

## News on the enigmatic ant genus *Anillidris* (Hymenoptera: Formicidae: Dolichoderinae: Leptomyrmecini)

Fernando Augusto SCHMIDT, Rodrigo Machado FEITOSA, Francisko DE MORAES REZENDE & Rodrigo SILVA DE JESUS



### Abstract

We collected 17 worker ants of *Anillidris bruchi* SANTSCHI, 1936 in a semideciduous rainforest remnant in Viçosa, Minas Gerais, southeastern Brazil, using a hypogaecic pitfall trap placed at a depth of 50 cm below the soil surface. We also report on the presence of a gyne from Cotia, São Paulo state, deposited at the Museu de Zoologia da Universidade de São Paulo, Brazil. Additionally, we present the first high-resolution images of the worker, male and female of *A. bruchi*. This inconspicuous species was previously known only from a few specimens collected in the 1930s in localities from southern Brazil, northern Argentina and a possible record from 1981 in western Paraguay. Regardless of the uncertain Paraguayan record, all known sampling localities have a common phytogeographic origin, sharing similar climatic and environmental characteristics. It has long been thought that *A. bruchi* was a rare species with a restricted distribution; however, the new record reported here suggests that this could be an artifact of sampling insufficiency related to the subterranean life style of this species. The present finding of *A. bruchi* reaffirms that the subterranean ant fauna is a promising frontier for studies on ant biodiversity with opportunities for new myrmecological discoveries.

**Key words:** Brazil, hypogaecic pitfall trap, subterranean ants, seasonal semideciduous rainforests.

Myrmecol. News 19: 25-30 (online 29 May 2013)  
ISSN 1994-4136 (print), ISSN 1997-3500 (online)

Received 5 November 2012; revision received 18 April 2013; accepted 22 April 2013  
Subject Editor: John S. LaPolla

*Fernando Augusto Schmidt (contact author), Department of General Biology, Federal University of Viçosa, Viçosa, MG, 36570-000, Brazil; Ecology Section, Biology Department, Federal University of Lavras, Lavras, MG, 37200-000, Brazil. E-mail: schmidt.fa@gmail.com*

*Francisko de Moraes Rezende & Rodrigo Silva de Jesus, Department of General Biology, Federal University of Viçosa, Viçosa, MG, 36570-000, Brazil. E-mail: francisko.rezende@gmail.com; rsj1037@gmail.com*

*Rodrigo Machado Feitosa, Departamento de Zoologia, Universidade Federal do Paraná, Caixa Postal 19020, 81531-980, Centro Politécnico, Curitiba, PR, Brazil. E-mail: rsmfeitosa@gmail.com*

### Introduction

*Anillidris* SANTSCHI, 1936 is a monotypic dolichoderine ant genus known from a single Neotropical species, *A. bruchi* SANTSCHI, 1936, whose known geographical distribution is based on specimens from Loreto, province of Misiones, northeastern Argentina (SANTSCHI 1936, 1937, KUSNEZOV 1953) and Seara, state of Santa Catarina, southern Brazil (BORGMEIER 1937). Additionally, FOWLER (1980) reported a collection of *Anillidris bruchi* (as *Linepithema bruchi*) from km 30 of the Ruta Trans-Chaco, western Paraguay. While WILD (2007) lists this record in his catalogue of the ants of Paraguay, Fowler's vouchers were lost in a shipping accident impairing the verification of this record (A. Wild, pers. comm.). These scarce records suggest that the occurrence of *A. bruchi* is associated to subtropical humid forests in the Neotropics (KUSNEZOV 1953).

SANTSCHI (1936, 1937) reported that A. Ogloblin collected workers, males and gynes under a rock. At the same period BORGMEIER (1937) received, from F. Plaumann, workers and gynes also found under a rock. These findings have indicated a subterranean life style for *Anillidris bruchi* (see SHATTUCK 1992).

SANTSCHI (1937) considered that the differences in body size between *Anillidris bruchi* gynes and workers are similar to that found in parasitic ants (large gynes and tiny workers) and suggested an analogue of lestopibiotic behavior for *A. bruchi*. This author supposed that *A. bruchi* could establish its colony near the nest of a host ant and the workers would construct thin galleries toward the neighbour host nest, taking immature ants and foraged items as a food source. They could also escape the attack of host ants coming back to their galleries, which might be too thin for the host ants to pass through.

In this paper we present the first records of *Anillidris bruchi* from southeastern Brazil, based on workers recently collected in Viçosa, Minas Gerais, and specimens deposited in the myrmecological collection of the Museu de Zoologia da Universidade de São Paulo.

### Material and Methods

Workers of *Anillidris bruchi* were collected on 13.IV.2012 by the authors F.A. Schmidt, F.M. Rezende, and R.S. Jesus, using a hypogaecic pitfall trap (SCHMIDT & SOLAR 2010) in



Fig. 1: Worker of *Anillidris bruchi* from Viçosa, Minas Gerais state, southeastern Brazil. A: head in full-face view, B: body in dorsal view, C: body in profile.

a semideciduous rainforest remnant (20° 47' 54.4" S, 42° 50' 53.2" W) in Viçosa, Minas Gerais, southeastern Brazil. This remnant is locally known as "Mata do Seu Nico" and is on a cattle farm and surrounded by a large extension of pasture.

The sample belongs to a broad sampling project used to investigate patterns of ant diversity along a vertical gradient. In this study, we installed pitfall traps at several depth strata including below-ground, soil surface, tree trunks and canopies.

Along the 20 sampling points established in this study, we installed four pitfall traps for each stratum. The hypogaeic pitfall traps were placed at every 10 cm, encompassing five sampling depths (from -10 to -50 cm), resulting in 16 pitfall traps for each sampling depth, to a total of 80 hypogaeic pitfall traps.

After sampling *Anillidris bruchi* at Viçosa, we checked for further records of the species in the Neotropical region in addition to those previously reported in the literature (SANTOSCHI 1936, 1937, BORGMEIER 1937, KUSNEZOV 1953). We found specimens of *A. bruchi* deposited in the myrmecological collection of the Museu de Zoologia da Universidade de São Paulo (MZSP), Brazil, which holds the most representative ant collection for the Neotropical region, including the cotypes and Santa Catarina specimens (BORGMEIER 1937) of *A. bruchi*.

## Results

We collected 17 workers of *Anillidris bruchi* (Fig. 1) in only one of the 80 hypogaeic (below-ground) pitfall traps installed at Viçosa. The hypogaeic pitfall trap where the workers were found was at depth of 50 cm. No other ant

species was found in this trap. Moreover, we did not encounter *A. bruchi* specimens in pitfall traps placed at soil surface level or along the tree trunks or in the canopy.

Besides finding *Anillidris bruchi* in Minas Gerais, we observed that in addition to the Santa Catarina specimens (Figs. 2 - 3) there is a gyne in the MZSP collected from Cotia, São Paulo state, also in southeastern Brazil (28.VIII. 1961, Rabello col., unpubl.) (Fig. 4). These specimens of *A. bruchi* from São Paulo and Minas Gerais states are the first records of this ant in southeastern Brazil and extend its geographic distribution by some 1,500 - 2,000 km north-east (Fig. 4).

An examination of all available specimens of *Anillidris bruchi*, including gynes and males, reveals no significant morphological variation. Males from Santa Catarina are slightly smaller than the Argentine ones but are otherwise similar. Gynes from all localities are virtually identical.

Dr. Alex Wild kindly warned us about a problem with Kusnezov's 1953 record of *Anillidris* from Loreto, Argentina. According to Dr. Wild this record appears to be based on a misidentification of a male ant which probably belongs to the *Linepithema iniquum* or *L. neotropicum* group. This specimen is imaged at ANTWEB (2012) and an examination of these images clearly shows that this male is considerably different from the *Anillidris* male described by SHATTUCK (1992) as well as the male imaged in the present paper.

## Discussion

Our finding of *Anillidris bruchi* workers at a depth of 50 cm in the soil corroborates the previous hypothesis about its subterranean life style (SHATTUCK 1992). Additionally,



Fig. 2: Gyne of *Anillidris bruchi* from Seara, Santa Catarina state, southern Brazil. A: head in full-face view, B: body in dorsal view, C: body in profile.

*A. bruchi* fits the characteristics described by ANDERSEN & BRAULT (2010) for subterranean specialist ants, such as cryptobiotic morphology (small body size, short legs, and tiny or absent eyes) (Fig. 1), abundance disproportionately higher in subterranean samples compared with records from conventional (above-ground) sampling techniques, and occurrence mainly at depths below 5 cm.

Contrary to previous collections of *Anillidris bruchi*, we only obtained worker specimens in our pitfall trap. We understand that the differences between our samples and

the previous ones could be associated with the foraging habits of *A. bruchi* workers. The previous samplings of alate and workers found under rocks reported by BORGMEIER (1937) and SANTSCHI (1937) could indicate that the colonies of *A. bruchi* are established at upper soil layers, with foraging trails that extend to deeper soil layers. This could explain why we found only foragers but not alates.

The fact that we obtained *Anillidris bruchi* specimens in only one of the 80 pitfall traps suggests that this ant has a restricted distribution in the areas where it occurs. If the



Fig. 3: Male of *Anillidris bruchi* from Seara, Santa Catarina state, southern Brazil. A: head in full-face view, B: body in dorsal view, C: body in profile.

lestobiotic behavior proposed for *A. bruchi* holds true (SANTOSCHI 1937), its restricted distribution might be associated with the distribution of its still unknown host.

The discovery of *Anillidris bruchi* in southeastern Brazil may mean that its geographical distribution is broader than previously thought (SHATTUCK 1992) (Fig. 4). The environment of all sampling localities (previous and current), except the uncertain record in Paraguay, is essentially seasonal semideciduous rainforest occurring from 100 to 750 m of altitude (OLIVEIRA-FILHO & RATTER 1995).

Seasonal semideciduous rainforest habitats make up the Paranaense phytogeographic province, which includes northeastern Argentina, southeastern Brazil and eastern Paraguay (MORRONE 2001). The fact that all the collections of

*Anillidris bruchi* are associated with the Paranaense province (Fig. 4) suggests that this ant, regardless of its sampling rareness, could have a broad geographical distribution in the Neotropical region, and could occur throughout the seasonal semideciduous rainforest habitats of this phytogeographic area.

Thus, we considered that our finding of *Anillidris bruchi* in southeastern Brazil, around 1,500 to 2,000 km to the north east of previous sampling localities should not be unexpected, due to the similar habitats among the sampling sites (previous and current), which share a common biogeographical origin and similar climatic and environmental characteristics (MORRONE 2001). This is yet another example of a rarely collected ant whose distribution seems to follow the limits of the Paranaense province, as is the case

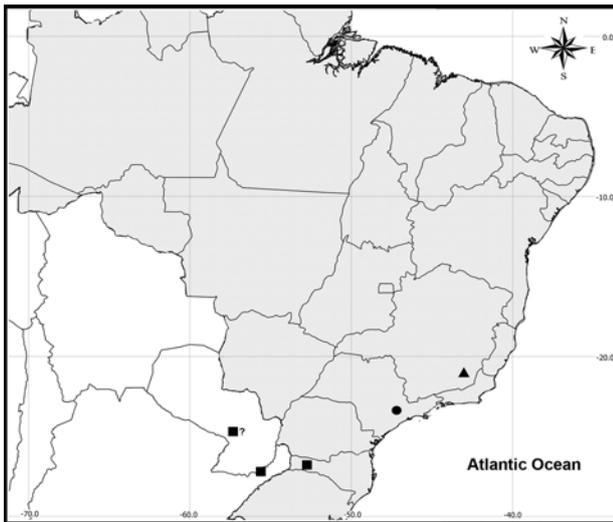


Fig. 4: Distribution of *Anillidris bruchi*. Squares = previous sampling: province of Misiones in northeastern Argentina (SANTSCHI 1936, 1937), Santa Catarina state, Brazil (BORGMEIER 1937) and Pte. Hayes in western Paraguay (FOWLER 1981) (? = unconfirmed identification). Circle = unpublished record (MZSP ant collection), São Paulo state, southeastern Brazil. Triangle = present record at Viçosa, Minas Gerais state, Brazil.

for the distantly related *Phalacromyrmex* KEMPF, 1960 (Myrmicinae) (KEMPF 1972).

The vague locality information available for the putative Paraguayan record impairs a precise description of the environment for this collection. However, this general region of Paraguay presents a mix of gallery forest, wet palm savannas and pastures (A. Wild, pers. comm.), which suggests that the specimens could have been collected in a forest environment, as is the case for the other known specimens of *Anillidris bruchi*.

The fact that the Minas Gerais specimens of *Anillidris bruchi* were sampled almost 80 years after the previous records of the species emphasizes the difficulty in sampling subterranean ant species. Recent efforts have been made to improve the representativeness of this hidden ant fauna (e.g., ANDERSEN & BRAULT 2010, SCHMIDT & SOLAR 2010, PACHECO & VASCONCELOS 2012) and have revealed some amazing findings, such as the rediscovery of the putatively extinct ant species *Simopelta minima* (BRANDÃO, 1989) (BRANDÃO & al. 2008).

BRANDÃO & al. (2008) discuss that, for ant species, sampling rareness does not necessarily mean biological rareness. A biologically rare ant species should present small population size, geographically restricted distribution, aggregated populations, and high habitat specificity.

*Anillidris bruchi* probably fulfills these criteria with regards to biological rareness. However, the time span between the record in Minas Gerais and the previous ones indicates that part of the apparent rareness of *A. bruchi* could be an artifact of sampling insufficiency related to its subterranean life style. We hope that this publication encourages further examination and revision of this interesting ant genus.

Therefore, the present findings of *Anillidris bruchi* in southeastern Brazil together with other recent records of

apparently cryptic ants (WILKIE & al. 2007, BRANDÃO & al. 2008, RABELING & al. 2008) strongly suggest that the lack of biological information on subterranean ant species is clearly a result of the scarcity of adequate sampling techniques. We suggest that systematic efforts for the improvement of subterranean ant sampling might provide interesting opportunities for new myrmecological discoveries, such as new biological and biogeographical data, the discovery and description of new species, and new evidence for inferring biological rarity of ant species.

#### Acknowledgements

This study was only possible with the contribution of many colleagues. We are indebted to M. Merinha, M. Madureira and A. Maradini for assistance in field work, R. Solar for his driving services and *Anillidris bruchi* identification. J. Chaul and A. Wild helped in the confirmation of *A. bruchi* identification. Our thanks also go to the Freitas family, owners of the farm where we developed our ant sampling. R. Kawada and L.P. Prado (MZSP) kindly helped in the preparation of the *Anillidris* images and R. Ferreira kindly translated Santschi's papers. We are most grateful for the critical reading of previous versions of the manuscript provided by G. Camacho, P. Ramirez, S. Shattuck, A. Wild, J. LaPolla, F. Steiner, and the two anonymous referees. We thank CAPES, CNPq and FAPEMIG for financial support and grants. We acknowledge the research grant received from Fundação de Amparo à Pesquisa do Estado de São Paulo to R.M. Feitosa (no. 11 / 24160 – 1).

#### References

- ANDERSEN, A.N. & BRAULT, A. 2010: Exploring a new biodiversity frontier: subterranean ants in northern Australia. – *Biodiversity and Conservation* 19: 2741-2750.
- ANTWEB 2012: Species: *Anillidris bruchi*. – <<http://www.antweb.org>>, retrieved on 21 April 2012.
- BORGMEIER, T. 1937: Formigas novas ou pouco conhecidas da America do Sul e Central, principalmente do Brasil (Hym.: Formicidae). – *Archivos do Instituto de Biologia Vegetal, Rio de Janeiro* 3: 217-255.
- BRANDÃO, C.R.F., FEITOSA, R.M., SCHMIDT, F.A. & DE CASTRO SOLAR, R.R. 2008: Rediscovery of the putatively extinct ant species *Simopelta minima* (BRANDÃO) (Hymenoptera: Formicidae), with a discussion on rarity and conservation status of ant species. – *Revista Brasileira de Entomologia* 52: 480-483.
- FOWLER, H.G. 1980: Nuevos registros de hormigas para el Paraguay (Hymenoptera: Formicidae). – *Neotropica* 26: 183-186.
- KEMPF, W.W. 1972: Catálogo abreviado das formigas da Região Neotropical. – *Studia Entomologica* 15: 1-344.
- KUSNEZOV, N. 1953: Die Ameisenfauna Argentinienens. – *Zoologischer Anzeiger* 150: 15-25.
- MORRONE, J.J. 2001: Biogeografía de América Latina y el Caribe. 1<sup>st</sup> edition. – *Sociedad Entomológica Aragonesa*, Zaragoza, 148 pp.
- OLIVEIRA-FILHO, A.T. & RATTER, J.A. 1995: A study of the origin of central Brazilian forests by the analysis of plant species distribution patterns. – *Edinburgh Journal of Botany* 52: 141-194.
- PACHECO, R. & VASCONCELOS, H.L. 2012: Subterranean pitfall traps: Is it worth including them in your ant sampling protocol? – *Psyche: A Journal of Entomology* 2012: ID 870794.
- RABELING, C., BROWN, J.M. & VERHAAGH, M. 2008: Newly discovered sister lineage sheds light on early ant evolution. – *Pro-*

- ceedings of the National Academy of Sciences of the United States of America 105: 14913-14917.
- SANTSCHI, F. 1936: Fourmis nouvelles ou intéressantes de la République Argentine. – *Revista de Entomologia* 6: 402-421.
- SANTSCHI, F. 1937: Les sexués du genre *Anillidris* SANTSCHI. – *Bulletin de la Société Entomologique de France* 42: 68-70.
- SCHMIDT, F.A. & DE CASTRO SOLAR, R.R. 2010: Hypogaeic pit-fall traps: methodological advances and remarks to improve the sampling of a hidden ant fauna. – *Insectes Sociaux* 57: 261-266.
- SHATTUCK, S.O. 1992: Generic revision of the ant subfamily Dolichoderinae (Hymenoptera: Formicidae). – *Sociobiology* 21: 1-181.
- WILD, A.L. 2007: A catalogue of the ants of Paraguay (Hymenoptera: Formicidae). – *Zootaxa*: 1-55.
- WILKIE, K.T.R., MERTL, A.L. & TRANIELLO, J.F.A. 2007: Biodiversity below ground: probing the subterranean ant fauna of Amazonia. – *Naturwissenschaften* 94: 725-731.