Short Communication

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The exotic palm *Roystonea oleracea* (Jacq.) O.F. Cook as a rural biotype for *Rhodnius neglectus* Lent, 1954, in Caçu, State of Goiás

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ABSTRACT

Introduction: *Rhodnius neglectus* is a triatomine that colonizes different palm species. In this study, we aimed to describe the presence of this triatomine bug in the royal palms (*Roystonea oleracea*) in a rural region of the State of Goiás. **Methods:** Palm infestation was investigated by dissecting the palms or by using live-bait traps. **Results**: Two palm trees were infested by *R. neglectus* negative for *Trypanosoma cruzi*, the etiological agent for Chagas disease. In the study area, *R. neglectus* is frequently found in households. **Conclusions:** The adaptation of this species to palm trees introduced in Brazil for landscaping purposes poses another challenge for controlling the vectors of Chagas disease.

Keywords: Triatomine bugs. Infestation. Palm trees.

Rhodnius neglectus Lent, 1954 (Hemiptera, Triatominae) is a triatomine bug that mainly inhabits palm trees in the Brazilian Savanna[1-3], Pantanal, and Caatinga biomes[4]. This species is found in the palm trees of the genera *Mauritia*, *Acrocomia*, *Attalea*, *Oenocarpus*, and *Copernicia*[3,5] and *Roystonea* and *Livistona*, exotic genera used for landscaping purposes in urban environments[6,7]. In Midwestern Brazil, *R. neglectus* is frequently detected in wild native palm trees near reservoirs, and it is a vector of *Trypanosoma cruzi* (trypanosomatids), the etiological agent of Chagas disease[2,3]. It is significantly more frequent in rural households (intradomiciles) in the State of Goiás than in other regions where it has been reported[8]. This species might occasionally have high rates of *T. cruzi* infection in the natural environment, as has been reported in the babaçu palm (*Attalea speciosa*) in Uberaba, State of Minas Gerais[2]. Thus, it is considered a relevant target for research on the ecology of vectors.

The southern region of Goiás, Brazil, where the Caçu municipality is located, within the microregion of Quirinópolis, is characterized by widely deforested areas with small fragments of forest that are used for extensive monoculture plantations (e.g., sugarcane and soybeans) and livestock subsistence. Native palm trees such as *gueiroba* (*Syagrus oleracea*) and *bacuri* (*Attalea phalerata*) are widely found close to dwellings in this region, and they are used for cooking. In this study, we aimed to describe the occurrence of *R. neglectus* in exotic palm trees (*Roystonea oleracea*) in the rural areas of Caçu, State of Goiás, Brazil, where hydroelectric power plants are being built.

The Caçu municipality has 13,283 inhabitants, land area of 2,251km^2, population density of 5.9 inhabitants/km^2,[9], and an altitude of 486m. According to the Köppen climate classification categories, the climate in Caçu is AW (A = tropical wet and W = dry or savanna climate), with two distinct seasons: dry winter and humid summer. The annual average temperature is around 21°C, and the annual average rainfall ranges between 1,200 and 1,800mm. This study was performed in two rural areas located near the Claro River: the first was conducted near the hydroelectric power plant (HPP) of Caçu (18°31′46″ S and 51°09′00″ W), and the second, 35km away, near the Barra dos Coqueiros HPP (18°43′24″ S and 51°00′11′ W)[10].

Forest fragments or palm trees in pastures were selected close to households in localities that had been subjected to deforestation for the construction of HPPs. The palm trees were randomly selected within a distance of approximately 200-500 m from the houses on the banks of the Claro River from an area that would become flooded in the future due to a HPP (**Figure 1**). Sampling was conducted in six rural localities that were characterized by a mixture of highly anthropogenic savanna and palm swamp.

The triatomine bugs were captured during the dry season in September 2009 when deforestation was authorized for the construction of dams. The insects were collected by dissecting palms after receiving approval from the Department

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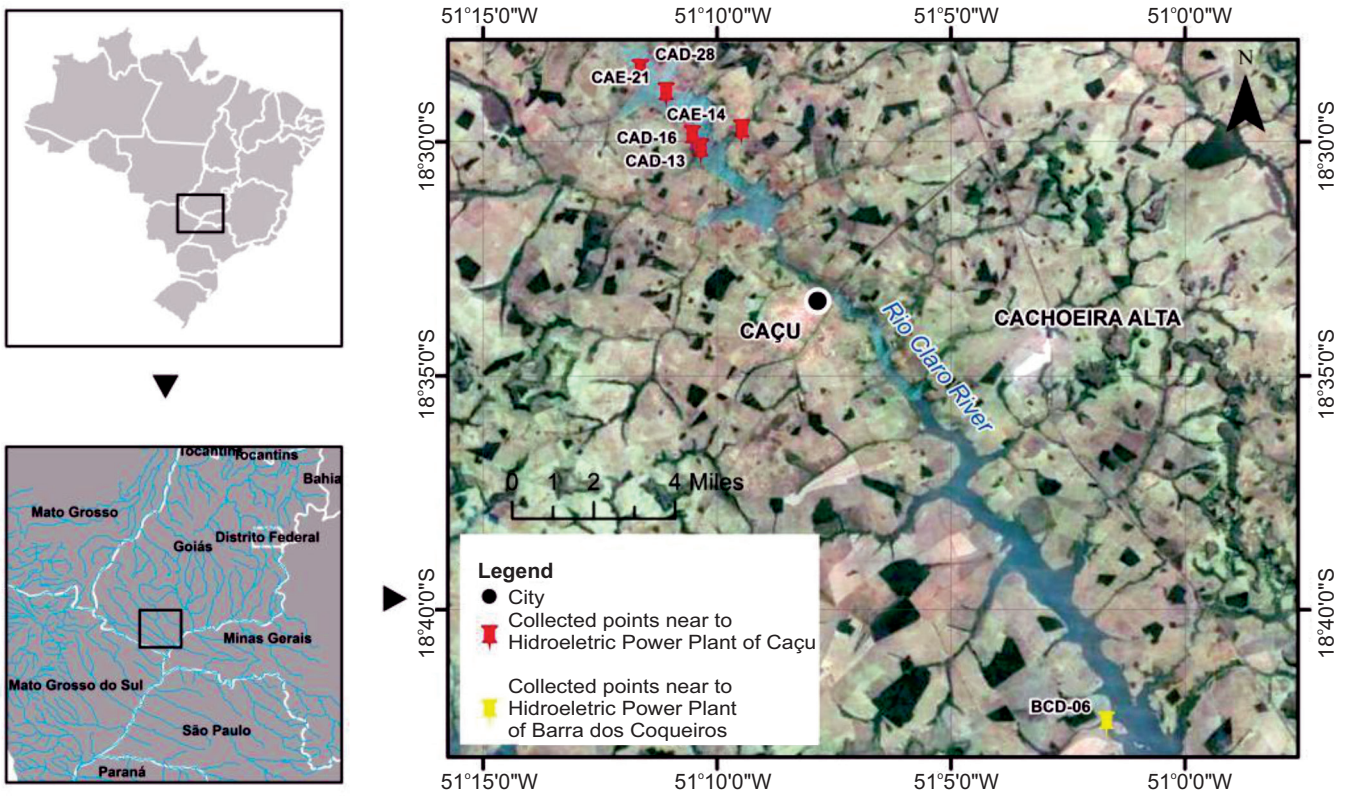

FIGURE 1 - Map of the Caçu municipality, State of Goiás, Brazil, and the regions in the rural localities from where the study palms were sampled.

for the Environment and Water Resources (*Secretaria do Meio Ambiente e dos Recursos Hídricos*) of the State of Goiás. The palm leaves were cut, and the leaf sheath was removed. All organic material as well as the sheaths were placed on white cloths measuring approximately 10m^2 and thoroughly searched for insects. Four *Attalea phalerata*, one *Mauritia flexuosa* (known as *buriti*), and three royal palms (*R. oleracea*) were dissected. Furthermore, forty-one traps with chicks as live bait[11] were placed under thirteen palm trees. Two to three traps were placed in the crown of each palm during the afternoon and removed the following morning approximately 15h after each of the localities was chosen. Four specimens of *gueiroba* (*S. oleracea*) and nine specimens of *A. phalerata* were examined (**Table 1**).

All triatomines found were identified[12], and fresh feces were submitted to parasitological examination to confirm the presence of trypanosomatids under light microscopy (400X magnification). The entire procedure was performed at the Laboratory of Triatomines and Chagas Disease Epidemiology (*Laboratório de Triatomíneos e Epidemiologia da Doença de Chagas*), René Rachou Research Center/Oswaldo Cruz Foundation (*Centro de Pesquisa René Rachou/Fundação Oswaldo Cruz*). Information about the profile of household infestation by triatomines over eight non-consecutive years in the region was collected. Such information was obtained from the Center for Endemic Disease Control of the town of Jataí *(Núcleo de Apoio ao Controle de Endemias de Jataí-NACE).*

All the *A. phalerata* and *M. flexuosa* specimens, as well as the palm trees sampled through the live-bait traps, were negative for the occurrence of triatomines. Two royal palms had been infested by *R. neglectus*. Seven nymphs and six adults were collected from one palm tree, and four nymphs were collected from the other. The global infestation rate of palms was 5.5%, and the average number of triatomines per positive palm was 8.5. The parasitological examination of fresh feces showed no flagellate forms similar to *T. cruzi*. Bird feces and parrot feathers were found between the leaf sheaths in the canopy of palm trees where the insects were detected and collected. This might suggest that birds are the main food source for *R. neglectus* that inhabit royal palms in this region.

Information about infestation, spread, and infection of *T. cruzi* via triatomines in the households of the Caçu municipality is limited. Nevertheless, some data could be collected, as shown in **Table 2**. *Triatoma sordida,* an ornithophilic species and, currently, the most captured triatomine species in Brazil according to the Chagas Disease Control Program, is predominant in this region, especially in peridomiciles. In the samples analyzed in this study, *T. sordida* was not identified, as previously reported in palms[5]. As revealed by the Support Center for Endemic Disease Control of Jataí, *R. neglectus* is the second-most captured triatomine species in this region. Moreover, this species is able to colonize peridomestic areas as well as intradomiciles (**Table 2**), as

TABLE 1 - Regions in the rural localities of the Caçu municipality, State of Goiás, Brazil, from where the study palms were sampled. Method used to capture triatomine bugs, number of traps placed under palm trees, palms dissected, palm species, and location of palm(s).

Locality	Method	Number of traps	Number of palms	Palm specie(s)	Place
BC-D-06	Live-bait trap	20	20	*Syagrus oleracea and Attalea phalerata*	Pasture
BC-D-06	Palm dissection	-	3	*Syagrus oleracea and Mauritia flexuosa*	Palm swamp
CA-D-13	Palm dissection	-	2	*Syagrus oleracea*	Forest
CA-D-16	Palm dissection	-	3	*Roystonea oleracea*	Pasture besides a forest
CA-D-14	Live-bait trap	4	2	*Syagrus oleracea*	Peridomicile
CA-D-28	Live-bait trap	15	5	*Syagrus oleracea and Attalea phalerata*	Pasture and Peridomicile
CA-E-21	Live-bait trap	2	1	*Syagrus oleracea*	Peridomicile
Total		41	36		

BC-D: Barra dos Coqueiros, right bank; **CA-D:** Caçu, right bank; **CA-E:** Caçu, left bank. Each locality belonged to a construction area of one of the hydroelectric power plants (Barra de Coqueiros or Caçu) and was enumerated by previous studies to investigate the environmental impact in the region.

TABLE 2 - Number of specimens of *Rhodnius neglectus* collected in 2000, 2001, 2002, 2004, 2005, 2006, 2007, and 2012 from the domiciliary location in the town of Caçu, State of Goiás, Brazil.

	Intradomicile		Peridomicile		Adults		Nymphs		Total
	n	%	n	%	n	%	n	%	n
Rhodnius neglectus	94	25.0	160	12.0	192	16.0	62	12.0	254
Triatoma sordida	282	75.0	1,128	84.5	974	81.0	436	86.0	1,410
Others*	0	0.0	46	3.5	38	3.0	8	2.0	1,710
Total	376	100.0	1,334	100.0	1,204	100.0	506	100.0	

Source: Support Center for Endemic Disease Control of Jataí, Office of Policies for Full Health Care, State Secretary of Health (State of Goiás). Result of surveys in peridomiciles and intradomiciles, according to the Manual of Technical Norms of the Program for the Control of Chagas Disease[15]. *No species was identified by entomologic surveillance.

reported in other regions of the State of Goiás[3,8]. The royal palm is native to the Antilles; it was introduced in Brazil for landscaping purposes. In Colombia, *Rhodnius prolixus* abundantly colonizes plantations of *Elaeis guineense*, a palm tree from Africa used for the extraction of a type of oil widely used for cooking (known as dendê in Brazilian cuisine)[13]. This shows that other triatomine species can adapt to exotic ecotopes in rural and agricultural areas. In 2007, in the municipality of Araçatuba, the occurrence of *R. neglectus* was described to colonize *R. oleracea* in urban areas[6]. In 2012, specimens of the exotic palm *Livistona australis* were also found to be infested by *R. neglectus* in the town of Monte Alto, in the State of São Paulo[7]. These studies emphasize the potential for *R. neglectus* to adapt to new habitats.

During the dissection of the royal palms, feathers of Psittacidae species were observed, and there was no trace of remains from other vertebrates. This might be the reason for the absence of *T. cruzi* infection in *R. neglectus*, due to its probable association with birds. This palm tree is gorgeous and has a leafy canopy; thus, it is attractive to birds for nesting purposes and serves as a food source for *R. neglectus*. The presence of vertebrates such as mammals and birds within the palm is one of the factors for the establishment and growth of the triatomine colonies[14]. Future studies need to be performed in other seasons of the year, since the dynamics of these vertebrates is seasonal; such investigations might show associations of *R. neglectus* with different vertebrates present in Caçu, as reported for other regions[3,13,14]. In other palm species surveyed, the presence of nests and/or traces (i.e., feathers or feces) of animals were not observed.

Data of the Program for the Control of Chagas Disease[15] showed that *R. neglectus* is frequently found in the artificial environment of the region, including intradomiciles, which is consistent with the behavior of the species in the State of Goiás[8]. The proximity of palm trees to households (300-700m) is an important factor while investigating the eco-epidemiology of Chagas disease, as shown in the State of Tocantins, a state neighboring the study area of this research and Goiás[3]. This suggests that *R. neglectus* can invade households and thus colonize there. Royal palm trees are usually planted close to households because of their beauty and scenic value. The colonization of these palm trees, therefore, indicates a potential risk of spreading *R. neglectus* in nature, especially in

an environment close to humans, as has been already reported[6]. In highly modified areas, as those affected by the construction of two HPPs, exotic palms might play a key role in the relationship between health and environment. Exotic palm trees widely used in landscaping in urban and rural environments might represent another challenge for controlling synanthropic triatomines in Brazil.

This study strictly followed the ethical codes of Brazil. The sampling was performed in complete compliance with the Brazilian laws (license number, 0941/2008, SEMARH - *Secretaria do Meio Ambiente e dos Recursos Hídricos* - and Goiás Environmental Agency; Case Number, 5601.03449/2007-4).

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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REFERENCES

1. Carcavallo RU, Curto De Casas SI, Sherlock IA, Galíndez-Girón I, Jurberg J, Galvão C, et al.. Distribuição geográfica e dispersão altitudinal. *In*: Carcavallo RU, Galíndez Girón I, Jurberg J, Lent H, editors. Atlas of Chagas' disease vector in the Americas. Vol III. Rio de Janeiro: FIOCRUZ; 1998. p. 747-792.
2. Barretto MP. Epidemiologia. *In*: Brener Z, Andrade Z, editors. *Trypanosoma cruzi* e doença de Chagas. Rio de Janeiro: Editora Guanabara Koogan, 1979. p. 89-151.
3. Abad-Franch F, Monteiro FA, Jaramillo N, Gurgel-Gonçalves R, Dias FBS, Diotaiuti L. Ecology, evolution and the long term surveillance of vector-borne Chagas disease: a multi-scale appraisal of the tribe *Rhodniini* (Triatominae). Acta Trop 2009; 110:35-41.
4. Batista TA, Gurgel-Gonçalves R. Ecological niche modelling and differentiation between *Rhodnius neglectus* Lent, 1954 and *Rhodnius nasutus* Stål, 1859 (Hemiptera: Reduviidae: Triatominae) in Brazil. Mem Inst Oswaldo Cruz 2009; 104:1165-1170.
5. Gurgel-Gonçalves R, Ribeiro Jr G, Costa Neto EM. Infestation of palm trees by triatomines (Hemiptera: Reduviidae) in the state of Bahia, Brazil. Entomo Brasilis 2012; 5:227-231.
6. Rodrigues VLCC, Silva RA, Wanderley DMV, Carvalho ME, Pauliquevis Jr C. Detecção de triatomíneos da espécie *Rhodnius neglectus* em área urbana de municípios da região de Araçatuba. Bol Epidemiol Paul 2009; 6:20-23.
7. Carvalho DB, Almeida CE, Rocha CS, Gardim S, Mendonça VJ, Ribeiro AR, et al. 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 Trop 2014; 130:35-38.
8. Oliveira AWS, Silva IG. Distribuição geográfica e indicadores entomológicos de triatomíneos sinantrópicos capturados no Estado de Goiás. Rev Soc Bras Med Trop 2007; 40:204-208.
9. Instituto Brasileiro de Geografia e Estatística. Censo 2012 [Internet]. 2012; [Cited 2013 August 9]. Available at: http://www.censo 2012.ibge.gov.br.
10. Sousa-Júnior WC, Sinisgalli PAA, Bermann ATC, Garcia L, Ghaz M, Cruz P, et al. Análise da Viabilidade Técnica e Ambiental de AHEs no Sudoeste de Goiás. Relatório Final São José dos Campos/SP [Internet]. 2005; [Cited 2013 August 9] Available at: http://www.geomatica.ita.br/wilson/artigos/AHES_GO_02abr2005_final.pdf.
11. Noireau F, Abad-Franch F, Valente SAS, Dias-Lima A, Lopes CCM, Cunha V, et al. Trapping Triatominae in silvatic habitats. Mem Inst Oswaldo Cruz 2002; 97:61-63.
12. Lent H, Wygodzinsky P. Revision of Triatominae (Hemiptera: Reduviidae), and their significance as vectors of Chagas disease. Bul Am Mus of Nat Hist 1979; 163:127-520.
13. Guhl F. Ecoepidemiologia de La fauna de triatominos (Reduviidae: Triatominae) en Colombia y su importancia para los programas de control. *In*: Taller del Cono Sur actualización de la tripanosomiasis americana, 1, 2007, Asunción, Paraguay. Libro de resúmenes. Universidad Nacional de Asunción 2007. p. 207-211.
14. Gurgel-Gonçalves R, Cuba-Cuba CA. Estrutura de populações de *Rhodnius neglectus* (Lent) e *Psammolestes tertius* (Lent & Jurberg) (Hemiptera, Reduviidae) em ninhos de pássaros (Furnariidae) presentes na palmeira *Mauritia flexuosa* no Distrito Federal, Brasil. Rev Bras Zool 2007; 24: 157-163.
15. Superintendência de Campanhas de Saúde Pública, Divisão de Doença de Chagas. Manual de Normas Técnicas da Campanha de Controle da Doença de Chagas. Brasília, DF: Ministério da Saúde; 1980.