

NOTES ON AFRICAN HAEMAPHYSALIS TICKS. VIII. *H. (RHIPISTOMA) MORELI* SP. N., A CARNIVORE PARASITE OF THE *H. (R.) LEACHI* GROUP (IXODOIDEA: IXODIDAE)*

Jean-Louis Camicas,† Harry Hoogstraal,‡ and Kawther M. El Kammah‡

ABSTRACT: *Haemaphysalis (Rhipistoma) moreli* sp. n., described from wild-caught adult and laboratory-reared immature samples, is a member of the African *H. (R.) leachi* group, which also includes *H. (R.) leachi* (Audouin) and *H. (R.) spinulosa* Neumann. *Rhipistoma ellipticum* Koch is a nomen nudum and *H. muhsamae* Santos Dias and *H. ethiopica* Santos Dias are junior synonyms of *H. (R.) spinulosa* Neumann. Records are provided for 701 adult and 126 immature *H. (R.) moreli* taken from 128 hosts in savannas of western and eastern Africa between about 15° N and 06° S. Hosts of adults are carnivores, chiefly genets and civets, and also the lion, leopard, wildcat, serval, hyena, jackal, fox, and domestic cats and dogs. Immature stages are recorded from rodents and the nest of a bushbaby (*Galago senegalensis* subsp.).

The African *Haemaphysalis (Rhipistoma) leachi* group appears to have evolved from an Asian progenitor similar to *H. (R.) canestrinii* (Supino) (Hoogstraal, 1971). The African group has long been the most taxonomically troublesome and biologically confusing assemblage within the genus *Haemaphysalis*. These problems are of more than academic interest since "*H. leachi*" has been incriminated in transmission of numerous pathogens causing diseases in man and animals (Neitz, 1956; Hoogstraal, 1967). The incorrect identification of many tick species has often seriously reduced the practical value of literature and of field and laboratory investigations and has caused suggested measures for prevention and control to be questionable. This report is the first in a series in which we hope to increase the understanding of the *H. (R.) leachi* group

and to stabilize its nomenclature. A species common on carnivores in middle Africa is described.

Four taxa have previously been proposed for the *H. (R.) leachi* group in Africa and another (*Rhipistoma ellipticum*) has also been referred to this group by certain authors. These are:

H. leachi (Audouin, 1827), as redescribed and redefined by Hoogstraal (1958). We consider this to be a valid name for the taxon.

H. spinulosa Neumann, 1906, as redescribed and redefined by Hoogstraal (1964). We consider this to be a valid name for the taxon.

[*Rhipistoma ellipticum* Koch, 1844. See Nuttall and Warburton, 1915, p. 517, for discussion of this taxon, which these and earlier authors considered to be a junior synonym of *H. leachi* (Audouin, 1827). The type material (a single male) appears to have been lost, and we consider *R. ellipticum* to be a nomen nudum.]

H. muhsamae Santos Dias (1954) was described from one male, one female, and one nymph. Santos Dias (1955) redescribed the male from another specimen, provided new descriptions for the female and nymph, and stated that the original descriptions of the female and nymph were in error and represented a different species (see *H. ethiopica*). As stated below, we consider this taxon to be a junior synonym of *H. spinulosa* Neumann, 1906.

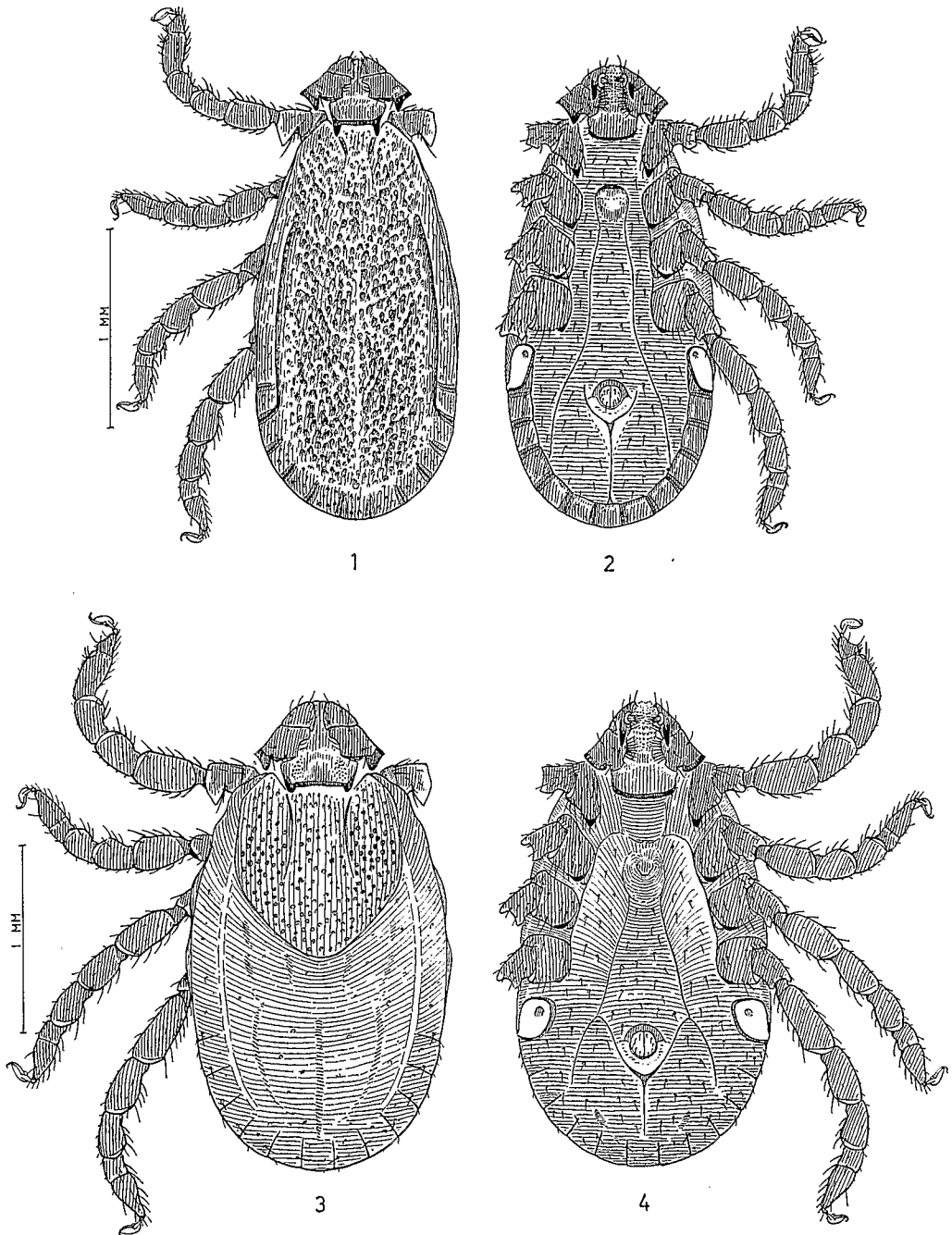
H. ethiopica Santos Dias (1958) was described from male specimens; the female and nymph of this taxon were stated to be those described under *H. muhsamae* Santos Dias

Received for publication 9 May 1972.

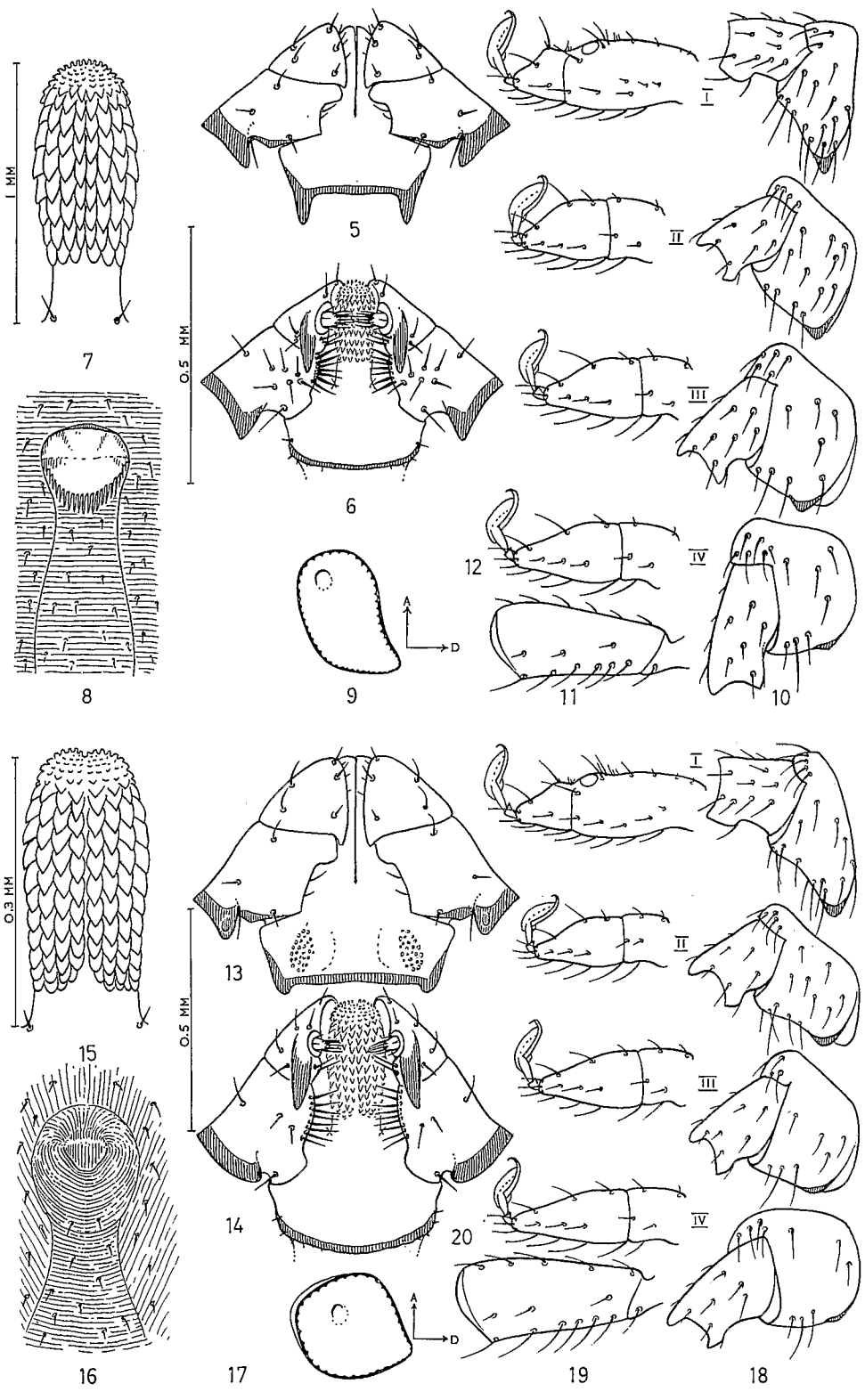
* From Research Project MF12.524.009-3010B, Bureau of Medicine and Surgery, Department of the Navy, Washington, D. C. The opinions and assertions contained herein are the private ones of the authors and are not to be construed as official or as reflecting the views of the Department of the Navy or of the naval service at large. The illustrations in this report were prepared under the auspices of Agreement 03-005-01 between the NIAID (NIH) and NAMRU-3.

† Medical entomologist, ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer), c/o Institut Pasteur, B.P. 220, Dakar, Senegal.

‡ Medical Zoology Department, United States Naval Medical Research Unit Number Three (NAMRU-3), U. S. Interests Section, c/o Spanish Embassy, Cairo, Arab Republic of Egypt.



FIGURES 1-20. *Haemaphysalis (Rhipistoma) moreli* sp. n., Senegal (HH40,927), paratypes. 1, 2. Male, dorsal and ventral views. 3, 4. Female (slightly engorged), dorsal and ventral views. 5, 6. Male capitulum, dorsal and ventral views. 7. Male hypostome, ventral view. 8. Male genital area. 9. Male spiracular plate (A = anterior; D = dorsal). 10. Male coxae and trochanters I to IV. 11. Male femur IV, internal view. 12. Male tarsi I to IV, external view. 13, 14. Female capitulum, dorsal and ventral views. 15. Female hypostome, ventral view. 16. Female genital area. 17. Female spiracular plate. 18. Female coxae and trochanters I to IV. 19. Female femur IV, internal view. 20. Female tarsi I to IV, external view.



(1954). As stated below, we consider this taxon to be a junior synonym of *H. spinulosa* Neumann, 1906.

From descriptions and illustrations of the taxa *muhsamae* Santos Dias and *ethiopica* Santos Dias we can discern no structural characters differing from those of *spinulosa* Neumann. This conclusion is also based on study of numerous collections of the *H. (R.) leachi* group from throughout Africa, during which no samples have been observed that might conform to the two Santos Dias taxa rather than to *spinulosa*. Thus we consider the taxa *muhsamae* and *ethiopica* to be junior synonyms of *spinulosa* Neumann.

***Haemaphysalis (Rhipistoma) moreli* sp. n.**

Morel's Middle African carnivore haemaphysalid

(Figs. 1–35)

Holotype

Male, from Senegal genet, *Genetta genetta senegalensis* (J. B. Fischer), Saboya (13°39' N, 16°06' W), 52 ft altitude, Departement Niore du Rip, Senegal, 16 July 1969, J.-L. Camicas (JLC-S1004) (HH40,927); deposited in Rocky Mountain Laboratory (RML54,902).

Allotype

Female, data and depository as for holotype.

Paratypes

Total: 7 ♂, 10 ♀, 75 F₁ larvae, all with same collecting data as holotype and allotype; also 10 F₁ nymphs, parent from false genet, *Pseudogenetta villiersi* Dekeyser, Kedougou (12°23' N, 12°11' W), 656 ft altitude, Région du Sénégal Oriental, Senegal, 17 November 1970, J.-L. Camicas (JLC-1865A) (HH41,826). Paratypes are deposited in collections of J.-L. Camicas (for ORSTOM), P.-C. Morel, and H. Hoogstraal (for Rocky Mountain Laboratory). (See also Other Material Examined below.)

DESCRIPTION

Male (Figs. 1, 2, 5–12)

Length from palpal apices to posterior scutal margin 1.7 to 2.2 (avg 2.0) mm; *breadth* 0.8 to 1.1 (avg 0.9) mm. *Color* yellowish brown.

Capitulum (Figs. 5–7). *Basis capituli* dorsally 1.8 to 2.1 (avg 2.07) times as broad (anteriorly) as long (including cornua); external margins strongly diverging anteriorly; cornua elongately triangular, bluntly pointed, ca. three-fifths as long as base of basis capituli. Basis capituli ventrally subrectangular; setae several posteroexternal, 1 pair posthypostomal. *Palpi* broadly salient (*leachi* type except profile angle more acute than in *leachi*); combined breadth 1.8 to 2.1 (avg 1.9) times

breadth of basis capituli; each palpus ca. 1.2 times as broad as long (from posterior margin of segment 2, excluding spur, to apex of segment 3). Segment 1 obsolete dorsally; ventrally as a short undifferentiated pedicle, 1 seta. Segment 2 ca. 1.9 times as broad as long; posterodorsal margin almost straight or slightly angular from insertion to external one-third of breadth, thence forming a large external spur which is somewhat elevated, bluntly triangular, and posteriorly directed, external margin of spur continuing anteriorly to sharply pointed posteroexternal juncture; posteroventral margin concave proximally, spur as long as dorsal spur but broader and situated nearer to segmental midbreadth; external profile acutely converging anteriorly, straight or mildly convex or concave; internodorsal margin strongly bulging anteriorly; dorsointernal setae number 2; ventrointernal setae number 6 to 9 (usually 7); dorsal and ventral setae usually number 4 and 6, respectively. In ventral profile, segment 2 ca. 1.1 to 1.7 (avg 1.3) times as long as 3. Segment 3 broadly triangular, ca. 1.4 times as broad as long, ca. 0.7 times as long as 2; posterodorsal margin almost straight; ventral spur narrowly elongate, apex bluntly pointed at or slightly beyond midlength of segment 2; setae usually number 5 dorsally, 4 ventrally, 2 to 4 (usually 3) on internoventral margin posteriorly. *Hypostome* (Fig. 7) as long as palpi; ca. 2.5 times as long as broad, apex broadly rounded; corona ca. one-fifth as long as denticle files; dental formula 4/4; denticles in subequal-length files of 7 or 8.

Scutum (Fig. 1) ca. 2 times as long as broad; anterior emargination broad, relatively shallow; scapulae pointed to bluntly rounded; margins gradually broadening to level of spiracular plates, posteriorly gradually rounded. *Cervical pits* deep, short, converging. *Cervical grooves* shallow, short, diverging. *Lateral grooves* deep, distinct, extend to anterior one-fourth of scutal length, enclose first festoon. *Punctations* numerous, medium size, walls sloping, closely spaced or contiguous giving surface a shagreened appearance, absent in narrow postero-medial line. *Festoons* number 11.

Venter (Fig. 2) and *genital area* (Fig. 8) as illustrated. *Spiracular plates* (Fig. 9) ca. 1.8 times as long as broad; subquadrate, dorsal and ventral margins subparallel, junctures rounded or angled; dorsal projection short, broadly subtriangular.

Legs (Figs. 1, 2, 10–12) short, stout. *Coxa* (Fig. 10) spurs I and II each very short, subtriangular, bluntly pointed, extending slightly beyond posterior margin; spurs II and III variable, each as on I and II or reduced to a broadly rounded ridge; setae (excluding anteroexternal group) number ca. 12 to 14 on I, 9 to 12 on II, 7 to 9 on III, 5 to 7 on IV. *Trochanters* ventrally (Fig. 10) lack spurs. *Femur* IV (Fig. 11) ventrointernal setae number 6 to 8, slightly more than one-half as long as breadth of femur at point of insertion, distal two longest. *Tarsi* (Fig. 12) II to IV short, stout; dorsal surface flat proximally, gradually

tapering distally; ventral surfaces lack hook or ridge. *Claws* moderate. *Pulvilli* reaching to apical curvature of claws.

Female (Figs. 3, 4, 13–20)

The female differs from the male in sexual characters but is similar in diagnostic details. *Length* (unengorged) 2.1 to 2.6 (avg 2.4) mm; *breadth* 1.0 to 1.3 (avg 1.2) mm.

Capitulum (Figs. 13–15). *Basis capituli* dorsally 2.7 to 2.9 (avg 2.8) times as broad as long (including cornua); external margins diverging anteriorly; cornua short, broadly triangular, bluntly rounded apically, ca. one-fifth as long as base of basis capituli; porose areas elongately oval, tilted, moderate size, widely spaced. *Basis capituli* ventrally as illustrated. *Palpi* similar to those of male except as follows: Profile more acute; apex more narrowly pointed. Segment 2 posterodorsal spur usually shorter and broader; posteroventral spur reduced to broadly rounded curve, ventrointernal setae number 6 to 9 (rarely 12). In ventral profile, segment 2 ca. 1.2 to 1.4 (avg 1.3) times as long as 3. Segment 3 slightly shorter, setae on interoventral margin posteriorly number 2 or 3. *Hypostome* (Fig. 15) essentially as in male; denticles in files of 9 to 11.

Scutum (Fig. 3) 1.1 to 1.4 (avg 1.2) times as long as broad; anterior emargination moderately deep, broad; scapulae as in male; margins subparallel (may be mildly convex) to level of two-thirds of scutal length, thence abruptly converging; posteriorly narrow, bluntly rounded. *Cervical grooves* as narrow arcs extending beyond scutal midlength. *Punctations* more distant than in male.

Dorsum (Fig. 3) and *venter* (Figs. 4, 16, 17) as illustrated. *Genital operculum* (Fig. 16) V-shaped, posteriorly blunt. *Spiracular plates* (Fig. 17) somewhat longer than broad, subquadrate, junctures rounded; dorsal projection slight or obsolete.

Legs (Figs. 3, 4, 18–20) as in male, except as follows: *Coxae* setae number 12 to 15 on I, 10 to 12 on II, 7 or 8 on III, 5 to 7 on IV. *Femur* IV ventrointernal setae number 7 to 9.

Nymph (Figs. 21, 22, 25–30)

Length (unengorged) from palpal apices to posterior body margin ca. 1.2 mm; *breadth* 0.6 mm.

Capitulum (Figs. 25–27). *Basis capituli* dorsally ca. 2.8 times as broad as long (including cornua); cornua triangular, one-third or one-fourth as long as base of basis capituli; ventrally as illustrated. *Palpi* broadly salient; combined breadth ca. 1.8 times breadth of basis capituli; each palpus ca. 2.3 times as long as its greatest breadth. Segment 1 obsolete. Segment 2 posterodorsal margin at a posteroexternally directed angle from insertion to ca. level of midlength of basis capituli, thence recurved to posteroexternal juncture at ca. level of anterior margin of basis capituli; posteroexternal juncture acutely angled; profile straight or slightly

convex (to palpal apex); posteroventral margin forming a broad spurlike angle recalling spur of male; internodorsal margin concave; dorsointernal and ventrointernal setae number 1 and 2, respectively; dorsal and ventral setae number 3 and 2, respectively. Segment 3 triangular, ca. 0.75 times as long as internodorsal margin of segment 2; ventral spur usually obsolete (sometimes faintly developed); setae number 3 dorsally, 5 ventrally, and several (small) subapically. *Hypostome* (Fig. 27) as long as palpi; cornua as illustrated; dental formula 2/2; denticles in files of 7 or 8 (rarely 8 or 9).

Scutum (Fig. 23) 1.04 to 1.27 times as long as broad; anterior emargination broad, very shallow; scapulae pointed or rounded; margins similar to those of female. *Cervical grooves* similar to those of female. *Setae* < 30 μ long.

Dorsum (Fig. 21) and *venter* (Fig. 22) as illustrated. *Spiracular plates* (Fig. 28) oval.

Legs (Figs. 23, 24, 29, 30) narrow, elongate. *Coxae* (Fig. 29) spur I reduced to broad, very short triangle; II as a broadly rounded marginal ridge; III and IV spurs obsolete. *Tarsi* (Fig. 30) moderately elongate. *Claw* I large, II to IV moderate. *Pulvilli* reaching apical curvature of claws.

Larva (Figs. 23, 24, 31–35)

Length (unengorged) from palpal apices to posterior body margin ca. 0.7 mm; *breadth* ca. 0.4 mm.

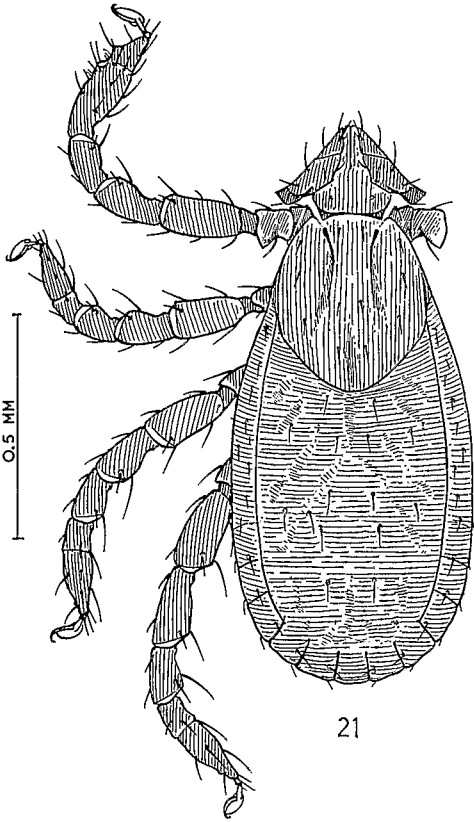
Capitulum (Figs. 31–33). *Basis capituli* dorsally ca. 2.1 times as broad as long; margins diverging anteriorly; cornua as slight marginal bulges; ventrally as illustrated. *Palpi* similar to those of nymph, except as follows. Segment 2 posterodorsal margin almost straight (rather than angular) distad of external margins of basis capituli at ca. level of anterior margin of basis capituli; posteroventral margin more like that of male than of nymph; dorsointernal and ventrointernal each single; dorsal and ventral setae number 3 and 1, respectively. Segment 3 ventral setae number 2 or 3. *Hypostome* (Fig. 33) somewhat longer than palpi, ca. 2.3 times as long as broad; corona slight; dental formula 2/2; denticles in files of 6 or 7.

Scutum (Fig. 23) ca. 0.8 times as long as broad, anterior emargination and scapulae as in nymph; margins acutely diverging to level of ca. anterior one-third of scutal length, subparallel on mid-third; thence abruptly converging, bluntly rounded posteriorly. *Cervical grooves* as in nymph. *Setae* short, Sc3 < 20 μ long.

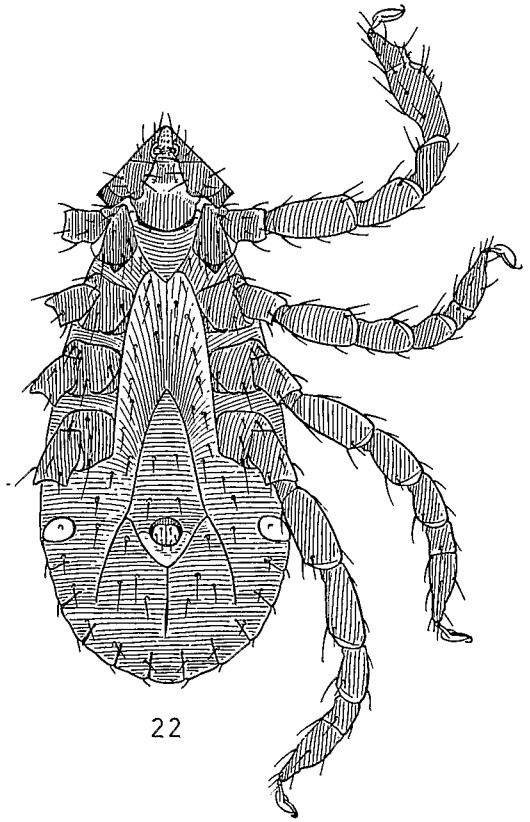
Dorsum (Fig. 23) and *venter* (Fig. 24) as illustrated. *Legs* (Figs. 23, 24, 34, 35) details as in nymph except coxal I spur not so broadly triangular and II and III spurs obsolete.

DIAGNOSIS (ADULTS)

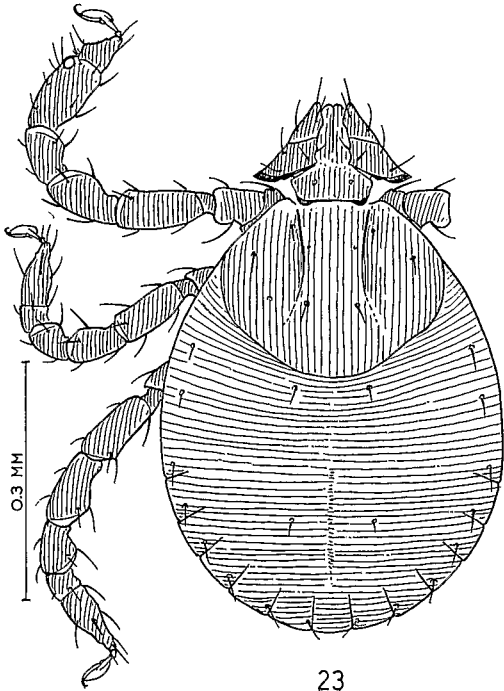
A small haemaphysalid (subgenus *Rhipistoma*; group *leachi*) [total length (mm): ♂, avg 2.0 (1.7 to 2.2), ♀, avg 2.4 (2.1 to 2.6); breadth:



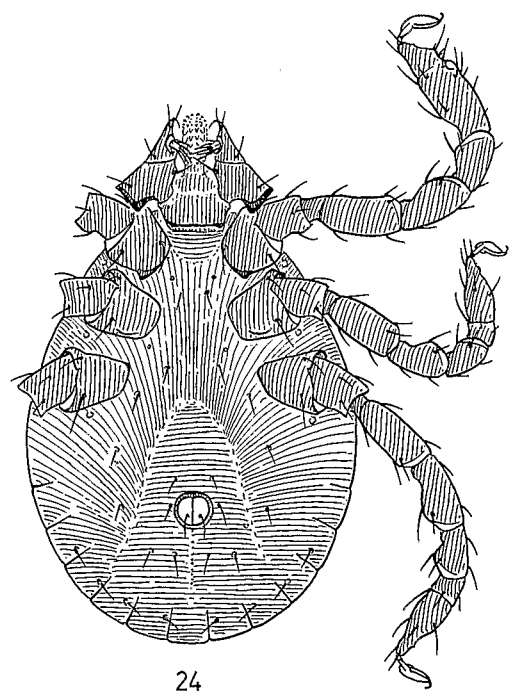
21



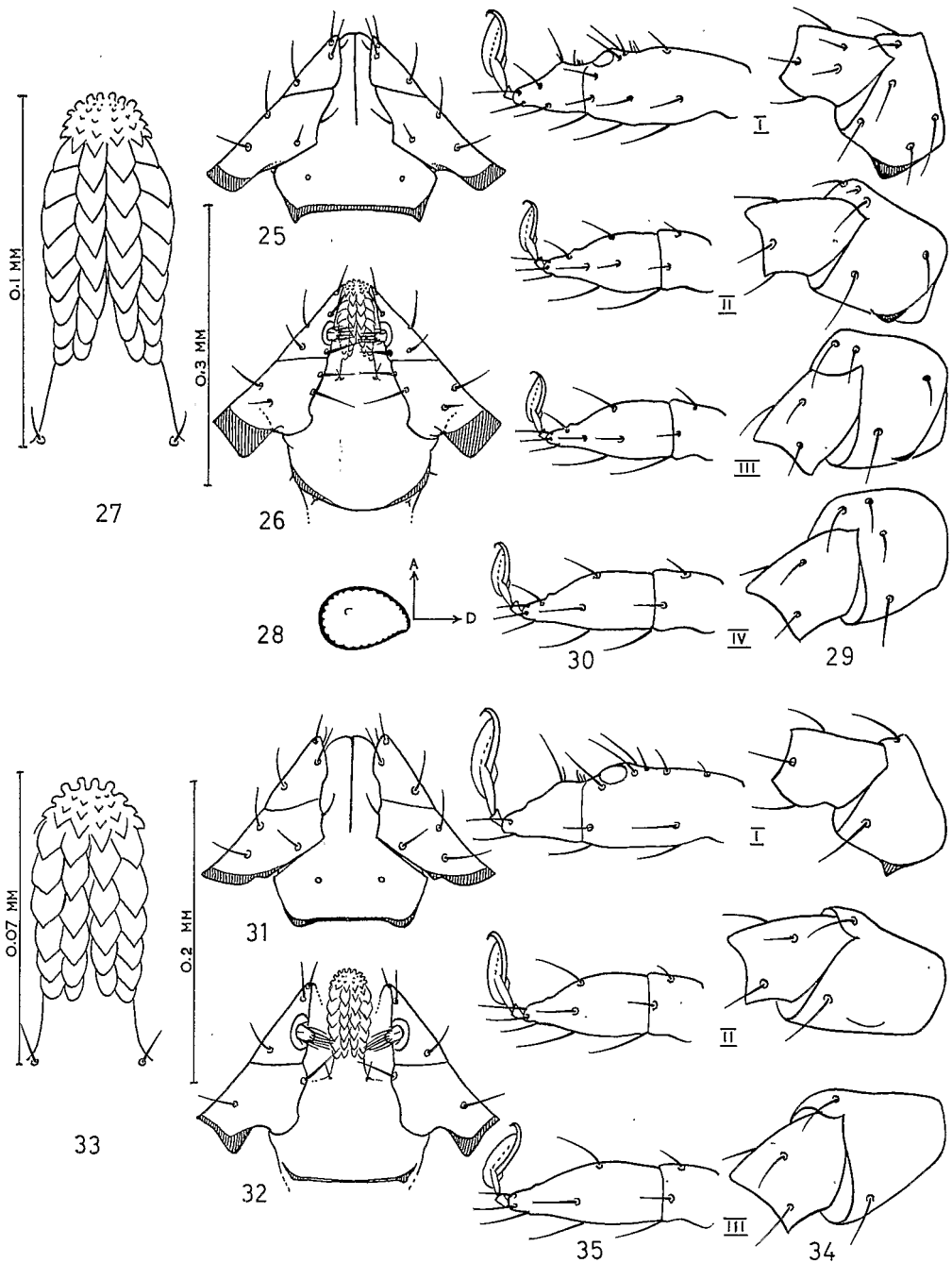
22



23



24



FIGURES 21-35. *Haemaphysalis (Rhipistoma) moreli* sp. n., Senegal, nymph (HH41,826), larva (HH 40,927), paratypes. 21, 22. Nymph, dorsal and ventral views. 23, 24. Larva, dorsal and ventral views. 25, 26. Nymph capitulum, dorsal and ventral views. 27. Nymph hypostome, ventral view. 28. Nymph spiracular plate (A = anterior; D = dorsal). 29. Nymph coxae and trochanters I to IV. 30. Nymph tarsi I to IV, external view. 31, 32. Larva capitulum, dorsal and ventral views. 33. Larva hypostome, ventral view. 34. Larva coxae and trochanters I to III. 35. Larva tarsi I to III, external view.

♂, avg 0.9 (0.8 to 1.1), ♀, avg 1.2 (1.0 to 1.3)]. *Basis capituli* dorsally ca. 2.1 (♂) or 2.8 (♀) times as broad as long; margins diverging anteriorly; cornua elongately (♂) or broadly (♀) triangular, ca. three-fifths (♂) or one-fifth (♀) as long as base of basis capituli; porose areas (♀) elongately oval, widely spaced. *Palpi* broadly salient, ca. 2 times as broad as basis capituli, profile acute, each palpus ca. 1.2 times as broad as long. Segment I obsolete dorsally, 1 ventral seta. Segment 2 posterodorsal margin forming a large, triangular external spur (shorter and broader in ♀); posteroventral margin concave proximally, spur (♂) as long as dorsally but broader and more median, or (♀) reduced to broadly rounded curve; internodorsal margin strongly bulging anteriorly; dorsointernal setae number 2; ventrointernal setae number 6 to 9 (usually 7) (♂) or 6 to 12 (♀). In ventral profile, segment 2 ca. 1.3 times as long as 3. Segment 3 ventral spur narrowly elongate, bluntly pointed, extending to or slightly beyond midlength of segment 2. *Hypostome* dental formula 4/4; denticles in files of 7 or 8 (♂) or 9 to 11 (♀). *Scutum* (♂) ca. 2 times as long as broad; margins gradually broadening from scapulae to level of spiracular plates, posteriorly gradually rounded; cervical pits short, converging; cervical grooves shallow, short, diverging; lateral grooves deep, extending to anterior one-fourth of scutal length, enclosing first festoon; punctations numerous, medium size, walls sloping, closely spaced or contiguous giving surface a shagreened appearance. *Scutum* (♀) ca. 1.2 times as long as broad; margins subparallel (or mildly convex) to level of two-thirds of scutal length, thence abruptly converging, posteriorly narrow, bluntly rounded; cervical grooves as narrow arcs extending beyond scutal midlength; punctations more distant than in male. *Genital operculum* (♀) V-shaped, posteriorly blunt. *Spiracular plates* subquadrate, junctures rounded; dorsal projection short, broadly subtriangular (♂) or slight or obsolete (♀). *Legs* short, stout. *Coxa* I and II spurs each very short, subtriangular, bluntly pointed; III and IV spurs variable, as on I and II or reduced to a broadly rounded ridge; setae (excluding anteroventral group) on I number 12 to 14 (♂) or 12 to 15 (♀), on II 9 to 11 (♂) or 10 to 12 (♀), on III 7 to 9 (♂) or 7 or 8 (♀), on IV 5 to 7 (♂, ♀). *Femur* IV ventrointernal setae number 6 to 8 (♂) or 7 to 9 (♀). *Tarsi* II to IV short, stout. *Pulvilli* reaching apical curvature of claws.

RELATED SPECIES

Male

The shagreened scutum of *moreli* is unlike those of other males in this group. In narrowly elongate body and cornua outlines, *moreli* and *leachi* are similar. Distinguishing characters are: the lateral grooves of *moreli* enclose only

the first festoon (at least two festoons in *leachi*); the palpal profile is more acute than in *leachi*; the spur of the posteroventral margin of palpal segment 2 is broader than in *leachi*; and the average size and ratio of body length (L) to breadth (B) differ (avg total L and B in *moreli* are 2.0 by 0.9 mm; in *leachi* 2.6 by 1.2 mm).

The elongate L:B ratio and elongately triangular cornua are characters easily separating most *moreli* samples from those of the generally broad-bodied *spinulosa*, which has short, broadly triangular cornua. Certain elongate *spinulosa* specimens tend to resemble *moreli* but the scanty scutal punctation, short cornua, and relative length of the ventral palpal profile of *spinulosa* permit diagnosis. In *moreli*, the ventral profile of segment 2 is always clearly longer than that of segment 3; in *spinulosa* it is shorter or, at the most, equal to segment 3. In *moreli*, but not in *spinulosa*, the palpal breadth exceeds the scutal breadth.

Female

The spurless posteroventral margin of palpal segment 2 of *leachi* is unlike those of other females in this group. In *moreli*, the palpal profile is much more acute than in *leachi*, the cornua are about one-half as long, the spurs of coxae I and II are somewhat smaller, and the spurs of coxae III and IV are much reduced or obsolete in *moreli* but distinct in *leachi*. Coxae IV setae (excluding the anteroventral group) number 5 to 7 in *moreli* and 9 in *leachi*. The scutum is more elongate in *leachi* than in *moreli*.

As in the male, *moreli* and *spinulosa* females may be distinguished by features of the ventral palpal profile. In *moreli*, the ventral profile of segment 2 is straight and clearly longer than that of segment 3, in *spinulosa* it is more or less deeply concave and the lengths of 2 and 3 are subequal. In *moreli*, ventrointernal setae number 6 to 12, in *spinulosa* they number 4. The *moreli* scutum is distinctly longer than broad and much more punctate than in *spinulosa*. The *spinulosa* scutum is generally subcircular, though in some specimens it tends to be longer and thus similar to that of *moreli*.

Nymph

The posteroventral margin of palpal segment 2 is broadly angular in *moreli* and more nar-

TABLE I. *Haemaphysalis (Rhipistoma) moreli* sp. n., material examined.

No. of ticks				Host (No. examined)	Locality	Month, year	Collector*
♂	♀	N	L				
Senegal (Nioro du Rip)							
0	1	0	0	<i>Genetta g. senegalensis</i> (1)	Saboya	May 55	PLD
1	1	0	0	<i>Genetta g. senegalensis</i> (1)	Saboya	Dec 68	JLC
3	1	0	0	<i>Genetta g. senegalensis</i> (1)	Saboya	Jun 69	JLC
17	20	0	75+	<i>Genetta g. senegalensis</i> (2)	Saboya	Jul 69	JLC
1	1	0	0	<i>Genetta g. senegalensis</i> (1)	Saboya	Nov 69	JLC
31	14	0	0	<i>Genetta g. senegalensis</i> (2)	Saboya	Sep 70	JLC
5	10	0	0	<i>Genetta tigrina</i> subsp. (1)	Saboya	Aug 70	JLC
1	0	0	0	<i>Pseudogenetta villiersi</i> (1)	Saboya	Mar 69	JLC
1	1	0	0	<i>Pseudogenetta villiersi</i> (1)	Saboya	Jun 70	JLC
24	20	0	0	<i>Pseudogenetta villiersi</i> (3)	Saboya	Jul 70	JLC
7	0	0	0	<i>Pseudogenetta villiersi</i> (1)	Saboya	Sep 70	JLC
7	0	0	0	<i>Pseudogenetta villiersi</i> (1)	Saboya	Oct 70	JLC
8	0	0	0	<i>Pseudogenetta villiersi</i> (1)	Saboya	Dec 70	JLC
1	0	0	0	<i>Erinaceus albiventris</i> subsp. (1)	Saboya	Dec 67	JLC
7	0	0	0	<i>Pseudogenetta villiersi</i> (3)	Petit Bao-Bolon	Mar 66	MC
Senegal (Senegal Oriental)							
17	17	0	0	<i>Genetta pardina</i> subsp. (1)	Kedougou	Nov 70	JLC
82	19	10+	0	<i>Pseudogenetta villiersi</i> (4)	Kedougou	Nov 70	JLC
2	1	0	0	<i>Viverra c. civetta</i> (1)	Niokolo Koba Nat. Parc	Sep 55	PLD
Senegal (Thies)							
9	6	0	0	<i>Genetta g. senegalensis</i> (2)	Bandia	Dec 66	MC
19	8	0	0	<i>Genetta g. senegalensis</i> (1)	Bandia	Mar 67	JLC
2	1	0	0	<i>Genetta g. senegalensis</i> (1)	Bandia	Apr 68	JLC
0	3	0	0	<i>Genetta g. senegalensis</i> (1)	Bandia	Sep 68	JLC
2	0	0	0	<i>Genetta g. senegalensis</i> (1)	Bandia	Apr 69	JLC
1	0	0	0	<i>Pseudogenetta villiersi</i> (1)	Bandia	Mar 67	JLC
1	0	0	0	<i>Pseudogenetta villiersi</i> (1)	Bandia	Apr 67	JLC
3	3	0	0	<i>Pseudogenetta villiersi</i> (1)	Bandia	Dec 70	JLC
2	3	0	0	<i>Felis libyca</i> subsp. (1)	Bandia	Aug 70	JLC
0	1	0	0	Domestic cat (1)	Bandia	Feb 68	JLC
1	0	0	0	<i>Erinaceus albiventris</i> subsp. (1)	Bandia	Aug 70	JLC
1	0	0	0	<i>Erinaceus albiventris</i> subsp. (1)	Thies (nr)	Nov 68	JLC
Senegal (Tambacounda)							
2	0	0	0	<i>Viverra c. civetta</i> (1)	Dialakoto	Dec 67	MC
Senegal (Cap Vert)							
0	1	0	0	<i>Genetta g. senegalensis</i> (1)	Tiaroye	Sep 59	PCM
62	12	0	0	<i>Genetta</i> sp. (1)	Diender	Jun 62	PCM
Senegal (Diourbel)							
1	0	0	0	<i>Vulpes pallida</i> subsp. (1)	N'Goye	Dec 65	MC
2	0	0	0	<i>Genetta g. senegalensis</i> (1)	N'Goye	Dec 65	MC
Senegal (Casamance)							
3	2	0	0	<i>Pseudogenetta villiersi</i> (1)	Kolda	Jan 64	PCM
2	0	0	0	<i>Felis serval</i> subsp. (1)	Bignona	Oct 45	PCM
Liberia							
1	1	0	0	Domestic cat (1)	Harbel	—	RF
Ivory Coast (Abidjan)							
0	0	3	0	<i>Dephomyes defua</i> (1)	Adiopodoume	Feb 65	LB
0	0	1	0	<i>Praomys tullbergi</i> subsp. (1)	Adiopodoume	Sep 65	LB
0	0	1	0	<i>Dephomyes defua</i> (1)	Adiopodoume	Oct 65	LB
1	1	0	0	"Bat" (?) (1)	Adiopodoume	—	IPP
1	0	0	0	<i>Viverra c. civetta</i> (1)	Adiopodoume	Sep 65	PCM
0	1	0	0	<i>Viverra c. civetta</i> (1)	Adiopodoume	May 63	PCM
Ivory Coast (Man)							
3	1	0	0	<i>Genetta maculata</i> subsp. (1)	Yeale	Jan 59	PCM
Ivory Coast (Nimba)							
1	0	0	0	Vegetation (1)	Mt. Nimba	Sep 46	AV

TABLE I. (Continued)

No. of ticks				Host (No. examined)	Locality	Month, year	Collector*
♂	♀	N	L				
Ivory Coast (Korhogo)							
1	0	0	0	Domestic cat (1)	Korhogo	Jul 67	DP
Ivory Coast (Tiassale)							
0	0	3	1	<i>Praomys tullbergi</i> subsp. (3)	Lamto	Dec 63	LB
0	0	3	0	<i>Praomys tullbergi</i> subsp. (2)	Lamto	Apr 64	LB
0	0	9	0	<i>Praomys tullbergi</i> subsp. (3)	Lamto	Jul 64	LB
Upper Volta (Bobo-Dioulasso)							
2	0	0	0	<i>Felis pardus</i> subsp. (1)	Santidougou	Jul 57	PCM
1	0	0	0	<i>Felis leo senegalensis</i> (1)	Santidougou	Sep 57	PCM
0	0	0	6	<i>Praomys tullbergi</i> subsp. (2)	Foret du Kou	Mar 66	RT
Upper Volta (Gaoua)							
8	2	0	0	<i>Viverra c. civetta</i> (1)	Batié	Jan 57	PCM
Mali (Sikasso)							
2	0	0	0	<i>Felis pardus</i> subsp. (1)	Sikasso	Aug 54	PCM
0	1	0	0	<i>Felis pardus</i> subsp. (1)	Sikasso	Jul 56	PCM
Cameroun (Occidental)							
3	1	0	0	<i>Genetta g. senegalensis</i> (1)	Mamfe	Oct 32	?
1	0	0	0	<i>Viverra c. civetta</i> (1)	Mamfe	Jun 33	?
Cameroun (Oriental)							
2	0	0	0	<i>Viverra c. civetta</i> (1)	Yaounde	- 55	JM
1	1	0	0	<i>Genetta</i> sp. (1)	Yaounde	Jun 49	IPP
8	0	0	0	<i>Viverra c. civetta</i> (2)	Nanga-Eboko	?	PCM
6	0	0	0	<i>Viverra c. civetta</i> (1)	Obala	Sep 64	PCM
Cameroun (Efoulan)							
9	1	0	0	<i>Viverra c. civetta</i> (1)	Nkomakak	Jul 54	?
Cameroun (Evodoula)							
29	2	0	0	<i>Viverra c. civetta</i> (1)	Evodula (nr)	Oct 52	PCM
1	0	0	0	<i>Genetta</i> sp. (1)	Evodula (nr)	Oct 52	PCM
Gabon (Libreville)							
10	4	0	0	<i>Genetta g. senegalensis</i> (1)	Cap Esterias	Feb 51	HAB
1	1	0	0	<i>Nandinia binotata</i> (1)	?	Feb 51	HAB
Zaire (Ibembo)							
1	1	0	0	<i>Viverra c. civetta</i> (1)	Ibembo	Mar 50	CM
Central African Republic (Bouar-Baboua)							
0	2	0	0	Domestic cat (2)	Bouar	Jul 69	MG
Uganda (Ankole)							
0	1	0	0	Domestic cat (1)	Queen Eliz. Park	Feb 71	MHW
0	1	0	0	<i>Lepus crawshayi</i> (1)	Queen Eliz. Park	Feb 71	MHW
Uganda (Buganda)							
0	3	0	0	Domestic dogs (11)	Kampala (pound)	May 71	-
Uganda (Karamoja)							
1	0	0	0	<i>Hyaena h. dubbah</i> (1)	Jie	Mar 42	TWC
Sudan (Upper Nile)							
4	1	0	0	<i>Felis libyca ugandae</i> (3)	Paloich (nr)	Feb 61	HH
14	2	0	0	<i>Felis libyca ugandae</i> (1)	Paloich (nr)	Aug 61	HH
1	1	0	0	<i>Genetta g. senegalensis</i> (2)	Paloich (nr)	Feb 61	HH
5	1	0	0	<i>Genetta g. senegalensis</i> (1)	Paloich (nr)	Aug 63	HH
5	3	0	0	<i>Genetta g. senegalensis</i> (1)	Malakal (nr)	Feb 61	HH
Ethiopia (Sidamo)							
2	0	0	0	<i>Genetta g. senegalensis</i> (1)	Bulcha Forest	Nov 70	JSA
Ethiopia (Shoa)							
0	0	1	0	<i>Arvicanthus</i> sp. (1)	Koka	Apr 71	JSA
0	0	5	0	<i>Praomys</i> sp. (1)	Koka	Apr 71	JSA

TABLE I. (Continued)

No. of ticks				Host (No. examined)	Locality	Month, year	Collector*
♂	♀	N	L				
Ethiopia (Harar)							
3	0	0	0	<i>Hyaena h. dubbah</i> (1)	Urso River	Jul 62	BG
4	2	0	0	<i>Felis leo</i> subsp. (1)	Urso River	Jul 62	BG
5	7	0	0	<i>Genetta g. senegalensis</i> (1)	Urso River	Jul 62	BG
Kenya (Central)							
1	0	7	1	<i>Galago senegalensis</i> subsp. Nest (1)	Nanyuki	Jan 59	WS
2	1	0	0	<i>Viverra civetta schwartzi</i> (1)	Langata	Mar 54	RH
Kenya (Rift Valley)							
1	0	0	0	<i>Lepus capensis</i> subsp. (1)	Lake Baringo	Feb 68	REK
9	1	0	0	<i>Felis libyca taitae</i> (1)	Lake Baringo	Feb 68	REK
1	0	0	0	<i>Felis pardus</i> subsp. (1)	Naivasha	Jul 29	PMJ
12	0	0	0	<i>Genetta g. senegalensis</i> (1)	Ngong Hills	Jul 56	HH
2	3	0	0	<i>Genetta g. senegalensis</i> (1)	Kerio	Nov 56	WEG
1	0	0	0	<i>Canis adustus</i> subsp. (1)	Kerio	Nov 49	WEG
0	1	0	0	<i>Canis adustus</i> subsp. (1)	Kerio Valley	Nov 56	WEG
2	0	0	0	<i>Canis adustus</i> subsp. (1)	Bungoma	May 51	JM
Tanzania (Northern)							
7	1	0	0	<i>Viverra civetta schwartzi</i> (1)	Temi River	Aug 56	HH
0	3	0	0	<i>Genetta g. senegalensis</i> (1)	Muriet (nr. Arusha)	Aug 56	FH
503	198	43	83	Total	(128)		

* COLLECTORS

JSA J. S. Ash
 LB L. Bellier
 HAB H. A. Beatty
 MC M. Cornet
 JLC J.-L. Camicas and R. Chateau
 TWC T. W. Chorley
 PLD P. L. Dekeyser
 RF R. Fox
 BG B. Glass
 MG M. Giret
 WEG W. E. Grainger
 FH F. Hampshire
 HH H. Hoogstraal

+ Reared specimens.

RH R. Harmsen
 PMJ P. M. Jenkins
 REK R. E. Kuntz
 CM Congo Museum (collection of)
 JM J. Mouchet (Cameroun)
 JM J. Maindi (Kenya)
 PCM P.-C. Morel (collection of)
 DP D. Parelus
 IPP Institut Pasteur Paris (collection of)
 WS W. Snow
 RT R. Taufflieb
 AV A. Villiers
 MHW M. H. Woodford

rowly spurlike in *leachi*. A ventral spur is absent on palpal segment 3 in *moreli* but present in *leachi*. Hypostome denticles number 7 to 9 per row in *moreli* and 5 or 6 in *leachi*. The scutum is longer than broad in *moreli* and subcircular in *leachi*. The nymph of *spinulosa* has not been described.

Larva

Palpal characters for differentiating *moreli* and *leachi* nymphs are similar in the larvae of these species. Hypostome denticles number 6 or 7 per row in *moreli* and 4 to 6 in *leachi*. The larva of *spinulosa* has not been described.

DISTRIBUTION AND HOSTS

The collection data for *Haemaphysalis (Rhipistoma) moreli* are listed in Table I. This

species is recorded from savanna regions of western and eastern Africa between about 15° N and 06° S.

Hosts of adults are carnivores, chiefly genets and civets, and also include the lion, leopard, wildcat, serval, hyena, jackal, fox, and domestic cats and dogs. Exceptional hosts of adults are hedgehogs, hares, and a (?) bat.

Immature stages were taken from rodents and the nest of a bushbaby (*Galago senegalensis* subsp.).

ACKNOWLEDGMENT

This species is dedicated to our colleague Dr. Pierre-Claude Morel in recognition of his many contributions to knowledge of the African tick fauna.

LITERATURE CITED

- HOOGSTRAAL, H. 1958. Notes on African *Haemaphysalis* ticks. IV. Description of Egyptian populations of the yellow dog-tick, *H. leachii leacheii* (Audouin, 1827) (Ixodoidea, Ixodidae). *J. Parasit.* **44**: 548-558.
- . 1964. Notes on African *Haemaphysalis* ticks. VI. *H. spinulosa* Neumann, and its relation to biological and nomenclatorial problems in the *H. leachii* group of Africa and Asia (Ixodoidea, Ixodidae). *J. Parasit.* **50**: 786-791.
- . 1967. Ticks in relation to human diseases caused by *Rickettsia* species. *Ann. Rev. Ent.* **12**: 377-420.
- . 1971. Identity, hosts, and distribution of *Haemaphysalis (Rhipistoma) canestrinii* (Supino) (resurrected), the postulated Asian progenitor of the African *leachi* complex (Ixodoidea: Ixodidae). *J. Parasit.* **57**: 161-172.
- NEITZ, W. O. 1956. A consolidation of our knowledge of the transmission of tickborne diseases. Onderstepoort *J. Vet. Res.* **27**: 115-163.
- SANTOS DIAS, J. A. T. 1954. Mais uma nova espécie de carraca do genero *Haemaphysalis* C. L. Koch, 1884, para a fauna de Moçambique. *Mem. Estud. Mus. Zool. Univ. Coimbra* (225), 9 p.
- . 1955. Sobre uma pequena coleção de carracas provenientes de Tete (Moçambique). *Moçambique* **81**: 117-132.
- . 1958. Identificação de uma segunda forma pequena de carraca africana do grupo *leachii*. *Haemaphysalis ethiopica* n. sp. Moçambique **88**: 87-108 (1956). (In English: NAMRU-3-T16.)