Notes and Comments

Contribution to knowledge of Amazonian Myrmecofauna: new records for the state of Mato Grosso, Brazil

F. J. A. Lopes[a] ⓘ, R. E. Vicente[b] ⓘ and J. Garlet[c*] ⓘ

[a]Universidade do Estado de Mato Grosso, Programa de Pós-Graduação em Biodiversidade e Agroecossistemas Amazônicos, Alta Floresta, MT, Brasil

[b]Universidade Federal de Mato Grosso, Laboratório de Ecologia de Comunidades, Cuiabá, MT, Brasil

[c]Universidade do Estado de Mato Grosso, Faculdade de Ciências Biológicas e Agrárias, Programa de Pós-Graduação em Biodiversidade e Agroecossistemas Amazônicos, Alta Floresta, MT, Brasil

Ants (Hymenoptera: Formicidae) are social insects present in almost all terrestrial ecosystems, except for the poles, and have high values of richness and abundance (Hölldobler and Wilson, 1990; McGeoch et al., 2011). Despite presenting peculiarities that make them an attractive study group, there are many gaps in knowledge regarding their distribution in the states of Brazil, including Mato Grosso state. This fact can be evidenced by finding out who Mato Grosso is the 3rd largest Brazilian state that comprises three biomes in its political-geographic limits (Amazon, Cerrado and Pantanal) (Vicente et al., 2018) but it has only 518 native species recorded for the state (Guénard et al., 2017). However, the increasing number of studies with ants (survey or ecology) in recent years contributed to the knowledge of the myrmecofauna in the region (Santos-Silva et al., 2016; Paolucci et al., 2017; Focas-Leite et al., 2018).

This sensitivity of ants to environmental changes gives this group the position of bioindicator organisms (Holt and Miller, 2010). The ants still have intimate association with flora gives them bioindicator properties, as the species richness may be positively correlated with the degree of environmental conservation (Aronson et al., 2011; Lutinski et al., 2017). Therefore, this study has the objective to report the occurrence of seven species recorded for the first time for the state of Mato Grosso.

The research was carried out in three environments: secondary forest fragment (F), recovered area (R) and pasture (P), all located in the municipality of Alta Floresta, in the southern Amazon, Mato Grosso, Brazil (9°50'40,67"S and 56°6'56,55"W). The region's climate is defined as Tropical Monsoon (Am), (Alvares et al., 2013). The sampling of the myrmecofauna was carried out between the months of July 2016 and July 2017, with 50-meter-long transects installed in each environment and seven PROVID-type soil traps (Antoniolli et al., 2006). The traps contained a saline solution for conservation of specimens collected over the 48 hours that the traps remained in the field. Ant morphospecies were quantified and separated, and then sent for taxonomic identification by the expert

of the Myrmecology Laboratory of the Cocoa Research Center on the Executive Committee of the Cocoa Crop Plan (CEPLAC) in Ilhéus (Bahia, Brazil) and were housed in the collection held there (CPDC, Delabie et al., 2020) under reference # 5814.

Species distribution records were searched for in Google Scholar, Scielo, Science Direct; Web of Science and on the free access platform AntMaps, which is part of the Global Ant Biodiversity Informatics – GABI project (Guénard et al., 2017). The nomenclature review was standardized according to the AntCat (2021).

The seven species that appear as a new record belong to three ant subfamilies with widespread occurrence in the Neotropical region, belonging to three tribes and six genera. The Myrmicinae presented the highest number of new records for the state of Mato Grosso (Table 1). The Myrmicine subfamily has been frequently collected in several types of ecosystems, being predominant in surveys, in natural and also anthropized ecosystems as noted by Souza-Campana et al. (2020) in an urban park from state of São Paulo.

Our results add to the knowledge of the distribution of species of the ant species of Amazonian in the state of Mato Grosso, with the occurrence recording of seven new species for the state. Even though studies using soil fauna sampling methodologies, as pitfalls trap that is similar to PROVID-type soil traps used in this study, are the most common in Brazilian Biomes (Carvalho et al., 2014; Souza et al. 2016; Gomes et al., 2018; Przybyszewski et al., 2020; Lutinski et al., 2021), the results of this study demonstrate that the diversity of ants in this region is still poorly known. This evidence is even greater when considering the arboreal stratum that is rarely sampled in some parts of the Amazon and Pantanal (Yamazaki et al., 2016; Dambros et al., 2018; Vicente and Izzo, 2021; Pringle et al., 2019). Therefore, studies focusing on Mato Grosso ant biodiversity should still focus on soil fauna, but also consider the vegetation, as well as the different habitats and phytophysiognomies of its biomes.

Table 1. Relative frequency (%) of general occurrence of epigeal ants sampled in the forest fragment (F), recovered area (R) and pasture (P) in Alta Floresta, MT, Brazil.

SUBFAMILY / TRIBE / SPECIES	F	R	P
ECTATOMMINAE			
Ectatommini			
Ectatomma suzanae Almeida Filho, 1986	17.14		
Gnamptogenys acuta (Brown, 1956)	5.71		
FORMICINAE			
Camponotini			
Camponotus fastigatus Roger, 1863	8.57	2.85	
MYRMICINAE			
Attini			
Acromyrmex subterraneus brunneus (Forel, 1912)	8.57		2.85
Mycetomoellerius compactus (Mayhé-Nunes & Brandão, 2002*)*	8.57		
Mycetomoellerius relictus (Borgmeier, 1934)	2.85		2.85
Pheidole jeannei Wilson, 2003			2.85

The relative frequency of general occurrence of species in the three different land uses was calculated, with 35 traps in each area. The percentage frequency of general occurrence of each species was calculated based on the number of traps in which it was sampled.

References

ALVARES, C.A., STAPE, J.L., SENTELHAS, P.C., GONÇALVEZ, J.L.M. and SPAROVEK, G., 2013. Köopen's climate classification map for Brazil. *Meteorologische Zeitschrift*, vol. 22, no. 6, pp. 711-728. http://dx.doi.org/10.1127/0941-2948/2013/0507.

ANTCAT, 2021 [viewed 1 July 2021]. *An online catalog of the ants of the world by Barry Bolton* [online]. ANTCAT. Available from: https://antcat.org/catalog/508321.

ANTONIOLLI, Z.I., CONCEIÇÃO, P.C., BÖCK, V., PORT, O., SILVA, D.M. and SILVA, R.F., 2006. Método alternativo para estudar a fauna do solo. *Revista Ciência Florestal*, vol. 16, no. 4, pp. 407-417. http://dx.doi.org/10.5902/198050981922.

ARONSON, J., DURINGAN, G. and BRANCALION, P.H.S., 2011. Conceitos e definições correlatos à ciência e à prática da restauração ecológica. *Instituto Florestal: Série Registros*, vol. 44, pp. 1-38.

CARVALHO, K.S., NASCIMENTO, I.C., DELABIE, J.H., ZINA, J., SOUZA, A.L.B., KOCH, E.B.A. and SANTOS, A.S., 2014. Litter as an important resource determining the diversity of epigeic ants in the south-central part of Bahia State, Brazil. *Sociobiology*, vol. 59, no. 4, pp. 1375-1387.

DAMBROS, J., FRANÇA, V.V., DELABIE, J.H.C., MARQUES, M.I. and BATTIROLA, L.D., 2018. Canopy ant assemblage (Hymenoptera: Formicidae) in two vegetation formations in the Northern Brazilian Pantanal. *Sociobiology*, vol. 65, no. 3, pp. 358-369. http://dx.doi.org/10.13102/sociobiology.v65i3.1932.

DELABIE, J., SANTOS-NETO, E., OLIVEIRA, M., SILVA, P., SANTOS, R., CAITANO, B., MARIANO, C., ARNHOLD, A. and KOCH, E., 2020. A coleção de Formicidae do Centro de Pesquisas do Cacau (CPDC), Ilhéus, Bahia, Brasil. *Boletim do Museu Paraense Emílio Goeldi. Ciências Naturais*, vol. 15, no. 1, pp. 289-305. http://dx.doi.org/10.46357/bcnaturais.v15i1.293.

FOCAS-LEITE, J., VICENTE, R.E. and CASTUERA, L.O., 2018. Forest understory ant (Hymenoptera: Formicidae) assemblage in a Meridional Amazonian landscape, Brazil. *Caldasia*, vol. 40, no. 1, pp. 192-194.

GOMES, C.B., SOUZA, J.L. and FRANKLIN, E., 2018. A comparison between time of exposure, number of pitfall traps and the sampling cost to capture ground-dwelling poneromorph ants (Hymenoptera: formicidae). *Sociobiology*, vol. 65, no. 2, pp. 138-148. http://dx.doi.org/10.13102/sociobiology.v65i2.1207.

GUÉNARD, B., WEISER, M., GOMEZ, K., NARULA, N. and ECONOMO, P.E., 2017. The Global Ant Biodiversity Informatics (GABI) database: a synthesis of ant species geographic distributions. *Myrmecological News*, vol. 24, pp. 83-89.

HÖLLDOBLER, B. and WILSON, E.O., 1990. *The ants*. Cambridge: Harvard University Press, 732 p. http://dx.doi.org/10.1007/978-3-662-10306-7.

HOLT, E.A. and MILLER, S.W., 2010. Bioindicators: using organisms to measure enviromental impacts. *Nature Education Knowldge*, vol. 3, pp. 8.

LUTINSKI, J.A., BAUCKE, L., FILTRO, M., BUSATO, M.A., KNAKIEWICZ, A.C. and GARCIA, F.R.M., 2017. Ant assemblage (Hymenoptera: Formicidae) in three wind farms in the State of Paraná, Brazil. *Brazilian Journal of Biology = Revista Brasileira de Biologia*, vol. 77, no. 1, pp. 176-184. http://dx.doi.org/10.1590/1519-6984.14115. PMid:27382991.

LUTINSKI, J.A., DORNELES, F.E., GUARDA, C., LUTINSKI, C.J., BUSATO, M.A., GIOVENARDI, R. and GARCIA, F.R.M., 2021. Ant diversity (Hymenoptera: Formicidae) in Turvo State Park, municipality of Derrubadas, state of Rio Grande do Sul, Brazil. *Brazilian Journal of Biology = Revista Brasileira de Biologia*, vol. 83, pp. e239642. http://dx.doi.org/10.1590/1519-6984.239642. PMid:34133487.

MCGEOCH, M.A., SITHOLE, H., SAMWAYS, M.J., SIMAIKA, J.P., PRYKE, J.S., PICKER, M., UYS, C., ARMSTRONG, A.J., DIPPENAAR-SCHOEMAN, A.S., ENGELBRECHT, I.A., BRASCHLER, B. and HAMER, M., 2011. Conservation and monitoring of invertebrates in terrestrial potectetd areas. *Koedoe*, vol. 53, no. 2, pp. 39-52. http://dx.doi.org/10.4102/koedoe.v53i2.1000.

PAOLUCCI, L.N., SCHOEREDER, J.H., BRANDO, P.M. and ANDERSEN, A.N., 2017. Fire-induced forest transition to derived savannas: cascading effects on ant communities. *Biological Conservation*, vol. 214, pp. 295-302. http://dx.doi.org/10.1016/j.biocon.2017.08.020.

PRINGLE, E.G., SANTOS, T.F., GONCALVES, M.S., HAWES, J.E., PERES, C.A. and BACCARO, F., 2019. Arboreal ant abundance tracks primary productivity in an Amazonian white-water river system. *Ecosphere*, vol. 10, no. 10, pp. e02902. http://dx.doi.org/10.1002/ecs2.2902.

PRZYBYSZEWSKI, K.R., SILVA, R.J., VICENTE, R.E., FREITAS, J.V.G., PEREIRA, M.J.B., IZZO, T.J. and TONON, D.S., 2020. Can baited pitfall traps for sampling dung beetles replace conventional traps for sampling ants? *Sociobiology*, vol. 67, no. 3, pp. 376-387. http://dx.doi.org/10.13102/sociobiology.v67i3.5201.

SANTOS-SILVA, L., VICENTE, R.E. and FEITOSA, R.M., 2016. Ant species (Hymenoptera, Formicidae) of forest fragments and urban areas in a Meridional Amazonian landscape. *Check List*, vol. 12, no. 3, pp. 1-7. http://dx.doi.org/10.15560/12.3.1885.

SOUZA, J.L.P., BACCARO, F.B., LANDEIRO, V.L., FRANKLIN, E., MAGNUSSON, W.E., PEQUENO, P.A.C.L. and FERNANDES, I.O., 2016. Taxonomic sufficiency and indicator taxa reduce sampling costs and increase monitoring effectiveness for ants. *Diversity & Distributions*, vol. 22, no. 1, pp. 111-122. http://dx.doi.org/10.1111/ddi.12371.

SOUZA-CAMPANA, D.R., CARVALHO, A.C.N., CANALI, M., SILVA, O.G.M., MORINI, M.S.C. and FUJIHARA, R.T., 2020. A rapid survey of ground-dwelling ants (Hymenoptera: Formicidae) in an urban park from state of São Paulo, Brazil. *Brazilian Journal of Biology = Revista Brasileira de Biologia*, vol. 80, no. 3, pp. 682-684. http://dx.doi.org/10.1590/1519-6984.221831. PMid:31596363.

VICENTE, R.E. and IZZO, T.J., 2021. Effect of dominant parabiotic Ant-Garden ants on the understory and ground-dwelling ant assemblage in the Amazon rainforest. *Insect Conservation and Diversity*, vol. 14, no. 1, pp. 95-106. http://dx.doi.org/10.1111/icad.12449.

VICENTE, R.E., FERREIRA, A.C., SANTOS, R.C.L.D. and PRADO, L.P.D., 2018. Ants (Hymenoptera: Formicidae) from an Amazonian fragmented landscape, Juara, Mato Grosso, Brazil, with new records of ant species. *Papéis Avulsos de Zoologia*, vol. 58, pp. e20185840. http://dx.doi.org/10.11606/1807-0205/2018.58.40.

YAMAZAKI, L., DAMBROZ, J., MEURER, E., VINDICA, V.F., DELABIE, J.H.C., MARQUES, M.I. and BATIROLLA, L.D., 2016. Ant community (Hymenoptera: Formicidae) associated with *Callisthene fasciculata* (Spr.) Mart. (Vochysiaceae) canopies in the Pantanal of Poconé, Mato Grosso, Brazil. *Sociobiology*, vol. 63, no. 2, pp. 735-743. http://dx.doi.org/10.13102/sociobiology.v63i2.824.