Notes on population dynamics of Amblyomma ticks (Acari: ixodidae) in Brazil

Journal of Parasitology, Lancaster, v. 95, n. 4, p. 1016-1018, 2009
http://producao.usp.br/handle/BDPI/1953

Downloaded from: Biblioteca Digital da Produção Intelectual - BDPI, Universidade de São Paulo
Notes on Population Dynamics of Amblyomma Ticks (Acari: Ixodidae) in Brazil

M. B. Labruna, F. A. Terassini1, and L. M. A. Camargo1
Department of Preventive Veterinary Medicine and Animal Health, Faculty of Veterinary Medicine, University of Sao Paulo, Sao Paulo, 05508-270, Brazil; *University of Sao Paulo, Monte Negro, Rondonia, Brazil, and Sao Lucas Faculty, Porto Velho, Rondonia. e-mail: labrunausp.br

ABSTRACT: Previous population dynamics data, generated for Amblyomma parvum Aragao and Amblyomma cajennense (Fabricius) in Argentina and southeastern Brazil, have indicated that these ticks complete 1 generation per year, with larvae predominating in autumn, nymphs in winter, and mostly adults during spring and summer. The present study reports population dynamics data for free-living Amblyomma spp. ticks in northern Brazil (Amazon forest, latitude 10° S, 63° W), and for Amblyomma spp. ticks collected on birds in southeastern Brazil (latitude 23° S, 45° W). In northern Brazil, adult ticks predominated from mid-spring to mid-autumn, larvae predominated in early winter, and nymphs from mid-winter to mid-spring. Seven Amblyomma spp. were identified, although A. cajennense predominated in 1 of the 2 sites sampled. In southeastern Brazil, larval infestations on birds peaked in autumn, followed by a nymphal infestation peak in late winter. At least 32% and 75% of these larvae and nymphs, respectively, were identified as Amblyomma longirostre (Koch). Similar to previous work, the present study showed that Amblyomma spp. larvae and nymphs predominated during autumn–winter months, and mostly adults during spring–summer months, a pattern compatible with 1 generation/yr, even at latitude 10° S in northern Brazil.

Amblyomma is currently composed of 127 species of ticks distributed in tropical and subtropical areas of the world, especially in the Neotropical region, where about half of the world’s Amblyomma species occur (Balashov, 1994; Horak et al., 2002; Guglielmone et al., 2003). In South America, only a minority of Amblyomma species have been studied with respect to their population dynamics. These include investigations on Amblyomma cajennense (Fabricius) in Argentina and southeastern Brazil (Guglielmone et al., 1990; Mangold et al., 1994; Souza and Serra-Freire, 1994; Oliveira et al., 2000; Labruna, Kasai et al., 2002; Oliveira et al., 2003) and Amblyomma parvum Aragao in Argentina (Nava et al., 2008). Data generated in these studies have shown similar seasonal distribution, characterized by larval predominating in autumn (April to June), nymphs in winter (July to September), and mostly adults during spring and summer (October to March). This pattern has indicated that A. cajennense and A. parvum complete 1 generation/yr in the areas where they were studied.

The present study aimed to report population dynamics data for Amblyomma ticks in 2 regions of Brazil. In one region, the western Brazilian Amazon (state of Rondonia), we report data for free-living ticks collected monthly in 2 areas from February 2001 to May 2002. Data on these ticks have been collected, with respect to species composition, as part of an extensive study on the tick fauna of Rondonia, but without any seasonal distribution record (Labruna et al., 2005). In southeastern Brazil (state of Sao Paulo), we report data of ticks collected from birds examined monthly from January 1997 to December 2000. Data on these ticks have been reported, with regard to tick and host species names, as part of an extensive study on ticks infesting wild birds in Sao Paulo, but without any seasonal distribution record (Labruna et al., 2007).

In the state of Rondonia, free-living ticks were collected monthly at the Amorim Farm (10°38' S, 63°31' W), from February 2001 to May 2002, and in the headwaters of Jamari River (10°18' S, 63°14' W), from April 2001 to May 2002. These 2 sites are composed primarily of Amazon forest and are not occupied by domestic animals or humans (Labruna et al., 2005). Ticks were collected by visual inspection on vegetation, and by flagging by 2 collectors, covering a distance of 900 m each month. In the state of Sao Paulo, ticks were collected from birds captured by mist netting in a forested area in Taubate (23°01' S, 45°33' W) from 1997 to 2000 (Labruna et al., 2007).

Adult ticks were identified to species using current taxonomic keys and morphological descriptions. Immature stages of most of the Amblyomma species from Brazil remain undescribed; therefore, some of the immature ticks collected in the present study were successfully reared to the adult stage under laboratory conditions, as previously described (Labruna, Paula et al., 2002), in order to obtain the species identification. An exception was the nymph of Amblyomma longirostre (Koch), which was easily identified by the elongate scutum and pointed hypostome (Labruna et al., 2007).

All ticks collected in the present study were species of Amblyomma. At the Amorim Farm, adult ticks predominated from February to May, 2001 (summer and early autumn) and from December 2001 to May 2002 (late spring, summer, and mid-autumn). Between these 2 adult major periods, larvae predominated in July 2001 (early winter), followed by a higher peak in September 2001 (late winter), whereas nymphs predominated from August to November 2001 (mid-winter to mid-spring) (Fig. 1A). Seven Amblyomma spp. were identified, although A. cajennense comprised 61.3% of the adults collected and 96.9% of the nymphs that were identified to species (Table I). At the headwaters of the Jamari River, mostly adult ticks predominated from November 2001 to May 2002 (mid-spring, summer, and mid-autumn); larvae predominated in July 2001 (early winter), whereas nymphs predominated on peaks in September to October 2001 (late winter to early spring) (Fig. 1B). Nymphs also predominated in a smaller peak from May to June 2001 (mid- to late autumn). Six Amblyomma spp. were identified, but no single species comprised most of the adults or nymphs (Table I).

In Taubate, only larvae (196 specimens) and nymphs (55 specimens) were collected from birds (mostly Passeriformes; see bird species names i et al., 2007), with a marked predominance of larvae from March to August (major peaks from May to July; mid-autumn to early winter), and nymphs predominated from September to December (major peak in September; late winter). No larvae or nymphs were found on birds in January and February (summer) (Fig. 2). In total, 62 larvae (32%) and 41 nymphs (75%) were identified as A. longirostre; the remaining larvae died before the nymphal stage and were regarded as Amblyomma spp., whereas 5 nymphs were identified as Amblyomma calcaratum Neumann. Adults of A. longirostre were not expected to be collected on birds, since they feed primarily on porcupines (Labruna et al., 2007). Similar to previous studies with A. cajennense and A. parvum in southeastern Brazil and Argentina, (Guglielmone et al., 1990; Mangold et al., 1994; Souza and Serra-Freire, 1994; Oliveira et al., 2000; Labruna, Kasai et al., 2002; Oliveira et al., 2003; Nava et al., 2008), the present study showed that Amblyomma spp. larvae and nymphs predominated during autumn–winter months and adults mostly during spring–summer months, a pattern compatible with 1 generation/yr. The vast majority of ticks collected at Amorim Farm and Taubate were A. cajennense and A. longirostre, respectively, indicating that at least these 2 species complete 1 generation/yr in northern and southeastern Brazil, respectively. At the headwaters of the Jamari River, there was not a predominance of any tick species because different species were collected in high numbers for adults or nymphs, but a similar distribution pattern for whole adults, larvae, and nymphs also indicated that at least some of these species complete 1 generation/yr. On the other hand, it is possible that one, or more, Amblyomma species have a different seasonal pattern, as suggested by a nymphal peak in May 2001, before the larval peak in July 2001 and the highest nymphal peak in September 2001. At the headwaters of the Jamari River (Fig. 1B), and to a lesser extent at the Amorim Farm (Fig. 1B), substantial numbers of adult ticks are found year-round, including during larval and nymphal peaks. This distribution could be related to prolonged survivorship of unfed adult ticks inside the rainforest, where wildlife density is usually low, or could also be affected by a diapause, which is yet to be determined.

Labruna et al. (2003) showed that the 1-yr generation pattern of A. cajennense in Pirassununga, southeastern Brazil (21°59' S, 47°25' W) is controlled primarily by larval behavioral diapause during summer, i.e., larvae hatched during spring–summer (October to March) do not host-seek until April (early autumn), when the number of daylight hours drop below 12, and mean temperature drops to below 20 C. Possibly, this kind

DOE: 10.1645/GE-1878.1
of behavioral diapause also occurs with A. parvum in northern Argentina, as Nava et al. (2008) showed that field-collected ticks developed no morphogenetic diapause in different photoperiods under laboratory conditions. Interestingly, our data from Amorim Farm suggest that A. cajennense completes 1 generation/yr even at latitude 10°S, where daylight and temperature ranges are much lower throughout the year.

In most parts of the southern latitudes of South America, autumn–winter is dry and cool–cold, whereas spring–summer is rainy and warm–hot (Silvestri et al., 2008). The 1-yr generation pattern of *Amblyomma* spp. ticks in South America, with larvae and nymphs mostly active during autumn–winter and adults during spring–summer, seems to be an adaptive behavior to these seasonal changes. This behavior synchronizes egg incubation to always occur during the spring–summer months, when higher temperatures decrease the egg incubation period and higher moisture (also provided by more abundant vegetal cover on the soil) increases egg hatchability. This higher moisture condition during the spring–summer months also provides suitable conditions for larvae in diapause.

The population dynamics reported in the present study seem to be the most common for South American *Amblyomma* spp. ticks. However, several other patterns have also been reported, as is the case of *Amblyomma neumanni* Ribaga in northern Argentina, for which a 3-yr life cycle with summer diapause has been suggested, with all active stages occurring during autumn–winter mo (Guglielmone et al., 1990; Mangold et al., 1994). Additionally, different populational dynamics have also been reported for *Amblyomma dubitatum* Neumann in Brazil and *Amblyomma trivittatum* Koch in Brazil and Uruguay (Szabo et al., 2007; Venzal et al., 2008). These 2 tick species are typical of marsh areas, where moisture variations during the year are indeed different from the above-high-water-level soils.

This work was supported by FAPESP and CNPq (Brazil).

**LITERATURE CITED**


---

**TABLE 1.** Species identification of free-living ticks collected in two sites in northern Brazil, in Amorim Farm from February 2001 to May 2002 and in the headwaters of the Jamari River from April 2001 to May 2002.

<table>
<thead>
<tr>
<th>Tick species</th>
<th>Amorim Farm</th>
<th></th>
<th>Headwaters of Jamari River</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adults</td>
<td>Nymphs*</td>
<td>Adults</td>
<td>Nymphs*</td>
</tr>
<tr>
<td><em>Amblyomma cajennense</em></td>
<td>288</td>
<td>308</td>
<td>61.3</td>
<td>96.9</td>
</tr>
<tr>
<td>A. ovale</td>
<td>87</td>
<td>0</td>
<td>18.5</td>
<td>0.0</td>
</tr>
<tr>
<td>A. scapulatum</td>
<td>45</td>
<td>2</td>
<td>9.6</td>
<td>0.0</td>
</tr>
<tr>
<td>A. japonense</td>
<td>20</td>
<td>1</td>
<td>4.3</td>
<td>0.0</td>
</tr>
<tr>
<td>A. latepunctatum</td>
<td>17</td>
<td>0</td>
<td>3.6</td>
<td>0.0</td>
</tr>
<tr>
<td>A. oblongoguttatum</td>
<td>11</td>
<td>4</td>
<td>2.3</td>
<td>1.2</td>
</tr>
<tr>
<td>A. coelebs</td>
<td>2</td>
<td>0</td>
<td>0.4</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>470</td>
<td>318</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* Refers to nymphs that were reared to the adult stage in the laboratory.

---

**FIGURE 2.** Population dynamics of *Amblyomma* spp. larvae and nymphs infesting wild birds in Taubaté, southeastern Brazil. Data are presented as mean number of ticks collected/month during 4 yr (1997–2000).
the State of Rondônia, western Amazon, Brazil. Systematic and Applied Acarology 10: 17–32.


