



ANNALS

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A LIST OF THE TICKS OF SOUTH AFRICA, With Descriptions and Keys to all the Forms known.

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There are probably none of the external parasites of domestic animals of more importance to the stock raiser in South Africa than the ticks, owing to the large number of diseases which they transmit from animal to animal. The ticks of South Africa have, however, only been studied with regard to their connection with the transmission of diseases, and very few people are aware of the distinction between the various species and the various forms of the same species.

With a view to throwing a little more light on these creatures, and mainly of assisting the work of those interested in the study of the diseases referred to, a study of the ticks of South Africa was taken up by me about three years ago while in the Transvaal. Since then a large number of the life histories of these ticks have been worked out, and their immature stages carefully studied and compared. There are still many species which I have not been able to see owing to the rareness with which they occur, but in such cases I have compiled the literature from other authors and placed it in such shape as I consider will prove useful to the South African workers. There is still an immense amount of work to be done on this subject, and my only plea for placing this paper before the public is in the hopes that it will arouse more interest in such studies, and consequently advance the work.

FAMILY IXODIDAE.

The ticks or *Ixodidae* are distinguishable from the other families of the order *Acarina* by the following characters:—

They are always large enough to be visible to the naked eye, flat when young, more or less swollen when fully engorged with blood; the females almost always larger than the males, often attaining in certain species the size of a hazel nut. The integument is always coriaceous, and usually of a dull colour, such as brown or reddish-brown, but sometimes adorned with bright colours and designs.

This tick is spoken of by Lounsbury in 1905 as *Rhipicephalus* (B) *sp.* He says it occurs in Cape Colony in the high inland districts, most probably because more horses are found there, and not on account of the climate. I have had it sent in also from Basutoland. It is found principally upon horses, and cattle are seldom infested, even when horses are very scarce. Horses often become very badly covered with these ticks when they run over the veld in the winter time. Very few are found during the summer months. From adults to hatching of larvae, in Capetown, took 186 to 201 days, and is probably longer on the veld. Lounsbury says that development cannot be forced in an incubator. There is probably only one generation in a year.

GENUS RHIPICEPHALUS. KOCH.

Acarus (ex. p.), Linnaeus (1758).

Ixodes (ex. p.), Latreille (1795).

Rhipicephalus, Koch (1844).

Phaulixodes Berlese (1889).

Boophilus, Curtice (1890).

Rhipicephalus, Koch, (Neumann, 1897).

Eyes present. Base of rostrum wider than long, hexagonal on the dorsal surface, forming on each side a prominent lateral angle. Palpi short, wide, the third article prolonged on the ventral by a short retrograde point; the first article by a lobe on the inner side, sometimes not very prominent, and slightly retrograde. Coxae I ordinarily with two strong teeth. Stigmatic plates comma-shaped, with a short tail in the female, and a long one in the male; males provided usually with two pairs of ventral plates, in the region of the anus and known as (1) anal plates, next to the anus, and (2) accessory anal plates, smaller in size and situated laterally of the anal plates. Males usually with a caudal prolongation on the posterior margin of the body.

This is one of the most important groups of ticks because of the role which so many of its species play in the transmission of diseases. It is especially an African genus, fully three-quarters of the species referred to it being found in Africa.

It presents the most difficulties to the student of the *Ixodidae*. Many of the species seem almost impossible to separate, especially where one has a large series of specimens with all stages of variations. The immature stages are very similar, and even the most careful study may fail to distinguish the species to which they belong.

The females are more difficult to distinguish than the males. The only characters which are easy to use are those of the shield and base of rostrum. With the males the characters of the shield, base of rostrum, and anal plates are of most use.

The males differ from the males of other genera by the fact that the body is much more slender, and after feeding a few days it usually swells.

and projects slightly beyond the shield on the lateral and posterior margins, the caudal prolongation also usually appearing at this time.

I have been unable to obtain or rear the immature stages of each species, so that the study of these stages is incomplete.

The following discussion, together with the keys, may serve to make the distinctions between the species more apparent. The drawings in the plates are made from what seemed typical specimens, and will probably assist most in studying this difficult genus.

MALES OF RHIPICEPHALUS. (See *Plates VIII and IX.*)

Among the males, *evertsi* is probably the most readily recognised, because of its shagreened shield and also its saffron-coloured legs. Besides this the eyes are spherical and in orbits (*VIII, a*).

R. oculatus resembles it closely in the matter of the eyes, but although the punctuations on the shield are numerous, fine, and almost equal, they do not coalesce so as to give a shagreened appearance (*VIII, b*).

In *capensis* the shield is shagreened, but here the eyes are not spherical, but flattened on the lateral margins (*VIII, c*).

R. sanguineus is the type species of the genus. The punctuating of the dorsal shield is here very distinct; the punctures are unequal in size, the smaller ones, more numerous, do not coalesce, but are regularly distributed; the larger punctuations are fewer in number and are arranged in more or less regular fashion. There is a narrow posterior groove, with a large, oval, shallow pit on each side of it, with further forward two wider, smooth impressions; the caudal prolongation is very short or may be wanting (*VIII, e*). Another species known as *punctatissimus* was originally described by Gerstäcker, and differed from *sanguineus* in the punctures being distributed more irregularly on the shield. Later studies made by Dönitz seem to show that this species is synonymous with *sanguineus* or at most only a variety of the latter species.

R. appendiculatus.—This species, together with *bursa*, have caused considerable confusion; *appendiculatus* is easily recognisable by the elongate, slender caudal prolongation, but where this is not present the punctuation is typical (*VIII, d*). The large punctuations are mostly confined to the anterior end of the shield, but in a large area on each side at about the middle of the length of the shield the punctuations are very scarce and very superficial. There is not so much difference in the size between the large and small punctuations as is the case with *sanguineus* and other species of *Rhipicephalus*. The anal plates are also characteristic, both ends are pointed quite sharply, and the accessory anal plates are only indicated or lacking.

R. bursa might be easily confused with *appendiculatus*, were it not for the anal plates, which are very broad, and not narrow and slender as in *appendiculatus*, there are also very small and slender accessory plates present. The punctuations of the dorsal shield are more even in size and distributed evenly over all its extent, a few large punctuations do exist, but they are situated near the margins and anterior end (*VIII, h*). The punctuations bring it near to *capensis*, which is, however, shagreened.

R. simus is quickly recognised. It is larger than *appendiculatus*, and the shield is almost black in colour and polished so as to shine

brightly. The grooves on the shield are almost obsolete, and the fine punctuations are very fine and superficial and few in number. The large punctuations are very large and distributed in four irregular longitudinal rows. These rows may vary in continuity, and the relative number and size of punctuations, both large and small, may vary considerably. The anal plates are triangular, with posterior edge rounded and inner edge concave (*VIII, f*).

R. nitens is considered by some workers as only a variety of *appendiculatus*. The punctuations on the dorsal shield are numerous, the small ones are very fine and superficial, but the large ones are confined to the margins and irregularly distributed in the anterior region. The anal plates are semi-lunate in shape and pointed at both ends.

R. lunulatus lies between *sanguineus* and *simus*. The males are smaller than *simus*, but almost equal to *sanguineus*. The small punctuations of the shield are larger than in either of these species, more numerous and evenly distributed over the whole surface. The large punctuations are most numerous in the anterior position, but four irregular lines extend longitudinally over the shield. The anal plates are triangular and concave on the posterior margin, forming two sharp teeth on posterior angles (*VIII, g*).

R. duttoni is very similar to *R. appendiculatus* and *R. lunulatus*. It differs from the former, however, in the body not projecting beyond the lateral margins of the dorsal shield; the fine punctuations are more evenly distributed over the surface of the shield, and larger than the fine punctuation of *appendiculatus*; the posterior angles of the base of the rostrum are more prominent than in *appendiculatus*. The anal plates are not spindle shaped, as in *appendiculatus*, but broadly triangular, with the inner angle of the base very prolonged and sharp. In *lunulatus* the two basilar angles are of about equal length and the plates are not so wide.

FEMALES OF RHIPICEPHALUS. (See *Plate X*.)

The females of this genus are much more difficult to distinguish than the males. The characters most used are the shields, as with the males, and the base of the rostrum.

Based on shape of shields, we may divide the species into two groups, (1) those with shields longer than wide, and (2) those with shields as wide or practically as wide as long. Class one includes *sanguineus*, with the doubtful species *punctatissimus* and *appendiculatus*, although the last one is not always apparently longer than wide. The remaining species come under class two. Dividing the species on the character of the eyes, we find that *evertsi* and *oculatus* have spherical eyes, situated in deep orbits, while the remaining species have flat unorbited eyes. In *evertsi* and *capensis* the punctuations on the shields are so numerous as to produce a shagreened effect, while the remainder of the species have the punctuations distinct and not coalescing.

R. evertsi is easily recognised from its broad oval shield, orbited eyes, and shagreened surface, as well as by its saffron-coloured legs (*IX, a*).

R. oculatus does not have the heart-shaped shield shagreened, but the eyes are orbited, setting it off at once as distinct from the other species (*IX, b*). The punctuations are mostly fine and distinct, with a few

very large ones in the median area and near the anterior margins, in this resembling *sanguineus*, but, unlike *sanguineus*, the shield is as wide as long.

R. capensis closely resembles *evertsi*, except that the eyes are flat, marginal grooves well developed, and a few large punctuations in the anterior part (*IX, c*).

R. sanguineus has a shield much longer than wide and very narrowly rounded behind. The eyes are situated near the posterior third of the length. The punctuations are mostly fine, and distant, on the whole surface of the shield. In the median area, the base of the marginal groove, and the marginal areas, are a few irregularly distributed very large punctuations (*IX, e*). The doubtful species *punctatissimus* is probably synonymous with *sanguineus*, as all the characters agree.

In *appendiculatus*, the shield is slightly longer than wide, but not so noticeably so as in *sanguineus*. The eyes are at about the middle of the length of the shield. The fine punctuations are larger than in *sanguineus*, and thickly distributed over all the surface, except in an area on each side near the eyes, where they are fewer in number. The large punctuations are mostly confined to the anterior and lateral portions of the shield. The porose areas on the base of the rostrum are separated by more than their diameter, thus separating them from *sanguineus*, where these porose areas are only about a diameter from each other (*IX, d*).

In *bursa* the dorsal shield is plainly as broad, or broader, than long, and hexagonal in outline. The punctures are equal, fairly fine, and evenly distributed over the whole surface; the porose areas in the rostrum are also separated by more than their diameter.

In *simus* the shield is as wide as long, with the sides rounded; in fact it often appears nearly circular in outline. The colour is nearly black, instead of dark brown, the usual colour, and shiny as in the male. The fine punctuations are numerous, evenly distributed, and usually very fine and superficial, often scarcely visible. The large punctuations are very large and few in number, situated in the median area, at the bottom of the marginal grooves and in the anterior portions of the marginal areas. Both the cervical and marginal grooves are continued to the posterior margin of the shield, where they meet (*IX, f*).

In *nitens* we find a shield similar to that of *appendiculatus*. It is oval in outline, but scarcely longer than wide; the marginal grooves are very superficial. The punctuations are unequal, the small ones numerous and superficial, while the large ones are situated in the median area and near the anterior edges, and not so scattered as in *appendiculatus*. Like *appendiculatus*, the porose areas of the rostrum are separated by more than their diameter.

The females of *lunulatus* resemble those of *simus*, as regards the dorsal shield, which is, however, slightly more elongate, of a brown colour, and with the fine punctuations slightly larger and more prominent. The large punctuations are smaller than in *simus*, and not so numerous. The cervical and marginal grooves are not so long, and do not meet at the posterior margin of the shield (*IX, g*).

*Males.**A.* Eyes orbited.

B. Shield with punctuations so close as to produce a shagreened effect ; shield deep brown in colour, body and legs saffron yellow *evertsi.*

BB. Shield with punctuations distinct ; legs and body not saffron coloured *oculatus.*

AA. Eyes flat.

B. Shield with punctuations numerous.

C. Punctuations unequal in size.

D. Punctuations all very apparent ; caudal prolongation absent or short.

E. Anal plates with posterior edge straight or convex *sanguineus.*

EE. Anal plates with posterior edge concave.

F. Anal plates with a single inner prolongation *duttoni.*

FF. Anal plates with two posterior prolongations *lunulatus.*

DD. Punctuations mostly very fine ; large ones in anterior and marginal areas.

E. Anal plates triangular, pointed at both ends ; caudal tail twice as long as wide
appendiculatus.

EE. Anal plates semi-lunate in outline . . . *nitens.*

CC. Punctuations equal or almost equal.

D. Punctuations distant but numerous, fine, covering all the shield *bursa.*

DD. Punctuations contiguous in places, making the shield shagreened *capensis.*

BB. Punctuations on shield not very numerous, but large ; usually arranged in fairly regular longitudinal lines ; fine punctuations may be present, but usually invisible . . . *simus.*

*Females.**A.* Eyes orbited.

B. Shield short, oval ; punctuations coalescing so as to make surface shagreened ; legs saffron yellow in colour . . . *evertsi.*

BB. Shield elongate, oval ; punctuations numerous, but not coalescing ; legs not saffron coloured. *oculatus.*

AA. Eyes flat.

B. Shield oval, longer than wide, punctuations on shield unequal, numerous *sanguineus.*

BB. Shield short, oval, or as wide as long.

C. Shield shagreened except on the margin . . . *capensis.*

CC. Shield with punctuations distinct.

D. Punctuations equal or nearly so, thick and close, but not coalescing *bursa.*

DD. Punctuations unequal in size.

E. Fine punctuations scarcely visible, large punctuations very large and few in number
simus.

EE. Fine punctuations very apparent.

F. Large punctuations scattered
appendiculatus.

FF. Large punctuations near lateral anterior margins and in middle area .. *nitens.*

Nymphs.

A. Eyes hemispherical ; base of rostrum with sides rounded
evertsi.

AA. Eyes flat ; base of rostrum with lateral edge produced into a point.

B. Base of rostrum with lateral angles short ; cervical grooves of shield nearly reaching posterior margin ; marginal grooves present, postero-lateral margin of shield concave
appendiculatus.

BB. Base of rostrum with lateral angles very long and sharp ; palpi very slender and conical at tips ; cervical grooves short ; marginal grooves lacking ; shield quadrangular, with posterior margin convex. *simus.*

Larvae.

A. Eyes hemispherical ; shield covers all of anterior portion of body.
evertsi.

AA. Eyes flat ; shield allows a portion of the body to show along the antero-lateral margin.

B. Base of rostrum with lateral edges rounded ; palpi moderately long *appendiculatus.*

BB. Base of rostrum with lateral edges produced into very long sharp points ; palpi long and slender and sharply pointed at the tip *simus.*

Eggs.

A. Dark brown in colour *evertsi.*

AA. Light brown in colour *appendiculatus, simus.*

RHIPICEPHALUS EVERTSI. NEUMANN.

THE RED TICK.

Rhipicephalus evertsi, Neumann (1897).

Plate VIII, figures *a, i, k* ; *Plate IX*, figure *a* ; *Plate X*, figure *a* ;
Plate XI, *a, e.*

Male.—*Body* short oval, widely rounded behind ; 5 to 6 mm. long by 3 to 4 mm. wide, widest at the level of coxae IV ; colour saffron yellow, except the shield and rostrum, which are dark chestnut brown. *Dorsal shield* (*VIII, a*) does not cover all the dorsal surface, but allows a margin of the body to be exposed on the sides and posterior end ; convex, shining, punctuations numerous and contiguous, or almost so, making the

shield shagreened; cervical grooves concave outward, prolonged to near the middle of the shield; lateral grooves deep, not passing beyond the first festoon, punctuations on the lateral margin not contiguous, but distinct; three longitudinal grooves in the posterior portion; festoons short, with punctuations distinct, continued on the exposed portion of the body; eyes small, reddish brown in colour; spherical in orbits. *Ventral surface* glabrous, with short hairs, reddish yellow in colour; sexual orifice opposite the anterior edge of coxae II; anal plates triangular (*IX, a*), posterior edge rounded, reddish brown in colour, punctuate, with or without short hairs; a very short spine opposite the centre of the eyes; festoons faintly marked, median festoon often prolonged into a short point. Stigmatic plates (*VIII, i*) reddish brown in colour, comma-shaped, with a postero-dorsal prolongation. *Rostrum* reddish brown in colour; base wider than long, bearing punctures near its posterior margin, which is straight; lateral angles projecting sharply near anterior third of length; mandibles (*XI, i*) with process of inner apophysis of digit conical, divided into two teeth on its outer edge; outer apophysis bears two teeth; the lower one stronger; hypostome with six rows of teeth; palpi longer than wide; article I with a fringe of hairs on its medio-ventral margin; article II wider than long with a row of hairs on the corresponding margin; article III wider than long. *Legs* saffron coloured, of medium length; coxae I produced into a point anteriorly, which may be seen from the dorsal surface, posterior margin divided into two large teeth; the other coxae each with two short teeth on their posterior margins. *Tarsi* relatively long, two terminal, consecutive spines, except on tarsi I; the caruncle passing slightly beyond the middle of the claws.

Female.—*Body* oval; deep chestnut brown in colour; often with reddish spots on fully engorged specimens; may reach a length of 14 mm. by a width of 10 mm., and a thickness of 8 mm. *Shield* (*X, a*) short oval in shape; sides slightly sinuous, 1.9 m.m. by 1.6 mm. wide; blackish brown in colour, shiny; surface entirely shagreened; cervical grooves extending to the posterior quarter of the shield; no marginal groove; eyes hemispherical, small, shiny, reddish brown in colour, near the middle of the length; in orbits. *Dorsal surface* of abdomen, in young specimen, bears a deep lateral groove, which extends to the antepenultimate festoon; punctuations large, except near the shield, in the bottom of each a very small white hair; four short anterior grooves and three long posterior ones; festoons well marked; when engorged only indications of the longitudinal grooves and the festoons persist. *Ventral surface* smooth with fine punctuations, bearing small whitish hairs; sexual orifice small, opposite first intercoxal space; sexual grooves extend to posterior margin; anus rather anterior. *Rostrum* reddish brown in colour; base wider than long, posterior angles scarcely noticeable; porose areas deep, elongate; mandibles with process of inner apophysis of digit tridentate, middle tooth longest, outer apophysis with three teeth, posterior the strongest; hypostome with six rows of teeth; palpi elongate; article II longer than wide; article III only slightly longer than wide; a fringe of stout hairs on the medio-ventral margin of articles I and II. *Legs* saffron coloured, longer than those of the male; coxae small; coxae I deeply bidentate; coxae II, III, and IV each with two small teeth on their posterior edges; tarsi longer than those of the male, spines of tarsi II, III, and IV not so strong as in the male; caruncles similar to those of male.

Nymph.—*Body* (unengorged) elongate, elliptical; reddish brown in colour; length 1.5 mm. by 1 mm. wide. *Shield* covers anterior half of body. When engorged, body oval, widely rounded, slightly wider in front than behind; length 4.5 mm. by 3 mm. wide; colour bright bluish, lighter on margins. *Shield* pentagonal (*XI a*); longer than wide, well rounded behind; deep brown in colour; lateral angles very posterior; cervical grooves nearly straight, deep, reaching almost to the posterior margin; eyes hemispherical, dark coloured. *Dorsal surface* with numerous unequal, deep and irregularly distributed pits, each with a minute whitish hair; two anterior grooves very divergent and slightly concave outward, sometimes these grooves are doubled by a second groove which is not continuous throughout its extent; three posterior grooves one median and faintly marked, laterals shorter and slightly divergent posteriorly. *Ventral surface* sometimes with whitish hairs; punctured as on dorsal surface; ano-marginal groove distinct and reaching to the posterior margin; genital grooves widely divergent behind coxae IV; stigmatic plates whitish, nearly circular; anus near posterior third of length. *Rostrum* (*XI, a*) short; base much wider than long; posterior edge straight; sides rounded; hypostome with four rows of teeth; mandibles with inner apophysis bearing a tridentate process, outer apophysis with three teeth, the upper of which is very small; palpi elongate, cylindrical, article I very short, article II at least twice as long as broad, article III only slightly longer than broad. *Legs* slender; reddish brown in colour; coxae each bear two blunt, almost inconspicuous teeth on their posterior margins, those of coxae I are longer and sharper than those on the remaining coxae; tarsi elongate, no spurs.

Larva.—*Body*, when unengorged, elongate, elliptical, widest near middle; well rounded behind; length 0.5 mm., width about 0.3 mm.; colour light yellowish; shield darker coloured and covering anterior half of body. When engorged, body is elongate, elliptical, sides nearly parallel; length 1.2 mm. by 0.6 mm. wide; colour deep brownish blue. *Shield* as wide as long; widely rounded behind; colour light reddish brown; shagreened; cervical grooves deep anteriorly then shallow, extending two-thirds of the length of the shield; eyes small, hemispherical, dark coloured. *Dorsal surface* (*XI, e*) with three longitudinal grooves. *Ventral surface* (*XI, e*), with anus near posterior third; eleven festoons, distinctly marked; stigmatic openings in four pairs, one behind each coxa and a fourth pair in the posterior portion of the body, not far from the margin. *Rostrum* short; base wider than long; posterior margin concave; sides rounded; palpi short and thick, article I very short, article II twice as long as wide, article III as wide as long; hypostome with four rows of teeth; mandibles with process of inner apophysis tridentate; outer apophysis tridentate, upper tooth very small and sub-terminal. *Legs* slender; coxae with no teeth; tarsi elongate.

Eggs.—Dark brown in colour; surface shiny; elliptical in outline; length 0.5 mm. by 0.3 mm. in width.

Hosts.—The different domestic animals, ox, horse, ass, mule, sheep, dog, giraffe, eland, reed buck.

Habitat.—South Africa: Cape Colony, Transvaal, Natal, Rhodesia, German East Africa, tropical Africa, German South-West Africa, Mozambique.

This tick has been found to be concerned to some extent in the transmission of East Coast fever; it also transmits billary fever of the horse, mule, and donkey. It is able to withstand very dry and desert conditions, and is found even in the Karroo. Unlike most other ticks, it passes its first molt on the host, and the second off the host; that is, it visits two hosts during its life-cycle instead of three.

RHIPICEPHALUS OCULATUS. NEUMANN.

THE EYED TICK.

Rhipicephalus oculatus, Neumann (1901).

Plate VIII, figure *b*; *Plate IX*, figure *b*; *Plate X*, figure *c*.

Male.—*Body* narrow, regularly widened from front to rear; 3 mm. long (rostrum included). *Shield* (*VIII*, *b*) reddish brown in colour; covers all of the dorsal surface; cervical grooves long, very divergent; lateral grooves deep, commencing at a little distance from the eyes, stopping at the outer festoon; a median posterior groove; festoons short; punctuations numerous, fine, sub-equal, distinct and not coalescing; eyes small, hemispherical, shiny, in an orbit. *Ventral surface* brownish in colour; anal plates elongate (*IX*, *b*) triangular, inner edge longer than outer edge; secondary plates weak, spinniform; no caudal prolongation; stigmatic plates elliptical, dark coloured, very long caudal prolongation, extending in a postero-dorsal direction; sexual opening opposite coxae II. *Rostrum* with base wider than long; lateral angles near the anterior third of the length; the posterior angles prominent; a line of punctuations parallel to the posterior margin; mandibles with process of inner apophysis transverse, bidentate on outer edge, outer apophysis with two teeth, terminal one weak, basilar tooth strong; hypostome with six rows of teeth; palpi short and stout, article I and II prolonged backward on their ventral surfaces, all three articles having a fringe of hairs on their medio-ventral edges. *Legs* slender; coxae I bidentate; coxae II, III, and IV, each with two teeth on their posterior margins; tarsi II, III, and IV terminate by two consecutive spurs.

Female.—*Body* of variable length. *Shield* elongate, oval (*X*, *c*); longer than wide; dark brown in colour; cervical grooves extending to the posterior third of the length; lateral grooves well developed, reaching the posterior margin; punctuations mostly small, sub-equal, occasionally coalescing, a very few larger ones in the median and lateral areas; eyes small, shiny, hemispherical, in orbits, behind the middle of the length of the shield. *Dorsal surface* of body with four anterior grooves and three posterior grooves. *Ventral surface*: stigmatic plates oval, with a posterior dorsal projection; anus near posterior third; sexual opening opposite first intercoxal space; festoons indistinct; *Rostrum* like that of male; outer apophysis of mandibles with three teeth. *Legs* slender as in male.

Hosts.—Cattle, *Lepus* sp. (Damaraland).

Habitat.—Damaraland, Transvaal, German East Africa.

RHIPICEPHALUS CAPENSIS. KOCH.

THE CAPE BROWN TICK.

Rhipicephalus capensis (Koch, 1844, 1847).

Rhipicephalus capensis, Koch (Neumann, 1897).

Plate VIII, figure *c* ; *Plate IX*, figure *c* ; *Plate X*, figure *b*.

Male.—*Body* oval, widely rounded behind, in which part it is three times as wide as in front ; length 3 to 5 mm. (including rostrum), width 1.75 to 3.0 mm. *Dorsal shield* (*VIII*, *c*) a little convex, shining, dark chestnut brown in colour, covered with contiguous punctuations, which give it a shagreened appearance ; a few large punctuations in anterior portion ; cervical grooves deep anteriorly, extending to the level of the eyes, which are flat, large, and pale yellow ; lateral groove wide, deep, close to the margin, extending from the eyes to the separation of the two extreme festoons ; lateral margin also shagreened ; festoons distinct, shagreened, extreme festoons short, median ones elongate. *Ventral surface* glabrous, yellowish ; sexual orifice opposite the middle of coxae II, followed by a whitish, strap-like appendage ; sexual grooves parallel ; anus opposite the middle of the stigmatic plates ; anal plates (*IX*, *c*) almost isosceles triangles, base rounded, dark brown in colour, slightly punctured ; accessory anal plates elongate and narrow, half as long as the anal plates ; festoons very plainly marked, each with a transverse spot of dark chestnut colour ; stigmatic plates large, whitish, elongate, comma-shaped. *Rostrum* dark brown in colour ; base almost as long as wide ; shagreened in the middle ; angles prominent ; palpi longer than wide ; article II wider than long ; a row of long stout hairs on the ventro-median margins of article II and III. *Legs* dark brown, strong ; coxae typical, coxae II, III, and IV, each with two short teeth on their posterior margins ; coxae I with two very long sharp teeth ; tarsi short, two consecutive spurs, except on tarsi I.

Female.—*Body* elongate, oval ; a little wider behind than in front ; 5 mm. long by 2.7 mm. wide. *Shield* (*X*, *b*) almost as wide as long ; sides rounded ; reaches the middle of the body in unengorged specimens ; dark chestnut brown in colour ; punctuations confluent making surface shagreened, except on the lateral margins ; cervical grooves reach almost to the middle of the shield ; marginal grooves reach to the posterior margin ; eyes flat, shiny, pale yellow in colour, a little behind the middle of the length of the shield. *Dorsal surface*, dark brown in colour, glabrous, coarsely shagreened by undulating, irregular transverse folds, crossing two short longitudinal grooves and three long posterior grooves ; marginal groove well marked, as also the festoons, which are separated by slightly sinuous grooves. *Ventral surface* shagreened like the dorsal surface, and of same colour ; festoons plain, elongate. *Rostrum* with base wider than long ; posterior angles only slightly projecting ; hypostome with six rows of teeth ; palpi elongate, article II as wide as long, dorso-median margin longer than the dorso-lateral margin ; article III as wide as long ; a fringe of stout hairs on the ventro-median margin of articles I and II. *Legs* more slender than in the male ; otherwise similar to those of the male.

Hosts.—Cattle, goat, dog, horse, *Varanus saurus*.

Habitat.—Namaqualand, Cape Colony, Transvaal.

This tick has also been found to be concerned in the transmission of East Coast fever. It is not a very common tick in the Transvaal. In Cape Colony it extends for some distance into the Karroo.

RHIPICEPHALUS SANGUINEUS. (LATREILLE.)

THE EUROPEAN BROWN TICK.

Ixodes sanguineus, Latreille (1804).

Ixode plumbe, Duges (1834).

Ixodes duguessi, Gervais (1844).

Ixodes rufus, Koch (1844).

Rhip. sanguineus, Koch (1844).

Rhip. limbatus, Koch (1844, 1847).

Rhip. siculus, Koch (1844, 1877).

Rhip. rubicundus, Frauenfeld (1867).

Rhip. stigmaticus, Gerstäcker (1873).

Rhip. beccarri, Pavesi (1883).

Phaulixodes rufus, Berlese (1889).

Rhip. sanguineus (Latreille) (Neumann, 1897).

Plate VIII, figure *e* ; *Plate IX*, figure *e* ; *Plate X*, figures *e*, *k*.

Male.—*Body* regularly enlarged from front to rear, 3.35 mm. long by 1.55 mm. wide, often with a conical prolongation on the posterior end. *Shield* (*VIII*, *e*) reddish brown, covering all the dorsal surface except a narrow margin on the sides and posterior end ; cervical grooves short ; a short median groove in the posterior part of the shield on each side of which is a rounded pit ; punctuations unequal, fine ones numerous on all the surface, large ones very large and more numerous in the anterior portion of the shield ; marginal grooves well marked ; eleven rectangular, posterior festoons ; eyes pale coloured, situated at level of posterior margin of coxae II. *Rostrum* with base wide, lateral angles projecting sharply ; palpi short and stout, articles I and II prolonged backward on their ventral surfaces ; inner margin of article I projecting inward ; articles I, II, and III each with a row of stout dental spines on the inner ventral margins ; process of inner apophysis of mandible tridentate, outer apophysis bidentate, terminal tooth weak (*X*, *k*) ; hypostome with six rows of teeth, with about twelve teeth in a row. *Ventral surface* brownish in colour ; on each side of anus is an elongate triangular plate, the tip of which extends to the level of coxae IV, the inner edge longer than the outer edge, base rounded (*IX*, *e*) ; a small spine outside of each of these plates ; stigmatic plates comma-shaped. *Legs* slender, dark brown in colour, coxae I bidentate, coxae II, III, and IV each with two spines on their posterior margins ; tarsi II, III, and IV terminated by two strong, consecutive spurs ; all the articles with numerous stiff hairs.

Female.—*Body* elliptical, as wide in front as behind, often reaching a size of 11 mm. long by 7 mm. wide ; reddish brown or yellowish in colour. *Dorsal shield* (*X*, *e*) very small, longer than wide (about 1.5 mm. long), lozenge oval in outline ; truncate in front to receive

the base of the rostrum; punctuations unequal, a few large ones in median area and forming part of lateral grooves, but the greater part fine and distant from each other; eyes in the middle of the length or slightly posterior of middle; cervical grooves elongate, nearly reaching posterior margin; lateral grooves deep and almost meeting cervical grooves at posterior end. *Dorsal surface* glabrous or almost glabrous; in the young female, four anterior grooves, sometimes not well marked, three posterior grooves. *Ventral surface* glabrous; festoons slightly marked; stigmatic plates oval, with a short postero-dorsal prolongation. *Rostrum* with base wider than long, lateral angles large and sharp, giving it a width twice that of the posterior margin; porose areas large, elliptical, close together; palpi not so short and massive as in male, and not so angular on outer edge; the three articles bearing spines as in male; inner ventral margin of article I projecting inward; hypostome with six rows of teeth of about 12 teeth to a row; mandibles (*X*, *k*) with process of inner apophysis tridentate, but teeth not so pronounced as in male; outer apophysis tridentate, anterior tooth sub-terminal and small. *Legs* rather slender, deep brown in colour; coxae longer than wide, coxae II, III, and IV, with two small spines on posterior margins, as in male, but the outer spine is not so strong as in male; stiff hairs on all the articles; especially on dorsal and ventral margins of articles III to VI; tarsi II, III, and IV with only one ventral spur, proximal spur represented by a blunt tuberosity.

Nymph.—(*Phaulixodes rufus*.) *Body* elliptical, a little compressed, greyish, reddish brown or blackish, often 5 mm. in length. *Dorsal shield* very small, elongate pentagon, lateral margins almost straight, not diverging very much; surface irregularly reticulated; cervical grooves diverging only behind; eyes on lateral angles, near posterior third. *Dorsal surface* of abdomen with four anterior grooves, the outer ones shorter; three posterior grooves, the median straight and the outer ones curving outward. On the *ventral surface*, sexual pit, unperforated, opposite coxae II; sexual grooves well marked; ano-marginal groove long; stigmatic plates circular. *Rostrum* very short, base a little widened behind insertion of palpi. Mandibles almost like those of female; hypostome with two rows of teeth on each half; palpi a little valvate, with a few scattered hairs; articles a little prominent on the outer edges, article IV relatively long. *Legs* short, slender, coxae I with division not very deep; the others as in female; tarsi without spurs.

Hosts.—Especially the dog, but also cattle, sheep, cat, sometimes man, and the following wild animals of South Africa and other countries:—Lion, fox, genette, hare, hedgehog (*Erinaceus niger*), lynx, jackal, gazelle, dromedary, chamoise, tortoise, pangolin, *Olus ellipsiprymnus*, *Canis megalotis* (Egypt), *Strix ascalaphus* (Egypt), *Lepus ethiopicus* (Nubia and Abyssinia), *Vulpes persica* (Arabia).

Habitat.—France, Italy, Sicily, Corsica, Roumania, Egypt, Somaliland, Algeria, Abyssinia, Nubia, Beirut, German East Africa, Portuguese East Africa, Natal, Cape Colony, Transvaal, Madagascar, German South-West Africa, Cameroons, Togo, Congo, Senegal, Antigua, Arabia, Persia, India, Singapore, China, Phillipine Islands, Australia, Panama, French Guiana.

This tick is of very wide distribution over Europe, Africa, and Asia, even extending into Central America. It seems to be of fair occurrence in the Transvaal, but is confined mostly to the northern and eastern

portions. The commonest host in the Transvaal is the dog ; one specimen has been taken from the ringed pigeon, and, what is probably a nymph of *sanguineus*, from the striped mouse (*Avicanthis pumillio*) at Pretoria. Dönitz states that *sanguineus* transmits a disease of dogs in France.

RHIPICEPHALUS LUNULATUS. NEUMANN.

Rhipicephalus lunulatus, Neumann (1907).

Plate VIII, figure *g* ; *Plate IX*, figure *g* ; *Plate X*, figure *g*.

Male.—*Body* a little wider behind and acuminate behind ; length 4 mm. (rostrum included), width 1.9 mm. near the posterior third. *Shield* (*VIII*, *g*) convex, shining, very dark brown, almost black in colour, without spots, showing a slight margin of the abdomen beyond the sides of the shield ; cervical grooves very short ; marginal grooves deep, occupied by large punctuations, commencing immediately behind the eyes and ending at the groove which separates the two extreme festoons ; punctuations large, distant, in irregular lines, one line on each side, a little inside of the marginal groove, forms its prolongation forward ; a few very fine punctuations in front, almost obsolete ; eyes flat, yellowish, large, marginal. *Ventral surface* reddish brown, punctuated with a few very short hairs ; anus near the anterior quarter of the anal plates (*IX*, *g*) ; the latter elongate, triangular, the inner margin concave, the outer margin convex, the posterior margin divided into two unequal lobes, the outer one of which is spine shaped ; the outer pair of anal plates projecting, spiniform ; no caudal prolongation ; stigmatic plates narrow, elongate comma-shaped, with the point recurved toward the dorsal surface. *Rostrum* 0.55 mm. long, dorsal surface of the base wider than long, lateral angles projecting, situated near the anterior quarter of the length, posterior angles not very prominent ; hypostome slightly spatulate, with six rows of teeth ; mandibles with process of inner apophysis elongate transversely and bidentate, outer apophysis bidentate ; palpi scarcely longer than wide, flat on the dorsal surface, the second article as long as the third and contracted into a point on its posterior-dorsal margin. *Legs* relatively strong. *Coxae* I with anterior point slightly visible from the dorsal surface, bears two very long spurs ; on the posterior margin of the other coxae, two wide, flat teeth ; tarsi medium in size, with terminal claws.

Female.—*Body* a wide ellipse in outline, length 8 mm. (including rostrum), width 6 mm., widely rounded at both extremities ; dark blue in colour. *Shield* (*X*, *g*) small ; dark brown in colour ; longer than wide or as wide as long ; widely rounded behind ; cervical grooves deep in anterior part, reaching posterior margin ; lateral grooves deep, set off by large punctuations ; nearly reaching posterior margin, punctuations small, evenly distributed, and well separated from one another, a few very large punctuations in median area, marginal grooves, and marginal ridges. *Rostrum* with base much wider than long ; posterior angles not very prominent ; lateral angles very prominent, porose areas small, circular, and separated by a diameter, numerous punctuations between them ; palpi typical ; hypostome with six rows of teeth ; mandibles with process of inner apophysis tridentate ; outer apophysis with three teeth. *Dorsal surface* glabrous, four anterior grooves and three posterior grooves. *Ventral surface* glabrous, numerous punctures and a few short whitish hairs ; sexual

opening opposite first intercoxal space ; stigmatic plates short, comma-shaped ; genital grooves extending to posterior margin, ano-marginal groove well marked ; festoons not very distinct. *Legs* slender, reddish brown in colour ; coxae II, III, and IV, each with two strong teeth on posterior margin ; coxae I, bidentate ; tarsi with two ventral spurs ; hairs on all the articles.

Hosts.—Dog, hedgehog (*Erinaceus frontalis*), horse.

Habitat.—Congo Free State, Transvaal.

This tick has only recently been described (Neumann, 1907) from the Congo. In the Transvaal it has only been taken in the Zoutpansberg district on dogs and hedgehogs.

RHIPICEPHALUS DUTTONI. NEUMANN.

THE CONGO BROWN TICK.

Rhipicephalus duttoni, Neumann (1907).

Male.—*Body* narrow in front, broadest (1.85 mm.) a little posterior to the middle, length with rostrum 3.55 mm. *Dorsal shield* slightly convex, chestnut brown without spots, abdomen does not extend beyond its margins ; cervical grooves very broad, shallow, and form elongate depressions, contain no punctures and are prolonged posteriorly by a narrow superficial groove which extends beyond the middle point of the length ; marginal grooves broad, shallow, slightly and finely punctured, commencing almost immediately behind the eyes, and terminating in a groove which separates the last from the following festoon ; punctuations irregular, coarsest in front, fine and superficial over the remainder of the surface ; behind are three wide, shallow, unpunctured longitudinal grooves, the middle one the longest ; festoons longer than broad, slightly punctured, otherwise normal ; eyes flat, yellowish, large, marginal. *Ventral surface* reddish brown, convexed with rather long and abundant whitish hairs ; anus anterior of the middle of the length of the anal shields ; and shields shaped like a scalene triangle, the inner edges longest, forming a long inner posterior spine, rectilinear in the anterior half, outer edge slightly convex, posterior edge concave and bordered by a row of large punctuations ; adanal shields replaced by a prominent non-chitinous fold ; no caudal prolongation but a chitinous thickening on the median festoon ; stigmatic plates, whitish, narrow, comma-shaped. *Rostrum* with base almost twice as broad as long, lateral angles at about the middle of the length, posterior angles quite prominent ; hypostome slightly spatulate, with six rows of teeth ; palpi as broad as long, flattened dorsally, second segment scarcely longer than the third and retraced into a blunt point dorsally at its posterior border. *Legs* relatively strong ; coxae covered with long white hairs, anterior summit much prolonged and conspicuous on the dorsal surface as an auricle, with two very long spines ; on the posterior margins of the second and third coxae an external spine, flat, as broad as long, coxae IV divided on its posterior margin into two broad flat spines ; tarsi of medium size, with two terminal spines.

Female.—Unknown.

Hosts.—Cattle.

Habitat.—Congo, Northern Transvaal, Mozambique.

This tick seems to be very closely related to *R. appendiculatus* and *R. lunulatus*. It was originally described from the Congo, and only a very few specimens have been found in the Northern Transvaal.

RHIPICEPHALUS APPENDICULATUS. NEUMANN.

THE BROWN TICK.

Rhipicephalus appendiculatus, Neumann (1901).

Plate VIII, figure *d* ; *Plate IX*, figure *d* ; *Plate X*, figure *d* ;
Plate XI, figures *b*, *d*, *g*, *i*, *k*.

Male.—Oval in outline, twice as wide at the posterior third as in front ; 3 to 4 mm. long ; reddish brown in colour. *Shield* (*VIII*, *d*) bordered by the body on the sides and behind ; of a dark brown colour ; a deep marginal groove limiting the last festoon ; cervical grooves very wide and short, but not very deep ; punctuations unequal, the small ones very numerous and superficial but quite apparent, the large ones rare and nearly all anterior, a few continue the marginal groove anteriorly from the eyes ; a space on each side near the middle of the length, where there are almost no punctuations ; posterior festoons twice as long as wide, except the extreme ones which are small and square or triangular ; all festoons continued into the margin of the body, the median is prolonged into a narrow tail twice as long as wide, truncate at tip ; in front of festoons are three longitudinal grooves, wide and short, the median a little the longest ; eyes flat, reddish in colour ; dorsal porose areas near the middle of the length. *Ventral surface* almost glabrous, punctured, anal plates triangular (*IX*, *d*), inner edge longer than outer, giving them the appearance of being pointed at both ends ; punctuations deep ; accessory plates lacking or very small. *Rostrum* with base relatively long, the lateral angles near the anterior third of the length, posterior angles prominent ; several large punctuations on dorsal surface of base ; palpi short and thick, articles angular on their outer edges, articles I and II prolonged backward on the ventral side ; mandibles with process of inner apophysis transverse and bidentate on inner edge, outer apophysis with two teeth, the terminal tooth small. *Legs* with coxae II, III, and IV, each with two teeth on their posterior margins, legs IV flattened dorso-ventrally ; tarsi II, III, and IV terminated by two consecutive ventral spurs.

Female.—When young, body oval, flat, reddish brown in colour ; when engorged body becomes elliptical, swollen, thick and almost as wide at each end, often reaches a length of 11 mm. and a width of 7 mm. *Dorsal shield* (*X*, *d*) an oval lozenge in shape, with sides slightly sinuous, rounded at angles ; almost as wide as long ; marginal grooves well formed, but not very deep ; punctuations numerous, unequal, mostly very fine and superficial, the remainder large, few in number, and scattered ; punctuations less numerous in an area on each side at about the middle of the length of the shield ; eyes large at the middle of the length of the shield. Integument of *dorsal surface* ordinarily provided with thinly distributed hairs, more abundant on the ventral surface ; when young, numerous punctuations on the dorsal surface ; a marginal groove on each side ; three longitudinal grooves ; eleven quadrangular posterior festoons ; integument often so thin as to allow ramifications of the intestines to show through when fully engorged ; two anterior and three posterior grooves ; dorsal porose areas in the anterior half of the length of the body, stigmatic plates oval, with a short postero-dorsal prolongation. *Rostrum* with base widened into prominent angles ; palpi comparatively smaller than those of the male, but more elongate ; first three articles bear three projections on their inner

ventral edges, as well as a row of stout spines, somewhat dentate ; the outer edge of article I strongly constricted, producing an apparent constriction of the rostrum at the base of the palpi ; porose areas of medium size, ovate in outline, and separated by more than their diameters ; hypostome with six rows of teeth, each row consisting of about 12 teeth ; mandibles (*XI, k*) with process of inner apophysis tridentate, outer apophysis tridentate, terminal tooth small and sub-ventral. *Legs* slender, dark brown in colour ; coxae longer than wide, coxae II, III, and IV each with two blunt teeth on their posterior margins ; stiff hairs on all the articles ; tarsi II, III, and IV each with two ventral spurs, the proximal one not so sharp.

Nymph.—Elliptical in outline ; when unengorged, 1.25 mm. long by 0.75 mm. wide ; when engorged, 4 mm. long by 2.25 mm. wide ; slightly wider in front than behind ; colour bluish. *Shield* (*XI, b*) small, dark brown in colour ; pentagonal in outline, deeply emarginate in front, antero-lateral edges straight and occupy fully two-thirds of the length of the shield ; posterior edges concave, but widely rounded in middle ; cervical grooves shallow, nearly straight, diverging slightly behind and nearly reaching the posterior margin ; lateral grooves very close to the margin, slightly concave, and reaching the posterior margin ; shield convex between the cervical grooves ; eyes at the lateral angles, small and shining ; shiny ; surface shiny and glabrous, with a few very large punctuations, mostly in the median area. *Dorsal surface* with numerous large papillae, distant from each other ; two anterior and three posterior grooves ; posterior festoons present. *Ventral surface* with papillae present only in posterior half ; genital grooves present and reaching almost to the posterior margin ; ano-marginal groove present ; stigmatic plates small, whitish, elliptical in outline. *Rostrum* (*XI, b*) light coloured, base wide and short, articulated by a slender neck ; lateral angles sharp ; palpi slender, articles elongate ; hypostome with four rows of teeth ; mandibles as in female. *Legs* slender, light coloured ; coxae I with a single median, posterior tooth, coxae II, III, and IV with two posterior teeth each (*XI, g*) ; tarsi elongate but thick.

Larva.—*Body* longer than wide ; widely rounded at both ends ; light reddish brown in colour ; length 0.75 mm., width 0.50 mm. ; when engorged, oval in outline, dark reddish or bluish in colour, 1.3 mm. long by 0.9 mm. wide. *Shield* as wide as long ; widely rounded behind ; antero-lateral edges very convex, allowing body to show for some distance before the lateral angle ; cervical grooves shallow ; eyes in lateral angles ; surface smooth, except for a few short spines. *Dorsal surface* (*XI, d*), when engorged, with two anterior and three posterior grooves ; festoons well marked. *Ventral surface* (*XI, d*) with genital grooves well marked ; ano-marginal groove deep ; festoons present ; stigmatic openings in four pairs, one behind each pair of coxae, and one pair near the posterior margin, in festoons next to the most anterior ones ; three pairs of spines between coxae ; several spines in posterior area. *Rostrum* with base wide and narrow, sides rounded ; palpi elongate, article I very short and almost invisible, articles II, III, and IV longer than wide ; article II constricted at base ; article III conical ; hypostome with four rows of teeth, about seven teeth in a row, and crenulations to the base ; mandibles as in female. *Legs* elongate but thick ; light coloured ; coxae I triangular, anterior end almost projecting beyond cervical angle of shield, one posterior tooth present ;

coxae II and III rectangular, coxae III with a small posterior tooth ; tarsi long and thick.

Eggs.—Light yellowish brown in colour ; elliptical in outline, surface smooth and shiny ; length 0.50 mm. by 0.30 mm. wide.

Hosts.—Cattle, horse, mule, sheep, goat, dog, rabbit, buffalo (*Bos caffer*), man.

Habitat.—Cape Colony, Transvaal, Rhodesia, Portuguese East Africa, Natal.

This tick is the principal agent in the transmission of the East Coast fever. It seems to be a general feeder on all warm-blooded animals, and is of very wide distribution over the whole of South Africa except in extremely dry places in the interior.

RHIPICEPHALUS BURSA. CANESTRINI AND FANZAGO.

Rhipicephalus bursa, Canestrini and Fanzago (1877-78).

Rhipicephalus bilenus, Pavesi (1883).

Rhipicephalus bursa, Canestrini and Fanzago (Neumann, 1897).

Plate VIII, figure *h* ; *Plate X*, figure *h*.

Male.—Length 4.5 mm. by 3 mm. wide, regularly widened from front to back, sometimes provided in the posterior extremity with a conical appendage. *Shield* (*VIII, h*) reddish brown, ordinarily covering all the dorsal surface, sprinkled with fine pores on all its extent, the largest on the borders, sometimes transparent and allowing the branches of the intestines to show through as black radiating lines ; cervical grooves short ; a short median groove in posterior portion, on each side of which are two rounded pits ; posterior margin divided into eleven rectangular festoons ; eyes pale, situated at the level of the posterior margin of coxae II. *Ventral surface* brownish red ; covered with fine hairs ; on each side of the anus a triangular plate, sides equal in length, base very wide, lateral of each of these plates, a straight spine, weak, often a little chitinous. *Rostrum* with base wider than long ; prominent lateral angles ; palpi rather short and thick and angular on their outer edges, articles I and II bearing on their inner ventral edges each a prominence, very marked on article I ; a row of stout spines, a little dentate on the inner ventral edges ; hypostome with six rows of teeth, each row composed of about 12 teeth ; mandibles with process of inner apophysis elongate transversely and tridentate, outer apophysis bidentate, terminal tooth very weak. *Legs* with coxae of their last pair, provided with two spines on their posterior margin, one in the middle, the other on the inner angle ; tarsi of the three last pairs terminated by two consecutive, well-developed claws.

Female (young).—*Body* oval, flat, reddish brown, 4 mm. long by 2 mm. wide ; (engorged) it is ovoid, swollen, thick, almost as wide at each end, and often attains a size of 17 mm. long by 9 mm. wide. *Dorsal shield* (*X, h*) an oval lozenge, with sides sinuous and rounded, almost as wide as long, hollowed by very numerous pores equal and evenly distributed ; eyes near the middle of the length, lateral grooves not well formed. *Dorsal integument* ordinarily provided with thinly distributed hairs, more abundant on the ventral surface ; when young, numerous punctuations on the dorsal surface ; a marginal groove on each side, three very deep grooves, the

laterals more prolonged in front, the median more prolonged behind, reaching almost to the posterior margin, which is divided into eleven quadrangular festoons, the integument often transparent, and allowing the ramifications of the intestines to show through as blackish, radiating lines. When fully engorged, two grooves in the anterior half, diverging behind and a little concave outward; three more in the middle posterior, of which a median, straight and two laterals, convex outward; stigmatic plates oval, with a prolongation, well marked, forming the postero-external angle. *Rostrum* with base widened into prominent points behind the insertion of the palpi, porose areas small, circular, and separated by more than their diameter; mandibles with process of inner apophysis elongate transversely and tridentate, outer apophysis tridentate, terminal tooth small and sub-ventral; hypostome a little spatulate, shorter than the palpi, provided with three rows of teeth on each half, almost equal in size, each row including about 12 teeth, of which the size diminishes a little from front backward; palpi short and strong, longer and more slender than in male, with sides not so angular, the first three articles bearing on their inner ventral edges three prominences, very marked on the first article; a row of stout spines, a little dentate, directed inward and forward, the outer edge of article I strongly constricted and concave, which produces a sort of constriction of the rostrum at the base of the palpi. *Legs* rather slender, dark brown; coxae longer than wide; those of the last three pairs provided with a small spine near the anterior external angle, and a blunt tuberosity on the external third of the posterior margin; stiff hairs on all the articles, especially on dorsal and ventral edges of third to last; tarsi of three last pairs terminated by a curved claw, preceded by a small blunt spine on the ventral edge.

Hosts.—The domestic animals, sheep, goats, cattle, horse, ass, dog; wild boar; hedgehog.

Habitat.—Southern France, Spain, Austria, Hungary, Italy, Corsica, Sardinia, Algeria, throughout West Africa and East Africa, Congo, Abyssinia, Cape Colony, Portuguese East Africa, Transvaal, Cuba, Haiti, Jamaica.

This tick has been frequently mistaken for the brown tick, which it very closely resembles. It is not of very common occurrence in the Transvaal, but seems to be more common in Northern Africa and Southern Europe.

RHIPICEPHALUS NITENS. NEUMANN.

THE SHINY BROWN TICK.

Rhipicephalus nitens, Neumann (1904).

Male.—*Body* oval, narrow in front, wide behind; length 4 mm. (rostrum included), width 2.5 mm; general colour reddish yellow. *Shield* shining, covering all the dorsal surface; cervical grooves not very deep; eyes flat, yellowish; marginal grooves well marked, extending from the eye to the extreme festoon; festoons very apparent, the median one smaller than the neighbouring ones, or almost as large; punctuations numerous, unequal, superficial, mostly very fine, the large ones distributed along the borders and irregularly in the anterior region. Anal plates semi-lunate, the inner edge very concave, the outer edge

curved, the two extremities pointed and almost similar, punctuations numerous; no accessory plates nor caudal prolongations. *Rostrum* with base twice as wide as long, marked with two or three large punctuations; the posterior and lateral angles salient; palpi shorter than the base, articles II and III of the same length, wider than long; article I very visible on its dorsal surface; prolonged in a retrograde point on the ventral surface; a retrograde spine ventral and anterior on article III; hypostome with six rows of teeth. *Legs* medium, not punctured, conforming to type; coxae I with an interior prolongation visible from the dorsal surface.

Female (young).—*Body* of the same form, dimensions, and colours as in the male. *Shield* shining, oval-lozenge shaped, scarcely longer than wide; cervical grooves deep at their origin, scarcely marked and almost joining the posterior edge; marginal grooves united at their origin to the cervical grooves, very superficial, reaching almost the posterior margin; punctuations unequal, numerous, superficial, larger near the latero-anterior edges, and in the middle space; eyes large, flat, greenish yellow, situated near the middle of the length of the shield. *Dorsal surface* shining, glabrous, with superficial grooves; a few scattered punctuations; posterior festoons present; marginal groove passing from the shield to the posterior limit of the penultimate festoon. *Ventral surface* wrinkled, glabrous, a little punctured. *Rostrum* conforming to the type; the base more than twice as wide as long, with posterior angles not prominent; porose areas large, oval, divergent, separated by more than their width. *Legs* long, slender, with punctuations superficial; long hairs on the ventral surface of all the articles.

Hosts.—Cattle, wild Cape dog.

Habitat.—Cape Colony, Transvaal.

The habits of this tick are very similar to those of *R. appendiculatus*, of which it may be only a variety, but more specimens of the adults are found on the face of the host, and the nymphs seem to require longer for engorgement. It is not very common in the Transvaal.

RHIPICEPHALUS SIMUS. KOCH.

THE BLACK-PITTED TICK.

Rhip. simus, Koch (1844, 1847).

Rhip. senegalensis, Koch (1844, 1847).

Rhip. praetextatus, Gerstäcker (1873).

Rhip. simus, Koch (Neumann, 1897).

Plate VIII, figure *f*; *Plate IX*, figure *f*; *Plate X*, figures *f*, *i*; *Plate XI*, figures *c*, *f*, *h*.

Male.—*Body* oval, rounded behind, where it is twice as wide as in front; length 4 to 6 mm. (without rostrum) by 2.2 to 3.5 mm. wide. *Dorsal shield* (*VIII*, *f*) a little convex, shining, very dark coloured, almost black, glabrous, covering all the dorsal surface, except on the largest individuals when it is bordered in front and behind by a narrow margin of the body; cervical grooves deep, wide and short, a little divergent; eyes large, yellowish, marginal groove deep, extending from the eyes to the anterior edge of the penultimate or ante-penultimate festoon; festoons elongate,

separated by deep grooves, punctuations unequal, the large ones very large and deep, in the marginal grooves they may be contiguous or almost so, they prolong the marginal groove anteriorly beyond the eyes by two lines of punctures, the remainder are arranged in four more or less regular, longitudinal lines in the middle area of the shield, the small punctures are evenly distributed over the shield, but distant from each other, and usually so fine and shallow as to be almost invisible; three posterior longitudinal grooves, very superficial; dorsal porose areas present at anterior quarter of length of shield. *Ventral surface* yellowish or brownish in colour; a few punctures; glabrous or with thinly scattered hairs; sexual orifice opposite the anterior edge of coxae II, sexual grooves diverging behind; anus chestnut brown in colour, opposite the middle of the anal plates, which are triangular, with the inner edge concave, outer edge convex, and posterior edge convex (*IX, f*); a chitinous point forms the accessory anal plates; eleven festoons present, the median one often prolonged in rectangular appendage; stigmatic plates elongate, comma-shaped. *Rostrum* with base wider than long; depressed in middle, the posterior angles prominent, lateral angles prominent at the anterior third of the length; mandibles (*X, i*) with process of inner apophysis transverse and bidentate, outer apophysis bidentate, the anterior tooth small; hypostome with six rows of teeth; palpi longer than wide, article II longer than article III, its inner dorsal margin longer than the outer; seven to nine hairs on the inner ventral margin; article I also with a ventral projection; article III wider than long. *Legs* reddish brown in colour, strong; articles somewhat flattened dorso-ventrally; tarsi short.

Female.—*Body* oval, a little wider behind than in front, may reach a length of 12 mm. by 8.5 mm. wide; colour brownish, with lighter colour marking the furrows and festoons. *Shield* (*X, f*) scarcely or not longer than wide; very dark, almost black in colour; shining; sides rounded or only slightly angular; punctuations numerous, unequal, large punctuations in middle and marginal areas; marginal grooves formed of a row of large pits, small pits evenly distributed, but usually so small and superficial as to be almost invisible; cervical grooves almost reach the posterior margin where they nearly join the marginal grooves; eyes shiny, flat, pale yellow, or often reddish in preserved specimens, a little behind the middle of the length of the shield. *Dorsal surface* of the abdomen lightly shagreened, in young individuals, punctuations large and occupied by whitish hairs; dorsal porose areas just posterior of the shield; marginal grooves at some distance from the margin, occupied by punctuations and hairs; four anterior grooves, the outer ones close to the corresponding marginal grooves and very long; three posterior grooves, the median longer; festoons well marked, elongate; when fully engorged the grooves and festoons are still faintly marked, usually by lines of a grey colour. *Ventral surface* of a uniform greyish or brownish colour, lighter than the dorsal surface; glabrous or with a few hairs; punctuations few and scattered; posterior festoons very apparent; sexual orifice opposite first inter-coxal space, sexual grooves diverging very rapidly behind coxae IV; anal groove well marked; ano-marginal groove present; stigmatic plates short, comma-shaped, with prolongations very short. *Rostrum* with base shorter than in male; mandibles (*X, i*) with process of inner apophysis bearing four teeth, outer apophysis tridentate; hypostome as in male, but longer; palpi similar to those of the male, only longer. *Legs* similar to those of the male, except that they are longer and more slender; tarsi relatively long.

Nymph.—*Body* oval in outline, widely rounded behind, narrower in front; length (unengorged) 1.50 mm., width 1.0 mm.; colour light brown. *Shield* (XI, c) quadrangular, narrow in front, sides diverging posteriorly, posterior edge wide and convex, cervical emargination shallow; eyes at postero-lateral angles; cervical grooves short, wide and shallow; surface covered with numerous granulations; colour darker near the anterior end. *Dorsal surface* with two anterior and three posterior grooves, numerous fine granulations and a few small whitish hairs; festoons plainly marked. *Ventral surface* like dorsal; genital grooves reaching nearly to posterior margin; anal groove and ano-marginal groove well marked; festoons present; stigmatic plates elliptical in outline. *Rostrum* (XI, c) with base very wide and short; lateral angles very prolonged and sharp at anterior quarter of length; palpi slender, inserted on ventral surface; article I very small, article II twice as long as wide; article III not quite as long as article II; pit on medio-ventral surface bears article IV; hypostome slender, bears four rows of teeth with about seven teeth in a row; mandibles as in female. *Legs* long and slender; coxae all rectangular; coxae I prolonged anteriorly, each coxae with two posterior teeth (XI, h); tarsi long, swollen in centre.

Larva.—*Body* oval, much longer than wide; colour light yellowish brown, shield darker; 0.50 mm. wide by 0.66 mm. long; when engorged they reach a length of 1.50 mm. by 0.66 mm. wide, sides nearly parallel, widely rounded behind and narrowed in front; colour dark reddish or bluish. *Shield* covers a little more than the anterior third of the body when engorged; wider than long; posterior edge only slightly convex; lateral angles rounded, and not at margins of body; deeply emarginate in front to receive the rostrum; cervical grooves shallow, a few spines present. *Dorsal surface* (XI, f) with three to five grooves; festoons well marked. *Ventral surface* (XI, f) with genital grooves and posterior grooves normal; stigmatic openings in four pairs, one behind each pair of coxae, and the fourth in the fourth festoon from the central one; three pairs of spines between coxae; numerous spines in posterior portion. *Rostrum* on a long neck, base very wide and short, lateral angles very sharp; palpi inserted on ventral side of rostrum; palpi swollen in middle, constricted at base and conical at tip; article I very short, article II wider than long, swollen at middle; article III conical; article IV in a pit on the median ventral surface of article III; hypostome slender, four rows of teeth; mandibles as in female. *Legs* thick; coxae all quadrangular, coxae I with an anterior prolongation which projects beyond the shield and shows from dorsal surface; each coxae with a single posterior tooth; tarsi thick, conical at tip.

Eggs.—Light brown in colour, elliptical in outline; surface polished; length 0.5 mm., width 0.3 mm.

Hosts.—Dog, horse, hare, goats, sheep, rabbit, cattle, lion, bush-pig (*Potamochoerus choeropotamus*), hedgehog (*Erinaceus frontalis*), wild dog (*Lycaon pictus*).

Habitat.—Turkestan, Borneo, German East Africa, Abyssinia, Sierre Leone, Transvaal, Cape Colony, Madagascar, Moçambique.

This tick assists in the transmission of East Coast fever. It seems to be confined to the more humid areas of South Africa. In Cape Colony it is confined more to the coastal belt of summer rainfall. In the Transvaal it seems to be most common in the bush and low veld, and more rare in the south-west high veld.

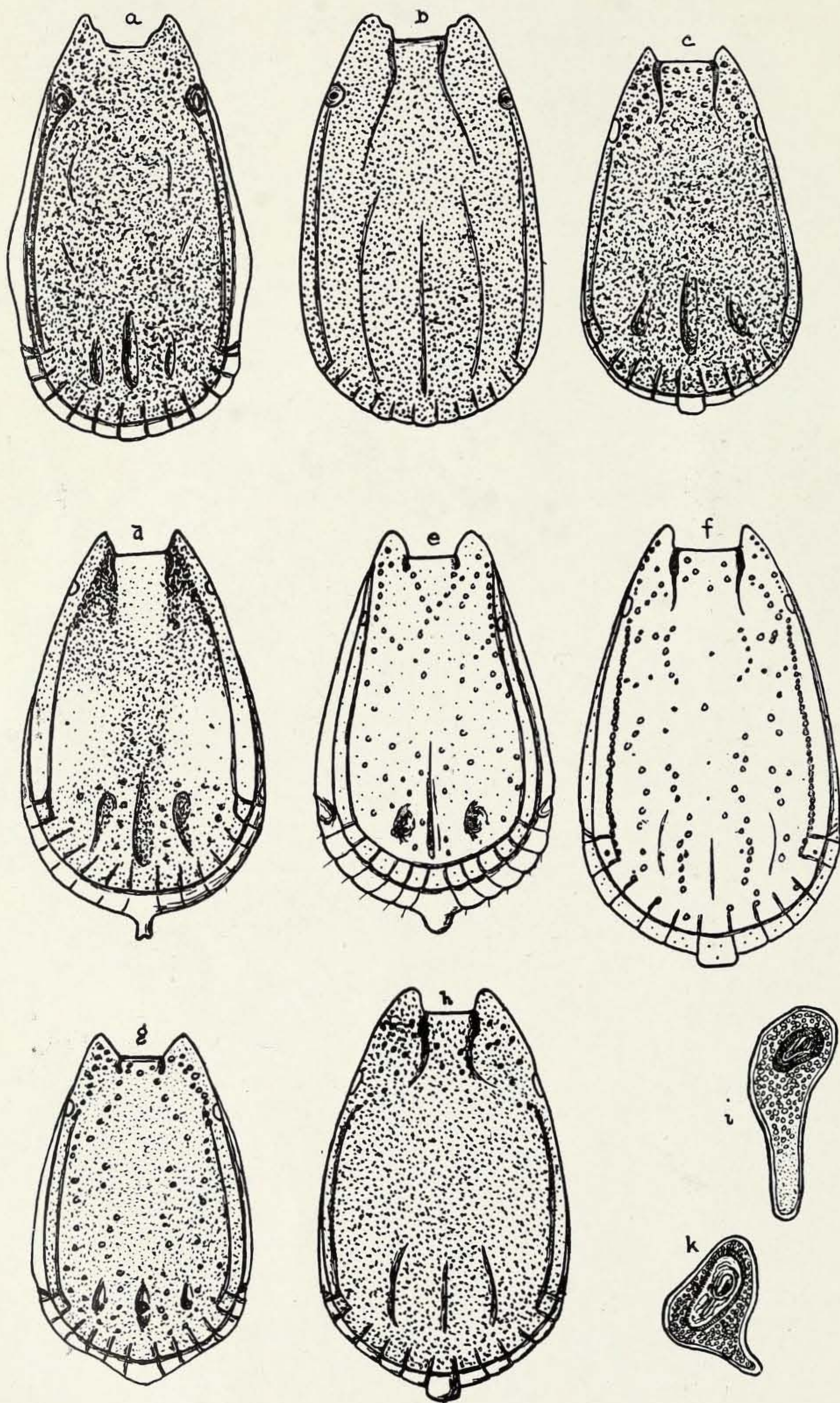


Plate VIII.

Rhipicephalus, shields of males.

- | | |
|---|---|
| (a) <i>R. evertsi</i> , Neumann. | (g) <i>R. lunulatus</i> , Neumann. |
| (b) <i>R. oculatus</i> , Neumann. | (h) <i>R. bursa</i> , Canestrini and Fanzango. |
| (c) <i>R. capensis</i> , Koch. | (i) Stigmatic plate of male <i>R. evertsi</i> ,
Neumann. |
| (d) <i>R. appendiculatus</i> , Neumann. | (k) Stigmatic plate of female <i>R. evertsi</i> ,
Neumann. |
| (e) <i>R. sanguineus</i> (Latreille). | |
| (f) <i>R. simus</i> , Koch. | |

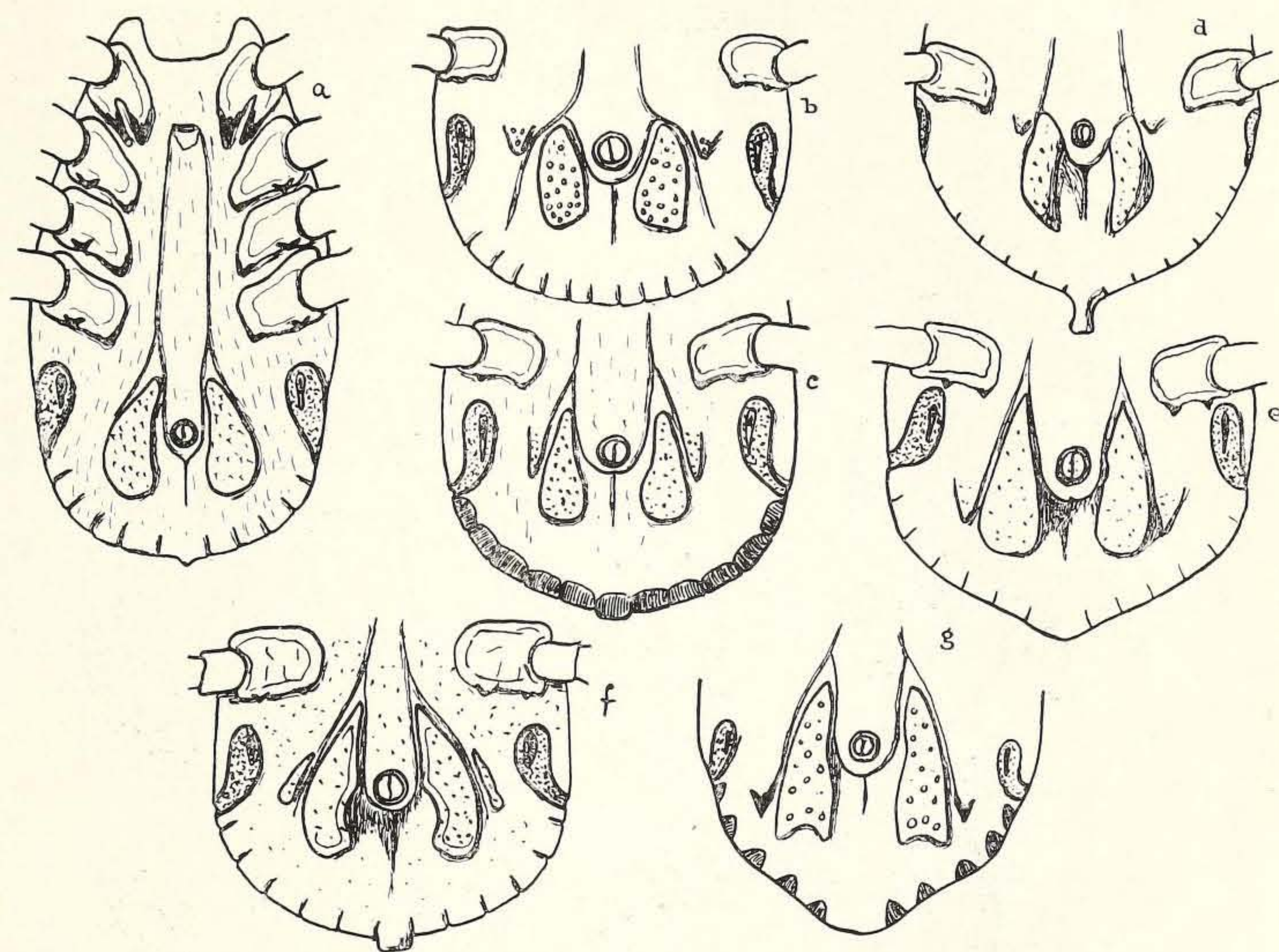


Plate IX.

Rhipicephalus, anal plates of males.

- | | |
|---|---------------------------------------|
| (a) <i>R. evertsi</i> , Neumann. | (e) <i>R. sanguineus</i> (Latreille). |
| (b) <i>R. oculatus</i> , Neumann. | (f) <i>R. simus</i> , Koch. |
| (c) <i>R. capensis</i> , Koch. | (g) <i>R. lunulatus</i> , Neumann. |
| (d) <i>R. appendiculatus</i> , Neumann. | |

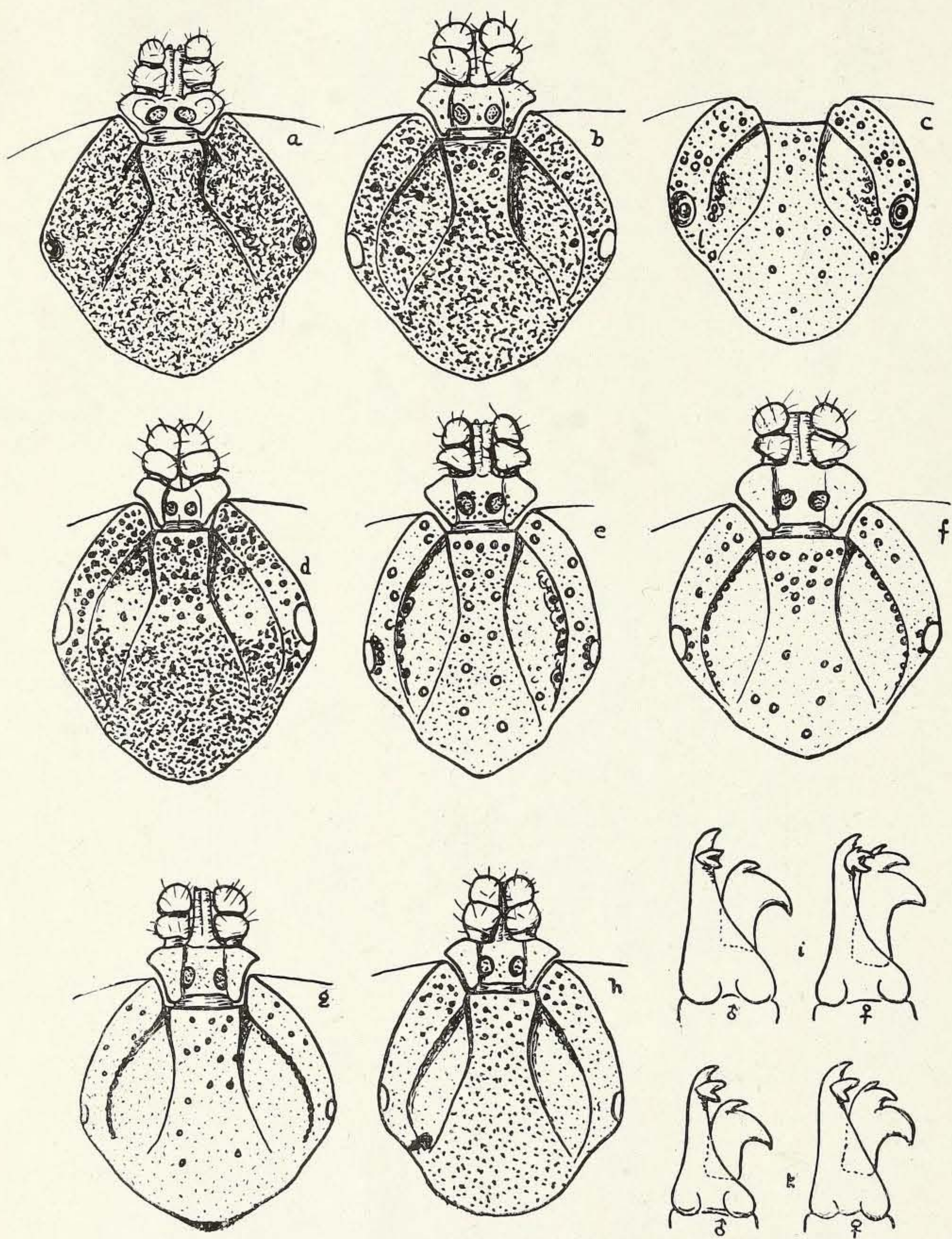


Plate X.

Rhipicephalus, shields of females.

- (a) *R. evertsi*, Neumann.
- (b) *R. capensis*, Koch.
- (c) *R. oculatus*, Neumann.
- (d) *R. appendiculatus*, Neumann.
- (e) *R. sanguineus* (Latreille).
- (f) *R. simus*, Koch.

- (g) *R. lunulatus*, Neumann.
- (h) *R. bursa*, Canestrini and Fanzango.
- (i) Mandibles of *R. simus*, Koch, male at left and female at right.
- (k) Mandibles of *R. sanguineus* (Latreille), male at left and female at right.

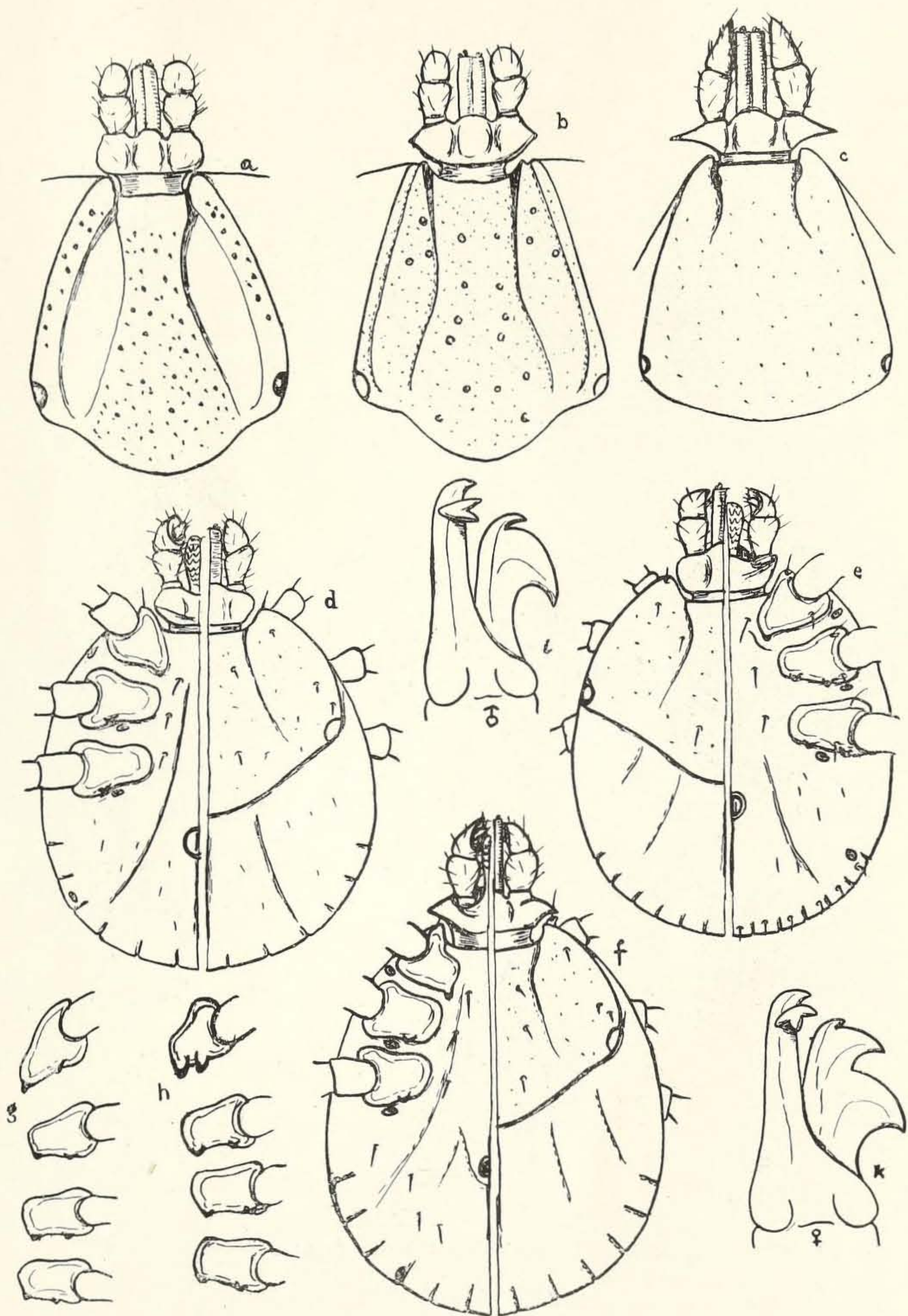


Plate XI.

Rhipicephalus, nymphs and larvae.

- | | |
|--|--|
| (a) Dorsal shield and rostrum of nymph of <i>R. evertsi</i> . | (e) Dorsal and ventral surfaces of larva of <i>R. evertsi</i> . |
| (b) Dorsal shield and rostrum of nymph of <i>R. appendiculatus</i> . | (f) Dorsal and ventral surfaces of larva of <i>R. simus</i> . |
| (c) Dorsal shield and rostrum of nymph of <i>R. simus</i> . | (g) Coxae of nymph of <i>R. appendiculatus</i> . |
| (d) Dorsal and ventral surfaces of larva of <i>R. appendiculatus</i> . | (h) Coxae of nymph of <i>R. simus</i> . |
| | (i) Mandibles of <i>R. appendiculatus</i> , male. |
| | (k) Mandibles of <i>R. appendiculatus</i> , female, nymph and larva. |