Brief Communication / Comunicación Breve

Presence of *Rhodnius neglectus* Lent, 1954 (Hemiptera: Reduviidae: Triatominae) in Araraquara, São Paulo, Brazil: signals the importance of surveillance for the municipality

Presencia de *Rhodnius neglectus* Lent, 1954 (Hemiptera: Reduviidae: Triatominae) en Araraquara, São Paulo, Brasil: señal de la importancia de la vigilancia para el municipio

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Abstract. Several publications have reported the occurrence of triatomines in urban areas of the Americas. Four species of triatomines are reported in the municipality of Araraquara, São Paulo, Brazil: *Panstrongylus megistus*, *Rhodnius neglectus*, *Triatoma infestans*, and *T. sordida*. Although already notified to the municipality, we present the record of household invasion by *R. neglectus* in urban area in the Araraquara. This occurrence reinforces the concern over urbanization by *R. neglectus* in the state of São Paulo, with reports of colonization and home invasion in various municipalities.

Key words: Chagas disease; invasion; kissing bugs; vectors; urban areas.

Resumen. Varias publicaciones han reportado la presencia de triatominos en áreas urbanas de las Américas. Cuatro especies de triatominos se reportan en el municipio de Araraquara, São Paulo, Brasil: *Panstrongylus megistus*, *Rhodnius neglectus*, *Triatoma infestans* y *T. sordida*. Aunque ya se notificado a la municipalidad, presentamos el registro de invasión domiciliaria por parte de *R. neglectus* en el área urbana de Araraquara. Este hecho refuerza la preocupación por la urbanización de *R. neglectus* en el estado de São Paulo, con relatos de colonización e invasión de viviendas en diversos municipios.

Palabras clave: Enfermedad de Chagas; chinches besuconas; invasión; vectores; áreas urbanas.

Triatominae is a subfamily that currently encompasses 159 species of hematophagous bugs (Alevi *et al*. 2021; Galvão 2021; Oliveira-Correia *et al*. 2024). The species grouped in this subfamily are of epidemiological importance, as they are vectors of *Trypanosoma cruzi* (Chagas, 1909) (Kinetoplastida: Trypanosomatidae), the etiological agent of Chagas disease, affecting humans and other animals (Vallejo *et al*. 2009).

In the last 30 years, approximately 40 publications have reported the occurrence of triatomines in urban areas of the Americas, including intradomiciliary invasions, with Brazil holding the highest number of such publications (Carbajal-de-la-Fuente *et al*.

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2022). The reported species are mostly grouped in the genera *Pastrongylus* Berg, 1879, *Rhodnius* Stål, 1859 and *Triatoma* Laporte, 1832, in addition to occasional reports for the genera *Eratyrus* Stål, 1859 and *Cavernicola* Barber, 1937 (Morocoima *et al*. 2010; Brito *et al*. 2017; Carbajal-de-la-Fuente *et al*. 2022).

In December 2022, a resident of the Parque das Hortências neighborhood (21°48'30"S, 48°07'57"W), in the municipality of Araraquara, São Paulo, Brazil (Fig. 1), collected and reported to the municipal Epidemiological Surveillance the presence of a possible triatomine bug inside her house. The municipal Epidemiological Surveillance forwarded the specimen to the Parasitology Laboratory of the School of Pharmaceutical Sciences/ Unesp, Araraquara, São Paulo, Brazil, where analysis was conducted for possible infection by trypanosomatids and taxonomic identification.

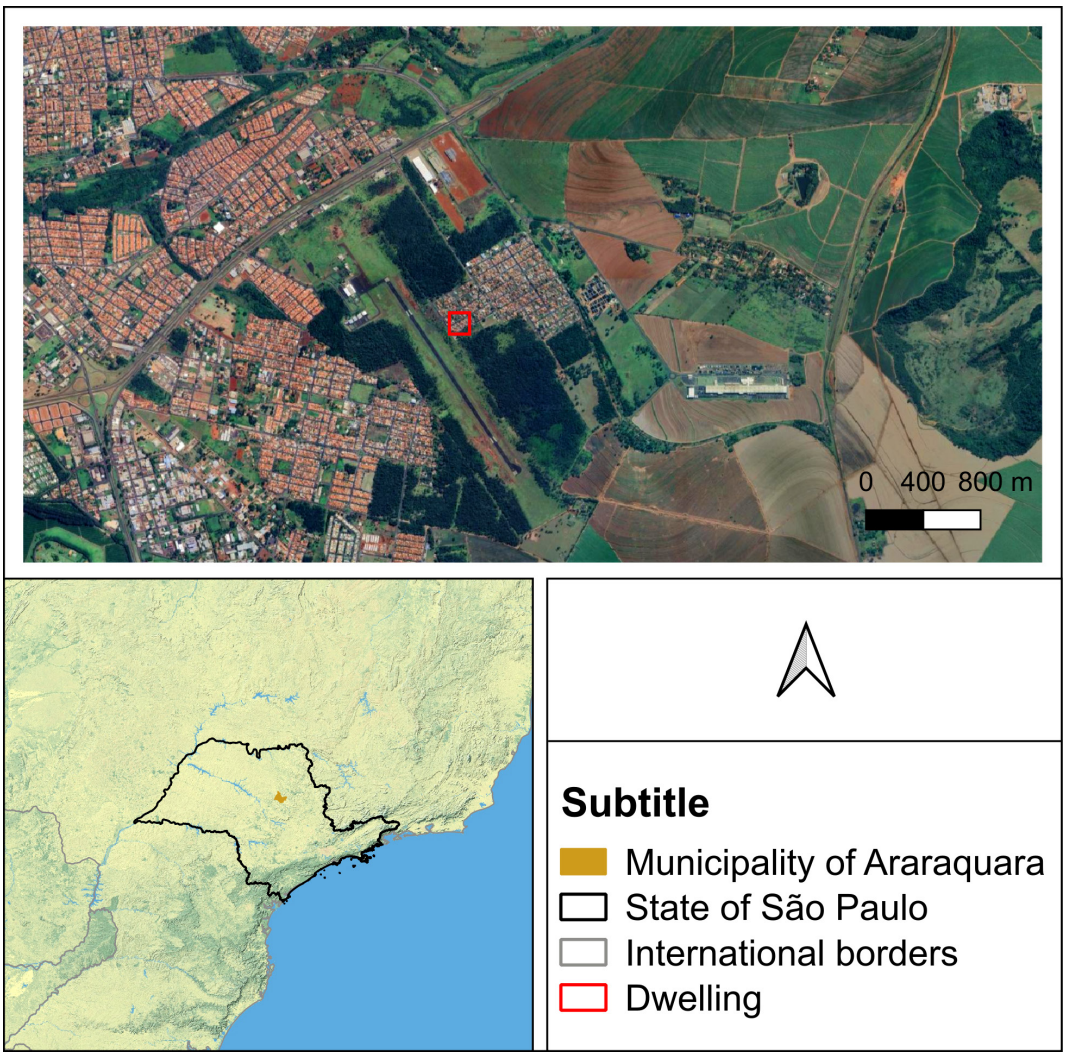

Figure 1. Location of the residence invaded by triatomines in the municipality of Araraquara, São Paulo, Brazil. / **Figura 1.** Ubicación de la residencia invadida por triatominos en el municipio de Araraquara, São Paulo, Brasil.

For the analysis of infection of the specimen by trypanosomatids, its feces were diluted in 15 µL of 0.9% saline solution and placed between a slide and a cover slip. Observation was carried out under an optical microscope (400x magnification). No trypanosomatids were observed.

Taxonomic identification was conducted based on the dichotomous key provided in Galvão (2014) and the observed characters in Rosa *et al*. (2014). The specimen was identified as a female of *R. neglectus* Lent, 1954, presenting a general dark brown coloration; clear trochanters contrasting with dark femurs; anterolateral angles of the pronotum projecting forward; line between the IIX and IIIX abdominal segments curved at the ends and convex in the middle region; line between the XI and X abdominal segments oval-shaped in the anterior region, widening laterally in the posterior region (Fig. 2).

The female *R. neglectus* was placed alive in a small vial for possible oviposition. The specimen was fertilized and laid 201 fertile eggs. After its death, the female *R. neglectus* and the colony composed of its descendants were added to the Triatominae Insectarium Collection of the School of Pharmaceutical Sciences/Unesp, Araraquara, São Paulo, Brazil. After the identification, a visit to the residence was conducted with the municipal Epidemiological Surveillance to inspect for triatomines and signs of colonization. No new specimens or evidence of colonization were found.

Four species of triatomines are reported in the municipality of Araraquara: *P. megistus* (Burmeister, 1835), *R. neglectus*, *T. infestans* (Klug, 1834), and *T. sordida* (Stål, 1859) (Rosenfeld & Cardoso 1941; Ceretti-Júnior 2003; Silva *et al*. 2020). The first record of *R. neglectus* in Araraquara occurred in the 2010s, according to the Epidemiological Surveillance (Silva *et al*. 2020). However, the specimen in question was not deposited in an entomological collection, making the specimen reported here the first to be deposited. Like the present study, a fresh examination of the specimen's feces was conducted in search of trypanosomatids, with a negative result. Subsequent visits to inspect the notifying residence, located in the Vila Melhado neighborhood approximately 3 km from the current occurrence, also yielded no findings (RA-S pers. obs.).

Rhodnius is the second largest genus in the subfamily, comprising 20 species, many of which have distribution throughout Brazilian territory (Alevi *et al.* 2021; Oliveira-Correia *et al*. 2024). In the wild, they are strongly associated with palm tree ecotopes, and they are also found in bird and mammal nests (Hernández *et al*. 2020). Since the early 2000s, the occurrence of *Rhodnius* spp. in urban areas of Brazil has increased considerably (Silva *et al*. 2022b). *Rhodnius neglectus* has been frequently recorded in urban areas of the state of São Paulo (Rodrigues *et al*. 2009; Silistino-Souza *et al.* 2013; Carvalho *et al*. 2014; Rodrigues *et al*. 2014; Alevi *et al.* 2015; Silva *et al*. 2022), adapting and successfully establishing colonies in exotic palm trees used in landscaping, such as *Livistona australis* (R. Br. Mart.) (palmeira de leque) and *Roystonea oleracea* (palmeira imperial) (Carvalho *et al*. 2014; Silva *et al*. 2022b).

Over the last two decades, hundreds of home invasions by *R. neglectus* have been reported in the state of São Paulo (Rodrigues *et al*. 2009; Silistino-Souza *et al*. 2013; Carvalho *et al*. 2014; Rodrigues *et al*. 2014; Silva *et al*. 2022b). Rodrigues *et al*. (2009) observed that residences near palm trees were more susceptible to invasion, with the presence of these ecotopes serving as a possible indicator of established colonies of *R. neglectus* in notified areas. In the residence reported here (December 2022), no palm trees were observed in its surroundings; however, in front of it, there is a forest fragment area, which may be providing conditions for the colonization of *R. neglectus*, with the presence of birds and mammals nests, as observed by Gurgel-Gonçalves *et al*. (2004).

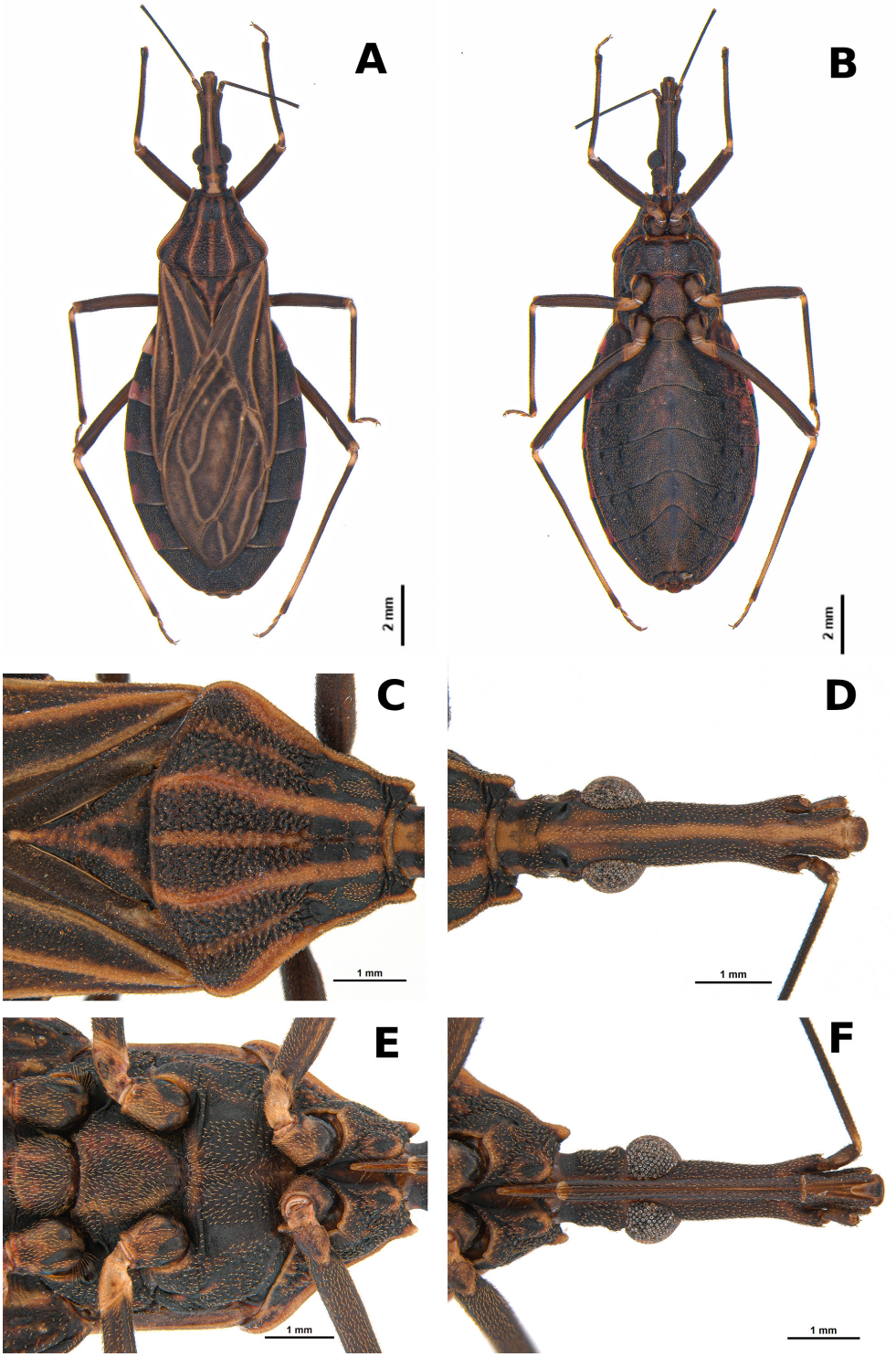

Figure 2. Female of *Rhodnius neglectus* captured inside the house in the municipality of Araraquara, São Paulo. **A-B.** Dorsal and ventral views. **C.** Pronotum and scutellum. **D.** Head. **E.** Ventral thorax. **F.** Labium. / **Figura 2.** Hembra de *Rhodnius neglectus* capturada en el interior de la casa en el municipio de Araraquara, São Paulo. **A-B.** Vistas dorsal y ventral. **C.** Pronoto y escutelo. **D.** Cabeza. **E.** Tórax, ventral. **F.** Labio.

Rhodnius domesticus also occurs in the state of São Paulo (Borsatto *et al.* 2019), however, unlike *R. neglectus*, it has not been reported for over 70 years, with the last occurrences in the municipalities of Guarujá and Prainha (Rosenfeld & Cardoso 1941). Its distribution spans along the entire east coast of Brazil, within the Atlantic Forest biome, associated with bromeliad ecotopes (Hernández *et al*. 2020). The Atlantic Forest is highly fragmented, and various actions have been and are being developed for its preservation and conservation (Piffer *et al*. 2022), which may be one of the possible factors positively influencing the species' persistence in the wild. Unlike *R. neglectus*, which has already been found infected with *T. cruzi* in peridomiciliary and intradomiciliary regions of the municipality of São Paulo, positive specimens of *R. domesticus* for the protozoan were never reported (Borsatto *et al.* 2019).

This occurrence reinforces the concern over urbanization by *R. neglectus* in the state of São Paulo, with reports of colonization and home invasion in various municipalities (Rodrigues *et al*. 2009; Silistino-Souza *et al.* 2013; Carvalho *et al*. 2014; Rodrigues *et al*. 2014; Alevi *et al.* 2015; Silva *et al*. 2022), including Araraquara. In addition to the action of municipal Epidemiological Surveillance, the participation of the population proves to be a strong ally in understanding the current panorama of triatomines in urban areas. It also demonstrates the high capacity of a single fertilized individual to initiate a large colony.

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Author Contributions

JKSS: Conceptualization, investigation, writing - original draft. **TB:** Investigation, writing - review and editing. **JAR:** Investigation, resources, writing - review and editing. **JO:** Investigation, identification of specimen, writing - review and editing.

Literature Cited

Alevi, K.C.C., Rodas, L.A.C., Tartarotti, E., Azeredo-Oliveira, M.T.V. and Guirado, M.M. (2015) Entoepidemiology of Chagas disease in the Western region of the State of São Paulo from 2004 to 2008, and cytogenetic analysis in *Rhodnius neglectus* (Hemiptera, Triatominae). *Genetics and Molecular Research*, *14*(2): 5775-5784. http://dx.doi.org/10.4238/2015.May.29.9

Alevi, K.C.C., de Oliveira, J., da Silva Rocha, D. and Galvão, C. (2021) Trends in taxonomy of Chagas disease vectors (Hemiptera, Reduviidae, Triatominae): from Linnaean to integrative taxonomy. *Pathogens*, *10*(12): 1627. https://doi.org/10.3390/pathogens10121627

Borsatto, K.C., Reis, Y.V., Garcia, A.C.C., Sousa, P.S., Azeredo-Oliveira, M.T.V. and Alevi, K.C.C. (2019) CytoKey: identification key for the Chagas disease vectors of the largest Brazilian urban center (São Paulo state), based on cytogenetic data. *American Journal of Tropical Medicine and Hygiene*, *3*: 113-115. https://doi.org/10.4269/ajtmh.18-0683

Brito, R.N., Gorla, D.E., Diotaiuti, L., Gomes, A.C.F., Souza, R.C.M. and Abad-Franch, F. (2017) Drivers of house invasion by sylvatic Chagas disease vectors in the Amazon-Cerrado transition: A multi-year, state-wide assessment of municipality-aggregated surveillance data. *PLoS Neglected Tropical Diseases*, *11*(11): 1-25. https://doi.org/10.1371/journal.pntd.0006035

Carbajal-De-La-Fuente, A.L., Sánchez-Casaccia, P., Piccinali, R.V., Provecho. Y., Salvá, L., Meli, S., Cano, F., Hernández, R. and Nattero, J. (2022) Urban vectors of Chagas disease in the American continent: A systematic review of epidemiological surveys. *PLoS Neglected Tropical Diseases*, *17*(6): 1-18. https://doi.org/10.1371/journal.pntd.0011003

Carvalho, D.B., Almeida, C.E., Rocha, C.S., Gardim, S., Mendonça, V.J., Ribeiro, A.R., Alves, Z.C.P. V.T., Ruellas, K.T., Vedoveli, A. and Rosa, J.A. (2014) A novel association between *Rhodnius neglectus* and the *Livistona australis* palm tree in an urban center foreshadowing the risk of Chagas disease transmission by vectorial invasions in Monte Alto City, São Paulo, Brazil. *Acta Tropica*, *130*: 35-38. http://dx.doi.org/10.1016/j.actatropica.2013.10.009

Ceretti-Junior, W. (2003) Estudos sobre domiciliação espontânea em galinheiros experimentais por população silvestre de triatomíneos no município de Araraquara, São Paulo, no período de XI/1998 a III/2002. Dissertação de Mestrado, Departamento de Epidemiologia, Faculdade de Saúde Pública, Universidade de São Paulo, São Paulo.

Galvão, C. and Gonçalves, R.G. (2014) Vetores conhecidos no Brasil. Pp. 88-170. *In*: Galvão, C. (Ed.), Série Zoologia: Guias e manuais de identificação. Vetores da doença de Chagas no Brasil. 1. ed. Curitiba: Sociedade Brasileira de Zoologia. 291 pp.

Galvão, C. (2021) Taxonomy. Pp. 16-38. *In*: Guarneri, A. and Lorenzo, M. (Ed.), Triatominae – The Biology of Chagas Disease Vectors. Springer, Cham. 642 pp.

Gurgel-Gonçalves, R., Duarte, M.A., Ramalho, E.D., Palma, A.R.T., Romaña, C.A. and Cuba, C.A.C. (2004) Distribuição espacial de populações de triatomíneos (Hemiptera: Reduviidae) em palmeiras da espécie *Mauritia flexuosa* no Distrito Federal, Brasil. *Journal of the Brazilian Society of Tropical Medicine*, *37*(3): 241-247.

Hernández, C., Rosa, J.A., Vallejo, G.A., Guhl, F. and Ramírez, J.D. (2020) Taxonomy, evolution, and biogeography of the Rhodniini tribe (Hemiptera, Reduviidae). *Diversity*, *12*(3): 1-28. https://doi.org/10.3390/d12030097

Morocoima, A., Chique, J., Herrera, L. and Urdaneta-Morales, S. (2010) *Eratyrus mucronatus* (Stal, 1859) (Hemiptera, Reduviidae, Triatominae): primer registro para el estado Anzoátegui (Venezuela). *Boletín de Malariología y Salud Ambiental*, *50*(2): 307-310.

Oliveira-Correia, J.P.S., Oliveira, J., Gil-Santana, H.R., Rocha, D.S. and Galvão, C. (2024) Taxonomic reassessment of *Rhodnius zeledoni* Jurberg, Rocha & Galvão: a morphological and morphometric analysis comparing its taxonomic relationship with *Rhodnius domesticus* Neiva & Pinto. *BMC Zoology*, *9*(6): 1-12. https://doi.org/10.1186/s40850-024-00197-w

Piffer, P.R., Rosa, M.R., Tambosi, L.R., Metzger, J.P. and Uriarte, M. (2022) Turnover rates of regenerated forests challenge restoration efforts in the Brazilian Atlantic Forest. *Environmental Research Letters*, *17*(4): 1-11. https://doi.org/10.1088/1748-9326/ac5ae1

Rodrigues, V.L.C.C., Pauliquevis, Jr. C., Silva, R.A., Wanderley, D.M.V., Guirardo, M.M., Rodas, L. A.C., Casanova, C., Pachioni, M.L., Souza, W.A., Costa, A.J., Baitelo, D. and Tonietti, V.L.B. (2014) Colonization of palm trees by *Rhodnius neglectus* and household and invasion in an urban area, Araçatuba, São Paulo state, Brazil. *Revista do Instituto de Medicina Tropical*, *56*(3): 213-218.

Rosa, J.A., Mendonça, V.J., Gardim, S., Carvalho, D.B., Oliveira, J., Nascimento, J.D., Pinotti, H., Pinto, M.C., Cilense, M., Galvão, C. and Barata, J.M.S. (2014) Study of the external female genitalia of 14 *Rhodnius* species (Hemiptera, Reduviidae, Triatominae) using scanning electron microscopy. *Parasites & Vectors*, *7*(17): 1-10. https://doi.org/10.1186/1756-3305-7-17

Rosenfeld, G. and Cardoso, F.A. (1941) Distribuição dos triatomíneos e da moléstia de Chagas no estado de São Paulo (Brasil). *Revista de Clínica de São Paulo*, *9*: 198-209.

Silistino-Souza, R., Alevi, K.C.C., Castro, N.F.C., Freitas, M.N., Papa, M.D., Scandar, S.A.S., Bestetti, R.R., Rosa J.A. and Azeredo-Oliveira, M.T.V. (2013) Entoepidemiology of Chagas disease in northwest São Paulo and cytogenetic analysis of its main vector, *Triatoma sordida* (Hemiptera: Triatominae). *Genetetics and Molecular Research*, *12*: 5810-5819. http://dx.doi.org/10.4238/2013.November.22.8

Silva, R.A., Maldonado, L.A., Pessoa, G.C. D'a. and Diotaiuti, L. (2022a) Monitoring *Rhodnius neglectus* (Lent, 1954) populations' susceptibility to insecticide used in controlling actions in urban areas northwest of São Paulo state. *Journal of the Brazilian Society of Tropical Medicine*, *55*: 1-5. https://doi.org/10.1590/0037-8682-0553-2021

Silva, R.A., Maldonado, L.A., Suto, R., Costa, A.J.B., Sabião, J.F., Luz-Requena, K.A.M., Guariente, C.S., Almeida, C.C., Montanholi, R.O., Rodrigues, S.C., Bracco, E.M.L., Rodrigues, T.F. and Gomes, J.R. (2022b) Fatores associados à infestação por *Rhodnius neglectus* (Lent, 1954) em palmeiras de áreas urbanas na região noroeste do estado de São Paulo, Brasil, 2014 a 2020. *Revista Pan-Amazônica de Saúde*, *13*: 1-9. http://dx.doi.org/10.5123/s2176-6223202200965

Silva, R.A., Silva, F.S., Estevão, V.A.O., Duarte, A.N., Nascimento, L.C. and Suto, R. (2020) Cenários entomológicos de triatomíneos em área urbana no estado de São Paulo, Brasil. Pp. 9-37. *In*: Oliveira, J., Alevi, K.C.C., Camargo, L.M.A. and Meneguetti, D.U.O. (Ed.), Atualidades em Medicina Tropical no Brasil: Vetores. Stricto Sensu, Rio Branco, Acre. 263 pp.

Vallejo, G.A., Guhl, F. and Schaub, G.A. (2009) Triatominae-*Trypanosoma cruzi*/*T. rangeli*: vector-parasite interactions. *Acta Tropica*, *110*: 137-147. https://doi.org/10.1016/j.actatropica.2008.10.001