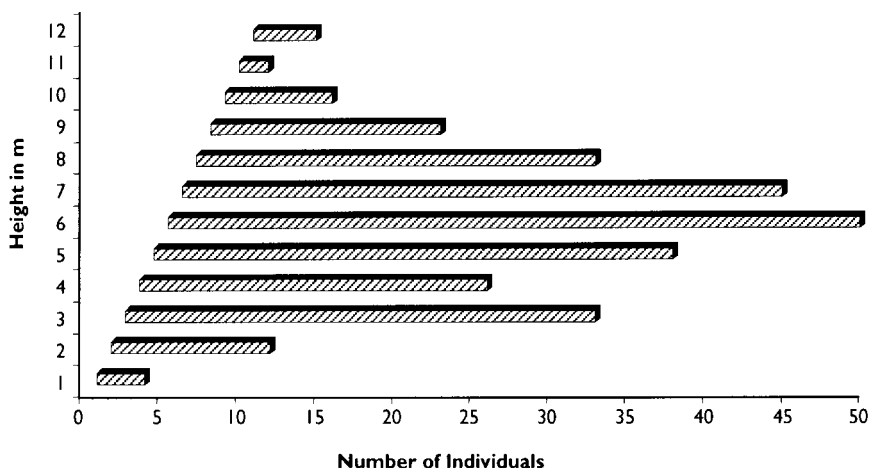


FIG. 4. Height classes of trees of *Callisthene fasciculata* in 1ha study plot.

of population dynamics should be made to aid their conservation, and where necessary, reforestation.

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