



Original article

The ticks (Acari: Ixodida: Argasidae, Ixodidae) of Bolivia

Mariano Mastropaolo^{a,b}, L. Fabián Beltrán-Saavedra^c, Alberto A. Guglielmono^{d,*}^a Comparative Tropical Medicine and Parasitology, Ludwig-Maximilians-Universität München, Leopoldstr. 5, 80802 Munich, Germany^b Cátedra de Parasitología y Enfermedades Parasitarias, Facultad de Ciencias Veterinarias, Universidad Nacional del Litoral, Kreder 2805, CP 3080 Esperanza, Santa Fe, Argentina^c Investigador Asociado: Invertebrados, Colección Boliviana de Fauna, Museo Nacional de Historia Natural, Instituto de Ecología, Casilla 8706, La Paz, Bolivia^d Instituto Nacional de Tecnología Agropecuaria, Estación Experimental Agropecuaria Rafaela & Consejo Nacional de Investigaciones Científicas y Técnicas, CC 22, CP 2300 Rafaela, Argentina

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ABSTRACT

The tick species reported in Bolivia are reviewed here as (1) endemic or established: *Ornithodoros echimys*, *O. guaporensis*, *O. hasei*, *O. kohlsi*, *O. mimon*, *O. peropteryx*, *O. rostratus*, *Otobius megnini*, *Amblyomma auricularium*, *A. cajennense*, *A. calcaratum*, *A. coelebs*, *A. dubitatum*, *A. humerale*, *A. incisum*, *A. longirostre*, *A. naponense*, *A. nodosum*, *A. oblongoguttatum*, *A. ovale*, *A. parvitarsum*, *A. parvum*, *A. pecarium*, *A. pseudoconcolor*, *A. rotundatum*, *A. scalpturatum*, *A. tigrinum*, *A. triste*, *Dermacentor nitens*, *Haemaphysalis juxtakochi*, *H. leporispalustris*, *I. boliviensis*, *I. cooleyi*, *I. luciae*, *Rhipicephalus microplus*, *R. sanguineus*, and (2) erroneously reported: *Ornithodoros puertoricensis*, *O. talaje*, *O. turicata*, *Amblyomma americanum*, *A. maculatum*, *A. multipunctum*, *Ixodes ricinus*, *I. scapularis*, *Rhipicephalus annulatus*. Many of these records are lacking locality and/or host, and some of them need new findings for confirmation. Some of the species recorded may represent a threat for human and animal health, therefore would be of great value to make a countrywide survey of ticks in order to update the information presented in this work.

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Introduction

Ticks (order Ixodida, superfamily Ixodoidea) are obligatory haematophagous ectoparasites in some or all of their postembryonic stages, infesting all classes of tetrapods. Several species are vectors of agents that may cause disease and even kill their hosts; they may also cause dermatoses, loss of blood, and can inoculate toxins. Most research of ticks from the Zoogeographic Neotropical Region has been focused on species of importance to livestock or important as vector of human diseases (Guglielmono et al., 2003a).

Bolivia is currently a land-locked country with animal husbandry as an important part of its economy. Bolivia is also characterized by a great diversity of climatic conditions, and conversely a diverse autochthonous fauna, but the only comprehensive review of Bolivian ticks being that of Payno Balazans (1978). Recently, collections of Bolivian ticks have permitted the current critical review of the country's tick fauna. New data on hosts and distribution that may be useful to assess the importance of ticks on human and animal health is presented thereafter.

Materials and methods

The phylogenies followed in this review were those of Barker and Murrell (2002) for Ixodidae and of Hoogstraal (1985) for the argasid ticks. Although there has been a more recent review of the taxonomy of Argasidae (Klompen and Oliver, 1993), we follow Estrada-Peña et al. (2010) who found that the new taxonomy has no obvious improvement when compared to that of Hoogstraal (1985).

This review is based on unpublished records of ticks deposited in the Colección Boliviana de Fauna (CBF), La Paz, Bolivia, and the tick collection of the Instituto Nacional de Tecnología Agropecuaria (INTA) at Rafaela, Argentina, plus a thorough appraisal of the scientific literature. Tick stages found on hosts or in the environment are detailed; anytime that the words "adult ticks" is used, the sex of the mentioned ticks is unknown. Whenever appropriate, the recorded names of mammalian hosts have been changed to follow those in Wilson and Reeder (2005) and Dunnun and Salazar-Bravo (2010a,b) for mammals in general and Rodentia: Caviinae in particular, respectively.

The tick fauna of Bolivia is discussed under 2 major headings: (1) endemic or established tick species and (2) species erroneously recorded for Bolivia. Records of ticks with no species definition are also included under the first heading. Remarks on tick families and genera are not included because these were treated in González-Acuña and Guglielmono (2005). Unless specifically stated, the

* Corresponding author at: Instituto Nacional de Tecnología Agropecuaria, Estación Experimental Agropecuaria Rafaela & Consejo Nacional de Investigaciones Científicas y Técnicas, CC 22, CP 2300 - Rafaela, Argentina
Tel.: +54 3492 440121 int 128; Fax: +54 3492 440114.

E-mail address: aguglielmono@rafaela.inta.gov.ar (A.A. Guglielmono).

known world distribution of each species follows Guglielmone et al. (2003a).

The collection localities according to each Bolivian department for each tick species are listed in the text and in Table 1. The coordinates from many “unnamed localities” are the result of an approximate approach by the authors taking the maps of Bolivian tick distribution in Payno Balazans (1978).

According to Ibisch and Mérida (2003), biogeography of Bolivia comprises 3 main regions: Tierras Bajas (TB), the vertiente Oriental Andina (OA), and the Cordilleras altas y el Altiplano (CA&AP). Following the criteria of Morrone (2006), the territory of TB is divided in Chaco and Pantanal. We adopt this division for comparison with similar studies in this region (Guglielmone and Nava, 2005; Nava et al., 2007a).

Included in TB Pantanal are the Bosques del Sudoeste de la Amazonía, Cerrado (paceño and beniano), Sabanas Inundables, and Bosque seco Chiquitano, comprising the departments of Beni and Pando and parts of Cochabamba and Santa Cruz. It is characterized by an annual rainfall of 1000–7000 mm, mean annual temperatures between 23 and 28 °C, and a landscape of mountains with deep valleys, slabs, evergreen woodlands in gullies, hills, alluvial terraces, plains and amazonic flatlands, savannas, and rain flooding. TB Chaco includes Cerrado (chaqueño and chiquitano) and Gran Chaco (departments of Chuquisaca, Santa Cruz, and Tarija) with an annual rainfall of 400–1400 mm, mean annual temperatures of 20–26 °C, and landscapes of flatlands with low hills and soft undulations.

OA includes Yungas, Bosque Tucumano-Boliviano, Chaco Serano, Bosques Secos Interandinos, and Prepuna, in the departments of Chuquisaca, Cochabamba, La Paz, Potosí, Santa Cruz, and Tarija. Mean annual rainfall of this region can be as low as 300 mm in Prepuna to 6000 mm in the Yungas, with annual mean temperatures of 5–24 °C, and landscapes shaped by steep slopes, broad valleys, semidesert valleys, ridges, low hills, small plains, and foothills. CA&AP with Puna Norteña and Puna Sureña include the department of Oruro and parts of Cochabamba, Chuquisaca, La Paz, Potosí, and Tarija, with an annual rainfall of 50–1600 mm, with annual average temperatures of 0–10 °C, and landscapes of hills, mountains, high plateaus, peaks, rocky ridges, slopes, highland plains and hills, wide valleys with glaciers, dunes, and salt flats. Figs. 1 and 2 depict the administrative division of Bolivia and the broad biogeographical division of the country.

Results

Endemic or established tick species

Argasidae *Canestrini*

Ornithodoros Koch; *Ornithodoros echimys* Kohls, Clifford & Jones: BENI, Río Iténez (= Río Guaporé), opposite of Costa Marques in Brazil is recorded by Jones et al. (1972) who found larvae on *Marmosa* sp. *Ornithodoros echimys* is also known from Venezuela (Guglielmone et al., 2003a).

Ornithodoros guaporensis Nava, Venzal, and Labruna: BENI, Guaporé River, where adults were collected from a rocky fissure inhabited by bats of the species *Centronycteris maximiliani* (Fischer, 1829) (Chiroptera: Emballonuridae) (Nava et al., 2013).

Ornithodoros hasei (Schulze): BENI, Magdalena, San Joaquín, larvae on *Noctilio labialis* and *Eumops* sp. (Kohls et al., 1965); SANTA CRUZ, 6 km West of Ascensión is reported by Dick et al. (2007) from larva collected on *N. labialis*. This Neotropical species ranges from southern Mexico to Argentina (Nava et al., 2007b). Jones et al. (1972) observed morphological variation among specimens from different Venezuelan localities and concluded that more than one taxon may be included under the name *O. hasei*.

Table 1

Tick collection sites in each department of Bolivia, with their geographical range.

| Department and collection site | Coordinates |
|---|--------------------|
| BENI | |
| Estancia Totai (25 km south of San Joaquín) | 13°16' S, 64°40' W |
| Guaporé River | 12°55' S, 62°52' W |
| La Asunta | 12°56' S, 64°53' W |
| Las Moscas (community near San Joaquín) | 14°06' S, 66°44' W |
| Magdalena | 13°20' S, 64°07' W |
| Orobayaya | 13°21' S, 63°45' W |
| Providencia | 14°35' S, 64°46' W |
| (Mouth of) Río Baures | 12°30' S, 64°16' W |
| Río Iténez (= Guaporé), opposite of Costa Marques in Brazil | 12°28' S, 64°14' W |
| San Joaquín | 14°06' S, 66°44' W |
| (17 km north of) San Joaquín | 13°56' S, 66°44' W |
| Trinidad | 14°50' S, 64°54' W |
| Unnamed locality 1 | 13°07' S, 65°16' W |
| Unnamed locality 2 | 13°27' S, 65°08' W |
| Unnamed locality 3 | 13°27' S, 64°50' W |
| Unnamed locality 4 | 13°34' S, 65°18' W |
| Unnamed locality 5 | 13°44' S, 65°25' W |
| Unnamed locality 6 | 13°48' S, 65°06' W |
| Unnamed locality 7 | 13°50' S, 66°23' W |
| Unnamed locality 8 | 14°00' S, 65°15' W |
| Unnamed locality 9 | 14°08' S, 66°36' W |
| Unnamed locality 10 | 14°10' S, 67°00' W |
| Unnamed locality 11 | 15°11' S, 64°50' W |
| Unnamed locality 12 | 15°21' S, 64°51' W |
| Unnamed locality 13 | 15°23' S, 64°34' W |
| Unnamed locality 14 | 15°45' S, 64°30' W |
| Yucumo | 15°15' S, 67°03' W |
| CHUQUISACA | |
| Cuevo | 20°27' S, 63°31' W |
| Padilla | 19°18' S, 64°18' W |
| Pirirenda | 20°15' S, 63°47' W |
| South Western Region | 20°00' S, 63°50' W |
| Sucre | 19°02' S, 65°15' W |
| Tarabuco | 19°10' S, 64°55' W |
| Unnamed locality 1 | 19°52' S, 63°46' W |
| Unnamed locality 2 | 20°32' S, 63°30' W |
| Unnamed locality 3 | 20°48' S, 63°19' W |
| Unnamed locality 4 | 20°51' S, 63°11' W |
| Unnamed locality 5 | 20°55' S, 63°30' W |
| COCHABAMBA | |
| Charapaya (= Charuplaya) | 17°22' S, 66°45' W |
| Cochabamba | 17°23' S, 66°09' W |
| (Close to) Cotapachi | 17°26' S, 66°18' W |
| Las Lomas | 17°21' S, 66°08' W |
| Quillacollo | 17°24' S, 66°17' W |
| Sacaba | 17°24' S, 66°02' W |
| Tiquipaya | 17°20' S, 66°13' W |
| Unnamed locality 1 | 16°57' S, 65°50' W |
| Unnamed locality 2 | 17°18' S, 66°03' W |
| (26 km west of) Villa Tunari | 16°54' S, 65°36' W |
| LA PAZ | |
| Cañuhuma | 15°02' S, 69°13' W |
| Chulumani | 16°24' S, 67°31' W |
| Huacochani | 14°59' S, 69°13' W |
| Nube Pampa | 14°53' S, 69°13' W |
| Puna norteña ecoregión | 15°03' S, 69°13' W |
| Puna norteña ecoregion | 14°58' S, 69°10' W |
| Valle de Yungas | 15°41' S, 67°05' W |
| ORURO | |
| Oruro | 17°58' S, 67°06' W |
| PANDO | |
| Chiquitos | 10°24' S, 66°24' W |
| Unnamed locality 1 | 11°52' S, 67°05' W |
| SANTA CRUZ | |
| (6 km west of) Ascensión | 15°43' S, 63°09' W |
| Boyuíbe | 20°24' S, 63°16' W |
| Buen Retiro | 17°16' S, 63°42' W |
| Cabezas | 18°47' S, 63°18' W |
| Cerro Cortado | 19°32' S, 62°19' W |
| Charagua | 19°47' S, 63°13' W |
| El Salvador | 20°25' S, 63°33' W |

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