

**Aspects of the ecology of *Amblyomma argentiniae*
Neumann, 1904 [= *Amblyomma testudinis* (Conil, 1877)]
(Acari: Ixodidae)**

A.A. GUGLIELMONE¹, C.A. LUCIANI² & A.J. MANGOLD¹

¹ Instituto Nacional de Tecnología Agropecuaria, Estación Experimental Agropecuaria Rafaela, CC 22, CP 2300 Rafaela (Santa Fe), Argentina; e-mail: aguglielmone@inta.gov.ar

² Estación Experimental Agropecuaria Colonia Benítez, CC 114, 3900 Resistencia, Chaco, Argentina

Abstract

Collections of *Amblyomma argentiniae* Neumann, 1904 [= *Amblyomma testudinis* (Conil, 1877)] in Argentina are discussed in the context of phytogeographic domains (Andean Patagonic, Amazonian and Chaco) and hosts. The seasonal distribution of adult ticks is depicted on a monthly basis. Two major Argentinean tick collections house a total of 448 *A. argentiniae* (147 females, 281 males, 10 nymphs and 10 larvae). Most ticks were collected in relatively dry areas of the Chaco domain. The great majority of *A. argentiniae* were removed from *Chelonoidis chilensis* (Gray, 1870), although some specimens were from other Reptilia: *Boa constrictor occidentalis* Philippi, 1873, *Eunectes notaeus* Cope, 1862, *Crotalus terrificus* (Laurenti, 1768), *Bothrops* Wagler in Spix, 1824 spp., and *Phrynops* Wagler, 1830 spp. (2 females). Additionally, 2 females and 4 males were from *Bufo* Laurenti, 1768 spp. Collection data revealed that adults of *A. argentiniae* are present in low numbers during winter months, when their principal hosts are largely inactive. No clear preference for any other season was observed. The geographical distribution of *A. argentiniae* matches that of its chief host, *C. chilensis*. This host is increasingly at risk of extinction in its southern (Argentinean) range, which may also endanger *A. argentiniae* in this region.

Key words: *Amblyomma argentiniae*, Argentina, ecology, phytogeographical distribution, seasonal distribution

Introduction

Amblyomma testudinis is considered a valid taxon by Keirans (1992), while Camicas *et al.* (1998) treat *A. testudinis* as a synonym of *Amblyomma argentiniae*. The male and female of *A. testudinis* were accurately described by Conil (1877) under the name *Ixodes testudinis*, and Lahille (1905) correctly placed this tick species in the genus *Amblyomma*. However, Oudemans (1939) noted that the name *I. testudinis* had been preoccupied by Leydig (1855), who used it for a tick species that is a junior synonym of *Hyalomma aegyptium* (Linneus, 1758) (Delpy, 1949; Santos Dias, 1961; Camicas *et al.*, 1998). Neumann (1904) described *A. argentiniae* as a new species although it was later realised by Barbará & Dios (1918) that his description matched that of Conil (1877) for *I. testudinis*. Barbará & Dios (1918) considered *A. argentiniae* to be a synonym of *A. testudinis*, a view that has been followed up to the present time. Most authors cited below use the name *A. testudinis* to refer to *A. argentiniae*. Therefore, we emphasize that the correct name for this tick species is *A. argentiniae*.

Amblyomma argentiniae is considered to be strictly specific to reptiles (Hoogstraal & Aeschlimann 1981). Most collections of this tick have been made in Argentina (Conil 1877, Neumann 1904, Lahille 1905, Barbará & Dios 1918, Dios & Knopoff 1930, Aragão 1938, Boero 1945, Ivancovich 1973, Kuhne *et al.* 1986, Richard & Guglielmone 1988 a, Ivancovich & Luciani 1992, Guglielmone & Viñabal 1994). However, there are also records of this species from Chile (Olialquaga Fauré 1951), and Lehmann *et al.* (1969) studied specimens of *A. argentiniae* that may have been collected outside Argentina (Peru near Iquitos?). Alleged records of *A. argentiniae* from Cuba (Santos Dias 1958 a, under the name *Amblyomma cubanum* Schulze, 1941 and

Aponomma thumbi Schulze, 1941) and Surinam (Santos Dias 1958 b) actually refer to *Amblyomma dissimile* Koch, 1844 (Cerný 1969; Estrada Peña & Castellá 1994; Camicas *et al.* 1998). Vogelsang and Cordero (1940) described the occurrence of *A. argentiniae* in Venezuela, but their finding was not confirmed by Jones *et al.* (1972). As well, De La Cruz (1976) tentatively identified a male tick found on *Corallus enydris cooki* Gray, 1872, from Venezuela as *A. argentiniae*. The United States National Tick Collection contains specimens of *A. argentiniae* from Argentina and Chile only (J.E. Keirans, personal communication). It appears that this tick species is largely restricted to southern South America.

The first biological study of *A. argentiniae* was conducted by Lahille (1905). Lehmann *et al.* (1969) observed that 190 days were needed to complete a generation when ticks were maintained at 27°C. These authors found that laboratory-reared *A. argentiniae* nymphs and adults fed only on reptiles and amphibians, but larvae would also feed on homeothermal hosts. Schneider *et al.* (1971) showed that repeated infestations on the same host induced an immunological response that inhibited tick growth. Lehmann *et al.* (1971) studied the phototaxis, thermotaxis, geotaxis and chemotaxis of *A. argentiniae*. Lahille (1905) described some morphological aspects of the larva, but Estrada Peña *et al.* (1993) described this stage in detail and concluded on the basis of larval morphology that *A. argentiniae* is a primitive *Amblyomma*. The nymph of this species was described by Neumann (1904).

Little information exists on the ecology of *A. argentiniae*. Guglielmo and Viñabal (1994) reported that this tick is found in the Chaco phytogeographic domain within Argentina, and Richard and Guglielmo (1988 b) stated that *A. argentiniae* parasitizes *Chelonoidis chilensis* (Gray, 1870) but not the parapatric *Chelonoidis donosobarrosi* Freiberg, 1973. According to Cei (1993), *C. chilensis* is increasingly at risk of extinction, especially in the southern portion of its range, which includes Argentina. Herein we discuss some aspects of the ecology of *A. argentiniae* in relation to the phytogeography of continental northern and central Argentina, as well as this ticks hosts and seasonal distribution.

Materials & methods

Most tick specimens used in this study were from the collections of the Instituto Nacional de Tecnología Agropecuaria, Estación Experimental Agropecuaria (INTA) Rafaela and INTA Colonia Benítez. Eleven additional collection sites for *A. argentinae* described by Lahille (1905), Dios y Knopoff (1930), Aragão (1938), Boero (1945, 1954) and Richard and Guglielmone (1988a) were included in order to depict the geographical distribution of this tick species. Ticks were identified using the key to the *Amblyomma* of the Western Hemisphere by Jones *et al.* (1972) and a subsequent work by Estrada Peña *et al.* (1993).

The seasonal distribution of adult stages reflects the number of ticks collected on a monthly basis, and here again the records of the INTA Rafaela tick collection were used. Since these records do not include the total number of hosts examined for ticks, no inferences could be drawn concerning mean tick abundance on hosts.

Collection sites were plotted against the main phytogeographic regions of continental Argentina north to 40° S (Fig. 1), as compiled by Ragonese (1967), Cabrera (1976) and Neumann R.A. (Departamento de Recursos Naturales, EEA INTA Salta, CC 228, CP 4400, Salta, Argentina, unpublished). Three phytogeographic domains are present in this area:

I Andean Patagonian: characterized by annual rainfall below 350 mm. Frost may occur throughout the year with snow during the winter. The dominant vegetation consists of scattered steppe-inhabiting shrubs and grasses.

II Amazonian: characterized by annual rainfall ranges between 900 and 2500 mm. The climate is hot and humid, and the dominant vegetation is rainforest.

III Chaco: divided into four phytogeographic provinces:

1 Chaco: hot, with mostly summer rains, ranging from 500 to more than 1,000 mm per year, and decreasing from east to west. This region is characterized by trees of the genus *Schinopsis* Engler, 1876.

2 Monte: hot and dry, with annual rainfall below 200 mm. The dominant vegetation consists of xerophytic, psammophytic and halophytic bushes.

3 Espinal: with a hot, humid climate in the north, but temperate and less humid elsewhere. Rainfall occurs chiefly in summer, ranging from 400 to 1,000 mm yearly. Bushes of the genus *Prosopis* Linnaeus, 1767, constitute the dominant vegetation.

4 Pampeana: temperate, with more frequent rains in autumn and spring, the yearly totals ranging from 600 to 1,000 mm. Depending on rainfall, grasslands are dominant in the east and steppes in the west.

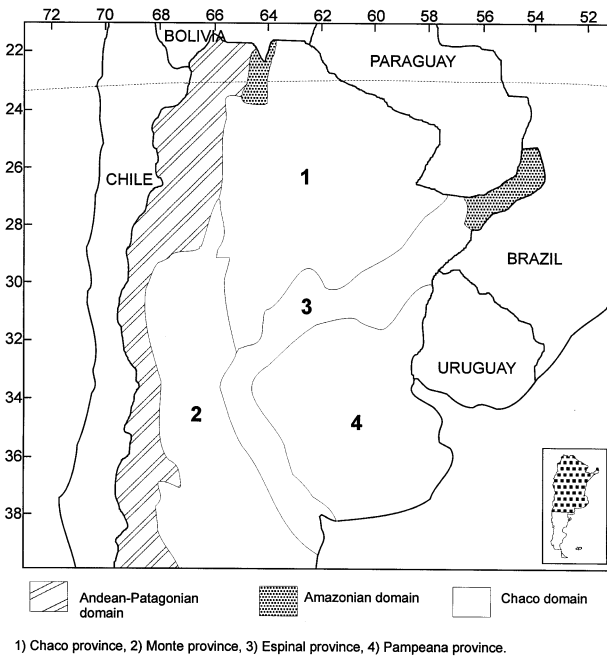


FIGURE 1. Phytogeographical division of continental Argentina north of 40° S (compiled from Ragonese, 1967; Cabrera, 1976 and Neumann, unpublished)

Results

A total of 448 *A. argentinae* were found in both tick collections, including 428 adults (147 females and 281 males), 10 nymphs and 10 larvae. All ticks were collected in the Chaco phytogeographic domain (Fig. 2). Ticks were concentrated in relatively dry areas of Chaco province and in the dry province of Monte. The great majority of *A. argentinae* were found on *C. chilensis* (126 females, 231 males, 9 nymphs, 10 larvae). Some specimens were found on other Reptilia: *Boa constrictor occidentalis* Philippi, 1873 (11 females, 36 males), *Eunectes notaus* Cope, 1862 (4 females, 1 male), *Crotalus terrificus* (Laurenti, 1768) (2 females, 1 male, 1 nymph), *Bothrops* Wagler in Spix, 1824 spp. (2 males), and *Phrynops* Wagler, 1830 spp. (2 females). Additionally, 2 females and 4 males were found on the amphibian *Bufo* Laurenti, 1768 spp.

Monthly totals of *A. argentinae* were low during winter months, but beyond this no clear evidence of tick seasonality emerges from our data (Fig. 3).

Discussion

Almost 99% of our specimens of *A. argentinae* were recovered from Reptilia, the remainder having been collected from Amphibia. Lehmann *et al.* (1969) were able to breed *A. argentinae* on toads. These findings may defy the concept of strict total specificity of this tick species to Reptilia (Hoogstraal & Aeschlimann 1982). However, it is uncertain whether parasitism of amphibians contributes to maintenance of *A. argentinae* populations in nature or merely represents spillover onto ecologically associated hosts. Regardless, *A. argentinae* appears to be strongly dependent on the presence of *C. chilensis*, and its abundance in nature probably reflects the population dynamics of its principal tortoise host. Were *C. chilensis* to become extinct, *A. argentinae* would almost certainly share its fate.

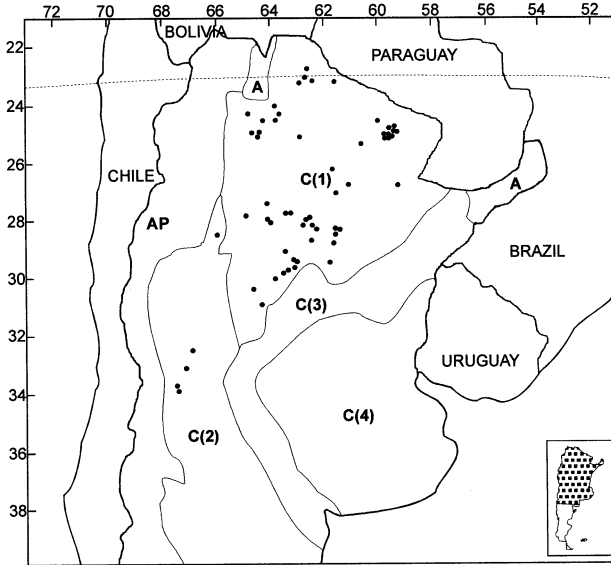


FIGURE 2. Geographical distribution of *Amblyomma argentiniae* (2) in Argentina. AP: Andean Patagonian domain, A: Amazonian domain, C: Chaco domain: C (1): Chaco province, C (2): Monte province, C (3): Espinal province, C (4): Pampeana province.

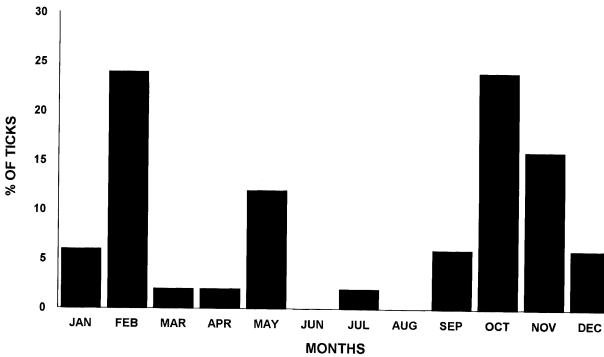


FIGURE 3. Monthly occurrence of adult *Amblyomma argentiniae* on their hosts.

All the collections of *A. argentinae* that we have examined were from sites in the hot and relatively dry Chaco phytogeographic domain. This ecogeographical distribution of *A. argentinae* closely matches that of *C. chilensis* within Argentina, according to Cei (1993). Thus, climate per se may play only a minor role in regulating populations of *A. argentinae* within the range of *C. chilensis*.

Our data for seasonal distribution reveal no consistent pattern other than a decreased presence of *A. argentinae* during winter months. Such winter figures probably reflect the reduced activity of tortoises at this time, and it is uncertain whether they represent genuine lows in tick parasitism. The occurrence of parasites on their hosts can often be described by the negative binomial distribution (Poulin 1993). However, it is quite possible that collectors of *A. argentinae* biased their samples by removing ticks chiefly from heavily infested tortoises. Therefore, our February and October infestation peaks may simply be artifacts of collecting rather than evidence of true seasonality. We have recorded a maximum 71 *A. argentinae* adults from a female *C. chilensis* (Richard & Guglielmone 1988 a). Obviously, additional studies are needed to describe the seasonal and host dynamics of this tick species.

Males of *A. argentinae* were more abundant than female ticks on their hosts. This was also noted by Lahille (1905), who found that male ticks remained on their hosts after the detachment of engorged females. A similar abundance of *H. aegyptium* males has recently been observed on the Russian spur thighed tortoise (*Testudo graeca nikolskii* Chkhikvadze & Tuniev, 1986) (Robbins *et al.* 1998).

Acknowledgements

We are grateful to J. Ivancovich, who collected many *A. argentinae* specimens and maintained the tick collection of INTA Colonia Benítez. We acknowledge the collaboration of D. Aguirre, E. Camna, C. Caparrós, M. Humacata, J. Iglesias, G. Khune (late), J. Manfrino (late), E. Spath, J. Vaschuk and A. Viñabal for sending tick samples to the tick collections. We are also grateful to V. Sapino and L. Franco for their collaboration in drawing the maps reproduced herein.

References

- Aragão, H. de B. (1938) Nota sobre ixodídeos de República Argentina. *Memórias do Instituto Oswaldo Cruz*, 33, 319-327.
- Barbará, R. & Dios, R.L. (1918) Contribución al estudio de la sistemática y biología de los Ixodidae de la República Argentina y de algunos países vecinos. *Revista del Instituto Bacteriológico del Departamento Nacional de Higiene*, 1, 285-322.
- Boero, J.J. (1945) Los ixodoideos de la República Argentina. *Revista de Medicina Veterinaria (Buenos Aires)*, 26, 1-10.
- Boero, J.J. (1954) Los ixodoideos de la República Argentina y sus huéspedes. *Revista de la Facultad de Agronomía y Veterinaria*, 12, 505-514.
- Cabrera, A.L. (1976) *Regiones fitogeográficas argentinas. 2ª edición*. Buenos Aires, Editorial ACME, 73 pp.
- Camicas, J.L., Hervy, J.P., Adam, F. & Morel, P.C. (1998) *Les tiques du monde. Nomenclature, stades décrits, hôtes, répartition (Acarida, Ixodida)*. Paris, Orstom, 233 pp.
- Cei, J.M. (1993) Reptiles del noroeste, nordeste y este de la Argentina. Herpetofauna de las selvas subtropicales, puna y pampas. *Monografie Museu Regionale di Scienze Naturalli Torino*, 14, 949 pp.
- Cerný, V. (1969) The tick fauna of Cuba. *Folia Parasitologica*, 16, 279-284.
- Conil, P.A. (1877). Description d'une nouvelle espèce d'ixode. *Ixodes testudinis*. *Actas de la Academia Nacional de Ciencias Exactas*, 3, 25-37.
- De La Cruz, J. (1976) Segundo hallazgo de la garrapata *Amblyomma testudinis* (Conil, 1877) (Acarina: Ixodidae) en Venezuela. *Miscelánea Zoológica*, (5), 1.
- Delpy, L.P. (1949). Essai critique de synonymie du genre *Hyalomma* C.L. Koch 1844 depuis Linné, 1758. *Annales de Parasitologie Humaine et Comparée*, 24, 464-494.
- Dios, R.L. & Knopoff, R. (1930) Sobre Ixodoidea de la República Argentina. *Revista de la Sociedad Argentina de Biología*, 6, 359-412.
- Estrada Peña, A. & Castella, J. (1994) Check list of the species of ticks (Ixodoidea). Part II. Genera *Amblyomma*, *Anomalohimalaya*, *Aponomma*, *Boophilus*, *Hyalomma*, *Margaropus*, *Palpoboophilus*, *Rhipicentor* and *Uroboophilus*. *Documents de Travail de l'Institut Royal des Sciences Naturelles de Belgique*, (76), 1-117.

- Estrada Peña, A., Guglielmone, A.A., Mangold, A.J. & Castella, J. (1993) A description of *Amblyomma tigrinum* Koch, *A. neumanni* Ribaga and *A. testudinis* (Conil) immatures (Acarina: Ixodidae). *Folia Parasitologica*, 40, 147-153.
- Guglielmone, A.A. & Viñabal, A.E. (1994) Claves morfológicas dicotómicas e información ecológica para la identificación de las garrapatas del género *Amblyomma* Koch, 1844 de la Argentina. *Revista de Investigaciones Agropecuarias*, 25, 39-67.
- Hoogstraal, H. & Aeschlimann, A. (1982) Tick host specificity. *Bulletin de la Société Entomologique Suisse*, 55, 5-32.
- Ivancovich, J.C. (1973) Las garrapatas del Chaco y Formosa. *Revista de Investigaciones Agropecuarias, Serie 4, Patología Animal*, 10, 9-24.
- Ivancovich, J.C. & Luciani, C.A. (1992) Las garrapatas de la Argentina. *Sociedad Argentina de Parasitología Veterinaria, Documento de Trabajo*, 135 pp.
- Jones, E.K., Clifford, C.M., Keirans, J.E. & Kohls, G.M. (1972) The ticks of Venezuela (Acarina: Ixodoidea) with a key to the species of *Amblyomma* in the Western Hemisphere. *Brigham Young University Science Bulletin, Biological Series*, 17, 1-40.
- Keirans, J.E. (1992) Systematics of the Ixodida (Argasidae, Ixodidae, Nutalliellidae): an overview and some problems. In Fivaz, B, Petney, T. & Horak, I (eds.) *Tick vector biology. Medical and veterinary aspects*. Springer Verlag, Berlin, pp 1-21.
- Kühne, G.I., Guglielmone, A.A. & Mangold, A.J. (1986) Parásitos diagnosticados en el decenio 1976-1985 en la Unidad Regional de Investigación en Sanidad Animal del Noroeste Argentino. II. Artrópodos. *Revista de Investigaciones Agropecuarias*, 21, 81-86.
- Lahille, F. (1905) Contribution a l'étude des ixodidés de la République Argentina. *Anales del Ministerio de Agricultura, Sección de Zootecnia, Bacteriología, Veterinaria y Zoología*, 2, 1-166.
- Lehmann, H.D., Roth, B. & Schneider, C.C. (1969) Die Zecke *Amblyomma testudinis* (Conil 1877), ihre Entwicklung und ihre Wirkung auf den Wirt. *Zeitschrift für Tropenmedizin und Parasitologie*, 20, 247-259.
- Lehmann, H.D., Roth, B. & Schneider, C.C. (1971) Einige Befunde zur Sinesphysiologie, der Kalblüterzecke *Amblyomma testudinis*. *Zeitschrift für Parasitenkunde*, 36, 169-178.

- Leydig, F. (1855) Zum feineren Bau der Arthropoden. *Archiv für Anatomie, Physiologie und Wissenschaftliche Medizin*, pp. 376-480.
- Neumann, L.G. (1904) Notes sur les ixodidés. III. *Archives de Parasitologie*, 9, 225-241.
- Oliarquaga Fauré, G. (1951) Tres garrapatas de Chile. *Agricultura Técnica*, 10, 55.
- Oudemans, A.C. (1939) Neue Funde auf dem Gebiete der Systematik und der Nomenklatur der Acari. VI. *Zoologische Anzeiger*, 127, 75-80.
- Poulin, R. (1993) The disparity between observed and uniform distributions: a new look at parasite aggregation. *International Journal for Parasitology*, 23, 937-944.
- Ragonese, A. (1967) *Vegetación y ganadería en la República Argentina*. Buenos Aires, INTA, 218 pp.
- Richard, E. & Guglielmone, A.A. (1988 a) Primera cita y distribución geográfica de *Amblyomma testudinis* (Conil) (Acari: Ixodidae) para la provincia de Mendoza (República Argentina). *Boletín de la Sociedad Herpetológica Argentina*, 4, 12.
- Richard, E. & Guglielmone, A.A. (1988 b) Análisis preliminar de la relación entre el parásito *Amblyomma testudinis* (Acari: Ixodidae) y las tortugas del complejo *chilensis* (Chelonii: Testudinae). I. Importancia en la discriminación específica de *Chelonoides chilensis* y *Chelonoides donosobarrosi*. *Boletín de la Sociedad Herpetológica Argentina*, 4, 12.
- Robbins, R.G., Karesh, W.B., Calle, P.P., Leontyeva, O.A., Pereshkolnik, S.L. & Rosenberg, S. (1998) First records of *Hyalomma aegyptium* (Acari: Ixodida: Ixodidae) from the Russian spur thighed tortoise, *Testudo graeca nikolskii*, with an analysis of tick population dynamics. *The Journal of Parasitology*, 84, 1303-1305.
- Santos Dias, J.A.T. (1958 a) Notas ixodológicas. IV. Estudo de alguns espécimes - tipo de Schulze em coleção no Museu de Hamburgo. *Memórias e Estudos Museu Zoológico da Universidade de Coimbra*, (250), 1-15.
- Santos Dias, J.A.T. (1958 b) Notas ixodológicas . V. Acerca de alguns ixodídeos do Museu do Hamburgo. *Memórias e Estudos Museu Zoológico da Universidade de Coimbra*. (253), 1-32.
- Santos Dias, J.A.T. (1961). Mais alguns ixodídeos do Museu de Hamburgo. *Anais dos Serviços Veterinários de Moçambique* (1955-1959), (7), 229-235.

- Schneider, C.C., Roth, B. & Lehmann, H.D. (1971) Untersuchungen zum Parasit-Wirt-Verhältnis der Zecke *Amblyomma testudinis*. *Zeitschrift für Tropenmedizin und Parasitologie*, 22, 1-17.
- Vogelsang, E.G. & Cordero, E.H. (1940) Las garrapatas (Ixodidae) de Venezuela. *Revista de Medicina Veterinaria y Parasitología*, 12, 63-69

Accepted: 20 May 2001

Published: 20 June 2001

Copyright 2001 Systematic & Applied Acarology Society

This paper is online at: www.nhm.ac.uk/hosted_sites/acarology/saas/saasp.html