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A NEW *IXODES* SPECIES (ACARI: IXODIDAE), PARASITE OF SHREW TENRECS (AFROSORICIDA: TENRECIDAE) IN MADAGASCAR

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Abstract

A new tick species belonging to the African subgenus *Afrixodes* Morel, 1966 of the genus *Ixodes* Latreille, 1795, namely, *Ixodes (Afrixodes) microgalei* n. sp., is described. Females of this species are most similar to those of *Ixodes colasbelcouri* Arthur, 1957 and *Ixodes nesomys* Uilenberg & Hoogstraal, 1969. The female of the new species can easily be differentiated from *I. colasbelcouri* by a short spur on coxae IV, and from *I. nesomys* by longer spurs on coxae I and large punctations on its scutum. *Ixodes microgalei* is known only from the eastern humid forest of Madagascar, specifically in the Province of Antananarivo, where its females have been collected from several species of shrew tenrecs (Afrosoricida, Tenrecidae), namely, *Microgale dobsoni* Thomas, *Microgale parvula* Grandidier, and *Microgale soricoides* Jenkins.

Despite the global distribution and significant medical importance of some species of the genus *Ixodes* Latreille, 1795, the vast majority of species in this genus are still inadequately studied, and the life stages of many remain undescribed. On the basis of new field collections, taxonomic revisions and descriptions of new taxa and different life stages help to fill these gaps.

Seven species of *Ixodes* are currently recognized from Madagascar (Uilenberg et al., 1979). One of these taxa, *Ixodes domerguei* Uilenberg & Hoogstraal, 1965 is a bird parasite, and the others, *Ixodes albignaci* Uilenberg & Hoogstraal, 1969, *Ixodes colasbelcouri* Arthur, 1957, *Ixodes lemuris* Arthur, 1958, *Ixodes lunatus* Neumann, 1907, *Ixodes nesomys* Uilenberg & Hoogstraal, 1969, and *Ixodes randrianasoloi* Uilenberg & Hoogstraal, 1969, are mammal parasites (Arthur, 1965; Uilenberg et al., 1979). These 6 species of *Ixodes* have been recorded from a wide variety of introduced and endemic small mammal species (Randimby et al., 2001; Klompen, 2003). There are notably few specimens of Malagasy *Ixodes* species in museum collections around the world, and virtually nothing is known about their natural history.

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A new species of *Ixodes* has recently been discovered at eastern humid forest sites in the Antananarivo Province, Madagascar, and the female is described here. Females of this species parasitize various species of shrew tenrecs of the genus *Microgale* Thomas (Afrosoricida: Tenrecidae, Oryzictinae); members of this mammal subfamily are endemic to Madagascar and are notably speciose in the island's humid forests (Soarimalala and Goodman, 2011).

MATERIALS AND METHODS

The material examined to diagnose this new taxon is provided below. Only ticks obtained during fieldwork associated with small mammal inventories were available for study. Ectoparasites from trapped animals were removed from their hosts and preserved in 75% ethanol. Examined tick specimens, as well as mammalian voucher specimens, are deposited in the Field Museum of Natural History (FMNH), Chicago, Illinois, USA; Université d'Antananarivo, Département de Biologie Animale (UADBA), Antananarivo, Madagascar; and the United States National Tick Collection (USNTC), Georgia Southern University, Statesboro, Georgia, USA.

The finer structures of the females were examined with the use of a compound microscope; the macrostructures of females were examined under a stereoscopic microscope. Tick measurements are given in millimeters (mm). Measurements are arranged as follows: minimum–maximum (average; n = number of specimens measured). All illustrations by D. A. Apanaskevich. Small mammal identifications were based on characters outlined in Soarimalala and Goodman (2011).

DESCRIPTION

Ixodes (*Afrixodes*) *microgalei* n. sp.

Female—Idiosoma (Fig. 1A, B): suboval, widest at level of coxae IV; length from scapular apices to posterior body margin 1.33, breadth 0.81, 1.64 times as long as broad (1 unengorged specimen measured). Scutum (Fig. 1A): Elongate, outline broadly rounded, length 0.82–0.95 (0.89; n = 7), width 0.55–0.61 (0.58; n = 7), 1.35–1.64 times (1.53; n = 7) as long as broad. Lateral carinae distinct, divergent, not reaching posterior margin; cervical grooves indistinct, shallow. Punctations relatively large and deep, evenly distributed over scutum. Setae numerous and moderately long (ca. 0.05), some slightly shorter than those on alloscutum, distributed as shown in figure. Alloscutum (Fig. 1A): as illustrated. Setae stout, numerous, evenly distributed, length ca. 0.06, with denticulate apex. Venter (Fig. 1B): as illustrated; small, virtually ovoid, paired jugular plates located medially to spur of coxae I, their longest dimension 0.05, each bearing 2 setae. Genital aperture medial to posterior margin of coxae III; genital apron broadly rounded posteriorly. Genital groove well developed. Anal groove circular with open posterior margin. Setae numerous, length of preanal setae ca. 0.06, evenly distributed. Spiracular plates (Fig. 1B, C): subcircular; diameter in anteroposterior plane slightly greater than that in dorsoventral plane; length 0.18–0.20 (0.19; n=5), width 0.18–0.19 (0.18; n = 5), 1.00–1.14 times (1.06; n = 5) as long as broad. Gnathosoma (Fig. 1A, B): length from palpal apices to posterior ventral suture on basis capituli 0.56–0.63 (0.59; n=6), width at apices of lateral projections 0.29–0.35 (0.33; n

= 6), 1.71–1.90 times (1.81; n = 6) as long as broad. Basis capituli (Fig. 1A, B): dorsally subtriangular; posterior margin convex; cornua modest, triangular with narrowly rounded or tapering apices. Porose areas indented with well-circumscribed borders, separated by a distance approximately equal to their own width. Basis capituli ventrally pentagonal; with posterior margin convex; auriculae recurved, long, triangular, sharply tapering to apices. Palpi (Fig. 1A, B): elongate, narrow; length (I–III segments) 0.38–0.45 (0.43; n = 6), width 0.09–0.10 (0.09; n = 6), 4.00–4.95 times (4.51; n = 6) as long as broad, length of segments in descending order: 2, 3, 1, 4; segment I well developed without spurs; segment II narrow proximally and gradually widening to midlength and nearly parallel sided from midlength to distal end; segment III laterally straight and medially converging to bluntly rounded apex. Hypostome (Fig. 1B): tapering with sharply pointed apex; arising from a medial anterior extension of basis; length 0.22–0.25 (0.24; n = 2), width 0.09 (n = 2), 2.37–2.86 times (2.61; n = 2) as long as broad; widest in posterior half; dental formula 3/3 throughout hypostomal length; denticles sharply pointed. Legs: moderately long, slender. Coxae (Fig. 1B): coxae I with long triangular posteromedian spur with sharply pointed apex and with modest triangular posterolateral spur with tapering apex; posterolateral spur considerably shorter than posteromedian spur; coxae II and III without spurs; coxae IV with short triangular spur with tapering apex; coxae I–III with syncoxae. Tarsi (Fig. 1D, E): tarsus I humped, tarsi II–IV not humped at distal end; tarsus I length 0.38–0.41 (0.39; n=7); tarsus IV length 0.27–0.41 (0.36; n = 7).

Male, nymph and larva—Unknown.

Taxonomic summary

Holotype—Female, from *Microgale dobsoni* Thomas (FMNH 166105), Andasivodihazo (19°40'S; 47°46'E, 1,550 m), Mahatsinjo Forest, 10 km SE of Tsinjoarivo, Antananarivo Province, Madagascar, 8.I.1999, S.M. Goodman (SMG-10436), deposited in the FMNH (FMNH-INS 0000093398).

Paratypes—Two females, from *Microgale parvula* Grandidier (FMNH 159457), 13 km SE of Anjozorobe (18°28'S; 47°57'E, 1,300 m), 2 km NNE of Andranomay, Antananarivo Province, Madagascar, 18.XII.1996, L. Olson (LEO-64), deposited in FMNH (FMNH-INS 0000093399); 1 female, from *M. dobsoni* (UADBA 47924), 12 km SE of Anjozorobe (18°28'S; 47°58'E, 1,320 m), Andasiroa Forest, Antananarivo Province, Madagascar, 7.I.2006, V. Soarimalala and L. Ramanana (VS-898), deposited in USNTC (USNMENT 00714129); 1 female, from *M. soricoides* Jenkins (FMNH 188753), 5.5 km E of Alakamisy (18°31'S; 47°58'E, 1,280 m), Iaban'Ikoto Forest, Fivondronana d' Anjozorobe, Antananarivo Province, Madagascar, 14.I.2006, S. M. Goodman (SMG-15110), deposited in USNTC (USNMENT 00714154); 2 females, from *M. dobsoni*, Analavory (18°13'S; 47°58'E), NE region of Antananarivo Province, Madagascar, X.1964, J.-M. Klein, deposited in USNTC (USNMENT 00714724).

Distribution and hosts—The collection data for *I. microgalei* are those of the type series. This species is confined to Madagascar and currently only known from the Antananarivo Province (Fig. 2). All specimens, which are composed exclusively of females, have been

collected from shrew tenrecs, *M. dobsoni*, *M. parvula*, and *M. soricoides*. All of these host species have broad geographical distributions in the humid forests of Madagascar, spanning much of the 1,300 km length of this formation, and frequently occurring in sympatry (Soarimalala and Goodman, 2011). Members of this genus are presumed to rest during the day in ground burrows. There is no obvious ecological reason why *I. microgalei* should be restricted to the Antananarivo Province and we suspect that with further collections it will be found in other areas of the eastern humid forest. In the forests of Tsinjoarivo, where the holotype was collected, 11 species of *Microgale* are known to occur in the same immediate region (Goodman et al., 2000).

Etymology—The species is named after the host genus *Microgale* Thomas on which it was discovered.

Remarks

Based on external morphology, females of *I. microgalei* most closely resemble those of *I. colasbelcouri* and *I. nesomys*. All 3 species have long, narrow, tapering auriculae and internal spur on coxae I, the external spur of coxae I is small but distinct, and coxae I–III have syncoxae. Females of *I. microgalei* are easily distinguishable from those of *I. colasbelcouri* by the distinctly shorter spur on coxae IV and from those of *I. nesomys* by the notably longer spurs on coxae I, larger areas of syncoxae, and large and deep punctations on scutum.

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Figure 1.

Ixodes microgalei n. sp., female. (A) Dorsal view. Leg segments from femur to tarsus are omitted. (B) Ventral view. Leg segments from femur to tarsus are omitted. (C) Spiracular plate. Arrows indicate orientation of spiracular plate (a, anterior; d, dorsal). (D) Tarsi I and II. (E) Tarsi III and IV. Bar = 0.5 mm.

Figure 2.

Ixodes microgalei n. sp., map of geographical distribution. Star indicates type locality; solid circles represent confirmed localities. The lines on the map represent the system of provincial boundaries.