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2010

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Journal of Medical Entomology, Lanham, v. 47, n. 6, p. 1243-1246, 2010  
<http://producao.usp.br/handle/BDPI/2035>

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## **Ticks Infesting Wildlife Species in Northeastern Brazil with New Host and Locality Records**

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Source: Journal of Medical Entomology, 47(6):1243-1246. 2010.

Published By: Entomological Society of America

DOI:

URL: <http://www.bioone.org/doi/full/10.1603/ME10156>

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## Ticks Infesting Wildlife Species in Northeastern Brazil With New Host and Locality Records

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J. Med. Entomol. 47(6): 1243–1246 (2010); DOI: 10.1603/ME10156

**ABSTRACT** From September 2008 to March 2010, 397 ticks (315 larvae, 33 nymphs, 23 females, and 26 males) were collected from captive and free-living wildlife species in northeastern Brazil. Six tick species were identified, including *Amblyomma auricularium* (Conil) on *Tamandua tetradactyla* (L.), *Amblyomma dubitatum* Neumann on *Hydrochaeris hydrochaeris* (L.), *Nectomys rattus* (Pelzen) and *T. tetradactyla*, *Amblyomma parvum* Aragão on *T. tetradactyla*, *Amblyomma rotundatum* Koch on *Boa constrictor* L., *Chelonoidis carbonaria* (Spix), *Kinosternon scorpioides* (L.) and *Rhinella jimi* (Stevaux), *Amblyomma varium* Koch on *Bradypus variegatus* Schinz, and *Rhipicephalus sanguineus* (Latreille) on *Lycalopex vetulus* (Lund). *Nectomys rattus* and *T. tetradactyla* are new hosts for *A. dubitatum*. This study extends the known distribution of *A. dubitatum* in South America and provides evidence that its geographical range has been underestimated because of the lack of research. Four (*A. dubitatum*, *A. parvum*, *A. rotundatum*, and *R. sanguineus*) of six tick species identified in this study have previously been found on humans in South America, some of them being potentially involved in the transmission of pathogens of zoonotic concern.

**KEY WORDS** ticks, Ixodidae, wildlife, Brazil

The Brazilian tick fauna comprises 62 species distributed in nine genera (Dantas-Torres et al. 2009, Labruna and Venzal 2009). The genus *Amblyomma* is by far the most representative, with 29 confirmed species (Dantas-Torres et al. 2009), some of which are of veterinary and public health significance (Guedes et al. 2005, Pinter and Labruna 2006, Rubini et al. 2009). *Amblyomma* ticks are parasitic of a broad range of hosts, including birds, mammals, reptiles, and amphibians (Robinson 1926, Aragão 1936). They are widespread throughout the Brazilian territory (Guimarães et al. 2001), occurring mainly in humid environments, such as the Amazon, Atlantic Forest, and Pantanal (Pereira et al. 2000, Labruna et al. 2009, Szabó et al. 2009). Remarkably, some *Amblyomma* species are adapted to live in different types of environments, as

is the case of *Amblyomma parvum* Aragão, which can be found in different biomes, including Caatinga, Cerrado, and Pantanal (Nava et al. 2008).

In Brazil, wild animals are natural hosts of many kinds of ectoparasites, including ticks. Accordingly, some ticks associated with wild animals can act as vectors of pathogens causing diseases in both domestic animals and humans. As a consequence, wild animals might eventually be involved in the natural transmission cycle of certain pathogens, including bacteria of the genus *Rickettsia* (Labruna 2009). For these reasons, the study of ticks associated with wild animals in Brazil has received increased attention in recent years (Pereira et al. 2000, Labruna et al. 2005, Ogrzewalska et al. 2008, Dantas-Torres et al. 2010). Indeed, recent studies have provided new data on tick ecology and biogeography, which in turn constitute the foundation toward a better understanding of the eco-epidemiology of tick-borne diseases.

In the current study, we identified ticks infesting captive and free-living wild animals in northeastern Brazil. Remarkably, new hosts and locality records are provided, including the first records of *Amblyomma dubitatum* in this Brazilian region.

### Materials and Methods

This study was carried out in the Parque Estadual Dois Irmãos. This Natural Conservation Unit is located

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Table 1. Ticks found on wild animals in northeastern Brazil, from September 2008 to March 2010

Vial	Tick data				Host data				
	Species	Specimens				Species	Locality	Date	History
		M	F	N	L				
1	<i>Amblyomma dubitatum</i>	-	-	1	301 <sup>a</sup>	<i>Tamandua tetradactyla</i>	João Pessoa	24 Sept. 2008	Free living
2	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Boa constrictor</i>	Recife	27 Mar. 2009	Captive
3	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Boa constrictor</i>	Recife	28 Mar. 2009	Captive
4	<i>Rhipicephalus sanguineus</i>	-	1	-	-	<i>Lycalopex vetulus</i>	João Pessoa	1 May 2009	Free living
5	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Rhinella jimi</i>	Recife	7 May 2009	Free living
6	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Kinosternon scorpioides</i>	Recife	18 May 2009	Captive
7	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Boa constrictor</i>	Recife	24 June 2009	Captive
8	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Chelonoidis carbonaria</i>	Recife	24 Aug. 2009	Captive
9	<i>Amblyomma varium</i>	3	1	-	-	<i>Bradypus variegatus</i>	João Pessoa	1 Sept. 2009	Free living
10	<i>Amblyomma parvum</i>	1	-	-	-	<i>Tamandua tetradactyla</i>	Serra Talhada	18 Nov. 2009	Free living
	<i>Amblyomma auricularium</i>	-	-	2	-				
11	<i>Amblyomma dubitatum</i>	22	11	7	-	<i>Hydrochaeris hydrochaeris</i>	Recife	28 Dec. 2009	Free living
12	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Chelonoidis carbonaria</i>	Recife	30 Dec. 2009	Captive
13	<i>Amblyomma rotundatum</i>	-	1	-	-	<i>Chelonoidis carbonaria</i>	Recife	30 Dec. 2009	Captive
14	<i>Amblyomma dubitatum</i>	-	-	22	14 <sup>a</sup>	<i>Nectomys rattus</i>	Recife	7 Jan. 2010	Free living
15	<i>Amblyomma rotundatum</i>	-	2	1	-	<i>Rhinella jimi</i>	Recife	5 Mar. 2010	Free living

M, male; F, female; N, nymph; L, larvae.

<sup>a</sup> Tentatively identified by direct comparison with larvae from an *A. dubitatum* laboratory colony.

in the municipality of Recife (8°7'30"S, 34°52'W), the capital of the State of Pernambuco. It has a total land area of 384.42 hectares, being one of the most important ecological reserves of Atlantic Forest in northeastern Brazil. The Parque Estadual Dois Irmãos is home to a great diversity of free-living wildlife species, including small and medium-sized mammals, birds, reptiles, and amphibians. Additionally, some wildlife species, including mammals, birds, and reptiles, are kept in captivity in the zoo's park.

From March 2009 to March 2010, ticks were collected casually (by chance) during routine clinical examination of wild animals maintained in captivity at the zoo's park as well as from free-living wild animals that were eventually captured within the park's territory. All captures were carried out by the park personnel, animals being physically restrained using hand nets or hooks, as appropriate. Then, the animals were carefully examined for the presence of ticks. The only exception were ticks collected from a free-living ant-eater that was captured in the municipality of Serra Talhada (07°59'31"S, 38°17'54"W) by the personnel of the Instituto Chico Mendes de Conservação da Biodiversidade (the federal government agency responsible for the management of wildlife fauna in Brazil) and brought to the Parque Estadual Dois Irmãos for quarantine. Besides the material from Pernambuco, noteworthy collections of ticks from three free-living wild animals captured in the municipality of João Pessoa, State of Paraíba (northeastern Brazil), by local authorities of the Polícia Florestal (Forest Law Enforcement Service), were also included in the current study. All these animals were captured manually, with the exception of a fox that was captured using a hand net.

Ticks were collected by hand and directly placed in labeled vials (individualized per host) containing 70% ethanol. Then, ticks were identified based on morphology, using appropriate taxonomic keys for adults (Robinson 1926, Aragão and Fonseca 1961, Onofrio et

al. 2006) and nymphs (Martins et al. 2010). In two cases, larvae were identified based on the original description (Amorim and Serra-Freire 1999) and by direct comparison with larvae obtained from a laboratory colony. Voucher tick specimens from this study are deposited in the Coleção Nacional de Carrapatos of the Faculty of Veterinary Medicine of the University of São Paulo, São Paulo, Brazil (accession numbers: 1511, 1515, 1520–1522, 1524, 1526–1531, 1557).

## Results and Discussion

A total of 15 wildlife hosts belonging to nine species was found infested by ticks in Paraíba and Pernambuco (Table 1). The following wildlife host species were recorded: Reptilia–Squamata: *Boidae–Boa constrictor* L. Testudines: Testudinidae–*Chelonoidis carbonaria* (Spix); Kinosternidae–*Kinosternon scorpioides* (L.). Amphibia–Anura: Bufonidae–*Rhinella jimi* (Stevaux). Mammalia–Carnivora: Canidae–*Lycalopex vetulus* (Lund). Pilosa: Myrmecophagidae–*Tamandua tetradactyla* (L.). Bradyrodentia–*Bradypus variegatus* Schinz. Rodentia: Hydrochoeridae–*Hydrochaeris hydrochaeris* (L.); Cricetidae–*Nectomys rattus* (Pelzen). A total of 397 ticks (315 larvae, 33 nymphs, 23 females, and 26 males) belonging to six species was collected from wild animals: Ixodida: Ixodidae–*Amblyomma auricularium* (Conil); *A. dubitatum*; *A. parvum*; *Amblyomma rotundatum* Koch; *Amblyomma varium* Koch; *Rhipicephalus sanguineus* (Latreille). Detailed information on tick-host associations found in the current study is provided in Table 1.

Some tick-host associations found in this study have already been reported in the study area (Dantas-Torres et al. 2010) and elsewhere in Brazil (Szabó et al. 2007). The new collections of *A. rotundatum* from *C. carbonaria* in Pernambuco presented in this work agree with previous findings (Szabó et al. 2007, Dantas-Torres et al. 2010) and reinforce the hypothesis of tortoises as natural hosts of this tick species in Brazil.

Again, the records of *A. varium* on *B. variegatus* and *R. sanguineus* on *L. vetulus* in Paraíba corroborate previous reports of these tick-host associations in this northeastern Brazilian state (Labruna et al. 2005, Dantas-Torres et al. 2010).

The water rat (*Nectomys rattus*) represents a new host record for *A. dubitatum*. Indeed, *A. dubitatum* immature stages have previously been collected from other two cricetid rodent species Uruguay (Nava et al. 2010). Together, these findings indicate that sigmodontine rodents might serve as hosts for immature stages of this Neotropical tick. Again, the giant anteater (*T. tetradactyla*) is a new host record for *A. dubitatum*. Remarkably, this is the first collection of this tick from a mammal belonging to the order Pilosa. This finding is not completely unexpected, as *A. dubitatum* has been found on mammals from six different orders (alphabetically, Artiodactyla, Canivora, Chiroptera, Perissodactyla, Primates, and Rodentia) (Nava et al. 2010). Certainly, this accents the catholic feeding habits of this tick.

In Brazil, all previous records of *A. dubitatum* are from the states of Espírito Santo, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraná, Rio de Janeiro, Rio Grande do Sul, and São Paulo (Nava et al. 2010). Thus, the present reports of *A. dubitatum* in Paraíba and Pernambuco extend the known distribution of this tick to northeastern Brazil. Indeed, the geographical distribution of *A. dubitatum* is narrower than the distribution of capybaras, its principal hosts. The present results indicate that the distribution of *A. dubitatum* in Brazil and perhaps in the Neotropics has been underestimated. The absence of this tick in areas where suitable hosts are available is probably a matter of lack of investigation rather than the absence of the tick itself. Further assessments in areas where capybaras are native (i.e., Bolivia, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, and Venezuela) (Queirolo et al. 2008) and *A. dubitatum* is regarded as absent would be most welcome to ascertain the actual geographical range of this tick.

The current study also confirms the presence of *A. auricularium* and *A. parvum* in Pernambuco. These ticks are widespread throughout the Neotropical Region (Guglielmone et al. 2003a, Nava et al. 2008), and therefore, their presence in this state is rather expected. One may argue that the present finding of *A. parvum* on a free-living lesser anteater provides further evidence supporting anteaters as hosts of this tick in nature. However, cattle and goats appear to be the principal hosts for *A. parvum* adults in Argentina as do caviid rodents for immature stages (Nava et al. 2006, 2008). In relation to *A. auricularium*, little is known about the natural hosts for immature stages of this tick, which were previously reported on armadillos, marsupials, a murid rodent, and domestic dog (Guglielmone et al. 2003b).

Because captive and free-living wild animals may serve as natural hosts for ticks of medical interest, further research to assess the risk of tick infestation and tick-borne pathogen transmission in zoo parks and

Natural Conservation Units in northeastern Brazil should be encouraged.

### Acknowledgments

We thank Polly-Ana C. P. Lima, Adriana V. de Melo, and Janaina A. C. Ramos for help in monitoring tick infestations in animals kept in the zoo of the Parque Estadual Dois Irmãos.

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Received 12 June 2010; accepted 3 September 2010.