

## Short communication

## Ticks on humans in the Pantanal wetlands, Brazil

Vanessa N. Ramos<sup>a</sup>, Carolina F. Osava<sup>a</sup>, Ubiratan Piovezan<sup>b</sup>, Matias P.J. Szabó<sup>a,\*</sup><sup>a</sup> Laboratório de Ixodologia, Faculdade de Medicina Veterinária, Universidade Federal de Uberlândia, Uberlândia, MG, Brazil<sup>b</sup> Empresa Brasileira de Pesquisa Agropecuária (Embrapa) Pantanal, Corumbá, MS, Brazil

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## ABSTRACT

Information on ticks biting humans in Brazil is very restricted. In fact, many times when human tick-borne diseases are diagnosed, the involved vector tick is not identified, although this may be clinically helpful. Pantanal is one of the world's largest floodplains, has an exuberant wildlife, and is place of extensive cattle ranching, ecotourism, and fishing. We herein report tick species found on humans in a 13-month survey in a region with both cattle and wildlife handling in the Brazilian Pantanal. From February 2012 to February 2013, a total of 280 ticks was collected from humans ( $n=22$ ), 121 of which were attached. *Amblyomma cajennense* sensu lato nymphs were the main tick species and stage found attached to humans ( $n=93$ ) especially during the dry months (winter). In the wet season (summer), *Amblyomma parvum* adults were the main ticks found attached to humans ( $n=19$ ) followed by *A. cajennense* s.l. adults ( $n=9$ ). Only one unattached nymph of *A. parvum* was collected in this study. These results reinforce that *A. cajennense* s.l. nymphs are an important parasite of humans (and vectors) in Brazil and draw also attention to *A. parvum* adults as frequent human parasites as well.

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## Introduction

Knowledge on ticks biting animals, on their biology and ecology in various biomes is continuously increasing in Brazil. On the other hand, information about ticks biting humans lags far behind. In fact, many times when human tick-borne diseases are diagnosed, the vector tick species is not identified. At the same time, various tick-borne agents are transmitted by specific tick species and identifying them is clinically helpful. Thus, awareness of the most important tick species biting humans in various regions may have diagnostic and preventive value.

Another important issue in this regard is the increasing contact of humans in Brazil with green areas. The human population seeks for green areas to live, for leisure, to work, or rest. Furthermore, preservation and reconstitution of natural areas is constant in the national policy agenda. Therefore, contact of humans with ticks within both anthropized and natural areas is by now enhanced.

Pantanal is one of the world largest floodplains and is famous for its unique abundance of conspicuous wildlife. At the same time, it is both place for extensive cattle ranching, ecotourism, and fishing. The tick *Amblyomma cajennense* has been reported as the most

abundant tick in Pantanal (Campos Pereira et al., 2000). It must be highlighted, that, throughout its wide range, from northern Argentina to the southernmost part of the U.S., what formerly was known as *A. cajennense* is in fact a complex of 6 species with distinct habitat associations (Beati et al., 2013). Hence, *Amblyomma cajennense* sensu lato is the generic denomination for ticks from this complex. Ticks from this work belong geographically to the eastern clade genotype encompassing populations from the Cerrado biome, the Brazilian savannah (Beati et al., 2013). These populations are vector of the human pathogen *Rickettsia rickettsii* in south-eastern Brazil (Labruna, 2009), but neither disease nor human bites by this tick species were ever reported in Pantanal. We herein report human-tick contact in an area of Pantanal to evaluate risks and potential for disease transmission as well as to add to the knowledge of human tick-bites in this ecosystem in Brazil.

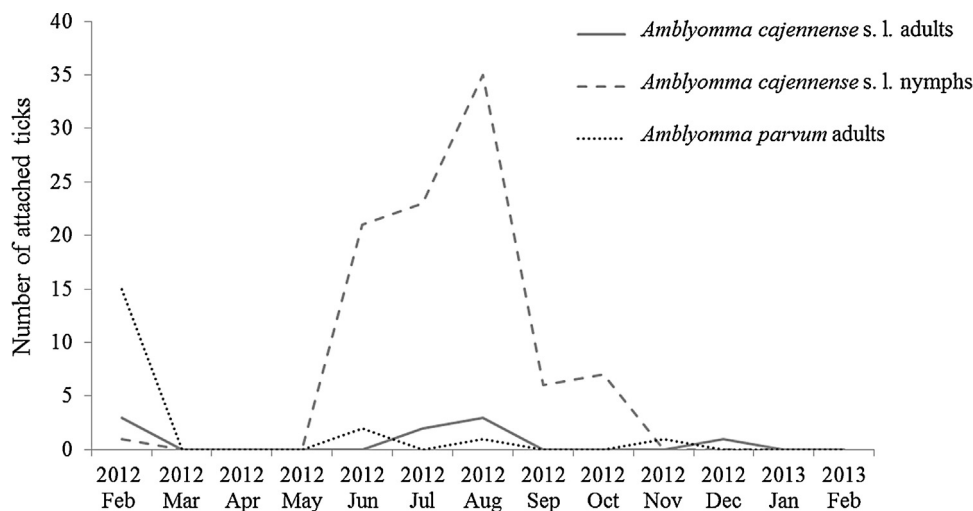
## Material and methods

## Study location and time

Ticks on human beings were collected for 13 months (February 2012 to February 2013) in Nhecolândia subregion of Pantanal, at the Nhumirim Farm, Corumbá Municipality, Mato Grosso do Sul State, Brazil (18°59'15"S; 56°37'03"W). This farm belongs to Empresa Brasileira de Pesquisa Agropecuária (Embrapa) Pantanal, a national research and development agency, with several research projects

\* Corresponding author at: Universidade Federal de Uberlândia, Faculdade de Medicina Veterinária, Av. Pará, 1720/Campus Umuarama-Bloco 2T, 38400-902 Uberlândia, MG, Brazil.

E-mail addresses: [szabo@famev.ufu.br](mailto:szabo@famev.ufu.br), [matias.szabo@gmail.com](mailto:matias.szabo@gmail.com) (M.P.J. Szabó).



**Fig. 1.** Seasonal distribution of *Amblyomma cajennense* and *Amblyomma parvum* ticks that attached to humans ( $n = 22$ ) in the Brazilian Pantanal, Corumbá Municipality, Mato Grosso do Sul State, from February 2012 to February 2013.

on wild animals and cattle. The climate in Nhecolândia is hot (mean temperature 25.8 °C that may be as high as 40 °C in summer and close to 0 °C in winter), with a pronounced dry season from May to September and a rainy season from October to April (Junk et al., 2006).

#### Sample collection

Samples were collected from humans that had fortuitous contact with ticks during their routine activities. Targets included researchers, students, and farm employees who had access to natural areas, wild animals, and livestock. Collected ticks were grouped in monthly samples per individual host. Whether ticks were firmly attached to the skin or just crawling on the surface of clothes was also recorded.

#### Tick identification

Ticks were identified according to dichotomous keys by Martins et al. (2010) and Onófrío et al. (2006). Voucher specimens of the ticks were deposited in the Federal University of Uberlândia's tick collection (CC-FAMEV/UFU, as accessions 632–636).

#### Results

A total of 280 ticks (and 2 larval clusters) was recorded on humans (70 monthly samples from 22 different persons) at the Nhumirim farm (Table 1). From these, 121 ticks (28 adults, 93 nymphs) and 1 larval cluster were attached and 159 ticks (62 adults and 97 nymphs) and 1 larval cluster were just crawling on hosts.

**Table 1**  
Ticks attached or crawling on 22 humans in the Brazilian Pantanal (Nhumirim Farm, Corumbá, Mato Grosso do Sul State) from February 2012 to February 2013.

Species	Stage	Attached	Non-attached	Total
<i>Amblyomma cajennense</i>	Males	5	6	11
	Females	4	8	12
	Nymphs	93	97	190
<i>Amblyomma parvum</i>	Males	10	22	32
	Females	9	26	35
Total		121	159	280

Only 2 tick species were recorded on humans: *Amblyomma cajennense* s.l. (213 specimens, 102 attached) and *Amblyomma parvum* (67 specimens, 19 attached). *Amblyomma cajennense* s.l. nymphs were the most prevalent human biters (76.9% of all tick bites and 91.2% of all *A. cajennense* s.l. bites) followed by *A. parvum* adults (15.7% of all and 100% from *A. parvum* bites). Only one nymph of *A. parvum* was found, and it was crawling on the host surface (not shown in Table 1). Nymphs were collected only in the dry months (May to October), mainly from July to September, and nymphal bites (attached ticks) presented a peak in August (Fig. 1). The number of adult ticks recovered from humans was higher in the wet season, especially in February, but some specimens were also collected during the dry months. Human tick bites presented a distinct seasonal pattern according to species, with dominance of nymphs of *A. cajennense* s.l. in the dry season and adults of *A. parvum* in the wet season (Fig. 1).

#### Discussion

Ticks known to prevail on animals and in the environment in the region of our survey in Pantanal (Campos Pereira et al., 2000; Ramos, 2013) were the same crawling on and biting people. Discerning ticks that attached to humans from those only crawling was important to discriminate accidental physical contact from true parasitism. In fact, even though tick samples were obtained from personnel that had visited various phytophysionomies of natural areas and had contact with several wild animal species and livestock, only 2 tick species, *A. cajennense* s.l. and *A. parvum*, were recorded biting or crawling on them. This is in contrast with the broader tick fauna described in the same area before, with at least 8 different species found on wild animals (Campos Pereira et al., 2000). The low number of tick species on humans may be explained by lack of contact (ticks seeking for hosts at sites or microenvironments not visited or reached by humans in our survey), lack of attraction of human hosts for several of the local tick species, and/or tick populations of some species too small to ensure tick-human encounter.

Both tick species, *A. cajennense* s.l. and *A. parvum*, were recorded on humans before. In fact, *A. cajennense* s.l. seems to be a tick species frequently biting humans in Brazil (Guglielmone et al., 2006). *Amblyomma cajennense* s.l. is a 3-host tick species and is associated to hosts such as horses and capybaras in south-eastern Brazil which feed the more host-specific adult stages as well (Labruna

et al., 2002; Heijden et al., 2005). A previous survey in the same region of our study in the Pantanal showed that it was also the most prevalent tick species and found on a wide array of wild animals (Campos Pereira et al., 2000).

The other tick species, *A. parvum*, had also been described on humans, albeit less frequently (Guglielmone et al., 2006; Szabó et al., 2007). This tick species also bites regularly several wild animal species in this region of Pantanal and elsewhere in Brazil (Campos Pereira et al., 2000; Szabó et al., 2007). Pathogen transmission by this tick species was never recorded, although a *Rickettsia* species of unknown pathogenicity and *Coxiella burnetii*, the agent of Q fever, were detected in *A. parvum* ticks from Argentina (Pacheco et al., 2007, 2013).

We did not find any *Ornithodoros rostratus* on humans in our survey, a tick species responsible for painful and hemorrhagic bites in humans in the same region (Ribeiro et al., 2013). In this regard, we speculate that people from our samplings did not go to sites where this tick occurs and/or that with all stages feeding fast, for only minutes according to a laboratory evaluation (Ribeiro et al., 2013), probability to find it on a host was lower. Whatever the case, some importance of *O. rostratus* in the study region cannot be ruled out, and this highlights that also other tick species might be relevant human biters at specific sites of Pantanal.

Nymphs were found only in the dry season (winter), whereas adults over the whole year. However, adults had a distinct peak in the wet season (in summer). These observations are according to the known seasonal pattern of occurrence of *A. cajennense* s.l. in south-eastern Brazil (Labruna et al., 2002). Seasonality of *A. parvum* has not been described in Brazil, but the peak of *A. parvum* adults found on humans in summer suggests that the life cycle of *A. parvum* is also under seasonal influence in the Brazilian Pantanal.

Overall, our observations show that in Nhecolândia region of Pantanal humans are bitten very frequently by *A. cajennense* s.l. nymphs with a clear seasonal peak in winter. Complementarily, in summer, human bites by *A. parvum* adults prevail. An important feature of *A. parvum* is that it is a tiny brown species and its scutum lacks ornamentation. For this reason, adults may be mistaken at a first sight for nymphs from other *Amblyomma* species or adults of other small brown ticks such as *Rhipicephalus sanguineus* and thus its prevalence on both humans and animals may be underestimated. In this regard, it was interesting to note that adults of *A. parvum* are highly anthropophilic prevailing over *A. cajennense* s.l. adults in the rainy season. Thus, *A. parvum* is a species that should be closely monitored for pathogen transmission as well.

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