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RODENTS OF THE SUBFAMILY CAVIINAE (HYSTRICOGNATHI, CAVIIDAE) AS HOSTS FOR HARD TICKS (ACARI: IXODIDAE)

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ABSTRACT: There are only 33 records of rodents of the subfamily Caviinae Fischer de Waldheim, 1817 (Hystricognathi: Caviidae) infested by hard ticks in South America, where the subfamily is established. Caviinae is formed by three genera: *Cavia* Pallas, 1766, *Galea* Meyen, 1833 and *Microcavia* Gervais and Ameghino, 1880. Records of *Amblyomma pictum* Neumann, 1906, *A. dissimile* Koch, 1844 and *A. pseudoparvum* Guglielmone, Keirans and Mangold, 1990 are considered doubtful. Bona fide records are all for localities south of the Amazonian basin in Argentina, Bolivia, Uruguay and Brazil. Thirteen records are for *A. tigrinum* Koch, 1844, four for *A. triste* Koch, 1844, three for *A. parvum* Aragão, 1908 (larvae and nymphs of these three species), one for *A. cajennense* (Fabricius, 1787) (nymph), four for *Ixodes longiscutatus* Boero, 1944 (females, nymphs and larvae) and one record for *I. loricatus* Neumann, 1899 (female). Rodents of the subfamily Caviinae are vital for the life cycle of *A. tigrinum* and *A. parvum* and probably for *A. triste* and *I. longiscutatus*. It is hypothesized that Ixodidae precedes Caviinae in establishment in South America (Neotropical), therefore this host-relationship is relatively recent measured in evolutionary times starting in late Miocene or afterwards. Rodents of the subfamily Caviinae appears to be relevant for the life cycle and speciation of hard ticks in South America as shown by studies carried out in Argentina and Uruguay. This role has been hidden presumably because this type of hosts was ignored in most ecological tick studies performed in South America.

RESUMEN: Roedores de la subfamilia Caviinae como hospedadores para garrapatas duras (Acari: Ixodidae). Existen solamente 33 registros de roedores de la subfamilia Caviinae Fischer de Waldheim, 1817 (Hystricognathi: Caviidae) infestados por garrapatas duras en Sudamérica, donde la subfamilia está establecida. Caviinae está formado por los géneros *Cavia* Pallas, 1766, *Galea* Meyen, 1833 y *Microcavia* Gervais y Ameghino, 1880. Los registros de *Amblyomma pictum* Neumann, 1906, *A. dissimile* Koch, 1844 y *A. pseudoparvum* Guglielmone, Keirans y Mangold, 1990 son considerados dudosos. Registros fehacientes fueron realizados al sur de la Amazonia, en Argentina, Bolivia Uruguay y Brasil. Trece registros son para *A. tigrinum* Koch, 1844, cuatro para *A. triste* Koch, 1844, tres para *A. parvum* Aragão, 1908, uno para *A. cajennense* (Fabricius, 1787), cuatro para *Ixodes longiscutatus* Boero, 1944 y uno para *I. loricatus* Neumann, 1899. Los roedores de la subfamilia Caviinae son vitales para el ciclo biológico de *A. tigrinum* y *A. parvum* y probablemente también para *A. triste* e *I. longiscutatus*. La hipótesis planteada consiste en que Ixodidae precede a Caviinae en su establecimiento en Sudamérica, por lo tanto la formación de esta relación hospedador-parásito es relativamente reciente medida en tiempos evolutivos, con un comienzo no anterior al Mioceno tardío. De acuerdo a estudios realizados en Argentina y Uruguay, los roedores de la subfamilia Caviinae son relevantes en el ciclo biológico y en los procesos de especiación de garrapatas duras en Sudamérica. El papel de estos roedores en la evolución de garrapatas sudamericanas es subvalorado porque

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este tipo de hospedadores fueron ignorados en la mayoría de los estudios ecológicos de dichos ectoparásitos.

Key words. *Amblyomma*. Caviinae. Hosts. *Ixodes*. Ixodidae.

Palabras clave. *Amblyomma*. Caviinae. Hospedadores. *Ixodes*. Ixodidae.

INTRODUCTION

Rodents of the family Caviidae Fischer de Waldheim, 1817 are divided into three subfamilies in Woods and Kilpatrick (2005): Caviinae Fischer de Waldheim, 1817, Dolichotinae Pocock, 1922 and Hydrochaerinae Gray, 1825. The Hydrochaerinae is formed by the genera *Hydrochoerus* Brisson, 1762 (two species) and *Kerodon* F. Cuvier, 1825 (two species), Dolichotinae has just one genera, *Dolichotis* Desmarest, 1820, with two species. *Amblyomma dubitatum* Neumann, 1899 is recognized by the preference of their immature and adult stages to feed on the capybara *Hydrochoerus hydrochaeris* (Linnaeus, 1766) as revised in Nava et al. (2010), while *Amblyomma pseudoparvum* Guglielmone, Mangold and Keirans, 1990 is prone to feed on *Dolichotis salinicola* Burmeister, 1876 (Guglielmone and Nava, 2006). However, there is no such obvious relationship of Caviinae with any tick species, although most species of Caviidae belong to Caviinae.

The subfamily Caviinae contains three genera: *Cavia* Pallas, 1766, *Galea* Meyen, 1833 and *Microcavia* Gervais and Ameghino, 1880. There appears to be consensus that *Microcavia* consists of three species, *M. australis* (Geoffroy and d'Orbigny, 1833), *M. niata* (Thomas, 1899) and *M. shiptoni* (Thomas, 1925) as presented in Woods and Kilpatrick (2005). *Galea* is generally considered to contain three species, *G. flavidens* (Brandt, 1835), *G. musteloides* Meyen, 1833, and *G. spixii* (Wagler, 1831), but recent work supports splitting *G. musteloides* into four species: *G. comes* (Thomes, 1919), *G. leucoblephara* (Burmeister, 1861), *G. musteloides* and a still unnamed species (Dunnum and Salazar-Bravo, 2010a). Controversy also exists for the genus *Cavia*; we follow Dunnum and Salazar-Bravo (2010b) that found this genus formed by six species: *C. aperea* Erxleben, 1777, *C. fulgida* Wagler, 1831, *C. intermedia* Cherem, Olimpo and Ximenez, 1999, *C. magna* Ximenez, 1980, *C. patzelti* Schliemann, 1982, and *C. tschudii* Fitzinger, 1857 (this last taxon was found to be the most certain origin of domesticated guinea pigs).

Species of Caviinae have an ample distribution in South America covering almost all continental land from 11° N to 53° S, with the exception of the Amazon basin. *Cavia aperea* has a disjunct distribution south and north of the Amazon separated by areas colonized by *C. patzetli* and especially *C. tschudii* in central-western South America. Other species of *Cavia* are concentrated in central-eastern South America. The southern limit of *Cavia* is about 39° S in Argentina for *C. aperea*. *Galea* is established from central Brazil-southern Peru to the Patagonia in Argentina with *G. flavidens* established in a small area of central Brazil, the rest of north-eastern distribution is covered by *G. spixii*. The *G. musteloides* species complex is established from southern Peru to Patagonia in Argentina as follows: *G. comes* in the Andes of southern Argentina and northern Bolivia; *G. leucoblephara* from Bolivian and Paraguayan lowlands to northern Patagonia in central Argentina, *G. musteloides* in highlands of northeastern Chile, southeastern Peru and northwestern Bolivia, while a still unnamed species of *Galea* is established at midlands of the Andes of southern Bolivia (Dunnum and Salazar-Bravo, 2010a). *Microcavia* is present from southern Bolivia to southern Argentina and Chile, with *M. niata* in south western Bolivia and northern Chile, *M. shiptoni* is established in a small area of north western

Argentina, and the rest of the distribution is covered by *M. australis*.

Recent studies show that rodents of the subfamily Caviinae are of relevance for a few species of Ixodidae ticks (Nava et al., 2006a, b, 2008a, b, 2009; Venzal et al., 2008 b), but this subfamily has not been reviewed for his importance as host for hard-ticks species. A revision has been made to know the relationship between hard ticks and species of Caviinae under the hypothesis that its role on this host-parasite relationship is more relevant than shown in the poor historical records of tick feeding on members of this subfamily.

MATERIALS AND METHODS

Literature information of ticks feeding on Caviinae were registered considering the species of tick and host, stages of ticks, locality, coordinates, political division, country, reference and comments, when appropriate, for each record. Repeated records for same host, tick stages and locality were considered as one record even if they have different dates. References to *Cavia pamparum* (Thomas, 1901) were considered to be referring to *C. aperea*. Records on hosts with no specific determinations were tentatively given specific status if the locality was within the range of a given species with few chances of confusion with other member of the subfamily. All these inferences are included in the corresponding comment. Additionally, data from the Acari Collection from Instituto Butantan (IBSP), São Paulo, Brazil, were included. The ticks of IBSP were determined by the curator Darci M. Barros-Battesti following Martins et al. (2010).

A line of *C. tschudii* has been domesticated by Andean civilizations (Dunnum and Salazar-Bravo, 2010b); it is currently distributed worldwide and known under the name of "cobayo" or "guinea pig". Cobayos were used for many biological experiments, including laboratory rearing of several species of ticks. Exclusively South American records from natural populations are included in this revision.

Amblyomma maculatum Koch, 1844 has been confused with *A. tigrinum* Koch, 1844 or *A. triste* Koch, 1844 in Argentina where that species of ticks is not present (Ivancovich, 1980, Guglielmone et al., 1982). There are several records of *A. maculatum* on Caviinae for Argentina. They were considered to be *A. triste* if recorded in riparian localities where this species prevails, or *A. tigrinum* if not recorded in riparian localities where this species is unusually found (Guglielmone and Nava, 2006). Each of these records is commented.

RESULTS

Records of ticks on rodents of the subfamily Caviinae are listed below.

Cavia sp.

1) *Amblyomma pictum* Neumann, 1906, male, Bonasika River, 06°45' N 58°30' W, Guayana, Guyana, Keirans (1985). This author has doubts about host identification. If confirmed it is probably *C. aperea*.

2) *Amblyomma tigrinum*, tick stage unregistered, Valle Fértil (San Agustín del Valle Fértil), 30°37' S 67°27' N, San Juan, Argentina, Capri and Mauri (1971). The tick species was classified as *A. maculatum*. The Argentinean San Juan province is out of the current known distribution of *Cavia* and may belong to a species of *Galea* or *Microcavia*.

3) *Ixodes longiscutatus* Boero, 1944, female, locality unknown, Uruguay, Keirans et al. (1976). The host may be *C. aperea* or *C. magna*, but lack of coordinates precludes any inference about which species is most probably the host for this specimen of *I. longiscutatus*. Keirans et al. (1976) named this tick as *I. uruguayensis* Kohls and Clifford, 1967.

4) *Ixodes longiscutatus*, nymph, San Vicente, 35°02' S 58°25' W, Buenos Argentina, Venzal et al. (2008 b). The Caviinae involved in this record is probably *C. aperea*.

5) *Ixodes loricatus* Neumann, 1899, female, Anápolis, 16°19' S 48°57' W, Goiás, Brazil, Fonseca and Aragão (1952). Probably the host is *C. aperea*. Fonseca and Aragão (1952) named this species as *I. didelphidis* Fonseca and Aragão, 1952.

C. aperea

6) *Amblyomma dissimile* Koch, 1844, nymph, Reserva Biológica, 08°39' S 38°01' W, Pernambuco, Brazil, Botelho et al. (2002). These authors found nymphs of *A. dissimile* (a tick found mainly on Anura and Squamata) on Rodentia and Didelphimorphia, which is

not unexpected considering that other authors also found this tick on mammals. However, the authors stated that the only tick found after two months of work and capture of 83 mammals recognized as hosts for several species of ticks, were exclusively *A. dissimile*. We consider that these records need confirmation.

7) *Amblyomma pseudoparvum*, nymph and larva, Fuerte Esperanza, 25°02' S 61°55' W, Chaco, Argentina, Ivancovich and Luciani, (1992). These authors named the species as *A. parvum* Aragão, 1908, but the diagnosis of the larva and nymph of *A. pseudoparvum* are considered doubtful because they are previous to the description of these tick stages.

8) *Amblyomma tigrinum*, nymph, Sierra de la Ventana, 38°00' S 62°00' W, Buenos Aires, Argentina, Capri and Mauri (1971). These authors classified the tick as *A. maculatum*.

9) *Amblyomma tigrinum*, tick stage unregistered, locality unknown, Buenos Aires, Argentina, Castro et al. (1987).

10) *Amblyomma triste*, tick stage unregistered, Delta del Paraná, 34°12' S 58°51' W, Buenos Aires, Argentina, Boero (1954). This author determined the specie as *A. maculatum.*

11) *Amblyomma triste*, nymph and larva, INTA Delta del Paraná, 34°11' S 58°50' W, Buenos Aires, Argentina, Nava et al. (2008c).

12) *Amblyomma triste*, nymph and larva, Reserva Natural Otamendi, 34°12' S 58°51' W, Buenos Aires, Argentina, Nava et al. (2008c).

13) *Amblyomma triste*, nymph, locality unknown, Uruguay, Venzal et al. (2008 a).

14) *Ixodes* sp., tick stage unregistered, locality unknown, Department of Durazno, Uruguay, Vogelsang (1928).

15) *Ixodes longiscutatus*, larva, locality unknown, Uruguay, Venzal et al. (2003).

C. tschudii

16) *I. longiscutatus*, female, nymph and larva, Parque Nacional El Rey, 24°15' S 64°40' W, Salta, Argentina, Beldoménico et al. (2003).

***Galea* sp.**

17) *Amblyomma tigrinum*, tick stage unregistered, Sierra de la Ventana, 38°08' S 61°47' W, Buenos Aires, Argentina, Castro et al. (1987). Most probably the host is *G. leucoblephara* as defined in Dunnum and Salazar-Bravo (2010a).

***G. musteloides* species complex**

18) *Amblyomma cajennense* (Fabricius, 1787), nymph, Cuevo, 20°26' S 63°32' W, Chuquisaca, Bolivia, Fonseca (1959). The author indicates collection of "juvenile specimens". In fact, one of these ticks is deposited at the IBSP (collection number 3558) and corresponds to a nymph of *A. cajennense*. This host may correspond to *G. leucoblephara* Burmeister, 1861 as described in Dunnun and Salazar-Bravo (2010a).

19) *Amblyomma tigrinum*, nymph, Cuevo, 20°26' S 63°32' W, Chuquisaca, Bolivia, Fonseca (1959). The author indicates collection of "juvenile specimens". In fact, 9 of these ticks are deposited at the IBSP (collection number 3558) and correspond to nymphs of *A. tigrinum*. This host may correspond to *G. leucoblephara* Burmeister, 1861 as described in Dunnun and Salazar-Bravo (2010a).

20) *Amblyomma tigrinum*, nymph, Padilla, 19°18' S 64°18' W, Chuquisaca, Bolivia, Fonseca (1959). The author indicates collection of "juvenile specimens", under collection number IBSP 3564, but in fact there are two nymphs mounted on slides. This host may correspond to *G. leucoblephara* as described in Dunnun and Salazar-Bravo (2010a).

21) *Amblyomma tigrinum*, nymph, Charagua, 19°47' S 63°13' W, Santa Cruz, Bolivia, Fonseca (1959). The author indicates collection of "juvenile specimens", under collection number IBSP 3559, but the material comprises 15 nymphs of *A. trigrinum*. This host may correspond to *G. leucoblephara* as described in Dunnun and Salazar-Bravo (2010a).

22) *Amblyomma tigrinum*, nymph, Vale Grande, 18°29' S 64°06' W, Santa Cruz, Bolivia, Fonseca (1959). The author indicates collection of "juvenile specimens", under collection numbers IBSP 3553 and IBSP 3556. There are 7 nymphs and 4 nymphs in both

lots, respectively. This host may correspond to *G. leucoblephara* as described in Dunnun and Salazar-Bravo (2010a).

23*) Amblyomma* sp. nymph and larva, Tarija, 21°31' S 64°44' W, Tarija, Bolivia, Fonseca (1959). The author indicates collection of "juvenile specimens", under collection numbers IBSP 3561. Unfortunately this material is lost according to the curator of the IBSP. It is uncertain if this host corresponds to *G. leucoblephara* or to a still unnamed species of *Galea* as described in Dunnun and Salazar-Bravo (2010a).

24) *Amblyomma parvum*, nymph and larva, Campo La Esperanza, 30°12' S 64°31' W, Córdoba, Argentina, Guglielmone et al. (2007). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

25) *Amblyomma parvum*, nymph and larva, Campo Los Socavones, 30°12' S 64°34' W, Córdoba, Argentina, Guglielmone et al. (2007). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

26) *Amblyomma parvum*, nymph and larva, Quilino, 30°12' S 64°31' W, Córdoba, Argentina, Nava et al. (2008a). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

27) *Amblyomma tigrinum*, nymph and larva, Campo La Esperanza, 30°12' S 64°31' W, Córdoba, Argentina, Guglielmone et al. (2007). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

28) *Amblyomma tigrinum*, nymph and larva, Campo La Luisiana, 30°22' S 64°23' W, Córdoba, Argentina, Guglielmone et al. (2007). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

29) *Amblyomma tigrinum*, nymph and larva, Campo Los Socavones, 30°12' S 64°34' W, Córdoba, Argentina, Guglielmone et al. (2007). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

30) *Amblyomma tigrinum*, nymph, Salta, 24°47' S 65°24' W, Salta, Argentina, Aguirre et al. (2005). It is uncertain if this host corresponds to *G. musteloides-leucoblephara* or to *G. comes* Thomas, 1919 as described in Dunnun and Salazar-Bravo (2010a).

31) *Amblyomma* sp., tick stage unregistered, Tornquist, 38°06' S 62°10' W, Buenos Aires, Argentina, Rood (1972). This host corresponds to *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a).

Microcavia australis

32) *Amblyomma* sp., tick stage unregistered, 40 Km north-east of Carmen de Patagones, 40°36' S 62°38' W, Buenos Aires, Argentina, Rood (1972).

"Wild cavy"

33) *Amblyomma tigrinum*, nymph?, Algarrobo, 38°53' S 63°08' W, Buenos Aires, Argentina, Voltzit (2007). Adults reared most probably from engorged nymphs fed on the "wild cavy", but not stated in Voltzit (2007). This author appears to locate this finding in Pampa (=La Pampa) province, but the locality belongs to the Province of Buenos Aires. The host may be either *G. leucoblephara* as presented in Dunnun and Salazar-Bravo (2010a) or *M. australis*.

The distribution of records is concentrated south of the Amazonian basin with 32 records (20 from Argentina, 6 from Bolivia, 4 from Uruguay and 2 from Brazil) and one report north to the basin in Guyana, but the author registered doubts about the identification of host parasitized with *A. pictum* (Keirans, 1985).

The records for Bolivia include *Amblyomma* sp.*, A. cajennense* and *A. tigrinun,* a record for Uruguay corresponded to an undetermined species of *Ixodes*, while the record of nymphs of *A. dissimile* and larvae and nymphs of *A. pseudoparvum* on *C. aperea* by Botelho et al. (2002) and Ivancovich and Luciani (1992), respectively, are considered doubtful. Therefore, bona fide records of Caviinae as hosts for recognized species of ticks are (all south to the Amazonian basin) as follows: 1 record of *A. cajennense* (nymph), 13 records of *A. tigrinum* (larvae and nymphs), 4 records of *A. triste* (larvae and nymphs), 4 records of *I.*

longiscutatus (females, nymph and larvae), 3 for *A. parvum* (larvae and nymphs) and 1 record of *I. loricatus* (female).

DISCUSSION

The scarcity of historical records of Ixodidae feeding on Caviinae is notorious apparently supporting the view of the irrelevance of this subfamily for Neotropical hard-tick life-cycles. *Ixodes loricatus* is recognized usually as a parasite of Neotropical marsupials and cricetid rodents (Nava et al., 2004) and, eventually, this species has been found on other mammals (Arzua et al., 2005) but not on Caviinae. Therefore, the biological significance of members of Caviinae as host of *I. loricatus* remains obscure. *Ixodes longiscutatus* presents a disjunct distribution with allopatric populations, one in Uruguay and neighboring Argentinean provinces, the other in northwestern Argentina. This species is peculiar forming the monotypic subgenus *Haemixodes* Kohls and Clifford, 1967 that appears to represent a different lineage of Neotropical *Ixodes* (Venzal et al., 2008 b), showing its importance for tick evolution in this Zoogeographic Region. Although larva and nymphs of *I. longiscutatus* have been found on Caviinae most records are from cricetid rodents. Adult ticks are just known for a total of six females, three of them were collected from cattle and horses which are obviously not the primeval host for this species, and the rest were found on *Cavia* sp., (probably *C. aperea*) in Uruguay and *C. tschudii* in northwestern Argentina. Indeed, additional work is needed to understand the ecology of *I. longiscutatus*, but again the role of Caviinae seems to be of importance in its life cycle.

Different is the situation when analyzing the relationship of Caviinae with the remainder species of ticks found on them. The presence of a nymph of *A. cajennense* on a species of *Galea* from Bolivia is not unexpected because immature stages of this tick species were observed parasitizing marsupials and rodents of the families Cricetidae, Echimyidae, Chinchillidae, Dsyproctidae and Myocastoridae (Ivancovich and Luciani, 1992; Estrada-Peña et al., 2004).

Studies in Argentina on the ecology of *A. tigrinum* and *A. parvum* showed a crucial role of *G. leucoblephara* (named as *G. musteloides*) for the life cycle of both ticks. *Amblyomma tigrinum* is peculiar for its ability to colonize areas with contrasting climatic conditions; adult ticks are prone to infest wild and domestic Canidae (Nava et al., 2006b). Ground feeding birds were found to harbor infestations with larvae and nymphs of *A. tigrinum*, but most larvae were found feeding on cricetid rodents and most nymphs (83%) were detected on *G. leucoblephara* (Nava et al., 2006b). This species is infested throughout the year with *A. tigrinum* nymphs showing peaks of median infestations ranging for 9 to 20 nymphs per host (Nava et al., 2009). Moreover, records from Bolivia and northwestern to central Argentina showed that Caviinae were hosts for sub-adults *A. tigrinum* beyond the area of study of Nava et al. (2006b, 2009) as presented in the Results section of this article, indicating a wide role as host for the immature stages of this tick. Finally, research in progress on the ecology of *A. triste* show that *C. aperea* is a relevant host for larvae and nymphs along with cricetid rodents (S. Nava, unpublished).

Amblyomma parvum is a Neotropical species with a partly surrogate host-parasite relationship depending on adults feeding on domesticated mammals, especially Bovidae, recently introduced into the Neotropics (Nava et al., 2006a). Birds, cricetid rodents and *G. leucoblephara* (named as *G. musteloides*) were evaluated by monthly sampling to determine their role as hosts for larvae and nymphs of *A. parvum* in Central Argentina. The result was conclusive, 99.3% and 99.8% of larvae and nymphs, respectively, were found on *G. leucoblephara* (Nava et al., 2006a, 2008a) presenting another evidence of the importance of Caviinae as host for Neotropical Ixodidae.

The Ixodidae family is formed by the Prostriata (genus *Ixodes*) and Metastriata (all genera apart of *Ixodes*) groups, and there is consensus among tick workers that Prostriata is basal. Rock evidence shows earliest emer-

gence of Metastriata 100 mya (Cretaceous) (Grimaldi et al., 2002) indicating a more ancient evolution of Prostriata, being almost certain that Ixodidae preceded Caviinae in colonizing South American niches. South American Rodentia has an African origin close to the Eocene-Oligocene boundary (ca. 34 mya), but Caviinae arose later as shown by the origin of *Galea* and *Cavia* in late Miocene (ca. 10 mya for *Galea* and 6 mya for *Cavia*) (Dunnum and Salazar-Bravo, 2010a, b). Therefore, it is considered that the relationship Caviinae-Ixodidae is relatively recent measured in evolutionary times (this is also true for the relationship of Cricetidae and Ixodidae in the Neotropics). Tick feeding strategy of *A. tigrinum* with adults nourishing on Canidae, a predator of Cricetidae and Caviinae which harbor most larvae and nymphs of this tick, is also rather recent considering the introduction of Canidae into South America occurred in Late Pliocene (ca. 3 mya) (Prevosti and Pardiñas, 2009). The same will be true for *I. longiscutatus* if confirmed that this species depends on Caviinae and Cricetidae for its life cycle.

In any situation, Caviinae play a relevant role for life cycle and probably speciation of hard ticks. We hypothesized that this role is not restricted to central-northern Argentina and Uruguay, but has been hidden because workers simply ignored this type of hosts in most ecological tick studies in others localities. This is especially noteworthy for *Microcavia* because it is considered that lack or poor tick searching is the explanation for the scarcity of findings (only one record) of hard ticks on rodents of this genus, in spite of the ample distribution that the members of *Microcavia* have in southern Neotropical Region. Additional ecological tick studies are needed to confirm this hypothesis.

Amblyomma parvum, *A. tigrinum* and *A. triste* are species recognized as parasites of man and domestic mammals; therefore the feeding of sub-adults ticks on Caviinae should have sanitary consequences. These rodents may constitute the route for wild tick-borne pathogens to reach man and domestic animals, a situation that needs investigations.

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