

A New Species of *Rhipicephalus* (Acari: Ixodidae), a Parasite of Red River Hogs and Domestic Pigs in the Democratic Republic of Congo

DMITRY A. APANASKEVICH,^{1,2} IVAN G. HORAK,^{3,4} AND LEOPOLD K. MULUMBA-MFUMU⁵

J. Med. Entomol. 50(3): 479–484 (2013); DOI: <http://dx.doi.org/10.1603/ME12266>

ABSTRACT A new tick species belonging to the genus *Rhipicephalus* Koch, 1844 (Acari: Ixodidae), namely, *Rhipicephalus congolensis* n. sp., is described. Males and females of this species are similar to those of *Rhipicephalus complanatus* Neumann, 1911 and *Rhipicephalus planus* Neumann, 1907, but it can be distinguished from them by a pattern of dense medium-sized punctations on the conscutum and scutum. Males of *R. congolensis* may be distinguished by the following characters: posterior half of the marginal groove deep with a sharp outer edge; anterior portion of the groove shallow with rounded edges; posteromedian groove distinct, long, and deep; adanal plates broadly sickle-shaped; bluntly pointed posteromedian spur on coxa I; and posterolateral spur on coxa I slightly longer or subequal to posteromedian spur. Females of *R. congolensis* may be distinguished by the following characters: outer edge of cervical grooves smooth and not clearly defined either by slope or punctations; genital aperture broad, bowl-shaped, and tripartite in appearance, with central flap flanked on either side by an oval depression; and posteromedian spur on coxa I tapering to its apex. *R. congolensis* is known only from the Democratic Republic of Congo, where the adults were collected from red river hogs, *Potamochoerus porcus* (L.), and domestic pigs, *Sus scrofa* (L.), within the dense equatorial forest in the districts of Équateur and Tshuapa, in the province of Équateur.

KEY WORDS *Rhipicephalus*, new species, Democratic Republic of Congo, Suidae

The genus *Rhipicephalus* Koch, 1844 (Acari: Ixodidae) currently comprises 82 valid species, including the five species previously belonging to the genus *Boophilus* (Curtice 1891 and Guglielmone et al. 2010). With the exception of the four ornate types and a few other species with unique taxonomic characters, species of this genus are generally considered difficult to identify. This difficulty stems from their overall morphological similarity, including their brown color, but marked geographical and individual variation in taxonomic characters. The last major taxonomic revision of the genus was that by Walker et al. (2000), who provided detailed descriptions and illustrations of the adults of all species they considered valid at that time. They also described and illustrated the nymphs and larvae of those species for which they were known.

Based on line drawings of the morphological characters of the dorsal aspect of the gnathosoma of the nymph and larva, Walker et al. (2000) proposed species groups within the genus. These proposals

proved to be extremely accurate in predicting which adult ticks belonged to a species within a particular grouping. Unfortunately, in those instances for which the immature stages were not known, Walker et al. (2000) did not assign the adults to a specific group. However, males and females of species within a group usually possess a common or similar set of characters that can be used for designating them to that specific group.

A new species of *Rhipicephalus* seemingly closely related to *Rhipicephalus complanatus* Neumann, 1911 and *Rhipicephalus planus* Neumann, 1907 has recently been discovered in Democratic Republic of Congo parasitizing both red river hogs, *Potamochoerus porcus* (L.), and domestic pigs, *Sus scrofa* (L.); the adults are described here.

Materials and Methods

The material examined for the description is summarized in Table 1. Only field-collected ticks were available for study. The specimens that we examined are deposited in the U.S. National Tick Collection (USNTC), The James H. Oliver, Jr. Institute of Arthropodology and Parasitology, Georgia Southern University (Statesboro, GA) and the I. G. Horak tick collection (IGHTC), Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria (Onderstepoort, South Africa). Some of the paratypes will be deposited in the collections of

¹ U.S. National Tick Collection, Georgia Southern University, 75 Georgia Ave., Statesboro, GA 30460-8056.

² Corresponding author, e-mail: dapanaskevich@georgiasouthern.edu.

³ Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort 0110, South Africa.

⁴ Department of Zoology and Entomology, University of the Free State, Bloemfontein 9301, South Africa.

⁵ Central Veterinary Laboratory, Ministry of Agriculture, P.O. Box 8842, Kinshasa 1, Democratic Republic of Congo.

Table 1. *Rhipicephalus congolensis* n. sp., material studied

| No. of ticks | | Host | Locality | Date | Collector | Accession. no. |
|--------------|----|------------------|----------|-------------|-----------|--|
| ♂ | ♀ | | | | | |
| 24 | 15 | <i>S. scrofa</i> | Boende | 21-VII-2007 | L.K.M.-M. | USNMMENT 00714032 USNMMENT 00714120 USNMMENT 00714223 USNMMENT 00714126 |
| 2 | 3 | <i>P. porcus</i> | Boende | 21-VII-2007 | L.K.M.-M. | IGHTC |
| 5 | | <i>S. scrofa</i> | Boende | 24-VII-2007 | L.K.M.-M. | USNMMENT 00714410 |
| 3 | | <i>S. scrofa</i> | Boende | 9-IX-2007 | L.K.M.-M. | IGHTC |
| 4 | 2 | <i>P. porcus</i> | Mbandaka | 14-VII-2007 | L.K.M.-M. | USNMMENT 00714306 |
| 2 | | <i>P. porcus</i> | Mbandaka | 20-VII-2007 | L.K.M.-M. | IGHTC |
| 2 | | | Mbandaka | 29-VII-2007 | L.K.M.-M. | IGHTC |
| 42 | 20 | Total | | | | |

All specimens were collected in Équateur Province, Democratic Republic of Congo.

the Zoological Institute, Russian Academy of Sciences (St. Petersburg, Russia), and the Gertrud Theiler Tick Museum of the ARC-Onderstepoort Veterinary Institute (Onderstepoort, South Africa).

The finer structures of the adults were examined with scanning electron microscopy; the macrostructures of males and females were examined under a stereoscopic microscope (Olympus SZX16, Olympus Corporation, Tokyo, Japan). Measurements are given in millimeters. Measurements are arranged as follows: minimum–maximum (average; n = number of specimens measured). All illustrations were drawn by D.A.A.

Rhipicephalus congolensis n. sp.
(Figs. 1–3)

Male. Conscutum (Fig. 1A): length 3.12–3.78 mm (3.48 mm; n = 5), width 2.07–2.73 mm (2.41 mm; n = 5), ratio length to width 1.39–1.51 (1.45; n = 5). Broadly oval, widest slightly posterior to mid-length; reddish brown; central and posterior surfaces depressed, giving conscutum a concave appearance; cervical grooves indistinct, very short and shallow; marginal grooves long, almost reaching eyes, shallow anteriorly with rounded edges and deeper posteriorly with sharp outer edges, demarcated by medium-sized punctations, enclosing the first festoons; posteromedian groove long, distinct; paramedian grooves indistinct, shallow depressions; medium-sized punctations densely aggregated on central part of conscutum; smaller punctations densely spaced on scapulae and sparsely distributed along lateral margins of conscutum; 11 distinct festoons posteriorly. Eyes oval, almost flat. In engorged males, body wall is expanded posterolaterally and forming a short, blunt caudal process posteromedially. Anal plates (Fig. 2A): two pairs; adanal plates long, fairly broad, sickle-shaped, mildly convex, with a long lateral margin, broadly rounded posterior margin, and inner margin distinctly concave posterior to the anus; accessory plates small, pointed. Spiracular plates (Fig. 2B): oval with short, broad dorsal prolongation. Circumspiracular setae sparse.

Gnathosoma (Fig. 2C and D): slightly longer than broad dorsally; length 0.79–0.92 mm (0.86 mm; n = 5), width 0.73–0.89 mm (0.81 mm; n = 5), ratio length to width 1.04–1.10 (1.07; n = 5). Basis capituli (Fig. 2C

and D): hexagonal, with short lateral angles at about the anterior quarter of its length; dorsal cornua large, triangular, with bluntly pointed tips, equal to between one fifth and one sixth of the length of the basis capituli; ventral auriculae short, broadly rounded. Palpi (Fig. 2C and D): short, 1.5× or less as long as broad dorsally; palpal segment II subrectangular, palpal segment III broadly rounded apically; segment II slightly longer than segment III dorsally. Hypostome (Fig. 2D): club-shaped, dental formula 3/3.

Legs (Fig. 1A) increase slightly in size from I to IV. Coxae (Fig. 2E and F): anterior process on coxa I inconspicuous from above; posteromedian and posterolateral spurs of coxa I are juxtaposed, long, subequal in length or posterolateral spur slightly longer than posteromedian spur, both spurs tapering to apex; coxae II–IV each with distinct, triangular posterolateral spur; coxae II and III each with modest, broadly arcuate posteromedian spur; coxa IV with distinct, triangular posteromedian spur.

Female. Scutum (Fig. 1B): broader than long; length 1.71–2.10 mm (1.92 mm; n = 4), width 1.93–2.27 mm (2.12 mm; n = 4), ratio length to width 0.88–0.93 (0.91; n = 4). Reddish brown; posterior margin sinuous; cervical pits deep; cervical grooves broad, shallow, diverging, outer edge of cervical grooves smooth; dense pattern of medium-sized punctations on central and cervical fields; smaller punctations less densely spaced on lateral fields. Eyes at about mid-length of scutum, oval, almost flat. Genital aperture (Fig. 3A): broad, bowl-shaped, tripartite in appearance, with the central pillar flanked on either side by an oval depression. Spiracular plate (Fig. 3B): broadly oval, with short, broad dorsal prolongation.

Gnathosoma (Fig. 3C and D): slightly longer than broad dorsally; length 0.92–1.13 mm (1.04 mm; n = 4), width 0.91–1.08 mm (1.00 mm; n = 4), ratio length to width 1.02–1.05 (1.03; n = 4). Basis capituli (Fig. 3C and D): hexagonal; with short lateral angles slightly anterior to its mid-length; dorsal cornua large, triangular, with rounded tips, comprising approximately one seventh of length of basis capituli; porose areas oval, ≈1.5× their own diameter apart; ventral auriculae short, broadly rounded. Palpi (Fig. 3C and D): short, 2× or slightly less as long as broad dorsally; palpal segment II subrectangular, palpal segment III

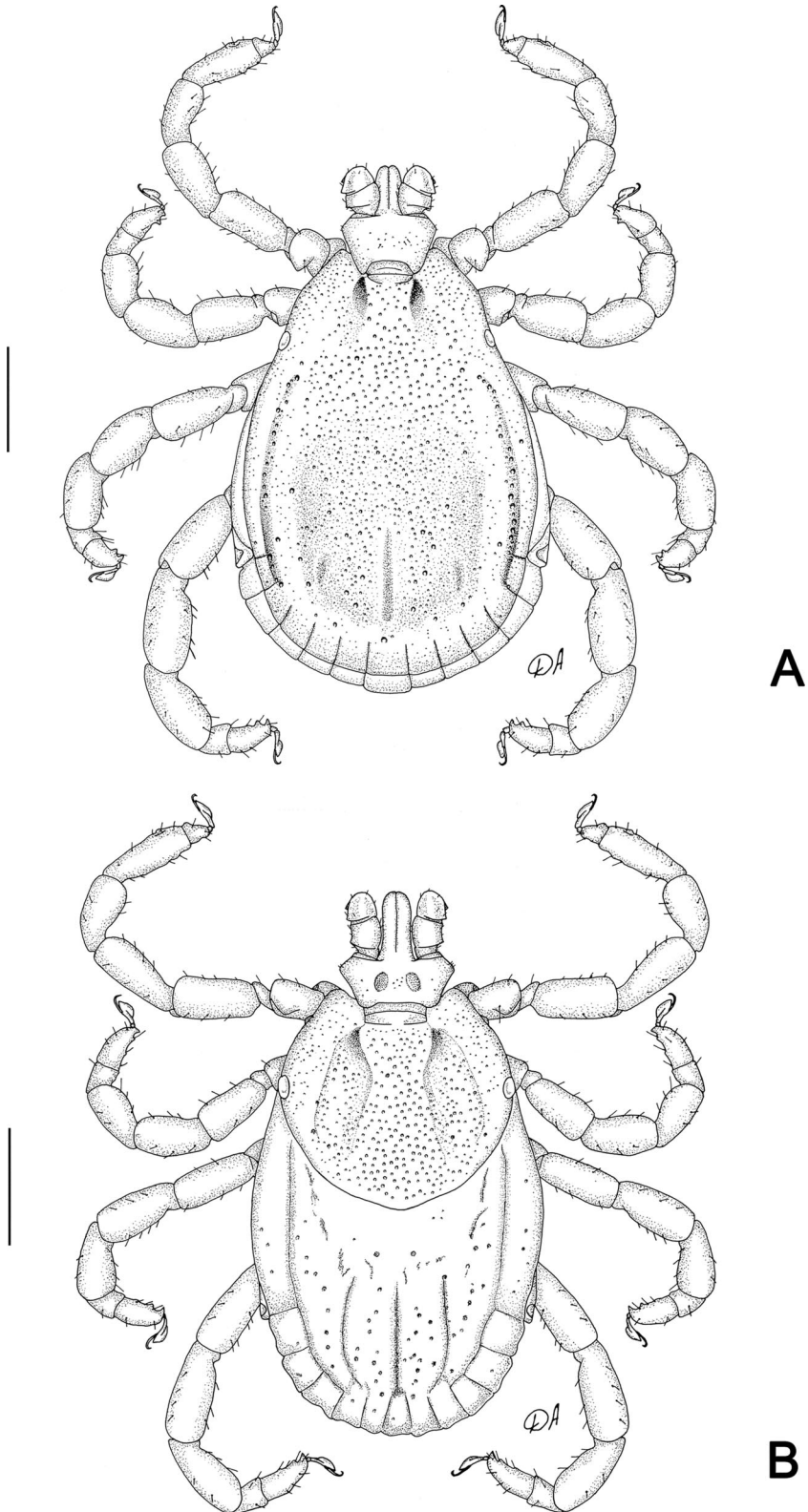


Fig. 1. *Rhipicephalus congolensis* n. sp. (A) Male dorsally. Bar = 1 mm. (B) Female dorsally. Bar = 1 mm.

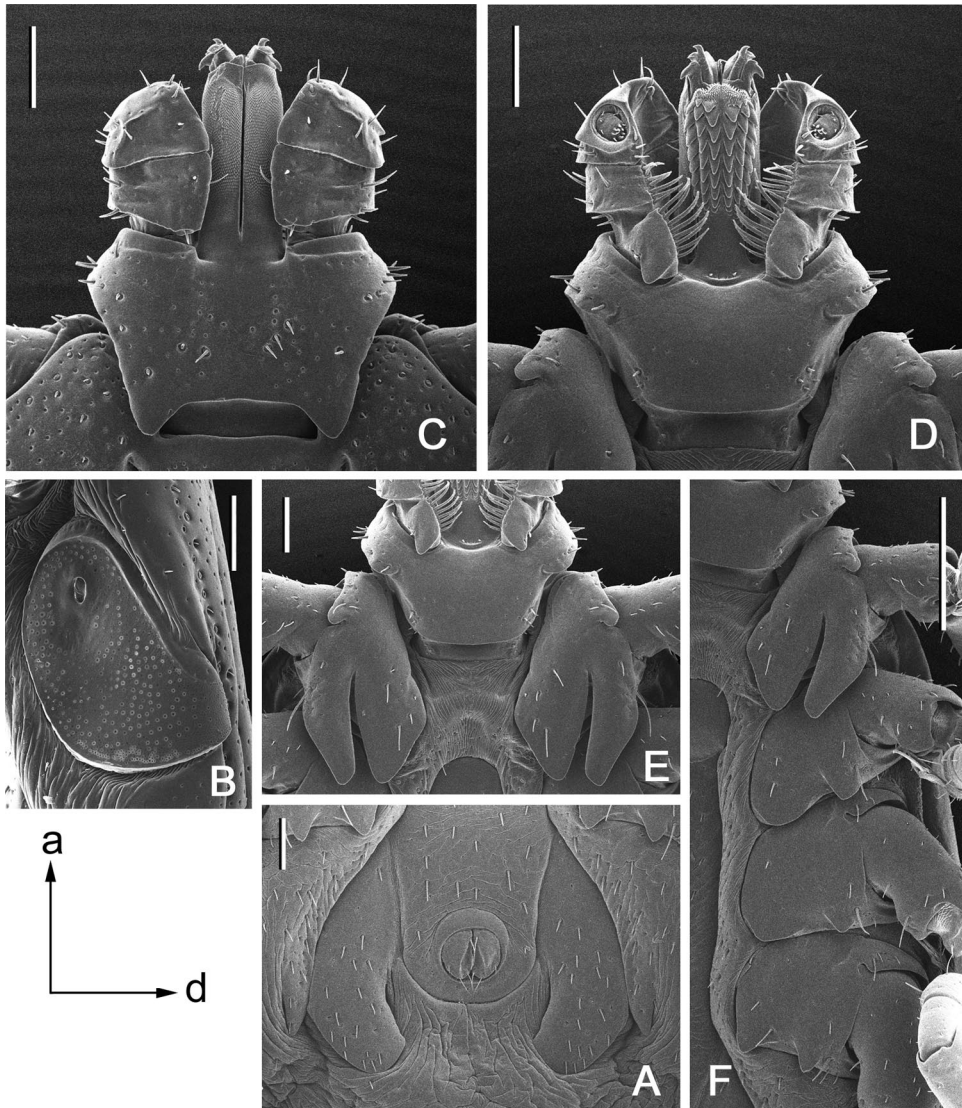


Fig. 2. *Rhipicephalus congolensis* n. sp., male. (A) Anal plates. Bar = 0.2 mm. (B) Spiracular plate. Bar = 0.2 mm. Arrows indicate orientation of spiracular plate (a = anterior; d = dorsal). (C) Gnathosoma dorsally. Bar = 0.2 mm. (D) Gnathosoma ventrally. Bar = 0.2 mm. (E) Coxae I. Bar = 0.2 mm. (F) Coxae. Bar = 0.5 mm.

broadly rounded apically; segment II slightly longer than segment III dorsally. Hypostome (Fig. 3D): club-shaped; dental formula 3/3.

Coxae (Fig. 3E and F): anterior process on coxa I inconspicuous from above; posteromedian and posterolateral spurs of coxa I juxtaposed, long, subequal in length or posterolateral spur slightly longer than posteromedian spur, posteromedian spur tapering to apex; coxae II-IV each with distinct, triangular posterolateral spur; coxae II and III each with modest, broadly arcuate, posteromedian spur; posteromedian spur on coxae IV distinct, broadly triangular.

Nymph and Larva. Unknown.

HOLOTYPE. Male, from *S. scrofa*, Boende, Équateur Province, Democratic Republic of Congo (0° 15'

S; 20° 45' E), 21-VII-2007, L. K. Mulumba-Mfumu; deposited in the USNTC (USNMMENT 00714032; CEN 126545).

ALLOTYPE. Female (USNMMENT 00714120; CEN 126545), with the same collection data as for holotype.

PARATYPES. Total: 41 males and 19 females. Collection data are listed in Table 1. Seven males and four females are deposited in the USNTC (USNMMENT 00714223, CEN 126545; USNMMENT 00714126, CEN 126546; USNMMENT 00714306, CEN 126547; USNMMENT 00714410, CEN 126548); the remaining specimens are deposited in the Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria. Some of the paratypes will be deposited in the collections of the Zoological Institute, Rus-

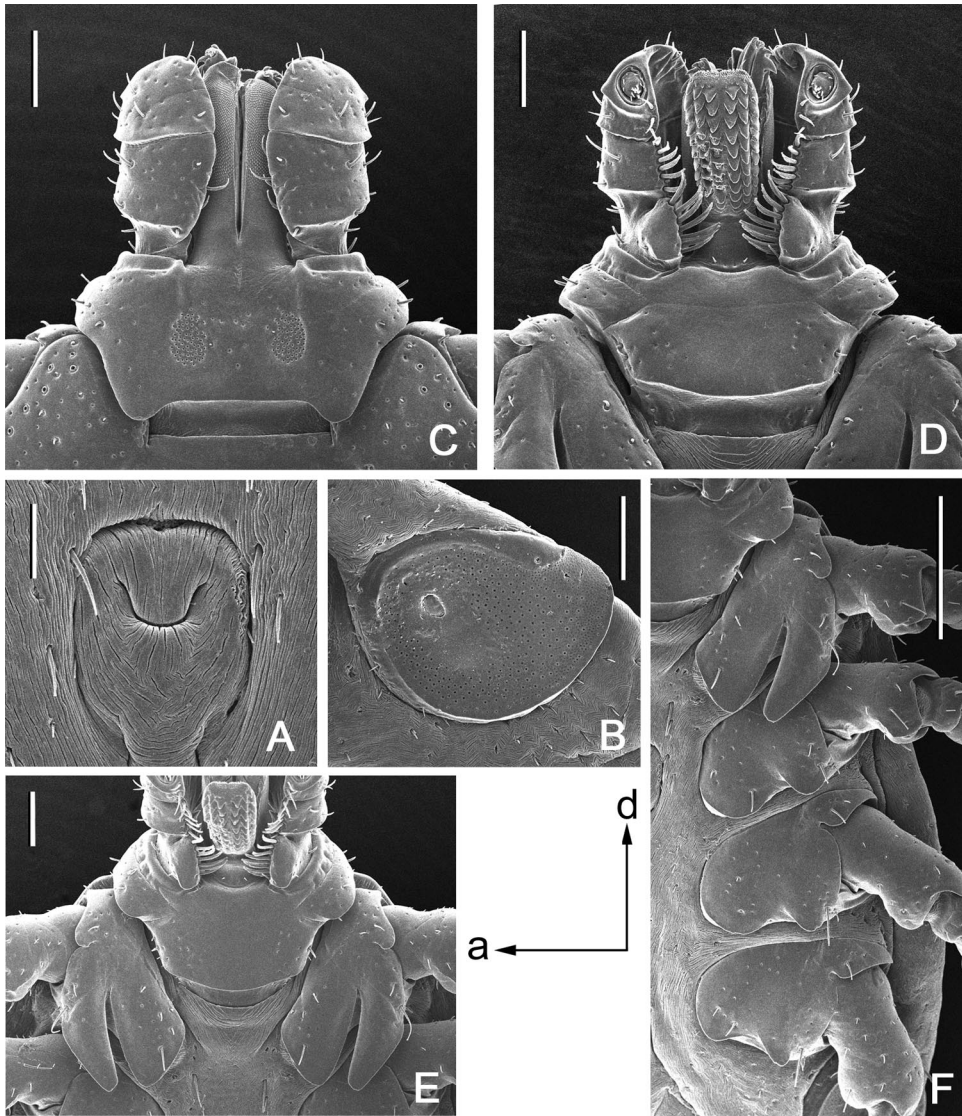


Fig. 3. *Rhipicephalus congolensis* n. sp., female. (A) Genital aperture. Bar = 0.1 mm. (B) Spiracular plate. Bar = 0.2 mm. Arrows indicate orientation of spiracular plate (a = anterior; d = dorsal). (C) Gnathosoma dorsally. Bar = 0.2 mm. (D) Gnathosoma ventrally. Bar = 0.2 mm. (E) Coxae I. Bar = 0.2 mm. (F) Coxae. Bar = 0.5 mm.

sian Academy of Sciences, and the Gertrud Theiler Tick Museum of the ARC-Onderstepoort Veterinary Institute.

Distribution and Hosts. The collection data for *R. congolensis* is that of the type series (Table 1). This species is confined to the Democratic Republic of Congo, Équateur Province (Fig. 4). All adult specimens have been collected from red river hogs and domestic pigs.

Etymology. The species is named after the Democratic Republic of Congo, in which it was discovered.

Related Species. Morphologically the adults of *R. congolensis* are most similar to those of *R. complanatus* and *R. planus*. The surface of the central and posterior regions of the conscutum of the males of these species

is depressed, giving the conscutum a concave appearance. Based on the shape of the adanal plates of the male and tripartite genital structures of the female, the new species is closer in appearance to *R. planus* than to *R. complanatus*.

The males of *R. congolensis* can be distinguished from those of *R. complanatus* and *R. planus* by the following characters: central part of conscutum densely covered with medium-sized punctations (smooth, sparsely covered with larger punctations in *R. complanatus* and *R. planus*); posterior half of marginal grooves deep with sharp outer edge, anterior portion of the groove shallow with rounded edges (marginal grooves deep throughout their length, with sharp lateral edges, in *R. complanatus* and *R.*

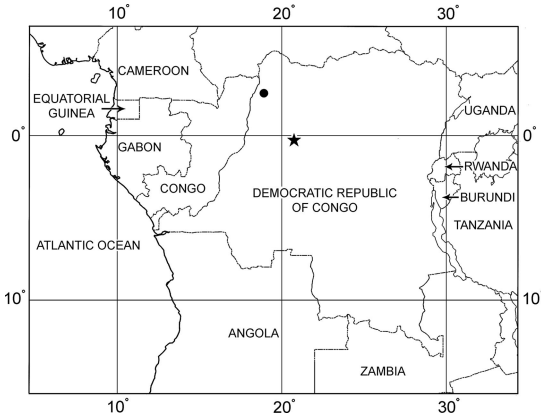


Fig. 4. *Rhipicephalus congolensis* n. sp., distribution. Star shows type locality, and filled circle shows confirmed locality.

planus); posteromedian groove distinct, long and deep (usually appears indistinct or sometimes as a short and shallow groove in *R. complanatus* and *R. planus*); adanal plates fairly broad, sickle-shaped (*R. complanatus* with broad adanal plates, particularly posteriorly, with concave posterior margin); posteromedian spur on coxa I pointed (rounded in *R. planus*); posterolateral spur on coxa I slightly longer or subequal to posteromedian spur (considerably longer in *R. complanatus*).

The females of *R. congolensis* can be distinguished from those of *R. complanatus* and *R. planus* by the following characters: central field of scutum densely covered with medium-sized punctations (smooth, sparsely punctate in *R. complanatus* and *R. planus*; rarely moderately covered with shallow punctations or ones with sloping walls in *R. planus*, giving an irregular

appearance to the scutal surface); outer edge of cervical grooves smooth, not clearly defined by slope or punctations (sharp, clear outer edge defined by large punctations in *R. planus*); genital aperture tripartite in appearance, with moderately broad central pillar with straight posterior margin, flanked on each side by a rounded depression (not tripartite in *R. complanatus*; central pillar very narrow and tapering posteriorly in *R. planus*); posteromedian spur on coxa I tapering to apex (rounded in *R. planus*).

Acknowledgments

We thank Gaspard Nsome, Jean Pierre Matondo Lusala, Boniface Lombe, and Stanislas Kayimbi for careful codification of the specimens and Excel file documentation. Earlier identifications of ticks from the Democratic Republic of Congo by Heloise Heyne (ARC-Onderstepoort Veterinary Institute) facilitated a meeting between L.K.M.-M. and I.G.H. and the discovery of *R. congolensis*. We thank Maria A. Apanaskevich for assistance with editing the illustrations. We are grateful to the Wellcome Trust, the organization that has financially enabled veterinary scientists in the Democratic Republic of Congo to conduct epidemiological studies concerning African swine fever.

References Cited

- Guglielmo, A. A., R. G. Robbins, D. A. Apanaskevich, T. N. Petney, A. Estrada-Peña, I. G. Horak, R. Shao, and S. C. Barker. 2010. The Argasidae, Ixodidae and Nuttalliellidae (Acari: Ixodida) of the world: a list of valid species names. *Zootaxa* 2528: 1–28.
- Walker, J. B., J. E. Keirans, and I. G. Horak. 2000. The genus *Rhipicephalus* (Acari, Ixodidae): a guide to the brown ticks of the world. Cambridge University Press, Cambridge, United Kingdom.

Received 4 December 2012; accepted 20 January 2013.