SCIENTIFIC NOTE

Occurrence of *Atta cephalotes* (L.) (Hymenoptera: Formicidae) in Alagoas, Northeastern Brazil

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Ocorrência de *Atta cephalotes* (L.) (Hymenoptera: Formicidae) em Alagoas

RESUMO - *Atta cephalotes* (L.) apresenta ampla distribuição na região Neotropical. No Brasil, foi registrada na região Amazônica e nos estados do Maranhão, Pernambuco e sul da Bahia, todos pertencentes à Região Nordeste. Neste trabalho é apresentado o registro de *A. cephalotes* em 42 remanescentes de Floresta Atlântica nordestina em Alagoas e Pernambuco. Os resultados incluem novos registros de *A. cephalotes* em Alagoas, ampliando a distribuição da espécie no Nordeste. Além disso, mostram que a espécie é fortemente associada a remanescentes de floresta bem conservados, indicando alta sensitividade a perturbações. É sugerido que, no cenário fragmentado da Floresta Atlântica nordestina, *A. cephalotes* pode estar sendo substituída por *A. sexdens* que esteve presente em todas as áreas amostradas.

PALAVRAS-CHAVE: Distribuição disjunta, Floresta Atlântica, formiga cortadeira, novo registro, substituição de espécies, taxon sensível a perturbações

ABSTRACT - *Atta cephalotes* (L.) presents a wide distribution in the Neotropical region. In Brazil, this species is disjunctly distributed in the Amazon region and in the states of Maranhão, Pernambuco and southern Bahia, all of which belong to Northeast Region. Here we report on a survey of *Atta* colonies in 42 remnants of the Atlantic rainforest in Alagoas and Pernambuco. Our results include new records of *A. cephalotes* in the state of Alagoas and thereby extend the known distribution area of its southern populations in Northeast Brazil. In addition, the species was strongly associated with well-conserved forest remnants, indicating that it is highly sensitive to disturbance. We suggest that, in the fragmented scenario of the northeastern Atlantic forest, *A. cephalotes* may be replaced by *A. sexdens*, which was present throughout all survey sites.

KEY WORDS: Brazilian Atlantic Forest, disjunct distribution, leaf-cutting ant, new record, species replacement, disturbance sensitive taxon

The genus *Atta*, together with the genus *Acromyrmex,* represents the true leaf-cutting ants, an ecological and taxonomic group exclusively restricted to the Neotropics. *Atta* ants are one of the major herbivores of tropical and subtropical America, cutting per year up to 13% of the standing leaf crop in a colony's territory (Wirth *et al.* 2003). Moreover, they are considered the principal pest of agro-ecosystems and reforested areas (Mariconi 1970, Anjos *et al.* 1993). Because of the damage they cause to agriculture and the conspicuousness of their nests, they certainly belong to the most studied insect species of the Neotropics. Yet, despite the wealth of knowledge available on leaf-cutting ants, there is still a lack of basic information, such as on the geographic distribution of some species (Teixeira *et al.* 2004). The species *Atta cephalotes* (L.) is known to have a wide and continuous distribution from Mexico to Bolivia (Kempf 1972). Nevertheless, in Brazil, existent data suggest a disjunct nature of its populations. According to Mariconi (1970) and Kempf (1972), this species occurs in the entire Amazon region and also in the states of Maranhão, Pernambuco and southern Bahia, all of which belong to Northeast Brazil. In this paper, we report the occurrence of *A. cephalotes* in

Alagoas, one of the two small states located between Bahia and Pernambuco.

Between 1999 and 2004, we surveyed a total of 42 remnants of Atlantic rainforest in Alagoas and Pernambuco for the presence of *Atta* colonies. The vegetation of these areas belongs to the Atlantic forest domain, ranging from lowland rain forest (< 100 m) to lower montane rain forest (100 – 600 m) (Veloso *et al*. 1991). Mean rainfall at all study sites ranges from 1240 mm to 2460 mm year $^{-1}$, with wet- and dry-season usually from April - October, and from November - March, respectively (Coutinho *et al*. 1998, Pimentel & Tabarelli 2004, Bieber *et al*. 2005). We collected major workers of *Atta* spp., which were identified following the keys provided by Mariconi (1970) and Fowler *et al.* (1993). Identification was subsequently confirmed by two specialists. Specimens were deposited in the collections of Laboratório de Invertebrados Terrestres da UFPE, Museu Nacional (Rio de Janeiro, RJ) and Centro de Pesquisas do Cacau (CEPLAC, Ilhéus, BA).

We recorded two *Atta* species, *A. sexdens* and *A. cephalotes*, that differed considerably in frequency of occurrence. *A. sexdens* was consistently present in all of the 42 forest remnants surveyed, whereas *A. cephalotes* occurred in only seven of these remnants - three in Alagoas and four in Pernambuco (Table 1). In Alagoas, we found *A. cephalotes* in the 3500-ha fragment of Coimbra (Usina Serra Grande), one of the largest remnants of Atlantic forest of the Pernambuco Center of Endemism, and in two smaller remnants called Aquidabam 1 and Aquidabam 2 in the close vicinity of Coimbra (ca. 300 m). In Pernambuco, we recorded *A. cephalotes* in four neighboring remnants (less than 50 m distance) of the Reserva Particular do Patrimônio Natural (R.P.P.N.) Frei Caneca – i.e., Quengo, Fervedouro, Ageró, and Espelho (see Table 1). All of these remnants where *A. cephalotes* was found, except Aquidabam 2, present well-conserved forests with the four strata characteristic of mature Atlantic forest (Pimentel & Tabarelli 2004, Bieber *et al*. 2005) and have previously been suggested as priority areas for Atlantic forest conservation (MMA 2002).

Our record brings to discussion three issues. Firstly, it reveals a serious lack of myrmecological studies in Alagoas, resulting in the fact that even after 500 years of colonization one of the most conspicuous ant species has been overlooked by scientists.

Secondly, it represents basic distributional data and thus contributes to the understanding of biogeographic patterns in leaf-cutting ants. In the case of *A. cephalotes* our records in Alagoas extend the known distribution area of the southern populations of this species (cf. Mariconi 1970, Kempf 1972) and may serve as a relevant basis for further studies on the disjunct nature of its occurrence.

The third and most obvious point emerging from the present report refers to the ecological distribution and the conservation status of *A. cephalotes*. Our survey of variable-sized forest remnants in Alagoas and Pernambuco clearly revealed a strong association of *A. cephalotes* with well-conserved forest patches (or close proximity to such forests, as in the case of Aquidabam 2). We therefore suggest that in the northeastern Atlantic forest *A. cephalotes* is restricted to a few suitable patches of forests that experienced less anthropogenic influence. This is in line with published knowledge describing *A. cephalotes* as a 'woodland species' commonly found in mature or old-growth forests (Rockwood 1973, Jaffe & Vilela 1989). Given the fact that Northeast Brazil is characterized by high levels of land-use and forest fragmentation (Ranta *et al*. 1998) dating back to the 16th century, it is reasonable to assume that *A. cephalotes* populations have been subject to a drastic decline in the humid forests of this region.

In contrast, *A. sexdens* occurs in a wide range of habitats from primary forests to plantations and has been repeatedly suggested to benefit from the dramatic increase of human-induced disturbances (Vasconcelos 1990, Fowler 1995, Vasconcelos & Cherrett 1995, Fowler *et al.* 1996). The differing disturbance sensitivity between the two species may be due to a more generalist foraging behavior of *A. sexdens,* which allows it to adapt to a broader range of environmental conditions than the more specialized *A. cephalotes* (Vasconcelos 1990). As a consequence of the above, we propose that *A. cephalotes* is being replaced by *A. sexdens* in the fragmented scenario of the northeastern Atlantic forest. The lack of *A. cephalotes* in disturbed fragments must result from intrinsic factors that limit its capacity to colonize and survive in these habitats. A similar pattern was observed in the restinga vegetation, where *Atta robusta* Borgmeier is being replaced by *Atta sexdens rubropilosa* (Forel) (Fowler 1995, Fowler *et al.* 1996). But generally such environmentally induced replacement of native species by other native species has rarely been documented in ants (Fowler *et al.* 1994).

Our results provide evidence that *A. cephalotes* represents a fragmentation-sensitive species of leaf-cutting ants, the disjunct southern populations of which may be prone to local extinction because of the erosion of suitable forest habitats in Northeast Brazil.

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Table 1. Forest fragments surveyed for the occurrence of *Atta* species in the states of Alagoas and Pernambuco. Data compiled from Leal (2002), MMA (2002), Bieber *et al*. (2005) and A. Grilo & M. Oliveira (personal comm.).

Remnant	Locality	Coordenates	Area (ha)	Occurence of *Atta* spp.
Ageró*	Jaqueira – PE	08º44'14.8"S 35º50'43.7"W	50	*A. cephalotes* and *A. sexdens*
Alto Guzerá	Ibateguara – AL	08º59'49.8"S 35º58'09.6"W	71	*A. sexdens*
Aquidabam 1*	Ibateguara – AL	08º55'12.6"S 35º56'09.0"W	28	*A. cephalotes* and *A. sexdens*
Aquidabam 2	Ibateguara – AL	08º55'00.7"S 35º56'03.0"W	11	*A. cephalotes* and *A. sexdens*
Bom Jesus 1	Ibateguara – AL	09º00'42.7"S 36º06'07.9"W	47	*A. sexdens*
Bom Jesus 2	São José da Lage – AL	09º00'32.0"S 36º05'55.2"W	10	*A. sexdens*
Cachoeira	São José da Lage – AL	08º56'22.4"S 36º03'36.0"W	292	*A. sexdens*
Café	Cabo de Santo Agostinho – PE	08º14'08.6"S 35º03'06.7"W	7	*A. sexdens*
Capoeirão	Ibateguara – AL	08º56'34.0"S 36º04'08.0"W	104	*A. sexdens*
Coimbra*	Ibateguara – AL	09º00'12.6"S 35º51'59.0"W	3375	*A. cephalotes* and *A. sexdens*
Cuxiu	Cabo de Santo Agostinho – PE	08º14'08.8"S 35º03'45.5"W	118	*A. sexdens*
Dois Braços 1*	Ibateguara – AL	08º59'43.7"S 36º02'18.7"W	24	*A. sexdens*
Dois Braços 2*	Ibateguara – AL	08º54'57.6"S 35º55'49.2"W	24	*A. sexdens*
Dois Braços 3*	Ibateguara – AL	08º55'34.9"S 35º55'34.9"W	52	*A. sexdens*
Dois Braços 4*	Ibateguara – AL	08º59'26.8"S 36º01'29.0"W	34	*A. sexdens*
Dois Irmãos	Recife – PE	07º59'30.0"S 34º56'37.0"W	390	*A. sexdens*
Espelho*	Jaqueira – PE	08º43'31.4"S 35º50'57.7"W	50	*A. cephalotes* and *A. sexdens*
Estrada Recife	Ibateguara – AL	08º55'54.6"S 36º01'11.5"W	86	*A. sexdens*
Fervedouro*	Jaqueira – PE	08º45'11.0"S 35º51'60.1"W	300	*A. cephalotes* and *A. sexdens*
Ibateguara	Ibateguara – AL	08º57'24.4"S 35º56'09.3"W	7	*A. sexdens*
Ilha do Amor	Jaboatão dos Guararapes – PE	08º13'46.0"S 34º56'05.0"W	8	*A. sexdens*
Jaca	Ibateguara – AL	08º59'40.2"S 36º00'39.4"W	3	*A. sexdens*
Jardim Botânico	Recife – PE	08º04'23.9"S 34º58'12.6"W	11	*A. sexdens*
Mata do Dante	Ibateguara – AL	08º54'38.9"S 36º01'33.3"W	9	*A. sexdens*
Mata do Encanamento	Ibateguara – AL	08º57'38.8"S 36º00'41.9"W	109	*A. sexdens*
Mata do Reservatório	São José da Lage – AL	08º59'41.4"S 36º01'17.1"W	3	*A. sexdens*
Mata do Zumbi	Cabo de Santo Agostinho - PE	08º14'23.0"S 35º00'59.5"W	160	*A. sexdens*
Oriental 1	Ibateguara – AL	08º59'50.9"S 35º59'04.6"W	40	*A. sexdens*
Oriental 2	São José da Lage – AL	08º58'45.7"S 35º54'16.9"W	26	*A. sexdens*
Quengo*	Jaqueira – PE	08º43'02.0"S 35º50'41.2"W	500	*A. cephalotes* and *A. sexdens*
Refúgio Charles Darwin	Igarassú – PE	07º48'37.1"S 34º27'25.2"W	64	*A. sexdens*
Saltinho	Tamandaré – PE	08º43'30.0"S 35º07'37.0"W	548	*A. sexdens*
São Brás	Cabo de Santo Agostinho – PE	08º13'37.9"S 35º04'10.7"W	37	*A. sexdens*
Taquara 1	Ibateguara – AL	08º54'46.3"S 36º00'17.6"W	53	*A. sexdens*
Taquara 2	Ibateguara – AL	08º54'38.1"S 35º59'47.8"W	5	*A. sexdens*
Taquara 3	Ibateguara – AL	08º54'22.2"S 36º00'44.3"W	68	*A. sexdens*
Taquara 4	Ibateguara – AL	08º54'35.1"S 36º00'57.2"W	67	*A. sexdens*
Taquara 6	Ibateguara – AL	08º54'38.9"S 36º01'33.3"W	120	*A. sexdens*
Tiriri	Cabo de Santo Agostinho – PE	08º21'17.0"S 34º58'57.0"W	4	*A. sexdens*
Usina	Ibateguara – AL	08º57'25.4"S 36º03'14.8"W	57	*A. sexdens*
Valparaíso	Ibateguara – AL	08º59'50.9"S 35º59'04.6"W	40	*A. sexdens*
Xangô	Cabo de Santo Agostinho – PE	08º14'23.4"S 35º03'54.4"W	9	*A. sexdens*

*Well-conserved remnants according to MMA (2002), Bieber *et al*. (2005), A. Grilo & M. Oliveira (pers. comm.).

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