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A preliminary list of the Herpetofauna from termite mounds of the cerrado in the Upper Tocantins river valley

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ABSTRACT

Termite mounds are known to offer refuge and microhabitats to a great variety of invertebrates and vertebrates. In the valley of the upper Tocantins River, within areas of influence of hydroelectric power plants 4,000 termite mounds were surveyed to evaluate the diversity of amphibians and reptiles using these environments. Surveys in termite mounds from two other areas (Corumbá River and Araguaia River basins) were used for comparative purposes. The results for termitaria in the upper Tocantins river valley revealed nine families, 13 genera, and 25 species of amphibians, and 16 families, 32 genera, and 47 species of squamate reptiles. Compared to a general herpetofaunal list of the region, the data indicate that between 30.6% and 56.8% of the species use termitaria.

Keywords: Amphibians; Reptiles; Termite Mounds; Cerrado.

INTRODUCTION

Termite mounds, or termitaria, are a distinctive component to the landscape of a variety of habitats worldwide, particularly xeric biomes and provide refuge for smaller animals via physical cover and in maintaining more constant internal humidities and temperatures than the surrounding environment (Pomeroy & Service, 1986). In African woodland habitats, termite mounds add to the heterogeneity and complexity of the environment, increasing both biodiversity and environmental carrying capacity (Flemming & Loveridge, 2003).

Worldwide, herpetofauna have been linked to termite mounds through a number of non-mutually exclusive associations: (1) by living permanent or temporarily in termitaria, (2) by breeding within or on them, or (3) by frequenting the mounds to feed on termites and other invertebrates living there (*e.g.,* Magnusson *et al.,* 1985; Murray & Schramm, 1987; Ehmann *et al.,*

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1991; Wikramanayake & Dryden, 1993; Griffiths & Cristian, 1996; Gandolfi & Rocha, 1998; Carter, 1999; Peña, 2000; Flemming & Loveridge, 2003).

The Cerrado of Brasil is a seasonally xeric tropical savannah peppered with termite mounds and accommodates 23% of all known Neotropical termite species (Brown, 1996; Raw, 1998; Cavalcanti & Joly, 2002 (and sources therein)), several of them being mound building (Domingos & Gontijo, 1996; Peña, 2000). Mounds often accommodate complex invertebrates assemblages including: multiple termite species – ranging as high as 14 species in one mound (Domingos & Gontijo, 1996), ant colonies (Mill, 1981), scorpions (Lourenço, 1975), spiders (Lourenço, 1978), beetles and their larvae (Bechara *et al.,* 1999), as well as opilionids, mites, and often dense populations of roaches (Blatodea) (pers. obs.). These resources increase the attractiveness of termite mounds to herpetofauna, particularly to ant and termite specialists. The protective environment inside of a mound is likely another attractive feature. Furthermore, considering that the Cerrado can experience temperature swings exceeding 35°C within a twenty-four hour window (Baptista, 1998). For these reasons, we initially hypothesized that the herpetofauna of termite mounds is diverse.

In accordance with Brazilian law, hydroelectric power companies must pay for pre-flood faunal surveys as well as for subsequent rescue programs to remove wildlife from flooded habitat upstream of hydroelectric dams. One year prior to the flooding of three power plant river valleys (Serra da Mesa, Cana Brava, and Corumbá IV) on the Tocantins and Corumbá Rivers of the Brazilian states of Goiás and Tocantins, we broke termite mounds open and took inventory of the wildlife in them.

Prior to and during the rescue programs, we compiled faunal lists for the habitats. When water impoundments flood habitat, nearly all terrestrial vertebrates are exposed, including fossorial and behaviorally cryptic species. These events provided opportunities to create thorough faunal lists for the affected regions. These lists were the material to which we compared our termite mound findings.

MATERIAL AND METHODS

Study Area

The collecting efforts were carried out in three sites under the direct influence of hydroelectric power plants (UHE) reservoirs included in environmental impact mitigation projects under our responsibility. All field work was done between 6 and 12 months prior to the filling of the reservoirs. The sites are located at the upper Tocantins River and included contiguous reservoir areas of UHEs Serra da Mesa (13°46'26"S and 48°20'33"W) and Cana Brava (13°21'45"S and 48°10'04"W). For comparative purposes we used the data from UHE Corumbá IV (16°19'38"S and 48°11'11"W) located on the upper Corumbá River valley a secondary tributary of the Paraná River and the data from a site at the Municipality of São Miguel do Araguaia (13°15'58"S and 50°09'17"W) on the Araguaia River valley in northwestern state of Goiás (Peña, 2000) (Figure 1).

Collecting

Termite mounds (TM) were opened using picks and shovels. A first cut was made on the upper base of a mound (surface level) pulling out the aerial part of the structure. From this point the site was excavated at a 20 to 30 cm out of the external limit of the mound till the loose soil was reached (Figure 2). A total of 4,530 TMs were examined as follows: a) UHE Serra da Mesa (SEM) – 2,500 TMs (July 1996); b) UHE Cana Brava (CAB) – 1,500 TMs (July 1999); c) UHE Corumbá IV (COR) – 350 TMs (July 2005); d) São Miguel do Araguaia (SMA) – 180 TMs (November 2000). All herpetofaunal specimens found within termitaria were collected and identified on the spot or in a laboratory facility of each UHE. Vouchers (UHEs Serra da Mesa, Cana Brava, and Corumbá IV) were deposited in the herpetological collection of the Centro de Estudos e Pesquisas Biológicas (CEPB) of the Universidade Católica de Goiás (UCG).

Data Analysis

Using complete faunal lists compiled from pre-flooding surveys for each power plant locality (SEM and CAB) (Silva Jr. *et al.,* 2005), we were able to compare our termite mound faunal lists and determine simple percentages of herpetofauna from each locality that inhabit termitaria. We also combine our list of herpetofauna with a list produced through an unpublished Master's thesis (Peña, 2000).

RESULTS

Reptile and amphibian specimens were found in both unused and active parts of termite mounds.

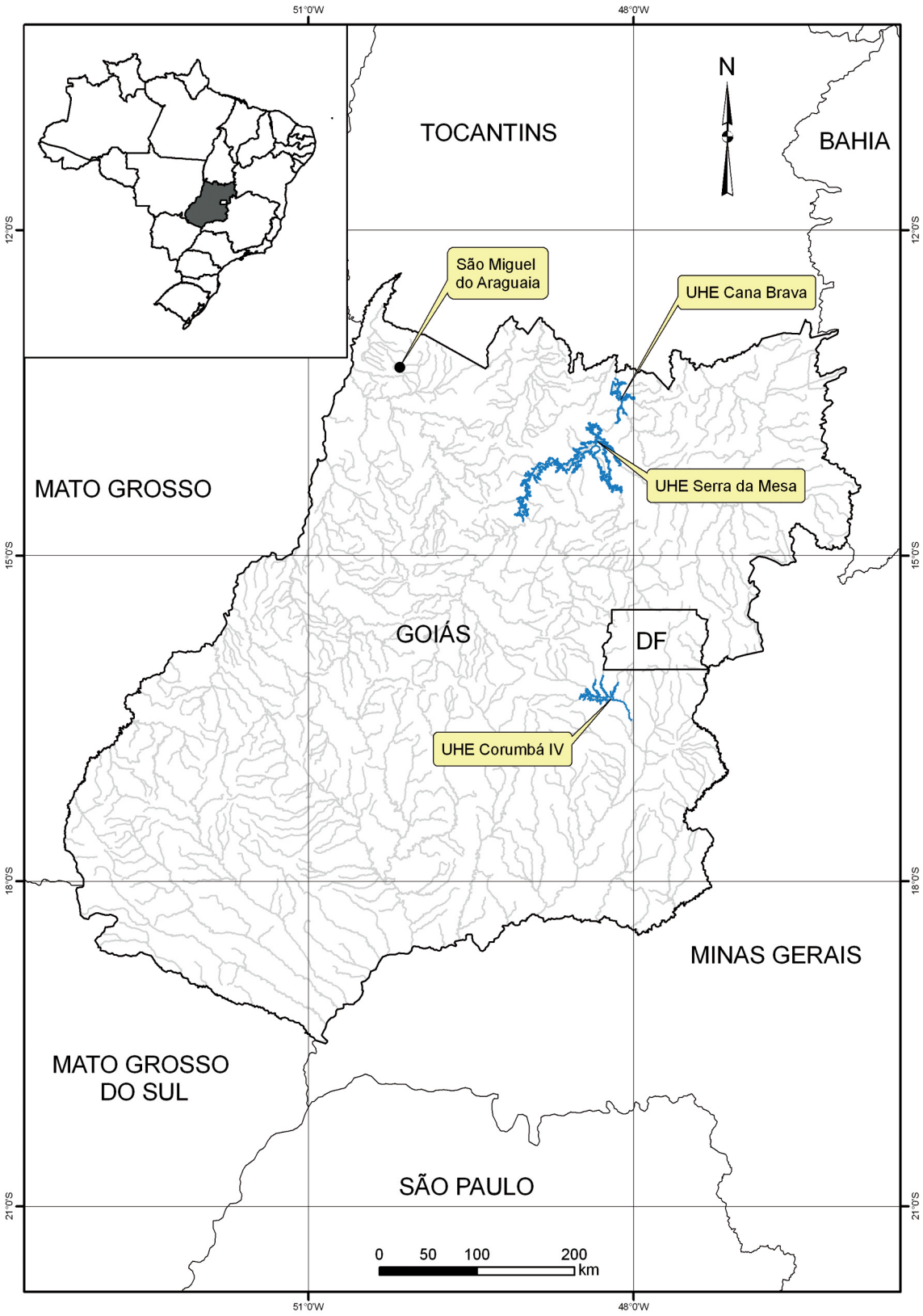

FIGURA 1: Collecting sites of termitaria in the State of Goiás.

FIGURA 2: Opening of a termite mound at Serra da Mesa site (Photo NJSJ).

At each location, a greater percentage of amphibians than reptiles were found to inhabit termitaria (60 to 85%). For the localities combined as the Upper Tocantins River Valley (Serra da Mesa and Cana Brava), 25 species of amphibians (one gymnophionan and 24 anurans), representing nine families and two orders, were recorded from termitaria. For Serra da Mesa we recorded 13 genera and 24 species, with seven exclusive species (*Hypsiboas raniceps, Leptodactylus martinezi, Leptodactylus petersii, Physalaemus centralis, Eupemphix nattereri, Allobates goianus,* and *Rhinella ocellata*), and for Cana Brava 10 genera and 18 species, with one exclusive species (*Proceratophrys goyana*). The site of COR listed four families, four genera, and five species with all species also found in the upper Tocantins river valley (UPT). At São Miguel do Araguaia, Peña (2000) listed five families, five genera, and five species, with one exclusive species (*Scinax rubra*) (Table 1).

From the same mounds, 49 squamate reptile species were recorded, representing 15 families. The UPT presented a total of 15 families, 32 genera, and 47 species, with a contribution of 45 species of SEM (17 exclusive: *Tupinambis merianae, Mabuya nigropunctata, Micrablepharus maximiliani, Apostolepis assimilis, Apostolepis flavotorquata, Apostolepis ammodites.,*

TABLE 1: Amphibian species from the termite mounds of the Upper Tocantins River Valley. Four localities are represented: SEM = Serra da Mesa: upper Tocantins River: Goiás: Brazil; CAB = Cana Brava: upper Tocantins River: Goiás: Brazil; UPT = Upper Tocantins River Valley (data combined); COR = Corumbá IV: Corumbá River: Goiás: Brazil; SMA = São Miguel do Araguaia: Araguaia River: Goiás: Brazil. Data from São Miguel do Araguaia is included from Peña (2000).

Order	Family	Genus and Species	Locality				
			SEM	CAB	UPT	COR	SMA
Anura	Hylidae	*Hypsiboas raniceps*	x		x		
		Scinax fuscovarius	x	x	x	x	
		Scinax rubra					x
		Scinax similis	x	x	x		
	Strabomantidae	*Barycholos ternetzi*	x	x	x		
	Leptodactylidae	*Leptodactylus martinezi*	x		x		
		Leptodactylus fuscus	x	x	x		
		Leptodactylus labyrinthicus	x	x	x		
		Leptodactylus mystaceus	x	x	x	x	
		Leptodactylus mystacinus	x	x	x		
		Leptodactylus ocellatus	x	x	x	x	x
		Leptodactylus petersii	x		x		
		Leptodactylus syphax	x	x	x		
	Leiuperidae	*Physalaemus centralis*	x		x		
		Physalaemus cuvieri	x	x	x	x	x
		Eupemphix nattereri	x		x		
	Cycloramphidae	*Proceratophrys cristiceps*	x	x	x		
		Proceratophrys goyana		x	x		
	Microhylidae	*Chiasmocleis albopunctata*	x	x	x		x
		Elachistocleis ovalis	x	x	x		
	Aromobatidae	*Allobates goianus*	x		x		
	Dendrobatidae	*Ameerega flavopicta*	x	x	x		
	Bufonidae	*Rhinella granulosa*	x	x	x		
		Rhinella ocellata	x		x		
		Rhinella schneideri	x	x	x	x	x
Gymnophiona	Caeciliidae	*Siphonops paulensis*	x	x	x		

TABLE 2: Reptile species from the termite mounds of the Upper Tocantins River Valley. Four localities are represented: SEM = Serra da Mesa: upper Tocantins River: Goiás: Brazil; CAB = Cana Brava: upper Tocantins River: Goiás: Brazil; UPT = Upper Tocantins River Valley (data combined); COR = Corumbá IV: Corumbá River: Goiás: Brazil; SMA = São Miguel do Araguaia: Araguaia River: Goiás: Brazil. Data from São Miguel do Araguaia is included from Peña (2000).

Order	Suborder	Family	Genus and Species	Locality				
				SEM	CAB	UPT	COR	SMA
Squamata	Amphisbaenia	Amphisbaenidae	*Amphisbaena alba*	x	x	x		
			Amphisbaena anaemariae	x	x	x	x	
			Amphisbaena fuliginosa	x	x	x	x	
			Amphisbaena mensae	x	x	x	x	
			Amphisbaena mertensii					x
			Amphisbaena vermicularis	x	x	x		
			Leposternon microcephalum	x	x	x		
	Sauria	Shaerodactylidae	*Coleodactylus brachystoma*	x	x	x		
		Phyllodactylidae	*Gymnodactylus carvalhoi*	x	x	x		x
		Teiidae	*Ameiva ameiva*	x	x	x	x	x
			Cnemidophorus ocellifer	x	x	x		
			Tupinambis quadrilineatus	x	x	x		
			Tupinambis merianae	x		x	x	
		Tropiduridae	*Tropidurus oreadicus*	x	x	x		
		Scincidae	*Mabuya bistriata*	x	x	x		x
			Mabuya frenata					x
			Mabuya nigropunctata	x		x		
		Gymnopthalmidae	*Micrablepharus atticolus*	x	x	x		x
			Micrablepharus maximiliani	x		x	x	
		Polychrotidae	*Anolis nitens*		x	x		x
	Serpentes	Colubridae	*Drymarchon corais*	x	x	x		
			Drymoluber brazili	x		x		
			Tantilla melanocephala	x		x		
		Dipsadidade	*Apostolepis ammodites*	x		x		
			Atractus albuquerquei	x	x	x		
			Atractus pantostictus	x	x	x		
			Clelia plumbea	x	x	x		
			Dipsas indica	x		x		
			Drymarchon corais	x		x		
			Drymoluber brazili		x	x		
			Erythrolamprus aesculapii	x	x	x		
			Leptodeira annulata	x		x		
			Liophis almadensis	x		x		
			Liophis poecilogyrus	x		x		
			Oxyrhopus rhombifer	x		x		
			Oxyrhopus trigeminus	x	x	x	x	
			Philodryas nattereri	x	x	x	x	
			Phimophis guerini	x	x	x		
			Pseudoboa nigra	x	x	x		
			Psomophis joberti	x	x	x		
			Rachidelus brazili	x		x		
			Tantilla melanocephala	x		x		
		Viperidae	*Bothrops moojeni*	x	x	x		
			Bothrops neuwiedi	x		x		
		Elapidae	*Micrurus frontalis*	x		x		
		Boidae	*Epicrates cenchria*	x		x		
		Anomalepididae	*Liotyphlops beui*	x	x	x	x	
		Leptotyphlopidae	*Leptotyphlops fuliginosus*	x	x	x		
		Typhlopidae	*Typhlops brongersmianus*	x	x	x		

Dipsas indica, Drymarchon corais, Leptodeira annulata, Liophis almadensis, Liophis poecilogyrus, Oxyrhopus rhombifer, Rachidelus brazili, Tantilla melanocephala, Bothrops neuwiedi, Micrurus frontalis, and *Epicrates cenchria*), and 30 species of CAB (two exclusive: *Anolis chrysolepis* and *Drymoluber brazili*). The site of COR listed eight species and Peña (2000) cited nine species for SMA (two exclusive: *Amphisbaena mertensii* and *Mabuya frenata*) (Table 2).

The data gathered from termitaria revealed a 56.8% similarity of amphibian and 50.0% of squamate reptile species compared to the known herpetofauna of the Upper Tocantins River Valley (Silva Jr. *et al.,* 2005). Separate termitaria data demonstrate a 54.5% similarity for amphibians and 45.9% for reptiles in SEM, and 40.9% for amphibians and 30.6% for reptiles in CAB compared to the same list. The low diversity recorded for COR and SMA is most probably a direct relationship to collecting efforts.

DISCUSSION

Our results suggest that termite mounds are important resources for significant portions of the herpetofauna of the upper Tocantins River Valley. They support our initial hypothesis that termite mounds would prove herpetologically diverse. Between 30% and 50% of the herpetofauna known from each of our study sites were also found in termite mounds. Future studies may demonstrate termite mounds are critical components to the environment in maintaining herpetological diversity.

There are species we predicted we would find in termite mounds which were conspicuously absent from our tallies at the end of the surveys. Among them was the microhylid anuran, *Dermatonotus muelleri.* This fossorial frog has an appropriate ecological niche for termite mound existence but was not encountered within termitaria.

Similarly there are several other species of amphibians and reptiles known for the region that might also use termitaria as a microhabitat but we were not able to confirm them and therefore suggest treating the results as preliminary.

RESUMO

Termiteiros são conhecidos por oferecer refúgio e micro habitats para uma grande variedade de invertebrados e vertebrados. Aproveitando trabalhos realizados na área de influência de usinas hidrelétricas no vale do rio Tocantins, inspecionamos avaliamos 4.000 termiteiros visando determinar os anfíbios e répteis que se utilizam desses ambientes. Resultados obtidos em duas outras áreas (bacias dos rios Corumbá e Araguaia) foram utilizadas como comparação. No vale do alto rio Tocantins nove famílias, 13 gêneros e 25 espécies de anfíbios e 15 famílias, 32 gêneros e 47 espécies de Squamata foram encontrados nos termiteiros. Esses dados indicam que entre 30.6% e 56.8% das espécies da herpetofauna utilizam termiteiros.

Palavras-chave: Anura; Gymnophiona; Squamata; Termiteiros; Cerrado.

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