

New host and locality records for the *Ixodes auritulus* Neumann, 1904 (Acari: Ixodidae) species group in northern Chile

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Abstract

Several larval, nymphal and female ticks belonging to the *Ixodes auritulus* species group were collected from *Thraupis bonariensis* (Gmelin, 1879) (Passeriformes: Thraupidae), *Phrygilus fruticeti* (Kittlitz, 1833), *Sicalis olivascens* (d'Orbigny & Lafresnaye, 1837) and *Xenospingus concolor* (d'Orbigny & Lafresnaye, 1837) (Passeriformes: Emberizidae) in Chusmisa (19° 40'S, 69° 10'W), Región de Taracapá, Region I, northern Chile. All these hosts and the collection locality are new for this species group. The gene sequence divergence between the *I. auritulus* group from Chusmisa and those from southern Argentina was 3.3%, but it remains unclear whether these populations represent different species.

Key words: Ixodidae, *Ixodes auritulus* species group, hosts, distribution, 16S sequences, Passeriformes, Chile

Introduction

Specimens of *Ixodes auritulus* Neumann, 1904 show considerable morphological variation (Nuttall 1916; Arthur 1960; Dumbleton 1973; González-Acuña *et al.* 2005); therefore, Arthur (1960) and González-Acuña *et al.* (2005) use the term “*I. auritulus* species group,” inferring that more than one taxon is included under this name. Ticks of this group are bird parasites in the Australasian, Ethiopian, Nearctic and Neotropical Zoogeographic Regions (Guglielmone *et al.* 2003). González-Acuña *et al.* (2005) studied the host relationships of the *I. auritulus* group in the Neotropics and found that while members of the orders Ciconiiformes, Columbiformes, Falconiformes, Galliformes, Passeriformes, Piciformes, Procellariiformes and Tinamiformes all serve as hosts for these ticks, passeriforms are probably the principal hosts, sustaining tick populations throughout the region.

The *I. auritulus* species group appears to have a disjunct distribution in the Neotropical Zoogeographic Region. One area of supposed endemism is located in southern South America (from 56°S to 51°S) and includes Punta Arenas, the Chilean type locality for *I. auritulus* (Neumann, 1899). Others are located in southern Brazil (25°S to 22°S), south-central Peru (14°S to 10°S) and Central America (10°N to 15°N). Herein we report new host and locality records and sequences of the mitochondrial 16S rDNA gene of *I. auritulus* group ticks from northern Chile.

Materials and methods

The following *Ixodes* specimens were collected from birds by one of us (DGA) in Chusmisa (19° 40'S, 69° 10'W), Región de Taracapá, Region I, northern Chile: ten females and one nymph on one of six *Thraupis bonariensis* (Gmelin, 1879) (Passeriformes: Thraupidae), one female and one nymph on one of nine *Sicalis olivascens* (d'Orbigny & Lafresnaye, 1837) (Passeriformes: Emberizidae), two larvae on one *Xenospingus concolor* (d'Orbigny & Lafresnaye, 1837) (Passeriformes: Emberizidae), 15 July 2008; two females and one nymph from one of five *Phrygilus fruticeti* (Kittlitz, 1833) (Passeriformes: Emberizidae), 16 July 2008. Ticks were identified to subgenus using the descriptions in Clifford *et al.* (1973), while the key in González-Acuña *et al.* (2005) was used to identify species within the diagnosed subgenus.

One female from *T. bonariensis* and one nymph from *P. fruticeti* were preserved in ethanol and stored at -20°C until they could be used for DNA extraction and polymerase chain reaction (PCR) amplification, as described by Nava *et al.* (2008), to obtain sequences of the 16S rDNA mitochondrial gene. These and corresponding species sequences deposited in GenBank were added to the *Ixodes* sequences used in González-Acuña *et al.* (2008) for comparison. Ticks selected for DNA extraction were deposited in the tick collection (DNA section) of the Instituto Nacional de Tecnología Agropecuaria, Estación Experimental Agropecuaria Rafaela, Rafaela, Santa Fe, Argentina. The remaining ticks were deposited in the Laboratorio de Zoología, Departamento de Ciencias Pecuarias, Universidad de Concepción, Chillán, Chile.

Results

All the Chusmisa tick specimens were found to belong to subgenus *Multidentatus* Clifford, Sonenshine, Keirans & Kohls, 1973 and were identified as members of the *I. auritulus* group. The four avian hosts and the collection locality are new for this tick group. *Ixodes paranaensis* Barros-Battesti, Arzua, Pichorim & Keirans, 2003 is morphologically closest to *Ixodes auritulus* but the female of the former species has one spur on coxae II and III, whereas females of the *I. auritulus* group possess two spurs on these coxae. Additionally, the nymph of *I. paranaensis* lacks cornua on the basis capituli, but cornua are present in nymphs of the *I. auritulus* group.

The 16S sequences (429 bp) for the female and nymph used in this study were identical and have been given GenBank accession numbers FJ392273 and FJ392274, respectively. These sequences diverge 3.3% from those of *I. auritulus* deposited in GenBank under accession numbers AF549845 and AF113928. Sequence AF549845 is cited by Xu *et al.* (2003) and corresponds to *I. auritulus* voucher (sic) 3859, U.S. National Tick Collection (USNTC, Georgia Southern University, Statesboro), collected in Argentina without further locality data, April 1971. This sequence was surely obtained from a tick in one of the following USNTC collections: RML118072, RML118083 or RML118089, all from birds in southern Argentina, April 1971 (Robbins *et al.* 2001; González-Acuña *et al.* 2005). Sequence AF113928 is included in Klompen *et al.* (2000) and corresponds to USNTC collection RML118076, which contains larvae and nymphs of *I. auritulus* collected from *Phalcooenus* (= *Poliburos*) *australis* (Gmelin, 1788), Isla Observatorio (54° 38'S, 64°09'W), also in southern Argentina, 17 May 1971 (González-Acuña *et al.* 2005).

Discussion

The one thraupid and three emberizid birds found infested with ticks of the *I. auritulus* species group in northern Chile are new hosts for this complex, extending the list of Neotropical hosts published by González-Acuña *et al.* (2005), although it is likely that many more of this region's birds are parasitized by *I. auritulus*. The greater than 3% divergence in 16S rDNA sequences between specimens of the *I. auritulus* group from northern Chile and southern Argentina may be considered evidence that these tick populations represent different species within the group. However, this evidence is inconclusive. Although we support the hypothesis that *I. auritulus* comprises more than one taxon, it is clear that additional molecular (all comparable 16S sequences are from the southern Neotropics) and morphological studies will be needed to confirm this view. As in the case of the North American blacklegged tick, *Ixodes scapularis* Say, 1821, perceived intraspecific variation should be analyzed using the broadest possible range of tools, such as reciprocal crosses, assortative mating, morphometrics, karyology, molecular genetics, and life history data (Oliver *et al.* 1993).

The location of the Chusmisa *I. auritulus* specimens lies outside the Neotropical areas of endemism for this tick postulated by González-Acuña *et al.* (2005). However, all new hosts for the *I. auritulus* group reported here are established in southern Peru (Dickinson 2003), where this tick is common, and the ranges of *T. bonariensis* and *P. fruticeti* include southern Brazil, and southern Argentina and Chile (Dickinson 2003), respectively, coinciding with *I. auritulus* areas of endemism (González-Acuña *et al.* 2005). This may mean that the supposedly disjunct Neotropical distribution of the *I. auritulus* group is merely an artifact of inadequate sampling, rather than a natural condition. The distribution of the *I. auritulus* species group extends well beyond northern Chile and the ranges of the new passeriform hosts of this tick. It is therefore important that efforts be made to look for this tick throughout the Neotropics and to continue comparative studies of specimens from the Australasian, Ethiopian and Nearctic Zoogeographic Regions.

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