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Amazon Rainforest Ant-Fauna of Parque Estadual do Cristalino: Understory and Ground-Dwelling Ants

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Abstract

Ants are ecologically dominant and have been used as valuable bio-indicators of environmental change or disturbance being used in monitoring inventories. However, the majority of inventories have concentrated on ground-dwelling ant fauna disregarding arboreal fauna. This paper aimed to list the ant species collected both on the ground and in the vegetation of the Parque Estadual do Cristalino, an important protected site in the center of the southern Amazon. Moreover, we compared the composition of the ground dwelling and vegetation foraging ants. Two hundred and three (203) species distributed among 23 genera and eight subfamilies were sampled, wherein 34 species had not yet been reported in the literature for Mato Grosso State. As expected, the abundance and richness of ants was higher on the ground than in the understory. Also, the composition of the ant assemblages was different between these habitats (with only 20% occurring in both) indicating that complementary methods which include arboreal and terrestrial ants are indicated for efficient inventory. This study provides an inventory of the arboreal and ground ant fauna contributing to the knowledge and conservation of Amazonian ant fauna.

Introduction

Ants are ecologically dominant, playing several ecosystem services in the environment (Del Toro et al., 2012) and occupying the most varied habitats (Bruhl et al., 1998; Dejean et al., 2015; Rocha et al. 2015; Pape et al., 2016). Ants strongly influence several terrestrial communities due to their abundance and potential relationships with various biological groups. The interactions of ants can be positive or negative, ranging from interactions with microorganisms (Hanshew et al., 2014; Sanders et al., 2014), plants (Izzo & Vasconcelos, 2009; Vicente et al., 2012, 2014; Koch et al., 2015) and other invertebrates (Dáttilo et al., 2012a; Freitas & Rossi, 2015; Puker et al., 2015), even other ants (Adams et al., 2007; Sanhudo et al., 2008; Gallego-Ropero & Feitosa, 2014). Therefore, ants have been used as a model to understand the various ecological patterns and as valuable bio-indicators of environmental change or disturbance (Andersen et al., 2002; Bruna et al., 2014; Falcão et al., 2015).

Regardless of their ecological importance and diversity, studies on Brazilian ant fauna were usually concentrated in the Atlantic Forest (Feitosa & Ribeiro, 2005; Figueiredo et al., 2013; Silva et al., 2007), the Cerrado (Dáttilo et al., 2012b; Silva & Brandão, 2014; Camacho & Vasconcelos, 2015), and Pantanal (Ribas & Schoereder, 2007; Silva et al., 2013; Meurer et al., 2015). Although the Amazon is one of the largest and heterogeneous tropical forests remaining, the panorama is not different. The studies of Amazonian ants in Brazil are generally concentrated in small parts of the Central region (e.g. Vasconcelos et al., 2006, 2010; Santos et al., 2007; Baccaro et al., 2013; Souza et al., 2012). Studies in the southern Amazon region are few, and because they focus on local ecological patterns, the list of species therein usually does not have confirmation of specialists and comprises a

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large number of morphospecies (for example: Dáttilo et al., 2013; Falcão et al., 2015). The absence of surveys in this area is particularly problematic to the knowledge of the distribution of ant diversity in the tropics. More than being a frontier between the Amazonia and Cerrado biomes, the south of Amazonia is a frontier of fast agricultural expansion, being subject to enormous rates of deforestation (Fearnside, 2005). In such a scenario, several species could become, and probably some already have become extinct without being known by science. This is worrying in a region that has many species with unknown distribution (Vicente et al., 2011, 2012, 2015, 2016; Prado et al., 2016).

Whereas inventories are fundamental to promote conservation of tropical forest remnants and the ants are important components of biodiversity, this work aims to contribute to the knowledge of the Amazonian ground-dwelling and arboreal ant fauna. The reserve is a *terra firme* Tropical Rainforest located in the Southern Amazon, but with little known diversity of various taxa. In this study, we list the fauna of ground-dwelling ants and the assemblages of ants foraging on lower vegetation in the same site. We compared the difference between the strata in order to demonstrate the increase in local biodiversity by using a simple additional method.

Material and methods

Study area

The surveys were conducted in an Amazonian Research Program Station in Biodiversity in the Brazilian Parque Estadual do Cristalino (henceforward PEC), with RAPELD methodology (see Magnusson et al., 2005). The park is a large protected area defined as "Priority for Conservation Site" (Ministério do Meio Ambiente [MMA], 2001) that hosts an area of 184,900 ha, situated in the middle of an area called "Arc of Deforestation" (Fearnside, 2005), comprising the Brazilian municipality of Alta Floresta and Novo Mundo, state of Mato Grosso bordering on Pará state. The research study was carried in a station installed in the north of the park (9° 32'47 "S, 55° 47'38" W) (Fig 1) in the municipality of Novo Mundo. The vegetation is characterized as transition zones between ombrophilous and seasonal forest, seasonal forest and savanna (Cerrado), and ombrophilous and savanna (Cerrado) (Instititudo Brasileiro de Geografia e Estatística [IBGE], 2004).

Ant sampling

The inventory of ants was conducted between November 2012 (begining of the rainy season with sporadic rains) and May 2013 (end of the rainy season with sporadic rains) in 11 trails 250m long, with a distance between sites of at least 1 km. In each trail, ants were collected every 25m, resulting in 20 samples per trail (10 samples of the ground-dwelling ants and 10 samples of the arboreal ants) and totaling 220 samples (110 samples of ground-dwelling ants and 110 samples of arboreal ants). The collection of the ground ant assemblages was made using a single pitfall trap that remains installed for 48 hours in each sample point. For sampling arboreal ants a beating-tray method was used in vegetation of understory. In each of these points, we selected the four treelets equidistant of about 2 m of the pitfall. Under each treelet, a white canvas was installed to prevent some ants from jumping and getting away from the sampling (Dáttilo et

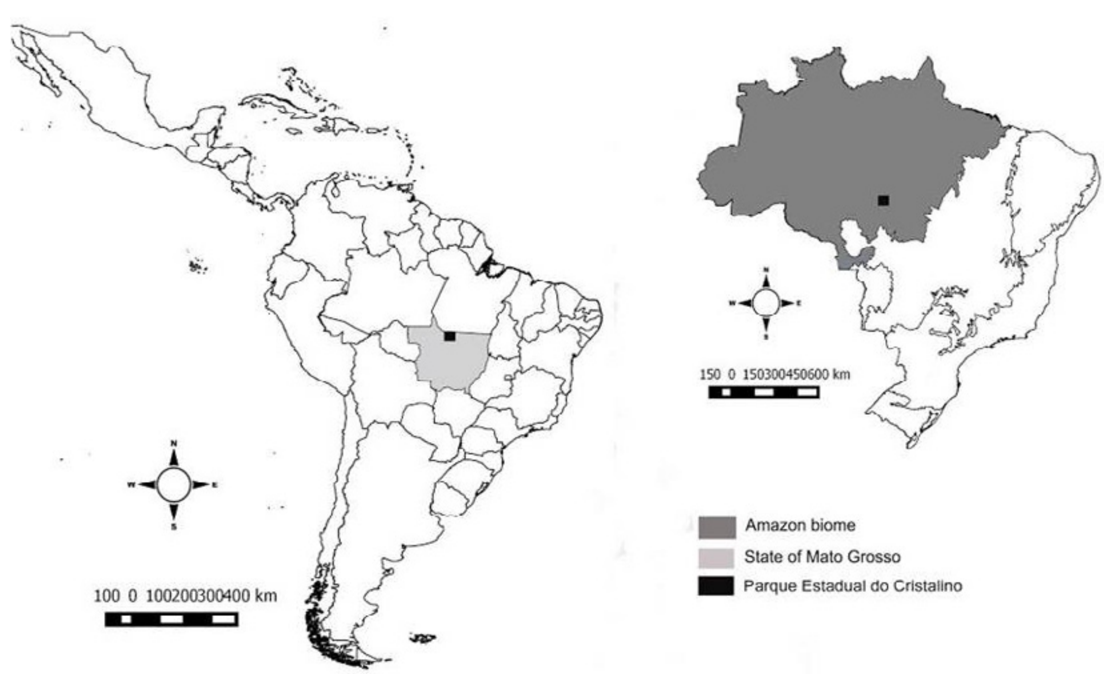


Fig 1. Location map of the Parque Estadual do Cristalino (filled circle).

al., 2013), and about one meter from the ground to prevent ants from walking on the ground and climbing on the canvas. Then all vegetation in each treelet within 1m² with between 1-3 meters in height was steadily shaken and the ants that fell on the canvas were properly collected. The sampling of ground and arboreal ants was carried out concomitantly, so the sampling of arboreal ants was performed between 9 am and 3 pm on the same day that the pitfall was removed.

Ant identification

Ants collected initially were identified using dichotomous key for subfamilies and genera available in Baccaro et al. (2015). So as to separate into morphospecies and identify to a specific level we used several taxonomic keys (Brandão, 1990; Fernández, 2003; Longino, 2003a; MacKay & MacKay, 2010; Fernandes et al., 2014). Posteriorly we made comparisons with specimens deposited at the Laboratório de Ecologia de Comunidades from the Centro de Biodiversidade da Universidade Federal de Mato Grosso (UFMT) and the ant collection from the Laboratório de Sistemática, Evolução e Biologia de Hymenoptera from the Museu de Zoologia da Universidade de São Paulo (MZSP). We also consulted specialists to confirm species identification (see acknowledgments). Vouchers were deposited in the collections mentioned above. After the identification and confirmation by specialists we consulted the distribution of each species using the AntMaps (Janicki et al., 2016), a new interactive tool recently used by taxonomists and ecologists (Gérnard & Economo, 2015; Vicente et al., 2015; Santos-Silva et al., 2016; Wepfer et al., 2016). This tool comprises the geographic distributions of more than 15,000 species/subspecies in over 1.7 million records of about 8,650 publications, museum collections and specimen databases (Janicki et al., 2016). Furthermore, we researched in bibliographic references related to taxonomy of species or lists of ants from region.

Data analysis

We carried out a t-test to access the difference of ant abundance and richness patterns between ground and understory. Because ants are social insects, the sampled abundance of workers in pitfalls may be strongly related to the proximity to the nest (Gotelli et al., 2011) or workers' number in a colony, which varies greatly between species (Baccaro et al., 2015). To minimize this effect, we treated the abundance as sample-based occurrences (Gotelli et al., 2011) as is commonly done in studies with ants (Ryder-Wilkie et al., 2010; Dáttilo & Izzo, 2012; Baccaro et al., 2013). To access the distribution patterns of the ant assemblages we performed an ordenation with Principal Coordinate Analysis (PCoA) technique based on a matrix of Raup-Crick dissimilarity measures calculated in a binary matrix with presence and absence date. Raup-Crick was used because it is a robust index that calculates how different pairwise samples are than expected by chance implementing null models which consider the variation in the number of local species and alpha diversity (Chase et al., 2011). This index is frequently used to compare the dissimilarity of invertebrate communities between different habitats (Ryder-Wilkie et al., 2010; Ribas et al., 2012; Reis et al., 2013). We utilized the first two PCoA axis (which represented 66.76 % of explication) in a Multivariate Analysis of Variance (MANOVA) as dependent variables and vertical habitat (ground and understory) as a factor. All analysis were performed with R-software (R Core Team, 2015) using the Vegan-package (Oksanen et al., 2015).

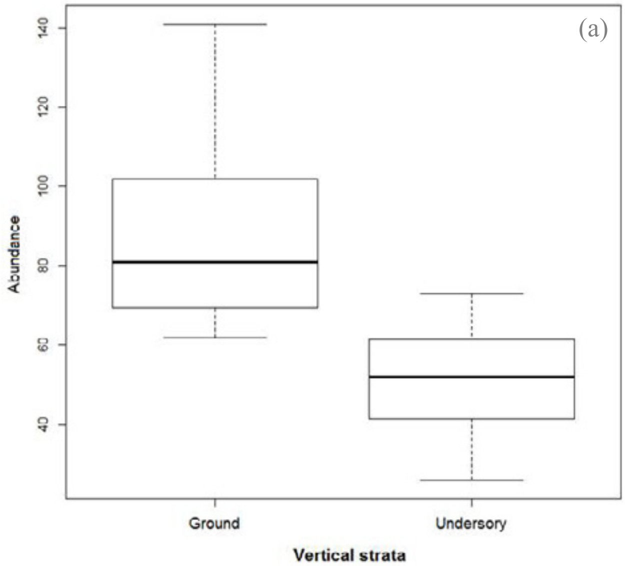
Results

We recorded 1,581 occurrences of ants in the 220 samples. The ants collected belong to 203 species, 45 genera and eight subfamilies. Subfamilies with greater richness were Myrmicinae with 23 genera and 113 species, Ponerinae with eight genera and 23 species and Formicinae with five genera and 27 species. The genus with greater richness was *Pheidole* (37 species), *Camponotus* (17), *Neoponera* and *Crematogaster* (both 10 species).

Both abundance ($p < 0.001$) and richness ($p < 0.001$) of ants were different between the vertical strata (Table 1 – Fig 2), being greater on the ground than on the understory. We collected almost 63.4% of ant occurrences (total: 1,002, mean: 89.1, SD: ±26.3 per sample) and 65% of ant species (total: 143 species, mean: 47.91, SD: ±10.26) on the ground stratum. The understory showed a total of 579 occurrences (mean: 51±, SD: 15.1) and a total of 100 species (mean: 26.6, ±SD: 6.67). Of these 203 species, 164 species were restricted to a vertical stratum with 104 species collected only on the ground and 60 only on the understory, and just 39 species collected in both strata (Table 2). Although on average 41.09 species by trail (±SD: 9.07) were exclusive to the ground, there is a mean increase of 19.73 species by trail (±SD: 5.85) by adding beating tray in the ant collection. Only one subfamily (Amblyoponinae) was sampled exclusively on the ground. Consequently, the species composition was different between the habitats (MANOVA - Pillai-Trace: 0.852, $F_{1,20}$: 54.873, $p < 0.001$ – Fig 3). Among the species sampled, 34 were recorded for the first time for Mato Grosso State, Brazil (Table 2).

Table 1. *t*-test measures for difference in abundance and richness between ground and arboreal ant assemblages.

Parameters	*t*	df	p-value
Abundance	4.1599	15.979	<0.001
Richness	5.7656	17.167	<0.001



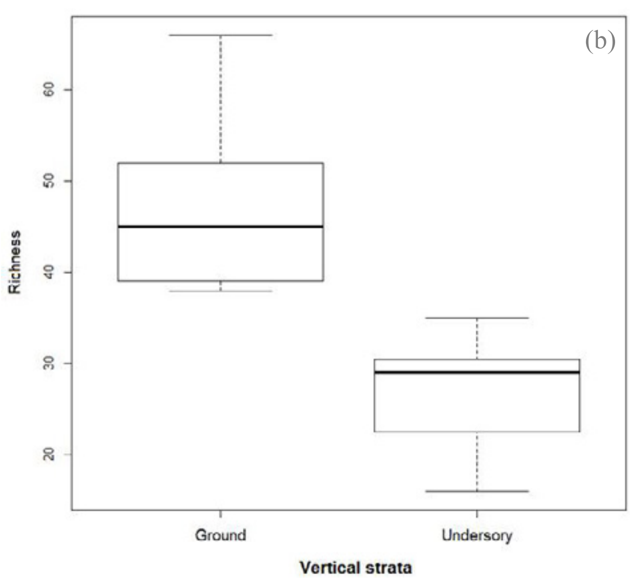


Fig 2. (a) Abundance mean of ants and (b) richness of ant species in vertical strata (ground and understory).

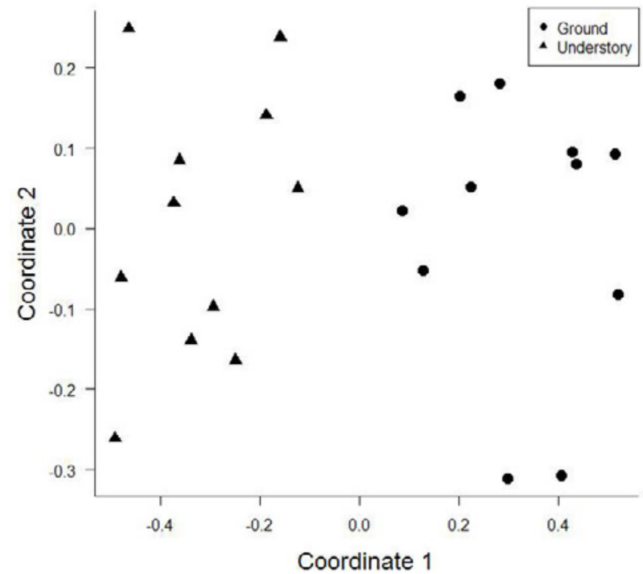


Fig 3. Composition of ground (filled circle) and understory (filled circle) ant community of the Parque Estadual do Cristalino. Principal Coordinate Analysis axis represented 71.6% of total ordination.

Discussion

Of the inventories on ant assemblages conducted in the Amazon, the major part of the studies focused just on ground-dwelling ants (Miranda et al., 2012; Souza et al., 2012, 2015; Baccaro et al., 2013) and few comprised both terrestrial and arboreal ant fauna detailing the strata in which each species was collected (e.g.: Vasconcelos & Vilhena, 2006; Ryder-Wilkie et al., 2010). These few studies carried out in the Amazon embracing both soil and vegetation ants have demonstrated extremely different ant assemblages between these habitats (Vasconcelos & Vilhena, 2006; Ryder-Wilkie et al., 2010). The methods employed here are very different. The both methods capture active foraging ants, however the pitfall traps were active during day and night whereas the beating tray method was used only during the day. This can explain the small number of species collected on vegetation, preventing strong inferences towards the patterns of species richness. However we observed a strong turnover on ant composition, since only about 20% of all collected species were sampled both on the ground and on vegetation. Hence, even missing several nocturnal species on vegetation strata, the species collected just on vegetation were certainly absent on ground strata. Therefore, the vertical stratification in the ant fauna is a robust ecological pattern found in both the Amazon forest and in other biomes (Bruhl et al., 1998; Vasconcelos & Vilhena, 2006; Neves et al., 2013; Camacho & Vasconcelos, 2015). Additionally our results indicate that, using an additional simple method focusing on vegetation foraging ants, as beating-tray, one can increase the number of collected species. Therefore, besides the vegetation foraging ant community can show different ecological patterns they contribute to our understanding of the real ant biodiversity in an area and, as well as the knowledge of biogeographical patterns.

The Amblyoponinae subfamily, considered as a basal group in the evolution of ants (Saux et al., 2004), as well as the 18 other genera were sampled exclusively on the ground. Among these genera collected only in soil are the fungus-growing ants *Atta*, *Mycetarotes*, *Mycocepurus*, *Myrmicocrypta* and *Sericomyrmex*. These ants nest directly on the ground or in rotten wood in contact with the soil (Baccaro et al., 2015). Except for the *Atta* species which climbs into vegetation to cut fresh vegetable matter, the other abovementioned species take advantage of organic matter found in litter such as fallen leaves, fruits, flowers, feces and corpses (Leal & Oliveira, 2000; Mayhé-Nunes & Brandão, 2006). *Hylomyrma immanis*, *Octostruma balzani, Rogeria scobinata* and three unidentified *Hypoponera* species also were collected exclusively in the soil. These genera have species with cryptic behavior (Lapolla

& Sosa-Calvo, 2006; Longino, 2013b). The sampling of only one *Daceton armigerum* worker on the ground should be considered as an accidental record, since species of this genus have adaptations such as hook-shaped claws which provide remarkable adhesion to the arboreal substrate (Billen et al., 2016) where they nest in tree branches (Azorsa & Sosa-Calvo, 2008; Vicente et al., 2011) and forage (Dejean et al., 2012).

Despite their hypogeal origin, ants diversify occupying other habitats (Lucky et al., 2013) and the occupation of the arboreal environment resulted in morphological and behavioral adaptations both to get around and feed on available resources in vegetation (Orivel & Dejean, 1999; Dejean et al., 2005). These adaptations were observed in the various *Neoponera* species sampled. *Neoponera* is composed mainly by arboreal behavior species (Schmidt & Shattuck, 2014) that live or forage on vegetation, and have morphological adaptations regarding modifications on claws, shape and adhesion (Orivel et al., 2001). Four other genera were restricted to vegetation: *Azteca*, *Myrmelachista, Nesomyrmex* and *Tapinoma*. Species of these genera usually nest on plants (Longino, 2007; Nakano et al., 2013; Longino, 2004). *Cephalotes* was another genus with a greater number of arboreal species, with just *C. atratus* being collected in both strata. The *Cephalotes* ant genus has as their main features a diet based largely on pollen and nectar and nesting in pre-existing plant cavities (Byk & Del-Claro, 2010), however, *C. atratus* can often be found foraging on the ground (Corn, 1980). Although some subfamilies as Pseudomyrmecinae and Dolichoderinae had a large proportion of species collected in the vegetation, no subfamily has been sampled exclusively to only this vertical strata. In Pseudomyrmecinae, only *Pseudomyrmex tenuis* was collected in both soil (one worker) and vegetation (seven workers). *P. tenuis* is a widespread ant species, frequently sampled foraging in all strata as epigaeic, arboreal and canopy stratum (Vasconcelos & Vilhena, 2006; Neves et al., 2013; Camacho & Vasconcelos, 2015; Souza et al., 2015). Also, in a Dolichoderinae subfamily with 18 ant species, only five species of *Dolichoderus* genus, occurred also on the ground.

Camponotus genus was particularly representative (17 species; 84 samples) in relation to the total number of collected species (5.6%). In two areas of Central Amazon, both in Amazonas state, Brazil, *Camponotus* species comprises 2.7% and 2.3% of total species collect on the ground (Souza et al., 2015). In addition, in the Central South Amazon this proportion ranges from 1.99% to 4.62% of ground ants in preserved areas of Rondônia state (Souza et al., 2015). On the other hand, in samples made in ground and understory of patches of forest in Southern Amazon in Rondonia state and Central East Amazon in Pará state, both in Brazil, there was a ratio of 9.33% and 7.09%, respectively (Santos-Silva et al. 2016; Vasconcelos et al., 2006). Therefore, this high proportion of *Camponotus* found in the Parque Estadual do Cristalino confirm that simple methodologies could sampled a greater number of considered arboreal ant species, such as *Camponotus*.

Mato Grosso State is the third largest state in Brazil, hosting three different Biomes and the many new records in an inventory (18 species collected in the soil, seven in vegetation and 10 in both strata) demonstrating a gap or shortcoming related mainly to the lack of surveys throughout the South American territory (but see: Kempf 1972; Brandão 1991; Silva et al., 2013; Meurer et al., 2015). Although there are a number of studies on the ecology and distribution of ants in the Amazon in northern Mato Grosso (Dáttilo et al., 2013; Falcão et al., 2015; Vicente et al., 2011, 2012, 2014, 2015) this is the first list of ant species for the region, as well as being the most complete list published until now for the southern Amazon. In summary, this work demonstrates that inventories should consider ants of both ground and vegetation for a better sampling of local ant diversity. In addition, the number of new records of ant fauna (35 species) for Mato Grosso state and the number of unnamed species (97 morphospecies), show that the ant fauna of the Amazon in general are not common or are extremely unknown. The tropical forests are being increasingly threatened by anthropic activities and Mato Grosso state in particular because they are located in a region with a historically strong pressure for disturbance, being an agricultural frontier. Therefore, efforts should be made to understand ant diversity distribution patterns and propose conservation strategies in this region.

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References

Adams, R.M.M. & Longino, J. (2007). Nesting biology of the arboreal fungus-growing ant *Cyphomyrmex cornutus* and its social parasite *Megalomyrmex mondabora*. Insectes Sociaux, 54(2): 136-143. doi: 10.1007/s00040-007-0922-0

Andersen, A.N., Hoffmann, B.D., Müller, W.J. & Griffiths, A.D. (2002). Using ants as bioindicators in land management:

simplifying assessment of ant community responses. Journal of Applied Ecology, 39: 8-17. doi: 10.1046/j.1365-2664.2002.00704.x

Azorsa, F. & Sosa-Calvo, J. (2008). Description of a remarkable new species of ant in the genus *Daceton* Perty (Formicidae: Dacetini) from South America. Zootaxa, 1749: 27-38.

Baccaro, F.B., Feitosa, R.M., Fernández, F., Fernandes, I.O., Izzo, T.J., Souza, J.L.P. & Solar, R. (2015). Guia para os gêneros de formigas do Brasil. Manaus: Editora INPA. doi: 10.5281/zenodo.32912

Baccaro, F.B., Rocha, I.F., Del Aguila, B.E.G., Schietti, J., Emilio, T., Pinto, J.L.P.D.V., Lima, A.P. & Magnusson, W.E. (2013). Changes in ground-dwelling ant functional diversity are correlated with water-table level in an Amazonian Terra Firme forest. Biotropica, 45: 755–763. doi: 10.1111/btp.12055

Brandão, C.R.F. (1990). Systematic revision of the Neotropical ant genus *Megalomyrmex* Forel (Hymenoptera: Myrmicinae), with the description of thirteen new species. Arquivos de Zoologia, 31:411-494. doi: 10.11606/issn.2176-7793.v31i5p1-91

Brandão, C.R.F. (1991). Adendos ao catalogo abreviado das formigas da regiao neotropical (Hymenoptera: Formicidae). Revista Brasileira Entomologia, 35: 319-412.

Billen, J., Al-Khalifa, M.S. & Silva, R.R. (2016). Pretarsus structure in relation to climbing ability in the ants *Brachyponera sennaarensis* and *Daceton armigerum*. Saudi Journal of Biological Sciences. doi:10.1016/j.sjbs.2016.06.007

Bruhl, C.A., Gunsalam, G. & Linsenmair, K.E. (1998). Stratification of ants (Hymenoptera: Formicidae) in a primary rain forest in Sabah, Borneo. Journal of Tropical Ecology, 14: 295-297.

Bruna, E.M., Izzo, T.J., Inouye, B.D. & Vasconcelos, H.L. (2014). Effect of mutualist partner identity on plant demography. Ecology, 95: 3237-3243. doi: 10.1890/14-0481.1

Byk J. & Del-Claro, K. (2010). Nectar- and pollen-gathering *Cephalotes* ants provide no protection against herbivory: a new manipulative experiment to test ant protective capabilities. Acta Ethologica, 13: 33-38. doi: 10.1007/s10144-010-0240-7

Camacho, G.P. & Vasconcelos, H.L. (2015). Ants of the Panga Ecological Station, a Cerrado Reserve in Central Brazil. Sociobiology, 62: 281-295. doi: 10.13102/sociobiology.v62i2.281-295

Chase, J.M., Kraft, N.J.B., Smith, K.G., Vellend, M. & Inouye, B.D. (2011). Using null models to disentangle variation in community dissimilarity from variation in α-diversity. Ecosphere, 2: 1-11. doi: 10.1890/ES10-00117.1

Corn, M.L. (1980). Polymorphism and polyethism in the neotropical ant *Cephalotes atratus* (L.). Insectes Sociaux, 27(1): 29-42. doi: 10.1007/BF02224519

DaRocha, W.D.; Ribeiro, S.P.; Neves, F.; Fernandes, G.W.; Leponce, M. & Delabie, J.H.C. (2015). How does bromeliad distribution structure the arboreal ant assemblage (Hymenoptera: Formicidae) on a single tree in a Brazilian Atlantic forest agroecosystem? Myrmecological News, 21: 83-92.

Dáttilo, W. & Izzo, T.J. (2012). Temperature Influence on Species Co-Occurrence Patterns in Treefall Gap and Dense Forest Ant Communities in a Terra-Firme Forest of Central Amazon, Brazil. Sociobiology, 59: 351-367. doi: 10.13102/sociobiology.v59i2.599

Dáttilo, W., Martins, R.L., Uhde, V., Noronha, J.C., Florêncio, F.P. & Izzo, T.J. (2012a). Floral resource partitioning by ants and bees in a jambolan Syzygium jambolanum (Myrtaceae) agroforestry system in Brazilian Meridional Amazon. Agroforestry Systems, 85: 105-111. doi:10.1007/s10457-012-9489-5

Dáttilo, W., Rico-Gray, V., Rodrigues, D.J. & Izzo, T.J. (2013). Soil and vegetation features determine the nested pattern of ant–plant networks in a tropical rainforest. Ecological Entomology, 38: 374-380. doi: 10.1111/een.12029

Dáttilo, W., Vicente, R.E., Nunes, R.V. & Feitosa, R. (2012b). Influence of cave size and presence of bat guano on ant visitation. Sociobiology, 59: 549-559. doi: 10.13102/sociobiology.v59i2.617

Dejean, A., Delabie, J.H.C., Corbara, B., Azémar, F., Groc, S., Orivel, J. & Leponce, M. (2012). The ecology and feeding habits of the arboreal trap-jawed ant *Daceton armigerum*. Plos One, 7(6): e37683. doi: 10.1371/journal.pone.0037683

Dejean, A., Groc, S., Hérault, B., Rodriguez-Pérez, H., Touchard, A., Céréghino, R., Delabie, J.H.C. & Corbara, B. (2015). Bat aggregation mediates the functional structure of ant assemblages. Comptes Rendus Biologies, 338: 688-695. doi:10.1016/j.crvi.2015.06.011.

Dejean, A., Solano, P.J., Ayroles, J., Corbara, B. & Orivel, J. (2005). Arboreal ants build traps to capture prey. Nature, 434: 973. doi: 10.1038/434973a.

Del Toro, I., Ribbons, R.R. & Pelini, S.L. (2012). The little things that run the world revisited: a review of ant-mediated ecosystem services and disservices (Hymenoptera: Formicidae). Myrmecological News, 17: 133-146.

Falcão, J.C.F., Dáttilo, W. & Izzo, T.J. (2015). Efficiency of different planted forests in recovering biodiversity and ecological interactions in Brazilian Amazon. Forest Ecology and Management, 339: 105-111. doi: 10.1016/j.foreco.2014.12.007

Fearnside, P.M. (2005). Deforestation in Brazilian Amazonia: History, Rates, and Consequences. Conservation Biology, 19: 680-688. doi: 10.1111/j.1523-1739.2005.00697.x

Feitosa, R.M. & Ribeiro, A.S. (2005). Mirmecofauna (Hymenoptera, Formicidae) de serapilheira de uma área de

Floresta Atlântica no Parque Estadual da Cantareira - São Paulo, Brasil. Biotemas, 18: 51-71.

Fernandes, I.O., Oliveira, M.L. & Delabie, J.H.C. (2014). Description of two new species in the Neotropical *Pachycondyla foetida* complex (Hymenoptera: Formicidae: Ponerinae) and taxonomic notes on the genus. Myrmecological News, 19: 133-163.

Fernández, F. (2003). Myrmicine ants of the genera *Ochetomyrmex* and *Tranopelta* (Hymenoptera: Formicidae). Sociobiology, 41:633-661.

Figueiredo, C.J.; Silva, R.R.; Munhae, C.B. & Morini, M.S.C. (2013). Ant fauna (Hymenoptera: Formicidae) attracted to underground traps in Atlantic Forest. Biota Neotropica, 13: 176-182. doi: 10.1590/S1676-06032013000100020

Freitas, J.D. & Rossi, M.N. (2015). Interaction between trophobiont insects and ants: The effect of mutualism on the associated arthropod community. Journal of Insect Conservation. doi: 10.1007/s10841-015-9785-2

Gallego-Ropero, M.C. & Feitosa, R.M. (2014). Evidences of batesian mimicry and parabiosis in ants of the Brazilian Savanna. Sociobiology, 61: 281-285. doi:10.1007/s10841-015-9785-2

Gotelli, N.J.G., Ellison, A.M., Dunn, R.R. & Sanders, N.J. (2011). Counting ants (Hymenoptera: Formicidae): biodiversity sampling and statistical analysis for myrmecologists. Myrmecological News, 15: 13-19.

Guénard, B. & Economo, E.P. (2015). Additions to the checklist of the ants (Hymenoptera: Formicidae) of Peru. Zootaxa, 4040(2): 225-235. doi: 10.11646/zootaxa.4040.2.8

Hanshew, A.S., McDonald, B.R., Díaz-Díaz, C., Djieto-Lordon, C., Blatrix, R. & Currie, C.R. (2014). Characterization of Actinobacteria Associated with Three Ant–Plant Mutualisms. Microbial Ecology, 69: 192-203. doi: 10.1007/s00248-014-0469-3

Instituto Brasileiro de Geografia e Estatística. 2004. Mapa da vegetação brasileira. 3ª edição. Ministério do Planejamento, Orçamento e Gestão.

Izzo T.J. & Vasconcelos H.L. (2002). Cheating the cheater: domatia loss minimizes the effects of ant castration in an Amazonian ant–plant. Oecologia, 133: 200-205. doi: 10.1007/s00442-002-1027-0.

Janicki, J., Narula, N., Ziegler, M., Guénard, B. & Economo, E.P. (2016). Visualizing and interacting with large-volume biodiversity data using client-server web-mapping applications: The design and implementation of antmaps.org. Ecological Informatics, 32: 185-193.

Kempf W.W. (1972). Catalago abreviado das formigas da região Neotropical (Hym. Formicidae). Studia Entomologica, 15:1-4.

Koch, E.B.A., Camarota, F. & Vasconcelos, H.L. (2016). Plant Ontogeny as a Conditionality Factor in the Protective Effect of Ants on a Neotropical Tree. Biotropica, 48: 198–205. doi: 10.1111/btp.12264

Lapolla, J.S. & Sosa-Calvo, J. (2006). Review of the ant genus *Rogeria* (Hymenoptera: Formicidae) in Guyana. Zootaxa, 1330: 59-68.

Leal, I.R. & Oliveira, P.S. (2000). Foraging ecology of attine ants in a Neotropical savanna: seasonal use of fungal substrate in the cerrado vegetation of Brazil. Insectes Sociaux, 47: 376-382. doi: 10.1007/PL00001734

Longino, J.T. (2003a). The *Crematogaster* (Hymenoptera, Formicidae, Myrmicinae) of Costa Rica. Zootaxa, 151: 1-150.

Longino, J.T. (2004). Ants of Costa Rica. http://academic.evergreen.edu/projects/ants/Genera.html. (accessed date: 20 July, 2015).

Lucky, A., Trautwein, M.D., Guénard, B.S., Weiser, M.D. & Dunn, R.R. (2013). Tracing the Rise of Ants - Out of the Ground. PLoS ONE, 8: e84012. doi: 10.1371/journal.pone.0084012

MacKay, W.P. & MacKay, E.E. (2010). The systematics and biology of the New World ants of the genus *Pachycondyla* (Hymenoptera: Formicidae). Edwin Mellen: Press Lewiston, NY.

Magnusson, W.E., Lima, A.P., Luizão, R., Luizão, F., Costa, F.R.C., Castilho, C.V. & Kinupp, V.P. (2005). RAPELD: a modification of the Gentry method for biodiversity surveys in long-term ecological research sites. Biota Neotropica, 5: 19-24.

Mayhé-Nunes, A.J. & Brandão, C.R.F. (2006). Revisionary notes on the fungus-growing ant genus *Mycetarotes* Emery (Hymenoptera, Formicidae). Revista Brasileira de Entomologia, 50: 463-72. doi: 10.1590/S0085-56262006000400005

Meurer, E., Battirola, L.D., Delabie, J.H.C. & Marques, M.I. (2015). Influence of the Vegetation Mosaic on Ant (Formicidae: Hymenoptera) Distributions in the Northern Brazilian Pantanal. Sociobiology, 62: 382-388. doi:10. 13102/sociobiology.v62i3.359

Miranda, P.N., Oliveira, M.A., Baccaro, F.B., Morato, E.F. & Delabie, J.H.C., (2012). Check list of ground-dwelling ants (Hymenoptera: Formicidae) of the eastern Acre, Amazon, Brazil. Check List, 8: 722-730.

Ministério do Meio Ambiente (2001). Avaliação e identificação de ações prioritárias para a conservação, utilização sustentável e repartição dos benefícios da biodiversidade na amazônia brasileira. Brasília: Ministério do Meio Ambiente, MMA/SBF.

Nakano, M.A., Miranda, V.F.O., Souza, D.R., Feitosa, R.M. & Morini, M.S.C. (2013). Occurrence and natural history of *Myrmelachista* Roger (Formicidae: Formicinae) in the Atlantic Forest of southeastern Brazil. Revista Chilena de Historia Natural, 86: 169-179.

Neves, F., Queiros-Dantas, K.S., Rocha, W.D. & Delabie, J.H.C. (2013). Ants of three adjacent habitats of a transition region between the Cerrado and Caatinga Biomes: The effects of heterogeneity and variation in canopy cover. Neotropical Entomology, 42: 258-268. doi: 10.1007/s13744-013-0123-7

Oksanen, J., Blanchet, F.G., Kindt, R., Legendre, P., Minchin, P.R., O'Hara, R.B., Simpson, G.L., Solymos, P., Stevens M.H.H. & Wagner H. (2015). vegan: Community Ecology Package. R package version 2.3-0. http://CRAN.R-project.org/package=vegan. (accessed date: 20 November, 2015).

Orivel J. & Dejean A. (1999). L'adaptation á la vie arboricole chez les fourmis. L'Année biologique, 38: 1-18.

Orivel, J., Malherbe, M.C. & Dejean, A. (2001). Relationships between pretarsus morphology and arboreal life in ponerine ants of the genus *Pachycondyla* (Formicidae: Ponerinae). Annals of the Entomological Society of America, 94: 449-456.

Prado, L.P.; Vicente, R.E.; Silva, T.S.R. & Souza, J.L. (2016). *Strumigenys fairchildi* Brown, 1961 (Formicidae, Myrmicinae): First record of this rarely collected ants from Brazil. Check List, 12: 1-5. doi: 10.15560/12.4.1922

Puker, A., Rosa, C.S., Orozco, J., Solar, R.R.C. & Feitosa, R.M. (2015). Insights on the association of American Cetoniinae beetles with ants. Entomological Science, 18: 21-30. doi: 10.1111/ens.12085

R Core Team (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/. (accessed date: 20 November, 2015).

Reis, P.C.J., DaRocha, W.D., Falcão, L.A.D., Guerra, T.J. & Neves F.S., 2013. Ant fauna on *Cecropia pachystachya* Trécul (Urticaceae) trees in an Atlantic Forest Area, Southeastern Brazil. Sociobiology, 60: 222-228. doi:10.13102/sociobiology.v60i3.222-228

Ribas, C.R., Schmidt, F.A., Solar, R.R.C., Campos, R.B.F., Valentim, C.L. & Schoereder, J.H. (2012). Ants as Indicators of the Success of Rehabilitation Efforts in Deposits of Gold Mining Tailings. Restoration Ecology, 20: 712-720. doi: 10.1111/j.1526-100X.2011.00831.x

Ribas, C.R. & Schoereder, J.H. (2007). Ant communities, environmental characteristics and their implications for conservation in the Brazilian Pantanal. Biodiversity and Conservation, 16: 1511-1520. doi: 10.1007/s10531-006-9041-x

Ryder-Wilkie, K.T., Mertl, A.L. & Traniello, J.F.A. (2010). Species diversity and distribution patterns of the ants of Amazonian Ecuador. Plos One, 5: e13146. doi: 10.1371/journal.pone.0013146

Sanders, J.G., Powell, S., Kronauer, D.J., Vasconcelos, H.L., Frederickson, M.E. & Pierce, N.E. (2014). Stability and phylogenetic correlation in gut microbiota: lessons from ants and apes. Molecular Ecology, 23: 1268-1283. doi:10.1111/mec.12611

Sanhudo, C.E.D., Izzo, T.J. & Brandão, C.R.F. (2008). Parabiosis between basal fungus-growing ants (Formicidae, Attini). Insectes Sociaux, 55: 296-300. doi: 10.1007/s00040-008-1005-6

Santos, I.A., Harada, A.I., Alves, S.B., Santos, M.P.D. & Ribas, C.R. (2007). Diversity of ants on palms in Varzea habitats at Amazonia (Hymenoptera: Formicidae). Sociobiology, 50: 23-33.

Santos-Silva, L., Vicente, R.E. & Feitosa, R.M. (2016). Ant species (Hymenoptera, Formicidae) of forest fragments and urban areas in a Meridional Amazonian landscape. Check List, 12(3)1-7. doi: 10.15560/12.3.1885.

Saux, C., Fisher, B.L. & Spicer, G.S. (2004). Dracula ant phylogeny as inferred by nuclear 28S rDNA sequences and implications for ant systematics (Hymenoptera: Formicidae: Amblyoponinae). Molecular Phylogenetics and Evolution, 33:457-68.

Schmidt, C.A. & Shattuck, S.O. (2014). The higher classification of the ant subfamily Ponerinae (Hymenoptera: Formicidae), with a review of ponerine ecology and behavior. Zootaxa, 3817(1): 1-242.

Silva, F.H.O., Delabie, J.H.C., Santos, G.B., Meurer, E. & Marques, M.I. (2013). Mini-winkler extractor and pitfall trap as complementary methods to sample Formicidae. Neotropical Entomology, 42: 351-358. doi: 10.1007/s13744-013-0131-7

Silva, R.R. & Brandão, C.R.F. (2014). Ecosystem-wide morphological structure of leaf-litter ant communities along a tropical latitudinal gradient. Plos One, 9:e93049. doi: 10.1371/journal.pone.0093049

Silva, R.R., Feitosa, R.M. & Eberhardt, F. (2007). Reduced ant diversity along a habitat regeneration gradient in the southern Brazilian Atlantic Forest. Forest Ecology and Management, 240: 61-69. doi: 10.1016/j.foreco.2006.12.002

Souza, J.L.P., Baccaro, F.B., Landeiro, V.L., Franklin, E., Magnusson, W.E., Pequeno, P.A.C.L. & Fernandes, I.O. (2015). Taxonomic sufficiency and indicator taxa reduce sampling costs and increase monitoring effectiveness for ants. Diversity and Distributions. doi: 10.1111/ddi.12371

Souza, J.L.P., Baccaro, F.B., Landeiro, V.L., Franklin, E. & Magnusson, W.E. (2012). Trade-offs between complementarity and redundancy in the use of different sampling techniques for ground-dwelling ant assemblages. Applied Soil Ecology, 56: 63-73. doi: 10.1016/j.apsoil.2012.01.004

Vasconcelos, H.L. & Vilhena, J.M.S. (2006). Species turnover and vertical partitioning of ant assemblages in the Brazilian Amazon: A comparison of forests and savannas. Biotropica, 38: 100-106. doi: 10.1111/j.1744-7429.2006.00113.x

Vasconcelos, H.L., Vilhena, J.M.S., Facure, C.G. & Albernaz, A.L.K.M. (2010). Patterns of ant species diversity and turnover across 2000km of Amazonian floodplain forest. Journal of Biogeography, 37: 432-440. doi: 10.1111/j.1365-2699.2009.02230.x

Vasconcelos, H.L., Vilhena, J.M.S., Magnusson, W.E. & Albernaz, A.L.K.M. (2006). Long-term effects of forest fragmentation on Amazonian ant communities. Journal of Biogeography, 33: 1348-1356. doi:10.1111/j.1365-2699.2006.01516.x

Vicente, R.E., Dambroz, J. & Barreto, M. (2011). New distribution record of *Daceton boltoni* Azorsa & Sosa-Calvo, 2008 (Insecta: Hymenoptera) ant in the Brazilian Amazon. Check List, 7: 878-879. doi: 10.15560/7.6.878

Vicente, R.E., Dáttilo, W. & Izzo, T.J. (2012). New record of a very specialized interaction: *Myrcidris epicharis* Ward 1990 (Pseudomyrmecinae) and its myrmecophyte host *Myrcia madida* McVaugh (Myrtaceae) in Brazilian Meridional Amazon. Acta Amazonica, 42: 567-570. doi: 10.1590/S0044-59672012000400016

Vicente, R.E., Dáttilo, W. & Izzo, T.J. (2014). Differential recruitment of *Camponotus femoratus* (Fabricius) ants in response to ant garden herbivory. Neotropical Entomology, 43: 519-525. doi: 10.1007/s13744-014-0245-6

Vicente, R.E., Prado, L.P. & Souza, R.C.L. (2015). Expanding the Distribution of the Remarkable Ant *Gnamptogenys vriesi* Brandão & Lattke (Formicidae: Ectatomminae): First Record From Brazil. Sociobiology, 62: 615-619. doi: 10.13102/sociobiology.v62i4.920

Wepfer, P., Guénard, B. & Economo, E.P. (2016). Influences of climate and historical land connectivity on ant beta diversity in East Asia. Journal of Biogeography. doi: 10.1111/jbi.12762

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Appendix. List of species recorded at the Parque Estadual do Cristalino. Numbers represent the total number of occurrences in strata. *First record in literature from Mato Grosso state.

Subfamily/Genus/Species	Ground (pitfall trap)	Understory (beating-tray method)	Total
Amblyoponinae			
Prionopelta			
Prionopelta punctulata Mayr, 1866*	4	-	4
Dolichoderinae			
Azteca			
Azteca alfari Emery, 1893	-	4	4
Azteca prox.*aurita* Emery, 1893	-	3	3
Azteca INPA01	-	19	19
Azteca TJI02	-	5	5
Azteca TJI04	-	2	2
Azteca TJI05	-	1	1
Azteca TJI07	-	4	4
Azteca TJI08	-	2	2
Azteca TJI09	-	3	3
Dolichoderus			
Dolichoderus abruptus (Smith, 1858)*	-	1	1
Dolichoderus attelaboides (Fabricius, 1775)*	2	3	5
Dolichoderus bidens (Linnaeus, 1758)*	1	2	3
Dolichoderus bispinosus (Oliver, 1792)	1	-	1
Dolichoderus gagates Emery, 1890	1	5	6
Dolichoderus ghilianii Emery, 1894	-	1	1
Dolichoderus imitator Emery, 1894	3	2	5
Tapinoma			
Tapinoma CR1	-	12	12
Tapinoma CR2	-	5	5
Dorylinae			
Eciton			
Eciton burchellii (Westwood, 1842)	3	-	3
Neivamyrmex			
Neivamyrmex prox. *pilosus* (Smith, 1858)	1	-	1
Neivamyrmex INPA02	-	1	1
Ectatomminae			
Ectatomma			
Ectatomma edentatum Roger, 1863	14	-	14
Ectatomma lugens Emery, 1894*	65	-	65
Ectatomma tuberculatum (Olivier, 1792)	3	31	34
Gnamptogenys			
Gnamptogenys prox. *ericae* (Forel, 1912)	5	-	5
Gnamptogenys horni (Santschi, 1929)*	17	-	17
Gnamptogenys kempfi Lenko, 1964*	1	-	1
Gnamptogenys moelleri (Forel, 1912)*	10	-	10
Gnamptogenys pleurodon (Emery, 1896)	-	1	1
Gnamptogenys striatula Mayr, 1884	5	13	18
Gnamptogenys prox. *sulcata* (Smith, 1858)	1	-	1
Gnamptogenys TJI4	1	-	1

Appendix. List of species recorded at the Parque Estadual do Cristalino. Numbers represent the total number of occurrences in strata. *First record in literature from Mato Grosso state. (Continuation)

Subfamily/Genus/Species	Ground (pitfall trap)	Understory (beating-tray method)	Total
Formicinae			
Acropyga			
Acropyga TJI1	3	-	3
Brachymyrmex			
Brachymyrmex CR1	4	41	45
Brachymyrmex CR2	-	1	1
Brachymyrmex CR3	-	13	13
Camponotus			
Camponotus atriceps (Smith, 1858)	1	1	2
Camponotus diversipalpus Santschi, 1922	3	-	3
Camponotus femoratus (Fabricius, 1804)	13	10	23
Camponotus latangulus Roger, 1863	-	8	8
Camponotus mus Roger, 1863	-	1	1
Camponotus nidulans (Smith, 1860)	-	5	5
Camponotus novogranadensis Mayr, 1870	1	-	1
Camponotus scissus Mayr, 1887*	-	1	1
Camponotus trapezoideus Mayr, 1870	-	5	5
Camponotus CR02	-	2	2
Camponotus CR06	-	1	1
Camponotus CR07	-	2	2
Camponotus CR11	-	8	8
Camponotus CR16	3	2	5
Camponotus CR19	2	-	2
Camponotus TJI01	-	3	3
Camponotus TJI04	10	2	12
Gigantiops			
Gigantiops destructor (Fabricius 1804)	2	1	3
Nylanderia			
Nylanderia prox. *caeciliae* (Forel, 1899)	15	11	26
Nylanderia prox. *fulva* (Mayr, 1862)	4	1	5
Nylanderia CR1	26	16	42
Nylanderia CR5	1	-	1
Nylanderia TJI2	17	3	20
Myrmicinae			
Apterostigma			
Apterostigma urichii Forel, 1893	9	-	9
Apterostigma CR1	-	2	2
Apterostigma INPA01	4	-	4
Apterostigma INPA04	5	-	5
Atta			
Atta cephalotes (Linnaeus, 1758)	13	-	13
Atta sexdens (Linnaeus, 1758)	1	-	1
Carebara			
Carebara urichi (Wheeler, 1922)	13	-	13
Carebara JTI1	2	-	2

Appendix. List of species recorded at the Parque Estadual do Cristalino. Numbers represent the total number of occurrences in strata. *First record in literature from Mato Grosso state. (Continuation)

Subfamily/Genus/Species	Ground (pitfall trap)	Understory (beating-tray method)	Total
Cephalotes			
Cephalotes atratus (Linnaeus, 1758)	3	3	6
Cephalotes oculatus (Spinola, 1851)*	-	5	5
Cephalotes pallens (Klug, 1824)	-	1	1
Cephalotes CR1	-	2	2
Cephalotes CR3	-	1	1
Crematogaster			
Crematogaster arcuata Forel, 1899	-	2	2
Crematogaster brasiliensis Mayr, 1878	-	14	14
Crematogaster carinata Mayr, 1862*	-	1	1
Crematogaster curvispinosa Mayr, 1862*	-	1	1
Crematogaster erecta Mayr, 1866	3	8	11
Crematogaster levior Longino 2003*	8	7	15
Crematogaster limata Smith, 1858*	6	23	29
Crematogaster nigropilosa Mayr, 1870*	3	26	29
Crematogaster stollii Forel, 1885	1	-	1
Crematogaster tenuicula Forel, 1904*	32	24	56
Cyphomyrmex			
Cyphomyrmex laevigatus Weber, 1938*	7	-	7
Cyphomyrmex peltatus Kempf, 1966	5	-	5
Cyphomyrmex prox. *rimosus*	-	3	3
Cyphomyrmex CR7	1	-	1
Cyphomyrmex TJI02	1	-	1
Cyphomyrmex TJI03	9	-	9
Cyphomyrmex TJI06	1	-	1
Daceton			
Daceton armigerum (Latreille, 1802)	1	-	1
Hylomyrma			
Hylomyrma immanis Kempf, 1973*	8	-	8
Megalomyrmex			
Megalomyrmex ayri Brandão, 1990	16	-	16
Megalomyrmex cuatiara Brandão, 1990*	1	-	1
Megalomyrmex drifti Kempf, 1961	2	-	2
Megalomyrmex CR3	1	-	1
Mycetarotes			
Mycetarotes CR1	1	-	1
Mycocepurus			
Mycocepurus smithii (Forel, 1893)	4	-	4
Myrmelachista			
Myrmelachista TJI01	-	1	1
Myrmicocrypta			
Myrmicocrypta INPA01	2	-	2
Myrmicocrypta INPA02	1	-	1

Appendix. List of species recorded at the Parque Estadual do Cristalino. Numbers represent the total number of occurrences in strata. *First record in literature from Mato Grosso state. (Continuation)

Subfamily/Genus/Species	Ground (pitfall trap)	Understory (beating-tray method)	Total
Nesomyrmex			
Nesomyrmex prox. *asper* (Mayr, 1887)	-	1	1
Nesomyrmex prox. *pleuriticus* (Kempf, 1959)	-	1	1
Nesomyrmex tonsuratus (Kempf, 1959)	-	1	1
Nesomyrmex CR1	-	1	1
Nesomyrmex TJI2	-	1	1
Ochetomyrmex			
Ochetomyrmex neopolitus Fernández, 2003	18	8	26
Ochetomyrmex semipolitus Mayr, 1878	3	56	59
Octostruma			
Octostruma balzani (Emery, 1894)	1	-	1
Pheidole			
Pheidole biconstricta Mayr, 1870*	4	4	8
Pheidole bufo Wilson, 2003	1	-	1
Pheidole gertrudae Forel, 1886*	1	-	1
Pheidole prox. *gilva* Wilson, 2003	-	2	2
Pheidole nitella Wilson, 2003*	22	-	22
Pheidole radoszkowskii Mayr, 1884*	17	7	24
Pheidole transversostriata Mayr, 1887*	65	2	67
Pheidole vorax (Fabricius, 1804)*	1	-	1
Pheidole CR16	22	-	22
Pheidole CR44	2	-	2
Pheidole INPA008	2	2	4
Pheidole INPA019	6	-	6
Pheidole INPA020	4	-	4
Pheidole INPA025	1	-	1
Pheidole INPA026	1	-	1
Pheidole INPA037	5	-	5
Pheidole INPA045	3	2	5
Pheidole INPA048	8	-	8
Pheidole INPA049	2	-	2
Pheidole INPA051	13	-	13
Pheidole TJI02	16	1	17
Pheidole TJI07	-	1	1
Pheidole TJI09	10	1	11
Pheidole TJI10	2	2	4
Pheidole TJI17	6	-	6
Pheidole TJI21	22	-	22
Pheidole TJI22	8	-	8
Pheidole TJI23	2	-	2
Pheidole TJI24	3	-	3
Pheidole TJI26	3	-	3
Pheidole TJI28	5	-	5
Pheidole TJI29	6	-	6
Pheidole TJI30	4	-	4
Pheidole TJI31	4	-	4
Pheidole TJI33	3	-	3
Pheidole TJI40	1	-	1
Pheidole TJI41	1	-	1

Appendix. List of species recorded at the Parque Estadual do Cristalino. Numbers represent the total number of occurrences in strata. *First record in literature from Mato Grosso state. (Continuation)

Subfamily/Genus/Species	Ground (pitfall trap)	Understory (beating-tray method)	Total
Rogeria			
Rogeria scobinata Kugler, 1994	3	-	3
Sericomyrmex			
Sericomyrmex INPA001	14	-	14
Solenopsis			
Solenopsis prox. *geminata* (Fabricius, 1804)	4	-	4
Solenopsis CR1	2	44	46
Solenopsis CR6	18	-	18
Solenopsis CR7	6	-	6
Solenopsis CR8	8	-	8
Solenopsis CR9	6	-	6
Solenopsis TJI2	22	6	28
Solenopsis TJI4	1	-	1
Strumigenys			
Strumigenys alberti Forel, 1893	-	1	1
Strumigenys beebei (Wheeler, 1915)*	2	-	2
Strumigenys elongata Roger, 1863	3	-	3
Strumigenys fairchildi Brown, 1961	-	1	1
Strumigenys trinidadensis Wheeler, 1922	-	3	3
Strumigenys vilhenai Bolton, 2000*	8	-	8
Strumigenys INPA03	1	-	1
Strumigenys TJI8	1	-	1
Trachymyrmex			
Trachymyrmex INPA03	8	-	8
Trachymyrmex INPA05	6	-	6
Trachymyrmex INPA10	5	-	5
Trachymyrmex TJI1	33	1	34
Trachymyrmex TJI4	7	-	7
Trachymyrmex sp.	3	-	3
Wasmannia			
Wasmannia auropunctata (Roger, 1893)	22	9	31
Wasmannia rochai Forel, 1912*	2	-	2
Wasmannia scrobifera Kempf, 1961*	24	4	28
Ponerinae			
Anochetus			
Anochetus diegensis Forel, 1912*	1	-	1
Anochetus horridus Kempf, 1964*	1	-	1
Dinoponera			
Dinoponera quadriceps Kempf, 1971*	4	-	4
Hypoponera			
Hypoponera TJI1	1	-	1
Hypoponera TJI2	2	-	2
Hypoponera TJI3	2	-	2
Leptogenys			
Leptogenys INPA02	2	-	2

Appendix. List of species recorded at the Parque Estadual do Cristalino. Numbers represent the total number of occurrences in strata. *First record in literature from Mato Grosso state. (Continuation)

Subfamily/Genus/Species	Ground (pitfall trap)	Understory (beating-tray method)	Total
Mayaponera			
Mayaponera constricta (Mayr, 1884)	10	1	11
Neoponera			
Neoponera apicalis (Latreille, 1802)	4	-	4
Neoponera commutata (Roger, 1860)	2	-	2
Neoponera crenata (Roger, 1861)	-	2	2
Neoponera globularia (MacKay & MacKay, 2010)*		1	1
Neoponera inversa (Smith, 1858)	1	3	4
Neoponera striatinodis (Emery, 1890)*	-	2	2
Neoponera unidentata (Mayr, 1862)	-	4	4
Neoponera verenae Forel, 1922*	14	-	14
Neoponera villosa (Fabricius, 1804)	-	1	1
Neoponera TJI8	-	4	4
Odontomachus			
Odontomachus haematodus (Linnaeus, 1758)	1	-	1
Odontomachus meinerti Forel, 1905	2	-	2
Odontomachus TJI1	3	-	3
Pachycondyla			
Pachycondyla crassinoda (Latreille, 1802)	31	-	31
Pachycondyla harpax (Fabricius, 1804)	6	-	6
Pseudomyrmecinae			
Pseudomyrmex			
Pseudomyrmex oculatus (Smith, 1855)	-	2	2
Pseudomyrmex tenuis (Fabricius, 1804)	1	7	8
Pseudomyrmex tenuissimus (Emery, 1906)	-	2	2
Pseudomyrmex unicolor (Smith, 1855)	-	1	1
Pseudomyrmex INPA001	-	1	1
Pseudomyrmex TJI3	-	3	3
Pseudomyrmex TJI8	-	1	1
Total occurrences	**1002**	**579**	**1581**