

# Alien spiders: First record of *Loxosceles gaucho* Gertsch, 1967 (Araneae: Sicariidae) in the Amazon region, Brazil

Marlus Queiroz Almeida<sup>1,3</sup>; João Rafael Alves-Oliveira<sup>1,4</sup>; Diego Matheus de Mello Mendes<sup>2,5</sup>; Rafael Sobral<sup>1,6</sup>; Alberto Moreira da Silva-Neto<sup>2,7</sup> & José Wellington de Morais<sup>1,8</sup>

<sup>1</sup> Instituto Nacional de Pesquisas da Amazônia (INPA), Coordenação de Biodiversidade (CBIO), Laboratório de Sistemática e Ecologia de Invertebrados do Solo (LSEIS). Manaus, AM, Brasil.

<sup>2</sup> Instituto Nacional de Pesquisas da Amazônia (INPA), Coordenação de Biodiversidade (CBIO), Laboratório de Entomologia Sistemática, Urbana e Forense (LESUF). Manaus, AM, Brasil.

<sup>3</sup> ORCID: <http://orcid.org/0000-0001-5580-088X>. E-mail: marlusqazoo@gmail.com (corresponding author)

<sup>4</sup> ORCID: <http://orcid.org/0000-0002-2300-8780>. E-mail: jraoliveira.bio@gmail.com

<sup>5</sup> ORCID: <http://orcid.org/0000-0001-5037-9686>. E-mail: diego.mello.mendes@gmail.com

<sup>6</sup> ORCID: <http://orcid.org/0000-0002-4975-1193>. E-mail: rafaelsobralves@gmail.com

<sup>7</sup> ORCID: <http://orcid.org/0000-0002-4522-3756>. E-mail: bio.alberto@gmail.com

<sup>8</sup> ORCID: <http://orcid.org/0000-0003-3801-7054>. E-mail: moraisjw@gmail.com

**Abstract.** We present the first record for *Loxosceles gaucho* Gertsch, 1967 in the Amazonian region of Brazil. Four males, fifteen females and forty-nine immatures were collected in different places in Manaus, Amazonas, Brazil. This is the third species of *Loxosceles* reported in the Amazon region along with *L. amazonica* Gertsch, 1967, and *L. similis* Moenkhaus, 1898. This is the first record of an invasive species of a venomous animal in the state of Amazonas, Brazil, which is noteworthy due to its synanthropic habit, which increases the risk to the local population.

**Key-Words.** Manaus; Aranha marrom; Brown recluse spider; Venomous species.

## INTRODUCTION

*Loxosceles* Heineken & Lowe, 1832 is a cosmopolitan genus of spiders that are commonly known as “violin spiders”, “recluse spiders” or “brown recluse spiders” in North America (Valdez-Mondragón *et al.*, 2018). In Brazil, *Loxosceles* spiders are better known as “aranhas-marrons” (brown spiders, in Portuguese) and are distributed through the whole country (Table 1).

Many species in the genus can cause severe envenoming of humans, which is known as loxoscelism (Swanson & Vetter, 2006). The venom of *Loxosceles* causes an intense inflammatory process around the site of the bite along with vasoconstriction, edema, hemorrhage and focal necrosis, therefore the clinical picture may be cutaneous or cutaneous-visceral (Barbaro & Cardoso, 2003). In Brazil, *Loxosceles intermedia* Mello-Leitão, 1934, *Loxosceles laeta* (Nicolet, 1849) and *Loxosceles gaucho* Gertsch, 1967 are the main species responsible for in-house bites on humans (Cardoso

*et al.*, 2003). There is a single species recorded in Amazonas, Brazil, *Loxosceles amazonica* Gertsch, 1967 (Gertsch, 1967; Almeida *et al.*, 2017).

*Loxosceles gaucho* is an endemic species from south and southwest of Brazil, being its type locality known for São Paulo (Gertsch, 1967). The female of this species is easily identifiable by the presence of a transverse and sclerotized plate firmly holding the seminal receptacles in genitalia of female (Figs. 2B-C), while males are easily identified by having the palpal femur 4 times longer than wide and by the embolus thick at base, forming sinuous curve (Figs. 1B-C) (Gertsch, 1967). The distribution of the species is currently known only for the states of São Paulo, Minas Gerais, Rio Grande do Sul and Paraná (Gertsch, 1967; Fischer, 1994). The purpose of this work is to record for the first time *L. gaucho* in northern Brazil (Amazonas, Manaus), to report a checklist of the known Brazilian species of *Loxosceles* and to present an identification key to the known *Loxosceles* species of Amazonas, Brazil.

Pap. Avulsos Zool., 2019; v.59: e20195953

<http://doi.org/10.11606/1807-0205/2019.59.53>

<http://www.revistas.usp.br/paz>

<http://www.scielo.br/paz>

Edited by: Carlos José Einicker Lamas

Received: 24/04/2019

Accepted: 14/10/2019

Published: 31/10/2019

ISSN On-Line: 1807-0205

ISSN Printed: 0031-1049

ISNI: 0000-0004-0384-1825



**Table 1.** Species of *Loxosceles* recorded for Brazil. Data based exclusively on taxonomic papers included in the World Spider Catalog, version 20.5. 2019.

Species	Distribution
<i>Loxosceles adelaida</i> Gertsch, 1967	<sup>1</sup> Rio de Janeiro and <sup>1</sup> São Paulo
<i>Loxosceles amazonica</i> Gertsch, 1967	<sup>1,3</sup> Amazonas, <sup>2</sup> Pará, <sup>2</sup> Tocantins, <sup>2</sup> Bahia, <sup>2</sup> Ceará, <sup>2</sup> Maranhão, <sup>2</sup> Paraíba, <sup>2</sup> Pernambuco, <sup>2</sup> Piauí, <sup>4</sup> Rio Grande do Norte and <sup>2</sup> Mato Grosso
<i>Loxosceles anomala</i> (Mello-Leitão, 1917)	<sup>8</sup> Minas Gerais
<i>Loxosceles cardosoi</i> Bertani, von Schimonsky & Gallão, 2018	<sup>5</sup> Bahia
<i>Loxosceles carinhanha</i> Bertani, von Schimonsky & Gallão, 2018	<sup>5</sup> Bahia
<i>Loxosceles chapadensis</i> Bertani, Fukushima & Nagahama, 2010	<sup>5</sup> Bahia
<i>Loxosceles ericsoni</i> Bertani, von Schimonsky & Gallão, 2018	<sup>5</sup> Minas Gerais
<i>Loxosceles gaucha</i> Gertsch, 1967	<sup>1</sup> São Paulo, <sup>1,9</sup> Paraná, <sup>1</sup> Rio Grande do Sul and Amazonas*
<i>Loxosceles hirsuta</i> Mello-Leitão, 1931	<sup>6</sup> Paraná and <sup>6</sup> Rio Grande do Sul
<i>Loxosceles immodesta</i> (Mello-Leitão, 1917),	<sup>8</sup> São Paulo
<i>Loxosceles intermedia</i> Mello-Leitão, 1934	<sup>7</sup> São Paulo, <sup>1,7</sup> Rio de Janeiro, <sup>9</sup> Paraná and Distrito Federal
<i>Loxosceles karstica</i> Bertani, von Schimonsky & Gallão, 2018	<sup>5</sup> Bahia and <sup>5</sup> Minas Gerais
<i>Loxosceles laeta</i> (Nicolet, 1849)	<sup>1</sup> Rio Grande do Sul, <sup>1</sup> Santa Catarina, <sup>9</sup> Paraná, <sup>1</sup> São Paulo, <sup>1</sup> Minas Gerais and <sup>10</sup> Rio de Janeiro
<i>Loxosceles muriciensis</i> Fukushima, de Andrade & Bertani, 2017	<sup>4</sup> Alagoas
<i>Loxosceles niedeguidonae</i> Gonçalves-de-Andrade, Bertani, Nagahama & Barbosa, 2012	<sup>11</sup> Piauí
<i>Loxosceles puortoi</i> Martins, Knysak & Bertani, 2002	<sup>12</sup> Tocantins
<i>Loxosceles similis</i> (Moenkhaus 1898),	<sup>1</sup> Pará, <sup>1</sup> São Paulo and <sup>1</sup> Minas Gerais
<i>Loxosceles troglobia</i> Souza & Ferreira, 2018	<sup>13</sup> Bahia
<i>Loxosceles willianilsoni</i> Fukushima, de Andrade & Bertani, 2017	<sup>4</sup> Rio Grande do Norte

<sup>1</sup>Gertsch, 1967; <sup>2</sup>Silveira, 2015; <sup>3</sup>Almeida et al., 2017; <sup>4</sup>Fukushima et al., 2017; <sup>5</sup>Bertani et al., 2018b; <sup>6</sup>Mello-Leitão, 1931; <sup>7</sup>Mello-Leitão, 1934; <sup>8</sup>Mello-Leitão, 1917; <sup>9</sup>Marques-da-Silva & Fischer, 2005; <sup>10</sup>Silveira, 2009; <sup>11</sup>Gonçalves-de-Andrade et al., 2012; <sup>12</sup>Martins et al., 2002; <sup>13</sup>Souza & Ferreira, 2018.

## MATERIAL AND METHODS

The specimens were captured in the period from 2016 to 2018 in two popular farmers market, one located at the central region of the Manaus city, at Manaus Moderna farmers market (03°08'28.20"S, 60°01'19.35"W) and the other at the eastern part of the city, at the Coroado farmers market (03°05'00.37"S, 59°58'49.18"W). The spiders were located in cardboard boxes and in debris next to the farmers market and were manually collected. Egg sacs and immatures were also collected at the Coroado farmers market.

Specimens were deposited in the Invertebrate Zoology Collection at Instituto Nacional de Pesquisas da Amazônia (INPA). Specimen identification was made using Gertsch (1967). The left male palp was illustrated in prolateral view and female spermathecae were illustrated in prolateral and retrolateral view. Digital images were taken using a stereomicroscope Leica M205A equipped with a camera (Leica DMC4500), the illustrations were made in an Adobe Photoshop CC 2017 and the distribution map was created using SimpleMapp (Shorthouse, 2010).

**Material examined (4 ♂ and 15 ♀):** 2 ♂ and 2 ♀, BRAZIL, Amazonas, Manaus, Centro, (03°08'28.20"S, 60°01'19.35"W) 26.viii.2016, M.Q. Almeida leg.; 2 ♂ and 3 ♀, 49 juveniles, BRAZIL, Amazonas, Manaus, Coroado, (03°05'00.37"S, 59°58'49.18"W), 09.vi.2018, M.Q. Almeida leg.; 9 ♀ and 52 specimens prelarva state, BRAZIL, Amazonas, Manaus, Coroado, (3°8'28.20"S, 60°1'19.35"W), 09.vi.2018, M.Q. Almeida leg.; 1 ♀ BRAZIL, Amazonas, Manaus, Coroado, (03°08'28.20"S, 60°01'19.35"W), 09.vi.2018, M.Q. Almeida leg. The specimens will be deposited in the Invertebrate Collection of

the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil.

## RESULTS

A total of 68 specimens of *L. gaucha* were collected, four males (Fig. 1), fifteen females (Figs. 2, 3A) and forty-nine juveniles. Egg sacs were found with 52 specimens in prelarva state (Figs. 3B-E). This is the second record of a *Loxosceles* species to state of Amazonas, Brazil, as previously, only *L. amazonica* was registered. These two species can be distinguishable by the identification key below.

### Key to the *Loxosceles* species in Amazonas state, Brazil (Modified from Gertsch, 1967)

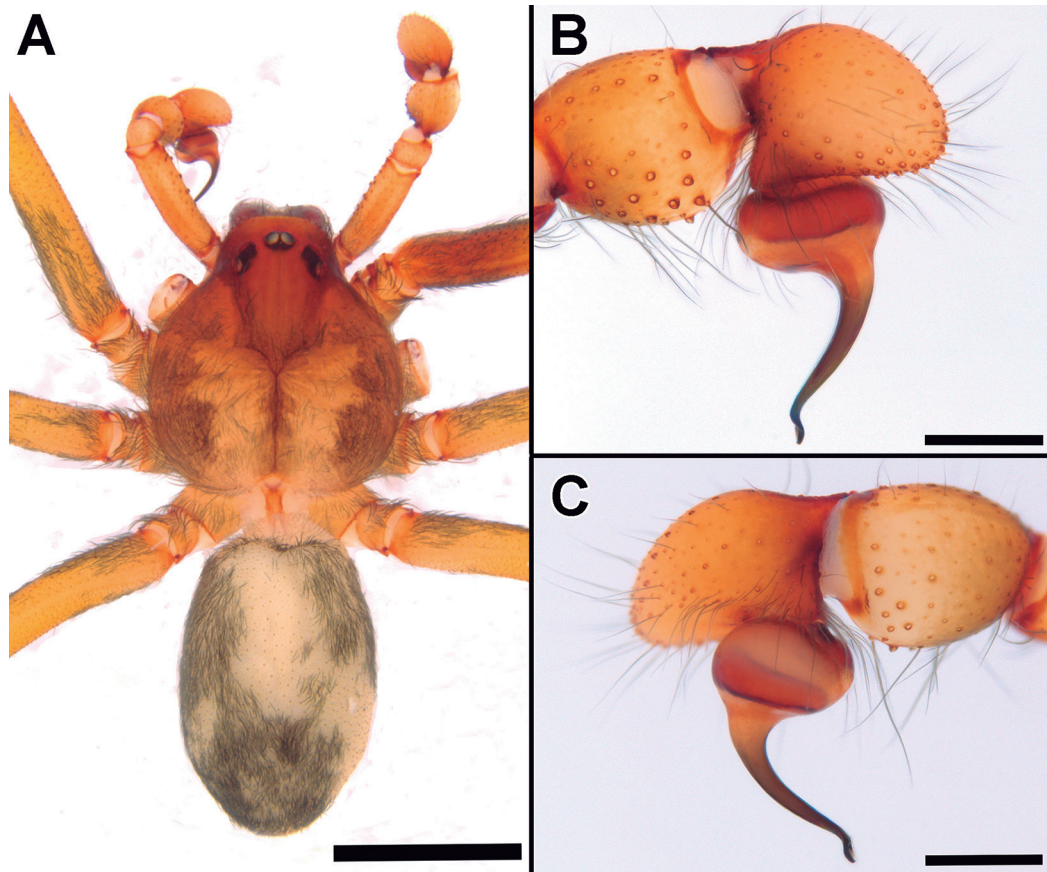
#### Males

- Palpal tarsus as wide as palpal tibia. Apex of embolus forming a sinuous curve (Figs. 1B-C) ..... *Loxosceles gaucha* Gertsch
- Palpal tarsus thinner than palpal tibia. Apex of embolus with a mild curvature (Figs. 4B-C) ..... *Loxosceles amazonica* Gertsch

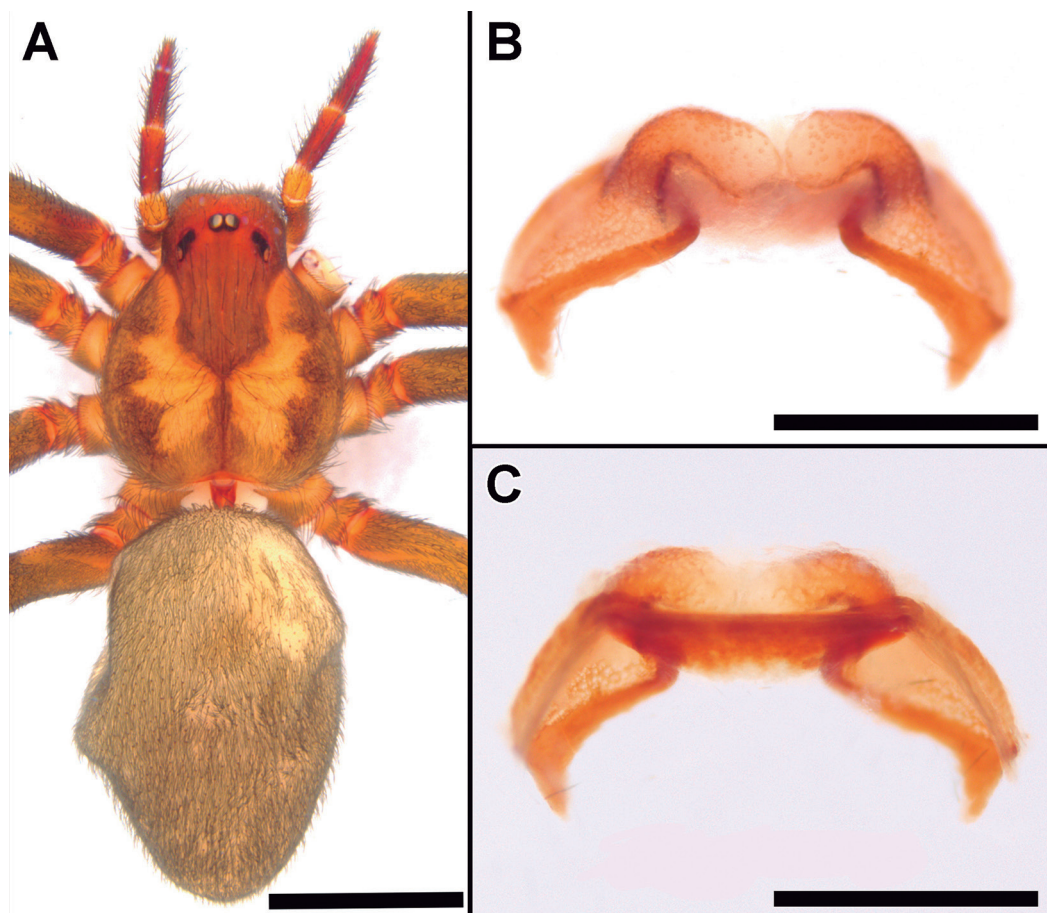
#### Females

- Spermathecae with a transverse and sclerotized plate and absence of globular lobes at apex (Fig. 2C) ..... *Loxosceles gaucha* Gertsch
- Spermathecae lacking a sclerotized plate and presence of a group of small globular lobes at apex (Fig. 4D) .... *Loxosceles amazonica* Gertsch

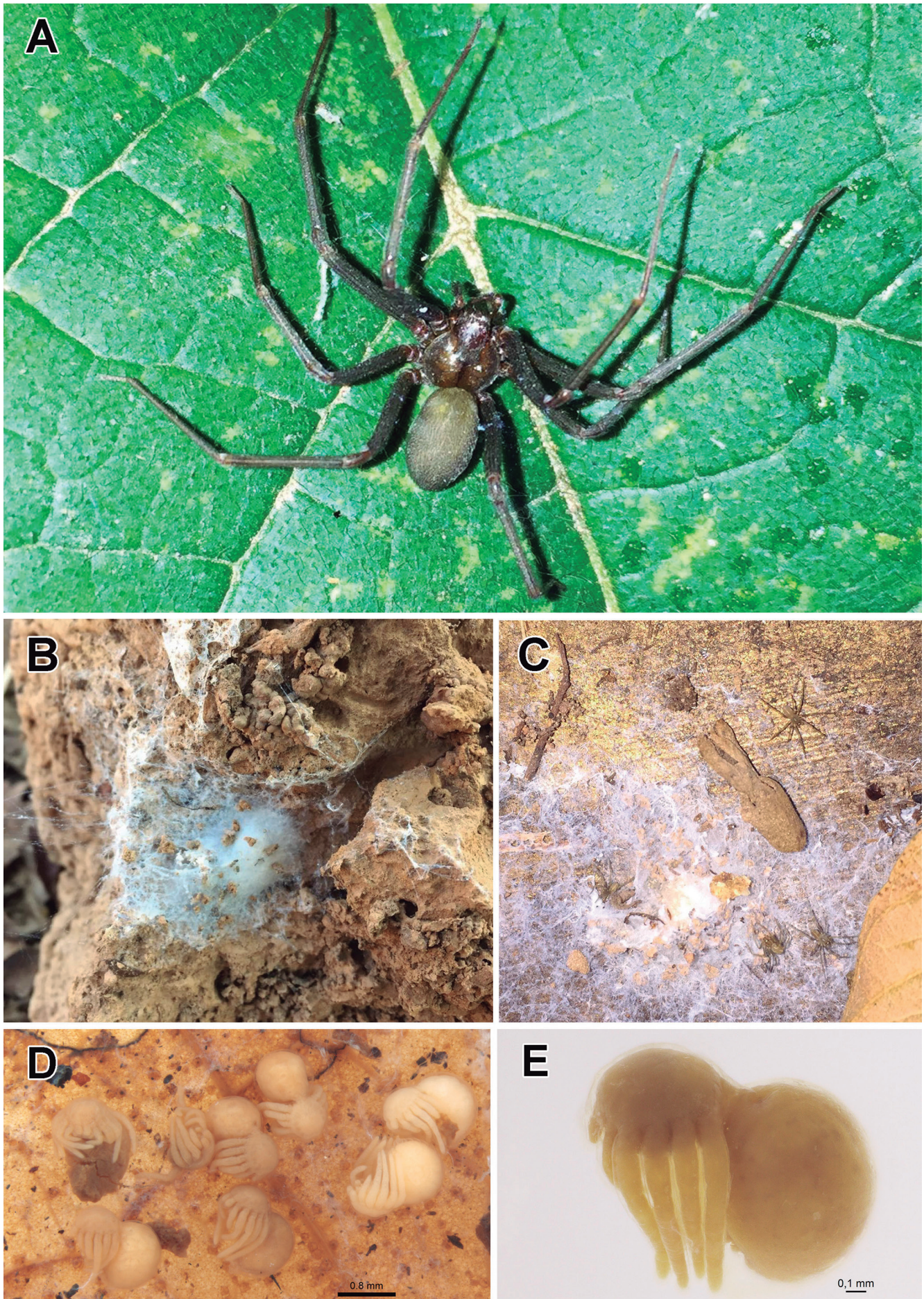
Of the five Brazilian regions, the North and the Central-West have the lesser number of species of *Loxosceles* recorded (3 species in each of these regions)



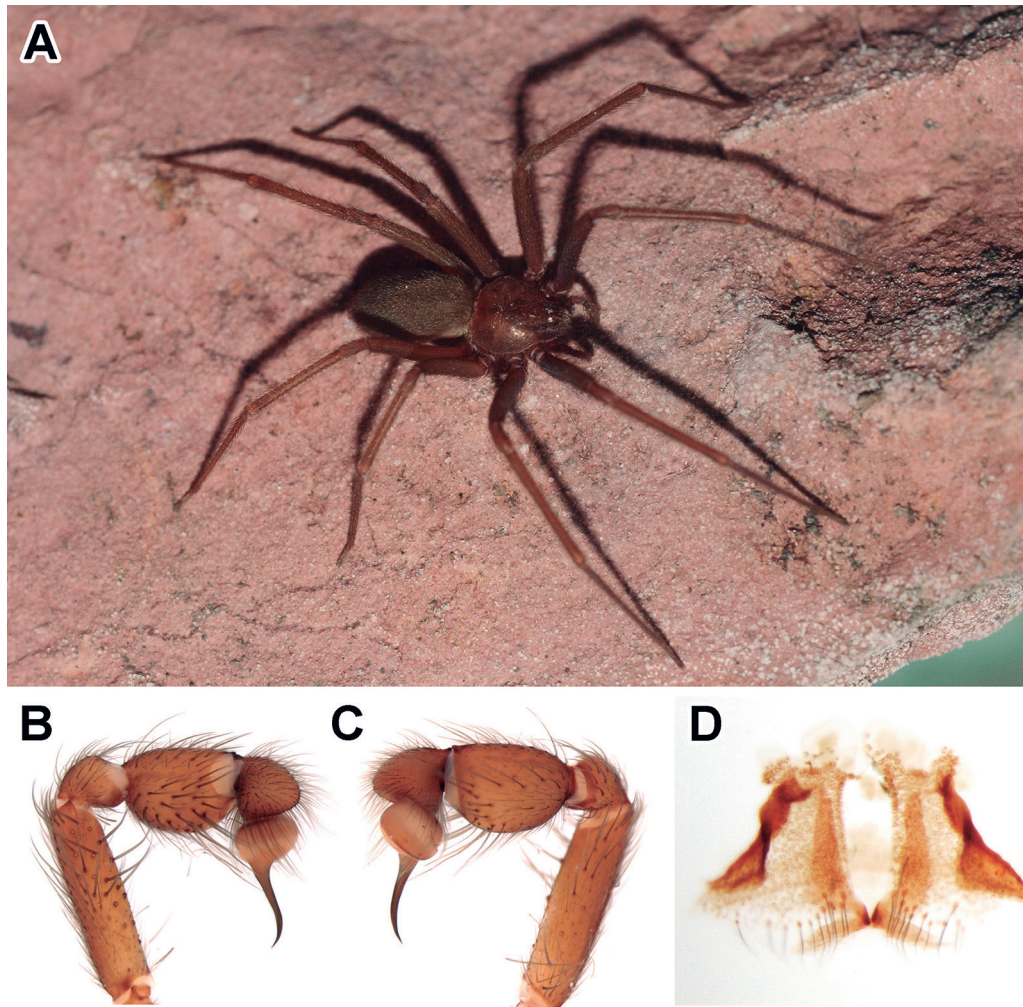
**Figure 1.** *Loxosceles gaucho* (male). (A) habitus; (B) palp, retrolateral view; (C) palp, prolateral view. Scale bars: A, 3 mm; B-C, 2 mm.



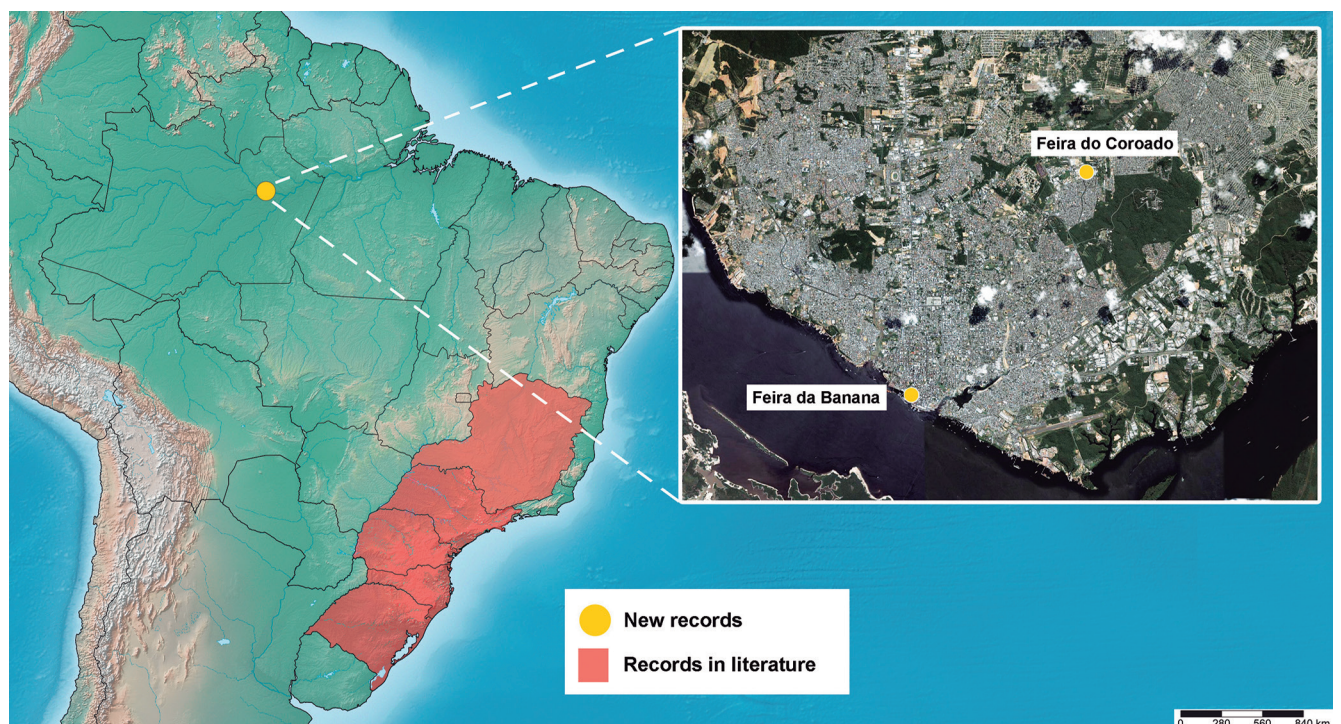
**Figure 2.** *Loxosceles gaucho* (female). (A) habitus; (B) spermathecae, ventral view; (C) epigynum, dorsal view. Scale bars: A, 3 mm; B-C, 2 mm.



**Figure 3.** *Loxosceles gaucha*. (A) (female), live specimen; (B) eggsacs; (C) immatures live specimens; (D) specimens in prelarva state; (E) specimen in prelarva state, detail.



**Figure 4.** *Loxosceles amazonica*. (A) (Female), live specimen. (B) palp, retrolateral view; (C) palp, proximal view. (D) spermathecae, ventral view.



**Figure 5.** Map showing records of *L. gaucho* in Brazil. It is indicated in brown the Brazilian states with records in literature: São Paulo and Minas Gerais (Gertsch, 1967; Cardoso et al., 2003), Paraná and Rio Grande do Sul (Gertsch, 1967; Fischer, 1994). In yellow the new record in the state of Amazonas, Manaus city.

whereas the Northeast has the most species recorded (11 species) (Table 1).

## DISCUSSION

The introduction of non-native species can cause serious risks to local biodiversity and some species has the potential to cause envenomation of humans, such as spiders and scorpions (Mack *et al.*, 2000; Silveira, 2009; Duncan *et al.*, 2010; Bertani *et al.*, 2018a).

Most probably, *L. gaucho* was accidentally introduced in the city of Manaus alongside the trade of fruits, vegetables and other goods from the Southeast region to the North region of the country, since these spiders were collected in farmers' market in the city (Fig. 5). This species seems to be well adapted to the region's climate and already has established populations, since egg sacs were collected (Fig. 3B) and also a large number of immatures were collected in one of the localities (Fig. 3C). Those spiders adapt themselves very well in the urban environment due to its various types of shelters (boxes, holes, debris), high availability of alimentary resources and the scarcity of natural predators.

Duncan *et al.* (2010) reported that a female specimen of *Loxosceles* was identified by Brignoli (1976) as *L. gaucho* in Tunisia, which has somatic and spermathecae morphology indistinguishable from Brazilian *L. gaucho*. The formerly mentioned authors discuss that the Tunisian specimen is a representative of another population of *L. gaucho* that has dispersed across the Atlantic through human trade activities. This idea is supported by the fact that the Tunisian *L. gaucho* was found near Sfax, the major port and commercial hub in the Mediterranean and a likely place to have introduced species. The city of Manaus is also a city with a large portuary activity although fluvial and the introduction of *L. gaucho* in Manaus may have been due to this way.

This is the first record of accidental introduction of a venomous animal in the state of Amazonas (Fig. 5). Finally, we hope than beside alert the Public Health Agencies, this led to the discussion of preventive measures to reduce the potential damage to human health and the necessity of having measures to control the identified focus for this species in Manaus.

## ACKNOWLEDGMENTS

We thank the Invertebrates Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA) for allowing the use of photographic equipment used in this work. M.Q.A. thanks particularly the support for the CNPq for the Ph.D. scholarship (Process: 140081/2019-4). R.S. acknowledges Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM) for the Ph.D. scholarship (Process 002/2016 – POSGRAD 2017). A.M.S.N. thanks particularly the support for the Capes-INPA research grant (Process: 88887.312051/2018-00). D.M.M.M. thanks particularly the support for the CNPq research grant

(Process: 141878/2018-5). We thank the anonymous reviewers greatly contributed to the improvement of the manuscript.

## REFERENCES

- Almeida, M.Q.; Salvatierra, L.; Carvalho, T.G.; Prestes, F.J.; Brescovit, A.D. & Gasnier, T. 2017. Long time not seen: Expanding the records of *Loxosceles amazonica* (Araneae: Sicariidae) in the Amazonas state, Brazil. *Acta Amazonica*, 47(2): 163-166.
- Barbaro, K.C. & Cardoso, J.L.C. 2003. Mecanismo de ação do veneno de *Loxosceles* e aspectos clínicos do loxoscelismo. In: Cardoso, J.L.C.; França, F.O.S.; Wen, F.H.; Santanna Málague, C.M. & Haddad, V. (Eds.). *Animais peçonhentos no Brasil: biologia, clínica e terapêutica dos acidentados*. São Paulo, Sarvier. p. 160-174.
- Bertani, R.; Bonini, R.K.; Toda, M.M.; Isa, L.S.; Figueiredo, J.V.A.; Santos, M.R. & Ferraz, S.C. 2018a. Alien Scorpions in the municipality of São Paulo – evidence of successful establishment of *Tityus stigmurus* (Thorell, 1876) and first records of *Broteocheactas parvulus* Pocock, 1897, and *Jaguajir rochae* (Borelli, 1910). *BioInvasions Records*, 7: 89-94.
- Bertani, R.; von Schimonsky, D.M.; Gallão, J.E. & Bichuette, M.E. 2018b. Four new troglomorphic species of *Loxosceles* Heineken & Lowe, 1832: contributions to the knowledge of recluse spiders from Brazilian caves (Araneae, Sicariidae). *ZooKeys*, 806: 47-72.
- Brignoli, P.M. 1976. Beiträge zur Kenntnis der Scytodidae (Araneae). *Revue suisse Zoologie*, 83: 125-191.
- Cardoso, J.L.C.; França, F.O.S.; Wen, F.H.; Málague, C.M.S. & Haddad Jr, V. 2003. Animais peçonhentos no Brasil: biologia, clínica e terapêutica dos acidentados. *Revista do Instituto de Medicina Tropical de São Paulo*, 45(6): 338-338.
- Duncan, R.P.; Rynerson, M.R.; Ribera, C. & Binford, G. 2010. Diversity of *Loxosceles* spiders in Northwestern Africa and molecular support for cryptic species in the *Loxosceles rufescens* lineage. *Molecular Phylogenetics and Evolution*, 55: 234-248.
- Fischer, M.L. 1994. Levantamento das espécies de *Loxosceles* Heineken & Lowe, 1832 no município de Curitiba, Paraná, Brasil. *Estudos de Biologia*, 3: 63-88.
- Fukushima, C.S.; Andrade, R.M.G. & Bertani, R. 2017. Two new Brazilian species of *Loxosceles* Heineken & Lowe, 1832 with remarks on *amazonica* and *rufescens* groups (Araneae, Sicariidae). *ZooKeys*, 667: 67-94.
- Gertsch, W.J. 1967. The spider genus *Loxosceles* in South America (Araneae, Scytodidae). *Bulletin of the American Museum of Natural History*, 136: 117-174.
- Gonçalves-de-Andrade, R.M.; Bertani, R.; Nagahama, R.H. & Barbosa, M.F.R. 2012. *Loxosceles niedeguidonae* (Araneae, Sicariidae) a new species of brown spider from Brazilian semi-arid region. *ZooKeys*, 175: 27-36.
- Mack, R.N.; Simberloff, D.; Lonsdale, M.W.; Evans, H.; Clout, M. & Bazzaz, F.A. 2000. Biotic invasions: causes, epidemiology, global consequences, and control. *Ecological Applications*, 10: 689-710.
- Marques-da-Silva, E. & Fischer, M.L. 2005. Distribuição das espécies do gênero *Loxosceles* Heineken & Lowe, 1835 (Araneae; Sicariidae) no Estado do Paraná. *Revista da Sociedade Brasileira de Medicina Tropical*, 38(4): 331-335.
- Martins, R.; Knysak, I. & Bertani, R. 2002. A new species of *Loxosceles* of the laeta group from Brazil (Araneae: Sicariidae). *Zootaxa*, 94: 1-6.
- Mello-Leitão, C.F. 1917. Notas arachnológicas. V. Espécies novas ou pouco conhecidas do Brasil. *Brotéria (Serie Zoológica)*, 15: 74-102.
- Mello-Leitão, C.F. 1931. Arachnideos do Rio Grande do Sul. *Boletim Biológico*, São Paulo, 17: 10-14.

- Mello-Leitão, C.F. 1934. Espécies brasileiras do genero *Loxosceles* Lowe. *Anais da Academia Brasileira de Ciências*, 6: 69-73.
- Shorthouse, D.P. 2010. SimpleMapp, an online tool to produce publication-quality point maps. Available at: <http://nolinoideae.e-monocot.org/node/6>. Access in: 29/03/2019.
- Silveira, A.L. 2009. First synanthropic record of *Loxosceles laeta* (Nicolet, 1849) (Araneae, Sicariidae) in the municipality of Rio de Janeiro State of Rio de Janeiro. *Revista da Sociedade Brasileira de Medicina Tropical*, 42(6): 723-726.
- Silveira, A.L. 2015. New geographic records of the brown spider *Loxosceles amazonica* Gertsch, 1967 (Araneae: Sicariidae) in Northeastern Brazil and its medical importance. *Revista Médica de Minas Gerais*, 25(1): 37-45.
- Souza, F.V.R. & Ferreira, R.L. 2018. A new highly troglomorphic *Loxosceles* (Araneae: Sicariidae) from Brazil. *Zootaxa*, 4438(3): 575-587.
- Swanson, D.L. & Vetter, R.S. 2006. Loxoscelism. *Clinics in Dermatology*, 24(3): 213-221.
- The world spider catalog, version 20.5. 2019. American Museum of Natural History (<http://research.amnh.org/entomology/spiders/catalog/index.html>). Access in: 26/09/2019.
- Valdez-Mondragón, A.; Cortez-Roldán, M.R.; Juárez-Sánchez, A.R. & Solís-Catalán, K.P. 2018. A new species of *Loxosceles* Heineken & Lowe (Araneae, Sicariidae), with updated distribution records and biogeographical comments for the species from Mexico, including a new record of *Loxosceles rufescens* (Dufour). *ZooKeys*, 802: 39-66.