



RESEARCH ARTICLE - ANTS

First Records of the Exotic Ant *Strumigenys rogeri*, Emery 1890 in Brazil

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Abstract

Strumigenys Smith, 1860 is a megadiverse ant genus with 858 species distributed worldwide. These ants forage and nest in the leaf litter, rotten wood, dried leaves, or twigs and are specialized predators. Here we present the first records of the pantropical *Strumigenys rogeri* Emery, 1890 in Brazil. The information was obtained from specimens conserved in the Formicidae Collection of the Cocoa Research Center. We recovered data on the occurrence of *S. rogeri* in six locations in southern Bahia, Brazil. The specimens were found in remnants, secondary growths, or agroforest areas within the Atlantic Brazilian rainforest biome. Interestingly, it seems that areas of cocoa agrosystems shaded with *Eritryna* legume trees make this ant relatively easy to find. It is reasonable to think that many specimens of *S. rogeri* were accumulated in entomological collections throughout Brazil or were misidentified due to the complicated taxonomy of the genus.

Introduction

Strumigenys Smith, 1860 (Formicidae: Myrmicinae) is a megadiverse ant genus with 858 extant species distributed worldwide (Bolton, 2023). Most species are known for foraging and nesting in leaf litter, rotten wood, dried leaves, or twigs. These ants are known as predators of Collembola but may prey on tiny leaf litter arthropods such as Diplura, Symphyla, Chilopoda, Pseudoscorpiones, Acari, Araneae, Isopoda, Amphipoda, and occasionally on many other small insects and their larvae (Wilson, 1953; Masuko, 1985; Dejean, 1985, 1987; Lattke et al., 2018)

For a long time, *Strumigenys* remained an under-sampled genus, and this ant genus became better known since

the methodology of Winkler extraction for sampling leaf litter ants came to be universally used (Longino & Nadkarni, 1990; Agosti et al., 2000). With the use of adequate techniques for studying ground-dwelling ants (Agosti et al., 2000; Delabie et al., 2021), the knowledge about the diversity of the genus significantly increased, and today, *Strumigenys* represents the third World's most diverse ant genus.

Strumigenys rogeri Emery, 1890 is a tiny ant that nests in rotten wood, branches, and other components of the leaf litter; it usually feeds on springtails (Collembola) but also on Diplura of the family Campodeidae according to observations of E.O. Wilson in Cuba (Brown, 1954). The origin of this species is possibly West Africa, from where the ant has spread to several other regions of the World (Bolton, 1983).



The distribution of this ant has been reviewed by Wetterer (2012). This study shows that the ant is distributed in different parts of the World, being prevalent in Oceanic and Caribbean islands; several continental records are also reported outside Africa: Florida in the U.S.A., Mexico, Costa Rica, Panama e Malaysia, Guyana, and Ecuador (Wetterer, 2012). Here we report the occurrence of this species in the Brazilian territory for the first time.

Materials and Methods

Data collection

Strumigenys rogeri records were obtained from ant specimens deposited in the Formicidae Collection of the Cocoa Research Center (C.P.D.C.) (Delabie et al., 2020) at Ilhéus-BA, Brazil, during the last decades. After analyzing all available material for the genus *Strumigenys*, information was obtained from labeled specimens such as location, geographic coordinates, vegetation type, sampling methods, and collection date. Identification confirmation was made using Bolton's key for Neotropical and Nearctic *Strumigenys* (Bolton, 2000) and images available on Antweb.org (last accessed February 2023). We used the study of Wetterer (2012) to check the current distribution of this ant. Looking for possible records posterior to Wetterer's publication, an extensive search was performed in online academic bases, in Antmaps.org (last accessed on February 2023), as well in recent studies on Brazilian ant diversity (Feitosa et al., 2022; Silva et al., 2022).

Results

We examined approximately 5,000 specimens of different species of *Strumigenys* kept in the C.P.D.C. collection collected between 1997 to 2019. Numerous specimens were also collected in 2022 in Ilhéus cocoa plantations, intensively sampled for ants. Most samples were collected using the Winkler method of leaf-litter extraction, except in 2017 when a single specimen was found in a cocoa plantation at Ilhéus using honey/sardine baits.

We recovered data on the occurrence of *S. rogeri* in six locations in southern Bahia, Brazil (Table 1). All the specimens were found in remnants, secondary growths, or agroforests within the Atlantic Brazilian rainforest biome.

Table 1. Records of *Strumigenys rogeri* for Brazil with their respective geographic coordinates and type of vegetation.

State	County	Coordinate	Vegetation type
Bahia	Aritaguá	-14.6608 -39.0758	Atlantic Forest
Bahia	Igrapiúna	-13.8197 -39.1752	Atlantic Forest
Bahia	Ilhéus	-14.5005 -39.0411	Atlantic Forest
Bahia	Ilhéus	-14.7761 -39.2288	Cocoa plantation
Bahia	Itacaré	-14.3178 -39.0719	Atlantic Forest
Bahia	Salvador	-12.8912 -38.4805	Urban Fragment

Samples from Ilhéus were collected at two forest locations under the influence of the Atlantic coast. In Aritaguá, the ant was found in an area of riparian forest on the banks of the Almada River, 1.2 km from the Atlantic Ocean, and 'Ponta do Ramo' was collected in a "restinga" forest (forest growing on coastal sandy soils) at a similar distance from the seashore.

The ant was found in a sample taken from the grounds of the "Michelin Ecological Reserve", a private conservation area with 3,064 ha, located at Igrapiúna. Despite being currently a conservation area, this site suffered from a high level of anthropization in several parts, with rubber and cocoa plantations interposed with forest remnants.

The ants found at Itacaré were collected in a cocoa plantation on the banks of the river 'Rio de Contas' which is close to the state reserve 'Parque Estadual da Serra do Conduru', a large park that houses a high biodiversity (Thomas et al., 1998). The cocoa plantations of the experimental area of the Cocoa Research Center were the locations where the ant was most frequently sampled since it was found five times from 2000 to 2022.

Some specimens were collected in a small urban forest fragment of 950 m² in the metropolitan region of Salvador, Bahia, Brazil, during a study of ant diversity in urban green fragments (Melo et al., 2022).

Strumigenys rogeri Emery, 1890 (Figs 1-2)

Junior synonyms

Strumigenys incisa Godfrey, 1907 (synonymized by Donisthorpe 1915)

Strumigenys sulfurea Santschi, 1915 (synonymized by Brown 1954)

Material Examined and Current known distribution (only continental South America)

BRAZIL, BA, Igrapiúna: Reserva Ecológica da Michelin, CPDC 5704, sampling method: Winkler, v.ix.2012, ant collector: Varjão, S.L.S. 4 Workers. cocoa Winkler 6, CPDC 5747, Winkler, date: 22-26.vii. and 08-14.ix.2013, Leg: Benati, K. et al. 2 Workers; **BRAZIL**, BA, Ilhéus: Ponta do Ramo, -14.5975 -39.0556, sampling method: Winkler, 11.ii.1997, ant collector: Santos, J.R.M. 5 workers. Aritaguá, -14.6608 -39.0758, sampling method: Winkler, 05.x.1998, ant collector: Carmo, J.C.S; Santos, J.R.M. 2 workers. CEPEC/CEPLAC, Quadra G, sampling method: Winkler: data: 08.x.2000. Santos, J.R.M. 1 Worker, -14.7586 -39.2325, sampling method: Winkler, vi.2013, ant collector: Junior, J.G.A. et al., 2013. 14 workers, 2 Queens. CPDC 5824, sampling method: honey and sardine bait, date: viii.x.2017, ant collector: Carvalho, E.; Queiroz Jr, J.E. 3 Workers. -14.7763 -39.2305, sampling method: Winkler, date: iv-x.2019, ant collector: Santos-Neto, E.A. et al. 11 workers, -14.7811 -39.2305, sampling method: Manual Search, date: ii-viii.2022, ant collector: Santos-Neto,

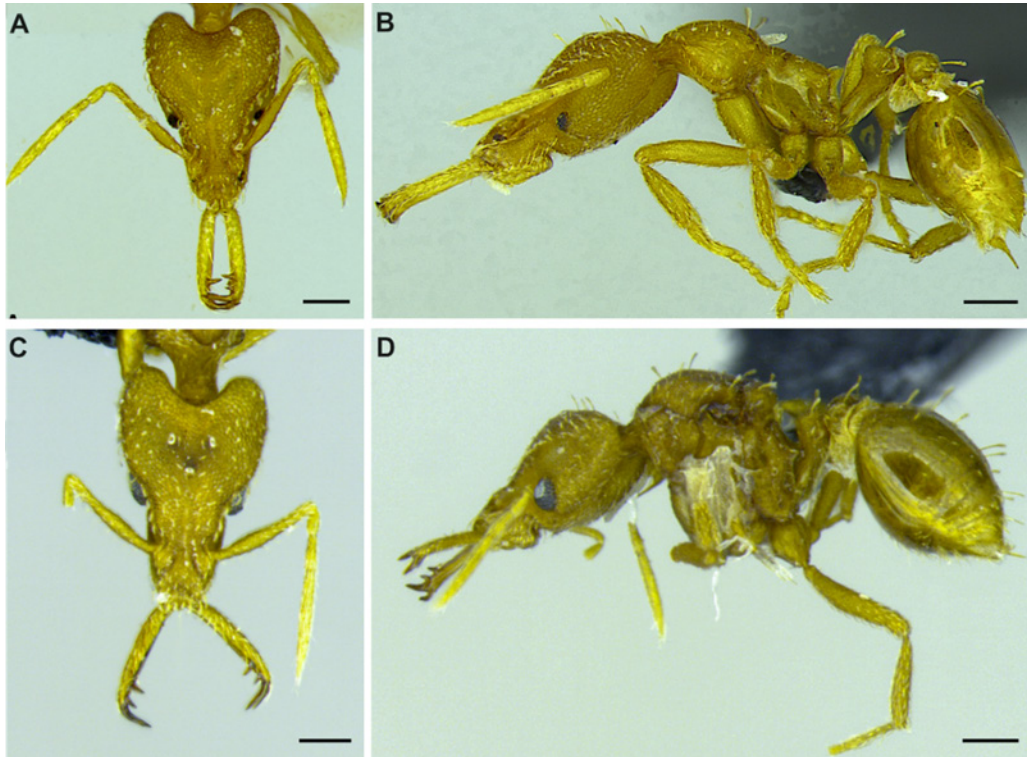


Fig 1. *Strumigenys rogeri* sampled in an experimental area of the Cocoa Research Center, Ilhéus, Bahia, Brazil. Worker: head in full-face view (A), lateral view (B). Gyne: head in full-face view (C), lateral view (D). Scale bars are 0.2 mm in all images.

E.A.; Bomfim, L.S. 4 workers; **BRAZIL**, BA, Itacaré: -14.3177 -39.0719, cocoa plantation, sampling method: Winkler, CPDC 5651, Winkler, date: 21.iii.2010, ant collector: J.R.M., J.C., J.A. 3 Workers; **BRAZIL**, BA, Salvador. CPDC 5703, sampling method: Winkler, date: viii-x.2012, ant collector: Melo, T.S. 1 Worker. **COLOMBIA**: Aguas Claras AC, 4.8897 -75.9323, 940 m; Alejandria AL, 4.8329 -75.88, 900-940 m; Colindres CO, 3.2738 -76.4919, 975 m; El medio MD,

4.3371 -76.0833, 950 m; San Julián SJ, -3.1107 -76.4919, 950 m (Chacón de Ulloa et al., 2012), sampling method, date, ant collector: not informed. **ECUADOR**, 1975 (S. & J. Peck, M.C.Z.): Santo Domingo (Wetterer, 2012), sampling method, date, ant collector: not informed; **GUYANA**, 1935 (N.A. Weber, M.C.Z.): Rio Mazaruni Forest Settlement (Wetterer, 2012), sampling method, date, ant collector: not informed (Fig 3).



Fig 2. Worker of *Strumigenys rogeri* foraging in an experimental cocoa plantation, Cocoa Research Center, Ilhéus, Bahia, Brazil. Picture by Esperidião Alves dos Santos-Neto.



Fig 3. Known distribution of *Strumigenys rogeri* in South America, including the new records from the state of Bahia, Brazil.

Discussion

Exotic ants have been collected in Brazil for a long time, mainly in urban environments (Santos et al., 2016). For example, *Strumigenys emmae* Emery, 1890, *Monomorium floricola* Jerdon, 1851, *Tetramorium simillimum* Smith, 1851, *Tetramorium bicarinatum* Nylander, 1846, *Tetramorium lucayanum* Wheeler, 1905, *Pheidole megacephala* Fabricius, 1793, *Cardiocondyla emeryi* Forel, 1881, *Cardiocondyla obscurior* Wheeler, 1929, are some of the species already known for the State of Bahia (Delabie, 1993). Most exotic ant species cannot colonize natural environments, restricted to urban areas or natural environments that have suffered strong human impacts. A notable exception is *Monomorium floricola* which seems established everywhere in Bahia forests and agroforests (Conceição et al., 2015). However, Longino (1997) mentioned that *S. rogeri* was found only in Costa Rican mature tropical forests. Interestingly, in Bahia, the ant was found in secondary forests and in areas of cocoa agrosystems shaded by *Eritryna* legume trees, where it seems to be relatively easy to find (Santos-Neto personal observation). It is worth noting that in this kind of cocoa plantation, the ant diversity is like that of native forest areas of the same region (Delabie et al., 2007).

Many specimens of *S. rogeri* may be accumulated in entomological collections throughout Brazil or reported with an equivocate identification, as discussed by Wetterer (2012), since the taxonomy of the genus is rather delicate. It is the case, for example, in Melo et al. (2022), where the species was published under the name *Strumigenys precava* Brown,

1954, with which it often seems confused. The data collection presented here shows that *S. rogeri* is much more frequent than *S. emmae*, another exotic species of the same genus already found at Bahia (Delabie, 1993). To date, we know only three records of the latter.

Clouser (1999) mentions *Strumigenys rogeri* as an aggressive invader occupying the same habitat as other species of the genus, such as *Strumigenys louisianae*. However, since this information is only corroborated by the high density of individuals of this species, this characteristic alone is not enough to qualify the ant as aggressive. High densities in populations of this species have also been observed by Deyrup and Trager (1984) at Archbold Biological Station in Florida. Still, until now, there has been no study on the relationships of this ant with native species. Currently, it is impossible to affirm whether *S. rogeri* negatively or positively affects other species or exerts some other type of influence on the local fauna. Another interesting point that needs to be mentioned is if the *S. rogeri* population living in Brazil can reproduce by thelytokous parthenogenesis (production of diploid female offspring by unmated females), such as in the Taiwanese population (Lee et al., 2018). We believe that studies in this direction could help elucidate these issues in the Brazilian Atlantic Forest and other locations where this invasive ant occurrence is verified.

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Authors' Contribution

E.A.S-N: Conceptualization, Data curation, Investigation, Writing-original draft, Writing-review & editing;
E.B.A.K: Writing-original draft, Writing-review & editing;
A.A: Writing-original draft, Writing-review & editing;
J.H.C.D: Conceptualization, Supervision, Validation, Writing-original draft, Writing-review & editing. All the authors approved the final version of the manuscript.

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