

Short communication

Ticks (Acari: Argasidae, Ixodidae) from Middle and pre-Hispanic Late Holocene associated with human activities in northwestern Argentina

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ARTICLE INFO

Article history:

Received 1 August 2012

Accepted 10 October 2012

Keywords:

Amblyomma

Argas

Ornithodoros

Middle Holocene

Northwestern Argentina

Archaeological records

ABSTRACT

One male of *Amblyomma parvitarsum* and one male and a female of *Ornithodoros* sp. were recovered from archaeological layers of the Middle Holocene in a rock shelter in the province of Catamarca, used by hunter-gatherer groups. Another two ticks identified as a female and a nymph of *Argas* cf. *neghmei* were recovered from a layer of the Late Holocene in other rock shelter in the province of Tucumán used by humans of agro-pastoral complex societies previous to the Hispanic invasion. The presence of *Amblyomma parvitarsum* is probably related to hunting activity, while *Ornithodoros* sp. was probably an opportunistic parasite established in the shelter. *Argas* cf. *neghmei* was probably a parasite of birds as is *A. neghmei*, a tick that has been found in the nests of birds, chicken houses, but also in human dwellings. The presence of *A. cf. neghmei* may originate from birds naturally breeding in the shelter or from the nests of birds introduced into the shelter by humans.

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Introduction

Ticks dated from the Holocene Period earlier than a few centuries before present (BP) are a rarity. Guerra et al. (2003) found larvae of *Amblyomma* sp. and larvae of an argasid erroneously named as *Ixodes* sp. from Felidae coprolites in Brazil (Holocene period uncertain). Johnson et al. (2008) and Fugassa et al. (2011) recovered *Dermacentor andersoni* from Late Holocene human coprolites in the U.S.A., whilst Sánchez et al. (2010) determined *Ixodes sigelos* from a Late Holocene owl pellet in Argentina. In the present study, we describe the presence of Ixodidae and Argasidae specimens very well preserved in Holocene layers associated with evidences of early hunter-gatherer groups and pre-Hispanic agro-pastoral societies in northwestern Argentina.

Materials and methods

Three ticks were recovered from Middle Holocene archaeological layers dated between 7910 ± 100 (UGA-10192) and 7270 ± 40 years before present (BP) (UGA-9072; Martínez, 2005) at Peñas de la Cruz 1.1 ($26^{\circ}05'S$ $67^{\circ}19'W$), a rock shelter located at 3665 m above sea level in Antofagasta de la Sierra (Catamarca Province, Argentina) used by hunter-gatherer groups. Another 2 ticks were recovered

from a Late Holocene layer dated 630 ± 140 years BP (UGA-01977; Oliszewski, 2011) at Cueva de los Corrales 1 ($26^{\circ}43'S$ $65^{\circ}47'W$), a rock shelter located at 2992 m above sea level in Quebrada de Los Corrales (Tucumán Province, Argentina) used by agro-pastoral complex societies previous to the Hispanic invasion.

Ticks were examined using stereomicroscopy and identified using keys and descriptions for Ixodidae and Argasidae (see Results), following the systematic classification used in Guglielmo et al. (2010). All specimens were deposited in the tick collection of INTA, Estación Experimental Agropecuaria Rafaela.

Results

Ticks recovered from stratigraphic layers of Peñas de la Cruz 1.1 (PCz1.1) consisted of an ixodid male and both a male and a female of Argasidae. The ixodid male belongs to the genus *Amblyomma*, while the argasids were determined to belong to the genus *Ornithodoros* following the keys in Keirans (2009). The combination of morphological characters of size, orbited eyes, incomplete marginal groove, and long-stout spur in cox IV indicates that the *Amblyomma* male is *Amblyomma parvitarsum* (Fig. 1a and b) as described in Boero (1957) and Estrada-Peña et al. (2005) (accession number INTA 2189). On the other hand, no attempt has been made to determine the specific status of the specimens of *Ornithodoros* because relevant anatomical parts (i.e. legs) were missing. Dorsal and ventral views of the *Ornithodoros* sp. female are presented in

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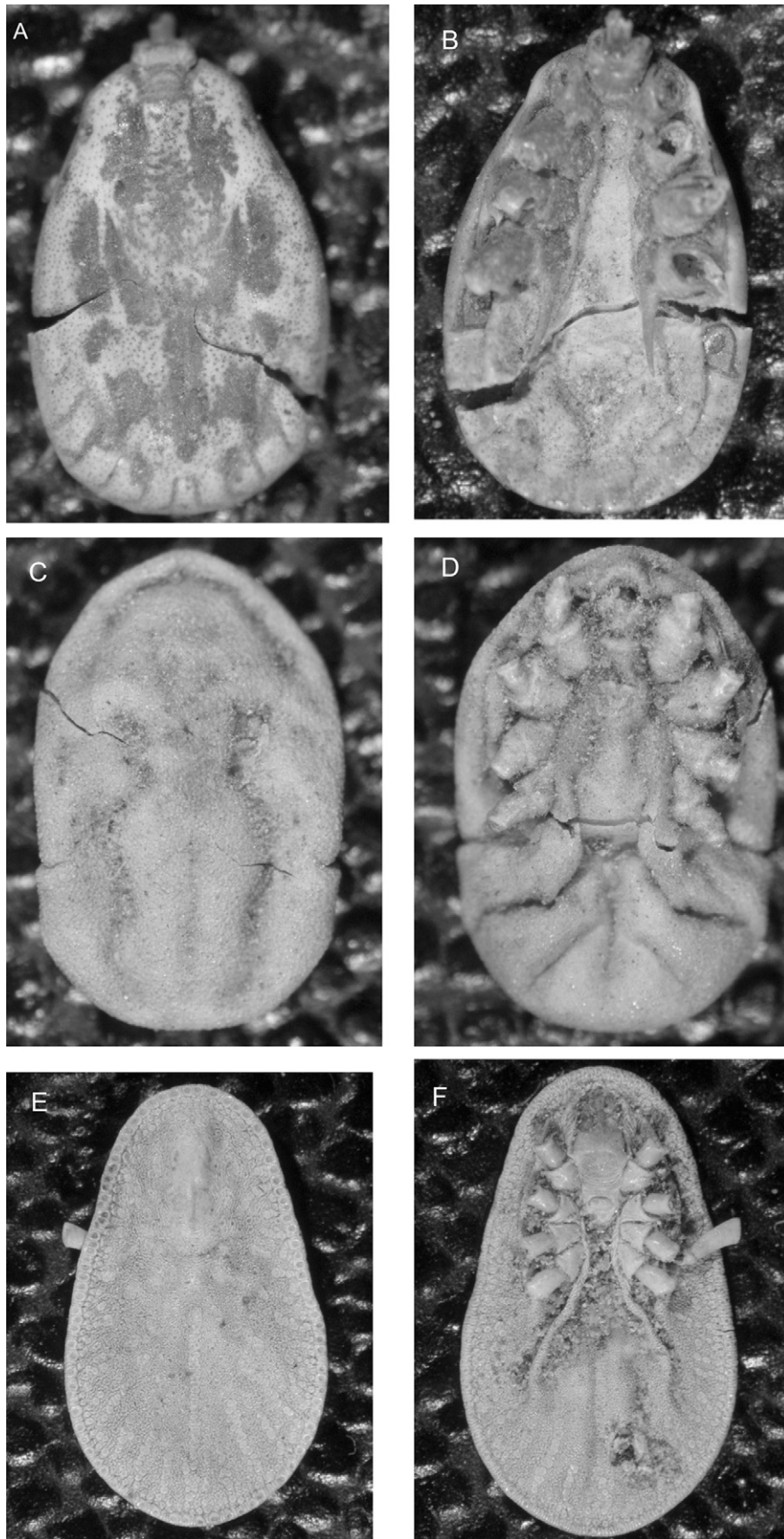


Fig. 1. (a and b) Dorsal and ventral views of *Amblyomma parvitarsum* recovered from a Middle Holocene layer in northwestern Argentina. (c and d) Dorsal and ventral views of *Ornithodoros* sp. recovered from a Middle Holocene layer in northwestern Argentina. (e and f) Dorsal and ventral views of *Argas* cf. *neghmei* recovered from a Late Holocene layer in northwestern Argentina.

Fig. 1c and d. Both *Ornithodoros* individuals are deposited in the INTA Collection under accession number INTA 2190.

The 2 ticks recovered from a stratigraphic layer of Cueva de los Corrales 1 (CC1) are a female and a nymph that belong to the genus *Argas* following Keirans (2009) (accession number INTA 2191). The general aspects of the integumental ridges, the cells in the peripheral striated areas, and the pattern of disc distribution appear to indicate that the female tick is an *Argas neghmei* (Fig. 1e and f) according to the key of Keirans et al. (1979), and this diagnosis is also true for the nymph. *A. neghmei* was recorded in northwestern Argentina (Aguirre et al., 1997; Di Iorio et al., 2010), and the specimens from the Late Holocene probably belong to this taxon. However, there are other South American species closely related to *A. neghmei* (i.e. *Argas moreli*) that prevent to be conclusive about the diagnosis, and therefore we prefer to name these argasids from the Late Holocene in northwestern Argentina as *Argas cf. neghmei*.

Discussion

The record of *A. parvitarsum* in a rock shelter used by hunter-gatherer groups in the Andean Region of Argentina during the Middle Holocene is most probably a consequence of human hunting activities. Adults of Ixodidae feed on their hosts for several days, and *A. parvitarsum* are usually found on wild and domestic South American Camelidae in Andean Regions of Argentina, Bolivia, Chile, and Peru (Estrada-Peña et al., 2005). Therefore, the presence of this tick in Middle Holocene layers may trace back to the remains of camelids transported by hunters into the rock shelter. According to this, numerous skeletal remains assigned to wild camelids, mainly *Vicugna vicugna*, were found in this site (Martínez, 2005). The presence of adult *Ornithodoros* sp. in the layer where *A. parvitarsum* has been found, too, is most probably unrelated to human hunting activities because adult argasids are intermittent feeders that remain on the host usually for no more than 2 hours for each meal. *O. rostratus* is an extant species established in the arid zones of the Chaco Phytogeographic Domain in Argentina (Guglielmone and Nava, 2005) found in precarious human dwellings and pens for domesticated animals where ticks buried in the sand wait for their hosts. Hypothetically, *Ornithodoros* sp. found in Peñas de la Cruz 1.1 may be a species with a similar feeding behavior as *O. rostratus* that obtained its nourishment from animals and human inhabitants of this rock shelter, which could be related to a frequent use of the same.

A. neghmei has been found in the nests of birds (Di Iorio et al., 2010) and houses (Aguirre et al., 1997) in the Andean Region of northwestern Argentina, but also in human dwellings and chicken

houses in northern Chile (Kohls and Hoogstraal, 1961) that may have been infested by ticks carried by poultry. Our hypothesis is that *A. cf. neghmei* was a parasite of birds. Therefore, the presence of this tick in the CC1 rock shelter may originate from birds naturally breeding in the shelter or from nests of birds introduced into the shelter by humans.

Acknowledgments

We acknowledge with thanks the support of INTA, CONICET and the Asociación Cooperadora of EEA-INTA Rafaela to AAG and SN.

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