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Notes and Comments

A rapid survey of ground-dwelling ants (Hymenoptera: Formicidae) in an urban park from state of São Paulo, Brazil

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The growing urbanization process has led to significant changes in natural environments (Kamura et al., 2007; Guimarães et al., 2013). Thus, it becomes necessary to search for alternatives aiming at conservation and improvement in environmental quality. The creation of forest reserves and ecological parks in urban regions (Kowarik, 2011) can be an effective strategy to conserve biodiversity. The maintenance of these areas benefits many organisms, mainly by providing refuges for many animal species, including ants (Souza-Campana et al., 2016).

Ants play a key role in different ecosystems, acting in nutrient cycling (Hölldobler and Wilson, 1990), soil structuring, and interacting with other organisms (Folgarait, 1998; Sanders and Van Veen, 2011). Due to their high diversity, wide world distribution, and sensitivity to environmental changes, they are important organisms for biodiversity studies (Alonso and Agosti, 2000). Here, we describe a rapid survey of ground-dwelling ants.

The area comprises a fragment of Atlantic Forest of 48.4 hectares located on the urban perimeter of Águas da Prata, state of São Paulo, Brazil (21° 55'S; 46°42'W). It is influenced by the proximity to the Governador Adhemar Pereira de Barros Highway (SP-342) and by trails accessed by visitors.

Ants were collected once in June 2016 (dry season), along a 400m transect (into the fragment), within the fragment of about 100 m from the border region. In total, 20 sample points 20 m distance were evaluated. At each point, we collected two samples of 1 m^2 leaf litter, one to the left and one to the right of the transect, 20 m apart. Each sample was submitted to a mini-Winkler extractor for 48 hours. The ground-dwelling ants were identified following taxonomic key from Baccaro et al. (2015), and had their species/morphospecies named according to Suguituru et al. (2015). Voucher specimens were deposited at Universidade de Mogi das Cruzes, in São Paulo, Brazil.

We collected a total of 6,361 ants with representatives of six subfamilies, 19 genera, and 24 species/morphospecies (Table 1). The taxa are characteristic of the litter stratum (Delabie et al., 2000) and represent a mosaic composed of species found in forests and urban environments.

Pheidole Westwood, 1839 (4) and *Solenopsis* Westwood, 1840 (3), both with generalists feeding habits, were the richness generas (Table 1). That is an expected finding, since they are common taxa in urban environments (Morini et al., 2007; Souza et al., 2012a; Guimarães et al., 2013; Souza-Campana et al., 2016), fed on diversified resources (Baccaro et al., 2015).

The fungus-grower ants *Acromyrmex coronatus* (Fabricius, 1804), *Cyphomyrmex rimosus* (Spinola, 1851), and *Apterostigma* sp. were also collected. With the exception of *Acromyrmex* Mayr, 1865, *Cyphomyrmex* Mayr, 1862 and *Apterostigma* Mayr, 1865 are peculiar to the choice of food sources (Leal and Oliveira, 2000), and although present in urban parks, they present low frequency of occurrence when compared to the other taxa (Morini et al., 2007; Souza et al., 2012a; Souza-Campana et al., 2016).

The following genera were present: *Basiceros* Schulz, 1906 and *Oxyepoecus* Santschi, 1926, characterized as cryptic taxa; *Strumigenys* Smith, 1860 and *Rhopalothrix* Mayr, 1870, which are specialized predators; and *Hypoponera* Santschi, 1938, *Pachycondyla* Smith, 1858, and *Odontomachus* Latreille, 1804, characterized as generalist predators (Baccaro et al., 2015). In fact, a generalist predatory morphospecies (*Hypoponera* sp.4, Table 1) had the highest occurrence (11.11%).

Moreover, as the poorly studied *Discothyrea* Roger, 1863, *Heteroponera* Mayr, 1887, and *Typhlomyrmex* Mayr, 1862 occurred in the study site, which has been reported from preserved other than urban areas (Baccaro et al., 2015; Suguituru et al., 2015). The finding of *Discothyrea sexarticulata* Borgmeier, 1954, *Heteroponera dolo* (Roger, 1860) and *Typhlomyrmex* cf. *pusillus* suggest food availability and refuge sites for these species in the area, which have specialized life style. *Discothyrea* fed on arthropod eggs (Delabie et al., 2000; Brandão et al., 2015; Baccaro et al., 2015). *H. dolo* nestings on fallen tree trunks and branches (Suguituru et al., 2015), where as for

Table 1. List of ant species collected in the Águas da Prata State Park, state of São Paulo, Brazil.

Taxa	Frequency ocurrence %	Abundance
Myrmicinae		
Acromyrmex coronatus (Fabricius, 1804)	3.33	35
Apterostigma sp.	0.56	1
Basiceros disciger (Mayr, 1887)	6.11	80
Crematogaster sp.	0.56	22
Cyphomyrmex rimosus (Spinola, 1851)	10.00	394
Hylomyrma reitteri (Mayr, 1887)	0.56	1
Octostruma stenognatha Brown and Kempf, 1960	1.11	5
Oxyepoecus myops Albuquerque and Brandão, 2009	0.56	1
Pheidole (gr *flavens*)	2.22	9
Pheidole sp.14	8.33	485
Pheidole sp.16	0.56	1
Pheidole sp.36	1.67	4
Rhopalothrix sp.	0.56	1
Solenopsis sp.2	10.56	2.619
Solenopsis sp.3	7.78	618
Strumigenys eggersi Emery, 1890	5.56	150
Wasmannia affinis Santschi, 1929	8.33	244
Ponerinae		
Hypoponera sp.4	11.11	1.018
Odontomachus meinerti Forel, 1905	7.22	42
Pachycondyla striata Smith, 1858	0.56	1
Dolichoderinae		
Linepithema cf *pulex*	10.00	610
Ectatomminae		
Typhlomyrmex cf *pusillus*	1.11	17
Proceratiinae		
Discothyrea sexarticulata Borgmeier, 1954	1.11	2
Heteroponerinae		
Heteroponera dolo (Roger, 1860)	0.56	1
Richness total	**24**	
Abundance total	**6,361**	

Typhlomyrmex feeding habit is still incipient (Weiser and Kaspari, 2006; Brandão et al., 2015; Suguituru et al., 2015).

Data on ant diversity in fragments and urban parks of São Paulo State have been described by Morini et al. (2007), Souza et al. (2012a, b), Tachira et al. (2012), and Souza-Campana et al. (2016). Although further research is necessary to ensure that the ant fauna is sufficiently represented, this rapid assessment provides information about ants living in the leaf litter of the Águas da Prata State Park, improving data for the region. In addition, information will be important for monitoring these populations over time, thus contribution in decision-making for biodiversity conservation programs.

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References

ALONSO, L.E. and AGOSTI, D., 2000. Biodiversity studies, monitoring, and ants: an overview. In: D. AGOSTI, J.D. MAJER, L.E. ALONSO and T.R. SCHULTZ, eds. *Ants: standard methods for measuring and monitoring biodiversity.* Washington: Smithsonian Institution Press, pp. 1-8.

BACCARO, F.B., FEITOSA, R.M., FERNANDEZ, F., FERNANDES, I.O., IZZO, T.J., SOUZA, J.P. and SOLAR, R., 2015. *Guia para os gêneros de formigas do Brasil.* Manaus: IMPA, 388 p.

BRANDÃO, C.R.F., PRADO, L.P., ULYSSÉA, M.A., PROBST, R.S. and ALARCON, V., 2015. Dieta das poneromorfas neotropicais. In: J.C. DELABIE, R.M. FEITOSA, J.E. SERRÃO, C.S.F. MARIANO and J.A. MAJER, eds. *As formigas poneromorfas do Brasil.* Ilhéus: Editus, pp. 145-161. http://dx.doi.org/10.7476/9788574554419.0012.

DELABIE, J.H.C., AGOSTI, D. and NASCIMENTO, I.C., 2000. Litter and communities of the Brazilian Atlantic rain forest region.

In: D. AGOSTI, J.D. MAJER, L.E. ALONSO and T. SCHULTZ, eds. *Sampling ground-dwelling ants: case studies from the worlds rain forest.* Bulletin, no. 18, pp. 1-10.

FOLGARAIT, P.J., 1998. Ant biodiversity and its relationship to ecosystem functioning: a review. *Biodiversity and Conservation*, vol. 7, no. 9, pp. 1221-1244. http://dx.doi.org/10.1023/A:1008891901953.

GUIMARÃES, M.V.A., BENATI, K.R., PERES, M.C.L. and DELABIE, J.H.C., 2013. Assembleia de formigas de serapilheira em fragmentos florestais no município de Salvador, Bahia, Brasil. *Revista Biociências*, vol. 19, no. 2, pp. 1-9.

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

KAMURA, C.M., MORINI, M.S.C., FIGUEIREDO, C.J., BUENO, O.C. and CAMPOS-FARINHA, A.E.C., 2007. Ant communities (Hymenoptera: Formicidae) in an urban ecosystem near the Atlantic Rainforest. *Brazilian Journal of Biology = Revista Brasileira de Biologia*, vol. 67, no. 4, pp. 635-641. http://dx.doi.org/10.1590/S1519-69842007000400007. PMid:18278314.

KOWARIK, I., 2011. Novel urban ecosystems, biodiversity, and conservation. *Environmental Pollution*, vol. 159, no. 8-9, pp. 1974-1983. http://dx.doi.org/10.1016/j.envpol.2011.02.022. PMid:21435761.

LEAL, I.R. and OLIVEIRA, P.S., 2000. Foraging ecology of attine ants in a Neotropical savanna: seasonal use of fungal substrate in the cerrado vegetation of Brazil. *Insectes Sociaux*, vol. 47, no. 4, pp. 376-382. http://dx.doi.org/10.1007/PL00001734.

MORINI, M.S.C., MUNHAE, C.B., LEUNG, R., CANDIANI, D.F. and VOLTOLINI, J.C., 2007. Comunidades de formigas (Hymenoptera: Formicidae) em fragmentos de Mata Atlântica situados em áreas urbanizadas. *Ilheringia: Série Zoologia*, no. 3, pp. 246-252.

SANDERS, D. and VAN VEEN, F.F., 2011. Ecosystem engineering and predation: the multi-trophic impact of two ant species. *Journal of Animal Ecology*, vol. 80, no. 3, pp. 569-576. http://dx.doi.org/10.1111/j.1365-2656.2010.01796.x. PMid:21244419.

SOUZA, D.R., MUNHAE, D.R., KAMURA, C.M., PORTERO, N.S. and MORINI, M.S.C., 2012a. Formigas em áreas urbanizadas da Serra do Itapeti. In: M.S.C. MORINI and V.F. MIRANDA, eds. *Serra do Itapeti: aspectos históricos, sociais e naturalísticos.* Bauru: Canal 6, pp. 301-310.

SOUZA, D.R., SANTOS, S.G., MUNHAE, C.B. and MORINI, M.S.C., 2012b. Diversity of epigeal Ants (Hymenoptera: Formicidae) in urban areas of alto Tietê. *Sociobiology*, vol. 59, no. 3, pp. 703-717.

SOUZA-CAMPANA, D.R., SILVA, O.G.M., MENINO, L. and MORINI, M.S.C., 2016. Epigaeic ant (Hymenoptera: Formicidae) communities in urban parks located in Atlantic Forest biome. *Check List*, vol. 12, no. 5, pp. 1967. http://dx.doi.org/10.15560/12.5.1967.

SUGUITURU, S.S., MORINI, M.S.C., FEITOSA, R.M. and SILVA, R.R., 2015. *Formigas do Alto Tietê.* 1. ed. Bauru: Canal 6, 456 p.

TACHIRA, M.M., SOUZA, D.R., SUGUITURU, S.S., MUNHAE, C.B. and MORINI, M.S.C., 2012. Diversidade da fauna de formigas no Parque Municipal Nagib Najar. In: M.S.C. MORINI and V.F. MIRANDA, eds. *Serra do Itapeti: aspectos históricos, sociais e naturalísticos.* Bauru: Canal 6, pp. 345-353.

WEISER, M.D. and KASPARI, M., 2006. Ecological morphospace of New World ants. *Ecological Entomology*, vol. 31, no. 2, pp. 131-142. http://dx.doi.org/10.1111/j.0307-6946.2006.00759.x.