

First report of *Amblyomma latepunctatum* and the second record of *Ixodes luciae* in the state of Acre, Brazil

Primeiro relato de *Amblyomma latepunctatum* e o segundo registro de *Ixodes luciae* no estado do Acre, Brasil

Simone Delgado Tojal^{1,2*} ; Dionatas Ulises de Oliveira Meneguetti^{2,3}; Thiago Fernandes Martins⁴; Marcelo Bahia Labruna⁴; André de Abreu Rangel Aguirre⁵; Emilly Amanda Mesquita Siebra⁶; Karoline Silva da Cruz³; Luís Marcelo Aranha Camargo^{3,7,8,9,10}

¹ Programa de Pós-graduação em Ciências da Saúde, Universidade Federal São João del-Rei – UFSJ, Divinópolis, MG, Brasil

² Colégio de Aplicação, Universidade Federal do Acre – UFAC, Rio Branco, AC, Brasil

³ Programa de Pós-graduação em Ciências da Saúde na Amazônia Ocidental, Universidade Federal do Acre – UFAC, Rio Branco, AC, Brasil

⁴ Faculdade de Medicina Veterinária e Zootecnia – FMVZ, Universidade de São Paulo – USP, São Paulo, SP, Brasil

⁵ Fundação Oswaldo Cruz – Fiocruz Rondônia, Porto Velho, RO, Brasil

⁶ Programa de Iniciação Científica, Universidade Federal do Acre – UFAC, Rio Branco, AC, Brasil

⁷ Instituto de Ciências Biomédicas – ICB5, Universidade de São Paulo – USP, Monte Negro, RO, Brasil

⁸ Instituto Nacional de Epidemiologia da Amazônia Ocidental – INCT-EpiAmO, Porto Velho, RO, Brasil

⁹ Centro de Pesquisas em Medicina Tropical – CEPem, Porto Velho, RO, Brasil

¹⁰ Departamento de Medicina, Centro Universitário São Lucas – UniSL, Porto Velho, RO, Brasil

How to cite: Tojal SD, Meneguetti DUO, Martins TF, Labruna MB, Aguirre AAR, Siebra EAM, et al. First report of *Amblyomma latepunctatum* and the second record of *Ixodes luciae* in the state of Acre, Brazil. *Braz J Vet Parasitol* 2021; 30(3): e007221. <https://doi.org/10.1590/S1984-29612021063>

Abstract

The state of Acre is in the western part of the Brazilian Amazon region and few studies involving ticks are available. The aim of the present study was to provide the first report of occurrence of *Amblyomma latepunctatum* and the second record of *Ixodes luciae* in Acre. Ticks were collected in October 2020 inside an open forested area in the municipality of Rio Branco, the state capital of Acre. Ixodid ticks were identified according to their external morphological characteristics. Three specimens were found on the vegetation by means of a visual search and were identified as *Amblyomma scalpturatum* (one male and one female) and *Amblyomma latepunctatum* (one male). Another specimen was found parasitizing a *Didelphis marsupialis* female that was caught using a Tomahawk trap; this was identified as *Ixodes luciae* (one male). This first report of *A. latepunctatum* in the state of Acre increases the number of species recorded here to 22. In addition, presence of *I. luciae* is confirmed in this state (second record), in the western Brazilian Amazon region.

Keywords: Ixodidae, Amazon, parasitism, opossum.

Resumo

O estado do Acre está localizado na Amazônia ocidental brasileira e apresenta poucos estudos envolvendo carrapatos. O presente estudo objetivou relatar, pela primeira vez, a ocorrência da espécie *Amblyomma latepunctatum* e o segundo registro de *Ixodes luciae* no estado do Acre, Brasil. A coleta de carrapatos foi realizada em outubro de 2020 no interior de uma floresta aberta no município de Rio Branco, capital do estado do Acre. Carrapatos ixodídeos foram identificados de acordo com suas características morfológicas externas. Três espécimes foram encontrados sobre a vegetação pelo método de inspeção visual e identificados como as espécies *Amblyomma scalpturatum* (um macho e uma fêmea) e *Amblyomma latepunctatum* (um macho); e outro foi encontrado parasitando uma fêmea de *Didelphis marsupialis* que foi capturada por uma armadilha Tomahawk, e identificado como *Ixodes luciae* (um macho). Este primeiro relato de *A. latepunctatum* no estado do Acre aumenta o número de espécies registradas aqui para 22. Além disso, a presença de *I. luciae* é confirmada no estado do Acre (segundo registro), na região da Amazônia ocidental brasileira.

Palavras-chave: Ixodidae, Amazônia, parasitismo, gambá.

Received April 16, 2021. Accepted June 15, 2021.

*Corresponding author: Simone Delgado Tojal. E-mail: sytotal@gmail.com



This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Amblyomma latepunctatum was originally described by Tonelli-Rondelli (1939) through examining two females deposited in the Museo Zoologico, Università Degli Studi de Firenze, Florença, Italy (Onofrio, 2007). Aragão & Fonseca (1953) relegated *A. latepunctatum* to a synonym of *Amblyomma sculpturatum* Neumann, 1906 and this remained the situation until Labruna et al. (2005a) redescribed the adult stages of these species based on morphological and molecular analyses, and confirmed *A. latepunctatum* as a valid species.

Currently, the geographical distribution of this ixodid species is in South America, with reports from Peru, Ecuador, Venezuela, Guiana (published as British Guyana), Brazil (Labruna et al., 2005a) and, most recently, French Guiana (Binetruy et al., 2019). In Brazil, it was previously reported in the states of Amazonas (Labruna et al., 2005a; Gianizella et al., 2018), Rondônia and Pará, all in the northern region of this country (Labruna et al., 2005a, b).

The adult stages of *A. latepunctatum* seem to show specificity of parasitism for *Tapirus terrestris* (tapirs), since they are frequently found on these mammals (Binetruy et al., 2019; Gianizella et al., 2018; Labruna et al., 2005a, b, 2010). The nymph stage of *A. latepunctatum* has already been reported parasitizing *Tayassu pecari* (peccaries) in Brazil (Gianizella et al., 2018) and Peru (Labruna et al., 2010); and *Dasyprocta fuliginosa* (agoutis), *Didelphis marsupialis* (opossums) (Guglielmone et al., 2014; Gianizella et al., 2018) and *Hydrochoerus hydrochaeris* (capybaras) in Brazil (Martins et al., 2014).

Although Labruna et al. (2005a) reported that they encountered adults of *A. latepunctatum* “crawling” on humans, the first record of adult ticks of this species feeding on humans was made by Gianizella et al. (2018) in the state of Amazonas, Brazil. Presence of its immature stages parasitizing humans was reported in French Guiana by Binetruy et al. (2019), whose larval stage of *A. latepunctatum* had not been reported yet (Guglielmone et al., 2014).

The state of Acre is one of the Brazilian states in which few studies on ticks have been conducted. Its ixodid fauna currently consists of 21 species (Tojal et al., 2020). In the present study, the presence of *A. latepunctatum* in the state of Acre was shown for the first time, along with a second record of *Ixodes luciae*.

In 2020, ticks were collected along animal trails inside an open forested area in the municipality of Rio Branco (10°00'48.4" S 68°14'31.5" W), the capital of the state of Acre (northern Brazil) (Figure 1A, B), in the western part of the Amazon region (Tojal et al., 2020). During one of these collections, in October 2020, were realized the visual search method in the search for ticks (Terassini et al., 2010) and Tomahawk traps for capturing animals, using corn, bacon and ground peanut candy (paçoca) as bait. After tick collection, the animal specimen was released in the same place where it had been caught.

The tick specimens were collected with permission from the Chico Mendes Institute for Biodiversity Conservation (ICMBio), under license number 69.943-4; and with permission from the Ethics Committee for Animal Use of the Federal University of Acre (UFAC), under protocol 36/2019.

The tick specimens thus collected were placed in plastic tubes containing absolute ethyl alcohol and were taken to the Tropical Medicine Laboratory (LABMEDT) of the Federal University of Acre, to be identified and stored under refrigeration at -20 °C, Subsequently, they were sent to the Coleção Nacional de Carrapatos Danilo Gonçalves Saraiva,

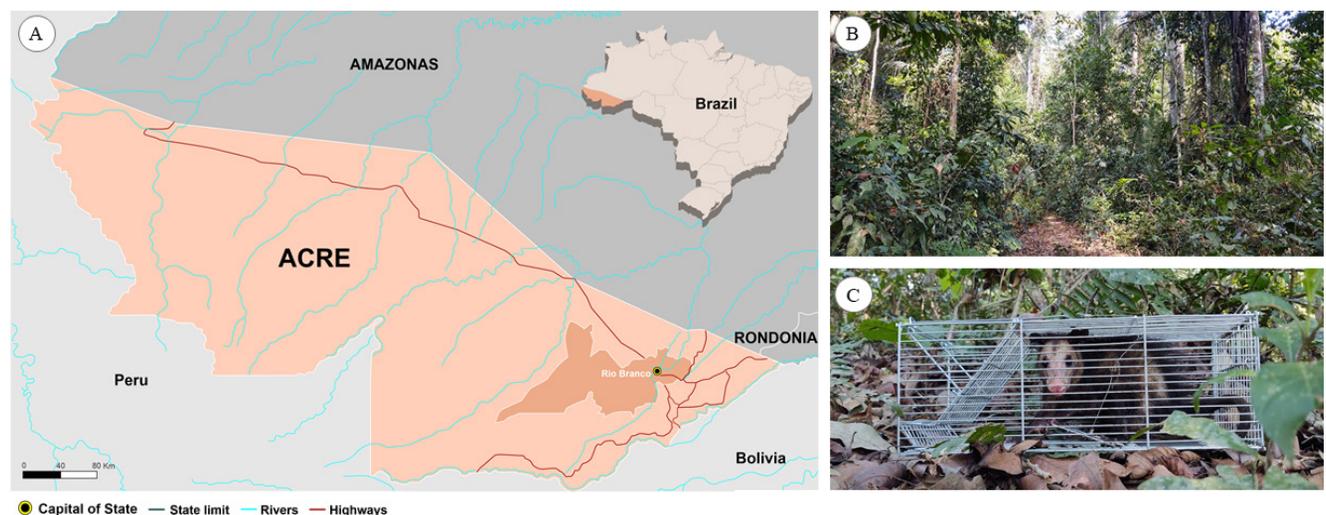


Figure 1. (A) Map of Rio Branco, Acre; (B) Trail in open forest; *Didelphis marsupialis* (C).

at the University of São Paulo (CNC-FMVZ/USP). The specimens were identified under a Leica M205 stereoscope, using the dichotomous keys for adult ticks of Onofrio et al. (2006, 2010) and redescriptions by Labruna et al. (2005a).

Three adult specimens of ixodid ticks, comprising two males (M) and one female (F), were found at heights of 70 cm (M) and 55 cm (F) above ground level, on vegetation (adaxial position). Another male was found feeding on a female of the *Didelphis marsupialis* opossum (Mammalia: Didelphimorphia), which is known in that region as “mucura” (Figure 1C). One tick was observed, attached to its skin, so we decided to collect it with the aid of tweezers, directly from the host still imprisoned.

The male specimens were morphologically identified as *Amblyomma latepunctatum* Tonelli-Rondelli, 1939 (Figure 2A, B), and *Amblyomma scalpturatum* Neumann, 1906, and the female also as *A. scalpturatum*. The specimen collected from the opossum was identified as *Ixodes luciae* Sénevet, 1940 (Figure 2C, D).

The male of *A. latepunctatum* that was collected on the vegetation presented the diagnosis described by Labruna et al. (2005a) for this species, especially the presence of deep punctations throughout the scutum and the absence of brown elevations without punctations. In contrast, males of *A. scalpturatum* and *Amblyomma incisum* Neumann, 1906 have elevations without punctations in the scutum (Labruna et al., 2005a). Another characteristic that was observed in the specimen of this study was the presence of chitinous blades incised in all festoons, characteristic that can be confused with the species *A. incisum* (Labruna et al., 2005a). In this regard, in a review on the tick species of the state of Acre, Lima et al. (2018) suggested that there was a need to confirm the species *A. incisum*, which may have been confused with the species *A. latepunctatum* and *A. scalpturatum*. As so, *A. incisum* had only been reported once, by Aragão (1936), through examining the material in the Ixodid Collection of the Oswaldo Cruz Institute. About *A. scalpturatum* was confirmed by Aguirre et al. (2019) through morphological and molecular analyses (subjected to sequencing of the ITS2 gene). Now, through the present study, occurrence of the species *A. latepunctatum* in the state of Acre has been confirmed.

These findings of *A. latepunctatum* and *A. scalpturatum* in the same environment and presenting ambush behavior at the edges of leaves, at a height equivalent to that of their main host (tapirs), confirm what Labruna et al. (2005a) reported. They considered the species *A. latepunctatum*, *A. scalpturatum* and *A. incisum* (northern group) to be sympatric in the Amazon region. This had already been observed in studies in the state of Rondônia (Labruna et al., 2005a). This also suggests that in the future it will be possible to confirm the presence of *A. incisum* (northern group) in the state of Acre.

The finding of occurrence of *A. latepunctatum* in Acre expands the geographical distribution of this species in the Amazon biome and in Brazilian territory, where it had previously been described in the states of Amazonas, Rondônia and Pará (Labruna et al., 2005a). This also demonstrates that this species is not restricted to dense

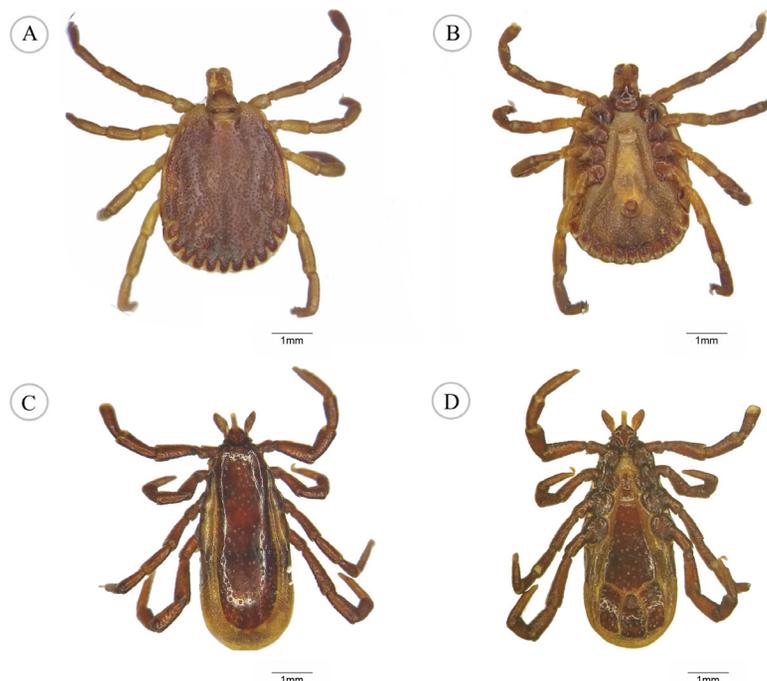


Figure 2. (A, B) *Amblyomma latepunctatum* male; (C, D) *Ixodes luciae* male.

forest, as in the study conducted by Labruna et al. (2005a), but can also be found on vegetation that allows light to penetrate to the understory layer of an open forested (Silveira et al., 2008), which is a characteristic of our study area.

Less is known about the population of the tick *A. latepunctatum* than about the populations of the other two sympatric species. Therefore, more information needs to be gathered, such as in relation to its life cycle dynamics, seasonality in this region, presence of immature stages in the hosts and its vector capacity for infectious agents. It is important to mention that *A. latepunctatum* is a tick species that bite humans (Gianizella et al., 2018). It is closely related to *A. scalpturatum*, which has been found infected with *Rickettsia amblyommatis* (spotted fever group - SFG) in the Amazon biome (Colle et al., 2020).

A thorough investigation of genotypes of the genus *Rickettsia* found in ticks collected in French Guiana yielded three *Rickettsia* strains that were present in all *A. latepunctatum* tick samples (Binetruy et al., 2020). The analyses revealed that two of these strains were related to the *Rickettsia* species in the SFG and that the other was the species *Rickettsia bellii* (Binetruy et al., 2020). However, further studies are needed in order to elucidate whether *A. latepunctatum* might have the capacity to become infected with a pathogenic *Rickettsia* species.

The species *I. luciae*, which was found parasitizing *D. marsupialis*, is widely distributed from southern Mexico to Argentina and the Caribbean islands (Díaz et al., 2009), in the following countries: Argentina, Bolivia, Peru, Brazil, Ecuador, Colombia, Venezuela, Surinam, French Guiana, Costa Rica, Guatemala, Belize, Honduras, Mexico, Nicaragua, Panama and Trinidad and Tobago (Labruna et al., 2009; Onofrio et al., 2010).

Morphological examination of the *I. luciae* male found in this study showed that this species had larger scutal punctations (Figure 2C) and a longer external spur on coxa I (Figure 2D). These characteristics distinguish it from other, closely related *Ixodes* species (*Ixodes loricatus*, *Ixodes schulzei* and *Ixodes amarali*) (Onofrio et al., 2010).

The main aspects of the ecology of *I. luciae* are basically unknown (Díaz et al., 2009), but it has frequently been mentioned in the literature that its adult stage is primarily found on marsupials and that the immature stages parasitize small marsupials and rodents (Labruna et al., 2005b, 2009). A study conducted in the Peruvian Amazon region demonstrated that in the natural cycle of *I. luciae*, the nymphal stage of this species parasitizes rodents, while knowledge of the preferred hosts of the larval stage still seems to be uncertain (Díaz et al., 2009).

There is no evidence that this species should be considered to be a vector for humans (Díaz et al., 2009). However, given that infection by *R. bellii* in *I. luciae* has been confirmed in French Guiana (Binetruy et al., 2020) and that there is one record of females of *I. luciae* parasitizing humans in Argentina (Ivancovich & Luciani, 1992), special attention should be paid to this tick species as a possible vector of potentially pathogenic agents.

Ixodes luciae has been reported in Brazil in the following states: Acre, Amazonas, Mato Grosso do Sul, Pará and Rondônia (Onofrio et al., 2010; Lima et al., 2018). In Acre, adults of *I. luciae* were found to be present at CNC-FMVZ/USP, which resulted in the first report of this species in the state (Guglielmone et al., 2011; Lima et al., 2018). The present *in situ* finding confirms the presence of the species *I. luciae* in Acre.

Thus, the present study provides the first report of the species *A. latepunctatum* in the state of Acre and confirms the presence of the species *I. luciae*. This finding of *A. latepunctatum* in Acre increases the ixodid fauna of the state to a total of 22 species.

Acknowledgements

This study was supported by the National Epidemiological Institute of the Western Amazon Region (Instituto Nacional de Epidemiologia na Amazônia Ocidental, INCT-EpiAmO), National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico, CNPq) and Pro-Rectorate for Research and Postgraduation (Pró-Reitoria de Pesquisa e Pós-Graduação) of the Federal University of Acre (UFAC).

References

- Aragão HB. Ixodidas brasileiros e de alguns países limítrofes. *Mem Inst Oswaldo Cruz* 1936; 31(4): 759-843. <http://dx.doi.org/10.1590/S0074-02761936000400004>.
- Aragão HB, Fonseca F. Notas de Ixodologia: V - a propósito da validade de algumas espécies do gênero *Amblyomma* do continente americano (Acari: ixodidae). *Mem Inst Oswaldo Cruz* 1953; 51: 485-492. <http://dx.doi.org/10.1590/S0074-02761953000100014>.
- Aguirre AAR, Rodrigues VS, Costa IN, Garcia MV, Csordas BG, Andreotti R, et al. *Amblyomma scalpturatum* Neumann, 1906 (Acari: Ixodidae): confirmation in Acre State, Brazil, and description of parasitism in a human. *Braz J Vet Parasitol* 2019; 28(3): 473-478.

- Binetruy F, Buysse M, Barosi R, Duron O. Novel *Rickettsia* genotypes in ticks in French Guiana, South America. *Sci Rep* 2020; 10(1): 2537. <http://dx.doi.org/10.1038/s41598-020-59488-0>. PMID:32054909.
- Binetruy F, Chevillon C, Thoisy B, Garnier S, Duron O. Survey of ticks in French Guiana. *Ticks Tick Borne Dis* 2019; 10(1): 77-85. <http://dx.doi.org/10.1016/j.ttbdis.2018.09.003>. PMID:30224310.
- Colle AC, Mendonça RFB, Maia MO, Freitas LC, Martins TF, Muñoz-Leal S, et al. Rickettsial survey and ticks infesting small mammals from the Amazon forest in midwestern Brazil. *Syst Appl Acarol* 2020; 25(1): 78-91. <http://dx.doi.org/10.11158/saa.25.1.6>.
- Díaz MM, Nava S, Guglielmone AA. The parasitism of *Ixodes luciae* (Acari: Ixodidae) on marsupials and rodents in Peruvian Amazon. *Acta Amazon* 2009; 39(4): 997-1002. <http://dx.doi.org/10.1590/S0044-59672009000400029>.
- Gianizella SL, Martins TF, Onofrio VC, Aguiar NO, Gravena W, Nascimento CAR, et al. Ticks (Acari: Ixodidae) of the state of Amazonas, Brazil. *Exp Appl Acarol* 2018; 74(2): 177-183. <http://dx.doi.org/10.1007/s10493-018-0221-7>. PMID:29383533.
- Guglielmone AA, Nava S, Díaz MM. Relationships of South American marsupials (Didelphimorphia, Microbiotheria and Paucituberculata) and hard ticks (Acari: Ixodidae) with distribution of four species of *Ixodes*. *Zootaxa* 2011; 3086(1): 1-30. <http://dx.doi.org/10.11646/zootaxa.3086.1.1>.
- Guglielmone AA, Robbins RG, Apanaskevich DA, Petney TN, Estrada-Peña A, Horak IG. Individual Species Accounts. In: Guglielmone AA, Robbins RG, Apanaskevich DA, Petney TN, Estrada-Peña A, Horak IG, editors. *The Hard Ticks of the World*. Dordrecht: Springer; 2014. p. 377-526. http://dx.doi.org/10.1007/978-94-007-7497-1_7.
- Ivancovich JC, Luciani CA. *Las garrapatas de Argentina*. Buenos Aires: Monografías de la Asociación Argentina de Parasitología Veterinaria; 1992.
- Labruna MB, Keirans JE, Camargo LMA, Ribeiro AF, Soares RM, Camargo EP. *Amblyomma latepunctatum*, a valid tick species (Acari: Ixodidae) long misidentified with both *Amblyomma incisum* and *Amblyomma scalpturatum*. *J Parasitol* 2005a; 91(3): 527-541. <http://dx.doi.org/10.1645/GE-446R>. PMID:16108543.
- Labruna MB, Camargo LM, Terrassini FA, Ferreira F, Schumaker TS, Camargo EP. Ticks (Acari: Ixodidae) from the state of Rondônia, western Amazon, Brazil. *Syst Appl Acarol* 2005b; 10(1): 17-32.
- Labruna MB, Cabrera RR, Pinter A. Life cycle of *Ixodes luciae* (Acari: Ixodidae) in the laboratory. *Parasitol Res* 2009; 105(6): 1749-1753. <http://dx.doi.org/10.1007/s00436-009-1621-8>. PMID:19756745.
- Labruna MB, Romero M, Martins TF, Tobler M, Ferreira F. Ticks of the genus *Amblyomma* (Acari: Ixodidae) infesting tapirs (*Tapirus terrestris*) and Peccaries (*Tayassu pecari*) in Peru. *Syst Appl Acarol* 2010; 15(2): 109-112. <http://dx.doi.org/10.11158/saa.15.2.3>.
- Lima MA, Martins TF, Muñoz-Leal S, Guilherme E, Ogrzewalska M, Labruna MB. Ticks and tick-associated spotted fever group *Rickettsia* from birds in the Southwestern Brazilian Amazon. *Rev Colomb Cienc Pecu* 2018; 31(1): 26-35. <http://dx.doi.org/10.17533/udea.rccp.v31n1a04>.
- Martins TF, Venzal JM, Terrassini FA, Costa FB, Marcili A, Camargo LMA, et al. New tick records from the state of Rondônia, western Amazon, Brazil. *Exp Appl Acarol* 2014; 62(1): 121-128. <http://dx.doi.org/10.1007/s10493-013-9724-4>. PMID:23975565.
- Onofrio VC, Labruna MB, Faccini JLH, Barros-Battesti DM. Description of immature stages and redescription of adults of *Ixodes luciae* sémévet (Acari: ixodidae). *Zootaxa* 2010; 2495(1): 53-64. <http://dx.doi.org/10.11646/zootaxa.2495.1.2>.
- Onofrio VC, Labruna MB, Pinter A, Giacomini FG, Barros-Battesti DM. Comentários e chaves para as espécies do gênero *Amblyomma*. In: Barros-Battesti DM, Arzua M, Bechara GH, editors. *Carrapatos de importância médico-veterinária da Região Neotropical: um guia ilustrado para identificação de espécies*. São Paulo: Vox/ICTTD-3/Butantan; 2006. p. 53-113.
- Onofrio VC. *Revisão do gênero Amblyomma Koch, 1844 (Acari: Ixodidae) no Brasil* [thesis]. Rio de Janeiro: Universidade Federal Rural do Rio de Janeiro; 2007.
- Silveira M, Daly DC, Salimon CI, Wadt PGS, Amaral EF, Pereira MG, et al. Ambientes físicos e coberturas vegetais do Acre. In: Daly DC, Silveira M, editors. *Primeiro catálogo da flora do Acre, Brasil*. Rio Branco: Edufac; 2008. p. 36-46.
- Terrassini FA, Barbieri FS, Albuquerque S, Szabó MPJ, Camargo LMA, Labruna MB. Comparison of two methods for collecting free-living ticks in the Amazonian forest. *Ticks Tick Borne Dis* 2010; 1(4): 194-196. <http://dx.doi.org/10.1016/j.ttbdis.2010.08.002>. PMID:21771528.
- Tonelli-Rondelli M. Ixodoidea. Parte II - contributo alla conoscenza della fauna ixodologica Sud-Americana. *Riv Parassitol* 1939; 3: 39-55.
- Tojal SD, Martins TF, Meneguetti DUO, Costa IN, Labruna MB, Cruz KS, et al. Carrapatos do Estado do Acre e sua Infecção por *Rickettsia* spp.: uma revisão e perspectivas para estudos futuros. In: Silveira M, Silva E, Lima RA, editors. *Biodiversidade e biotecnologia no Brasil 1*. Rio Branco: Stricto Sensu; 2020. p. 68-90.