

Jane B. Walker,
James E. Keirans
and Ivan G. Horak

The Genus *Rhipicephalus* (Acari, Ixodidae)

A Guide to the
Brown Ticks of the World

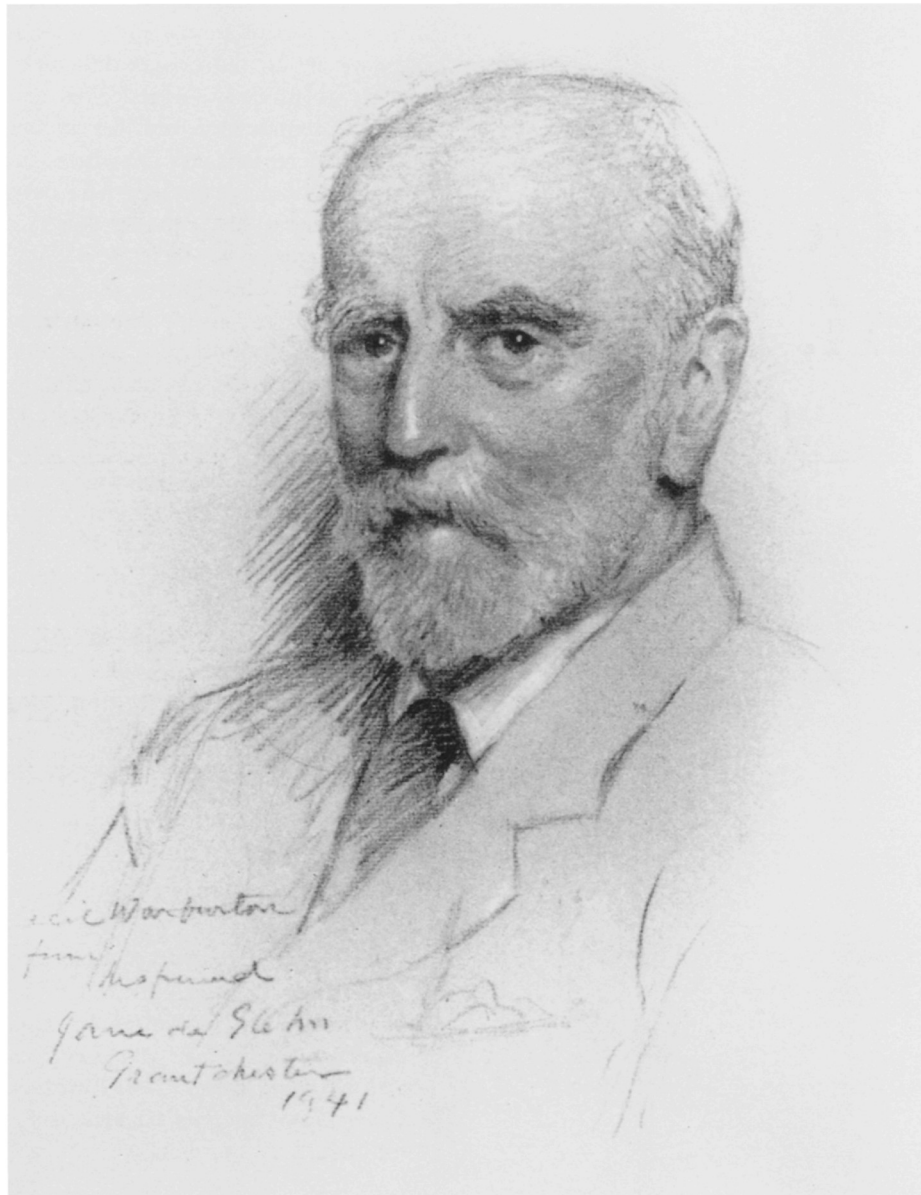


Ticks in the genus *Rhipicephalus* include many important vectors of animal and human pathogens, but many species are notoriously difficult to identify, particularly as immature stages. This reference volume provides identification keys for adult ticks from the Afrotropical regions and elsewhere. For the nymphs and larvae, unique plates have been compiled in which line drawings of the capitula of similar species are grouped together to facilitate identification. Brief, well-illustrated, descriptions of the known stages of every species are given, plus information on their hosts, distribution, and disease relationships. Tables providing data on host/parasite relationships and disease transmission are also included, making this the definitive reference source on this group for all those interested in acarology, veterinary or medical parasitology, and entomology for many years to come.

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Frontispiece. Cecil Warburton. Photo courtesy of the Master and Fellows of Christ's College, Cambridge.

The Genus *Rhipicephalus* (Acari, Ixodidae):

A Guide to the Brown Ticks of the World

by

JANE B. WALKER

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AND IVAN G. HORAK



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This contribution to our knowledge of the genus
Rhipicephalus is respectfully dedicated to the memory
of

CECIL WARBURTON
(1854–1958)

In his valuable paper on this genus published in 1912
he commented: 'The systematist has no need to
apologise for a want of definiteness the responsibility
for which lies with Nature herself.' We therefore feel
that he would be sympathetic to the 'want of
definiteness' that remains in parts of this book.

Errata

p.31. The correct date of publication for *R. oreotragi* Walker & Horak is 2000, not 1999.

p.38. The correct date of publication for *R. warburtoni* Walker & Horak is 2000, not 1999.

p.45. The Rocky Mountain Laboratory is in Hamilton, Montana (MT), not Massachusetts (MA).

p.408. *Notes on identification*. First sentence should read 'We have not seen the type series of *R. serranoi* (2♂♂, 5♀♀).

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Introduction

'Haba na haba hujaza kibaba'. Little by little fills up the measure! This Swahili proverb encapsulates the contributions made by many people, starting in 1806, towards an understanding of the genus *Rhipicephalus*, an important group of ixodid ticks occurring mainly, but by no means exclusively, in Africa. So far as we know our book represents the first completed attempt to review this knowledge. Almost certainly G.H.F. Nuttall, C. Warburton, W.F. Cooper and L.E. Robinson originally intended to include the genus in their series of monographs on the Ixodoidea but they never managed to do so. The first part, by Nuttall *et al.* on the family Argasidae, was published in 1908. Thereafter three further parts on individual ixodid genera appeared, by Nuttall & Warburton (1911, 1915) on *Ixodes* and *Haemaphysalis*, respectively, and by Robinson (1926) on *Amblyomma*.

In 1939 F. Zumpt, in the first of a series of papers entitled 'Vorstudie zu einer Revision der Gattung *Rhipicephalus*', noted that he planned to revise the genus in collaboration with Dr W. Minning. However, after publishing a key to the known species within the genus in 1949 he apparently abandoned this idea. In 1960 D.R. Arthur, of King's College, London, produced the fifth volume in the monographic series started by Nuttall and his colleagues in which he dealt with the genera *Dermacentor*, *Anocentor*, *Cosmiomma*, *Boophilus* and *Margaropus*. At the same time he gave notice of his intention to complete the

series, including a study of *Rhipicephalus* and *Rhipicentor*, but neither this nor his proposed volume on the genus *Hyalomma* ever materialized. Two years later Gertrud Theiler issued a long report in which she dealt with all the ticks known to occur in Africa, including the rhipicephalids, together with their hosts and distribution. P.C. Morel followed this in 1969 with his valuable thesis on all the ixodid ticks occurring in Africa, including maps showing their distribution. The section in that study on the *Rhipicephalus* spp. has been most helpful to us. We have often referred to it, especially in connection with the West African species, of which we ourselves have little first-hand knowledge.

One of us (J.B.W.) has been particularly involved with the rhipicephalids for over 40 years and finally decided to try, with the help of her colleagues, to consolidate available information on the genus. It has been a daunting task and, despite our best efforts, we are well aware of some of the remaining shortcomings of the final result. Wherever possible we have tried to draw attention to outstanding problems and possible mistakes in our interpretation of the existing data. We therefore remain hopeful that our contribution will provide a useful foundation for further studies on these interesting ticks.

We start with a brief account of the relationships of the ticks and a definition of the genus *Rhipicephalus*. This is followed by an explanation of the format used in the accounts of individual

species, then a glossary, together with labelled diagrams showing the essential external morphological features of adult rhipicephalids. The last part of this introductory section of the book is a list of the *Rhipicephalus* species names of the world.

Two major sections appear next, the first on species occurring in the Afrotropical region and the second on those found elsewhere. Accounts of the four species that are present in both regions, *R. camicasi*, *R. evertsi evertsi*, *R. sanguineus* and *R. turanicus*, feature in the Afrotropical section. Each of these sections comprises a historical review of research on the *Rhipicephalus* spp. recorded in the region, keys for the identification of the adults, the accounts of individual species listed alphabetically, and a host/parasite list.

The identification of the immature stages of the rhipicephalids has always been particularly difficult because many of them are very much alike in appearance. We have not attempted to produce keys for their identification. Instead we have included a series of plates in which line drawings of the capitula of the nymphs and larvae of morphologically similar species are grouped together. This will facilitate direct comparisons between them and thus, we hope, help readers to identify them.

The last section in the book comprises information on the transmission of various pathogens to animals and humans by *Rhipicephalus* spp.

Pertinent references are listed at appropriate points throughout the text.

Relationships of the ticks (Ixodida) and definition of the genus *Rhipicephalus*

Ticks are all obligate blood-feeding parasites of terrestrial vertebrates at some stage of their life cycle. Many species are of considerable interest and importance as vectors of a wide variety of pathogens to both humans and animals.

They are members of the phylum Arthropoda, the jointed-legged animals. Although often referred to as insects, whose adults have six legs, they are in fact members of the class Arachnida. This class, whose adults have eight legs, includes spiders and scorpions as well as the order Acari, a large and diverse group to which the ticks and mites belong. Within the Acari the suborder Ixodida encompasses the three families of ticks, the Argasidae, Nuttalliellidae and Ixodidae. The systematics of the Ixodida were reviewed recently by Keirans (1992).

Members of the family Ixodidae, to which the genus *Rhipicephalus* belongs, are characterized by having a hard sclerotized scutum. This completely covers the dorsal surface of the body in the males but is merely a smaller shield just behind the capitulum in the females and immature stages. The mouthparts of all these ticks are anterior in position; their eyes, when present, are near the lateral margin of the scutum, and their spiracles, which are large, are located behind coxae IV. This combination of characters readily distinguishes ixodid ticks from species in the Nuttalliellidae and the Argasidae. Members of

both the latter families lack a hard sclerotized scutum: the main feature characterizing them is the leathery integument that covers their bodies.

Keirans (1992) noted that: 'The family Ixodidae is usually considered to be composed of approximately 13 genera . . .', of which the genus *Rhipicephalus* is one of the largest. Species in this genus have the following morphological features in common: their hypostome and palps are short and their basis capituli is usually hexagonal; they have eyes, festoons and, in the males, adanal plates. With the exception of four species, *R. dux*, *R. humeralis*, *R. maculatus* and *R. pulchellus*, they are inornate, i.e. the adults do not have a colour pattern on the scutum, hence their common name 'the brown ticks'.

In this book we recognize 74 *Rhipicephalus* species and 2 subspecies. We believe, however, that further studies may show that several other entities whose precise status is at present uncertain are in fact valid species. It is mainly an African genus. Of the known species one, *R. sanguineus*, occurs practically worldwide between latitudes 50°N and 30°S. Sixty species have been recorded only in the Afrotropical region and one, *R. fulvus*, appears to be confined to parts of north-western Africa. Two species, *R. turanicus* and to a lesser extent *R. camicasi*, are widely distributed both in Africa and further afield. Ten species are known only from outside

the Afrotropical region. One subspecies, *R. evertsi evertsi*, which is very widely distributed in the Afrotropical region, has apparently now also gained a foothold on the Arabian peninsula; time will show how far it manages to spread there.

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- Keirans, J.E. (1992). Systematics of the Ixodida (Argasidae, Ixodidae, Nuttalliellidae): an overview and some problems. In *Tick Vector Biology, Medical and Veterinary Aspects*, ed. B. Fivaz, T. Petney & I. Horak, pp. 1–21. Heidelberg: Springer-Verlag.

Format for the accounts of individual species

SOURCES OF INFORMATION

The data presented in this book have been obtained from many sources. A major source has been the data files of the United States National Tick Collection (USNTC), whose history has been documented by Durden, Keirans & Oliver (1996). It had its origins early in the century at the Rocky Mountain Laboratory, Hamilton, Montana, hence the prefix 'RML' to its collection numbers. In 1983 it was donated to the United States National Museum of Natural History (Smithsonian Institution), where it was curated by J.E.K. Shortly after H. Hoogstraal died in 1986 his tick collection was also sent to the Smithsonian Institution for incorporation into the USNTC. In 1990 the collection was transferred on long-term enhancement loan from the Smithsonian Institution to the Institute of Arthropodology and Parasitology, Georgia Southern University, where it is still curated by J.E.K., assisted by L.A. Durden. It is the world's largest tick collection, including over 300 types and more than 122 500 individual accessioned collections.

Another important source of information has been material from the collections of The Natural History Museum, London, loaned to us by Anne Baker. These include, amongst many others, the Nuttall Tick Collection (Keirans, 1985) and the Tanzanian Tick Survey Collection (Yeoman & Walker, 1967). Among other sources from which we have obtained data are

the Onderstepoort Tick Collection, built up largely by Gertrud Theiler; the Namibian Tick Survey Collection, by courtesy of Heloise Heyne; the collection of the Musée Royal de l'Afrique Centrale, Tervuren, Belgium, including many specimens obtained during colonial times in the Democratic Republic of Congo and now curated by F. Puylaert; and numerous collections from East Africa and South Africa accumulated by J.B.W. and I.G.H. respectively.

Details of various individual collections, obtained as either gifts or loans, are detailed elsewhere in the text, as are literature references.

DESCRIPTIONS

Brief descriptions are given of every available stage of all the *Rhipicephalus* species that are presently regarded as valid. Explanations of their specific names are given and their synonyms, if any, are listed. Often the descriptions, especially those of the nymphs and larvae, are based on laboratory-reared specimens. They are illustrated with line drawings of the adults and, in almost every case, with scanning electron micrographs (SEMs) of each of the known stages. The descriptive terms used are defined in the glossary. Some also appear on Figs 1 and 2.

Measurements, quoted in mm, are given simply as guides to the size of the species under discussion. They are not statistically valid.

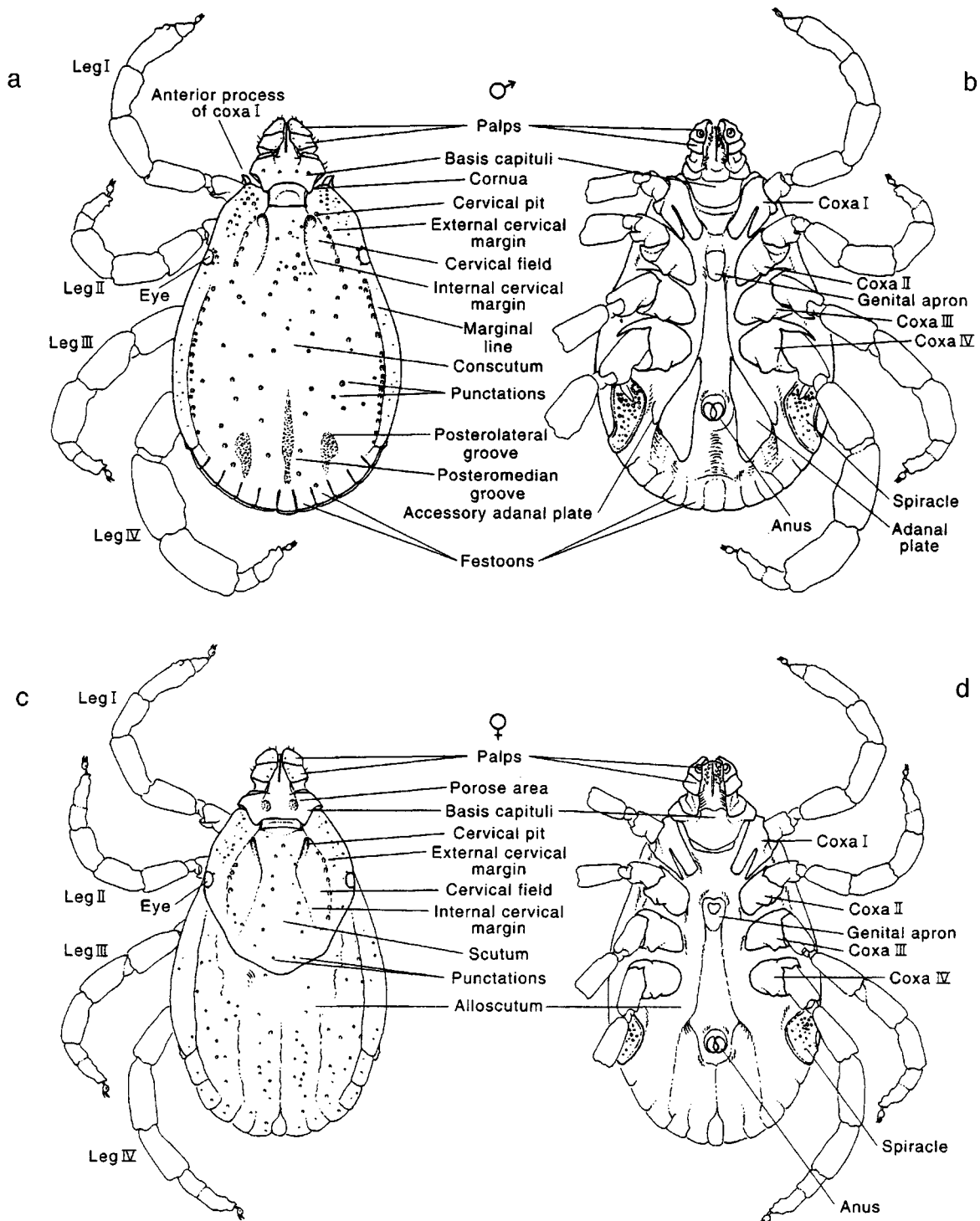


Figure 1. *Rhipicephalus* sp. adults showing morphological features. Male: (a) dorsal view; (b) ventral view. Female: (c) dorsal view; (d) ventral view.

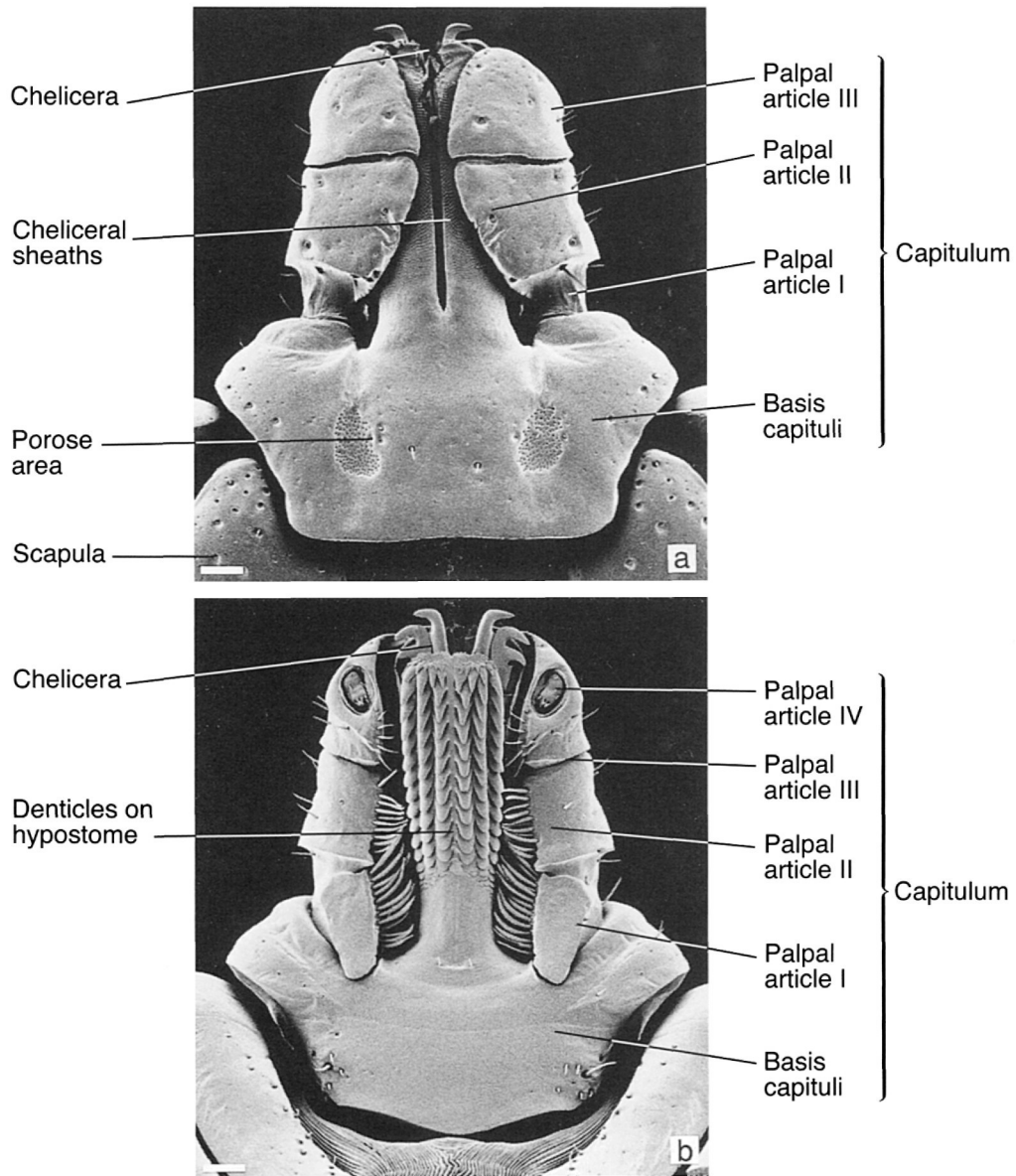


Figure 2. *Rhipicephalus longicoxatus* female capitulum showing morphological features: (a) dorsal view; (b) ventral view. Scale bars represent 0.10 mm. SEMs by J.F. Putterill.

Sometimes it has been possible to give an idea of the potential range of sizes seen in a species, but in some cases very few specimens were available to us for measurement. Rarely, for example for the seldom-collected Saharan species *R. fulvus*, we have merely cited measurements from the literature.

The differences between the length and breadth of various morphological features are

described in standardized terms. If, for example, the mean of the smallest and greatest measurements of the length of a morphological feature differs by less than 1% from the mean of the smallest and greatest measurements of its width it is described as being either 'as broad as long' or, conversely, 'as long as broad'. If this difference ranges from 1% to less than 5% it is described as 'slightly broader than long' or 'slightly longer

than broad'. With a difference of 5% to less than 20% it is described simply as 'broader than long' or 'longer than broad'. When the difference is greater than 20% it is described as 'much broader than long' or 'much longer than broad'.

One of the greatest difficulties experienced when attempts are made to identify rhipicephalids is to establish the range of morphological variation shown by individual species. Warburton (1912) began his valuable paper on the genus by saying:

'The identification of species of *Rhipicephalus* is likely to give more trouble than is the case with any other genus of Ixodidae, for while, on the one hand, there are few species which depart greatly from the general type, on the other hand the range of variation within the species is extremely great. In no genus is it so dangerous to describe a new species from a single individual, especially if the specimen be a female'.

He went on to discuss the variations seen in some of the species and the consequent problems encountered with their identification. He regarded the following features as the most useful for identifying the males: the shape of the basis capituli, including the position and precise form of its lateral angles; the anterior process of coxae I; the presence or absence, and shapes, of the various grooves and other depressions on the conscutum; the punctation pattern, and the shapes of the spiracles and adanal plates. He commented that, in the females, the porose areas and shape of the scutum are also worth noting.

A major factor influencing this morphological variation is nutrition. In general some species are large while others are small. It has been shown experimentally, though, that within a single species a great range in the size of the adults can occur that is directly related to the degree of engorgement of the immature stages. These differences in size are usually accompanied by other morphological disparities, for example in the shape of the basis capituli or in the punctation pattern.

Our descriptions are followed by notes on identification. These comprise information on aspects such as previous misidentifications of the

tick in question, its possible relationships within the genus and comparisons with other morphologically similar species.

HOSTS

The common names used for domestic animals include the various breeds of each of them. Several breeds of the same species occur in different areas and it would be impossible to list the tick species recorded from each of these breeds separately. In the case of cattle, records from the two species that have been described, *Bos taurus* and *Bos indicus*, as well as the records from all the breeds are listed together under the common name 'cattle'.

The scientific nomenclature for wild mammalian hosts that we have used is based mainly, but not exclusively, on that given by the numerous contributors to Wilson & Reeder (1993). For the primate genera *Cercopithecus* and *Papio* we have followed the classification of Napier & Napier (1967). In most cases we have used the host's binomen, i.e. its generic plus its specific name, but we have gone to the subspecific level of classification given by Ansell (1971) for the artiodactyl genera *Alcelaphus* and *Damaliscus* because marked differences exist between the various subspecies of hartebeests. Most of the common names that we have added for the hosts conform to those appearing in Corbet & Hill (1991). Occasionally we have quoted a common name from the new field guide for African mammals by Kingdon (1997), in which recent changes in the nomenclature of African mammals have been incorporated. This useful publication includes illustrations of many species as well as numerous distribution maps for individual species or species groups. Some names for the Palearctic and Indian mammals have been taken from Ellerman & Morrison-Scott (1951).

For various reasons it has not always been feasible to give the host's binomen. Sometimes it was originally designated only in vague terms, e.g. 'jackal', 'wild pig', 'duiker' or 'hare'. In such cases it has been impossible to determine the

exact species involved. Sometimes we have been unable to decide to which host species certain tick records should be assigned when the nomenclature of a previously monotypic entity has been emended to encompass two or more species. This has been the case with both *Phacochoerus* spp. (warthogs) and *Potamochoerus* spp. (bushpigs). These have been regarded as monotypic genera by most authorities in recent years but P. Grubb (in Wilson & Reeder, 1993) has now designated two species in each. He considers that *Phacochoerus aethiopicus* presently occurs in 'N Kenya and Somalia', and *P. africanus* 'outside [the] forest zone of Africa from Senegal to Somalia, south to S Africa'. He regards *Potamochoerus porcus* as an inhabitant of the rainforests of Africa from Senegal to the Democratic Republic of Congo (formerly Zaire) and designates as *P. larvatus* the species occurring in 'Ethiopia, S Sudan and E Zaire south to E and S South Africa, west to N Botswana and Angola'.

We have also had problems with some records from African porcupines. Basically *Hystrix africae australis* occurs in the southern half of the continent, from about the level of the mouth of the Congo River eastwards to Rwanda, Uganda, Kenya, W. and S. Tanzania and thence southwards. *Hystrix cristata* occurs in the northern half of the continent. In parts of central Africa, however, these two species are sympatric. In addition even mammalogists sometimes confess to difficulty in distinguishing between them morphologically. In cases of doubt, therefore, we have assigned records merely to *Hystrix* sp.

References to other publications on African mammals that we have consulted appear in appropriate places in the text.

For birds we have used both the scientific and common names listed by Howard & Moore (1991).

In the host tables that are given for most *Rhipicephalus* species we have tried to indicate the importance or otherwise of each host included by noting the number of collections of the tick in question recorded from it. It should be

emphasized that the numbers given in these tables represent numbers of collections of a particular *Rhipicephalus* species from a host, not the number of individual ticks of that species on the host in question. A host may have a burden of several hundred ticks but this would be counted as a single collection. These figures have been compiled from our own data plus information from the literature. Obviously they are often extremely conservative, particularly for the commoner rhipicephalids. In the case of some of the commonest species found on cattle, for example *R. appendiculatus* and *R. duttoni*, we have simply stated that they are 'commonly parasitized' as any attempt to give actual figures for these species would be completely meaningless. For other rhipicephalid species, though, when an author stated that collections were made from 'cattle', without giving any indication of the number of animals examined or noting how many were parasitized by the tick in question, we have added only 'one' to the number of collections recorded. But if, for example, an author stated that collections were made from cattle monthly for a year, and the tick was recorded from March to September, a total of 'seven' would be added to the number of collections recorded. We have also included data on the rhipicephalids collected during various long-term surveys of the parasites of domestic and wild animals. The animals concerned are listed in the introduction to the host/parasite tables. Obviously these data will considerably increase the number of records of the particular ticks found during such surveys and may give a false impression of host preference. If possible we have indicated which hosts are parasitized by the immature stages of the ticks under discussion.

Whenever we consider that a specific tick prefers a certain host that tick's binomen appears in **bold** under the host's name in the host/parasite list.

For a few species there are, for various reasons, doubts about some records that have been included. These are listed as 'unconfirmed'.

Despite the shortcomings that are undoubtedly inherent in these methods we trust

that our findings will be more informative than simply listing the names of a tick's known hosts would have been.

ZOOGEOGRAPHY

In the Afrotropical region the distributions of the two most important rhipicephalid vectors of pathogens, *R. appendiculatus* and *R. zambeziensis*, have been mapped as precisely as possible. The locations of almost all the other *Rhipicephalus* species in this region are indicated with symbols mapped on 1° squares. Occasionally, though, it has only been possible to register the presence of a tick in a country, using a single symbol and giving no indication of the areas where it occurs. The distributions of species occurring outside the Afrotropical region have been indicated in very broad terms only.

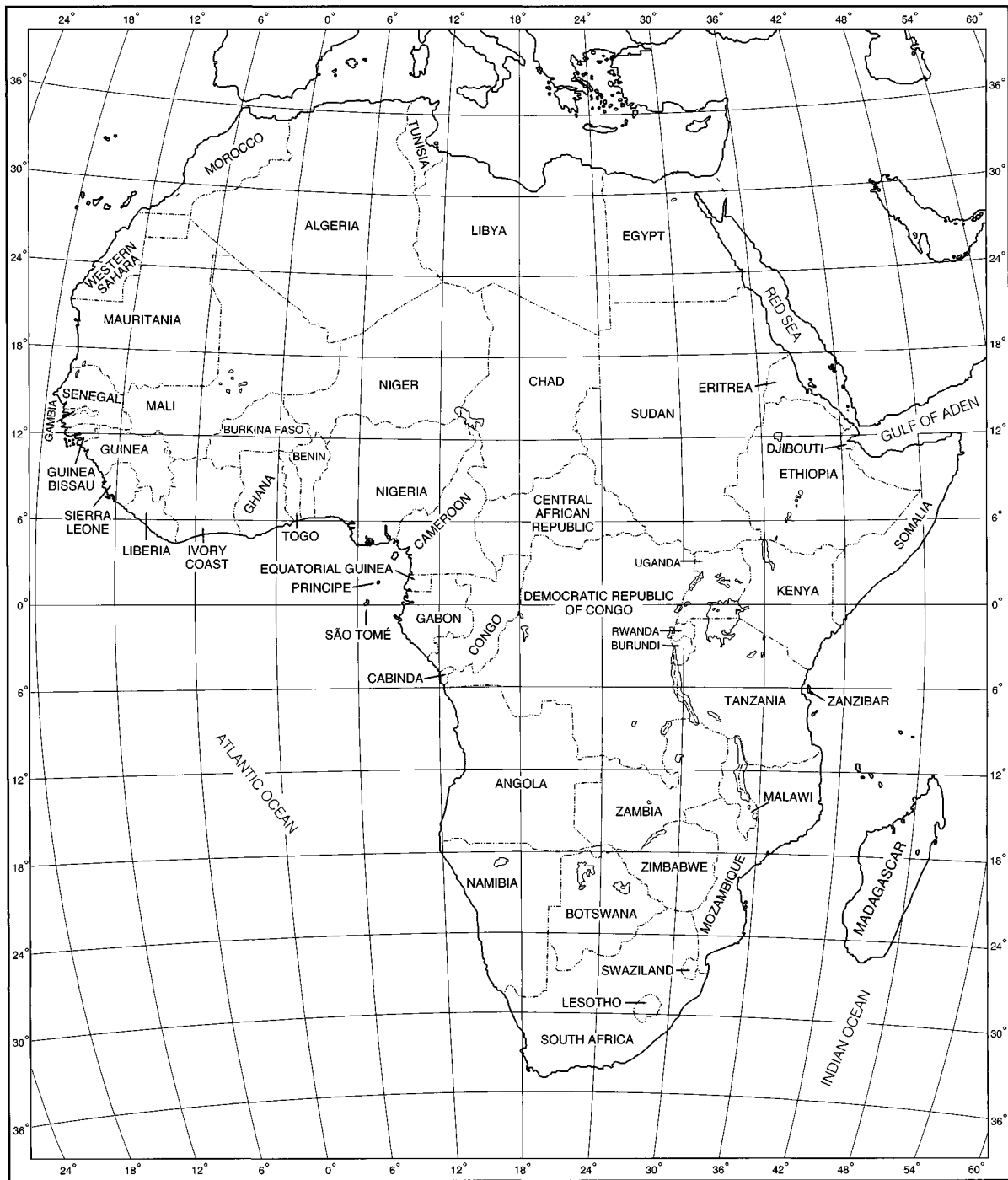
As in the case of the hosts the information we present is derived partly from our own data and partly from records in the literature.

The current names of African countries are shown on Map 1. Although their boundaries have rarely been altered since colonial times the names of many of these countries have been changed, sometimes more than once. Naturally the older names feature in the earlier literature on African ticks. To avoid confusion we are therefore listing below those current names (in bold) that have been changed together with their earlier names (in parenthesis), and some in other European languages, as follows: **Algeria** (Algérie); **Angola** (Portuguese Congo; Portuguese West Africa); **Benin** (Dahomey); **Botswana** (Bechuanaland Protectorate); **Burkina Faso** (Upper Volta; Haute Volta); **Burundi** (Ruanda-Urundi (in part)); **Cameroon** (British Cameroons; plus Kamerun, later Cameroun); **Central African Republic** (Ubangi Shari; Oubangui Chari); **Chad** (Tchad); **Congo** (Congo Français; Moyen Congo; People's Republic of Congo); **Democratic Republic of Congo** (Congo Free State; Belgian Congo; Congo Belge; Zaire); **Djibouti** (French Somali-

land; Afars and Issas); **Egypt** (United Arab Republic); **Equatorial Guinea** (Spanish Guinea; Rio Muni); **Eritrea** (Italian Eritrea; Ethiopia (in part)); **Ethiopia** (Abyssinia); **Ghana** (Gold Coast); **Guinea** (French Guinea; Guinée Française); **Guinea-Bissau** (Portuguese Guinea; Guinée Portugaise; Guiné Portuguesa); **Ivory Coast** (Côte d'Ivoire); **Kenya** (East African Protectorate; British East Africa); **Lesotho** (Basutoland); **Libya** (comprising Tripolitania, Cyrenaica & Fezzan); **Malawi** (Nyasaland Protectorate); **Mali** (French Sudan, Sudan Français); **Mauritania** (Mauritanie); **Morocco** (Moroc; Spanish Morocco (in part)); **Mozambique** (Portuguese East Africa, Moçambique); **Namibia** (Deutsch Südwestafrika, South West Africa); **Republic of South Africa** or **South Africa** (Union of South Africa); **Rwanda** (Ruanda-Urundi (in part)); **Senegal** (Sénégal); **Somalia** (Somaliland Protectorate (British) plus Italian Somaliland (Somalia)); **Sudan** (Anglo-Egyptian Sudan); **Tanzania** (German East Africa; Deutsch Ostafrika; Tanganyika plus Zanzibar); **Tunisia** (Tunisie); **Western Sahara** (Spanish West Africa; Africa Occidental Española; Rio de Oro); **Zambia** (Northern Rhodesia); **Zimbabwe** (Southern Rhodesia; Zimbabwe Rhodesia).

During the colonial era the French territories in the Afrotropical region, with the exception of French Somaliland, were divided into two major groups. French West Africa (Afrique Occidentale Française) comprised Sénégal, Mauritanie, Guinée Française, Côte d'Ivoire, Soudan Français, Haute Volta, Niger, Dahomey and the Trust Territory of Togo. French Equatorial Africa (Afrique Équatoriale Française) comprised Tchad, Cameroun, Oubangui Chari, Moyen Congo and Gabon. Further south in the continent the three British territories of Northern Rhodesia, Southern Rhodesia and Nyasaland were amalgamated into the Federation of Rhodesia and Nyasaland from 1953–1963.

Authors have sometimes listed the geographical coordinates of localities where specific ticks have been recorded. Otherwise these coordinates have either been read from maps of the



Map 1. Africa: political divisions.

areas concerned or obtained either from *The Times Atlas of the World – Comprehensive Edition* (Bartholomew & Times Books, 1992) or from the excellent gazetteers for individual countries produced by the United States Board on Geographic Names. (At the time of writing these gazetteers were obtainable from the following address: USGS Map Sales, Box 25286, DFC, Denver, CO 80225-0046, U.S.A.). These sources of information have rarely failed us, although it has sometimes been impossible to determine which of the coordinates for several places, or farms, listed under the same name are relevant in the circumstances. We have usually tried to avoid records based on single ticks, especially females, and have not included those of ticks collected from animals at abattoirs unless the origin of these animals was specifically known.

When possible we have included brief notes on the general ecological conditions in the areas favoured by individual tick species, particularly on altitude, rainfall (Jackson, 1961) and vegetation (White, 1983).

Readers must remember that tick distributions, like those of any other living organisms, may vary from time to time in response to changes in the distribution of their hosts and/or expanding human populations. These shifts can sometimes take place rapidly over large areas. In Africa probably the most widespread environmental change during approximately the last 25 years has been the degradation of the fragile ecosystem along the southern borders of the Sahel. This has been caused by persistent drought exacerbated by factors such as deforestation and increasing cultivation. As a result the Sahel has moved southwards, displacing and impoverishing entire communities. There are a few references, mentioned later in the text, to the effects that this had also had on tick populations in northern Senegal. Doubtless such effects are far more widespread but they remain to be documented. We have of necessity relied largely on the findings of Morel (1969) and his colleagues regarding tick distribution in West Africa. This information may well be somewhat out-

of-date now, but we have usually had no means of revising it.

DISEASE RELATIONSHIPS

The pathogens known to be transmitted by rhipicephalids have been included in the accounts of the individual tick species. We have also appended disease transmission tables at the end of this book for both animals and humans in which we have listed the diseases and the pathogens that cause them, followed by details regarding their specific tick vectors.

BASIC REFERENCES

Comprehensive lists of the references concerning every *Rhipicephalus* sp. described up to 1969, valid or otherwise, and their hosts and geographical distribution, have been compiled by Doss *et al.* (1974–1978). In these publications literature citations appear under the name(s) of the author(s) and date of publication. Usually, but not invariably, some indication of the contents of the reference in question is also given. When required the complete title of a reference is obtainable either from the author index of the *Index-Catalogue of Medical and Veterinary Zoology* (1932–1982), published by the United States Department of Agriculture, or from the comprehensive bibliography published by Hoogstraal (1970–1988).

We have listed pertinent references at the ends of chapters and after each account of an individual species. These lists commonly appear in two sections. References that apply mainly or exclusively to a particular chapter or species account are given first. They are always quoted in the preceding text and listed in full. Although they may be referred to more than once in the book they are often relatively restricted in scope. Some, indeed, deal with only one species of *Rhipicephalus*. These specific references are usually followed, after the words ‘Also see the following Basic References (pp. 12–14)’, by a number of basic references, cited under the name(s) of their author(s) and date of publication only. These basic references are sometimes, but not invariably, quoted in the preced-

ing text. They are always wider in scope. They are either books, such as the mammalian checklists and accounts of rainfall and vegetation mentioned above, or publications such as those describing the tick fauna of a particular country or region. With the exception of Warburton (1912), who is quoted in full later as the author of three specific names, the full titles of basic references are listed once only, below.

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Glossary

Morphological features used in descriptions of <i>Rhipicephalus</i> spp. and taxonomic and other terms.			
Accessory adanal plates	Pair of small sclerotized structures lateral to the adanal plates in males. May be present or absent. Also called accessory plates.	Article	Distinct articulated portion of a jointed appendage.
Adanal plates	Ventral pair of large sclerotized structures lateral to the anus in males.	Basal	Closest to the origin or insertion.
Alloscutum	The portion of the body wall in females and immatures posterior to the scutum that expands enormously to accommodate the large volume of blood ingested when these stages feed.	Basis capituli	Basal portion of the capitulum on which the mouthparts are attached; in the genus <i>Rhipicephalus</i> the basis capituli is hexagonal.
Anterior	Towards the front end.	Bifid	Deeply cleft, forming two long spurs. (<i>See coxa</i>).
Anterior process	Referring to anterior process on coxae I. When seen from the dorsal surface it is a sclerotized anterior projection of these coxae protruding in front of the scapulae as in <i>R. appendiculatus</i> .	Capitulum	Anterior movable portion of the body which includes the basis capituli, palps, hypostome and chelicerae. The tick's 'head'.
Anus	Posterior opening of the alimentary tract, situated ventrally and medially,	Caudal process	Distinct projection arising posteromedially from the median posterior end of engorged males of many <i>Rhipicephalus</i> species.
		Central field	Area on the conscutum or scutum between and delimited by the internal cervical margins.
		Cervical fields	Areas anteriorly on the conscutum or scutum delimited by the internal and external cervical margins. These fields are

	variously shaped, depending on the species. They are often depressed into the scutal surface and may be flat, roughened or smooth.		internal aspect of the adanal plates.
Cervical grooves	<i>See</i> internal cervical margins.	Denticles	Small, individual, recurved projections or 'teeth' on the ventral surface of the hypostome.
Cervical pits	Paired anterior depressions in the scuta of both sexes; vary in shape and depth.	Distal	Farthest from the point of attachment or origin.
Chaetotaxy	Arrangement and nomenclature of setae.	Dorsal	Pertaining to the back or top of the body.
Chelicera (pl. chelicerae)	Paired cutting mouthparts lying dorsal to the hypostome, each terminating in an internal (fixed) and external (moveable) digit.	Dorsal prolongation	Posterodorsal extension of the spiracle.
Clavate	Clubbed; thickening gradually toward the tip as in the alloscutal setae of <i>R. humeralis</i> females.	Dorsum	The entire dorsal surface of the body.
Conscutum	Sclerotized plate posterior to the capitulum that covers almost the entire dorsal surface of male <i>Rhipicephalus</i> .	Emargination	Anterior indentation or excavation in the scutum between the scapulae that receives the basis capituli.
Cornua	Small, paired projections extending from the dorsal, posterolateral angles of the basis capituli.	Engorged	Enlargement of a tick following a blood meal. Pronounced distention is seen in females, nymphs and larvae. Males, because they have a sclerotized conscutum, cannot take in such large blood meals as females and immatures, and are therefore incapable of the same degree of engorgement.
Coxa (pl. coxae)	Sclerotized plate on the venter representing the first leg segment to which the trochanter is attached. From anterior to posterior the coxae are designated by Roman numerals I, II, III and IV. <i>Rhipicephalus</i> species adults have bifid first coxae.	<i>et al.</i> [Latin]	(<i>et alii</i>); and others.
Coxal spurs	Large or small projections extending from the posterior margins of the coxae.	External cervical margins	Faint or definite ridges or punctations found anterolaterally on the scutum or conscutum. May be present or absent. Also known as lateral carinae.
Cusps	Small points or projections extending medially from the	Eyes	A pair of lens-like structures at the lateral margins of the scutum. May be flat, convex or beady; sometimes delimited by grooves (orbited).
		Festoons	Eleven uniform rectangular areas, separated by distinct grooves, located on the posterior margin of the

	tick's body; distinct in males and unengorged females and immatures, but difficult to discern in engorged specimens of the latter.	Internal cervical margins	A pair of grooves or ridges on the conscutum of males or scutum of females extending posteriorly from the inner angles of the cervical pits. May be continuous or interrupted, shallow or deep, faint or absent.
Genital aperture	External opening of the genital organs; located anteriorly on the ventromedian line, posterior to the basis capituli. In the genus <i>Rhipicephalus</i> only the female genital aperture has taxonomic value.	Integument	Outer covering or cuticle of the tick's body. Slip of the pen.
Genital apron	The area within the lateral margins of the female genital aperture.	<i>Lapsus calami</i> [Latin]	
Goblets	Round structures located in the spiracle; they may be small and numerous or relatively large and few.	Lateral Lateral carinae	Towards the side. <i>See</i> external cervical margins.
Haller's organ	Sensory structure located on the subapical dorsal surface of tarsus I.	Legs	Segmented appendages of which nymphs and adults have four pairs and larvae have three pairs. From anterior to posterior the legs are identified by Roman numerals I, II, III, IV. The segments from proximal to distal are designated coxa, trochanter, femur, genu, tibia, metatarsus, and tarsus.
Hyaline	Glassy; tending towards the transparent.		
Hyaline flaps	External projections from the lateral margins of the female genital aperture.		
Hypostome	Median ventral structure of the mouthparts that lies parallel to and between the palps, ventral to the chelicerae, and is immovably attached to the basis capituli. It bears the recurved denticles or 'teeth' and acts as a holdfast organ.	Macula	Large sclerotized structure located in the spiracle of adult <i>Rhipicephalus</i> . It may be of variable size, shape and location.
Idiosoma	All of the tick's body exclusive of the capitulum.	Marginal lines	Lines or grooves running along the lateral margins of the male's conscutum. They may be faint, deep, punctate or impunctate, and delimit one or more festoons. (Note: a series of discrete punctations does not constitute a marginal line; a series of contiguous punctations does.)
<i>Incertae sedis</i> [Latin] <i>in litt.</i> [Latin]	Of uncertain taxonomic position. (<i>in letteris</i>) in correspondence.		
Inornate	Absence of a colour pattern on the conscutum of males and scutum of females.	Medial	Situated in or extending toward the median axis of the body.

Median	Lying in a plane that divides the body into right and left halves.		by Gene's organ for stabilizing the egg lipids, is discharged.
Morphological	Pertaining to form and structure.	Posterior	Toward the rear end.
<i>Nomen nudem</i> [Latin]	Naked name. A name that fails the rules for availability then in force.	Posterolateral grooves	Paired depressions lateral to the posteromedian groove in the conscutum of almost all male <i>Rhipicephalus</i> .
Orbited	Descriptive term for the eyes of some species of <i>Rhipicephalus</i> that are surrounded by grooves in the conscutum or scutum.	Posteromedian groove	A depression situated slightly anterior to the median festoon and between the posterolateral grooves in almost all male <i>Rhipicephalus</i> .
Ornamentation	Enamel-like colour pattern that is superimposed on the base colour of the integument in adults of the following four species of <i>Rhipicephalus</i> , <i>R. dux</i> , <i>R. humeralis</i> , <i>R. maculatus</i> and <i>R. pulchellus</i> .	Protuberance	Any elevation above the surface.
Ornate	Definite colour pattern on the conscutum of males and scutum of females of four species of <i>Rhipicephalus</i> . (See ornamentation).	Proximal	Nearest to the point of attachment or origin.
Palps	Paired articulated appendages located anterolaterally upon the basis capituli and lying parallel to the hypostome. Article I (segment I) is proximal, article IV (segment IV) is distal.	Pseudoscutum	In males the anterior portion of the conscutum which corresponds to the female scutum.
Pedicel	A narrow stalk-like first palpal article as in <i>R. glabroscutatum</i> .	Punctations	Pits in the surface of the cuticle, present on the conscutum and scutum, and sometimes on the basis capituli of all <i>Rhipicephalus</i> adults. These pits vary in number, size and depth, and are often arranged in patterns that are specifically characteristic.
Periphery	Circumference or outer margin.	Reticulate	See shagreened.
Porose areas	A pair of pitted areas, usually depressed and round to oval in shape, on the dorsal surface of the basis capituli of female ixodid ticks; they contain the openings through which the anti-oxidant, produced	Rugose	Roughened or slightly ridge-like in appearance.
		Scapulae	Anterior angles or 'shoulders' of the conscutum or scutum that extend forwards on either side of the emargination.
		Sclerotized	Hardened in definite areas by the deposition or formation of organic or inorganic substances in the cuticle.
		Scutum	Sclerotized dorsal plate posterior to the capitulum in

	females, nymphs and larvae. It covers one-third to one-half of the dorsum in unengorged specimens.	Tarsus	The terminal or most distal segment of the leg.
Segment	Distinct articulated portion of a palp or a leg. Synonym of article.	Type	A term used alone, or as part of a compound term, to denote a particular kind of specimen or taxon. Allotype, a designated specimen of opposite sex to the holotype. Holotype, a single specimen designated as the name-bearing type of a species or subspecies when it was established, or the single specimen on which such a taxon was based when no type was specified. Lectotype, a syntype designated as the single name-bearing type specimen subsequent to the establishment of a nominal species or subspecies. Neotype, a single specimen designated as the name-bearing type of a nominal species or subspecies for which no holotype, or lectotype, or syntype(s), or prior neotype is believed to exist. Paralectotype, each specimen of a former syntype series remaining after the designation of a lectotype. Paratype, each specimen of a type series other than the holotype. Syntype, each specimen of a type series from which neither a holotype nor a lectotype has been designated.
<i>Sensu lato</i> [Latin]	In the broad sense.		
<i>Sensu stricto</i> [Latin]	In the strict sense.		
Seta (pl. setae)	Slender hollow extensions of the epidermal layer of the cuticle.		
Setiferous punctations	Usually relatively large punctations each bearing a seta on the conscutum of males and the scutum and alloscutum of females and nymphs.		
Shagreened	Granular in texture; displaying a pebbled or grainy appearance.		
' <i>Simus</i> ' pattern	Large conscutal punctations roughly arranged in four longitudinal rows, like the punctation pattern found in <i>R. simus</i> .		
<i>sp. nov.</i> [Latin]	(<i>Species nova</i>); new species.		
Spiracles	Paired plates located ventrolaterally and posterior to coxae IV in adults and nymphs; may be oval, rounded or comma-shaped. They are the external portion of the respiratory system.		
Spurs	Coxal spurs are projections from the posterior margin of the coxae; projections on the inner side are called internal spurs; those on the outer side are called external spurs. Spurs may also be present on the ventral posterolateral border of the basis capituli.	Venter	Entire ventral or underside of the body.
Subterminal	Before the end, or not quite attaining the end.	Ventral	Pertaining to the underside of the body.
<i>Stat. nov.</i> [Latin]	(<i>Status nova</i>); new status.	<i>Vide</i> [Latin]	See.

Rhipicephalus species names of the world

[Numbered species names in **bold** are considered to be valid at this time].

Rhipicephalus anatolicum (Koch, 1844)

Dönitz, W. 1905. *Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin*, (4): 114.

Dönitz, in discussing Koch's naming of new *Hyalomma* species from different areas, mentioned the names *R. hispanum*, *lusitanicum* and *anatolicum*. The generic initial 'R.' before the three species names is, in all probability, a typographical error and not a change of generic status from *Hyalomma* to *Rhipicephalus*.

[= *Hyalomma anatolicum* Koch]

Rhipicephalus annulatus (Say, 1821)

Neumann, L.G. 1897. *Mémoires de la Société Zoologique de France*, 10: 407, 419 (key), figs. 37–41.

New combination for *Ixodes annulatus* Say, 1821.

[= *Boophilus annulatus* (Say)]

Rhipicephalus (*Boophilus*) *annulatus argentina* (sic) Neumann, 1901

Neumann, L.G. 1904. *Archives de Parasitologie*, 8: 450.

New combination for *Rhipicephalus annulatus argentinus*.

[= *Boophilus microplus* (Canestrini)]

Rhipicephalus annulatus argentinensis Neumann, 1901

Mémoires de la Société Zoologique de France, 14: 361.

[*Lapsus calami* for *R. annulatus argentinus*]

Rhipicephalus annulatus argentinus Neumann, 1901

Mémoires de la Société Zoologique de France, 14: 280.

From 160 or so specimens [sex/stage not stated but ♂ unknown], host not stated, Province of Buenos Aires, Argentina. Deposited in the Zoological Museum, Hamburg.

[= *Boophilus microplus* (Canestrini)]

Rhipicephalus annulatus australis (Fuller, 1899)

Neumann, L. G. 1901. *Mémoires de la Société Zoologique de France*, 14: 280.

Stat. nov. for *Rhipicephalus australis* Fuller, 1899.

Described from a number of specimens ex cattle, Australia; 1 ♂, Borneo ex deer, 1 ♂, Sumatra, ex buffalo in the Oudemans collection; 1 ♀, Sumatra in the Zoological Museum, Hamburg; 4 ♂♂, 2 nymphs, New South Wales, ex cattle, in the Department of Agriculture, New South Wales.

[= *Boophilus microplus* (Canestrini)]

Rhipicephalus (*Boophilus*) *annulatus calcarata* (Birula, 1894)

Neumann, L.G. 1904. *Archives de Parasitologie*, 8: 450.

New combination for *Ixodes calcaratus* Birula.

[= *Boophilus annulatus* (Say)]

Rhipicephalus annulatus caudatus Neumann, 1897

Mémoires de la Société Zoologique de France, 10: 413, fig. 42.

Described from 23 ♀♀, 2 ♂♂, Miyasaki, Japan ex horse, deposited in the Neumann collection; 250 ♀♀, 6 ♂♂, l'Île de France ex cattle (probably), in the Natural History Museum, Paris; 22 ♀♀, 1 ♂ from 'Cayenne'; 1 ♂, 1 ♀ from Senegal in A. Railliet collection.

[= *Boophilus microplus* (Canestrini)]

Rhipicephalus annulatus decoloratus Koch, 1844

Neumann, L. G. 1901. *Mémoires de la Société Zoologique de France*, 14: 279.

New combination for *Rhipicephalus decoloratus* Koch, 1844.

[= *Boophilus decoloratus* (Koch)]

Rhipicephalus annulatus dugesi (Mégnin, 1880)

Neumann, L.G. 1901. *Mémoires de la Société Zoologique de France*, 14: 279.

Described from 4 ♂♂, 23 ♀♀, Morocco, ex cattle; 3 ♂♂, many ♀♀, Algeria, ex cattle; 2 ♀♀, Blida, one ex deer and one ex cattle; many ♀♀, Egypt, ex cattle.

[= *Boophilus annulatus* (Say)]

Rhipicephalus annulatus microplus (Canestrini, 1888)

Neumann, L.G. 1901. *Mémoires de la Société Zoologique de France*, 14: 280.

Described from a number of ♂♂ and ♀♀, Argentina; Guadeloupe ex cattle; Antigua ex cattle, sheep and deer; 8 ♀♀, Montevideo, Uruguay; 3 ♀♀, Guatemala; ± 100 ♀♀, 15 ♂♂ Jamaica ex cattle, horses and dogs; many ♀♀ from Brazil, Paraguay and Guatemala, in the Zoological Museum, Hamburg; several ♀♀ Cuba ex cattle, in the Bureau of Animal Industry, Washington.

[= *Boophilus microplus* (Canestrini)]

1. *Rhipicephalus appendiculatus* Neumann, 1901

Mémoires de la Société Zoologique de France, 14: 270.

Described from 3 ♂♂, 7 ♀♀ Cape Colony, South Africa, Lounsbury collection; 3 ♂♂, of which the origin of two is unknown, the

other from l'Afrique S.-O.; ± 100 ♂♂ and ♀♀ ex *Bos caffer* [= *Syncerus caffer*]. In the Berlin Museum. We herein designate as lectotype ♂ and paralectotype ♀ the syntypes collected from *Bos caffer* [= *Syncerus caffer*], Tangani, German East Africa [Tanzania], received 1900 from Schillings (Nuttall Collection 2893, Neumann 1143), deposited in The Natural History Museum, London (Keirans, 1985). Furthermore, we amend the locality designation for these types to Pangani River, German East Africa, at Masimani Mountain (cf. ZMB 16890, syntypes, in the Zoological Museum, Berlin – see Moritz & Fischer, 1981).

2. *Rhipicephalus aquatilis* Walker, Keirans & Pegram, 1993

Onderstepoort Journal of Veterinary Research, 60: 205, figs. 1–8.

Holotype ♂, allotype ♀, and 4 ♂♂, 2 ♀♀ paratypes collected from a sitatunga (*Tragelaphus speki*) at Kaisho (01° 19' S, 30° 37' E), Karagwe District, Tanzania, 14 August 1959, Mrs. G. Tullock, from Tanzania Tick collection WA99, deposited in The Natural History Museum, London. Other paratypes deposited in the Onderstepoort Tick Collection 3143i, ii, iii, and in the U.S. National Tick Collection [RML 120946].

Rhipicephalus arakeri Hiregoudar, 1975

Mysore Journal of Agricultural Science, 9: 473, figs. 1–10.

Described from 2 ♂♂, 1 ♀, 8 nymphs, 15 larvae ex *Mus rattus* [= *Rattus rattus*], Anand, Gujarat, India. Types: holotype ♂, allotype ♀, 1 ♂, 8 nymphs, 15 larvae paratypes. The holotype and allotype deposited in the Zoological Survey of India, Calcutta. Depository for nymphal and larval paratypes not stated. Correspondence with both Professor Hiregoudar and the Zoological Survey of India, Calcutta revealed that the types of this species could not be located. Subsequently, Professor Hiregoudar sent the U.S. National Tick Collection slide-

mounted specimens of *R. arakeri*, one slide being labelled 'Paratypes'. Although much overcleared, the specimens appear to be *R. ramachandrai*.

[= *Rhipicephalus ramachandrai* Dhanda]

3. *Rhipicephalus armatus* Pocock, 1900

Proceedings of the Zoological Society of London, Pt. 1: 50, pl. III, figs. 2–2f.

Described from 4 ♂♂, 2 ♀♀, Bularli, West Somaliland. Type ♂ and two co-types (♂ and ♀) in The Natural History Museum, London. Three co-types (2 ♂♂ and 1 ♀) in the Hope Museum, Oxford.

4. *Rhipicephalus arnoldi* Theiler & Zumpt, 1949

In: Zumpt, F. 1949. *Moçambique*, (60): 111, figs. 32–36.

Described from F1 generation of a ♀ ex *Lepus* sp. Also from wild hare, *Pronolagus* sp., Transvaal and Cape Province, South Africa. Types: the F1 generation of a ♀ ex *Lepus* sp., Toverwater, Murraysburg, Cape Province, South Africa, deposited in Onderstepoort Tick Collection 2793 and 2845. Three ♀♀ paratypes from *Pronolagus* sp., Murraysburg, South Africa are deposited in the Zoological Museum, Hamburg.

Rhipicephalus attenuatus Neumann, 1908

Archives de Parasitologie, 12: 12, fig. 8.

Described from 1 ♀ holotype, ex *Equus caballus*, Kansanshi (Congo indépendant) [Democratic Republic of Congo], on the River Lualaba (10° 40' south latitude). In The Natural History Museum, London.

[= *Rhipicephalus lunulatus* Neumann]

Rhipicephalus aurantiacus Neumann, 1907

Notes from the Leyden Museum, 29: 90, figs. 3, 4.

Described from 5 ♂♂, 3 ♀♀ ex *Buffelus pumilus* [presumably = *Syncerus caffer nanus*], Liberia. In the National Museum van Natuurlijke Historié, Leiden.

[= ?*Rhipicephalus ziemannii* Neumann]

Rhipicephalus australis Fuller, 1899

Agricultural Journal of the Cape of Good Hope, 14: 369, 3 figs.

Described from ♂, ♀ [number not stated], ex horses, cattle, etc, north-west to north-east Australia.

[Also described as a new species in 1899, *Queensland Agricultural Journal*, 4: 392].

[= *Boophilus microplus* (Canestrini)]

Rhipicephalus ayrei Lewis, 1933

Parasitology, Cambridge, 25: 269, figs. 1, 2.

Described from numerous ♂♂, ♀♀ ex buffalo, rhinoceros and lion, Kiagu and Mbeyo, Meru district, Mount Kenya and Sianna Plains, Masai reserve, Kenya. Co-types sent to Imperial Bureau of Entomology, British Museum (Natural History) [now The Natural History Museum, London], and to The Molteno Institute for Research in Parasitology, University of Cambridge. A collection retained at the Veterinary Research Laboratory, Kabete, Kenya and a collection sent to the Coryndon Memorial Natural History Museum, [now the National Museum], Nairobi, Kenya. Those syntypes sent to The Molteno Institute are now in The Natural History Museum, London (Nuttall 3845) – see Keirans (1985).

[= *Rhipicephalus compositus* Neumann]

Rhipicephalus beccarii Pavesi, 1883

Annali del Museo Civico di Storia Naturale di Genova, 20: 102.

Description based on a ♂ from Bogos, Abyssinia [Ethiopia]. Depository not stated.

[= *Rhipicephalus sanguineus* (Latreille)]

Rhipicephalus belli Sonenshine, 1993

Biology of Ticks, vol. 2, p. 463. Oxford and New York: Oxford University Press. [*Lapsus calami* for *Rickettsia belli*]

5. *Rhipicephalus bequaerti* Zumpt, 1949

Moçambique, (60): 119, figs. 37–39.

Described from 1 ♂, 1 ♀. 'The pair at my disposal was caught in Central Africa on the buffalo (*Syncerus caffer* Sparrm.). The tag on the ♂ says that it was found in 'Lissenji' (?).' Depository not stated. However, types were deposited in the Institute for Medical Research, Johannesburg.

6. *Rhipicephalus bergeoni* Morel & Balis, 1976

Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 29 (nouvelle série): 141, figs. 1 a–h, 2 a–i.

'Type' ♂ [i.e. holotype] and allotype ♀ from Hubeta, Harrar, Ethiopia. Depository not stated.

Rhipicephalus bhamensis Supino, 1897

Atti della Società Veneto-Trentina di Scienze Naturali in Padova, 2nd ser. 3: 233, pl. V, figs. 1–6.

Description based on a ♂, Bhamò, Burma. [= *Rhipicephalus sanguineus* (Latreille)]

Rhipicephalus bicornis (Nuttall & Warburton, 1908)

Brumpt, E. 1936. *Précis de Parasitologie*, 2: 119.

[*Lapsus calami* for *Rhipicentor bicornis* Nuttall & Warburton]

Rhipicephalus bilenus Pavesi, 1883

Annali del Museo Civico di Storia Naturale di Genova, 20: 102.

Description based on a ♂ from Bogos, Abyssinia [Ethiopia]. [= perhaps *Rhipicephalus bursa* Canestrini and Fanzago. *Fide* Neumann (1911), *Das Tierreich*, p. 46]

7. *Rhipicephalus boueti* Morel, 1957

Bulletin de la Société de Pathologie Exotique, 50: 696, fig. 1 (1956).

Described from 2 ♂♂, 3 ♀♀, ex *Procapra ruficeps* subsp., Agouagon, Dahomey [Benin]. Holotype ♂ deposited in the Neumann Collection, École Vétérinaire, Toulouse. Allotypes 2 ♀♀ (*sic*), 1 ♂, 1 ♀ paratypes deposited in Laboratoire Fédéral de l'Élevage, Dakar, Senegal.

Rhipicephalus bovis (Riley, 1869)

Galli-Valerio, B. 1901. *Bulletin de la Société Vaudoise des Sciences Naturelles*, Ser. 4, 37: 355.

New combination for *Ixodes bovis* Riley, 1869.

[= *Boophilus annulatus* (Say)]

Rhipicephalus breviceps Warburton, 1910

Parasitology, Cambridge, 3: 398, fig. 3.

Description based on a single ♀ holotype ex *Erinaceus collaris*, Sind, Pakistan. Depository not stated. This specimen is now in the Nuttall Collection (Nuttall 1103) in The Natural History Museum, London. The genital aperture has been removed and mounted on a slide. See Keirans (1985).

[= *Rhipicephalus sanguineus* (Latreille)]

Rhipicephalus brevicollis Neumann, 1897

Mémoires de la Société Zoologique de France, 10: 402, fig. 35.

Description based on a single ♀ holotype from Mombas, Zanzibar [Mombasa, Kenya]. Deposited in the Zoological Museum, Berlin.

[= *Rhipicephalus sanguineus* (Latreille)]

Rhipicephalus brevicoxatus Morel & Mouchet, 1958

Annales de Parasitologie Humaine et Comparée, 33: 94, fig. 2 f–h.

Description based on a ♂ from Akok Bekoé, Cameroon, and described as a 'form' of *Rhipicephalus ziemanni* Neumann.

8. *Rhipicephalus bursa* Canestrini & Fanzago, 1878

Atti della Reale Istituto Veneto di Scienze, Lettere ed Arte, ser. 5, 4: 190.

Described from ♂ and ♀ collected live on a 'cinghiale' (wild boar). Depository not stated.

Rhipicephalus bursa americanus Neumann, 1897

Mémoires de la Société Zoologique de France, 10: 393.

Two ♀♀ from Jamaica in the collection of G. Marx, Smithsonian Institution. [These specimens are not in the U.S. National Tick Collection].

[= *Rhipicephalus sanguineus* (Latreille)]

Rhipicephalus bursa pusillus Gil Collado, 1936

Treballs del Museu de Ciències Naturals de Barcelona, Ser. Entomològica, 11: 4.

Described from 2 ♀♀ ex fox, Barcelona. Depository not stated.

[= *Rhipicephalus pusillus* Gil Collado]

Rhipicephalus calcaratus (Birula, 1894)

Birula, A. 1895. *Izvēstiya Imperatorskoi*

Akademii Nauk, Ser. 5, 2: 137.

? New combination for *Ixodes calcaratus* Birlula, 1894.

[= *Boophilus annulatus* (Say)]

Rhipicephalus camelopardalis Walker & Wiley, 1959

Parasitology, Cambridge, 49: 448, figs. 1–4.

Described from specimens collected from a giraffe, Talek River, Cis-Mara area of West Masai, Kenya. Holotype ♂, allotype ♀ ex *Giraffa camelopardalis tippelskirchi*, locality as above; deposited in The Natural History Museum, London. Paratypes in The Natural History Museum, London; Rocky Mountain Laboratory (now U.S. National Tick Collection, Georgia Southern University); Onderstepoort Tick Collection 3058; Veterinary Research Station, Mpwapwa, Tanzania; in H. Hoogstraal's collection, now in U.S. National Tick Collection [RML 34921, 90316 – see Keirans & Clifford (1984)]; Veterinary Research Laboratory, Kabete; East African Veterinary Research Organization, Kikuyu, Kenya.

[= *R. longicoxatus*]

9. *Rhipicephalus camicasi* Morel, Mouchet & Rodhain, 1976

Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 29 (nouvelle série): 337, fig. 1.

Description based on ♂♂, ♀♀ from Ethiopia and Afars and Issas [Djibouti] on cattle, sheep, camel, goat and *Lepus capensis*. Holotype ♂ and allotype ♀ ex sheep, Randa, Afars and Issas [Djibouti]. Depository not stated.

10. *Rhipicephalus capensis* Koch, 1844

Archiv für Naturgeschichte, 10: 238.

Described from 1 ♂ [holotype], Cape Colony, South Africa. Deposited in the Zoological Museum, Berlin, accession number ZMB 1097 – see Moritz & Fischer (1981).

Rhipicephalus capensis compositus Neumann, 1905

Archives de Parasitologie, 9: 231.

New subspecific status for *Rhipicephalus*

compositus Neumann, 1897.

[= *Rhipicephalus compositus* Neumann]

Rhipicephalus capensis longus Neumann, 1907

Zumpt, F. 1942. *Zeitschrift für Parasitenkunde*, 12: 484, figs. 6–8.

Stat. nov. for *Rhipicephalus longus* Neumann, 1907.

[= *Rhipicephalus longus* Neumann]

Rhipicephalus capensis pseudolongus Santos Dias, 1953

Memórias e Estudos do Museu Zoológico da Universidade de Coimbra, (214): 5, figs. 1–3.

Holotype ♂ and allotype ♀ ex *Bos indicus*, Yaoundé, Cameroon. Depository not stated.

[= *Rhipicephalus longus* Neumann]

Rhipicephalus carinatus Frauenfeld, 1867

Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien, 17: 462. [Publication not seen]

From 1 ♂ collected on the deck of a ship in the China Sea.

[= *Rhipicephalus sanguineus* (Latreille)]

11. *Rhipicephalus carnivoralis* Walker, 1966

Parasitology, Cambridge, 56: 1, figs. 1–15a, 16a.

Described from numerous specimens, both wild caught and reared. Holotype ♂ and allotype ♀ from laboratory reared series, the progeny of a ♀ ex lioness, Muguga, Kiambu District, Kenya [accession number B.S. 913]. Deposited in The Natural History Museum, London. Paratypes in many institutions and collections including the U.S. National Tick Collection [RML 46183 – see Keirans & Clifford (1984)].

Rhipicephalus cliffordi Morel, 1965

Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 17 for 1964 (nouvelle série): 637, figs. 1–4 (1965).

Holotype ♂, allotype ♀ ex *Syncerus caffer namus*, Assagni, Ivory Coast. Depository not stated. (Vol. 17 of this journal commenced publication in 1964, but the final

- part containing descriptions of this species and *R. moucheti* was published in 1965).
[= *Rhipicephalus pseudolongus*]
12. *Rhipicephalus complanatus* Neumann, 1911
Archives de Parasitologie, 14: 415.
Stat. nov. for *Rhipicephalus planus complanatus* Neumann, 1911. [*nec Rhipicephalus simus planus* Neumann, 1907].
13. *Rhipicephalus compositus* Neumann, 1897
Mémoires de la Société Zoologique de France, 10: 393.
Described from 1 ♂ [holotype], host unknown, Khartoum, Sudan. Deposited in the Natural History Museum, Paris. [*R. compositus* is a highland species; therefore, the type locality of Khartoum is probably incorrect].
- Rhipicephalus confusus* Santos Dias, 1956
Moçambique, (87): 2, figs. 3–5.
Holotype ♂ ex buffalo, Ile, Zambézia, Mozambique. Deposited in the Laboratory of Veterinary Pathology, Maputo, Mozambique. One ♂, 1 ♀ paratypes deposited in The Natural History Museum, London.
[= *Rhipicephalus longus*]
- Rhipicephalus coriaceus* Nuttall & Warburton, 1908
Proceedings of the Cambridge Philosophical Society, 14: 402, figs. 17–20.
Description based on 2 ♂♂, 6 ♀♀, host unknown, North Nyasa [Malawi]; 1 ♂ host unknown, Benguella, W. Africa [Angola]. Deposited in the Nuttall Collection (Nuttall 320e) in The Natural History Museum, London – see Keirans (1985). Lectotype and paralectotypes designated – see Keirans & Brewster (1981).
[= *Rhipicephalus supertritus* Neumann]
- Rhipicephalus cuneatus* Neumann, 1908
Notes from the Leyden Museum, 30: 76, figs. 2, 3.
Described from 3 ♂♂ ex cattle, Ngômo on l'Ogooué, French Congo [Congo]. Deposited in the collection of Professor Galli-Valerio, Lausanne, Switzerland.
[= *Rhipicephalus ziemanni* Neumann]
14. *Rhipicephalus cuspidatus* Neumann, 1906
Archives de Parasitologie, 10: 209, fig. 11.
Described from 1 ♂, 4 ♀♀, ex *Phacochoerus* sp., Senegal. Deposited in The Natural History Museum, London.
- Rhipicephalus decoloratus* (Birula, 1894)
Velu, H. 1922. *Mémoires de la Société des Sciences Naturelles (et Physiques) du Maroc*, 2: 187.
New combination for *Boophilus calcaratus* (Birula, 1894).
[= *Boophilus annulatus* (Say)]
15. *Rhipicephalus deltoideus* Neumann, 1910
Tijdschrift voor Entomologie, 53: 13, figs. 3–7.
Described from 1 ♂, 3 ♀♀, host unknown, Basutoland [Lesotho]. Depository not stated. One ♀ syntype (Nuttall 2894) is in The Natural History Museum, London – see Keirans (1985).
16. *Rhipicephalus distinctus* Bedford, 1932
Report of the Director of Veterinary Services and Animal Industry, Union of South Africa, (18): 523.
New name for *Rhipicephalus punctatus* Bedford, 1929 (preoccupied).
Described from specimens on dassies (rock hyrax) at Onderstepoort and in South-West Africa [Namibia], also on sheep at Victoria West, Cape Province, South Africa. [These Victoria West specimens are *Rhipicephalus neumanni* – see Walker (1990)]. Depository not stated but in the Onderstepoort Tick Collection 2488 ii, iii, iv.
- Rhipicephalus dugesi* Neumann, 1896
Mémoires de la Société Zoologique de France, 9: 11.
New combination for *Ixodes bovis* Riley, 1869.
[= *Boophilus annulatus* (Say)]
17. *Rhipicephalus duttoni* Neumann, 1907
Annals of Tropical Medicine and Parasitology

- ogy, 1: 115, figs. 22, 23.
Described from a single ♂, ex bovine [presumably *Bos taurus*], Zambi (*sic*). Depository not stated. Neumann (1911) stated that the locality was 'Congo indépendant [Democratic Republic of Congo], (Zambu)'.
18. *Rhipicephalus dux* Dönitz, 1910
Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin, (6): 275, figs. 1–3.
Described from 1 ♂, 1 ♀ ex elephant, oberen Congogebiet [Democratic Republic of Congo]. Depository not stated. One ♂ syntype is in the Zoological Museum, Berlin [ZMB 17714] – see Moritz & Fischer (1981).
- Rhipicephalus ecinctus* Neumann, 1901
Mémoires de la Société Zoologique de France, 14: 275.
Described from 6 ♂♂, origin unknown. Deposited in the Berlin Museum. All 6 syntype males are in the Zoological Museum, Berlin [ZMB 17690] – see Moritz & Fischer (1981).
[♂ = *Rhipicephalus maculatus* Neumann]
- Rhipicephalus ellipticum* Koch, 1847
Uebersicht des Arachnidensystems, (4): 135, pl. 30, fig. 111.
New combination for *Rhipistoma ellipticum* Koch, 1844.
[= *Haemaphysalis leachi* (Audouin)]
- Rhipicephalus erlangeri* Neumann, 1902
Archives de Parasitologie, 6: 111.
Described from a single ♂ holotype ex horse, near the river Daroli. Depository not stated.
[= *Rhipicephalus simus* group]
19. *Rhipicephalus evertsi evertsi* Neumann, 1897
Mémoires de la Société Zoologique de France, 10: 405, fig. 36.
Described from 8 ♂♂, 3 ♀♀, host unknown, Transvaal, South Africa. Deposited in the Oudemans Collection, National Museum van Natuurlijke Historié, Leiden.
Rhipicephalus evertsi albigeniculatus Warburton, 1916
In: Nuttall, G. H. F. & Warburton, C. 1916. *Bulletin of Entomological Research*, 6: 327.
From Lower Congo; further details not given. For hosts and collecting localities see Keirans (1985). Lectotype and paralectotypes designated by Keirans & Brewster (1981).
[= *Rhipicephalus evertsi mimeticus* Dönitz]
20. *Rhipicephalus evertsi mimeticus* Dönitz, 1910
Denkschriften der Medizinisch-Naturwissenschaftlichen Gesellschaft zu Jena, 16: 475.
Described from ♂♂, ex cattle, South-West Africa [Namibia]. Depository not stated. Syntypes in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
21. *Rhipicephalus exophthalmos* Keirans & Walker, 1993
In: Keirans, J.E., Walker, J.B., Horak, I.G. & Heyne, H. 1993. *Onderstepoort Journal of Veterinary Research*, 60: 230, figs. 1–16.
Described from laboratory-reared specimens of all stages from ♀ originally collected on a farm 'Kosos 11', Karas region (formerly Bethanien), Namibia, c. 10.III.1970, host not stated. Holotype ♂, allotype ♀ and ♂♂, ♀♀, nymphs, and larvae paratypes deposited in Onderstepoort Tick Collection 3144. Paratypes of all stages deposited in The Natural History Museum, London and in the U.S. National Tick Collection [RML 56729].
- Rhipicephalus expositicius* Koch, 1877
Abhandlungen der Naturhistorischen Gesellschaft zu Nürnberg, 6: 196. [Publication not seen].
[= *Haemaphysalis punctata* (in part). *Fide* Neumann, 1911]
- Rhipicephalus falcatus* Neumann, 1908
Notes from the Leyden Museum, 30: 77, fig. 4.
Described from 3 ♂♂, 8 ♀♀, host unknown, north of Lake Nyasa, deposited in The Natural History Museum, London; 4 ♂♂, 1 ♀, host unknown, from Liberia, deposited in the Leiden Museum.
[= *Rhipicephalus longus*]

- Rhipicephalus flavus* Supino, 1897
Atti della Società Veneto-Trentina di Scienze Naturali in Padova, 2nd. ser., 3: 233, pl. IV, figs. 5–9.
 Description based on a ♀, Prome, Burma [Myanmar].
 [= *Rhipicephalus sanguineus* (Latreille)]
22. *Rhipicephalus follis* Dönitz, 1910
Denkschriften der Medizinisch-Naturwissenschaftlichen Gesellschaft zu Jena, 16: 481, pl. 16A, fig. 3.
 Described from 2 ♂♂, host probably domestic cattle, locality not stated. Depository not stated. Two ♂♂ syntypes (Nuttall 2110) are deposited in The Natural History Museum, London – see Keirans (1985).
23. *Rhipicephalus fulvus* Neumann, 1913
Bulletin de la Société Zoologique de France, 38: 147, figs. 1, 2.
 Described from a single ♂ [holotype], host unknown, Matmata, south of Gabès [Tunisia]. Depository not stated.
- Rhipicephalus furcosum* Neumann, 1901
Mémoires de la Société Zoologique de France, 14: 361.
 Typographical error for *Amblyomma furcosum* Neumann, 1901.
 [= *Amblyomma helvolum* Koch]
24. *Rhipicephalus gertrudae* Feldman-Muhsam, 1960
Journal of Parasitology, 46: 104, figs. 3–5.
 Described from a batch of ticks collected in Namaqualand. Holotype ♂, allotype ♀ in Feldman-Muhsam collection. Paratypes sent to Dr Theiler [Onderstepoort Tick Collection 3137 ii. Paratypes: Namaqualand. Gen. apert. No. 144–145]. One ♀ paratype [ZMB 1101] in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
25. *Rhipicephalus glabroscutatum* Du Toit, 1941
Onderstepoort Journal of Veterinary Science and Animal Industry, 16: 115, figs. 1, 2.
 Described from all stages, ex domestic stock, Fairview District, Aberdeen, Cape Province, South Africa. Depository not stated but in the Onderstepoort Tick Collection 2711 i. Type ♂♂ and ♀♀ ex Angora goats.
- Rhipicephalus gladiger* Neumann, 1908
Archives de Parasitologie, 12: 8, figs. 4–7.
 Described from 2 ♂♂, 2 ♀♀, ex *Equus caballus*, Kansanshi (Congo indépendant) [Democratic Republic of Congo] on the Lualaba River (10° 40' south latitude). Deposited in The Natural History Museum, London. Also 1 ♂ ex *Capra hircus*, Pweto, Congo indépendant [Democratic Republic of Congo]. Depository not stated.
 [= *Rhipicentor bicornis* Nuttall and Warburton]
- Rhipicephalus glyphis* Dönitz, 1910
Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin, (6): 278, fig. 4.
 Described from 2 ♂♂, one from a 'Wasserschwein', Lake Tanganyika [Tanzania], the other from Togo, probably on a bovine. Depository not stated. A pinned syntype ♂ (Nuttall 2108) from a 'Wasserschwein' [most likely *Potamochoerus larvatus*], Lake Tanganyika [Tanzania] is in The Natural History Museum, London – see Keirans (1985). The ♂ from Togo is in the Zoological Museum, Berlin [ZMB 17734] – see Moritz & Fischer (1981).
 [= *Rhipicephalus lunulatus* Neumann]
26. *Rhipicephalus guilhoni* Morel & Vassiliades, 1963
Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 15 for 1962 (nouvelle série): 378, figs. 7–11.
 Described from a collection of ticks; ♀ holotype (gonopore slide-mounted), ♂ allotype ex sheep, Mioro, Mali. Allotype and ♀ paratype deposited in the National Museum of Natural History, Paris.
27. *Rhipicephalus haemaphysaloides* Supino, 1897
 Neumann, L.G. 1897. *Mémoires de la Société Zoologique de France*, 10: 417.
 New combination for *Rhipicephalus haemaphysaloides niger* Supino, 1897. Two ♂♂, 1 ♀ syntypes (Nuttall 2963, 2965, 2971) are in The Natural History Museum, London –

- see Keirans (1985).
- Rhipicephalus haemaphysaloides expeditus* Neumann, 1904
Archives de Parasitologie, 8: 454.
 Described from ♂, ♀ ex *Buffelus indicus* [*Bubalus bubalis*], China, Sumatra.
 [= *Rhipicephalus haemaphysaloides* Supino]
- Rhipicephalus haemaphysaloides niger* Supino, 1897
Atti della Società Veneto-Trentina di Scienze Naturali in Padova, 2nd Ser., 3: 234, pl. V, figs. 6–8.
 Described from a ♀, host unknown, Yado, Burma [Myanmar], deposited in the Genoa Museum.
 [= *Rhipicephalus haemaphysaloides* Supino]
- Rhipicephalus haemaphysaloides pilans* Schulze, 1935
 Zumpt, F. 1940. *Zeitschrift für Parasitenkunde*, 11: 675.
Stat. nov. for *Rhipicephalus pilans* Schulze, 1935.
 [= *Rhipicephalus pilans* Schulze]
- Rhipicephalus haemaphysaloides paulopunctata* Neumann, 1897
 Neumann, L.G. 1904. *Archives de Parasitologie*, 8: 449.
Stat. nov. for *Rhipicephalus paulopunctatus* Neumann, 1897.
 [= *Rhipicephalus pilans* Schulze]
- Rhipicephalus haemaphysaloides ruber* Supino, 1897
Atti della Società Veneto-Trentina di Scienze Naturali in Padova, 2nd Ser., 3: 234, pl. VI, figs. 6–10.
 Described from ♂, ♀, host unknown, Mt Mooleyit, Tenasserim; Meteléo, Thagatà, Juva, Cagò del Cadù Giannng, north-east of Bomò, Burma [Myanmar]. Deposited in the Genoa Museum.
 [= *Rhipicephalus haemaphysaloides* Supino]
- Rhipicephalus hilgerti* Neumann, 1902
Archives de Parasitologie, 6: 111.
 Described from 1 ♂, 1 ♀ ex *Canis variegatus* [*Canis aureus*], Abyssinia [Ethiopia]. Depository not stated.
 [= *Rhipicephalus praetextatus* Gerstäcker]
- Rhipicephalus hispanum* Dönitz, 1905
Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin, (4): 114.
 [See comment under *Rhipicephalus anatolicum*].
28. *Rhipicephalus humeralis* Rondelli, 1926
 Zumpt, F. 1949. *Moçambique*, (60): 49.
Stat. nov. for *Rhipicephalus pulchellus humeralis* Rondelli, 1926.
29. *Rhipicephalus hurti* Wilson, 1954
Parasitology, Cambridge, 44: 277, figs. 1–6.
 Described from ♂♂, ♀♀ ex buffalo, Karati Forest, Naivasha, Kenya (Coll. No. 221). Type ♂ and ♀ deposited in The Natural History Museum, London. Paratypes in the Onderstepoort Tick Collection 2929 ii. Paratypes 2 ♂♂, 2 ♀♀ sent to Dr H. Hoogstraal in Cairo, are no longer present in the Hoogstraal collection, now part of the U.S. National Tick Collection. Paratypes sent to Dr J.T. Santos Dias, Mozambique.
- Rhipicephalus inermis* (Birula, 1895)
L'Insecte et l'Infection, 1: *Acarines*, p. 103.
 [= *Haemaphysalis inermis* Birula]
- Rhipicephalus?* (*sic*) *intermedius* (Neumann, 1897)
 Neumann, L.G. 1901. *Mémoires de la Société Zoologique de France*, 10: 416.
 Questionable combination for *Phaulixodes intermedius* Neumann, 1897.
 [= *Rhipicephalus sanguineus* (Latreille) *vide* Santos Dias (1991)]
30. *Rhipicephalus interventus* Walker, Pegram & Keirans, 1995
Onderstepoort Journal of Veterinary Research, 62: 89, figs. 1a, b; 2a–f.
 Described from 28 ♂♂, 69 ♀♀ collected primarily from cattle in Uganda, Tanzania, Rwanda, Malawi, and Zambia. Holotype ♂, allotype ♀ collected at Kawoko-Masaka, Masaka district, Uganda, 2.III.1967, J. G. Matthyse, deposited in the U.S. National Tick Collection (RML 53849). Paratypes 2 ♂♂, 7 ♀♀ data as above; 2 ♂♂, 8 ♀♀ collected at Igula village, Ihimbu Gunguli, Tanzania,

- 31.XII.1960, Veterinary Assistant Robert, deposited in The Natural History Museum, London, (Tanzania Tick Collection IR/47); and 1 ♂, 2 ♀♀ collected at Lutale, Mumbwa, Zambia, XII.1981, R.G. Pegram, deposited in the Onderstepoort Tick Collection 3144 i.
- Rhipicephalus janneli* Pomerantsev, 1936
Parazitologicheskii Sbornik Institut Akademiya Nauk SSSR, 6: 15.
[*Lapsus calami* for *Rhipicephalus jeanneli* Neumann, 1913]
- Rhipicephalus javanensis* Supino, 1897
Atti della Società Veneto-Trentina di Scienze Naturali in Padova, 2nd Ser, 3: 233.
A nymphal syntype (Nuttall 2955) is deposited in The Natural History Museum, London – see Keirans (1985).
[= *Amblyomma javanense* (Supino)]
31. *Rhipicephalus jeanneli* Neumann, 1913
Voyage de Ch. Alluaud et R. Jeannel en Afrique Orientale (1911–1912). Résultats Scientifiques. Arachnides II. Ixodidae: 31, figs. 3–5.
Description based on 4 ♂♂, 5 ♀♀, host unknown, Molo, Burguret River, also 1 ♂, 1 ♀ Station 38, Kenya; 2 ♂♂ upper edge of forest on Kilimandjaro near Bismark Hill, also 1 ♂ Station 71, German East Africa [Tanzania]. Depository not stated.
32. *Rhipicephalus kochi* Dönitz, 1905
Sitzungsberichten der Gesellschaft naturforschender Freunde zu Berlin, (4): 106.
Described from 1 ♂, 5 ♀♀ Sadani, and 3 ♀♀ Lindi, German East Africa [Tanzania], ex cattle. Lectotype ♀ designated by Clifford *et al.* (1983), deposited in the Zoological Museum, Berlin, No. 8490; paralectotypes (Nuttall 2109) deposited in The Natural History Museum, London – see Keirans (1985).
- Rhipicephalus leachi* Schwetz, 1927
Revue Zoologique Africaine, 15: 89.
[*Lapsus calami* for *Haemaphysalis leachi*]
33. *Rhipicephalus leporis* Pomerantsev, 1946
Opredeliteli po Faune SSSR, Izdavaemye Zoologicheskim Institutom Akademii Nauk SSSR, (26); 20, fig. 16.
Described by Pomerantsev (*in litt.*) but a valid description and figure given from specimens ex rabbit, Uzbekistan.
- Rhipicephalus limbatus* Koch, 1844
Archiv für Naturgeschichte, 10: 239.
Described from 1 ♂, Egypt. Holotype in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
[= *Rhipicephalus sanguineus*]
- Rhipicephalus linnei* (*sic*) (Audouin, 1826)
Koch, C.L. 1844. *Archiv für Naturgeschichte*, 10: 238.
New combination for *Ixodes linnaei* Audouin, 1826.
[= Unknown species]
34. *Rhipicephalus longiceps* Warburton, 1912
Parasitology, Cambridge, 5: 11, figs. 6, 7.
Described from 18 ♂♂, 3 ♀♀ [Nuttall 351] ex Klipspringer Bok [Klipspringer], Benguella Hinterland, Angola and 19 ♂♂, 2 ♀♀, no host recorded, same locality. Originally deposited in Cambridge. Lectotype and paralectotypes designated – see Keirans & Brewster (1981). Collections now in The Natural History Museum, London.
35. *Rhipicephalus longicoxatus* Neumann, 1905
Archives de Parasitologie, 9: 225.
Described from 1 ♂, 2 ♀♀ from German East Africa [Tanzania], deposited in the Zoological Museum, Berlin. There is 1 ♀ paratype, accession no. ZMB 17740 in the collection – see Moritz & Fischer (1981).
- Rhipicephalus longoides* Zumpt, 1943
Tendeiro, J. 1952. *Anais do Instituto de Medicina Tropical, Lisboa*, 9: 234.
Stat. nov. for *Rhipicephalus simus longoides* Zumpt, 1943.
[= *Rhipicephalus senegalensis* Koch]
36. *Rhipicephalus longus* Neumann, 1907
Annals of Tropical Medicine and Parasitology, 1: 117, figs. 24, 25.

- Described from a single ♂ [holotype] ex *Bos taurus*, Kasongo, Nyasaland [Malawi]. Depository not stated. This specimen (Nuttall 1460) is in The Natural History Museum, London – see Keirans (1985).
37. *Rhipicephalus lounsburyi* Walker, 1990
Onderstepoort Journal of Veterinary Research, 57: 57, figs. 1–24.
Described from ♂♂, ♀♀, NN, LL, reared from material originally collected at Dordrecht, Eastern Cape Province, South Africa. Holotype ♂, allotype ♀ No. 2820 and paratypes No. 2821, deposited in Onderstepoort Tick Collection. Paratypes [RML 105789] deposited in the U.S. National Tick Collection.
- Rhipicephalus lundbladi* Schulze, 1939
Arkiv för Zoologi, 31: 2, pl. 1.
Described from 1 ♂, ex vegetation, Paul de Serra, Madeira [Portugal]. Type [i.e. holotype] in the Natural History Museum, Stockholm.
[= *Rhipicephalus* species *incertae sedis*]
38. *Rhipicephalus lunulatus* Neumann, 1907
Archives de Parasitologie, 11: 215, fig. 1.
Described from 2 ♂♂ ex horse, near the Lualaba River, Congo Free State [Democratic Republic of Congo]. Deposited in The Natural History Museum, London. Lectotype [BM(NH) 5708; RML 105707] designated by Walker *et al.* (1988).
- Rhipicephalus lusitanicum* Dönitz, 1905
Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin, (4): 114.
[See comment under *Rhipicephalus anatolicum*].
- Rhipicephalus macropis* Schulze, 1936
Zeitschrift für Parasitenkunde, 8: 521, figs. 1, 2.
Description based on ♂♂, ex dog, Aden, and ♀♀ ex dog, Port Sudan. Type ♂ deposited in the Zoological Museum, Berlin. Specimen lost? Not cited by Moritz & Fischer (1981).
[= *Rhipicephalus sanguineus* (Latreille)]
39. *Rhipicephalus maculatus* Neumann, 1901
Mémoires de la Société Zoologique de France, 14: 273.
Described from 1 ♂, 2 ♀♀ ex *Psytalla horrida* (syn. *Platymeris horrida*), Cameroon, deposited in the Berlin Museum. Syntypes [ZMB 17716] in the Zoological Museum, Berlin – see Moritz & Fischer (1981). [The type host listed is an assassin bug, family Reduviidae; obviously this is incorrect].
- Rhipicephalus marmoreus* Pocock, 1900
Proceedings of the Zoological Society of London, Pt. 1: 50, pl. III, figs. 1–1d.
From a single ♂ specimen, holotype, Bularli, West Somaliland, deposited in The Natural History Museum, London.
[= *Rhipicephalus pulchellus* Gerstäcker]
40. *Rhipicephalus masseyi* Nuttall & Warburton, 1908
Proceedings of the Cambridge Philosophical Society, 14: 404, figs. 21–26.
Described from 31 ♂♂, 21 ♀♀ ex *Bos caffer* [= *Syncerus caffer*], Kansanshi, north-west Rhodesia [Zambia]. Depository not stated. Lectotype and paralectotypes designated – see Keirans & Brewster (1981). Specimens deposited in The Natural History Museum, London.
- Rhipicephalus microplus* (Canestrini, 1888)
Canestrini, G. 1890. *Prospetto dell' Acarofauna Italiana*, (4): 493.
New combination for *Haemaphysalis microplus* Canestrini, 1888.
[= *Boophilus microplus* (Canestrini)]
- Rhipicephalus mossambicus* Santos Dias, 1950
Moçambique, (59): 137, figs. 4–6.
Described from 1 ♂, ex buffalo, Mozambique. Deposited in the Santos Dias collection.
[= *Rhipicephalus pravus* Dönitz]
41. *Rhipicephalus moucheti* Morel, 1965
Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 17 for 1964 (nouvelle série): 615, fig. 1 (1965).
Holotype ♂ ex *Erythrocebus patas*, Cameroon; 'Plésiotype' ex cattle, Toui

- (Kandi), Dahomey [Benin]. Depository not stated.
42. *Rhipicephalus muehlensi* Zumpt, 1943
Zeitschrift für Parasitenkunde, 13: 105, figs. 1–4.
Described from numerous specimens ex bushbuck, giraffe, roan antelope, Kondoa-Irangi, Mikindani and Maliwe-See [Lake Maliwe], German East Africa [Tanzania]. All specimens in the Berlin Museum. Holotype [ZMB 17742] and paratypes are in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
43. *Rhipicephalus muhsamae* Morel & Vasiliades, 1965
Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, 17 for 1964 (nouvelle série): 619, figs. 1–4 (1965).
Holotype ♀, allotype ♂ ex cattle, Sangalkam, Senegal. Depository not stated.
- Rhipicephalus neavei* Warburton, 1912
Parasitology, Cambridge, 5: 7, figs. 2, 3.
Described from specimens ex eland near the mouth of the Tasangazi River, Luangwa Valley, north-east Rhodesia [Zambia]. Types were deposited at the British Museum (Natural History) and Cambridge. Lectotype and paralectotypes designated – see Keirans & Brewster (1981). All specimens are now in The Natural History Museum, London.
[= *Rhipicephalus kochi* Dönitz]
- Rhipicephalus neavei punctatus* Warburton, 1912
Parasitology, Cambridge, 5: 10, figs. 4, 5.
Described from 13 ♂♂, 8 ♀♀ ex kudu, near Fort Mlangeni, Central Angoniland, Nyasaland [Malawi], and 1 ♀ ex reed-buck, valley of the Rukuru River, northern Nyasaland. Types were deposited at the British Museum (Natural History) and Cambridge. Lectotype and paralectotypes designated – see Keirans & Brewster (1981). All specimens are now in The Natural History Museum, London.
[= *Rhipicephalus punctatus* Warburton]
44. *Rhipicephalus neumanni* Walker, 1990
Onderstepoort Journal of Veterinary Research, 57: 66, figs. 26–49, 52–54.
Described from specimens collected on sheep and goats, Namibia. Holotype ♂, allotype ♀ ex sheep, farm 'Soutdoringvlei', Bethanien District, Namibia [Onderstepoort Tick Collection 3141 i]. Paratypes [Onderstepoort Tick Collection 3141 ii, iii]. Paratypes also deposited in the U.S. National Tick Collection [RML 119860] and in The Natural History Museum, London [1990.1.18.1–4].
- Rhipicephalus niger* Rudow, 1870
Zeitschrift für die Gesamte Naturwissenschaften Halle, 35: 19.
Described from 1 ♂ ex *Boa* sp., locality and depository not stated.
[= species *incertae sedis*. A nymph]
45. *Rhipicephalus nitens* Neumann, 1904
Archives de Parasitologie, 8: 462.
Described from 6 ♂♂, 12 ♀♀ ex vegetation, Stellenbosch, Cape Colony, South Africa. [Onderstepoort Tick Collection 2667 i. 1 ♀, Stellenbosch, Dec. 1902, Lounsbury Collection 1456. There is no definite indication that this ♀ is a type specimen]. One ♂ syntype (Nuttall 2896) is in The Natural History Museum, London – see Keirans (1985).
46. *Rhipicephalus oculatus* Neumann, 1901
Mémoires de la Société Zoologique de France, 14: 274.
Described from 2 ♂♂, 2 ♀♀ ex *Lepus timidus*, Damaras, [Namibia], and 1 ♀ ex cattle, Kilossa [Tanzania]. [The latter ♀ is probably not *R. oculatus*, which is not now thought to occur in Tanzania]. In Berlin and Hamburg Museums. Syntype ♂ and ♀ in the Zoological Museum, Berlin – see Moritz & Fischer (1981), Keirans *et al.* (1993).
47. *Rhipicephalus oreotrugi* Walker & Horak, 1999
In: Walker, J.B., Keirans, J.E. & Horak, I.G. 1999. *The genus Rhipicephalus (Acari: Ixodidae): A Guide to the Brown Ticks of the World*, pp. 330–333. Cambridge: Cambridge University Press.

- Described from holotype ♂, allotype ♀, ♂♂ and ♀♀ paratypes collected from klipspringer (*Oreotragus oreotragus*), Sentinel Ranch, 70 km west of Beit Bridge, Zimbabwe, on 4 July 1992. Holotype ♂, allotype ♀, ♂♂, ♀♀ paratypes deposited in Onderstepoort Tick Collection 3145 i, ii. Paratypes in the U.S. National Tick Collection and The Natural History Museum, London.
- Rhipicephalus paulopunctatus* Neumann, 1897
Mémoires de la Société Zoologique de France, 10: 397.
Described from 1 ♂, 1 ♀, Indrapura, Sumatra. Deposited in the Hamburg Museum. Anastos (1950) indicated that the types were lost, but one of us (J.E.K.) saw the holotype ♂ in the Zoological Museum, Hamburg in 1995.
[= *Rhipicephalus pilans* Schulze]
- Rhipicephalus perpulcher* Gerstäcker, 1873
Baron Carl Claus von der Decken's Reisen in Ost-Afrika, 3: 469.
Described from 1 ♀, Mombassa [Mombasa, Kenya]. Holotype with genital aperture dissected out [ZMB 2373] deposited in the Zoological Museum, Berlin – see Moritz & Fischer (1981) and Pegram *et al.* (1987).
[= *Rhipicephalus praetextatus* Gerstäcker]
- Rhipicephalus phthirioides* Cooper & Robinson, 1907
Journal of the Linnean Society of London, Zoology, 30: 35, figs. 1–4, pl. 5 (consisting of photos 1–4). Also inset by Cooper & Robinson (published privately): figs. 1–4 (same as pl. 5, above), figs. 5 and 6.
Described from 1 ♂, 1 ♀ [dried specimens] ex horse, Rhodesia [Zimbabwe]. Depository not stated.
[= *Margaropus winthemi* Karsch]
48. *Rhipicephalus pilans* Schulze, 1935
Wissenschaftliche Ergebnisse der Niederländischen Expeditionen in dem Karakorum, (1922–1930): 180.
Described in a key. Specimens from Flores, Dutch East Indies [Indonesia]. Depository not stated. Full description and figures in Schulze P. 1936. *Zeitschrift für Parasitenkunde*, 8: 521–7, figs. 1–6.
- Rhipicephalus piresi* Santos Dias, 1950
Moçambique, (62): 133, figs. 1, 2.
Described from 1 ♂ ex *Paraxerus cepapi auriventris* from Lumasse (vicinity of Guijá, Gaza district), Mozambique, 15.IX.1947, Dr F. Pires. Depository not stated but in the Veterinary Research Laboratory, Maputo, Mozambique.
[= *Rhipicephalus kochi* Dönitz]
49. *Rhipicephalus planus* Neumann, 1907
Morel, P.C. 1976. *Etude sur les tiques d’Ethiopie (Acariens, Ixodides)*, p. 156. Paris: Institut d’Élevage et de Médecine Vétérinaire des Pays Tropicaux.
Stat. nov. for *Rhipicephalus simus planus* Neumann, 1907.
[= *Rhipicephalus planus*]
Rhipicephalus planus Neumann, 1910
Annales des Sciences Naturelles, Zoologie, 12: 165, figs. 4–7.
Described from 6 ♂♂, 1 ♀ ex wild boar, l’Ivindo basin, Cameroon. Deposited in the Natural History Museum, Paris. [Preoccupied name; *nec Rhipicephalus simus planus* Neumann, 1907].
[= *Rhipicephalus complanatus*]
Rhipicephalus planus complanatus Neumann, 1911
Zumpt, F. 1943. *Zeitschrift für Parasitenkunde*, 13: 17, figs. 15–17.
Stat. nov. for *Rhipicephalus complanatus* Neumann, 1911.
[= *Rhipicephalus complanatus* Neumann]
Rhipicephalus planus planus Neumann, 1910
Zumpt, F. 1943. *Zeitschrift für Parasitenkunde*, 13: 15, figs. 13, 14.
Stat. nov. for *Rhipicephalus planus* Neumann, 1910.
[= *Rhipicephalus planus* Neumann]
Rhipicephalus plumbeus (Panzer, 1795)
Neumann, L.G. 1901. *Mémoires de la Société Zoologique de France*, 14: 353. Also in 1901 by Salmon, D.E. & Stiles, C.W. *17th Annual Report Bureau of Animal Industry*: 419.

- [= ? *Ixodes lividus* Koch]
- Rhipicephalus pomeranzevi* Muratbekov, 1945
Byulleten' Sredne-Aziatskago Gosudarstvennago Universiteta. Tashkent, (23): 147.
 Described from specimens ex *Lepus tibetanus*, Kzyl-Kum.
 [= *Rhipicephalus* species – publication not seen. Some authors consider this taxon to be a junior synonym of *Rhipicephalus leporis*]
50. *Rhipicephalus praetextatus* Gerstäcker, 1873
Baron Carl Claus von der Decken's Reisen in Ost-Afrika, 3: 468.
 Described from 1 ♂, Mombassa [Mombasa, Kenya]. Holotype [ZMB 2372] deposited in the Zoological Museum, Berlin – see Moritz & Fischer (1981) and Pegram *et al.* (1987).
51. *Rhipicephalus pravus* Dönitz, 1910
Denkschriften der Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena, 16: 479.
 Described from several specimens ex buffalo, giraffe and antelopes, Damaraland, Transvaal and Massai steppe. Depository not stated. Syntypes [ZMB 9844, 17668, 17669] in the Zoological Museum, Berlin – see Moritz & Fischer (1981). Three ♂♂, 2 ♀♀ syntypes (Nuttall 1246) are in The Natural History Museum, London – see Keirans (1985).
- Rhipicephalus pravus pravus* Dönitz, 1910
 Santos Dias, J.A.T. 1951. *Anais do Instituto de Medicina Tropical, Lisboa*, 8: 373.
Stat. nov. for *Rhipicephalus pravus* Dönitz, 1908.
 [= *Rhipicephalus pravus* Dönitz]
52. *Rhipicephalus pseudolongus* Santos Dias, 1953
 Santos Dias, J.A.T. 1955. *Boletim da Sociedade de Estudos de Moçambique*, (92): 110, fig. 2.
Stat. nov. for *Rhipicephalus capensis pseudolongus* Santos Dias, 1953.
53. *Rhipicephalus pulchellus* (Gerstäcker, 1873)
Baron Carl Claus von der Decken's Reisen in Ost-Afrika, 3: 467, pl. 18, fig. 2.
 Described as a species of *Dermacentor* from a few ♂♂, host not stated, Aruscha [Arusha, Tanzania], Uru [Tanzania], and Lake Jipe [Kenya/Tanzania border]. Depository not stated. There are 3 ♂♂ syntypes [ZMB 2347] deposited in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
- Rhipicephalus pulchellus humeralis* Rondelli, 1926
Res Biologicae, 1: 34, fig. 1.
 Described from 16 ♂♂, host unknown, Mogadiscio, Somalia. Depository not stated.
 [= *Rhipicephalus humeralis* Rondelli]
54. *Rhipicephalus pumilio* Schulze, 1935
Wissenschaftliche Ergebnisse der Niederländischen Expeditionen in dem Karakorum, 1: 178, fig. 1.
 Described from 4 ♂♂, host unknown, Maralbashi. Type 1 ♂, deposited in the Zoological Museum, Amsterdam.
- Rhipicephalus punctatissimus* Gerstäcker, 1873
Baron Carl Claus von der Decken's Reisen in Ost-Afrika, 3: 470.
 Described from 1 ♀, Mombassa [Mombasa, Kenya], deposited in the Zoological Museum, Berlin [ZMB 2370] – see Moritz & Fischer (1981).
 [= *Rhipicephalus sanguineus* (Latreille)]
55. *Rhipicephalus punctatus* Warburton, 1912
 Santos Dias, J.A.T. 1951. *Anais do Instituto de Medicina Tropical, Lisboa*, 8: 383.
Stat. nov. for *Rhipicephalus neavei punctatus* Warburton, 1912.
 [= *Rhipicephalus punctatus*]
- Rhipicephalus punctatus* Bedford, 1929
15th Annual Report of the Director of Veterinary Services, Union of South Africa, 1: 495, pl. III, Figs. 4B, 4D, 5B.
 Described from 7 ♂♂, 1 ♀ ex *Procavia capensis coombi*, near Onderstepoort. Also 2 ♂♂, 2 ♀♀ ex dassie [rock hyrax], Omaruru, South-West Africa [Namibia]. Depository not stated but in the Onderstepoort Tick Collection 2488.

- [= *Rhipicephalus distinctus* Bedford]
56. *Rhipicephalus pusillus* Gil Collado, 1936
 Gil Collado, J. 1938. *Broteria, Lisboa, Serie Trimestral: Ciências Naturais*, 7: 102.
Stat. nov. for *Rhipicephalus bursa pusillus* Gil Collado, 1936.
 [= *Rhipicephalus pusillus* Gil Collado]
57. *Rhipicephalus ramachandrai* Dhanda, 1966
Journal of Parasitology, 52: 1025, figs. 1–17.
 Described from numerous specimens, holotype ♂, allotype ♀ reared from fed nymph ex *Tatera indica*, Mundhwa, Poona district, Maharashtra State, India, deposited in Virus Research Centre, Poona. Paratypes in various institutions, including The Natural History Museum, London with 1 ♂ (1966.12.21.1) and 1 ♀ (1966.12.21.2), and in the U.S. National Tick Collection [RML 47338, 101124, 101125 – see Keirans & Clifford (1984)].
- Rhipicephalus reichenowi* Zumpt, 1943
Zeitschrift für Parasitenkunde, 13: 19, figs. 18, 19.
 Described from 13 ♂♂ ex *Hystrix africae australis*, near Mikesse, German East Africa [Tanzania]. Depository not stated. Holotype ♂ and 2 paratype ♂♂ are in the Zoological Museum, Berlin, ZMB No. 17687 – see Moritz & Fischer (1981).
 [= *Rhipicephalus planus*]
- Rhipicephalus rhipicephaloides* (Neumann, 1901)
 Jacob, E. 1924. *Zeitschrift für Morphologie und Ökologie der Tiere*, 1: 364.
 New combination for *Hyalomma rhipicephaloides* Neumann, 1901.
 [= *Hyalomma rhipicephaloides* Neumann]
- Rhipicephalus ricinus* (Linnaeus, 1758)
 Marchoux, E. & Couvy, L. 1912. *Bulletin de la Société de Pathologie Exotique*, 5: 798.
 [Probably a *lapsus calami* for *Ixodes ricinus* (Linnaeus)]
- Rhipicephalus rosea* (Koch, 1844)
 Salmon, D.E. & Stiles, C.W. 1901. *17th Annual Report Bureau of Animal Industry*, pl. LXXXI, figs. 167, 168.
 [*Lapsus calami* for *Haemaphysalis rosea* Koch, 1844]
58. *Rhipicephalus rossicus* Yakimov & Kol-Yakimova, 1911
Archives de Parasitologie, 14: 419, figs. 1–4.
 Described from ♂, ♀, host not stated, from Government of Saratov, Russia [USSR]. Depository not stated. One ♂, 1 ♀ syntypes (Nuttall 2897) are in The Natural History Museum, London – see Keirans (1985). Filippova (1996) designated a neotype male for *Rhipicephalus rossicus* and deposited it in the Zoological Institute of the Russian Academy of Sciences in St. Petersburg. However, because syntypes exist, this neotype has no validity.
- Rhipicephalus ruber* Supino, 1897
 Neumann, L. G. 1897. *Mémoires de la Société Zoologique de France*, 10: 418.
Stat. nov. for *Rhipicephalus haemaphysaloides ruber* Supino, 1897.
 [= *Rhipicephalus haemaphysaloides* Supino]
- Rhipicephalus rubicundus* Frauenfeld, 1867
Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien, 17: 462.
 Described from 1 ♂, found on a ship, Sonde Sea (probably the Sunda Sea). Depository not stated.
 [Probably *Rhipicephalus sanguineus* (Latreille)]
- Rhipicephalus rufus* (Koch, 1844)
 Salmon, D.E. & Stiles, C.W. 1901. *17th Annual Report Bureau of Animal Industry*: 419.
 New combination for *Ixodes rufus* Koch, 1844.
 [= *Ixodes ricinus* (Linnaeus). Fide Neumann (1901) who examined the types]
- Rhipicephalus rutilus* Koch, 1844
Archiv für Naturgeschichte, 10: 238.
 Described from 1 ♀, Damiette, Egypt. Holotype in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
 [= *Rhipicephalus sanguineus* (Latreille)]
59. *Rhipicephalus sanguineus* (Latreille, 1806)

- Koch, C.L. 1844. *Archiv für Naturgeschichte*, 10: 238.
New combination for *Ixodes sanguineus* Latreille, 1806. [The type specimen of this species is apparently lost].
[= *Rhipicephalus sanguineus* (Latreille)]
Rhipicephalus sanguineus brevicollis Neumann, 1897
Neumann, L.G. 1904. *Archives de Parasitologie*, 9: 449.
Stat. nov. for *Rhipicephalus sanguineus* (Latreille, 1806).
[= *Rhipicephalus sanguineus* (Latreille)]
Rhipicephalus sanguineus punctatissimus Gerstäcker, 1873
Neumann, L.G. 1904. *Archives de Parasitologie*, 9: 449.
Stat. nov. for *Rhipicephalus sanguineus* (Latreille, 1806).
[= *Rhipicephalus sanguineus* (Latreille)]
Rhipicephalus sanguineus rossicus Yakimov & Kol-Yakimova, 1911
Zumpt, F. 1939. *Zeitschrift für Parasitenkunde*, 11: 405, fig. 3.
Stat. nov. for *Rhipicephalus rossicus* Yakimov & Kol-Yakimova, 1911.
[= *Rhipicephalus rossicus* Yakimov & Kol-Yakimova]
Rhipicephalus sanguineus sanguineus (Latreille, 1806)
Neumann, L.G. 1911. *Das Tierreich. Acarina*, p. 35. Berlin: R. Friedländer & Sohn.
Stat. nov. for *Rhipicephalus sanguineus* (Latreille, 1806).
[= *Rhipicephalus sanguineus* (Latreille)]
Rhipicephalus sanguineus schulzei Olenov, 1929
Zumpt, F. 1940. *Zeitschrift für Parasitenkunde*, 11: 677.
Stat. nov. for *Rhipicephalus schulzei* Olenov, 1929.
[= *Rhipicephalus schulzei* Olenov]
Rhipicephalus sanguineus simus Koch, 1844
Diaz Ungria, C. 1957. *Revista de Sanidad y Asistencia Social, Caracas*, 22: 463.
Stat. nov. for *Rhipicephalus simus* Koch, 1844.
[= *Rhipicephalus simus* Koch]
Rhipicephalus sanguineus sulcatus Neumann, 1908
King, H.H. 1926. *Sudan Government Entomology Section Bulletin*, (23): Appendix I–II, 12.
Stat. nov. for *Rhipicephalus sulcatus* Neumann, 1908.
[= *Rhipicephalus sulcatus* Neumann]
60. *Rhipicephalus scalpturatus* Santos Dias, 1959
Memórias e Estudos do Museo Zoológico da Universidade de Coimbra, (256): 1, figs. 1–3.
Described from 4 ♂♂, 2 ♀♀, host not stated, Umsaw, Khasi Hills, Assam [India]. Holotype ♂ and 3 ♂♂, 2 ♀♀ paratypes deposited in the Zoological Museum, Hamburg.
61. *Rhipicephalus schulzei* Olenov, 1929
Vestnik Sovremennoy Veterinariï, 5: 192, pl. 1, fig. 6.
Described without details on host or locality. Depository not stated.
Rhipicephalus schwetzi Larousse, 1927
Revue Zoologique Africaine, 15: 214, figs. 2, 3.
Described from 7 ♂♂, 5 ♀♀ ex *Hylochoerus ituriensis*, Koteli (Bas-Uelé) [Democratic Republic of Congo]. Depository not stated.
[= *Rhipicephalus dux* Dönitz]
62. *Rhipicephalus sculptus* Warburton, 1912
Parasitology, Cambridge, 5: 13, figs. 8, 9.
Described from 11 ♂♂, 5 ♀♀ ex roan antelope, Mpalali River, Nyasaland [Malawi], 1 ♂ from the same locality and host, 3 ♂♂, 1 ♀ ex zebra, S. Rukuru Valley, N. Nyasaland [Malawi]. Types were deposited in the British Museum (Natural History) and Cambridge. Lectotype and paralectotypes designated – see Keirans & Brewster (1981). All specimens are now in The Natural History Museum, London.
Rhipicephalus secundus Feldman-Muhsam, 1952
Bulletin of the Research Council of Israel, 2: 192, figs. 3A, 4A, 5, 6A, 8.
Described from ♀, nymph and larva, based

- on laboratory reared specimens. Depository not stated.
[=*Rhipicephalus turanicus* Pomerantsev]
63. *Rhipicephalus senegalensis* Koch, 1844
Archiv für Naturgeschichte, 10: 238.
Described from ♀♀, host not stated, from Senegal and Egypt. Depository not stated. Three ♀♀ syntypes in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
64. *Rhipicephalus serranoi* Santos Dias, 1950
Moçambique, (63): 143, figs. 1–3.
Described from 2 ♂♂, 5 ♀♀ ex 2 *Oreotragus oreotragus*, Mutuali, Nampula District, Niassa Province, Mozambique, 23.VI.50 and 27.VII.50, Dr António de Melo Serrano. Depository not stated but in the Veterinary Research Laboratory, Maputo, Mozambique.
- Rhipicephalus shipleyi* Neumann, 1902
Archives de Parasitologie, 6: 112.
Described from 2 ♂♂, 3 ♀♀ ex *Hyaena* sp.?, from the Sudan. Deposited in Cambridge. One ♀ syntype (Nuttall 1562) is in The Natural History Museum, London – see Keirans (1985).
[=*Rhipicephalus praetextatus* Gerstäcker]
- Rhipicephalus siculus* Koch, 1844
Archiv für Naturgeschichte, 10: 239.
Described from 2 ♂♂, 1♀ from Sicily. Syntypes [ZMB 1091] in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
[=*Rhipicephalus sanguineus* (Latreille)]
65. *Rhipicephalus simpsoni* Nuttall, 1910
Parasitology, Cambridge, 3: 413, figs. 6, 7.
Described from 5 ♂♂, 11 ♀♀ ex large rodent, Oshogbo, S. Nigeria. Depository not stated. Lectotype and paralectotypes designated – see Keirans & Brewster (1981). Specimens in The Natural History Museum, London.
66. *Rhipicephalus simus* Koch, 1844
Archiv für Naturgeschichte, 10: 238.
Described from 1 ♂, South Africa. Holotype [ZMB 1098] deposited in the Zoological Museum, Berlin – see Moritz & Fischer (1981) and Pegram *et al.* (1987).
- Rhipicephalus simus erlangeri* Neumann, 1902
Neumann, L.G. 1904. *Archives de Parasitologie*, 8: 449.
Stat. nov. for *Rhipicephalus erlangeri* Neumann, 1902.
[=*Rhipicephalus simus* group]
- Rhipicephalus simus hilgerti* Neumann, 1902
Neumann, L.G. 1904. *Archives de Parasitologie*, 8: 449.
Stat. nov. for *Rhipicephalus hilgerti* Neumann, 1902.
[=*Rhipicephalus praetextatus* Gerstäcker]
- Rhipicephalus simus longoides* Zumpt, 1943
Zeitschrift für Parasitenkunde, 13: 11, figs. 6, 7.
Described from specimens from Cameroon, Sierra Leone, Ivory Coast, Gold Coast [Ghana], Togo, French Congo [Congo] and Belgian Congo [Democratic Republic of Congo]. Type and paratypes (16 ♂♂, 24 ♀♀ in the Museum of Berlin and in my [i.e. Zumpt's] collection) come from Cameroon. Holotype [ZMB 17780] and paratypes [ZMB 17780–17786] in the Zoological Museum, Berlin – see Moritz & Fischer (1981). An additional paratype in the Zumpt collection, South African Institute for Medical Research, Johannesburg. There is also 1 ♂ paratype ex *Bos taurus*, Akra (*sic*), Gold Coast [Ghana] in the Zoological Museum, Hamburg which Neumann identified as *Rhipicephalus bursa* (Neumann, 1897. *Mémoires de la Société Zoologique de France*, 10: 393), and determined subsequently by Zumpt as *Rhipicephalus simus longoides*.
[=*Rhipicephalus senegalensis* Koch]
- Rhipicephalus simus lunulatus* Warburton, 1912
Parasitology, Cambridge, 5: 19, fig. 12.
Stat. nov. for *Rhipicephalus lunulatus* Neumann.
[=*Rhipicephalus lunulatus* Neumann]
- Rhipicephalus simus planus* Neumann, 1907
Wissenschaftliche Ergebnisse der Schwedischen Zoologische Expedition nach dem Kilimandjaro, dem Meru und den umgeben-

- den Massaisteppe, Deutsch-Ostafrikas 1905–06 (Sjöstedt), 3, Abteilung 20: *Arachnoidea*, (2): 20.
Described from 4 collections: 3 ♂♂, 1 ♀ ex *Hystrix africae australis*, Kilimandjaro, Kibonoto; 2 ♀♀, host unknown, Kilimandjaro, Kibonoto; 3 ♂♂, host unknown, Kilimandjaro; 1 ♂, Kilimandjaro, Steppe [Tanzania]. Depository not stated.
[= *Rhipicephalus planus* Neumann]
- Rhipicephalus simus senegalensis* Koch, 1844
Zumpt, F. 1949. *Moçambique*, (60): 91, figs. 23, 24.
Stat. nov. for *Rhipicephalus senegalensis* Koch.
[= *Rhipicephalus senegalensis* Koch]
- Rhipicephalus simus shipleyi* Neumann, 1902
Neumann, L.G. 1904. *Archives de Parasitologie*, 8: 449.
Stat. nov. for *Rhipicephalus shipleyi* Neumann, 1902.
[= *Rhipicephalus praetextatus* Gerstäcker]
- Rhipicephalus simus simus* Koch, 1844
Zumpt, F. 1949. *Moçambique*, (60): 90.
Stat. nov. for *Rhipicephalus simus* Koch.
[= *Rhipicephalus simus* Koch]
- Rhipicephalus simus tricuspis* Dönitz, 1910
Paoli, G. 1916. *Redia*, 11: 281, pl. 5, figs. 12, 13.
Stat. nov. for *Rhipicephalus tricuspis* Dönitz, 1910.
[= *Rhipicephalus tricuspis* Dönitz]
- Rhipicephalus stigmaticus* Gerstäcker, 1873
Baron Carl Claus von der Decken's Reisen in Ost-Afrika, 3: 469.
Described from 1 ♂, Mombassa [Mombasa, Kenya]. Holotype [ZMB 2371] deposited in the Zoological Museum, Berlin – see Moritz & Fischer (1981).
[= *Rhipicephalus sanguineus* (Latreille)]
67. *Rhipicephalus sulcatus* Neumann, 1908
Bulletin du Museum National d'Histoire Naturelle, 14: 352, figs. 1, 2.
Described from 3 ♂♂, 4 ♀♀, host not stated, from Congo [Democratic Republic of Congo]. Deposited in the Museum of Natural History, Paris.
68. *Rhipicephalus supertritus* Neumann, 1907
Archives de Parasitologie, 11: 216, figs. 2, 3.
Described from 2 ♂♂ ex horse, near the Lualaba River, Congo Free State [Democratic Republic of Congo]. Deposited in The Natural History Museum, London.
Rhipicephalus tendeiroi Santos Dias, 1950
Anais do Instituto de Medicina Tropical, Lisboa, 7: 217, figs. 1, 2.
Described from 1 ♂ ex *Felis leo leo*, Mocimboa do Rovuma, Macondes, district of Porto Amélia, Niassa Province, Mozambique, 28.III.50, L. Silveira. Depository not stated but in the Veterinary Research Laboratory, Maputo, Mozambique.
[= *Rhipicephalus masseyi* – see Santos Dias (1989)]
- Rhipicephalus tetracornus* Kitaoka & Suzuki, 1983
Tropical Medicine, 25: 210, figs. 6–23.
Described from larvae, nymphs and reared adults. Immatures ex *Rattus surifer*, *R. nitidus*, *Bandicota savilei*, *Mus pahari*, and possibly *Eothenomys melanogaster* and *Anourosorex squamips*, Nakhon Nayok and Doi Inthanon, Thailand. Deposited in the National Science Museum, Natural History Institute, Shinjuku, Tokyo. [Unfortunately, all adults and some of the nymphs and larvae of this species were lost while being sent to Dr Harry Hoogstraal in Cairo, Egypt for illustration. Because we do not have specimens, and until additional material becomes available, we are considering *R. tetracornus* to be a species *incertae sedis*].
- Rhipicephalus texanus* Banks, 1908
Technical Series Bureau of Entomology, U. S. Department of Agriculture, (15): 34, pl. 5, figs. 1–4.
Described from ♂♂, ♀♀ ex dogs and horses, Texas, New Mexico and Mexico. Depository not stated. Syntypes in the U.S. National Tick Collection [RML 21579, 56742 – see Keirans & Clifford (1984)].
[= *Rhipicephalus sanguineus* (Latreille)]
69. *Rhipicephalus theileri* Bedford & Hewitt, 1925

- South African Journal of Natural History*, 5: 263, figs. 7–9.
Described from 1 ♂ holotype, 1 partially engorged ♀ ex *Xerus capensis*, Glen, Orange Free State, Republic of South Africa. Depository not stated but in Onderstepoort Tick Collection [2480 i. ♂, ♀ (type) ex *Geosciurus capensis*, Glen, O.F.S., 15. viii.21, R. Bigalke].
70. ***Rhipicephalus tricuspis* Dönitz, 1906**
Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin, (5): 146, figs. 7–9.
Described from 1 ♂, 1 ♀ found free in the Kalahari [Botswana]. Depository not stated. Syntypes in Zoological Museum, Berlin – see Moritz & Fischer (1981). Lectotype designated – see Walker *et al.* (1988).
- Rhipicephalus turanicus* Pomerantsev, 1936
Uzakov, U. Ya. 1964. *Trudy Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Veterinarnoi Sanitarii i Éktoparazitologii*, 24: 341. [*Lapsus calami* for *Rhipicephalus turanicus* Pomerantsev]
71. ***Rhipicephalus turanicus* Pomerantsev, 1936**
Parazitologicheskii Sbornik, (6): 6
Subgeneric group description which included *Rhipicephalus turanicus* Pomerantsev. Depository not stated.
- Rhipicephalus walckenaeri* (Gervais, 1842)
Kratz, W. 1940. *Zeitschrift für Parasitenkunde*, 11: 560.
New combination for *Ixodes walckenaerii* Gervais, 1842.
[Species *incertae sedis*]
72. ***Rhipicephalus warburtoni* Walker & Horak, 1999**
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[= *Nomen nudum*]
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Described from holotype ♂, allotype ♀, ♂♂, ♀♀, nymphs and larvae paratypes, laboratory reared from a strain ex cattle, near West Nicholson, Gwanda District, Zimbabwe. Holotype, allotype and some paratypes in the Onderstepoort Tick Collection 3140 [not 3240 as appeared in the publication]. Other paratypes in Veterinary Research Laboratory, Harare, Zimbabwe; The Natural History Museum, London and U.S. National Tick Collection [RML 105751 – see Keirans & Clifford (1984)].
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[= *Rhipicephalus ziemanni* Neumann]

75. *Rhipicephalus zumpti* Santos Dias, 1950
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Described from 1 ♂ ex buffalo, [*Syncerus*
caffer], Govuro, Mozambique, 5.I.50, Dr
J.M. da Silva. Deposited in the Santos Dias
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Rhipicephalus species occurring in the Afrotropical region

HISTORICAL REVIEW

The first rhipicephalid to be recognized was the cosmopolitan species *Rhipicephalus sanguineus*, collected in France and described by Pierre André Latreille (1806). His description was brief in the extreme – ‘*Sanguineus, punctatus, postice lineolis tribus impressis; dorso antico macula nulla thoracica, distincta.*’ Translated from the Latin this means: ‘Blood red, punctate posteriorly with three impressed lines; no distinct thoracic spot anterodorsally’ (M.-L. Penrith, pers. comm., 1997). Latreille placed this tick in the genus *Ixodes* but Koch (1844) reclassified it as a member of his newly erected genus *Rhipicephalus*, and at the same time described three new species, *R. capensis*, *R. senegalensis* and *R. simus*. Nearly 30 years later A. Gerstäcker (1873), who studied various arthropods collected by Baron C.C. von der Decken during his travels in East Africa, described *R. praetextatus* and *R. pulchellus*. The latter, on account of the ornate scutal pattern of the adults, was originally regarded as a species of *Dermacentor*.

Towards the end of the 19th century and early in this century research on ticks rapidly gathered momentum as these parasites became increasingly recognized as important vectors of various animal pathogens. In 1898 an American, C.P. Lounsbury, who had arrived in South Africa 3 years earlier to take up his appointment as Government Entomologist to the Depart-

ment of Agriculture, Cape of Good Hope, turned his attention to ticks and tick-borne diseases. He soon established contact with two outstanding authorities in Europe, L.G. Neumann in Toulouse, France, and G.H.F. Nuttall in Cambridge, England. Neumann, who had already described *R. compositus* in 1877 and *R. evertsi* in 1899, based his descriptions of *R. appendiculatus* and *R. nitens* on Lounsbury’s collections. By 1911 he had described 19 rhipicephalids that are still regarded as valid from specimens obtained in different parts of Africa. During this period one of the rarest and most distinctive species in the genus, *R. armatus*, was described by R.I. Pocock (1900) from Harar Province in Ethiopia.

Amongst other ticks Lounsbury managed to supply live *R. appendiculatus* to Nuttall for his studies on the variations in size and morphology due to nutrition seen in this species, a remarkable feat considering communications at that time. Many other collectors in Africa also sent ticks to Nuttall. These were all carefully documented, deposited in the Nuttall collection and later donated to The Natural History Museum, London (Keirans, 1985). Nuttall described only one rhipicephalid himself, *R. simpsoni*, and a second, *R. masseyi*, with his colleague C. Warburton. Another three, *R. longiceps*, *R. punctatus* and *R. sculptus*, were erected by Warburton (1912) in a paper that is still extremely relevant for anyone interested in this genus.

During this early period the eminent German taxonomist, W. Dönitz, was also active and was the author of five species, *R. dux*, *R. follis*, *R. kochi*, *R. pravus* and *R. tricuspis*, and one subspecies, *R. evertsi mimeticus*. Although neither he nor Neumann ever co-authored any papers with Nuttall and his colleagues there was evidently a cordial relationship between all these scientists and they exchanged specimens and information.

By 1913, therefore, 36 *Rhipicephalus* species, i.e. just over half of those now recognized from the Afrotropical region, had been described, all of them by authorities working in Europe. But apart from those studied by Lounsbury and by Sir Arnold Theiler at the newly established Veterinary Research Institute at Onderstepoort, both of whom were interested primarily in the life cycles and disease relationships of South African ticks rather than their taxonomy, little was known about many of them. Often only the hosts from which they had been collected and the localities where they were found were recorded, and sometimes not even these basic details. Subsequently the rate at which new species were erected decreased markedly, and most were described by scientists who were living and working in Africa even though their origins were often elsewhere. Of these the first was G.A.H. Bedford, who had arrived in 1912 from England to take up the post of Entomologist at Onderstepoort, where he worked until his death in 1938. Referred to later by Gertrud Theiler (1975) as 'a taxonomist *par excellence*', he described several new species of ticks, among them *R. distinctus* and, with J. Hewitt, *R. theileri*. He also produced a valuable checklist and host list of the external parasites, including ticks, of South African mammals, birds and reptiles. He was succeeded by R. du Toit, who described *R. glabroscutatum* in 1941.

In 1940 Gertrud Theiler was appointed in the Entomology Section at Onderstepoort. She soon took over responsibility for the research on ticks, a task that was to occupy her for over 25 years and for which she became world renowned. Although she was involved, with F. Zumpt, in the description of only one new rhipicephalid, *R.*

arnoldi, in 1949, she contributed greatly to our knowledge of this genus, especially by rearing and describing the immature stages of several South African species and studying their host relationships and zoogeography. In 1947 she published a particularly valuable paper in which she collated existing information on many of the lesser known African rhipicephalids. In 1962 she issued a report documenting the hosts and distribution of all the African ticks, including the rhipicephalids. She always maintained close contact with other tick workers, who relied on her for advice and help such as pertinent extracts from the literature and reference specimens of ticks. These were a great boon to those without ready access to such aids.

Fritz Zumpt had become interested in the genus *Rhipicephalus* during the 1940s. While he was still in Germany he wrote eight papers on individual species and groups with the evident aim of revising this genus later. After the Second World War he and his family emigrated to South Africa. In 1949 he published the last of these preliminary studies to his intended revision in the form of a key to the known species, plus a description of *R. bequaerti*. Thereafter he left this field of study to Dr Theiler. He was for many years Head of the Department of Entomology, South African Institute for Medical Research in Johannesburg.

Although most veterinarians and medical authorities in Africa have not been interested in tick taxonomy *per se* they have always been deeply concerned with the various tickborne diseases of animals and man and also realized the necessity of studying their vectors. Consequently research on these parasites often received a high priority during the colonial era. As early as 1907 R.J. Stordy, the Chief Veterinary Officer of the East African Protectorate (as Kenya was then known), had already identified six tick-borne diseases of domestic animals there and had become alarmed about the possible spread of African Coast fever, i.e. East Coast fever (ECF). He listed eight species of ticks occurring in the country, including *R. appendiculatus*, *R. evertsi*, *R. pulchellus* and *R. simus*, and gave details of the

localities where they occurred. Work on both the ticks and the diseases they transmitted, especially ECF and Nairobi sheep disease, was continued in Kenya, even during the First World War, by successive researchers including T.J. Anderson, E. Montgomery and, a few years later, by R. Daubney and J.R. Hudson, at the Veterinary Research Laboratory, Kabete. The work was given extra impetus by the appointment in 1930 of E.A. Lewis, who conducted investigations on ticks and tick-borne diseases in Kenya, and also identified some tick collections from Tanzania and Uganda, during the following 22 years.

In general, though, fewer advances in knowledge were made in either Tanzania or Uganda during this early period. Following the outbreak of the First World War in 1914 tick collections from domestic animals in Tanzania virtually ceased for almost 20 years. Thereafter, despite widespread recognition of the importance of ECF in the country, only sporadic investigations were carried out until after the Second World War. Finally in 1955 G.H. Yeoman was able to plan and, with J.P.J. Ross and T. Docker, conduct a well-organized tick survey covering the entire country (Yeoman & Walker, 1967). In Uganda a tick collection that accumulated at the Animal Health Research Centre during the late 1920s and early 1930s was documented by R.W.M. Mettam in his annual reports. Fortunately these specimens were deposited in the Nuttall Collection, and some of Mettam's identifications were later emended by Keirans (1985). The results of a survey by S.G. Wilson during the late 1940s also appeared mainly in the annual reports of the Uganda Veterinary Department. In 1965, with the support of the Uganda Government and the United States Agency for International Development, J.G. Matthyse and M.H. Colbo carried out further field work to fill gaps in the existing knowledge of Uganda ticks. By 1972 their first manuscript documenting this information was completed but it was largely destroyed during the political turmoil in the country at that time. A revised, rewritten and updated version of their work was published only in 1987. It is particularly useful because it

is copiously illustrated and includes a number of species that the authors thought might occur in Uganda, plus keys for their identification (Keirans, 1988).

Prior to his service in Uganda, Wilson had worked in Malawi for some years and made valuable contributions to our knowledge of the ticks there, especially *Rhipicephalus* species, in which he was particularly interested. When he left Uganda he served for a short period in Kenya, during which he described *R. hurti* and organized some valuable collections of ticks. He was succeeded by A.J. Wiley, who had trained originally with E.A. Lewis and consequently had much experience with Kenya ticks. Sadly he died just a few years later, in 1959. Research on the hosts and distribution of ticks in Kenya has since been carried out by the senior author (Walker, 1974), and also under the auspices of the United Nations Development Programme (FAO, 1975).

Before the Second World War the ticks occurring in southern Somalia were studied by Maria Tonelli-Rondelli, who described *R. humeralis*, originally as a subspecies of *R. pulchellus*. Subsequently both she and E. Stella, amongst others, extended their investigations to parts of Ethiopia. In 1976 R.G. Pegram reviewed the ixodid ticks occurring in northern Somalia, followed 2 years later by D. Scaramella, who recorded the known tick species present throughout this country. Afterwards Pegram turned his attention to the ticks of Ethiopia, which were also the subject of research during the 1970s by the French workers P. Bergeon, J. Balis and especially P.C. Morel, who had previously worked in West Africa for many years. The review of Ethiopian ticks by Morel (1976) was originally published in French. It was reissued in 1980 in English and we have quoted the English edition throughout this book.

Harry Hoogstraal, who has been described as 'the greatest authority on ticks and tick-borne diseases who ever lived' (Keirans, 1986), was based at the United States Naval Medical Research Unit No. 3 (NAMRU3) in Cairo, Egypt from 1949 until his death in 1986. From 1950 onwards he served as Head of the Medical Zool-

ogy Department there. In 1956 he published his monograph on the ticks of the Sudan, based on research he had carried out in Equatoria Province. This book is particularly valuable for its detailed reviews of those ticks he included and its comprehensive bibliography. He was not, however, especially interested in the rhipicephalids, about which both he and his associate Makram Kaiser often consulted either Gertrud Theiler or authorities at the Rocky Mountain Laboratory, Hamilton, Montana, USA, especially Carleton M. Clifford.

During the colonial era West Africa, broadly speaking, was primarily the sphere of interest of a succession of eminent French scientists. Those who made initial contributions to our knowledge of *Rhipicephalus* spp. there include J. Colas-Belcour, who studied *R. fulvus* in North Africa in 1932; J. Rageau, who worked on the ticks of Cameroon in the early 1950s, and R. Rousselot, who had a general interest in the ticks recorded in the French West African territories, also during the 1950s. In 1954 P.C. Morel arrived to take charge of the research on entomology and parasitology at the laboratory operating in Dakar-Hann, Senegal, under the auspices of the Institute d'Élevage et de Médecine Vétérinaire des Pays Tropicaux, Paris (IEMVT). During the following 10 years he, together with his associates P. Finelle, M. Graber, J. Magimel, J. Mouchet and G. Vassiliades, made major contributions to the systematics of West African ticks, to which frequent reference is made later in this book, especially in Chapter 7. Particular mention should be made of the study that he and Vassiliades published on the *R. sanguineus* group in 1963. Unfortunately, though, it has up to now been impossible to integrate some of their conclusions fully with other workers' findings, particularly those of R.G. Pegram. In 1965 Morel returned to Alfort, Paris, as Head of the Parasitology Section at the IEMVT. In 1969 he produced a remarkable thesis, accompanied by distribution maps, on the systematics of all the ticks then known to occur in the Afrotropical region; this has been of material assistance to us during the preparation of this book.

Notable contributions to our knowledge of West African rhipicephalids were also made between 1946 and 1963 by the Portuguese scientist J. Tendeiro, working mainly in Guinea, and by A. Aeschlimann, from Switzerland, who spent three years (1959–1961) collecting ticks in the Ivory Coast (Aeschlimann, 1967). A little earlier, records of *Rhipicephalus* spp. occurring in Nigeria, particularly in the northern territories, were included in the results of a survey on cattle ticks published by K. Unsworth (1952). Further surveys, again with emphasis on the ticks in northern Nigeria, were carried out by K.L. Strickland (1961) and by A.N. Mohammed (1977). More recently investigations in West Africa have centred on the ticks of Mali (Matthysse, 1980); Senegal (Gueye *et al.*, 1986, 1987), and Cameroon (Merlin, Tsanguieu & Rousvoal, 1986, 1987).

Since the beginning of this century various publications have featured the *Rhipicephalus* spp. occurring in the Democratic Republic of Congo, Rwanda and Burundi. Among these are the reports published by Nuttall & Warburton (1916); Bequaert (1931); Pierquin & Niemegeers (1957, 1958); Theiler & Robinson (1954); Clifford & Anastos (1962, 1964) and Elbl & Anastos (1966). A useful feature of the latter work is the lists of species from this vast area recorded in the literature and in the collections of the Musée Royal de l'Afrique Centrale, Tervuren, Belgium.

Until about the last 50 years little attention had been paid to the ticks of Zambia. Both the checklist by Theiler & Robinson (1954) and the report by Matthysse (1954) on the tick-borne diseases occurring there included records of various *Rhipicephalus* spp. In 1961 W.J. Gray described his biological studies carried out on *R. evertsi* on the Kafue Flats. From 1966 to 1973 J. MacLeod and his colleagues M.H. Colbo and B. Mwanaumo, working initially under the auspices of the FAO and later the Agricultural Research Council (Zambia), studied tick populations in various parts of the country. Their findings, published in a series of papers cited under the accounts of individual species, provide a foundation for much of our knowledge of Zambian

ticks. From 1980 onwards further work was carried out, still under the auspices of the FAO, by R.G. Pegram, including important taxonomic and biological studies on the *R. sanguineus* and *R. simus* groups. Unfortunately, though, we have been unable to trace any recent publications by the Zambian taxonomist, the late F. Zulu, who was involved in research on *Rhipicephalus* species, amongst others, during the 1980s.

From 1910 onwards numerous contributions to our knowledge of ticks in Zimbabwe were made by R.W. Jack, culminating in 1942, to which Kate Jooste (1969) and also J. MacLeod, again working under the auspices of the FAO, added over 25 years later. In 1975 a National Tick Survey was instituted by R.A.I. Norval aided by several co-workers, particularly J. Muchuwe, as described by Mason & Norval (1980). This resulted in the acquisition of much valuable information on the hosts and distribution of the *Rhipicephalus* spp. occurring in that country.

In the former Portuguese colonies of Angola and Mozambique considerable attention has been paid to the tick fauna. In Angola, V.A. Sousa Dias (1950) compiled a detailed account of the tick species present, and a number of collections made there subsequently have been recorded by J.A.T. Santos Dias. Despite the constraints imposed by the devastating civil war in that country further investigations have been organized recently in the Huambo area, in the south of the country, by A. Gomes (see Gomes, Pombal & Venturi, 1994). The main focus of attention by Santos Dias has been the ticks of Mozambique. He was based at the Veterinary School in Maputo (formerly Lourenço Marques) from 1946 to 1981 and published many papers during this period, including descriptions of two new species, *R. serranoi* and *R. pseudolongus*. He then returned to Portugal, where he continued his research at the Instituto de Investigação Científica Tropical until his retirement in 1990, though he maintained his interest in ticks until his death 5 years later. Additional contributions to our knowledge of Mozambican ticks were also made by J. Tendeiro.

In 1910 Dönitz described *R. evertsi mimeticus* from Namibia, *R. follis* from 'Südafrika' and *R. tricuspis* from Botswana, and discussed several other rhipicephalids occurring in southern Africa. Ticks occurring in Botswana featured in few publications thereafter until 1955, when Santos Dias published the results of a survey by Zumpt. Available records of the ticks occurring there were consolidated by Walker, Mehlitz & Jones (1978) and G.D. Paine added further information, following a survey that he had undertaken, in 1982. In Namibia early studies on ticks were carried out by Trommsdorff (1914) and Hans Sigwart (1915) but little further information became available until Santos Dias (1955) published the records of a short survey conducted in 1952 by Zumpt. Numerous collections, covering much of the country, have been made since 1970 by J.D. Bezuidenhout and others. These have included a new species, *R. neumanni* Walker, 1990. Many unpublished records of other rhipicephalids identified in these collections have kindly been made available to us by Heloise Heyne for inclusion in our accounts of individual species.

In a short review such as this it is obviously possible to mention only a few of those responsible for existing knowledge of African rhipicephalids. Comprehensive references to those who have contributed further information prior to 1969 are quoted by Doss *et al.* (1974–1978). A brief note should be added about our own involvement in the acquisition of this knowledge. J.B.W. has been concerned with research on African ticks since 1949. After training with Gertrud Theiler she worked until 1966 at the East African Veterinary Research Organization, Muguga, Kenya. She then moved to the Onderstepoort Veterinary Institute, South Africa, where she took over from Dr Theiler. She has been particularly involved in studies on the systematics of the African *Rhipicephalus* spp. and for over 10 years has been working towards a consolidation of information on these ticks. She has been the author or co-author of the following nine species: *R. aquatilis* (with J.E.K. and R.G. Pegram); *R. carnivoralis*; *R. exophthalmos* (with

J.E.K.); *R. interventus* (with R.G. Pegram and J.E.K.); *R. lounsburyi*; *R. neumanni*; *R. oreotragi* sp.nov. (with I.G.H.); *R. warburtoni* sp.nov. (with I.G.H.), and *R. zambeziensis* (with R.A.I. Norval and D. Corwin).

J.E.K. has been curator of the U.S. National Tick Collection for several years, first with the National Institutes of Health at the Rocky Mountain Laboratory, Hamilton, MA (with Dr Carleton M. Clifford), then at the Smithsonian Institution, Washington, DC, and currently at Georgia Southern University, Statesboro, GA. He and J.B.W. have collaborated on the descriptions of *R. aquatilis*, *R. exophthalmos* and *R. interventus* and on systematic studies on other *Rhipicephalus* spp.

I.G.H. has been involved in research on helminths in South Africa since 1961 and on ticks since 1974 when he joined the Faculty of Veterinary Science, University of Pretoria at Onderstepoort as a lecturer in Ectoparasitology. After spending 5 years from 1982 to 1987 at the Tick Research Unit, Rhodes University, Grahamstown he rejoined the staff of the Veterinary Faculty. His research has concentrated on the distribution, host preferences and seasonal abundance of ticks in South Africa and Namibia.

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KEYS

Those readers who have previously attempted to key species of *Rhipicephalus* realize that it can be a daunting and, at times, a frustrating process. We have done our best to make this difficult task as straightforward as possible including, when appropriate, miscellaneous information on hosts and distribution within the couplets themselves. After keying a tick to a particular species we urge the reader not only to compare the specimen with the illustrations provided under that name but also to read the full description, hosts, sites of attachment and zoogeography. Even if you have given a tick a name, this does not necessarily mean you have got it right.

In preparing the keys we owe a considerable debt to those who have travelled this road before: Zumpt, Pomerantsev, and Matthyse & Colbo. Because of the conservative nature of these parasites, we freely admit to borrowing one or more of these authors' couplets.

The host preferences listed are those of the adults. In several cases the immature stages prefer different hosts.

KEY TO THE AFROTROPICAL
RHIPICEPHALUS SPECIES MALES

These keys were constructed merely to help readers to identify their specimens, not to demonstrate phylogenetic relationships.

- 1a. Small subadanal plates visible just posterior to adanal plates. (Subgenus *Hyperaspidion* Pomerantsev, 1936). One of the rarer species, recorded most commonly from carnivores in East Africa. *R. armatus* (Note: Some male specimens of *R. cuspidatus* have small to minute idiosomal plaques beneath or medial to the adanal plates, but these integumental thickenings do not constitute subadanal plates)
- 1b. Subadanal plates absent. 2
- 2a. Adanal plates large, curving externally and extended posteriorly into broadly-rounded points; medially projecting cusps absent; accessory adanal plates absent. 3
- 2b. Adanal plates of various shapes, but not produced posteriorly into broadly-rounded points; medially projecting cusps and accessory adanal plates present or absent 4
- 3a. Spiracles each with a long, narrow dorsal prolongation. Almost exclusively a parasite of yellow mongoose, meercat and Cape ground squirrel in South Africa, Botswana and Namibia. *R. theileri*
- 3b. Spiracles each with a long, broad dorsal prolongation. Parasitic mainly on warthogs and porcupines in West Africa, from Senegal eastward to the Sudan *R. cuspidatus*
- 4a. Scapular areas of conscutum bearing a large anterior process on each side of the basis capituli. (Subgenus *Pterygodes* Neumann, 1913). Parasitic on the gundi and some larger animals in North Africa and the Sahara. *R. fulvus*
- 4b. Scapular area of conscutum not bearing a large anterior process on each side of the basis capituli. 5
- 5a. Conscutum ornamented with ivory markings. 6
- 5b. Conscutum lacking ornamentation. . . . 9
- 6a. Ivory colouration encircling conscutal margin and often much of the central area. A common tick in dry areas in eastern Africa east of the Rift Valley. *R. pulchellus*
- 6b. Ivory colouration not encircling conscutal margin; markings restricted to scapular or central areas. 7
- 7a. An ivory patch present on each scapula (uncommonly a patch may also be present behind each eye, which rarely may extend forward to the scapular patch). Present in dry areas in southern Somalia, Kenya and Tanzania. *R. humeralis*
- 7b. Lacking ornamentation in scapular areas 8
- 8a. A variable pattern of diffuse ornamentation found on the conscutum often associated with larger punctations. Occurring on a wide range of hosts, mainly in coastal regions from Kenya to northern KwaZulu-Natal, South Africa but also recorded

- sometimes from Zambia, Zimbabwe and Malawi. *R. maculatus*
- 8b. A small patch of ornamentation present anteriorly and centrally on the conscutum plus a larger patch posteriorly partially surrounding the posterior grooves; the patches may be joined. Present in western Uganda, and in Rwanda and Democratic Republic of Congo. *R. dux*
- 9a. Eyes round, beady, deeply orbited. . . . 10
- 9b. Eyes flat, slightly bulging or convex, but not beady and deeply orbited. 14
- 10a. Spiracles surrounded by numerous long setae. 11
- 10b. Long setae absent from circumspiracular area. 12
- 11a. A rather densely punctate tick with larger punctations marking the external cervical margins; legs uniformly bright reddish orange. Very common and widely distributed in the Afrotropical region. . . . *R. evertsi evertsi*
- 11b. As in couplet 11a, but with saffron annulations on the legs. Almost exclusively in dry areas from south-western Democratic Republic of Congo south to Namibia and western Botswana. *R. evertsi mimeticus*
- 12a. Conscutum smooth, shiny, almost devoid of punctations. A parasite of the lower legs and feet of ungulates in the Eastern and Western Cape Provinces, South Africa *R. glabroscutatum*
- 12b. Conscutum densely punctate. 13
- 13a. Adanal plates with posterior margins broad and slightly convex; internal margins nearly straight until they lead to small medial points or cusps. Recorded mainly from southern Namibia and South Africa *R. exophthalmos*
- 13b. Adanal plates with posterior margins almost straight and without small medial points or cusps. Almost exclusively a parasite of hares in the drier areas of Namibia, Botswana and South Africa *R. oculatus*
- 14a. Conscutum with a large depressed area centrally, posteriorly, or in a central posterior trough, giving the conscutum a concave appearance. 15
- 14b. Conscutum convex or flat but without a concave appearance or large depressed area. 16
- 15a. Conscutum length from 3.0 mm to 4.0 mm; depressed from anterior margin to festoons; adanal plates broadly triangular with concave posterior margins *R. complanatus*
- 15b. Conscutum length from 2.5 mm to 3.0 mm; depressed in posterior half; adanal plates almost sickle-shaped, with broadly-rounded or convex posterior margins *R. planus*
- 16a. Adanal plates either with posterior margins deeply concave between two bluntly-rounded cusps, or with a bluntly-rounded internal and a sharply-pointed external cusp; accessory adanal plates narrowly elongate and pointed; thus giving the adanal plates a 'tricuspid' appearance 17
- 16b. Adanal plates of various shapes but not deeply concave posteriorly, and not appearing 'tricuspid'; accessory adanal plates present or absent. 19
- 17a. Pedicel of palpal article I elongate and easily visible dorsally, producing a U-shaped indentation in the external margin of the first article. Widespread on numerous hosts in the Afrotropical region. . . . *R. humulatus*
- 17b. Pedicel of palpal article I visible dorsally but short and not producing a U-shaped indentation in the external margin of the first article. 18
- 18a. Spiracles each with a short, broad dorsal prolongation. Parasitic on cattle and various mostly small to medium-sized antelopes in East and Central Africa; sometimes sympatric with *R. humulatus* *R. interventus*
- 18b. Spiracles each with a long, narrow dorsal prolongation. Recorded occasionally from domestic animals but more commonly from the smaller wild carnivores, and from

- antelopes, springhares and hares, mainly in southern Africa, more rarely further north. *R. tricuspis*
- 19a. Coxae of the first pair of legs exceptionally long, deeply divided; spiracles unique in shape, oval, each with a short, stubby, dorsal prolongation. A large tick of giraffes in Kenya and Tanzania *R. longicoxatus*
- 19b. Coxae of the first pair of legs not exceptionally long; spiracles of various shapes but not as in couplet 19a. 20
- 20a. Adanal plates tending to be sickle shaped, their external and internal margins roughly parallel and curving around the anus 21
- 20b. Adanal plates of various shapes, may be somewhat curved, but not sickle shaped 26
- 21a. External cervical margins marked by a cessation of the punctation pattern in the cervical fields. *R. pseudolongus*
- 21b. External cervical margins marked by a row of punctations larger than those of the cervical fields. 22
- 22a. A 'simus' pattern of punctations obvious on the conscutum. 23
- 22b. A 'simus' pattern of punctations absent or obscured because the conscutum is too densely punctate. 24
- 23a. Clusters of large punctations present between the posterolateral grooves and the posteromedian groove. Primarily a West African species. *R. senegalensis*
- 23b. Clusters of large punctations lacking between the posterolateral grooves and the posteromedian groove, conscutum essentially impunctate except for the 'simus' pattern. Widely distributed in the Afrotropical region in association with its preferred host, the greater cane rat; rarely recorded from other hosts. *R. simpsoni*
- 24a. Conscutum densely punctate; marginal lines deep grooves composed of large punctations. *R. longus*
- 24b. Conscutum punctate but not densely so; marginal lines slender, narrow, shallow grooves outlined by small punctations 25
- 25a. Posteromedian groove quite short, broad, deep; posterolateral grooves small, rounded and deep. A rare West African species *R. moucheti*
- 25b. Posteromedian groove long, narrow and shallow; posterolateral grooves begin at festoons and extend forward as comma-shaped shallow grooves. A parasite of the sitatunga and sometimes other mammals sharing its semi-aquatic habitat *R. aquatilis*
- 26a. Marginal lines either absent, or short and merely indicated by a row of discrete punctations, or by shagreening. Slight grooves may occasionally be seen in some specimens. 27
- 26b. Marginal lines as definite grooves, either narrow or broad, shallow or deep, for at least part of their length; may be formed by depressions in the conscutum or by contiguous punctations, and may also contain discrete punctations. 35
- 27a. Conscutum with large discrete punctations obvious on either a smooth or a finely punctate background. 28
- 27b. Conscutum without large discrete punctations; it may be smooth with a background of fine punctations or have a relatively punctate background of small to medium-sized punctations. 30
- 28a. Conscutum with a background of numerous fine punctations and scattered rows of medium-sized to large punctations; without clusters of large punctations posteriorly; coxae I each with distinct anterior process visible dorsally. A rare tick recorded from East and Central Africa on the African buffalo. *R. bequaerti*
- 28b. Conscutum with large punctations on a smooth, mostly impunctate background; clusters of large punctations posteriorly; coxae I each with only a slight anterior process visible dorsally. 29
- 29a. Cervical pits small; posteromedian and posterolateral grooves absent or only faintly

- indicated. Present in East, Central and southern Africa, almost exclusively on hyraxes. *R. distinctus*
- 29b. Cervical pits large; posteromedian and posterolateral grooves small but obvious. A parasite of klipspringers in southern Africa. *R. oreotragi*
- 30a. At high magnification each conscutal punctation is seen to be composed of a cluster of closely packed fine punctations. Recorded mainly from cattle, impala and tragelaphine antelopes in countries along the eastern seaboard of Africa from Somalia southwards. *R. muehlensi*
- 30b. At high magnification, each conscutal punctation is seen to be a discrete entity 31
- 31a. Adanal plates each with a medially-projecting cusp or point. 32
- 31b. Adanal plates each without a medially-projecting cusp or point. 33
- 32a. Posteromedian and posterolateral grooves either absent or merely indicated by a slight scoring on the conscutum; accessory adanal plates long and sharply pointed. An East African highland species *R. jeanneli*
- 32b. Posteromedian groove long and narrow; posterolateral grooves small and rounded; accessory adanal plates broad and bluntly rounded. *R. masseyi*
- 33a. Cornua short; adanal plates tend to appear banana shaped. To date recorded twice only from rock hyraxes in West Africa *R. boueti*
- 33b. Cornua long; adanal plates either pear shaped or triangular in shape. 34
- 34a. Adanal plates pear shaped; a small tick with a capitulum that superficially appears triangular in shape. Almost exclusively a parasite of red rock rabbits in southern Zimbabwe and in South Africa *R. arnoldi*
- 34b. Adanal plates triangular in shape; a moderately-large tick with the typical hexagonal basis capituli. *R. ziemanni*
- 35a. Cervical fields and/or marginal lines shagreened or reticulated. 36
- 35b. Cervical fields and/or marginal lines not shagreened or reticulated. 41
- 36a. Basis capituli with long sharp lateral angles projecting over the anterior process of coxae I; a single caudal process is seen in replete specimens. A parasite of hyaenas and the larger wild felids, with most records to date from East Africa *R. carnivoralis*
- 36b. Basis capituli with short, blunt lateral angles not projecting over the anterior process of coxae I; either no caudal process or three caudal processes present in replete specimens. 37
- 37a. With smooth glossy ridges defining a pseudoscutum; conscutum divided into separate raised areas by shagreened tracts; no caudal process in replete specimens *R. sculptus*
- 37b. Without smooth glossy ridges defining a pseudoscutum; conscutum not divided into separate areas; one or three caudal process(es) in replete specimens. 38
- 38a. Central area of conscutum densely punctate, punctations contiguous giving the conscutum a rugose appearance; marginal lines deep, shagreened grooves lacking punctations; three caudal processes in replete specimens. Most commonly parasitic on cattle, African buffalo and the larger antelopes, especially in Central Africa but with scattered records from other areas *R. supertritus*
- 38b. Central area of conscutum not densely punctate, or not densely punctate enough to give the conscutum a rugose appearance; marginal lines with punctations; a single caudal process in replete specimens. . . 39
- 39a. Lateral angles of basis capituli quite broad and recurved; conscutal punctations coalesce to form a roughened depressed area just anterior to the posteromedian groove. A parasite of cattle, the African buffalo and probably other ungulates, primarily in Angola. *R. duttoni*
- 39b. Lateral angles of basis capituli short, only

- slightly recurved; conscutal punctations not forming a roughened depressed area just anterior to the posteromedian groove. . . 40
- 40a. Conscutum quite densely punctate *R. zambeziensis*
- 40b. Conscutum quite lightly punctate *R. appendiculatus*
(Males of *R. zambeziensis* and *R. appendiculatus* are difficult to differentiate, especially when only one or two specimens, or only small specimens are available. Refer to the descriptions, figures and distributions of these two species).
- 41a. Posterior grooves on the conscutum composed of four elements; essentially two posteromedian grooves and two posterolateral grooves. 42
- 41b. Posterior grooves three in number; one posteromedian groove and two posterolateral grooves. 43
- 42a. Cornua very short; two posteromedian punctate depressions and two posterolateral aggregates of large punctations. A small species, collected in northern Mozambique and eastern Zambia *R. serranoi*
- 42b. Cornua very long; all posterior grooves composed of four branches which coalesce anteriorly. A large triangular-shaped species, collected originally in Lesotho *R. deltoideus*
- 43a. Marginal lines long, reaching anteriorly almost to eye level. 46
- 43b. Marginal lines short to medium in length, ending well behind eyes. (If a short marginal line ends and is continued anteriorly towards the eye merely by a series of punctations it is still considered to be short) 44
- 44a. Conscutum heavily punctate with many large punctations posteriorly; broadly rounded posteriorly; caudal process bulbous. *R. gertrudae*
- 44b. Conscutum moderately or lightly punctate. 45
- 45a. Marginal lines outlined by large punctations; adanal plates scooped out posterior to anus, posterior margins broadly rounded *R. zumpti*
- 45b. Marginal lines outlined with small punctations and extending anteriorly as a series of punctations; adanal plates approaching the triangular. A highland species, occurring primarily in East Africa. *R. hurti*
- 46a. The medial aspect of the conscutum (i.e. internal to the marginal lines and external cervical margins), gives the overall impression that this male is a densely and quite evenly punctate tick regardless of the size of the punctations. 47
- 46b. The medial aspect of the conscutum gives the overall impression that this male is a moderately or lightly-punctate tick regardless of the size of the punctations. 52
- 47a. Anterior projection on coxae I prominent, visible dorsally, often heavily sclerotized, as in *R. appendiculatus*. 48
- 47b. Anterior projection on coxae I when present, not prominent nor visible dorsally although a small process may be seen. . . . 49
- 48a. Conscutum uniformly densely punctate, but less so in scapular areas; most punctations of the same size. *R. punctatus*
- 48b. Conscutum more densely punctate posterior to the pseudoscutal area; punctations of varying sizes. Thus far found almost exclusively in the Free State Province of South Africa. *R. warburtoni*
- 49a. Cervical fields long, narrow, depressed, with both their internal and external cervical margins sharply defined. Found almost exclusively in the western regions of the Western Cape Province of South Africa *R. capensis*
- 49b. Limits of cervical fields not clearly defined, at least on the internal aspect; external cervical margins usually indicated by a row of larger punctations or by a cessation of the punctation pattern. 50
- 50a. External cervical margins delimited by a cessation of the punctation pattern; conscutum covered with a dense, even pattern of medium-sized punctations that sometimes coalesce. *R. compositus*

- 50b. External cervical margins delimited by a row of larger conscutal punctations. 51
- 51a. Posteromedian and posterolateral grooves indicated by pronounced sunken areas in the conscutum; posterolateral grooves quite broad; dorsal prolongation of spiracles narrow. *R. sulcatus*
- 51b. Posteromedian and posterolateral grooves usually present but shallow and indistinct; dorsal prolongation of spiracles broad. Occurs in eastern South Africa. *R. follis*
- 52a. Anterior projection on coxae I prominent, visible dorsally. 53
- 52b. Anterior projection on coxae I, when present, not prominent, although a small process may be seen. 55
- 53a. Posteromedian groove and posterolateral grooves well marked, long and narrow; adanal plates elongated posteromedially into extended rounded points. Found almost exclusively in the Fynbos regions of the Eastern and Western Cape Provinces of South Africa. *R. nitens*
- 53b. Posteromedian groove long and narrow; posterolateral grooves bluntly rounded; adanal plates not elongated posteromedially into extended rounded points. 54
- 54a. Cervical fields narrow and lanceolate; internal cervical margins marked by rugosity, external cervical margins marked by a row of large punctations; eyes slightly to markedly convex. *R. pravus*
- 54b. Cervical fields narrow, tapering, shallow; internal cervical margins marked by a slight declination, external cervical margins marked by a few small punctations; eyes flat. *R. kochi*
- 55a. Posteromedian groove and posterolateral grooves primarily indicated as pronounced sunken areas in the conscutum; posterolateral grooves relatively broad, often subcircular or comma shaped. 56
- 55b. Posteromedian groove and posterolateral grooves primarily indicated by rugosity or punctations that may be entirely absent or present as shallow grooves, the posterolateral grooves are not broad sunken areas in the conscutum. 60
- 56a. Marginal lines deep, distinct, heavily punctate. 57
- 56b. Marginal lines shallow, quite indistinct, lightly punctate. *R. camicasi*
- 57a. Dorsal prolongation of spiracles broad, equal to the breadth of the adjacent festoons. 58
- 57b. Dorsal prolongation of spiracles narrow, equal to about one-half the breadth of the adjacent festoons. Almost exclusively a parasite of domestic dogs around the world. *R. sanguineus*
- 58a. Posterolateral grooves subcircular, not originating either at, or very near the festoons; punctations present in areas adjacent to the marginal lines. 59
- 58b. Posterolateral grooves comma shaped, beginning at, or very near the festoons; punctations in the areas adjacent to the marginal lines either sparse or absent. Recorded almost exclusively in Ethiopia. *R. bergeoni*
- 59a. A moderately sized tick with small cervical fields and a diffuse pattern of punctations scattered over the conscutal surface. *R. guilhoni*
- 59b. A large tick with large cervical fields and a dense pattern of punctations scattered over the conscutal surface. *R. turanicus*
- 60a. Posteromedian groove and posterolateral grooves, when present, shallow and rather inconspicuous; palps short. 61
- 60b. Posteromedian groove long and narrow, posterolateral grooves shorter and broader; palps somewhat elongated. A rare species in Namibia and Angola. *R. longiceps*
- 61a. Adanal plates broadly curved posterior to anus, but never as strongly as the curved sickle-shape of those of *R. senegalensis*. 63
- 61b. Adanal plates broad posteriorly and may be slightly concave on their inner aspect, but not strongly curved posterior to anus. Parasitic on the feet of sheep, goats and antelopes in the southern part of Africa. 62