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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-m^2 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 km^2 of the country (Ab'Sáber 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, southeast 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-*

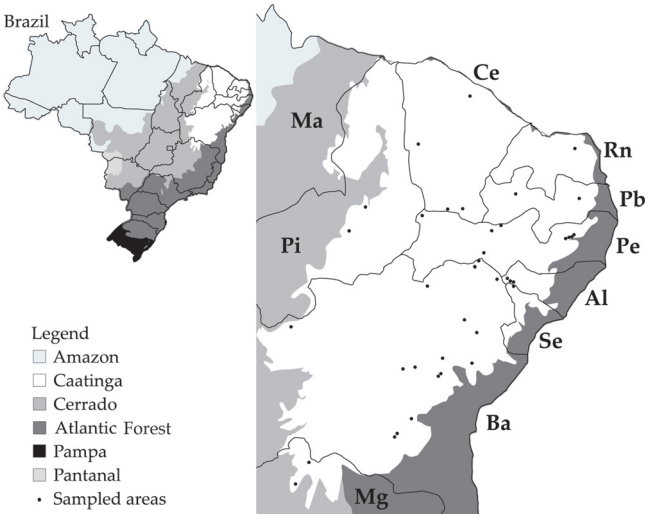

Fig. 1. Sites sampled for ants in the Caatinga biome. State abbreviations: Al/Alagoas, Ba/Bahia, Ce/Ceará, Ma/Maranhão, Mg/Minas Gerais, Pb/Paraíba, Pe/Pernambuco, Pi/Piauí, Rn/Rio Grande do Norte and Se/Sergipe. For areas whose coordinates were not available in the articles, we used the coordinates 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-m^2 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, Mucururé 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 m^2 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 Florest Contendas do Sincorá (municipality of Contendas do Sincorá and Tanhaçu), Ba6 = Milagres, Ba7 = Euclides da Cunha, Ba8 = Mucururé, 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
Amblyoponinae – Amblyoponini	
Prionopelta punctulata Mayr, 1866	Mg1
Stigmatomma armigerum (Mayr, 1887)*	Ba6
Stigmatomma elongatum (Santschi, 1912)*	Ba6
Cerapachyinae – Acanthostichini	
Acanthostichus serratulus (F. Smith, 1858)	Mg1
Dolichoderinae – Dolichoderini	
Azteca alfari Emery, 1893	Ba4, Mg1
Dolichoderus attelaboides (Fabricius, 1775)*	Ba6
Dolichoderus diversus Emery, 1894	Ba12
Dolichoderus germaini Emery, 1894	Pb2
Dolichoderus lutosus (F. Smith, 1858)	Ba6, Rn
Dolichoderus voraginosus Mackay, 1993	Mg1
Dorymyrmex brunneus (Forel, 1908)	Se
Dorymyrmex pyramicus (Roger, 1863)	Ba4
Dorymyrmex thoracicus Gallardo, 1916	Ba5, Ba6, Ba9, Ba10, Ba11, Ce1, Pe4, Se
Forelius brasiliensis (Forel, 1908)	Ba6, Mg1
Forelius pusillus Santschi, 1922	Mg1
Linepithema humile (Mayr, 1868)	Ba6
Linepthema neotropicum Wild, 2007	Ba11
Tapinoma melanocephalum (Fabricius, 1793)	Al, Ba6, Ce1, Mg1, Se
Ecitoninae – Ecitonini	
Cheliomyrmex morosus (F. Smith, 1859)	Mg1
Eciton hamatum (Fabricius, 1782)	Ba11
Labidus coecus (Latreille, 1802)	Ba6, Ba10, Ba11, Ce1, Mg1
Labidus mars (Forel, 1912)	Ba6
Labidus praedator (F. Smith, 1858)	Ba6, Ba11
Neivamyrmex caretteri (Forel, 1913)	Ba11
Neivamyrmex diana (Forel, 1912)	Ce2
Neivamyrmex minensis (Borgmeier, 1928)	Ce1
Nomamyrmex esenbeckii (Westwood, 1842)	Ce1
Ectatomminae – Ectatommini	
Ectatomma brunneum (F. Smith, 1858)	Ba1, Ba2, Ba4, Ba11
Ectatomma edentatum Roger, 1863	Ba2, Ba3, Ba4, Ba6, Ba10, Ba11, Ce1, Mg1, Pe1
Ectatomma muticum Mayr, 1870	Al, Ba1, Ba3, Ba4, Ba6, Ba8, Ba10, Ba15, Ce1, Pi1, Pi2, Se
Ectatomma opavicentre (Roger, 1861)	Ba4
Ectatomma suzanae Almeida, 1986	Ba6, Ce2, Mg1
Ectatomma tuberculatum (Oliver, 1792)	Ba2
Gnamptogenys bruchi (Santschi, 1922)*	Ba6
Gnamptogenys concinna (F. Smith, 1858)	Ba6
Gnamptogenys moelleri (Forel, 1912)*	Ba6, Ba7
Gnamptogenys regularis Mayr, 1870*	Ba6
Gnamptogenys striatula Mayr, 1884	Ba4, Ce1, Ce2
Gnamptogenys sulcata (F. Smith, 1858)	Ce1, Mg1
Formicinae – Camponotini	
Camponotus arboreus (F. Smith, 1858)	Ba4, Ba6, Ce2, Mg1
Camponotus atriceps (F. Smith, 1858)	Ba6, Ba10, Ce2, Mg1, Pe1
Camponotus blandus (F. Smith, 1858)	Ba4, Ba6, Ba10, Ba11, Ce1, Pe4, Se
Camponotus cameranoi (Emery, 1894)*	Ba6
Camponotus cingulatus Mayr, 1862	Ba4, Mg1
Camponotus crassus Mayr, 1862	Ba4, Ba6, Ba9, Ba10, Ce1, Ce2, Mg1, Pe1
Camponotus fastigatus Roger, 1863	Ba4, Ce1, Ce2
Camponotus genatus Santschi, 1922*	Ba6, Ba11
Camponotus germaini Emery, 1903	Mg1
Camponotus lespesii (Forel, 1886)*	Ba6
Camponotus melanoticus Emery, 1894	Ba6, Ba10, Ba11, Mg1
Camponotus novogranadensis Mayr, 1870	Ba11, Mg1
Camponotus pallecens (Mayr, 1887)	Al, Pe4
Camponotus renggeri (Emery, 1894)	Ba2, Ba3, Ba11, Mg1, Pi2
Camponotus rufipes (Fabricius, 1775)	Ba1, Ba2, Ba6, Ba7
Camponotus sericeiventris (Guérin-Méneville, 1838)	Mg1
Camponotus substitutus (Emery, 1894)	Ba10, Ce2, Mg1
Camponotus vittatus (Forel, 1904)	Ce2, Mg1
Formicinae – Myrmelachistini	
Myrmelachista sp.	Ce1, Mg1
Formicinae – Plagiolepidini	
Brachymyrmex coactus (Mayr, 1887)	Mg1
Brachymyrmex patagonicus Mayr, 1868	Mg1
Nylanderia sp.	Ba6, Ba11
Paratrechina longicornis (Latreille, 1802)	Ba4
Heteroponerianae – Heteroponerini	
Acanthoponera mucronata (Roger, 1860)	Ba6, Mg1
Myrmicinae – Attini	
Acromyrmex balzani (Emery, 1890)	Ba4, Ba10, Ba15, Mg1
Acromyrmex octospinosus (Reich, 1793)	Mg1
Acromyrmex rugosus (F. Smith, 1858)	Ba4, Mg1
Acromyrmex subterraneus (Forel, 1893)	Ce1, Mg1
Apterostigma gr. *pilosum**	Ba6
Atta laevigata (F. Smith, 1858)	Al, Pe1
Atta opaciceps Borgemeier, 1939	Ba11
Atta sexdens (Linnaeus, 1758)	Mg1
Atta sexdens rubropilosa (Forel, 1908)	Ba6
Cyphomyrmex olitor Forel, 1893	Ba11
Cyphomyrmex peltatus Kempf, 1966	Ba15
Cyphomyrmex rimosus (Spinola, 1851)	Ce2, Se
Cyphomyrmex tranversus (Emery, 1894)	Ba2, Ba4, Mg1, Pi2
Kalathomyrmex emeryi (Forel, 1907)	Ba12, Pi1, Pe2
gen. sp. nov. near *Mycetophylax*	Ce1
Myrmicocrypta sp.	Ba2, Ba4, Ce1, Pi1
Trachymyrmex sp.	Al, Ba1, Ba2, Ba6, Ce1, Se
Myrmicinae – Basicerotini	
Basiceros scambognathus (Brown, 1949)	Ba2
Eurhopalothrix bruchi (Santschi, 1922)	Ba6
Octostruma rugifera (Mayr, 1887)	Ba2, Ba6
Myrmicinae – Blepharidattini	
Blepharidatta conops Kempf, 1967	Ce1
Wasmannia auropunctata (Roger, 1863)	Ce2, Ba5, Ba6, Ba11, Mg1, Pe1
Wasmannia lutzi Forel, 1908	Ba6, Mg1
Wasmannia rochai Forel, 1912	Mg1
Wasmannia sigmoidea (Mayr, 1884)	Ba11
Myrmicinae – Cephalotini	
Cephalotes angustus (Mayr, 1862)*	Ba6

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Table I. Continued.

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

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Table I. Continued.

Subfamily – Tribe – Genera and Species	Occurrence
Megalomyrmex drifti Kempf, 1961*	Ba6
Megalomyrmex silvestrii Wheeler, 1909	Pe3
Monomorium floricola (Jerdon, 1851)	Ba6
Oxyepoecus browni Albuquerque & Brandão, 2004	Ba6
Oxyepoecus vezenyii (Forel, 1907)*	Ba6, Ce1
Oxyepoecus regularis Ulysséa & Brandão, 2012	Ba6, Ba11
Solenopsis geminata (Fabricius, 1804)	Ba2, Ba4, Mg1, Pi2
Solenopsis globularia (F. Smith, 1858)	Ba4, Ba5, Ce2
Solenopsis invicta Buren, 1972	Pe5
Solenopsis saevissima (F. Smith, 1855)	Ba3, Mg1, Pi2
Solenopsis tridens Forel, 1911	Villa Nova ["in the region of Caatingas" (Ihering & Ihering 1911), " = Bonfim" (Kempf 1971), today named Senhor do Bonfim], Bahia
Myrmicinae – Stenammini	
Rogeria alzatei Kugler, 1994*	Ba6
Rogeria blanda (F. Smith, 1858)	Ba6, Ce2, Mg1
Myrmicinae – Tetramoriini	
Tetramorium bicarinatum (Nylander, 1846)	Pi1
Ponerinae – Platythyreini	
Platythyrea sp. nov.	Ce2
Ponerinae – Ponerini	
Anochetus emarginatus (Fabricius, 1804)	Ce1
Anochetus gr. *inermis**	Ba6
Centromyrmex brachycola (Roger, 1861)	Pi2
Dinoponera mutica (Emery, 1901)	Al, Se
Dinoponera quadriceps Kempf, 1971	Ba1, Ba4, Ba5, Ba6, Ba10, Ba15, Ce1, Ce2, Pi1, Pi2, Se
Hypoponera sp.	Ba2, Ba4, Ba6, Pi1
Odontomachus bauri Emery, 1892	Ba4, Ba5, Ce1, Ce2, Mg1
Odontomachus brunneus (Patton, 1894)	Ba6
Odontomachus chelifer (Latreille, 1802)	Ba6
Odontomachus haematodus (Linnaeus, 1758)	Ba4, Ba6, Ba10, Se
Pachycondyla bucki (Borgmeier, 1927)	Ba6
Pachycondyla magnifica Borgmeier, 1929*	Ba6
Pachycondyla striata (F. Smith, 1858)	Ba6
Pachycondyla venusta (Forel, 1912)*	Ba6
Pachycondyla villosa (Fabricius, 1804)	Ba6, Mg1
Ponerinae – Thaumatomyrmecini	
Thaumatomyrmex atrox Weber, 193980	Ba2, Ba6
Thaumatomyrmex contumax Kempf, 1975	Ba2, Pe2
Thaumatomyrmex mutilatus Mayr, 1887	Ce1, Ce2
Proceratiinae – Proceratiini	
Discothyrea sexarticulata Borgmeier, 1954*	Ba6
Pseudomyrmecinae – Pseudomyrmecini	
Pseudomyrmex acanthobius (Emery, 1896)	Ce2
Pseudomyrmex elongata (Mayr, 1870)	Ba6
Pseudomyrmex flavidulus (F. Smith, 1855)	Ba4, Ba6, Mg1
Pseudomyrmex gracilis (Fabricius, 1804)	Ba4, Ba6, Ce1, Mg1
Pseudomyrmex oculatus (F. Smith, 1855)	Ba4
Pseudomyrmex pisinnus Ward, 1989	Ce1
Pseudomyrmex schuppi (Forel, 1901)	Ba6, Mg1
Pseudomyrmex simplex (F. Smith, 1877)	Ba4
Pseudomyrmex tenuis (Fabricius, 1804)	Ba6
Pseudomyrmex termitarius (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 (Mayhé-Nunes & 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*, *Hypoponera*, *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*, *Hypoponera*, *Myrmelachista*, *Myrmicocrypta*, *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 morphospecies. 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. Paraiba 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	10º25'05.94"S, 39º02'23.22"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	09º12'34.62"S, 39º03'48.42"W
	Paulo Afonso	–
	Rodelas	08º50'55.56"S, 38º48'02.94"W
	Santa Rita de Cássia	–
	Tanhaçu	–
	Tucano	10º46'58.86"S, 38º53'27.36"W
Ceará	Barbalha	–
	Chapada do Araripe	–
	Crateús	0292508S, 94344123W
	Pentecoste	03°48'S, 39°20'W
Minas Gerais	Januária	–
	Manga	14°48'36"/14°56'59"S 43°55'12"/44°04'12"W
Paraíba	Coremas	–
	Guarabira	–
Pernambuco	Araripina	–
	Bezerros	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

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