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Can environmental complexity predict functional trait composition of ground-dwelling ant assemblages? A test across the Amazon Basin

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ABSTRACT

Environmental gradients may influence species distributions by filtering their functional traits, resulting in a correspondence between community functional composition and local environmental conditions. We used a vegetation gradient as an indicator for environmental complexity to test whether it predicted the morphological composition of ground-dwelling ant assemblages across geographic extents. The sampling design covered 126 plots distributed across eight sampling sites along a broad environmental gradient in the Amazon Basin. Plots covered different phytophysiognomies that have a strong relation with forest biomass and, consequently, litter production. We selected six morphological traits related to ant foraging strategies and behavior. Generalized linear mixed models were used to predict how environmental complexity affects trait composition of ground-dwelling ant assemblages. Structurally less complex environments (eg. Amazonian savannah) harboured more species of smaller ants, with relatively smaller mandibles and relatively larger eyes. In more complex environments (eg. dense ombrophylous forest), there were more ant species of larger size, with relatively larger mandibles and relatively smaller eyes. No relationship was detected between relative femur length and the environmental gradient investigated. The functional approach focused on individual traits may illuminate which ant foraging strategies are best adapted to a particular habitat. Our data reveal that the morphological composition of ground-dewelling ant assemblages responds clearly to environmental complexity suggesting that certain ant characteristics offer ecological advantages to particular species in particular habitats.

1. Introduction

One of the main objectives of ecology is to understand the relationship between organisms and the environment (Vellend, 2016). To address this, ecologists try to identify which mechanisms structure assemblages in different habitats and scales (Levin, 1992; Mcgill, 2010; Sobral and Cianciaruso, 2012). Locally, environmental conditions may play a key role in selecting species exhibiting similar morphological, behavioral or reproductive traits (Keddy, 1992). This suggests that along a gradient with distinct environmental conditions, the functional traits of species should gradually change so that assemblages have different functional compositions on each side of the environmental gradient (Weiher et al., 2011; Sommer et al., 2014; Bishop et al., 2016; Peters et al., 2016). This process forms the basis of functional ecology (McGill et al., 2006).

Several studies have investigated how habitat conditions can play a role in the selection of functional traits in invertebrates and sometimes showing strong associations between morphology, habitat type (Barton et al., 2011; Gibb and Parr, 2013; Yates et al., 2014; Schofield et al., 2016; Peters et al., 2016; Graça et al., 2017). In particular, ants are a useful group for investigating this question given their extensive morphological variation and wide ecological distribution (Silva and Brandão, 2010; Arnan et al., 2017). For example, habitat complexity can often filter ant species based on morfological traits (Gibb and Parr, 2013; Yates et al., 2014; Schofield et al., 2016). Ants with proportionally longer legs may move faster and more efficiently in less complex habitats. Otherwise, proportionally smaller legs allow better access to microhabitats in rugose substrates, such as litter interstices (Kaspari and Weiser, 1999; Farji-Brener et al., 2004; Gibb and Parr, 2013). However, a field test found smaller ant species with

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proportionally smaller legs being more abundant in habitats with lower litter amount (Parr et al., 2003). Another trait often related to environmental complexity is eye size (Schofield et al., 2016). Ant species with proportionally smaller eyes are associated in habitats with low light availability (Weiser and Kaspari, 2006; Schofield et al., 2016). However, in more complex environments such as dense forests, where there is lower light availability at ground layer, larger eyes may indicate a greater demand in the capacity of perception of the environment (Yates et al., 2014). Similarly, the average mandible size of ant assemblages may respond to increased availability of resources. Ants with larger mandible may acess prey of different shapes and sizes (Fowler et al., 1991; Schofield et al., 2016). Thus, these studies reveal the link between ant traits and the environment and show the ambiguity in ant responses.

While there are clear differences between the functional composition of ant assemblages inhabiting contrasting biomes (Schofield et al., 2016), and disturbed vs. undisturbed habitats (Yates et al., 2014), biomes are not homogeneous and may also encompass significant variation in ant functional composition. Moreover, ant species density peaks in the tropics (Dunn et al., 2009) but the drivers of ant functional composition in tropical forest such as the Amazon are largely unknow. For instance, the Amazon Basin shows a wide landscape estructure variation ranging from plant- and nutrient-rich non-flooded ombrophilous forest (Chauvel et al., 1987; ter Steege et al., 2013) to white-sand forest on nutrient-poor soil which is under the influence of periodic flooding (do Vale et al., 2014). Thus, phytophysiognomy can vary from Amazonian savannah to dense forest resulting in many vegetation classes with different levels of environmental complexity (Instituto Brasileiro de Geografia e Estatística-IBGE, 2012; Emilio et al., 2010). Theses vegetation classes have a strong relation with forest biomass (Saatchi et al., 2007) which in turn correlates with the production of litter (Aragão et al., 2009), a key factor for several ant functional traits (Kaspari and Weiser, 1999; Weiser and Kaspari, 2006; Schofield et al., 2016). In the present study, we used a large standardized database (Baccaro et al., 2013; Oliveira et al., 2009; Souza et al., 2012, 2016) that covers several phytophysiognomies in the Brazilian Amazonia to ask how the environmental complexity gradient of the Amazon Basin may affect the functional trait composition of ground-dwelling ant assemblages.

We selected six ant morphological traits (Weber's length, head length and width, hind femur length, eye length and mandible length) related to foraging behavior and predatory specialization (Silva and Brandão, 2010; Schofield et al., 2016) to test the following hypotheses:

(i) less complex habitats favor larger ants species with a longer femur length, while more complex environmets favor smaller body size and relative femur length, as predicted by the size-grain hypothesis (Kaspari and Weiser, 1999); (ii) the average eye size is relatively smaller in ant assemblages in dense forests than in ant assemblages in more open vegetation, as predicted by the light level-eye size hypothesis (Schofield et al., 2016); and (iii) more complex environments favor more specialized predator species, represented by ants with relatively large mandibles, thus, dense forests should harbor more ground-dwelling ant species with relatively larger mandibles, as predicted by the foraging specialization hypothesis (Gronenberg et al., 1997; Schofield et al., 2016; Silva and Brandão, 2010).

2. Materials and methods

2.1. Study site

Ground-dwelling ants were sampled at eight sampling sites maintained by the Brazilian Biodiversity Research Program, PPBio (Costa and Magnusson, 2010). Three of these sites (Maracá Ecological Station, Cauamé Campus and Viruá National Park) are located in the Roraima State (extreme north of Brazil) and the other five (Ducke Reserve, Manaquiri, Orquestra, Capanã and Jari) are located in the Amazonas State (Fig. 1).

Fig. 1. Map of the study area. Location of the eight sampling sites (white balloons) along a broad environmental gradient in the Brazilian Amazon.

The Maracá Station (Maracá) is located on an island on the Uraricoera River which is an ecotone zone between savannas and Amazonian forests (Souza et al., 2012). Cauamé Campus (Cauamé) belongs to the Federal University of Roraima and presents typical savanna vegetation with a markedly dry period (Instituto Brasileiro de Geografia e Estatística-IBGE, 2012). The Viruá Park (Viruá) is located in low plains subject to flood, with some hills with moderate altitudes (Souza et al., 2012).

The Ducke Reserve (Ducke) is covered by undisturbed dense forest on moderately rugged terrain, with small perennial streams in the valleys (Chauvel et al., 1987). The sites located along the BR-319 highway in the interfluve between the Purus and Madeira rivers habour open and dense forests mosaics (Magnusson et al., 2013). The Manaquiri site is characterized by seasonal floods in soils with small intermittent streams (Baccaro et al., 2013).

These sites encompass a broad environmental gradient of approximately 1,050 km of extent (between the first and last sampling point, in the North/South direction) (Fig. 1). Sampling sites, geographic coordinates, phytophysiognomies found at each site, number of plots and number of samples per plot is summarized in Table 1.

2.2. Experimental design

The experimental design of the sampling sites followed the RAPELD system (Magnusson et al., 2013). Each grid-shaped system gives access to permanent plots where several organisms and environmental variables can be surveyed (Costa and Magnusson, 2010). In the research sites the grid consists of parallel trails of 5 km located 1 km apart. In each trail, five permanent plots are distributed. Each plot has 250 m of extension per 1 m of width, following the altitudinal contours to minimize within plot topo-edaphic variation. The number plots per sampling site ranged from five to 30 totaling 127 plots. The sampling effort and the spatial distribution of the subsamples were the same among all plots (Table 1).

2.3. Ant sampling

The ants were collected between September 2006 and June 2012 and all the collections were carried out in the respective dry season. The

Table 1
Sampling sites ordered from the north to the south in Brazil, their geographic coordinates, phytophysiognomy, mean annual cumulative rainfall, number of plots and number of samples per plot.

Sites	Geographical coordinates	Phytophysiognomies	Number of plots	Samples per plot
Maracá	03° 23′ 45.60″ N 61° 28′ 24.61″ W	Open ombrophylous forest, Semideciduous forest, Deciduous forest, Campinarana forest	30	10
Cauamé	02° 52′ 01.20″ N 60° 38′ 02.40″ W	Open savana	11	10
Viruá	01° 27′ 01.72″ N 61° 01′ 28.96″ W	Open ombrophylous forest, Campinarana forest Seasonal campinarana, Seasonal shrubby campinarana	30	10
Ducke	02° 58′ 17.51″ S 59° 57′ 28.43″ W	Dense ombrophylous forest	30	10
Manaquiri	03° 41′ 24.00″ S 60° 18′ 36.00″ W	Open ombrophylous forest	10	10
Orquestra	04° 59′ 04.16″ S 61° 34′ 14.20″ W	Dense ombrophylous forest	5	10
Capanã	05° 37′ 31.92″ S 62° 10′ 56.92″ W	Dense ombrophylous forest	5	10
Jari	05° 57′ 26.94″ S 62° 29′ 20.51″ W	Dense ombrophylous forest	5	10

ants were sampled with pitfall traps, placed at 25 m intervals of each other, totaling 10 samples per plot. The pitfalls (plastic cups 8 cm long by 9.5 cm in diameter) were buried until their edge remained at the same level as the ground and were filled with 1/3 of 70% alcohol and a few drops of detergent. After 48 h the traps were collected, the ants were sorted and placed in 90% alcohol to preserve the material in the laboratory (Souza et al., 2016). Ants were classified up to genus level with the use of taxonomic keys (Baccaro et al., 2015). Later, the ants were morphotyped and, when possible, were identified to the species level using available taxonomic keys or by specialists and by comparison with specimens deposited in zoological collections. The voucher specimens were deposited at the INPA Invertebrate Collection.

2.4. Functional traits

Six morphological traits related to foraging strategies were measured from each ant species/morphospecies. We followed the measurement protocol described in Schofield et al. (2016):

1. Weber's length - it was measured from the anterodorsal margin of the pronotum to the posteroventral margin of the propodeum (Hölldobler and Wilson, 1990). This measure is an indicator of body size, which is a key life history trait (Kaspari, 1996; Kaspari and Weiser, 1999).
2. Hind femur length - straight-line distance from the femur's insertion into the coxae, and its attachment to the tibia (Kaspari and Weiser, 1999). The femur length is related to habitat complexity. Larger legs may allow faster and more efficient locomotion in relatively flat habitats; however, they become a disadvantage by increasing the cross-sectional area of the ant's body and limiting its access to interstitial environments (Hurlbert et al., 2008; Kaspari and Weiser, 1999).
3. Eye length - the measurement was made from the upper to lower border covering the maximum length of the eye. Eye size is an important feature in the search for food resources (Weiser and Kaspari, 2006).
4. Mandible length - in front view, it was measured at the point of the clypeus insertion to the apex of the mandible. Mandible size is related to the diet and predatory specialization of ants (Schofield et al., 2016). Larger mandible allows access to different shapes and sizes of prey (Fowler et al., 1991).
5. Head length - it was measured from the maximum length from the apex of the head to the ventral/anterior-most portion of the clypeus. Head length is a proxy for body mass and may contribute to the cross-sectional area of the ant body (Kaspari and Weiser, 1999).
6. Head width - in frontal view, the measurement was made of the maximum width of the head, without considering the eyes. Head width is related to ants' foraging strategy so that larger heads can support larger mandibles and thereby prey upon larger prey (Fowler et al., 1991).

All morphological traits, except for mandible and Weber's length, were standardized by head length (trait value/head lenght) to obtain the value of the trait relative to the size of the ant species (Schofield et al., 2016). Head length was used for standardization because it is used to measure the cross-sectional area of the ant's body (how much the leg of the ant can exceed the height of its head), in addition to being highly correlated with Weber's length (Pearson correlation = 0.975). Mandible length was standardized by head width because the muscular tissue of the mandible, which occupies much of the internal volume of the head, divides space with the mandible glands which are located on the lateral margins of the ant's head (Fowler et al., 1991; Bishop et al., 2015). Head length and head width were used only for the standardization of the traits and were not tested against the environmental gradient. The number of individuals measured by species ranged from one to six specimens, depending on the abundance of the species in the samples. For the most abundant species we sampled individuals from different locations and vegetations to encompass the natural variation that may exist in functional traits along the environmental gradient (Appendix Table B.1). Measurements were only taken for workers and, for the polymorphic species, only minor workers were sampled. Measurements were used to obtain trait means for each species. All measurements were made using Leica M 125 stereomicroscope with the aid of Leica Application Suite, Version: 4.8.0.

2.5. Environmental gradient

To evaluate how the environmental gradient may influence the functional composition of ant assemblages, we used the phytophysiognomy (Table 1) as a proxy to the amount and heterogeneity of litter. The phytophysiognomy unit is defined as a vegetation type with its own characteristics of structure and species composition. In the Amazon, the phytophysiognomy has a strong connection with precipitation, tree height and forest biomass (Saatchi et al., 2007; IBGE, 2012). Soil litter accumulation is a factor that can vary greatly within a few meters within the forest, but on average, it changes more between vegetations than within vegetation types (Villela and Proctor, 1999). Thus, given the scale of the work, we used the phytophysiognomy of the area sampled as an indicator of the level of environmental complexity for ground-dwelling ants. We used information on vegetation and climate characteristics, average height of trees and average percentage of vegetation cover of each phytophysiognomies unit to represent this gradient on an ordinal scale (Fig. 2).

Based on information from these descriptors, the phytophysiognomy were ordered according to the level of environmental complexity. Less complex vegetations were assigned smaller values; the more complex the vegetation the higher the value assigned as seen in Appendix Table A. The data on phytophysiognomy for each site were taken from the PPBio site {"https://ppbiodata.inpa.gov.br/metacatui/"} and were based on the Brazilian Vegetation Classification System developed by the Brazilian Institute of Geography and Statistics (in

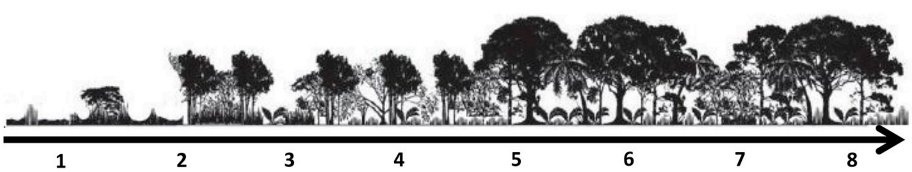

Fig. 2. Ordination of phytophysiognomies according to environmental complexity. 1. Open savanna, 2. Seasonal shrubby campinarana, 3. Seasonal campinarana, 4. Campinarana forest, 5. Deciduous forest, 6. Semideciduous forest, 7. Open ombrophylous forest and 8. Dense ombrophylous forest. Adapted from Graça et al. (2017).

Table 2
Summary of Generalized Linear Mixed Models (GLMM) results relating community-trait mean (CTM) of ground-dwelling ants to environmental complexity. Except for Weber's length, all traits were standardized relative to head size (see Methods for details). a: model intercept; *b*: model slope, R^2m: variance explained by predictor; R^2c: variance explained by predictor plus random factor; *P*: test probability.

Functional traits	Models				
	a	*b*	r^2m	r^2c	*P*
Weber's length	1.531	−0.517	0.22	0.59	< **0.01**
Hind femur length	1.224	−0.048	0.02	0.17	0.258
Eye length	0.204	0.051	0.32	0.46	< **0.001**
Mandible length	0.658	−0.090	0.44	0.44	< **0.001**

Portuguese, Instituto Brasileiro de Geografia e Estatística -IBGE). Data on mean tree height, average vegetation cover and vegetation and climate characteristics of each phytophysiognomy were taken from the Technical Manual of Brazilian Vegetation of Instituto Brasileiro de Geografia e Estatística-IBGE (2012).

2.6. Statistical analysis

All statistical analyzes were performed in the R environment for statistical computing (R Core Team, 2017; version 3.4.3), with support of packages "lmerTest" (Kuznetsova et al., 2017), "MuMIn" (Barton, 2009) and "visreg" (Breheny and Burchett, 2016). First, to understand how the environment can select species based on their traits we calculated the community-trait mean (CTM) in each plot, i. e. the mean trait value of species co-occurring in a given plot:

$$CTM_j = \frac{\sum_i^k x_i}{\sum_i^k s}$$

where x is the trait value of species i, s is number of species collected in the plot and j represents a given trait. We used a linear mixed effects model (GLMM) to evaluate whether variation in CTM across plots could be explained by environmental complexity while controlling for possible effects related to the location of the collection sites. We included sampling site as a random factor in the models to control for the potential spatial autocorrelation between nearby collection points. Thus, collection site was declared as a random factor and environmental complexity was declared as a fixed factor in the models. One model was created for the CTM of each trait. For each model, the marginal r_m^2 (variation explained only by the fixed factor) and conditional r_c^2 (variation explained by the fixed and random factors) were calculated (Nakagawa and Schielzeth, 2013). The models were built with the predictor variable being environmental complexity (x) and the response variable the morphological traits (y). To evaluate which models best express the shape of the relationships, linear models were compared with models that assumed a rationalization of the standard linear equation ($Y = a + b \times 1/X$) to account for asymptotic relationships (i.e. functional composition changing along part of the environmental gradient, and then remaining constant). The Akaike's Information Criterion corrected for sample size (AICc) (Burnham and Anderson, 2002) was used to choose the best model and as the asymptotic models best represented all the relationships, only they were included in the main text (Appendix Table C and Figures). The intercept (the value of the response variable when the predictor variable is equals zero) and the slope (how much the response variable changes due to the increase of one unit in the predictor variable) of the models were calculated.

3. Results

A total of 994 ants belonging to 271 species/morphospecies were measured in the 127 plots sampled along the environmental gradient studied (Appendix Table B.2). The number of species varied considerably between the assemblages, from 4 species captured in a plot of Viruá Park to 56 species in a plot in Maracá Station. A total of 5,964 morphological measurements of the ants were made. Weber's length, relative eye length, and relative mandible length were related to the environmental complexity gradient (Table 2). Weber's length and the relative length mandible responded positively to environmental complexity. More complex areas harboured larger ants (Weber's length) and ants with relative longer mandibles (Fig. 3 a, d). The relative length eye responded negatively to the gradient, meaning that the increase in complexity decreased the relative length of the ants' eyes (Fig. 3c). Relative mandible length had the best-fitted model, followed by the relative eye length and Weber's length (Table 2). No significant

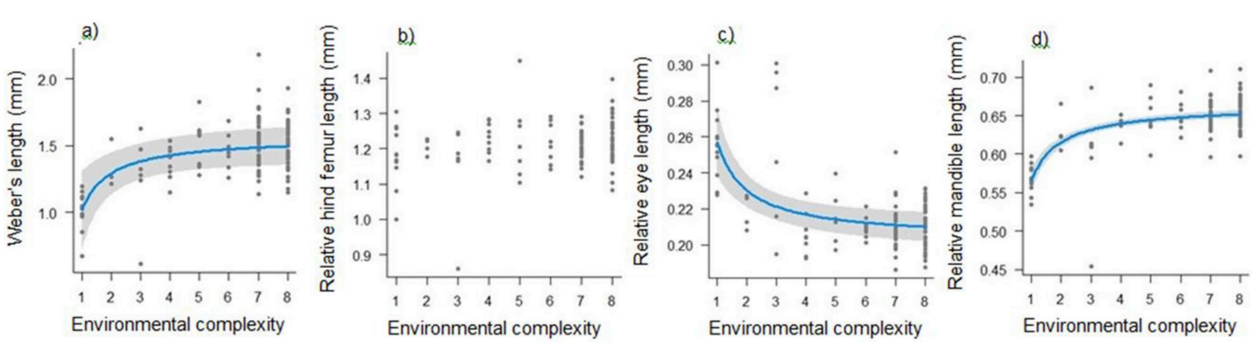

Fig. 3. Relationship between abundance-weighted trait average and environmental complexity across ant assemblages for different traits. Each point represents one ant assemblage sampled at a given plot. The blue line represents model predictions and the surrounding gray area represents the 95% confidence interval of the significant models. The figure of the hind femur length (b) was included for illustration although it has no relationship with the environmental complexity. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

Table 3
The minimum, maximum and mean of the trait values at each level of environmental complexity are given in table.

Environmental complexity	Weber's length			Relative hind femur length			Relative eye length			Relative mandible length		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1	0.803	1.322	1.137	1.008	1.311	1.187	0.224	0.289	0.250	0.543	0.597	0.570
2	1.464	1.775	1.563	1.178	1.228	1.208	0.219	0.237	0.229	0.604	0.655	0.622
3	0.903	1.912	1.532	0.862	1.247	1.147	0.206	0.311	0.267	0.453	0.682	0.593
4	1.354	1.746	1.582	1.159	1.284	1.228	0.204	0.238	0.214	0.606	0.651	0.634
5	1.313	1.800	1.534	1.064	1.410	1.189	0.196	0.237	0.215	0.594	0.690	0.643
6	1.318	1.741	1.501	1.104	1.253	1.179	0.199	0.219	0.208	0.620	0.675	0.647
7	1.159	2.281	1.581	1.081	1.291	1.203	0.192	0.259	0.211	0.587	0.703	0.645
8	0.949	1.920	1.292	1.087	1.425	1.238	0.181	0.240	0.207	0.597	0.707	0.649

relationship was detected between the relative hind femur length and the environmental gradient studied (Table 2). The minimum, maximum and average values of the observations at each level of environmental complexity for each trait are given in Table 3.

4. Discussion

Our results show that habitat complexity can promote significant changes in the functional composition of ground-dwelling ant assemblages. The functional approach focused on each morphological trait individually provides information about how ant foraging strategy responds to environmental variation. We found that ant species inhabiting less complex habitats were smaller than ant species inhabiting more complex habitats, and on average, relative hind femur length was invariant along the environmental gradient studied. We also found that with increasing environmental complexity the ants exhibited relatively smaller eyes and relatively larger mandibles.

Taken together, the results of body size and relative hind femur length are partially in line with the size-grain hypothesis. The size-grain hypothesis states that ants in less complex habitats would be larger assuming they have longer legs, allowing for more efficient movement through fissures and obstacles of a relatively “flat” habitat. On the other hand, the greater complexity generated by the debris and leaves stacked on the surface of the habitat would benefit smaller ants with relatively shorter legs because they can exploit resources more efficiently and shelter in these environments (Kaspari and Weiser, 1999; Farji-Brener et al., 2004; Gibb and Parr, 2013; Yates et al., 2014; Schofield et al., 2016). Three possible explanations could account for the observed pattern of body size with the environmental gradient.

The first explanation is related to thermoregulatory capacity of ants. Body size has an important role in heat conservation in both vertebrate (Amado et al., 2018) and invertebrate ectotherms (Pereboom and Biesmeijer, 2003; Chown and Gaston, 2010). Surface-to-volume ratio increases as body size decreases, so that insects with small body size tend to exchange heat more easily (Chapman, 1998). Thus, ground-dwelling ant assemblages in environments more exposed to sunlight, such as open vegetation, may harbour smaller species because they avoid overheating. In addition, the body size of ants is related to cuticle coloration (Bishop et al., 2016), which plays an important thermoregulatory role in insects (Clusella Trullas et al., 2007). Assemblages of ants composed of small-sized species have a lighter coloration (Bishop et al., 2016), which can also prevent overheating through low heat retention (Clusella Trullas et al., 2007). It is possible that thermoregulatory requirements are more important than the size-grain hypothesis explaining the size composition of ground-dwelling ant assemblages in hot environments. Another, alternative explanation would be associated with the availability of resources. The greater supply of food in more complex habitats may favor larger ants because they have larger food requirements, as in butterflies (Barlow, 1994) and other arthropods (Chown and Gaston, 2010). However, studies evaluating the role of body size in ants indicate that larger size may confer protection against desiccation in extremely hot habitats and greater resistance to starvation in unproductive habitats (Cerdá and Retana, 2000; Kaspari and Vargo, 1995). Threfore, the explanations of thermoregulatory capacity and availability of resources have little support for ant responses to environmental complexity.

The third explanation is related to a possible bias in the measure used to estimate the environmental complexity gradient in our study. For instance, some plots in classified as less complex in our study have the soil covered by grasses (shrubby campinarana and open savanna), which may lead the ants to experience a relatively complex habitat and buffer the thermal variation. This could explain the small size of the ants' body in less complex environments, assuming that they can move better through the interstices of the grasses. However, the lack of relationship between hind femur length and environmental complexity contradicts this “grass hypothesis”. Further studies directly evaluating the effect of the substrate on a scale corresponding to the scale of ant's activity may clarify how these traits (body size and leg length) are related with the environmental gradient.

In line with our second and third predictions, ant species in dense forests had relatively smaller eyes and relatively large mandibles. Two hypotheses can explain these relationships: the light level-eye size hypothesis and the foraging specialization hypothesis (Schofield et al., 2016). In environments with high luminosity, ants can orient themselves and navigate better using vision and, conversely, in places with lower luminosity, the visual orientation becomes less relevant (Schofield et al., 2016). The absence of eyes or reduction in eye size is a common feature in Neotropical ant genera inhabiting the subsoil or at the interface between soil and litter such as *Acropyga*, *Prionopelta*, *Tranopelta*, *Nomamyrmex*, and others. Thus, sites with a large accumulation of litter may favor ant species inhabiting this microhabitat, and therefore, these sites harbor ants with smaller eyes, on average. In addition, many foraging species within the litter have predatory behavior (Weiser and Kaspari, 2006). If low light levels in the litter select ants with smaller eyes, then the predatory ants would have to use other atributes in searching for prey in these environmental conditions. The larger antennal scape found in ants inhabiting more complex environments (Yates et al., 2014) or mechanosensitive bristles related to prey detection (Brown and Wilson, 1959), are examples of how some features may compensate for the decrease in visual perception while foraging for prey in the litter layer.

The positive relationship between relative mandible length and environmental complexity is possibly associated with specialization in species foraging. Ants with longer mandibles can capture prey with variable shapes and sizes (Fowler et al., 1991), and this advantage can be increased in habitats with greater resource availability due to the greater possibility of finding prey of large sizes. Thus, investment in the construction of a large mandible allowing greater amplitude in prey size becomes an important factor for predatory ants in more productive environments (Schofield et al., 2016). In addition, analyzes of guild classification based on ant morphology have shown that generalist species, such as omnivorous or granivorous species, have relatively smaller mandibles (Silva and Brandão, 2010), and this strategy has been related to more simple and open habitats (Bishop et al., 2015;

Schofield et al., 2016). Taken as a whole, this indicates that although many ant species belonging to guilds such as fungus-growers or some invasive species occur in almost all habitats, some foraging behaviors may be associated with specific habitat types. We suggest that generalist species may represent the common strategy to survive in simple environmental conditions and that more complex habitats may support more specialized foraging due to the greater diversity and abundance of prey.

A pattern that was repeated in all traits investigated was that the change in trait composition along the environmental gradient ocurred mainly between the less complex vegetation (Amazonian savannah) and other vegetations (white-sand forests and terra-firme forests). On average, assemblages had similar trait compositions between intermediate and more complex vegetation. Possibly the availability of niches created by the litter on the ground of these intermediate to more complex habitats favors species functionally equivalent to those living in the more complex habitats, making the asymptotic model a better descriptor of the observed trait relations.

5. Conclusions

In general, this work shows clear relationships between the functional composition (community-trait mean) of ground-dwelling ant assemblages and environmental complexity. We suggest that at the investigated spatial scale and extent, environmental complexity acts as a "filter" on certain morphological characteristics, so that species having certain morphologies - namely, larger bodies with relatively small eyes and large mandibles - tend to be favoured in complex habitats. Our work corroborates some hypotheses although others need further investigation, bearing in mind that other factors may be acting simultaneously on ant species assemblages.

Author's contribution

J.L.P.S., F.B.B., E.F. and D.R.G. conceived the idea; A.C. and D.R.G. performed the morphological measurements; P.A.C.L.P., F.B.B. and D.R.G. analyzed the data and D.R.G. wrote the article with substantial collaboration from all authors.

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Appendix B. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.actao.2019.05.004.

Appendix

Table A
Data used as criteria for ordering phytophysiognomy at levels of environmental complexity. Data on the characteristics of the vegetation were taken from the Brazilian Vegetation Classification System of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística-IBGE, 2012).

Phytophysiognomies ordered at levels of complexity	Number of plots in each level of complexity	Criteria used for the classification of phytophysiognomies		
		Characteristics of vegetation and climate	Height of trees (m)	Percentage of plant cover (%)
1- Open savana	12	Widely open area with some grass on the ground	0	0
2 – Seasonal shrubby campinarana	4	Purely herbaceous vegetation with waterlogging during the rainy season	~2	<5%
3 - Seasonal campinarana	6	More densely planted or wooded vegetation than Seasonal shrubby	~20	<50
4 - Campinarana forest	9	More densely planted or wooded vegetation than Seasonal campinarana	~20	<50
5 - Deciduous forest	7	Seasonal climate with the deciduity of much of the vegetation cover	between 20 and 40	~50
6 - Semideciduous forest	8	Seasonal climate with semi-deciduous vegetation cover	between 20 and 40	between 60 and 80%
7 - Open ombrophylous forest	36	It exhibits less dense vegetation, with around 60 dry days	~40	<80%
8 - Dense ombrophylous forest	45	Dense vegetation with well-distributed rainfall throughout the year	~40	~80%

Table B1
Sampling site and phytophysiognomy from which the individuals were taken to the measurements of each species.

Taxon	Site	Phytophysiognomy
Acanthognathus ocellatus	Viruá	Seasonal shrubby campinarana
Acanthostichus bentoni	Ducke	Dense ombrophylous forest
Acanthostichus bentoni	Ducke	Dense ombrophylous forest
Acanthostichus bentoni	Ducke	Dense ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Acanthostichus bentoni	Ducke	Dense ombrophylous forest
Acanthostichus bentoni	Ducke	Dense ombrophylous forest
Acanthostichus bentoni	Ducke	Dense ombrophylous forest
Acromyrmex sp. 01	Ducke	Dense ombrophylous forest
Acromyrmex sp. 01	Ducke	Dense ombrophylous forest
Acromyrmex subterraneus	Maracá	Semideciduous forest
Acropyga sp. 01	Ducke	Dense ombrophylous forest
Acropyga sp. 01	Ducke	Dense ombrophylous forest
Acropyga sp. 01	Manaquiri	Open ombrophylous forest
Acropyga sp. 01	Manaquiri	Open ombrophylous forest
Acropyga sp. 01	Maracá	Semideciduous forest
Acropyga sp. 01	Maracá	Semideciduous forest
Acropyga sp. 02	Ducke	Dense ombrophylous forest
Anochetus diegensis	Ducke	Dense ombrophylous forest
Anochetus diegensis	Ducke	Dense ombrophylous forest
Anochetus diegensis	Ducke	Dense ombrophylous forest
Anochetus diegensis	Manaquiri	Open ombrophylous forest
Anochetus diegensis	Manaquiri	Open ombrophylous forest
Anochetus diegensis	Manaquiri	Open ombrophylous forest
Anochetus emarginatus	Ducke	Dense ombrophylous forest
Anochetus horridus	Ducke	Dense ombrophylous forest
Anochetus horridus	Ducke	Dense ombrophylous forest
Anochetus horridus	Ducke	Dense ombrophylous forest
Anochetus horridus	Ducke	Dense ombrophylous forest
Anochetus horridus	Manaquiri	Open ombrophylous forest
Anochetus horridus	Manaquiri	Open ombrophylous forest
Apterostigma pilosum	Ducke	Dense ombrophylous forest
Apterostigma pilosum	Maracá	Open ombrophylous forest
Apterostigma pilosum	Viruá	Campinarana forest
Apterostigma sp. 03	Ducke	Dense ombrophylous forest
Apterostigma sp. 04	Ducke	Dense ombrophylous forest
Apterostigma urichii	Maracá	Semideciduous forest
Apterostigma urichii	Ducke	Dense ombrophylous forest
Apterostigma urichii	Ducke	Dense ombrophylous forest
Apterostigma urichii	Ducke	Dense ombrophylous forest
Atta cephalotes	Maracá	Deciduous forest
Atta cephalotes	Viruá	Seasonal campinarana
Atta cephalotes	Ducke	Dense ombrophylous forest
Atta sexdens	Maracá	Deciduous forest
Atta sexdens	Viruá	Open ombrophylous forest
Atta sexdens	Viruá	Open ombrophylous forest
Atta sexdens	Ducke	Dense ombrophylous forest
Atta sexdens	Ducke	Dense ombrophylous forest
Atta sexdens	Ducke	Dense ombrophylous forest
Azteca sp. 01	Viruá	Campinarana forest
Azteca sp. 01	Viruá	Seasonal campinarana
Azteca sp. 01	Ducke	Dense ombrophylous forest
Azteca sp. 01	Ducke	Dense ombrophylous forest
Blepharidatta brasiliensis	Jari	Dense ombrophylous forest
Blepharidatta brasiliensis	Jari	Dense ombrophylous forest
Blepharidatta brasiliensis	Ducke	Dense ombrophylous forest
Blepharidatta brasiliensis	Ducke	Dense ombrophylous forest
Blepharidatta brasiliensis	Ducke	Dense ombrophylous forest
Blepharidatta brasiliensis	Ducke	Dense ombrophylous forest
Brachymyrmex heeri	Viruá	Seasonal shrubby campinarana
Brachymyrmex heeri	Viruá	Seasonal shrubby campinarana
Brachymyrmex heeri	Viruá	Seasonal shrubby campinarana
Brachymyrmex heeri	Maracá	Semideciduous forest
Brachymyrmex heeri	Manaquiri	Open ombrophylous forest
Brachymyrmex sp. 01	Manaquiri	Open ombrophylous forest
Brachymyrmex sp. 01	Manaquiri	Open ombrophylous forest
Brachymyrmex sp. 01	Cauamé	Open savanna
Brachymyrmex sp. 01	Cauamé	Open savanna
Brachymyrmex sp. 01	Cauamé	Open savanna
Brachymyrmex sp. 02	Capana	Dense ombrophylous forest
Brachymyrmex sp. 02	Capana	Dense ombrophylous forest
Brachymyrmex sp. 02	Cauamé	Open savanna
Brachymyrmex sp. 03	Manaquiri	Open ombrophylous forest
Camponotus ager	Cauamé	Open savanna
Camponotus ager	Cauamé	Open savanna
Camponotus ager	Viruá	Seasonal shrubby campinarana
Camponotus ager	Viruá	Open ombrophylous forest
Camponotus ager	Ducke	Dense ombrophylous forest
Camponotus atriceps	Ducke	Dense ombrophylous forest

(*continued on next page*)

Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Camponotus atriceps	Ducke	Dense ombrophylous forest
Camponotus atriceps	Capana	Dense ombrophylous forest
Camponotus atriceps	Viruá	Seasonal shrubby campinarana
Camponotus atriceps	Viruá	Seasonal campinarana
Camponotus atriceps	Viruá	Open ombrophylous forest
Camponotus balzani	Orquestra	Dense ombrophylous forest
Camponotus balzani	Orquestra	Dense ombrophylous forest
Camponotus balzani	Orquestra	Dense ombrophylous forest
Camponotus crassus	Cauamé	Open savanna
Camponotus crassus	Cauamé	Open savanna
Camponotus crassus	Ducke	Dense ombrophylous forest
Camponotus crassus	Viruá	Seasonal campinarana
Camponotus crassus	Viruá	Seasonal campinarana
Camponotus fastigatus	Cauamé	Open savanna
Camponotus fastigatus	Ducke	Dense ombrophylous forest
Camponotus fastigatus	Ducke	Dense ombrophylous forest
Camponotus femoratus	Manaquiri	Open ombrophylous forest
Camponotus femoratus	Manaquiri	Open ombrophylous forest
Camponotus femoratus	Viruá	Campinarana forest
Camponotus femoratus	Ducke	Dense ombrophylous forest
Camponotus femoratus	Ducke	Dense ombrophylous forest
Camponotus femoratus	Ducke	Dense ombrophylous forest
Camponotus leydigi	Cauamé	Open savanna
Camponotus leydigi	Cauamé	Open savanna
Camponotus leydigi	Viruá	Seasonal shrubby campinarana
Camponotus novogranadensis	Cauamé	Open savanna
Camponotus novogranadensis	Cauamé	Open savanna
Camponotus novogranadensis	Jari	Dense ombrophylous forest
Camponotus novogranadensis	Ducke	Dense ombrophylous forest
Camponotus novogranadensis	Viruá	Seasonal shrubby campinarana
Camponotus rapax	Ducke	Dense ombrophylous forest
Camponotus rapax	Manaquiri	Open ombrophylous forest
Camponotus rapax	Viruá	Open ombrophylous forest
Camponotus rapax	Viruá	Seasonal shrubby campinarana
Camponotus rapax	Viruá	Seasonal campinarana
Camponotus rapax	Viruá	Seasonal shrubby campinarana
Camponotus sericeiventris	Viruá	Campinarana forest
Camponotus sericeiventris	Viruá	Campinarana forest
Camponotus sp. 14	Maracá	Open ombrophylous forest
Carebara escherichi	Ducke	Dense ombrophylous forest
Carebara escherichi	Ducke	Dense ombrophylous forest
Carebara escherichi	Ducke	Dense ombrophylous forest
Carebara escherichi	Ducke	Dense ombrophylous forest
Carebara lignata	Maracá	Open ombrophylous forest
Carebara urichi	Ducke	Dense ombrophylous forest
Carebara urichi	Ducke	Dense ombrophylous forest
Carebara urichi	Ducke	Dense ombrophylous forest
Carebara urichi	Ducke	Dense ombrophylous forest
Carebara urichi	Manaquiri	Open ombrophylous forest
Centromyrmex gigas	Maracá	Open ombrophylous forest
Centromyrmex sp. 01	Jari	Dense ombrophylous forest
Cephalotes pusillus	Maracá	Semideciduous forest
Cephalotes pusillus	Maracá	Semideciduous forest
Cephalotes pusillus	Viruá	Seasonal campinarana
Cephalotes atratus	Capana	Dense ombrophylous forest
Cephalotes atratus	Capana	Dense ombrophylous forest
Cephalotes maculatus	Maracá	Semideciduous forest
Cephalotes marginatus	Jari	Dense ombrophylous forest
Crematogaster brasiliensis	Ducke	Dense ombrophylous forest
Crematogaster brasiliensis	Ducke	Dense ombrophylous forest
Crematogaster brasiliensis	Maracá	Semideciduous forest
Crematogaster brasiliensis	Viruá	Open ombrophylous forest
Crematogaster brasiliensis	Viruá	Campinarana forest
Crematogaster brasiliensis	Viruá	Seasonal shrubby campinarana
Crematogaster tenuicula	Ducke	Dense ombrophylous forest
Crematogaster tenuicula	Maracá	Open ombrophylous forest
Crematogaster tenuicula	Maracá	Seasonal campinarana
Crematogaster tenuicula	Viruá	Seasonal shrubby campinarana
Crematogaster tenuicula	Viruá	Campinarana forest
Crematogaster tenuicula	Viruá	Campinarana forest
Crematogaster limata	Manaquiri	Open ombrophylous forest
Crematogaster limata	Manaquiri	Open ombrophylous forest
Crematogaster limata	Ducke	Dense ombrophylous forest
Crematogaster limata	Viruá	Campinarana forest

(*continued on next page*)

Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Crematogaster limata	Viruá	Campinarana forest
Crematogaster sotobosque	Ducke	Dense ombrophylous forest
Crematogaster sotobosque	Ducke	Dense ombrophylous forest
Crematogaster sotobosque	Orquestra	Dense ombrophylous forest
Crematogaster sotobosque	Manaquiri	Open ombrophylous forest
Crematogaster sotobosque	Manaquiri	Open ombrophylous forest
Crematogaster flavosensitiva	Ducke	Dense ombrophylous forest
Crematogaster flavosensitiva	Ducke	Dense ombrophylous forest
Crematogaster flavosensitiva	Manaquiri	Open ombrophylous forest
Crematogaster flavosensitiva	Viruá	Open ombrophylous forest
Crematogaster flavosensitiva	Viruá	Seasonal shrubby campinarana
Crematogaster curvispinosa	Ducke	Dense ombrophylous forest
Crematogaster stollii	Ducke	Dense ombrophylous forest
Crematogaster stollii	Ducke	Dense ombrophylous forest
Crematogaster erecta	Ducke	Dense ombrophylous forest
Crematogaster erecta	Ducke	Dense ombrophylous forest
Crematogaster nigropilosa	Ducke	Dense ombrophylous forest
Crematogaster nigropilosa	Ducke	Dense ombrophylous forest
Crematogaster evallans	Viruá	Seasonal campinarana
Crematogaster evallans	Viruá	Seasonal campinarana
Crematogaster evallans	Viruá	Seasonal campinarana
Crematogaster longispina	Ducke	Dense ombrophylous forest
Crematogaster longispina	Maracá	Deciduous forest
Crematogaster rochai	Maracá	Deciduous forest
Crematogaster jardinero	Cauamé	Open savanna
Crematogaster jardinero	Cauamé	Open savanna
Crematogaster jardinero	Cauamé	Open savanna
Crematogaster jardinero	Cauamé	Open savanna
Cyphomyrmex laevigatus	Ducke	Dense ombrophylous forest
Cyphomyrmex laevigatus	Ducke	Dense ombrophylous forest
Cyphomyrmex laevigatus	Ducke	Dense ombrophylous forest
Cyphomyrmex laevigatus	Ducke	Dense ombrophylous forest
Cyphomyrmex laevigatus	Ducke	Dense ombrophylous forest
Cyphomyrmex laevigatus	Maracá	Open ombrophylous forest
Cyphomyrmex peltatus	Orquestra	Dense ombrophylous forest
Cyphomyrmex peltatus	Orquestra	Dense ombrophylous forest
Cyphomyrmex peltatus	Orquestra	Dense ombrophylous forest
Cyphomyrmex peltatus	Viruá	Campinarana forest
Cyphomyrmex peltatus	Viruá	Campinarana forest
Cyphomyrmex peltatus	Ducke	Dense ombrophylous forest
Cyphomyrmex rimosus	Manaquiri	Open ombrophylous forest
Cyphomyrmex rimosus	Manaquiri	Open ombrophylous forest
Cyphomyrmex rimosus	Viruá	Campinarana forest
Cyphomyrmex rimosus	Viruá	Campinarana forest
Cyphomyrmex rimosus	Viruá	Campinarana forest
Cyphomyrmex rimosus	Viruá	Campinarana forest
Discothyrea denticulata	Maracá	Seasonal shrubby campinarana
Dolichoderus bispinosus	Maracá	Semideciduous forest
Dolichoderus bispinosus	Maracá	Semideciduous forest
Dolichoderus bispinosus	Jari	Dense ombrophylous forest
Dolichoderus bispinosus	Orquestra	Dense ombrophylous forest
Dolichoderus bispinosus	Capana	Dense ombrophylous forest
Dolichoderus bispinosus	Ducke	Dense ombrophylous forest
Dolichoderus imitator	Ducke	Dense ombrophylous forest
Dolichoderus imitator	Orquestra	Dense ombrophylous forest
Dolichoderus imitator	Jari	Dense ombrophylous forest
Dolichoderus imitator	Maracá	Open ombrophylous forest
Dolichoderus decollatus	Maracá	Deciduous forest
Dolichoderus decollatus	Maracá	Open ombrophylous forest
Dorymyrmex bicolor	Cauamé	Open savanna
Dorymyrmex bicolor	Cauamé	Open savanna
Dorymyrmex bicolor	Cauamé	Open savanna
Dorymyrmex goeldii	Cauamé	Open savanna
Dorymyrmex goeldii	Viruá	Open ombrophylous forest
Dorymyrmex goeldii	Viruá	Seasonal shrubby campinarana
Dorymyrmex goeldii	Viruá	Seasonal shrubby campinarana
Dorymyrmex richteri	Cauamé	Open savanna
Dorymyrmex richteri	Cauamé	Open savanna
Dorymyrmex richteri	Cauamé	Open savanna
Dorymyrmex richteri	Cauamé	Open savanna
Eciton burchellii	Maracá	Open ombrophylous forest
Eciton burchellii	Maracá	Open ombrophylous forest
Eciton burchellii	Maracá	Open ombrophylous forest
Eciton burchellii	Maracá	Open ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Eciton dulcius	Ducke	Dense ombrophylous forest
Eciton dulcius	Ducke	Dense ombrophylous forest
Eciton rapax	Ducke	Dense ombrophylous forest
Eciton rapax	Ducke	Dense ombrophylous forest
Eciton rapax	Manaquiri	Open ombrophylous forest
Eciton rapax	Manaquiri	Open ombrophylous forest
Ectatomma brunneum	Viruá	Open ombrophylous forest
Ectatomma brunneum	Viruá	Open ombrophylous forest
Ectatomma brunneum	Viruá	Seasonal campinarana
Ectatomma brunneum	Viruá	Campinarana forest
Ectatomma edentatum	Ducke	Dense ombrophylous forest
Ectatomma edentatum	Ducke	Dense ombrophylous forest
Ectatomma edentatum	Ducke	Dense ombrophylous forest
Ectatomma edentatum	Maracá	Open ombrophylous forest
Ectatomma edentatum	Viruá	Campinarana forest
Ectatomma edentatum	Viruá	Campinarana forest
Ectatomma edentatum	Viruá	Open ombrophylous forest
Ectatomma lugens	Ducke	Dense ombrophylous forest
Ectatomma lugens	Ducke	Dense ombrophylous forest
Ectatomma lugens	Viruá	Seasonal campinarana
Ectatomma lugens	Viruá	Seasonal campinarana
Ectatomma lugens	Ducke	Dense ombrophylous forest
Ectatomma lugens	Ducke	Dense ombrophylous forest
Ectatomma ruidum	Cauamé	Open savanna
Ectatomma ruidum	Cauamé	Open savanna
Ectatomma ruidum	Cauamé	Open savanna
Gigantiops destructor	Ducke	Dense ombrophylous forest
Gigantiops destructor	Ducke	Dense ombrophylous forest
Gigantiops destructor	Ducke	Dense ombrophylous forest
Gigantiops destructor	Viruá	Campinarana forest
Gigantiops destructor	Viruá	Open ombrophylous forest
Gnamptogenys acuminata	Manaquiri	Open ombrophylous forest
Gnamptogenys acuminata	Ducke	Dense ombrophylous forest
Gnamptogenys acuminata	Ducke	Dense ombrophylous forest
Gnamptogenys acuminata	Ducke	Dense ombrophylous forest
Gnamptogenys curvoclypeata	Maracá	Seasonal campinarana
Gnamptogenys curvoclypeata	Maracá	Seasonal campinarana
Gnamptogenys curvoclypeata	Maracá	Campinarana forest
Gnamptogenys strigata	Ducke	Dense ombrophylous forest
Gnamptogenys strigata	Maracá	Open ombrophylous forest
Gnamptogenys haenschi	Manaquiri	Open ombrophylous forest
Gnamptogenys haenschi	Manaquiri	Open ombrophylous forest
Gnamptogenys haenschi	Manaquiri	Open ombrophylous forest
Gnamptogenys horni	Jari	Dense ombrophylous forest
Gnamptogenys horni	Orquestra	Dense ombrophylous forest
Gnamptogenys horni	Ducke	Dense ombrophylous forest
Gnamptogenys horni	Ducke	Dense ombrophylous forest
Gnamptogenys horni	Manaquiri	Open ombrophylous forest
Gnamptogenys horni	Manaquiri	Open ombrophylous forest
Gnamptogenys moelleri	Ducke	Dense ombrophylous forest
Gnamptogenys moelleri	Ducke	Dense ombrophylous forest
Gnamptogenys moelleri	Ducke	Dense ombrophylous forest
Gnamptogenys moelleri	Capana	Dense ombrophylous forest
Gnamptogenys regularis	Maracá	Open ombrophylous forest
Gnamptogenys regularis	Maracá	Open ombrophylous forest
Gnamptogenys regularis	Maracá	Open ombrophylous forest
Gnamptogenys regularis	Maracá	Open ombrophylous forest
Gnamptogenys sulcata	Ducke	Dense ombrophylous forest
Gnamptogenys sulcata	Ducke	Dense ombrophylous forest
Gnamptogenys sulcata	Manaquiri	Open ombrophylous forest
Gnamptogenys sulcata	Maracá	Open ombrophylous forest
Gnamptogenys tortuolosa	Ducke	Dense ombrophylous forest
Gnamptogenys tortuolosa	Ducke	Dense ombrophylous forest
Gnamptogenys tortuolosa	Ducke	Dense ombrophylous forest
Gnamptogenys tortuolosa	Ducke	Dense ombrophylous forest
Gnamptogenys tortuolosa	Maracá	Semideciduous forest
Gnamptogenys tortuolosa	Maracá	Open ombrophylous forest
Hylomyrma immanis	Capana	Dense ombrophylous forest
Hylomyrma immanis	Capana	Dense ombrophylous forest
Hylomyrma immanis	Manaquiri	Open ombrophylous forest
Hylomyrma immanis	Manaquiri	Open ombrophylous forest
Hypoponera sp. 01	Ducke	Dense ombrophylous forest
Hypoponera sp. 01	Ducke	Dense ombrophylous forest
Hypoponera sp. 01	Ducke	Dense ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Hypoponera sp. 01	Manaquiri	Open ombrophylous forest
Hypoponera sp. 01	Maracá	Deciduous forest
Hypoponera sp. 02	Ducke	Dense ombrophylous forest
Hypoponera sp. 02	Ducke	Dense ombrophylous forest
Hypoponera sp. 03	Ducke	Dense ombrophylous forest
Hypoponera sp. 03	Ducke	Dense ombrophylous forest
Hypoponera sp. 03	Ducke	Dense ombrophylous forest
Hypoponera sp. 04	Maracá	Open ombrophylous forest
Hypoponera sp. 04	Maracá	Deciduous forest
Hypoponera sp. 04	Maracá	Open ombrophylous forest
Hypoponera sp. 04	Maracá	Deciduous forest
Hypoponera sp. 04	Ducke	Dense ombrophylous forest
Hypoponera sp. 04	Ducke	Dense ombrophylous forest
Hypoponera sp. 05	Ducke	Dense ombrophylous forest
Hypoponera sp. 05	Ducke	Dense ombrophylous forest
Hypoponera sp. 05	Ducke	Dense ombrophylous forest
Hypoponera sp. 05	Ducke	Dense ombrophylous forest
Hypoponera sp. 05	Maracá	Semideciduous forest
Hypoponera sp. 06	Ducke	Dense ombrophylous forest
Hypoponera sp. 06	Maracá	Open ombrophylous forest
Hypoponera sp. 06	Maracá	Semideciduous forest
Hypoponera sp. 06	Maracá	Semideciduous forest
Hypoponera sp. 07	Ducke	Dense ombrophylous forest
Hypoponera sp. 07	Ducke	Dense ombrophylous forest
Hypoponera sp. 07	Maracá	Open ombrophylous forest
Hypoponera sp. 07	Maracá	Semideciduous forest
Hypoponera sp. 07	Maracá	Semideciduous forest
Hypoponera sp. 08	Capana	Dense ombrophylous forest
Hypoponera sp. 08	Capana	Dense ombrophylous forest
Hypoponera sp. 08	Capana	Dense ombrophylous forest
Hypoponera sp. 08	Capana	Dense ombrophylous forest
Hypoponera sp. 09	Jari	Dense ombrophylous forest
Hypoponera sp. 09	Jari	Dense ombrophylous forest
Hypoponera sp. 09	Orquestra	Dense ombrophylous forest
Hypoponera sp. 09	Maracá	Open ombrophylous forest
Hypoponera sp. 11	Jari	Dense ombrophylous forest
Hypoponera sp. 11	Jari	Dense ombrophylous forest
Hypoponera sp. 11	Jari	Dense ombrophylous forest
Hypoponera sp. 14	Manaquiri	Open ombrophylous forest
Hypoponera sp. 14	Manaquiri	Open ombrophylous forest
Hypoponera sp. 14	Manaquiri	Open ombrophylous forest
Hypoponera sp. 14	Manaquiri	Open ombrophylous forest
Kalathomyrmex emryi	Cauamé	Open savanna
Labidus coecus	Ducke	Dense ombrophylous forest
Labidus coecus	Ducke	Dense ombrophylous forest
Labidus coecus	Viruá	Campinarana forest
Labidus coecus	Viruá	Campinarana forest
Labidus coecus	Maracá	Seasonal campinarana
Labidus coecus	Manaquiri	Open ombrophylous forest
Labidus mars	Ducke	Dense ombrophylous forest
Labidus praedator	Jari	Dense ombrophylous forest
Labidus praedator	Ducke	Dense ombrophylous forest
Labidus praedator	Manaquiri	Open ombrophylous forest
Labidus praedator	Manaquiri	Open ombrophylous forest
Labidus praedator	Ducke	Dense ombrophylous forest
Labidus praedator	Viruá	Campinarana forest
Labidus spininodis	Ducke	Dense ombrophylous forest
Labidus spininodis	Ducke	Dense ombrophylous forest
Leptogenys gaigei	Ducke	Dense ombrophylous forest
Leptogenys gaigei	Ducke	Dense ombrophylous forest
Leptogenys gaigei	Ducke	Dense ombrophylous forest
Leptogenys gaigei	Ducke	Dense ombrophylous forest
Leptogenys gaigei	Viruá	Open ombrophylous forest
Leptogenys gaigei	Viruá	Open ombrophylous forest
Leptogenys pusilla	Ducke	Dense ombrophylous forest
Leptogenys pusilla	Ducke	Dense ombrophylous forest
Leptogenys wheeleri	Ducke	Dense ombrophylous forest
Leptogenys wheeleri	Ducke	Dense ombrophylous forest
Leptogenys wheeleri	Ducke	Dense ombrophylous forest
Leptogenys wheeleri	Ducke	Dense ombrophylous forest
Leptogenys wheeleri	Ducke	Dense ombrophylous forest
Mayaponera constricta	Viruá	Seasonal campinarana
Mayaponera constricta	Viruá	Open ombrophylous forest
Mayaponera constricta	Ducke	Dense ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Mayaponera constricta	Ducke	Dense ombrophylous forest
Mayaponera constricta	Orquestra	Dense ombrophylous forest
Mayaponera constricta	Orquestra	Dense ombrophylous forest
Megalomyrmex balzani	Ducke	Dense ombrophylous forest
Megalomyrmex balzani	Manaquiri	Open ombrophylous forest
Megalomyrmex balzani	Jari	Dense ombrophylous forest
Megalomyrmex balzani	Jari	Dense ombrophylous forest
Megalomyrmex driftii	Jari	Dense ombrophylous forest
Megalomyrmex driftii	Jari	Dense ombrophylous forest
Megalomyrmex driftii	Jari	Dense ombrophylous forest
Megalomyrmex driftii	Jari	Dense ombrophylous forest
Megalomyrmex incisus	Maracá	Open ombrophylous forest
Megalomyrmex incisus	Maracá	Open ombrophylous forest
Megalomyrmex leoninus	Maracá	Deciduous forest
Megalomyrmex leoninus	Maracá	Deciduous forest
Megalomyrmex leoninus	Viruá	Semideciduous forest
Megalomyrmex leoninus	Viruá	Open ombrophylous forest
Megalomyrmex silvestrii	Jari	Dense ombrophylous forest
Megalomyrmex silvestrii	Jari	Dense ombrophylous forest
Megalomyrmex silvestrii	Jari	Dense ombrophylous forest
Megalomyrmex sp. 04	Ducke	Dense ombrophylous forest
Monomorium pharaonis	Ducke	Dense ombrophylous forest
Monomorium pharaonis	Ducke	Dense ombrophylous forest
Monomorium pharaonis	Ducke	Dense ombrophylous forest
Monomorium pharaonis	Ducke	Dense ombrophylous forest
Monomorium pharaonis	Ducke	Dense ombrophylous forest
Monomorium pharaonis	Ducke	Dense ombrophylous forest
Mycocepurus smithii	Maracá	Open ombrophylous forest
Mycocepurus smithii	Maracá	Open ombrophylous forest
Mycocepurus smithii	Maracá	Semideciduous forest
Mycocepurus smithii	Maracá	Semideciduous forest
Mycocepurus sp. 01	Maracá	Semideciduous forest
Mycocepurus sp. 01	Ducke	Dense ombrophylous forest
Mycocepurus sp. 01	Maracá	Semideciduous forest
Myrmicocrypta sp. 01	Ducke	Dense ombrophylous forest
Myrmicocrypta sp. 01	Ducke	Dense ombrophylous forest
Myrmicocrypta sp. 01	Ducke	Dense ombrophylous forest
Myrmicocrypta sp. 01	Ducke	Dense ombrophylous forest
Myrmicocrypta sp. 02	Viruá	Open ombrophylous forest
Myrmicocrypta sp. 02	Viruá	Campinarana forest
Myrmicocrypta sp. 02	Maracá	Open ombrophylous forest
Neivamyrmex adnepos	Jari	Dense ombrophylous forest
Neivamyrmex angustinodis	Ducke	Dense ombrophylous forest
Neivamyrmex angustinodis	Ducke	Dense ombrophylous forest
Neivamyrmex angustinodis	Ducke	Dense ombrophylous forest
Neivamyrmex angustinodis	Ducke	Dense ombrophylous forest
Neivamyrmex gibbatus	Ducke	Dense ombrophylous forest
Neivamyrmex gibbatus	Ducke	Dense ombrophylous forest
Neivamyrmex gibbatus	Viruá	Open ombrophylous forest
Neivamyrmex gibbatus	Viruá	Open ombrophylous forest
Neivamyrmex iridenscens	Ducke	Dense ombrophylous forest
Neivamyrmex orthonotus	Ducke	Dense ombrophylous forest
Neivamyrmex orthonotus	Ducke	Dense ombrophylous forest
Neivamyrmex pilosus	Maracá	Semideciduous forest
Neivamyrmex pilosus	Maracá	Semideciduous forest
Neivamyrmex swainsonii	Maracá	Deciduous forest
Neivamyrmex swainsonii	Maracá	Deciduous forest
Neivamyrmex swainsonii	Maracá	Deciduous forest
Neoponera apicalis	Ducke	Dense ombrophylous forest
Neoponera apicalis	Ducke	Dense ombrophylous forest
Neoponera apicalis	Ducke	Dense ombrophylous forest
Neoponera apicalis	Viruá	Seasonal campinarana
Neoponera apicalis	Maracá	Semideciduous forest
Neoponera apicalis	Manaquiri	Open ombrophylous forest
Neoponera commutata	Ducke	Dense ombrophylous forest
Neoponera commutata	Ducke	Dense ombrophylous forest
Neoponera commutata	Manaquiri	Open ombrophylous forest
Neoponera commutata	Manaquiri	Open ombrophylous forest
Neoponera commutata	Viruá	Open ombrophylous forest
Neoponera commutata	Viruá	Open ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Neoponera laevigata	Viruá	Open ombrophylous forest
Neoponera verenae	Orquestra	Dense ombrophylous forest
Neoponera verenae	Orquestra	Dense ombrophylous forest
Neoponera verenae	Orquestra	Dense ombrophylous forest
Neoponera verenae	Orquestra	Dense ombrophylous forest
Nomamyrmex esenbeckii	Ducke	Dense ombrophylous forest
Nomamyrmex esenbeckii	Ducke	Dense ombrophylous forest
Nomamyrmex esenbeckii	Ducke	Dense ombrophylous forest
Nomamyrmex hartigi	Ducke	Dense ombrophylous forest
Nomamyrmex hartigi	Ducke	Dense ombrophylous forest
Nylanderia caeciliae	Ducke	Dense ombrophylous forest
Nylanderia caeciliae	Ducke	Dense ombrophylous forest
Nylanderia caeciliae	Capana	Dense ombrophylous forest
Nylanderia caeciliae	Jari	Dense ombrophylous forest
Nylanderia caeciliae	Jari	Dense ombrophylous forest
Nylanderia caeciliae	Jari	Dense ombrophylous forest
Nylanderia guatemalensis	Cauamé	Open savanna
Nylanderia guatemalensis	Maracá	Open ombrophylous forest
Nylanderia guatemalensis	Ducke	Dense ombrophylous forest
Nylanderia guatemalensis	Ducke	Dense ombrophylous forest
Nylanderia guatemalensis	Jari	Dense ombrophylous forest
Nylanderia guatemalensis	Jari	Dense ombrophylous forest
Nylanderia sp. 01	Ducke	Dense ombrophylous forest
Nylanderia sp. 01	Ducke	Dense ombrophylous forest
Nylanderia sp. 01	Viruá	Campinarana forest
Nylanderia sp. 01	Viruá	Campinarana forest
Nylanderia sp. 01	Viruá	Seasonal campinarana
Nylanderia sp. 04	Manaquiri	Open ombrophylous forest
Nylanderia sp. 04	Manaquiri	Open ombrophylous forest
Nylanderia sp. 04	Maracá	Campinarana forest
Nylanderia sp. 04	Maracá	Campinarana forest
Ochetomyrmex semipolitus	Orquestra	Dense ombrophylous forest
Ochetomyrmex semipolitus	Orquestra	Dense ombrophylous forest
Ochetomyrmex semipolitus	Manaquiri	Open ombrophylous forest
Ochetomyrmex semipolitus	Manaquiri	Open ombrophylous forest
Ochetomyrmex semipolitus	Viruá	Campinarana forest
Ochetomyrmex semipolitus	Viruá	Open ombrophylous forest
Octostruma balzani	Ducke	Dense ombrophylous forest
Octostruma balzani	Ducke	Dense ombrophylous forest
Octostruma balzani	Capana	Dense ombrophylous forest
Octostruma balzani	Orquestra	Dense ombrophylous forest
Octostruma balzani	Jari	Dense ombrophylous forest
Odontomachus bauri	Capana	Dense ombrophylous forest
Odontomachus bauri	Viruá	Open ombrophylous forest
Odontomachus bauri	Viruá	Campinarana forest
Odontomachus bauri	Viruá	Campinarana forest
Odontomachus brunneus	Ducke	Dense ombrophylous forest
Odontomachus caelatus	Ducke	Dense ombrophylous forest
Odontomachus caelatus	Ducke	Dense ombrophylous forest
Odontomachus caelatus	Ducke	Dense ombrophylous forest
Odontomachus caelatus	Viruá	Open ombrophylous forest
Odontomachus caelatus	Viruá	Open ombrophylous forest
Odontomachus caelatus	Jari	Dense ombrophylous forest
Odontomachus haematodus	Ducke	Dense ombrophylous forest
Odontomachus haematodus	Ducke	Dense ombrophylous forest
Odontomachus haematodus	Viruá	Campinarana forest
Odontomachus haematodus	Viruá	Campinarana forest
Odontomachus haematodus	Maracá	Deciduous forest
Odontomachus haematodus	Manaquiri	Open ombrophylous forest
Odontomachus laticeps	Ducke	Dense ombrophylous forest
Odontomachus laticeps	Ducke	Dense ombrophylous forest
Odontomachus laticeps	Ducke	Dense ombrophylous forest
Odontomachus meinerti	Ducke	Dense ombrophylous forest
Odontomachus meinerti	Ducke	Dense ombrophylous forest
Odontomachus meinerti	Maracá	Semideciduous forest
Odontomachus meinerti	Maracá	Open ombrophylous forest
Odontomachus meinerti	Maracá	Open ombrophylous forest
Odontomachus meinerti	Maracá	Open ombrophylous forest
Odontomachus opaciventris	Ducke	Dense ombrophylous forest
Odontomachus opaciventris	Ducke	Dense ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Odontomachus opaciventris	Ducke	Dense ombrophylous forest
Odontomachus opaciventris	Ducke	Dense ombrophylous forest
Odontomachus opaciventris	Ducke	Dense ombrophylous forest
Odontomachus opaciventris	Manaquiri	Open ombrophylous forest
Odontomachus scalptus	Ducke	Dense ombrophylous forest
Odontomachus scalptus	Ducke	Dense ombrophylous forest
Odontomachus scalptus	Ducke	Dense ombrophylous forest
Odontomachus scalptus	Ducke	Dense ombrophylous forest
Odontomachus scalptus	Ducke	Dense ombrophylous forest
Oxyepoecus sp. 01	Maracá	Deciduous forest
Pachycondyla crassinoda	Ducke	Dense ombrophylous forest
Pachycondyla crassinoda	Ducke	Dense ombrophylous forest
Pachycondyla crassinoda	Ducke	Dense ombrophylous forest
Pachycondyla crassinoda	Maracá	Campinarana forest
Pachycondyla crassinoda	Manaquiri	Open ombrophylous forest
Pachycondyla crassinoda	Manaquiri	Open ombrophylous forest
Pachycondyla harpax	Ducke	Dense ombrophylous forest
Pachycondyla harpax	Ducke	Dense ombrophylous forest
Pachycondyla harpax	Ducke	Dense ombrophylous forest
Pachycondyla harpax	Manaquiri	Open ombrophylous forest
Pachycondyla harpax	Viruá	Campinarana forest
Pachycondyla impressa	Capana	Dense ombrophylous forest
Pheidole biconstricta	Ducke	Dense ombrophylous forest
Pheidole biconstricta	Ducke	Dense ombrophylous forest
Pheidole biconstricta	Orquestra	Dense ombrophylous forest
Pheidole biconstricta	Viruá	Campinarana forest
Pheidole biconstricta	Viruá	Campinarana forest
Pheidole biconstricta	Ducke	Dense ombrophylous forest
Pheidole cataractae	Ducke	Dense ombrophylous forest
Pheidole cataractae	Ducke	Dense ombrophylous forest
Pheidole cataractae	Maracá	Open ombrophylous forest
Pheidole cataractae	Maracá	Campinarana forest
Pheidole cataractae	Maracá	Campinarana forest
Pheidole embolopyx	Manaquiri	Open ombrophylous forest
Pheidole embolopyx	Manaquiri	Open ombrophylous forest
Pheidole exigua	Manaquiri	Open ombrophylous forest
Pheidole flavens	Ducke	Dense ombrophylous forest
Pheidole flavens	Ducke	Dense ombrophylous forest
Pheidole flavens	Ducke	Dense ombrophylous forest
Pheidole flavens	Maracá	Seasonal campinarana
Pheidole flavens	Maracá	Seasonal campinarana
Pheidole meinerti	Manaquiri	Open ombrophylous forest
Pheidole nitella	Ducke	Dense ombrophylous forest
Pheidole nitella	Ducke	Dense ombrophylous forest
Pheidole nitella	Ducke	Dense ombrophylous forest
Pheidole radoszkowskii	Orquestra	Dense ombrophylous forest
Pheidole radoszkowskii	Maracá	Semideciduous forest
Pheidole radoszkowskii	Ducke	Dense ombrophylous forest
Pheidole radoszkowskii	Viruá	Seasonal shrubby campinarana
Pheidole radoszkowskii	Ducke	Dense ombrophylous forest
Pheidole sp. 01	Ducke	Dense ombrophylous forest
Pheidole sp. 01	Ducke	Dense ombrophylous forest
Pheidole sp. 02	Ducke	Dense ombrophylous forest
Pheidole sp. 02	Ducke	Dense ombrophylous forest
Pheidole sp. 02	Capana	Dense ombrophylous forest
Pheidole sp. 02	Capana	Dense ombrophylous forest
Pheidole sp. 04	Ducke	Dense ombrophylous forest
Pheidole sp. 04	Ducke	Dense ombrophylous forest
Pheidole sp. 09	Ducke	Dense ombrophylous forest
Pheidole sp. 09	Ducke	Dense ombrophylous forest
Pheidole sp. 09	Manaquiri	Open ombrophylous forest
Pheidole sp. 09	Manaquiri	Open ombrophylous forest
Pheidole sp. 10	Orquestra	Dense ombrophylous forest
Pheidole sp. 10	Orquestra	Dense ombrophylous forest
Pheidole sp. 10	Capana	Dense ombrophylous forest
Pheidole sp. 10	Capana	Dense ombrophylous forest
Pheidole sp. 11	Ducke	Dense ombrophylous forest
Pheidole sp. 11	Ducke	Dense ombrophylous forest
Pheidole sp. 11	Jari	Dense ombrophylous forest
Pheidole sp. 11	Maracá	Seasonal campinarana

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Pheidole sp. 11	Maracá	Seasonal campinarana
Pheidole sp. 12	Ducke	Dense ombrophylous forest
Pheidole sp. 12	Ducke	Dense ombrophylous forest
Pheidole sp. 12	Maracá	Open ombrophylous forest
Pheidole sp. 12	Maracá	Deciduous forest
Pheidole sp. 12	Maracá	Deciduous forest
Pheidole sp. 13	Ducke	Dense ombrophylous forest
Pheidole sp. 13	Ducke	Dense ombrophylous forest
Pheidole sp. 13	Ducke	Dense ombrophylous forest
Pheidole sp. 13	Ducke	Dense ombrophylous forest
Pheidole sp. 13	Ducke	Dense ombrophylous forest
Pheidole sp. 14	Orquestra	Dense ombrophylous forest
Pheidole sp. 14	Ducke	Dense ombrophylous forest
Pheidole sp. 14	Ducke	Dense ombrophylous forest
Pheidole sp. 14	Jari	Dense ombrophylous forest
Pheidole sp. 14	Jari	Dense ombrophylous forest
Pheidole sp. 14	Jari	Dense ombrophylous forest
Pheidole sp. 15	Ducke	Dense ombrophylous forest
Pheidole sp. 15	Ducke	Dense ombrophylous forest
Pheidole sp. 15	Orquestra	Dense ombrophylous forest
Pheidole sp. 15	Manaquiri	Open ombrophylous forest
Pheidole sp. 15	Manaquiri	Open ombrophylous forest
Pheidole sp. 16	Ducke	Dense ombrophylous forest
Pheidole sp. 16	Ducke	Dense ombrophylous forest
Pheidole sp. 16	Ducke	Dense ombrophylous forest
Pheidole sp. 16	Ducke	Dense ombrophylous forest
Pheidole sp. 17	Ducke	Dense ombrophylous forest
Pheidole sp. 17	Ducke	Dense ombrophylous forest
Pheidole sp. 17	Manaquiri	Open ombrophylous forest
Pheidole sp. 19	Ducke	Dense ombrophylous forest
Pheidole sp. 19	Ducke	Dense ombrophylous forest
Pheidole sp. 19	Capana	Dense ombrophylous forest
Pheidole sp. 19	Capana	Dense ombrophylous forest
Pheidole sp. 20	Jari	Dense ombrophylous forest
Pheidole sp. 20	Jari	Dense ombrophylous forest
Pheidole sp. 20	Manaquiri	Open ombrophylous forest
Pheidole sp. 20	Manaquiri	Open ombrophylous forest
Pheidole sp. 20	Orquestra	Dense ombrophylous forest
Pheidole sp. 23	Ducke	Dense ombrophylous forest
Pheidole sp. 23	Ducke	Dense ombrophylous forest
Pheidole sp. 23	Capana	Dense ombrophylous forest
Pheidole sp. 23	Capana	Dense ombrophylous forest
Pheidole sp. 23	Capana	Dense ombrophylous forest
Pheidole sp. 24	Maracá	Open ombrophylous forest
Pheidole sp. 24	Maracá	Open ombrophylous forest
Pheidole sp. 24	Viruá	Seasonal campinarana
Pheidole sp. 24	Viruá	Seasonal campinarana
Pheidole sp. 24	Ducke	Dense ombrophylous forest
Pheidole sp. 25	Ducke	Dense ombrophylous forest
Pheidole sp. 25	Ducke	Dense ombrophylous forest
Pheidole sp. 26	Orquestra	Dense ombrophylous forest
Pheidole sp. 26	Ducke	Dense ombrophylous forest
Pheidole sp. 26	Ducke	Dense ombrophylous forest
Pheidole sp. 26	Manaquiri	Open ombrophylous forest
Pheidole sp. 27	Orquestra	Dense ombrophylous forest
Pheidole sp. 27	Orquestra	Dense ombrophylous forest
Pheidole sp. 27	Jari	Dense ombrophylous forest
Pheidole sp. 27	Capana	Dense ombrophylous forest
Pheidole sp. 27	Ducke	Dense ombrophylous forest
Pheidole sp. 27	Ducke	Dense ombrophylous forest
Pheidole sp. 28	Maracá	Open ombrophylous forest
Pheidole sp. 28	Maracá	Open ombrophylous forest
Pheidole sp. 28	Ducke	Dense ombrophylous forest
Pheidole sp. 28	Ducke	Dense ombrophylous forest
Pheidole sp. 28	Ducke	Dense ombrophylous forest
Pheidole sp. 29	Ducke	Dense ombrophylous forest
Pheidole sp. 29	Ducke	Dense ombrophylous forest
Pheidole sp. 29	Ducke	Dense ombrophylous forest
Pheidole sp. 30	Ducke	Dense ombrophylous forest
Pheidole sp. 31	Ducke	Dense ombrophylous forest

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Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Pheidole sp. 31	Ducke	Dense ombrophylous forest
Pheidole sp. 31	Ducke	Dense ombrophylous forest
Pheidole sp. 31	Ducke	Dense ombrophylous forest
Pheidole sp. 32	Orquestra	Dense ombrophylous forest
Pheidole sp. 32	Orquestra	Dense ombrophylous forest
Pheidole sp. 32	Ducke	Dense ombrophylous forest
Pheidole sp. 32	Ducke	Dense ombrophylous forest
Pheidole sp. 34	Viruá	Campinarana forest
Pheidole sp. 34	Viruá	Campinarana forest
Pheidole sp. 36	Ducke	Dense ombrophylous forest
Pheidole sp. 36	Ducke	Dense ombrophylous forest
Pheidole sp. 37	Orquestra	Dense ombrophylous forest
Pheidole sp. 37	Orquestra	Dense ombrophylous forest
Pheidole sp. 37	Ducke	Dense ombrophylous forest
Pheidole sp. 38	Viruá	Open ombrophylous forest
Pheidole sp. 38	Viruá	Open ombrophylous forest
Pheidole sp. 41	Ducke	Dense ombrophylous forest
Pheidole sp. 41	Ducke	Dense ombrophylous forest
Pheidole sp. 43	Ducke	Dense ombrophylous forest
Pheidole sp. 43	Ducke	Dense ombrophylous forest
Pheidole sp. 44	Ducke	Dense ombrophylous forest
Pheidole sp. 44	Ducke	Dense ombrophylous forest
Pheidole sp. 44	Ducke	Dense ombrophylous forest
Pheidole sp. 45	Ducke	Dense ombrophylous forest
Pheidole sp. 45	Ducke	Dense ombrophylous forest
Pheidole sp. 45	Ducke	Dense ombrophylous forest
Pheidole sp. 46	Ducke	Dense ombrophylous forest
Pheidole sp. 46	Ducke	Dense ombrophylous forest
Pheidole sp. 46	Ducke	Dense ombrophylous forest
Pheidole sp. 47	Ducke	Dense ombrophylous forest
Pheidole sp. 47	Ducke	Dense ombrophylous forest
Pheidole sp. 47	Ducke	Dense ombrophylous forest
Pheidole sp. 48	Ducke	Dense ombrophylous forest
Pheidole sp. 48	Ducke	Dense ombrophylous forest
Pheidole sp. 49	Capana	Dense ombrophylous forest
Pheidole sp. 49	Capana	Dense ombrophylous forest
Pheidole sp. 49	Ducke	Dense ombrophylous forest
Pheidole sp. 49	Ducke	Dense ombrophylous forest
Pheidole sp. 49	Ducke	Dense ombrophylous forest
Pheidole sp. 51	Jari	Dense ombrophylous forest
Pheidole sp. 51	Jari	Dense ombrophylous forest
Pheidole sp. 51	Ducke	Dense ombrophylous forest
Pheidole sp. 51	Orquestra	Dense ombrophylous forest
Pheidole sp. 51	Orquestra	Dense ombrophylous forest
Pheidole sp. 52	Maracá	Open ombrophylous forest
Pheidole sp. 52	Maracá	Open ombrophylous forest
Pheidole sp. 52	Ducke	Dense ombrophylous forest
Pheidole sp. 52	Ducke	Dense ombrophylous forest
Pheidole sp. 53	Ducke	Dense ombrophylous forest
Pheidole sp. 53	Ducke	Dense ombrophylous forest
Pheidole sp. 53	Ducke	Dense ombrophylous forest
Pheidole sp. 54	Ducke	Dense ombrophylous forest
Pheidole sp. 54	Ducke	Dense ombrophylous forest
Pheidole sp. 54	Ducke	Dense ombrophylous forest
Pheidole sp. 55	Ducke	Dense ombrophylous forest
Pheidole sp. 55	Ducke	Dense ombrophylous forest
Pheidole sp. 55	Ducke	Dense ombrophylous forest
Pheidole sp. 55	Ducke	Dense ombrophylous forest
Pheidole sp. 55	Ducke	Dense ombrophylous forest
Pheidole sp. 57	Viruá	Seasonal shrubby campinarana
Pheidole sp. 57	Viruá	Seasonal shrubby campinarana
Pheidole sp. 57	Maracá	Open ombrophylous forest
Pheidole sp. 57	Maracá	Open ombrophylous forest
Pheidole sp. 59	Maracá	Semideciduous forest
Pheidole sp. 60	Maracá	Semideciduous forest
Pheidole sp. 60	Maracá	Semideciduous forest
Pheidole sp. 60	Orquestra	Dense ombrophylous forest
Pheidole sp. 60	Jari	Dense ombrophylous forest
Pheidole sp. 60	Maracá	Open ombrophylous forest
Pheidole sp. 61	Maracá	Semideciduous forest

(*continued on next page*)

Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Pheidole sp. 61	Maracá	Semideciduous forest
Pheidole sp. 61	Viruá	Open ombrophylous forest
Pheidole sp. 62	Maracá	Open ombrophylous forest
Pheidole sp. 62	Maracá	Deciduous forest
Pheidole sp. 62	Maracá	Deciduous forest
Pheidole sp. 63	Maracá	Open ombrophylous forest
Pheidole sp. 63	Maracá	Deciduous forest
Pheidole sp. 63	Maracá	Deciduous forest
Pheidole sp. 64	Maracá	Open ombrophylous forest
Pheidole sp. 64	Maracá	Semideciduous forest
Pheidole sp. 64	Maracá	Semideciduous forest
Pheidole sp. 70	Maracá	Open ombrophylous forest
Pheidole sp. 70	Maracá	Open ombrophylous forest
Pheidole sp. 70	Maracá	Deciduous forest
Pheidole sp. 70	Viruá	Campinarana forest
Pheidole sp. 70	Viruá	Campinarana forest
Pheidole sp. 71	Maracá	Semideciduous forest
Pheidole sp. 71	Maracá	Semideciduous forest
Pheidole sp. 71	Capana	Dense ombrophylous forest
Pheidole sp. 71	Capana	Dense ombrophylous forest
Pheidole sp. 73	Manaquiri	Open ombrophylous forest
Pheidole sp. 75	Maracá	Campinarana forest
Pheidole sp. 75	Maracá	Campinarana forest
Pheidole sp. 75	Maracá	Open ombrophylous forest
Pheidole sp. 75	Maracá	Open ombrophylous forest
Pheidole sp. 75	Manaquiri	Open ombrophylous forest
Pheidole sp. 76	Viruá	Seasonal campinarana
Pheidole sp. 76	Viruá	Seasonal campinarana
Pheidole sp. 76	Viruá	Open ombrophylous forest
Pheidole sp. 76	Maracá	Deciduous forest
Pheidole sp. 78	Maracá	Open ombrophylous forest
Pheidole sp. 78	Maracá	Semideciduous forest
Pheidole sp. 78	Viruá	Deciduous forest
Pheidole sp. 78	Viruá	Deciduous forest
Pheidole sp. 79	Maracá	Open ombrophylous forest
Pheidole sp. 87	Orquestra	Open ombrophylous forest
Pheidole sp. 87	Orquestra	Open ombrophylous forest
Pheidole sp. 87	Jari	Dense ombrophylous forest
Pheidole sp. 87	Jari	Dense ombrophylous forest
Pheidole sp. 87	Capana	Dense ombrophylous forest
Pheidole sp. 91	Jari	Dense ombrophylous forest
Pheidole sp. 91	Jari	Dense ombrophylous forest
Pheidole sp. 91	Jari	Dense ombrophylous forest
Pheidole sp. 97	Jari	Dense ombrophylous forest
Pheidole sp. 97	Jari	Dense ombrophylous forest
Pheidole sp. 105	Jari	Dense ombrophylous forest
Pheidole sp. 105	Jari	Dense ombrophylous forest
Pheidole sp. 111	Manaquiri	Open ombrophylous forest
Pheidole sp. 111	Manaquiri	Open ombrophylous forest
Pheidole sp. 120	Jari	Dense ombrophylous forest
Pheidole vorax	Manaquiri	Open ombrophylous forest
Pheidole vorax	Manaquiri	Open ombrophylous forest
Pheidole vorax	Ducke	Dense ombrophylous forest
Pheidole vorax	Orquestra	Dense ombrophylous forest
Pogonomyrmex naegelii	Cauamé	Open savanna
Pogonomyrmex naegelii	Cauamé	Open savanna
Pogonomyrmex naegelii	Cauamé	Open savanna
Pogonomyrmex naegelii	Cauamé	Open savanna
Pogonomyrmex naegelii	Cauamé	Open savanna
Pogonomyrmex naegelii	Cauamé	Open savanna
Prionopelta punctulata	Ducke	Dense ombrophylous forest
Prionopelta punctulata	Ducke	Dense ombrophylous forest
Prionopelta punctulata	Ducke	Dense ombrophylous forest
Prionopelta punctulata	Ducke	Dense ombrophylous forest
Prionopelta punctulata	Ducke	Dense ombrophylous forest
Prionopelta punctulata	Ducke	Dense ombrophylous forest
Pseudomyrmex flavidulus	Cauamé	Open savanna
Pseudomyrmex flavidulus	Cauamé	Open savanna
Pseudomyrmex flavidulus	Maracá	Deciduous forest
Pseudomyrmex sp. 05	Viruá	Seasonal campinarana

(*continued on next page*)

Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Pseudomyrmex sp. 05	Viruá	Seasonal campinarana
Pseudomyrmex sp. 05	Cauamé	Open savanna
Pseudomyrmex sp. 05	Cauamé	Open savanna
Pseudomyrmex tenuis	Orquestra	Dense ombrophylous forest
Pseudomyrmex tenuis	Capana	Dense ombrophylous forest
Pseudomyrmex tenuis	Jari	Dense ombrophylous forest
Rasopone arhuaca	Maracá	Semideciduous forest
Rasopone arhuaca	Maracá	Semideciduous forest
Rasopone arhuaca	Maracá	Open ombrophylous forest
Rasopone arhuaca	Ducke	Dense ombrophylous forest
Rasopone arhuaca	Ducke	Dense ombrophylous forest
Rasopone arhuaca	Ducke	Dense ombrophylous forest
Rogeria alzatei	Ducke	Dense ombrophylous forest
Rogeria alzatei	Ducke	Dense ombrophylous forest
Rogeria alzatei	Ducke	Dense ombrophylous forest
Rogeria alzatei	Ducke	Dense ombrophylous forest
Rogeria alzatei	Ducke	Dense ombrophylous forest
Rogeria cornuta	Capana	Dense ombrophylous forest
Rogeria cornuta	Capana	Dense ombrophylous forest
Rogeria cornuta	Capana	Dense ombrophylous forest
Rogeria cornuta	Capana	Dense ombrophylous forest
Rogeria cornuta	Capana	Dense ombrophylous forest
Rogeria foreli	Maracá	Deciduous forest
Rogeria leptonana	Maracá	Deciduous forest
Rogeria sp. 01	Capana	Dense ombrophylous forest
Sericomyrmex sp. 01	Manaquiri	Open ombrophylous forest
Sericomyrmex sp. 01	Manaquiri	Open ombrophylous forest
Sericomyrmex sp. 01	Maracá	Semideciduous forest
Sericomyrmex sp. 01	Maracá	Semideciduous forest
Sericomyrmex sp. 01	Maracá	Campinarana forest
Sericomyrmex sp. 01	Maracá	Dense ombrophylous forest
Solenopsis brevicornis	Maracá	Dense ombrophylous forest
Solenopsis brevicornis	Ducke	Dense ombrophylous forest
Solenopsis brevicornis	Ducke	Dense ombrophylous forest
Solenopsis brevicornis	Ducke	Dense ombrophylous forest
Solenopsis castor	Maracá	Deciduous forest
Solenopsis castor	Maracá	Deciduous forest
Solenopsis castor	Jari	Dense ombrophylous forest
Solenopsis castor	Jari	Dense ombrophylous forest
Solenopsis clytemnestra	Cauamé	Open savanna
Solenopsis clytemnestra	Cauamé	Open savanna
Solenopsis clytemnestra	Manaquiri	Open ombrophylous forest
Solenopsis clytemnestra	Ducke	Dense ombrophylous forest
Solenopsis clytemnestra	Ducke	Dense ombrophylous forest
Solenopsis geminata	Ducke	Dense ombrophylous forest
Solenopsis geminata	Ducke	Dense ombrophylous forest
Solenopsis geminata	Maracá	Deciduous forest
Solenopsis geminata	Maracá	Deciduous forest
Solenopsis geminata	Maracá	Deciduous forest
Solenopsis saevissima	Cauamé	Open savanna
Solenopsis saevissima	Cauamé	Open savanna
Solenopsis saevissima	Ducke	Dense ombrophylous forest
Solenopsis saevissima	Ducke	Dense ombrophylous forest
Solenopsis saevissima	Ducke	Dense ombrophylous forest
Solenopsis sp. 06	Cauamé	Open savanna
Solenopsis sp. 06	Manaquiri	Open ombrophylous forest
Solenopsis sp. 06	Ducke	Dense ombrophylous forest
Solenopsis sp. 06	Ducke	Dense ombrophylous forest
Solenopsis sp. 09	Ducke	Dense ombrophylous forest
Solenopsis sp. 09	Ducke	Dense ombrophylous forest
Solenopsis sp. 09	Ducke	Dense ombrophylous forest
Solenopsis sp. 09	Ducke	Dense ombrophylous forest
Solenopsis sp. 11	Maracá	Open ombrophylous forest
Solenopsis sp. 11	Maracá	Deciduous forest
Solenopsis sp. 11	Maracá	Deciduous forest
Strumigenys appretiata	Maracá	Semideciduous forest
Strumigenys appretiata	Maracá	Semideciduous forest
Strumigenys appretiata	Maracá	Semideciduous forest
Strumigenys beebei	Capana	Dense ombrophylous forest
Strumigenys beebei	Capana	Dense ombrophylous forest

(*continued on next page*)

Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Strumigenys beebei	Capana	Dense ombrophylous forest
Strumigenys beebei	Capana	Dense ombrophylous forest
Strumigenys beebei	Capana	Dense ombrophylous forest
Strumigenys cosmostela	Manaquiri	Open ombrophylous forest
Strumigenys cosmostela	Manaquiri	Open ombrophylous forest
Strumigenys denticulata	Capana	Dense ombrophylous forest
Strumigenys denticulata	Capana	Dense ombrophylous forest
Strumigenys denticulata	Capana	Dense ombrophylous forest
Strumigenys denticulata	Jari	Dense ombrophylous forest
Strumigenys denticulata	Jari	Dense ombrophylous forest
Strumigenys denticulata	Jari	Dense ombrophylous forest
Strumigenys elongata	Maracá	Open ombrophylous forest
Strumigenys elongata	Maracá	Open ombrophylous forest
Strumigenys elongata	Maracá	Open ombrophylous forest
Strumigenys elongata	Maracá	Open ombrophylous forest
Strumigenys infidelis	Ducke	Dense ombrophylous forest
Strumigenys infidelis	Ducke	Dense ombrophylous forest
Strumigenys infidelis	Ducke	Dense ombrophylous forest
Strumigenys infidelis	Ducke	Dense ombrophylous forest
Strumigenys inusitata	Jari	Dense ombrophylous forest
Strumigenys perparva	Ducke	Dense ombrophylous forest
Strumigenys perparva	Ducke	Dense ombrophylous forest
Strumigenys perparva	Ducke	Dense ombrophylous forest
Strumigenys perparva	Manaquiri	Open ombrophylous forest
Strumigenys perparva	Manaquiri	Open ombrophylous forest
Strumigenys sp. 01	Ducke	Dense ombrophylous forest
Strumigenys sp. 01	Ducke	Dense ombrophylous forest
Strumigenys sp. 02	Ducke	Dense ombrophylous forest
Strumigenys sp. 02	Ducke	Dense ombrophylous forest
Strumigenys sp. 02	Ducke	Dense ombrophylous forest
Strumigenys sp. 02	Ducke	Dense ombrophylous forest
Strumigenys sp. 08	Maracá	Open ombrophylous forest
Strumigenys sp. 08	Maracá	Open ombrophylous forest
Strumigenys sp. 08	Maracá	Semideciduous forest
Strumigenys sp. 08	Maracá	Semideciduous forest
Strumigenys stenotes	Ducke	Dense ombrophylous forest
Strumigenys stenotes	Ducke	Dense ombrophylous forest
Strumigenys stenotes	Ducke	Dense ombrophylous forest
Strumigenys trinidadensis	Ducke	Dense ombrophylous forest
Strumigenys trinidadensis	Ducke	Dense ombrophylous forest
Strumigenys trinidadensis	Maracá	Open ombrophylous forest
Strumigenys trinidadensis	Maracá	Open ombrophylous forest
Strumigenys trudifera	Jari	Dense ombrophylous forest
Strumigenys trudifera	Jari	Dense ombrophylous forest
Strumigenys trudifera	Jari	Dense ombrophylous forest
Strumigenys trudifera	Jari	Dense ombrophylous forest
Strumigenys trudifera	Jari	Dense ombrophylous forest
Strumigenys trudifera	Jari	Dense ombrophylous forest
Strumigenys villiersi	Capana	Dense ombrophylous forest
Strumigenys villiersi	Capana	Dense ombrophylous forest
Strumigenys villiersi	Jari	Dense ombrophylous forest
Strumigenys zeteki	Orquestra	Dense ombrophylous forest
Strumigenys zeteki	Orquestra	Dense ombrophylous forest
Strumigenys zeteki	Jari	Dense ombrophylous forest
Strumigenys zeteki	Jari	Dense ombrophylous forest
Tapinoma sp. 01	Cauamé	Open savanna
Tapinoma sp. 01	Cauamé	Open savanna
Tapinoma sp. 01	Cauamé	Open savanna
Tapinoma sp. 01	Cauamé	Open savanna
Tapinoma sp. 01	Cauamé	Open savanna
Trachymyrmex bugnioni	Ducke	Dense ombrophylous forest
Trachymyrmex bugnioni	Ducke	Dense ombrophylous forest
Trachymyrmex bugnioni	Viruá	Campinarana forest
Trachymyrmex cornetzi	Ducke	Dense ombrophylous forest
Trachymyrmex cornetzi	Ducke	Dense ombrophylous forest
Trachymyrmex cornetzi	Manaquiri	Open ombrophylous forest
Trachymyrmex cornetzi	Manaquiri	Open ombrophylous forest
Trachymyrmex cornetzi	Maracá	Semideciduous forest
Trachymyrmex cornetzi	Maracá	Semideciduous forest
Trachymyrmex diversus	Manaquiri	Open ombrophylous forest

(*continued on next page*)

Table B1 (*continued*)

Taxon	Site	Phytophysiognomy
Trachymyrmex diversus	Manaquiri	Open ombrophylous forest
Trachymyrmex diversus	Manaquiri	Open ombrophylous forest
Trachymyrmex diversus	Manaquiri	Open ombrophylous forest
Trachymyrmex farinosus	Ducke	Dense ombrophylous forest
Trachymyrmex farinosus	Ducke	Dense ombrophylous forest
Trachymyrmex farinosus	Maracá	Open ombrophylous forest
Trachymyrmex farinosus	Maracá	Open ombrophylous forest
Trachymyrmex farinosus	Maracá	Open ombrophylous forest
Trachymyrmex isthmicus	Ducke	Dense ombrophylous forest
Trachymyrmex isthmicus	Ducke	Dense ombrophylous forest
Trachymyrmex mandibulares	Manaquiri	Open ombrophylous forest
Trachymyrmex opulentus	Ducke	Dense ombrophylous forest
Trachymyrmex opulentus	Ducke	Dense ombrophylous forest
Trachymyrmex opulentus	Ducke	Dense ombrophylous forest
Trachymyrmex opulentus	Ducke	Dense ombrophylous forest
Trachymyrmex opulentus	Ducke	Dense ombrophylous forest
Trachymyrmex ruthae	Maracá	Semideciduous forest
Trachymyrmex ruthae	Maracá	Semideciduous forest
Trachymyrmex sp. 01	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 01	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 01	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 01	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 01	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 02	Manaquiri	Open ombrophylous forest
Trachymyrmex sp. 04	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 04	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 04	Manaquiri	Open ombrophylous forest
Trachymyrmex sp. 04	Maracá	Open ombrophylous forest
Trachymyrmex sp. 05	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 05	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 05	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 05	Maracá	Open ombrophylous forest
Trachymyrmex sp. 05	Maracá	Open ombrophylous forest
Trachymyrmex sp. 06	Viruá	Campinarana forest
Trachymyrmex sp. 06	Maracá	Semideciduous forest
Trachymyrmex sp. 07	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 07	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 07	Manaquiri	Open ombrophylous forest
Trachymyrmex sp. 07	Maracá	Open ombrophylous forest
Trachymyrmex sp. 07	Viruá	Campinarana forest
Trachymyrmex sp. 07	Viruá	Campinarana forest
Trachymyrmex sp. 08	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 08	Ducke	Dense ombrophylous forest
Trachymyrmex sp. 08	Maracá	Open ombrophylous forest
Trachymyrmex sp. 08	Maracá	Open ombrophylous forest
Tranopelta gilva	Maracá	Campinarana forest
Wasmannia auropunctata	Manaquiri	Open ombrophylous forest
Wasmannia auropunctata	Manaquiri	Open ombrophylous forest
Wasmannia auropunctata	Ducke	Dense ombrophylous forest
Wasmannia auropunctata	Ducke	Dense ombrophylous forest
Wasmannia auropunctata	Jari	Dense ombrophylous forest
Wasmannia auropunctata	Jari	Dense ombrophylous forest
Wasmannia iheringi	Ducke	Dense ombrophylous forest
Wasmannia rochai	Maracá	Open ombrophylous forest
Wasmannia rochai	Maracá	Open ombrophylous forest
Wasmannia scrobifera	Ducke	Dense ombrophylous forest
Wasmannia scrobifera	Ducke	Dense ombrophylous forest
Wasmannia scrobifera	Ducke	Dense ombrophylous forest
Wasmannia scrobifera	Ducke	Dense ombrophylous forest
Wasmannia scrobifera	Ducke	Dense ombrophylous forest

Table B2
Total number of species/morphospecies collected, taxon and number of specimens measured of each species and total amount of ants measured.

Number of species/morphospecies	Taxon	Number of specimens measured for each species
1	*Acanthognathus ocellatus*	1
2	*Acanthostichus bentoni*	6
3	*Acromyrmex* sp. 01	2
4	*Acromyrmex subterraneus*	1
5	*Acropyga* sp. 01	6
6	*Acropyga* sp. 02	1
7	*Anochetus diegensis*	6
8	*Anochetus emarginatus*	1
9	*Anochetus horridus*	6
10	*Apterostigma pilosum*	3
11	*Apterostigma* sp. 03	1
12	*Apterostigma* sp. 04	1
13	*Apterostigma urichii*	4
14	*Atta cephalotes*	3
15	*Atta sexdens*	6
16	*Azteca* sp. 01	4
17	*Blepharidatta brasiliensis*	6
18	*Brachymyrmex heeri*	5
19	*Brachymyrmex* sp. 01	5
20	*Brachymyrmex* sp. 02	3
21	*Brachymyrmex* sp. 03	1
22	*Camponotus ager*	5
23	*Camponotus atriceps*	6
24	*Camponotus balzani*	3
25	*Camponotus crassus*	5
26	*Camponotus fastigatus*	3
27	*Camponotus femoratus*	6
28	*Camponotus leydigi*	3
29	*Camponotus novogranadensis*	5
30	*Camponotus rapax*	6
31	*Camponotus sericeiventris*	2
32	*Camponotus* sp. 14	1
33	*Carebara escherichi*	4
34	*Carebara lignata*	1
35	*Carebara urichi*	5
36	*Centromyrmex gigas*	1
37	*Centromyrmex* sp. 01	1
38	*Cephalotes atratus*	2
39	*Cephalotes maculatus*	2
40	*Cephalotes marginatus*	1
41	*Cephalotes pusillus*	3
42	*Crematogaster brasiliensis*	6
43	*Crematogaster curvispinosa*	1
44	*Crematogaster erecta*	2
45	*Crematogaster evallans*	3
46	*Crematogaster flavosensitiva*	5
47	*Crematogaster jardinero*	4
48	*Crematogaster limata*	5
49	*Crematogaster longispina*	2
50	*Crematogaster nigropilosa*	2
51	*Crematogaster rochai*	1
52	*Crematogaster sotobosque*	5
53	*Crematogaster stollii*	2
54	*Crematogaster tenuicula*	6
55	*Cyphomyrmex laevigatus*	6
56	*Cyphomyrmex peltatus*	6
57	*Cyphomyrmex rimosus*	6
58	*Discothyrea denticulata*	1
59	*Dolichoderus bispinosus*	6
60	*Dolichoderus decollatus*	2
61	*Dolichoderus imitator*	4
62	*Dorymyrmex bicolor*	3
63	*Dorymyrmex goeldii*	4
64	*Dorymyrmex richteri*	4
65	*Eciton burchellii*	4
66	*Eciton dulcius*	2
67	*Eciton rapax*	4
68	*Ectatomma brunneum*	4
69	*Ectatomma edentatum*	7

(*continued on next page*)

Table B2 (*continued*)

Number of species/morphospecies	Taxon	Number of specimens measured for each species
70	*Ectatomma lugens*	6
71	*Ectatomma ruidum*	3
72	*Gigantiops destructor*	5
73	*Gnamptogenys acuminata*	4
74	*Gnamptogenys curvoclypeata*	3
75	*Gnamptogenys haenschi*	3
76	*Gnamptogenys horni*	6
77	*Gnamptogenys moelleri*	4
78	*Gnamptogenys regularis*	4
79	*Gnamptogenys strigata*	2
80	*Gnamptogenys sulcata*	4
81	*Gnamptogenys tortuolosa*	6
82	*Hylomyrma immanis*	4
83	*Hypoponera* sp. 01	5
84	*Hypoponera* sp. 02	2
85	*Hypoponera* sp. 03	4
86	*Hypoponera* sp. 04	5
87	*Hypoponera* sp. 05	5
88	*Hypoponera* sp. 06	4
89	*Hypoponera* sp. 07	5
90	*Hypoponera* sp. 08	4
91	*Hypoponera* sp. 09	4
92	*Hypoponera* sp. 11	3
93	*Hypoponera* sp. 14	4
94	*Kalathomyrmex emryi*	1
95	*Labidus coecus*	6
96	*Labidus mars*	1
97	*Labidus praedator*	6
98	*Labidus spininodis*	2
99	*Leptogenys gaigei*	6
100	*Leptogenys pusilla*	2
101	*Leptogenys wheeleri*	5
102	*Mayaponera constricta*	6
103	*Megalomyrmex balzani*	4
104	*Megalomyrmex driftii*	4
105	*Megalomyrmex incisus*	2
106	*Megalomyrmex leoninus*	4
107	*Megalomyrmex silvestrii*	3
108	*Megalomyrmex* sp. 04	1
109	*Monomorium pharaonis*	6
110	*Mycocepurus smithii*	4
111	*Mycocepurus* sp. 01	3
112	*Myrmicocrypta* sp. 01	4
113	*Myrmicocrypta* sp. 02	3
114	*Neivamyrmex adnepos*	1
115	*Neivamyrmex angustinodis*	4
116	*Neivamyrmex gibbatus*	4
117	*Neivamyrmex iridenscens*	1
118	*Neivamyrmex orthonotus*	2
119	*Neivamyrmex pilosus*	2
120	*Neivamyrmex swainsonii*	3
121	*Neoponera apicalis*	6
122	*Neoponera commutata*	6
123	*Neoponera laevigata*	1
124	*Neoponera verenae*	4
125	*Nomamyrmex esenbeckii*	3
126	*Nomamyrmex hartigi*	2
127	*Nylanderia caeciliae*	6
128	*Nylanderia guatemalensis*	6
129	*Nylanderia* sp. 01	5
130	*Nylanderia* sp. 04	4
131	*Ochetomyrmex semipolitus*	6
132	*Octostruma balzani*	5
133	*Odontomachus bauri*	4
134	*Odontomachus brunneus*	1
135	*Odontomachus caelatus*	6
136	*Odontomachus haematodus*	6
137	*Odontomachus laticeps*	3
138	*Odontomachus meinerti*	6
139	*Odontomachus opaciventris*	6

(*continued on next page*)

Table B2 (*continued*)

Number of species/morphospecies	Taxon	Number of specimens measured for each species
140	*Odontomachus scalptus*	5
141	*Oxyepoecus* sp. 01	1
142	*Pachycondyla crassinoda*	6
143	*Pachycondyla harpax*	5
144	*Pachycondyla impressa*	1
145	*Pheidole biconstricta*	6
146	*Pheidole cataractae*	5
147	*Pheidole embolopyx*	2
148	*Pheidole exigua*	1
149	*Pheidole flavens*	5
150	*Pheidole meinerti*	1
151	*Pheidole nitella*	3
152	*Pheidole radoszkowskii*	5
153	*Pheidole* sp. 01	2
154	*Pheidole* sp. 02	4
155	*Pheidole* sp. 04	2
156	*Pheidole* sp. 09	4
157	*Pheidole* sp. 10	4
158	*Pheidole* sp. 105	2
159	*Pheidole* sp. 11	5
160	*Pheidole* sp. 111	2
161	*Pheidole* sp. 12	5
162	*Pheidole* sp. 120	1
163	*Pheidole* sp. 13	5
164	*Pheidole* sp. 14	6
165	*Pheidole* sp. 15	5
166	*Pheidole* sp. 16	4
167	*Pheidole* sp. 17	3
168	*Pheidole* sp. 19	4
169	*Pheidole* sp. 20	5
170	*Pheidole* sp. 23	5
171	*Pheidole* sp. 24	5
172	*Pheidole* sp. 25	2
173	*Pheidole* sp. 26	4
174	*Pheidole* sp. 27	6
175	*Pheidole* sp. 28	5
176	*Pheidole* sp. 29	3
177	*Pheidole* sp. 30	1
178	*Pheidole* sp. 31	4
179	*Pheidole* sp. 32	4
180	*Pheidole* sp. 34	2
181	*Pheidole* sp. 36	2
182	*Pheidole* sp. 37	3
183	*Pheidole* sp. 38	2
184	*Pheidole* sp. 41	2
185	*Pheidole* sp. 43	2
186	*Pheidole* sp. 44	3
187	*Pheidole* sp. 45	3
188	*Pheidole* sp. 46	3
189	*Pheidole* sp. 47	3
190	*Pheidole* sp. 48	2
191	*Pheidole* sp. 49	5
192	*Pheidole* sp. 51	5
193	*Pheidole* sp. 52	4
194	*Pheidole* sp. 53	3
195	*Pheidole* sp. 54	3
196	*Pheidole* sp. 55	5
197	*Pheidole* sp. 57	4
198	*Pheidole* sp. 59	1
199	*Pheidole* sp. 60	5
200	*Pheidole* sp. 61	3
201	*Pheidole* sp. 62	3
202	*Pheidole* sp. 63	3
203	*Pheidole* sp. 64	3
204	*Pheidole* sp. 70	5
205	*Pheidole* sp. 71	4
206	*Pheidole* sp. 73	1
207	*Pheidole* sp. 75	5
208	*Pheidole* sp. 76	4
209	*Pheidole* sp. 78	4
210	*Pheidole* sp. 79	1
211	*Pheidole* sp. 87	5
212	*Pheidole* sp. 91	3
213	*Pheidole* sp. 97	2

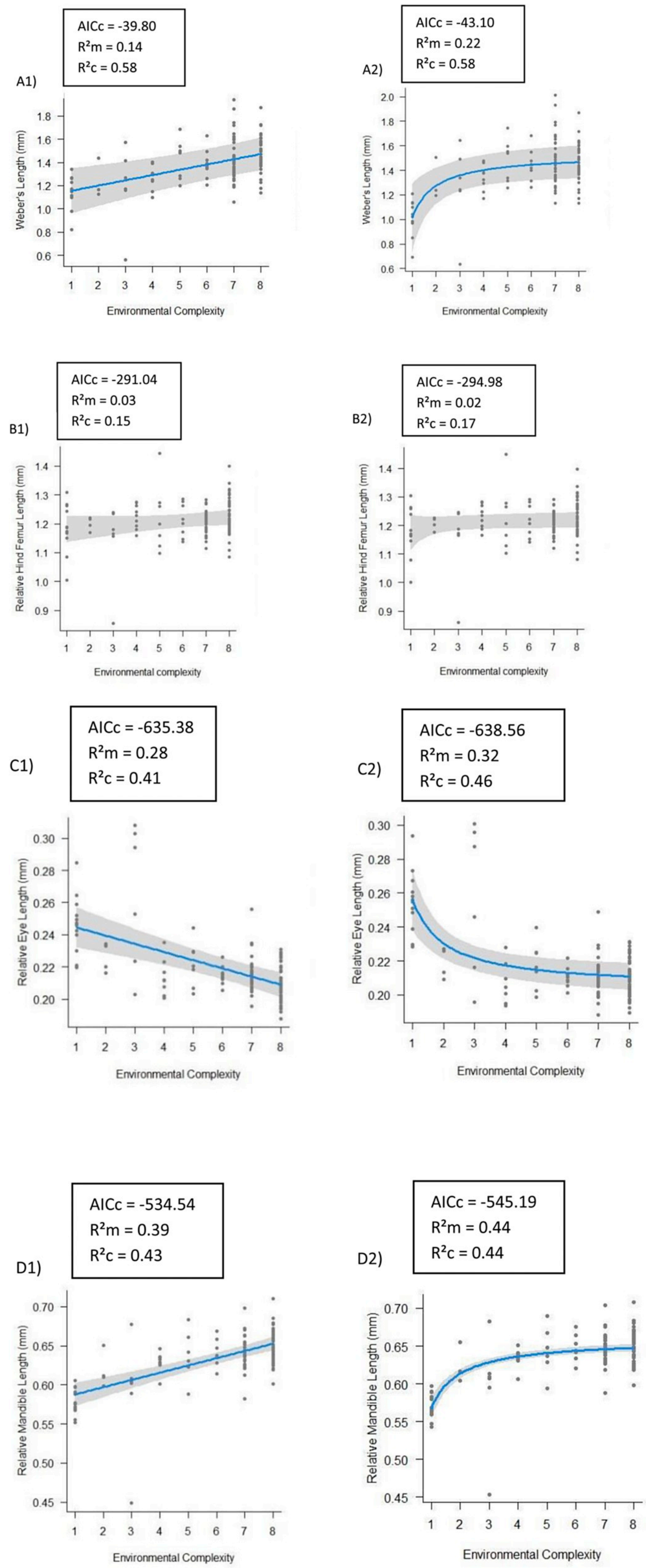
(*continued on next page*)

Table B2 (*continued*)

Number of species/morphospecies	Taxon	Number of specimens measured for each species
214	*Pheidole vorax*	4
215	*Pogonomyrmex naegelii*	6
216	*Prionopelta punctulata*	6
217	*Pseudomyrmex flavidulus*	3
218	*Pseudomyrmex* sp. 05	4
219	*Pseudomyrmex tenuis*	3
220	*Rasopone arhuaca*	6
221	*Rogeria alzatei*	5
222	*Rogeria cornuta*	5
223	*Rogeria foreli*	1
224	*Rogeria leptonana*	1
225	*Rogeria* sp. 01	1
226	*Sericomyrmex* sp 01	6
227	*Solenopsis brevicornis*	4
228	*Solenopsis castor*	4
229	*Solenopsis clytemnestra*	5
230	*Solenopsis geminata*	5
231	*Solenopsis saevissima*	5
232	*Solenopsis* sp. 06	4
233	*Solenopsis* sp. 09	4
234	*Solenopsis* sp. 11	3
235	*Strumigenys appretiata*	3
236	*Strumigenys beebei*	5
237	*Strumigenys cosmostela*	2
238	*Strumigenys denticulata*	6
239	*Strumigenys elongata*	4
240	*Strumigenys infidelis*	4
241	*Strumigenys inusitata*	1
242	*Strumigenys perparva*	5
243	*Strumigenys* sp. 01	2
244	*Strumigenys* sp. 02	4
245	*Strumigenys* sp. 08	4
246	*Strumigenys stenotes*	3
247	*Strumigenys trinidadensis*	4
248	*Strumigenys trudifera*	6
249	*Strumigenys villiersi*	3
250	*Strumigenys zeteki*	4
251	*Tapinoma* sp. 01	5
252	*Trachymyrmex bugnioni*	3
253	*Trachymyrmex cornetzi*	6
254	*Trachymyrmex diversus*	4
255	*Trachymyrmex farinosus*	5
256	*Trachymyrmex isthmicus*	2
257	*Trachymyrmex mandibulares*	1
258	*Trachymyrmex opulentus*	5
259	*Trachymyrmex ruthae*	2
260	*Trachymyrmex* sp. 01	5
261	*Trachymyrmex* sp. 02	1
262	*Trachymyrmex* sp. 04	4
263	*Trachymyrmex* sp. 05	5
264	*Trachymyrmex* sp. 06	2
265	*Trachymyrmex* sp. 07	6
266	*Trachymyrmex* sp. 08	4
267	*Tranopelta gilva*	1
268	*Wasmannia auropunctata*	6
269	*Wasmannia iheringi*	1
270	*Wasmannia rochai*	2
271	*Wasmannia scrobifera*	5

Table C
Results of Akaike Information Criterion corrected (AICc) for both models (linaear and asymptotic models) and *P* value. The lower the value of AICc the more supported is the fit of the model. More negative values indicate lower AICc values.

	Linear models		Asymptotic models	
	AICc	*P*	AICc	*P*
Weber lentgh	−39.80	< 0.05	−43.10	< 0.05
Femur length	−291.04	0.146	−294.98	0.258
Eye length	−635.38	< 0.05	−638.56	< 0.05
Mandible length	−534.54	< 0.05	−545.19	< 0.05



Figures. Figures of partial of the linear and asymptotic models with the values of AICc with R^2m and R^2c value of each model in the upper left corner. Figure A1, B1, C1 and D1 are the results of the linear models of the Weber Length, Relative Hind Femur Length, Relative Eye Length and Relative Mandible Length, respectively. Figures A2, B2, C2 and D2 are the results of the asymptotic models for each trait respectively

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