

Ant species (Hymenoptera, Formicidae) from the seasonally dry tropical forest of northeastern Brazil: a compilation from field surveys in Bahia and literature records

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ABSTRACT. Ant species (Hymenoptera, Formicidae) from the seasonally dry tropical forest of northeastern Brazil: a compilation from field surveys in Bahia and literature records. The Caatingas occur predominantly in northeastern Brazil and comparatively it is the biome that received less attention than any other ecosystem in Brazil, representing the region where invertebrate groups are less known. We present here the first list of ant species of the Caatingas, compiling information from the literature, from a study of samples preserved in alcohol in the Laboratory of Entomology (*Universidade Estadual de Feira de Santana*), and from a field survey conducted in Milagres, Bahia, submitting standardized 1-m² samples of the leaf-litter to Winkler extractors. Summing all information, 11 subfamilies, 61 genera and 173 species (plus one subspecies) of ants are recognized in the biome. This species number does not consider morphospecies that could not be named due to the lack of reliable recent taxonomic information for some Neotropical ant genera. The list presented here for ant species of the Caatingas is therefore underestimated, but it is relevant because it allows the identification of areas to be sampled in order to improve our knowledge of the diversity of ants in this biome.

KEYWORDS. Caatinga; Formicidae; Insecta; list of species; SDTF.

Studies about local or regional species biodiversity and the publication of taxonomic lists represent the base of biological knowledge on areas or biomes. This data is scientifically relevant (Vanzolini *et al.* 1980) as it is the basic element for the understanding of the functional relationships among organisms living in each biome (Marques *et al.* 2002; Lewinsohn *et al.* 2005).

The study of certain invertebrate groups is more appropriate than others for determining the local biological diversity, as well to assess or monitor them (Kremen *et al.* 1993). Furthermore, some of them can be used as environmental indicators (Freitas *et al.* 2004; Ribas *et al.* 2012). Ants, with 12,649 described species (Agosti & Johnson 2005), stand out in this scenario due to comparatively wide distribution (Brühl *et al.* 1999), strong interactions with several groups of plants and animals (Wilson 1987; Floren *et al.* 2002), sensitivity to habitat changes (Kaspari & Majer 2000) and their relatively short life cycles. Ants present also many specialized taxa, are relatively easy to collect and to separate into morphospecies, and account for more than 10% of animal biomass in tropical forests, savannas and other terrestrial biomes (Majer 1983; Hölldobler & Wilson 1990; Brown Jr. 1997; Folgarait 1998; Alonso 2000; Agosti *et al.* 2000; Leal 2003; Delsinne *et al.* 2008), except for the Arctic and the Antarctic.

Despite the crucial importance of species lists and the promising results generated by the studies of ants, there are still regions in Brazil where these studies are insufficient or absent (Brandão 1995). Comparatively, the Caatingas received

less attention than any other Brazilian biome and represent the region where invertebrate groups, such as ants, are less known and studied (Brandão & Yamamoto 2004).

The Caatingas can be characterized as a seasonally dry tropical forest (SDTF), and may be also referred as dry tropical forest (DTF) (Leal *et al.* 2005) – a biome which occurs in tropical and subtropical environments in large and smaller areas of South America, Central America, Africa, Asia and Oceania (Pennington *et al.* 2000; Cardoso & Queiroz 2010; Espírito-Santo *et al.* 2010; Werneck 2011).

The Caatingas are associated to relatively dry areas (Ab'Saber 2003), characterized by minimal limits of annual precipitation (until 1000 mm), irregular distribution of rains with six to nine months of drought (dry winters and rainy summers), high average annual temperature (between 26–28°C), and rates of relative humidity and cloudiness among the lowest in the country (Aquad 1986; Prado 2003). The Caatingas occur in Brazil (Santana & Souto 2006), covering some 750,000 km² of the country (Ab'Saber 2003), from the Jequitinhonha river valley (Minas Gerais) to the north, covering large areas in northeastern Brazilian states: Bahia, Ceará, Rio Grande do Norte and Pernambuco, west of Alagoas and Sergipe, south-east of Piauí and east of Maranhão (Fig. 1) (Ab'Saber 2003; Prado 2003; Leal *et al.* 2005; Zappi 2008). Furthermore, the Caatingas occur as enclaves in the Amazon and Atlantic Forest (Cabo Frio/Rio de Janeiro) (Ab'Saber 2003; Ibraimo *et al.* 2004; Werneck 2011). The Caatingas include diverse physiognomies that can be recognized locally, as the *caatinga-de-*

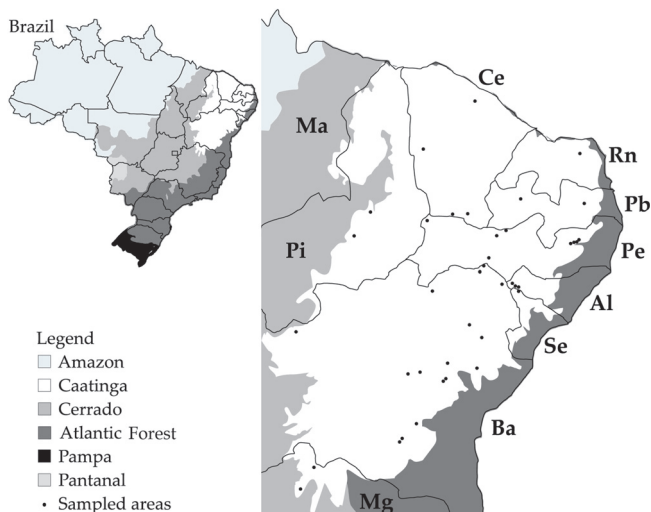


Fig. 1. Sites sampled for ants in the Caatinga biome. State abbreviations: Al/Alagoas, Ba/Bahia, Ce/Ceará, Ma/Maranhão, Mg/Minas Gerais, Pb/Paraíba, Pe/Pernambuco, Pi/Piauí, Rn/Rio Grande do Norte and Se/Sergipe. For areas whose coordinates were not available in the articles, we used the coordinates provided by Google Earth.

lajedo, dense dry and low thorny forests. This is why we prefer to call the biome as the Caatingas. However, these physiognomies are not always clearly limited and discernible, preventing the clear mapping of these types.

The present study was carried out with the objective to present the first list of ant species of the Caatingas, in an attempt to overcome the lack of basic knowledge about one of the most important insects groups living in a much stressed environment, due to a long history of human occupation.

MATERIAL AND METHODS

Study site. The surveys, authorized by the *Sistema de Autorização e Informação em Biodiversidade/SISBIO* (license nr. 24005–2), were carried out in the municipality of Milagres, Bahia, defined as an area of extremely high priority for conservation of the Caatingas biome by PROBIO (Velloso *et al.* 2002; MMA 2003; MMA 2007), in three private areas: A1) 12°54'32.52"S 39°51'16.74"W, A2) 12°54'17.64"S 39°52'04.98"W and A3) 12°54'24.66"S 39°50'51.78"W, all covered by arboreal caatinga vegetation (Figs. 2A-B).

Data collecting. Ants were collected in three field trips, comprising dry and wet seasons from July/2010 to January/2011. In each trip we went through all three study areas and collected a total of fifty 1-m² samples of leaf-litter in points distant at least 50 m one from each other, along irregular transects, due to fact that the Caatingas vegetation is rich in lianas, thorny and urticant plants). The samples were submitted to individual Winkler extractors for 48 h.

In addition, we actively searched for ants in the study areas, like in the soil, plants, fungus, rotten wood, fallen leaves and under rocks, to complement the list of species.



Fig. 2. View of the site surveyed for ants in Milagres, Bahia, Brazil. a) General view of the arboreal caatinga, and b) View of the understory.

Study of samples preserved in alcohol. The samples preserved in alcohol in the Laboratory of Entomology/LENT, in the *Universidade Estadual de Feira de Santana* (UEFS), were revised in search of ants. These samples came from surveys on the beetle fauna in distinct municipalities under Caatinga vegetation in the Bahia state (Euclides da Cunha, Milagres, Mucururê and Tucano), using baited pitfall traps as sampling technique (Campos 2012; Medina 2012).

Data from literature. Data on ant species recorded in the Caatingas available in literature were compiled from distinct sources: taxonomic reviews (Kempf 1975; Brandão 1990; Mackay 1993; De Andrade & Baroni-Urbani 1999; Bolton 2000; Albuquerque & Brandão 2004; Dietz 2004; Klingenberg & Brandão 2009), description of new species (Forel 1911), ecological investigations (Brandão 1995; Santos *et al.* 1999; Leal 2002; Leal 2003; Quinet & Tavares 2005; Leal *et al.* 2007; Tabatinga-Filho & Leal 2007; Oliveira *et al.* 2009; Neves *et al.* 2010; Silva *et al.* 2010; Brito 2011; Carvalho *et al.* 2011; Garro *et al.* 2011; Marques & Soares 2011; Nunes *et al.* 2011; Silva 2011a; Silva 2011b; Macêdo 2012) and an ethological study (Quinet *et al.* 2005). The main sampling techniques used in the compiled ecological investigations were sardine or honey baits and pitfall traps. Further, two studies used active search in flowers/plants (Tabatinga-Filho & Leal 2007; Brito 2011) and one submitted leaf-litter samples to Berlese-Tullgren funnels and extracted insects from vegetation with entomological umbrella (Santos *et al.* 1999).

RESULTS AND DISCUSSION

We recorded 68 ant species, 32 genera and 10 subfamilies in the 150 m² of leaf-litter sampled in the arboreal caatinga in Milagres, Bahia. Active search for ants in the study areas resulted in 23 species, 12 genera and five subfamilies. In the samples preserved in alcohol in the Laboratory of Entomology (UEFS), we recognized 42 species, 22 genera and eight subfamilies. Summing the information from the 28 surveys available in literature, we identified 151 species of 63 genera in 11 ant subfamilies.

Table I. Ants registered for the Caatingas. Sites of occurrence – Alagoas: Al = Olho D'água do Casado, Piranhas and Delmiro Gouveia; Bahia: Ba1 = Itaberaba, Ba2 = Maracás, Ba3 = Santa Rita de Cássia, Ba4 = Itatim, Ba5 = National Forest Contendas do Sincorá (municipality of Contendas do Sincorá and Tanhaçu), Ba6 = Milagres, Ba7 = Euclides da Cunha, Ba8 = Mucururê, Ba9 = Rodelas, Ba10 = Tucano, Ba11 = Boa Vista do Tupim, Ba12 = Juazeiro, Ba13 = Feira de Santana, Ba14 = Ipirá (before Camisão) and Ba15 = Paulo Afonso (Ecological Station Raso da Catarina); Ceará: Ce1 = Crateús, Ce2 = Pentecoste, Ce3 = Barbalha and Ce4 = Chapada do Araripe; Minas Gerais: Mg1 = Manga and Mg2 = Januária; Paraíba: Pb1 = Coremas and Pb2 = Guarabira (before Independência); Pernambuco: Pe1 = Bezerros, Caruaru, Gravatá and Pombos, Pe2 = Araripina, Pe3 = Caruaru, Pe4 = Serra Talhada, Pe5 = Santa Cruz da Baixa Verde and Pe6 = Floresta; Piauí: Pi1 = Canto do Buriti and Pi2 = Oeiras; Rio Grande do Norte: Rn = João Câmara (before Baixa-Verde); and Sergipe: Se = Canindé de São Francisco. In the case of genera identified only with morphospecies, we list just the genera. *Species collected in Milagres or identified in the samples preserved in alcohol of the Laboratory of Entomology/UEFS, new data.

Subfamily – Tribe – Genera and Species	Occurrence	Subfamily – Tribe – Genera and Species	Occurrence
Amblyoponinae – Amblyoponini		<i>Camponotus crassus</i> Mayr, 1862	
<i>Prionopelta punctulata</i> Mayr, 1866	Mg1		Ba4, Ba6, Ba9, Ba10, Ce1, Ce2, Mg1, Pe1
<i>Stigmatomma armigerum</i> (Mayr, 1887)*	Ba6	<i>Camponotus fastigatus</i> Roger, 1863	Ba4, Ce1, Ce2
<i>Stigmatomma elongatum</i> (Santschi, 1912)*	Ba6	<i>Camponotus genatus</i> Santschi, 1922*	Ba6, Ba11
Cerapachyinae – Acanthostichini		<i>Camponotus germaini</i> Emery, 1903	Mg1
<i>Acanthostichus serratulus</i> (F. Smith, 1858)	Mg1	<i>Camponotus lespesii</i> (Forel, 1886)*	Ba6
Dolichoderinae – Dolichoderini		<i>Camponotus melanoticus</i> Emery, 1894	Ba6, Ba10, Ba11, Mg1
<i>Azteca alfari</i> Emery, 1893	Ba4, Mg1	<i>Camponotus novogranadensis</i> Mayr, 1870	Ba11, Mg1
<i>Dolichoderus attelaboides</i> (Fabricius, 1775)*	Ba6	<i>Camponotus pallescens</i> (Mayr, 1887)	Al, Pe4
<i>Dolichoderus diversus</i> Emery, 1894	Ba12	<i>Camponotus renggeri</i> (Emery, 1894)	Ba2, Ba3, Ba11, Mg1, Pi2
<i>Dolichoderus germaini</i> Emery, 1894	Pb2	<i>Camponotus rufipes</i> (Fabricius, 1775)	Ba1, Ba2, Ba6, Ba7
<i>Dolichoderus lutosus</i> (F. Smith, 1858)	Ba6, Rn	<i>Camponotus sericeiventris</i> (Guérin-Ménéville, 1838)	Mg1
<i>Dolichoderus voraginosus</i> Mackay, 1993	Mg1	<i>Camponotus substitutus</i> (Emery, 1894)	Ba10, Ce2, Mg1
<i>Dorymyrmex brunneus</i> (Forel, 1908)	Se	<i>Camponotus vittatus</i> (Forel, 1904)	Ce2, Mg1
<i>Dorymyrmex pyramicus</i> (Roger, 1863)	Ba4	Formicinae – Myrmelachistini	
<i>Dorymyrmex thoracicus</i> Gallardo, 1916	Ba5, Ba6, Ba9, Ba10, Ba11, Ce1, Pe4, Se	<i>Myrmelachista</i> sp.	Ce1, Mg1
<i>Forelius brasiliensis</i> (Forel, 1908)	Ba6, Mg1	Formicinae – Plagiolepidini	
<i>Forelius pusillus</i> Santschi, 1922	Mg1	<i>Brachymyrmex coactus</i> (Mayr, 1887)	Mg1
<i>Linepithema humile</i> (Mayr, 1868)	Ba6	<i>Brachymyrmex patagonicus</i> Mayr, 1868	Mg1
<i>Linepithema neotropicum</i> Wild, 2007	Ba11	<i>Nylanderia</i> sp.	Ba6, Ba11
<i>Tapinoma melanocephalum</i> (Fabricius, 1793)	Al, Ba6, Ce1, Mg1, Se	<i>Paratrechina longicornis</i> (Latreille, 1802)	Ba4
Ecitoninae – Ecitonini		Heteroponerinae – Heteroponerini	
<i>Cheliomyrmex morosus</i> (F. Smith, 1859)	Mg1	<i>Acanthoponera mucronata</i> (Roger, 1860)	Ba6, Mg1
<i>Eciton hamatum</i> (Fabricius, 1782)	Ba11	Myrmicinae – Attini	
<i>Labidus coecus</i> (Latreille, 1802)	Ba6, Ba10, Ba11, Ce1, Mg1	<i>Acromyrmex balzani</i> (Emery, 1890)	Ba4, Ba10, Ba15, Mg1
<i>Labidus mars</i> (Forel, 1912)	Ba6	<i>Acromyrmex octospinosus</i> (Reich, 1793)	Mg1
<i>Labidus praedator</i> (F. Smith, 1858)	Ba6, Ba11	<i>Acromyrmex rugosus</i> (F. Smith, 1858)	Ba4, Mg1
<i>Neivamyrmex caretteri</i> (Forel, 1913)	Ba11	<i>Acromyrmex subterraneus</i> (Forel, 1893)	Ce1, Mg1
<i>Neivamyrmex diana</i> (Forel, 1912)	Ce2	<i>Apterostigma</i> gr. <i>pilosum</i> *	Ba6
<i>Neivamyrmex minensis</i> (Borgmeier, 1928)	Ce1	<i>Atta laevigata</i> (F. Smith, 1858)	Al, Pe1
<i>Nomamyrmex esenbeckii</i> (Westwood, 1842)	Ce1	<i>Atta opaciceps</i> Borgmeier, 1939	Ba11
Ectatomminae – Ectatommini		<i>Atta sexdens</i> (Linnaeus, 1758)	Mg1
<i>Ectatomma brunneum</i> (F. Smith, 1858)	Ba1, Ba2, Ba4, Ba11	<i>Atta sexdens rubropilosa</i> (Forel, 1908)	Ba6
<i>Ectatomma edentatum</i> Roger, 1863	Ba2, Ba3, Ba4, Ba6, Ba10, Ba11, Ce1, Mg1, Pe1	<i>Cyphomyrmex olitor</i> Forel, 1893	Ba11
<i>Ectatomma muticum</i> Mayr, 1870	Al, Ba1, Ba3, Ba4, Ba6, Ba8, Ba10, Ba15, Ce1, Pi1, Pi2, Se	<i>Cyphomyrmex peltatus</i> Kempf, 1966	Ba15
<i>Ectatomma opavicentre</i> (Roger, 1861)	Ba4	<i>Cyphomyrmex rimosus</i> (Spinola, 1851)	Ce2, Se
<i>Ectatomma suzanae</i> Almeida, 1986	Ba6, Ce2, Mg1	<i>Cyphomyrmex transversus</i> (Emery, 1894)	Ba2, Ba4, Mg1, Pi2
<i>Ectatomma tuberculatum</i> (Oliver, 1792)	Ba2	<i>Kalathomyrmex emeryi</i> (Forel, 1907)	Ba12, Pi1, Pe2
<i>Gnamptogenys bruchi</i> (Santschi, 1922)*	Ba6	gen. sp. nov. near <i>Mycetophylax</i>	Ce1
<i>Gnamptogenys concinna</i> (F. Smith, 1858)	Ba6	<i>Myrmicoecrypta</i> sp.	Ba2, Ba4, Ce1, Pi1
<i>Gnamptogenys moelleri</i> (Forel, 1912)*	Ba6, Ba7	<i>Trachymyrmex</i> sp.	Al, Ba1, Ba2, Ba6, Ce1, Se
<i>Gnamptogenys regularis</i> Mayr, 1870*	Ba6	Myrmicinae – Basicerotini	
<i>Gnamptogenys striatula</i> Mayr, 1884	Ba4, Ce1, Ce2	<i>Basiceros scabognathus</i> (Brown, 1949)	Ba2
<i>Gnamptogenys sulcata</i> (F. Smith, 1858)	Ce1, Mg1	<i>Eurhopalothrix bruchi</i> (Santschi, 1922)	Ba6
Formicinae – Camponotini		<i>Octostruma rugifera</i> (Mayr, 1887)	Ba2, Ba6
<i>Camponotus arboreus</i> (F. Smith, 1858)	Ba4, Ba6, Ce2, Mg1	Myrmicinae – Blepharidattini	
<i>Camponotus atriceps</i> (F. Smith, 1858)	Ba6, Ba10, Ce2, Mg1, Pe1	<i>Blepharidatta conops</i> Kempf, 1967	Ce1
<i>Camponotus blandus</i> (F. Smith, 1858)	Ba4, Ba6, Ba10, Ba11, Ce1, Pe4, Se	<i>Wasmannia auropunctata</i> (Roger, 1863)	Ce2, Ba5, Ba6, Ba11, Mg1, Pe1
<i>Camponotus cameranoi</i> (Emery, 1894)*	Ba6	<i>Wasmannia lutzi</i> Forel, 1908	Ba6, Mg1
<i>Camponotus cingulatus</i> Mayr, 1862	Ba4, Mg1	<i>Wasmannia rochai</i> Forel, 1912	Mg1
		<i>Wasmannia sigmoidea</i> (Mayr, 1884)	Ba11
		Myrmicinae – Cephalotini	
		<i>Cephalotes angustus</i> (Mayr, 1862)*	Ba6

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Table I. Continued.

Subfamily – Tribe – Genera and Species	Occurrence
<i>Cephalotes atratus</i> (Linnaeus, 1758)	Ba2, Ba6, Mg1
<i>Cephalotes betoi</i> De Andrade, 1999	Ba3, Mg1, Pi1
<i>Cephalotes christopherseni</i> (Forel, 1912)	Mg1
<i>Cephalotes clypeatus</i> (Fabricius, 1804)	Ba1, Ba4, Ba6, Ba14, Pi2
<i>Cephalotes cordatus</i> (F. Smith, 1853)	Ba4
<i>Cephalotes depressus</i> (Klug, 1824)	Ba6, Pe6
<i>Cephalotes eduarduli</i> (Forel, 1921)	Ba1, Mg1
<i>Cephalotes fiebrigi</i> (Forel, 1906)	Ba1
<i>Cephalotes maculatus</i> (F. Smith, 1876)	Pe3
<i>Cephalotes grandinosus</i> (F. Smith, 1860)	Ba6, Mg1
<i>Cephalotes minutus</i> (Fabricius, 1804)	Ba2, Ba4, Ba6, Mg1, Pi1, Pi2
<i>Cephalotes nilpiei</i> De Andrade, 1999	Mg1
<i>Cephalotes pallens</i> (Klug, 1824)	Ba1, Ba4, Ba6, Ba11, Ce1
<i>Cephalotes pavonii</i> (Latreille, 1809)	Ba4, Ba7, Mg1
<i>Cephalotes pellans</i> De Andrade, 1999	Ce2, Mg1
<i>Cephalotes persimilis</i> De Andrade, 1999	Ba13, Mg2, Pi1, Pi2
<i>Cephalotes pilosus</i> (Emery, 1896)	Ba1, Ba6
<i>Cephalotes pusillus</i> (Klug, 1824)	Ba1, Ba2, Ba3, Ba6, Ba10, Ba11, Ce1, Ce2, Ce3, Ce4, Mg1, Pb1, Pe6, Pi1, Pi2
<i>Cephalotes ustus</i> (Kempf, 1973)	Ba2, Ba6
<i>Procryptocerus goeldii</i> Forel, 1899*	Ba6
Myrmicinae – Crematogastrini	
<i>Crematogaster abstinens</i> Forel, 1899	Ba6, Ba10, Mg1
<i>Crematogaster acuta</i> (Fabricius, 1804)*	Ba8, Ba10
<i>Crematogaster ampla</i> Forel, 1912	Mg1
<i>Crematogaster brasiliensis</i> Mayr, 1887*	Ba6
<i>Crematogaster distans</i> Mayr, 1870	Ce2
<i>Crematogaster erecta</i> Mayr, 1866	Ba11, Mg1
<i>Crematogaster evallans</i> (Forel, 1907)	Ba6, Mg1
<i>Crematogaster montezumia</i> F. Smith, 1858	Ba15
<i>Crematogaster obscurata</i> (Emery, 1895)	Mg1
<i>Crematogaster rochai</i> Forel, 1903	Ce2
<i>Crematogaster torosa</i> Mayr, 1870	Mg1
<i>Crematogaster victima</i> F. Smith, 1858	Ba11, Ce2, Mg1
Myrmicinae – Dacetini	
<i>Strumigenys elongata</i> Roger, 1863	Ce2
<i>Strumigenys lilloana</i> (Brown, 1950)	Ba6, Mg1, Pi2
<i>Strumigenys louisianae</i> Roger, 1863*	Ba6
<i>Strumigenys schmalzi</i> Emery, 1906*	Ba6
Myrmicinae – Formicoxenini	
<i>Nesomyrmex</i> sp.	Ba1, Ba2, Pi2, Ce2
<i>Ochetomyrmex</i> sp.	Ba6
Myrmicinae – Myrmicini	
<i>Hylomyrma balzani</i> (Emery, 1894)	Ba6, Ba11, Ce1
<i>Pogonomyrmex naegelii</i> Forel, 1878	Ba6
Myrmicinae – Pheidolini	
<i>Pheidole diligens</i> (F. Smith, 1858)	Ce2
<i>Pheidole fallax</i> Mayr, 1870	Ba4
<i>Pheidole fowleri</i> Wilson, 2003	Mg1
<i>Pheidole obscurithorax</i> (Naves, 1985)	Ba11
<i>Pheidole radoszkowskii</i> Mayr, 1883	Ba11
<i>Pheidole rochai</i> Forel, 1912	Ba11
<i>Pheidole rufipilis</i> Forel, 1908	Mg1
<i>Pheidole scalaris</i> Wilson, 2003	Mg1
Myrmicinae – Solenopsidini	
<i>Carebara</i> sp.	Ce1

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Table I. Continued.

Subfamily – Tribe – Genera and Species	Occurrence
<i>Megalomyrmex driftii</i> Kempf, 1961*	Ba6
<i>Megalomyrmex silvestrii</i> Wheeler, 1909	Pe3
<i>Monomorium floricola</i> (Jerdon, 1851)	Ba6
<i>Oxyepoecus browni</i> Albuquerque & Brandão, 2004	Ba6
<i>Oxyepoecus vezenyii</i> (Forel, 1907)*	Ba6, Ce1
<i>Oxyepoecus regularis</i> Ulysséa & Brandão, 2012	Ba6, Ba11
<i>Solenopsis geminata</i> (Fabricius, 1804)	Ba2, Ba4, Mg1, Pi2
<i>Solenopsis globularia</i> (F. Smith, 1858)	Ba4, Ba5, Ce2
<i>Solenopsis invicta</i> Buren, 1972	Pe5
<i>Solenopsis saevissima</i> (F. Smith, 1855)	Ba3, Mg1, Pi2
<i>Solenopsis tridens</i> Forel, 1911	Villa Nova [“in the region of Caatingas” (Ihering & Ihering 1911), “ = Bonfim” (Kempf 1971), today named Senhor do Bonfim], Bahia
Myrmicinae – Stenammini	
<i>Rogeria alzatei</i> Kugler, 1994*	Ba6
<i>Rogeria blanda</i> (F. Smith, 1858)	Ba6, Ce2, Mg1
Myrmicinae – Tetramoriini	
<i>Tetramorium bicarinatum</i> (Nylander, 1846)	Pi1
Ponerinae – Platythyreini	
<i>Platythyrea</i> sp. nov.	Ce2
Ponerinae – Ponerini	
<i>Anochetus emarginatus</i> (Fabricius, 1804)	Ce1
<i>Anochetus</i> gr. <i>inermis</i> *	Ba6
<i>Centromyrmex brachycola</i> (Roger, 1861)	Pi2
<i>Dinoponera mutica</i> (Emery, 1901)	Al, Se
<i>Dinoponera quadriceps</i> Kempf, 1971	Ba1, Ba4, Ba5, Ba6, Ba10, Ba15, Ce1, Ce2, Pi1, Pi2, Se
<i>Hypoponera</i> sp.	Ba2, Ba4, Ba6, Pi1
<i>Odontomachus bauri</i> Emery, 1892	Ba4, Ba5, Ce1, Ce2, Mg1
<i>Odontomachus brunneus</i> (Patton, 1894)	Ba6
<i>Odontomachus chelifera</i> (Latreille, 1802)	Ba6
<i>Odontomachus haematodus</i> (Linnaeus, 1758)	Ba4, Ba6, Ba10, Se
<i>Pachycondyla bucki</i> (Borgmeier, 1927)	Ba6
<i>Pachycondyla magnifica</i> Borgmeier, 1929*	Ba6
<i>Pachycondyla striata</i> (F. Smith, 1858)	Ba6
<i>Pachycondyla venusta</i> (Forel, 1912)*	Ba6
<i>Pachycondyla villosa</i> (Fabricius, 1804)	Ba6, Mg1
Ponerinae – Thaumatomyrmecini	
<i>Thaumatomyrmex atrox</i> Weber, 193980	Ba2, Ba6
<i>Thaumatomyrmex contumax</i> Kempf, 1975	Ba2, Pe2
<i>Thaumatomyrmex mutilatus</i> Mayr, 1887	Ce1, Ce2
Proceratiinae – Proceratiini	
<i>Discothyrea sexarticulata</i> Borgmeier, 1954*	Ba6
Pseudomyrmecinae – Pseudomyrmecini	
<i>Pseudomyrmex acanthobius</i> (Emery, 1896)	Ce2
<i>Pseudomyrmex elongata</i> (Mayr, 1870)	Ba6
<i>Pseudomyrmex flavidulus</i> (F. Smith, 1855)	Ba4, Ba6, Mg1
<i>Pseudomyrmex gracilis</i> (Fabricius, 1804)	Ba4, Ba6, Ce1, Mg1
<i>Pseudomyrmex oculatus</i> (F. Smith, 1855)	Ba4
<i>Pseudomyrmex pisinnus</i> Ward, 1989	Ce1
<i>Pseudomyrmex schuppi</i> (Forel, 1901)	Ba6, Mg1
<i>Pseudomyrmex simplex</i> (F. Smith, 1877)	Ba4
<i>Pseudomyrmex tenuis</i> (Fabricius, 1804)	Ba6
<i>Pseudomyrmex termitarius</i> (F. Smith, 1855)	Al, Ba6, Ba7, Ba9, Mg1

In recent years, submission of standardized samples of the leaf-litter to Winkler extractors have been adopted worldwide to study this microhabitat, little investigated although explored by many relatively small and cryptic ant species (Delabie *et al.* 2000). In areas of arboreal caatinga, this technique has been applied only recently (Silva 2011a; Macêdo 2012). Our Winkler extracted samples in Milagres allowed us to add 23 new records of species for the biome (highlighted in Table I with an asterisk), which means an increase of almost 14% in the number of previously recognized species for the Caatingas, including a recently described species of *Oxyepoecus* (Myrmicinae, Solenopsidini), *O. regularis* Ulysséa & Brandão, 2012.

It is important to note that updated global and regional catalogues of ant species were published in the last decade (Bolton 2003; Bolton *et al.* 2006; Palácio & Fernández 2003), new mechanisms were made available for online identification (Longino 2005; Sarnat 2008), and tribes as well as widely distributed genera and subfamilies were partially or totally revised: Amblyoponinae (Yoshimura & Fisher 2012); *Crematogaster* of Costa Rica (Longino 2005); Dacetini (Baroni-Urbani & De Andrade 2007); Neotropical *Gnamptogenys* (Lattke *et al.* 2007); *Linepithema* (Wild 2007); *Megalomyrmex* (Brandão 1990, 2003); *Mycetophylax*, *Paramycetophylax* and *Kalathomyrmex* (Klingenberg & Brandão 2009), *Oxyepoecus* (Albuquerque & Brandão 2004, 2009); *Pheidole* of the Americas (Wilson 2003); *Prenolepis* (LaPolla *et al.* 2010), *Trachymyrmex* species groups (Mayhénunes & Brandão 2002, 2005, 2007) and *Wasmannia* (Longino & Fernández 2007). These revisions, associated with the direct comparison with specimens deposited in the collection of Hymenoptera in the MZSP, allowed the identification at species-level of most of the analyzed material.

Given the difficulty in assigning names to several Neotropical ant species, however, and the lack of recent taxonomic revisions for many of its richest genera – *Atta*, *Azteca*, *Brachymyrmex*, *Cyphomyrmex*, *Hypoconera*, *Nylanderia* and *Solenopsis* – most studies taken from the literature shows a high number of morphospecies. As it was not possible to match these morphospecies, housed in different institutions and collections, to the Milagres morphospecies and to the alcohol LENT/UEFS samples, we listed the genera identified only with morphospecies (i.e. *Carebara*, *Hypoconera*, *Myrmelachista*, *Myrmicoecrypta*, *Nesomyrmex*, *Nylanderia*, *Ochetomyrmex* and *Trachymyrmex*; see Table I) and all cases where confident assignments of specific names have been possible. Currently 11 subfamilies, 61 genera and 173 species of Formicidae are recognized as occurring in the Caatingas biome (Tables I and II).

Further, we are fully aware that this first list of ant species from the Caatingas represent an underestimation. *Pheidole*, for instance, is a worldwide genus, dominant in different habitats and with the largest number of described species (about 1,000; see Wilson 2003), of which 462 are recorded for the Neotropical region (Fernández & Sendoya 2004). Because there is no appropriate identification key for

the Neotropical species (Lach *et al.* 2010), most specimens of *Pheidole* collected are in general separated into morpho-species. In Milagres, we sampled 13 morphospecies of this genus, not accounted in the list.

Table II. Number of ant species and genera by subfamily, registered for the Caatingas (see text for explanation).

Subfamily	Species	Genera
Amblyoponinae	3	2
Cerapachyinae	1	1
Dolichoderinae	14	6
Ecitoninae	9	5
Ectatomminae	12	2
Formicinae	21	5
Heteroponerinae	1	1
Myrmicinae*	83	29
Ponerinae	18	8
Proceratiinae	1	1
Pseudomyrmecinae	10	1
Total	173	61

* Plus one subspecies, *Atta sexdens rubropilosa* (Forel, 1908).

Our study shows that the Bahia state presents the highest number of sampled areas in Caatinga vegetation for ants (16), followed by Pernambuco (8), Ceará (4), Alagoas (3), Minas Gerais (2), Paraíba (2), Piauí (2), Sergipe (1) and Rio Grande do Norte (1) (Fig. 1 and Table III). However, these 39 studied areas represent an insufficient sampling effort when one considers the dimension of the biome. Paraíba and Rio Grande do Norte states, both with significant areas of Caatingas (around 5.000.000 ha), and Caatingas enclaves in the Amazon and Atlantic Forests show the most critical situation. Nothing is known about the ant fauna in these regions that should be prioritized accordingly in order to improve our knowledge of the diversity of ants in the Caatingas.

The paucity of knowledge on ants occurring in the Caatingas reflects other aspects. For instance, the Caatinga is the less protected biome by the *Sistema Nacional de Unidades de Conservação/SNUC* (completely protected areas = 1.03% and areas of sustainable use = 6.3%) and indigenous territories (0.22%) (MMA, ICMBIO & TNC 2008). Historically, it has suffered from intensive anthropogenic disturbances, mainly due to deforestation and agriculture, presenting nowadays significant degradation and an intense process of desertification in different places (Garda 1996; MMA 2002; Leal *et al.* 2005). Tropical and subtropical dry forests are among the most threatened biomes in the world, but comparatively received less attention from conservationists and ecologists (Pennington *et al.* 2000; Quesada and Stoner 2004; Lopes 2006; Santos *et al.* 2011).

Our survey, although circumscribed to one region of arboreal caatinga, revealed a significant number of ant species, in comparison with similar efforts in other biomes. However, obtaining more samples in adjacent areas and in other regions covered by the same vegetation type shall most probably re-

veal further species. Beyond that, in order to improve the list of Caatinga's ant fauna, more surveys employing diverse collecting techniques are needed in all Brazilian states that present this vegetation and in all phytophysiognomies of this biome.

Table III. Coordinates of the areas with mirmecofauna sampled in the Caatingas. (–) Information not available in the articles or labels.

State	Municipality	Coordinates
Alagoas	Delmiro Gouveia	09°29'04"S, 38°00'00"W
	Olho D'água do Casado	09°33'42"S, 37°48'34"W
	Piranhas	09°32'86"S, 37°48'74"W
Bahia	Boa Vista do Tupim	12°39'37"S, 40°36'33"W
	Contendas do Sincorá	–
	Euclides da Cunha	10°25'05.94"S, 39°02'23.22"W
	Feira de Santana	–
	Ipirá	–
	Itaberaba	–
	Itatim	12042S, 49031W
	Juazeiro	–
	Maracás	–
	Milagres	12°54'32.52"/12°54'17.64"S 39°51'16.74"/39°52'04.98"W
	Mucururé	09°12'34.62"S, 39°03'48.42"W
	Paulo Afonso	–
	Rodelas	08°50'55.56"S, 38°48'02.94"W
Santa Rita de Cássia	–	
Tanhaçu	–	
Tucano	10°46'58.86"S, 38°53'27.36"W	
Ceará	Barbalha	–
	Chapada do Araripe	–
	Crateús	0292508S, 94344123W
Minas Gerais	Pentecoste	03°48'S, 39°20'W
	Januária	–
	Manga	14°48'36"/14°56'59"S 43°55'12"/44°04'12"W
Paraíba	Coremas	–
	Guarabira	–
Pernambuco	Araripina	–
	Bezerras	08°14'15"S, 35°46'32"W
	Caruaru	08°15'57"S, 35°59'51"W
	Floresta	–
	Gravatá	08°12'16"S, 35°38'12"W
	Pombos	08°07'25"S, 35°26'43"W
	Santa Cruz da Baixa Verde	07°85'8.90"S, 038°17'7.09"W
	Serra Talhada	07°59'00"S, 38°19'16"W
Piauí	Canto do Buriti	–
	Oeiras	–
Rio Grande do Norte	João Câmara	–
Sergipe	Canindé de São Francisco	09°38'35"S, 37°58'62"W

ACKNOWLEDGMENTS

We would like to thank Mr. Antônio, owner of the area in Milagres, for allowing us to survey ants in his properties; the Transport Sector of the UEFS; Anderson M. Medina and Elkaier M. Campos for their help in the field trips, with support provided by CNPq (grant nr. 0013/2009 to Dr. Gilberto M. de Mendonça Santos and scholarship nr. 148056/2010–5) and CAPES. We also thank Rodrigo M. Feitosa, Rogério

R. da Silva and Nicolas L. de Albuquerque (MZSP) for their help in the identification of some of the material.

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Received 4 October 2012; accepted 3 April 2013

Associate Editor: Maria Cristina Gaglianone