

New records of Scarabaeinae (Coleoptera: Scarabaeidae) in a biogeographical transition zone in the state of Maranhão, Brazil

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ABSTRACT: In this study, we present the first record of *Ateuchus semicribratus*, *Canthon simulans*, *Canthon histrio*, *Dichotomius carinatus*, *Eurysternus caribaeus*, *Eurysternus nigrovirens*, and *Ontherus sulcator* (Coleoptera: Scarabaeinae) for the state of Maranhão, Brazil. These records expand the currently known geographical distribution of these species and contribute to the knowledge of dung beetles in northeastern Brazil.

The subfamily Scarabaeinae comprises approximately 234 genera and 7,000 species distributed worldwide (Schoolmeesters *et al.* 2013). For the Neotropical region, approximately 70 genera, and 1,250 species have been described (Hanski and Cambefort 1991). In Brazil, 618 species from 49 genera have been recorded until 2000, of which 323 were considered endemic (Vaz-de-Mello 2000).

In northeastern Brazil, approximately 15 studies have been published focused faunistic inventories and ecology of dung beetles (see Vieira and Silva 2012 and Lima *et al.* 2013). According to Vaz-de-Mello (2000), approximately 150 species have been recorded in northeastern Brazil. The states with fewer species recorded until 2000 were: Piauí (1), Sergipe (1), Alagoas (5), Paraíba (6), Maranhão (7), Ceará (8), and Pernambuco (12). Among these states, recent studies have added significant records for Alagoas, Maranhão, Paraíba, Pernambuco, and Piauí (Endres *et al.* 2005; 2007; Hernández 2005; 2007; Silva *et al.* 2007; 2010; Costa *et al.* 2009; Filgueiras *et al.* 2009; Gillet *et al.* 2010; Filgueiras *et al.* 2011; Liberal *et al.* 2011). However, in many phytophysiognomies of northeastern Brazil, no information on dung beetles is available (Vaz-de-Mello 2000; Vieira and Silva 2012).

In Maranhão, the richness, diversity, and geographic distribution of these beetles in different biomes are still poorly known. Although Maranhão comprises a large geographic area of 331.937,450 km² (IBGE 2013), distributed in a region characterized as a biogeographical transition zone between the Amazon, Caatinga, and Cerrado biomes (IBGE 1984), the number of species of dung beetles currently recorded (<20 species) does not reflect the richness of this group in such large area. For example, much smaller states as Rio de Janeiro (>137), São Paulo (>192) and Espírito Santo (>81) have much more species recorded (Vaz-de-Mello 2000). Clearly the low number of records for the state is due to an almost

complete lack of surveys. Gillet *et al.* (2010) published the first and only study known for Maranhão, presenting records based on a standardized faunal survey covering many states of northeastern Brazil. In that study, the authors added three new records for Maranhão. Also, the limited information available on dung beetles from this state has been published in some annals of congress or in specialized taxonomic literature.

In this study, we present the first record of the species *Ateuchus semicribratus* (Harold, 1868), *Canthon simulans* (Martínez, 1950), *C. histrio* (LePeletier and Serville, 1828), *Dichotomius carinatus* (Luederwaldt, 1925), *Eurysternus caribaeus* (Herbst, 1789), *E. nigrovirens* Génier, 2009, and *Ontherus sulcator* (Fabricius, 1775) for the state of Maranhão (Table 1). The dung beetles were collected during field research in the municipality of Itapecuru-Mirim (3°23'34"S, 44°21'32"W), northeastern Maranhão, between July and August 2010. These records extend the geographic distribution currently known for these species and contribute to the knowledge of the fauna of dung beetles of the northeastern Brazil.

Specimens were sampled in a region considered a biogeographical transition zone between the Amazon, Caatinga, and Cerrado biomes in northeastern Brazil (IBGE 1984) in two occasions: 18 July 2010, in fragments with predominance of palm trees (*Attalea speciosa* [Arecaceae]), and 31 August 2010, in forest fragments (Table 1). Specifically in our study site, the fragments with predominance of palm trees (babassu) are characterized by an open tropical forest rich in babassu, a typical landscape of the biogeographical transitional regions of northeastern Brazil (IBGE 1984), while forest fragments are characterized here by a mixed forest "open ombrophile forest and surrounded by Cerrado patches" (Campos *et al.* 2013).

Dung beetles were collected with pitfall traps with two

types of baits, cow dung or human feces. Specimens were identified by the third author. The collected material was deposited in the "Coleção de Referência de Escarabeíneos Neotropicais" - (CREN), Universidade Federal de Lavras.

The species *Ateuchus semicribratus* (Harold, 1868) was originally described based on a specimen from the state of Bahia. However, the study does not provide more specific information on the type locality. According to Vieira and Silva (2012), this species has been recorded in northeastern Brazil in Caatinga, Cerrado, Atlantic Forest, "Brejo de Altitude", and pastures in the states of Bahia, Paraíba, and Pernambuco. In the above mentioned study, all specimens were captured in pitfall traps baited with human feces, while no species were recorded in traps with decomposing cow spleen. This new record expands the geographical distribution of *A. semicribratus* by approximately 945 km northwest from the nearest occurrence record, São José dos Cordeiros (36°48'30"W, 7°23'26"S), Paraíba (unpublished data).

In the original description of *Canthon histrio* (LePeletier and Serville, 1828), the type locality reported for the species was "Brazil", without additional information. According to the literature, its distribution comprises Bolivia, Colombia, French Guiana, Paraguay, Peru, and Brazil (Blackwelder 1944; Medina *et al.* 2001). It is a species commonly found in Cerrado lowlands, open areas in the Amazon, forest borders, riparian forests and river beaches, small forest clearings, agricultural lands, bamboo forests, disturbed habitats, and rarely found in mature forest. Specimens were collected in pitfall traps baited with feces, carrion, in dead invertebrates and fungi. This new record expands its geographic distribution by 1,179 km east of the nearest occurrence record, municipality of Santarém (54°42'34"W, 2°27'30"S), Pará (unpublished data), and fills a gap between Pará and Pernambuco states.

The species *Canthon simulans* (Martínez, 1950) was described based on a specimen from Yavita (67°26'16"W, 2°55'40"N), state of Amazonas, Venezuela. Specimens have been recorded along the Amazon basin in the following countries: Bolivia, Colombia, Peru, Venezuela, and Brazil. The specimens were collected mainly with pitfall traps baited with human feces. This new record is 2,685 km east from the type locality and expands the geographic distribution by 974 km also east from the nearest occurrence record, region of Jari, municipality of Monte Dourado (52°30'44"W, 0°52'17"S), Pará (unpublished data). Currently, *C. simulans* comprises a species complex closely related and need of taxonomic revision. Thus, a taxonomic study can modify the geographic distribution mentioned to this species.

The species *Dichotomius carinatus* (Luederwaldt, 1925), was described based on two specimens from Pará and Amazonas (Manaus). This new record extends the geographic distribution in more than 300 km east from the nearest occurrence record, Pará (Luederwaldt 1929). Currently, the genus *Dichotomius* is being reviewed. Thus, more precise data on the sites of occurrence for this species will be available in the taxonomic review of the genus.

The species *Eurysternus caribaesus* (Herbst, 1789) was originally reported for the Caribbean region. However, the

neotype designated by L. Jessop in 1984 is from Cayenne "Cajennae" (52°19'34"W, 4°55'19"N), French Guiana. This is a common species with a broad distribution from Mexico to Argentina. In Brazil, most of the sites where it has been documented are areas of Amazon and Atlantic Forest (Génier 2009). This species has been documented in palm forest, primary and secondary forests, seasonally flooded forest, marsh forest, gallery forest, disturbed and seasonally flooded riparian forest, sandy substrate and cocoa plantations. According to the literature, species where captured with flight interception traps, pitfall traps baited human feces and wild animal dung (tapir, coati, howler and spider monkeys), as well as fish, frog, anteater, and mouse carrion (Génier 2009). This new record is 1,278 km southeast from the type locality and extends the geographic distribution by 598 km east from the nearest occurrence record, municipality of Tucuruí (49°41'19"W, 3°46'26"S), Pará (Génier 2009).

Eurysternus nigrovirens Génier, 2009 was described based on a specimen from Ybycuí (57°00'58"W, 26°00'51"S), Paraguay. Its distribution in South America comprises Argentina, Bolivia, Paraguay, Peru, and Brazil. The species has been documented in areas of Cerrado or more open habits of this biome, some areas of Atlantic and Amazon Forests. Specimens have been collected more frequently with pitfall traps baited with human feces. This new record is 2,847 km north from the type locality and expands the geographic distribution by 581 km northwest from the nearest occurrence record in the Serra da Capivara National Park (42°41'10"W, 8°52'25"S), São Raimundo Nonato, Piauí (Génier 2009).

Ontherus sulcator (Fabricius, 1775) was originally reported as Cayenne "Cajennae" (52°19'34"W, 4°55'19"N), French Guiana. It is considered a common species with a broad distribution in South America, and is found in ecosystems of Chaco, Cerrado, Pampa, Atlantic Forest, Amazon Forest and the region of the Guiana Shield (Génier 2009). It presents a generalist food habit, recorded mainly in pitfall traps baited with feces. According to Génier (1996), some specimens were collected in the Chaco and subtropical forests in cow dung in bamboo patches, in carrion, or with ultraviolet light traps or pitfall traps baited with feces. This new record is 1,282 km southeast from the type locality and expands the distribution in approximately 370 km northwest from the nearest occurrence record in northeast Pará state, with no precise data on the locality (Génier 2009).

Some of the species recorded in this study are typical of Cerrado ecosystems or open areas, such as *E. nigrovirens* and *C. histrio*, while others are associated with the Amazon Forest, such as *C. simulans* and *D. carinatus*, or have a broad distribution in different ecosystems, such as *O. sulcator* and *E. caribaesus*. The presence of species associated with the Cerrado and Amazon Forest biomes interacting in the same community has been described in other studies conducted in Maranhão (De Marco and Vianna 2005; dos Santos *et al.* 2012; Campos *et al.* 2013; Matavelli in press), supporting the hypothesis of a large and peculiar transitional zone, comprising the eastern Amazon to the central region of Maranhão (Ab'Saber 1989).

TABLE 1. New records of species of Scarabaeinae (Coleoptera: Scarabaeidae) in a biogeographical transition zone in the state of Maranhão, Brazil. FB: bovine feces; FH: human feces.

TRIBE	SPECIES	ENVIRONMENTS		BAT		ABUNDANCE
		PALM TREES	FOREST	FB	FH	
Ateuchini	<i>Ateuchus semicribratus</i>	0	3	0	3	3
Deltochilini	<i>Canthon histrio</i>	9	0	0	9	9
Deltochilini	<i>Canthon simulans</i>	33	0	2	31	33
Dichotomini	<i>Dichotomius carinatus</i>	5	5	0	10	10
Oniticellini	<i>Eurysternus caribaeus</i>	6	25	0	31	31
Oniticellini	<i>Eurysternus nigrovirens</i>	10	0	0	10	10
Coprini	<i>Ontherus sulcator</i>	26	14	0	40	40
	Total abundance	89	47	2	134	136
	Richness	6	4	1	7	

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