The genus *Hyalomma*. VI. Systematics of *H*. (*Euhyalomma*) *truncatum* and the closely related species, *H*. (*E*.) *albiparmatum* and H. (*E*.) *nitidum* (Acari: Ixodidae)

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Abstract

The geographic distribution of three closely related *Hyalomma* species, namely *Hyalomma* (*Euhyalomma*) *truncatum* Koch, 1844, *Hyalomma* (*Euhyalomma*) *albiparmatum* Schulze, 1919 and *Hyalomma* (*Euhyalomma*) *nitidum* Schulze, 1919 is confined to Africa. A detailed comparison of all stages of development of the three taxa reveals that they possess many more shared than distinguishing characters. In fact differentiation between these species is based on single or dual qualitative characters on their adults. These are a conspicuous, ivory-coloured parma on *H*. (*E*.) *albiparmatum* males, and the absence or reduction in clarity of ivory-coloured bands on the leg segments of *H*. (*E*.) *nitidum* adults, as well as the shape of the external cuticular preatrial fold of the genital operculum of females of the latter species. The adults of all three species and the larva of *H*. (*E*.) *truncatum* are redescribed. The nymph of *H*. *truncatum* and the larva and nymph of *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum* are described for the first time. Data on their geographic distributions and hosts are provided.

Introduction

Hyalomma (*Euhyalomma*) *truncatum* Koch, 1844 is one of the most widely distributed ixodid ticks within the Afrotropical zoogeographic region. It is present from the south of Egypt in the north to the southern regions of South Africa in the south and from Senegal in the west to Somalia in the east. The very extensive distribution range of this species

also implies that it is likely to exhibit a wide range of morphological variability, both individually and geographically. It is thus not surprising that Schulze and his coworkers erected and described a number of species close to *H.* (*E.*) *truncatum*, only for these later to be made synonyms of the latter species (Camicas et al. *1998*).

Feldman-Muhsam (*1954*) redescribed the type specimen of *H.* (*E.*) *truncatum* and provided a list of synonyms which contains both *H. albiparmatum* Schulze, 1919 and *H. nitidum* Schulze, 1919, of which she had examined the type specimens. Hoogstraal (*1956*) and Walker (*1974*) examined a large number of *H.* (*E.*) *albiparmatum* from Kenya and Tanzania, and both concluded that this taxon is not a synonym of *H.* (*E.*) *truncatum*, but a separate species. Their principal and single criterion for this decision is the presence of a conspicuous, ivory-coloured parma in the male. They did, however, note that it was impossible to distinguish between the females and the immature stages of *H.* (*E.*) *albiparmatum* and *H.* (*E.*) *truncatum*. They did not describe the immature stages of either tick.

In a subsequent paper, devoted to Crimean-Congo haemorrhagic fever, Hoogstraal (*1979*) proposed that the old taxon, *H. nitidum*, should be re-established as a separate species. He intimated at the time that a description of this species would be published in a future communication, which, unfortunately has never appeared. Thereafter the designation *H.* (*E.*) *nitidum* appeared sporadically in the literature devoted to West and Central African ticks. More recently a paper on the discriminating characters, distribution and host-parasite records of *H.* (*E.*) *nitidum* has been published (Tomassone et al. *2005*). The latter authors state that the chief criteria for distinguishing *H.* (*E.*) *nitidum* from *H.* (*E.*) *truncatum* are the absence, or reduction in clarity, of ivory-coloured bands on the segments of the legs in both sexes, and that the shape of the external cuticular preatrial fold of the genital operculum differs in the females.

The current situation thus comprises a tenuously defined concept of the relationships between species of the *H.* (*E.*) *truncatum* group, in that there is one distinct species, namely *H.* (*E.*) *truncatum* and two less clear-cut entities, namely *H.* (*E.*) *albiparmatum* and *H.* (*E.*) *nitidum*. The purpose of the present study was to examine all developmental stages of *H.* (*E.*) *truncatum*, *H.* (*E.*) *albiparmatum* and *H.* (*E.*) *nitidum* collected from various parts of their respective geographical ranges and provide comprehensive diagnoses for each of them. This should aid parasitologists, virologists and epidemiologists in arriving at a correct identification for each of these ticks.

Materials and methods

The number of specimens studied and their geographic distribution are listed under each species. Both field-collected and laboratory-reared specimens were studied. The specimens that were examined are housed in the United States National Tick Collection (USNTC) (Institute of Arthropodology and Parasitology, Georgia Southern University, Statesboro, USA), the Zoological Institute, Russian Academy of Sciences (ZIN RAS) (Saint Petersburg, Russia), the Field Museum of Natural History (FMNH) (Chicago, USA), the Royal Museum for Central Africa (RMCA) (Tervuren, Belgium), the Gertrud

Theiler Tick Museum at the Onderstepoort Veterinary Institute (OVI) (Onderstepoort, South Africa), the Natural History Museum of Berlin (NHMB) (Berlin, Germany), the tick collection of the Department of Veterinary Tropical Diseases (Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa), and in the personal tick collection of Dr. J.B. Walker (South Africa).

The immature stages and the more delicate structures of the adults were mounted on glass slides and examined under a light microscope, and the macrostructures of males and females under a stereoscopic microscope. The spiracular plates of the nymphs were studied by means of a scanning electron microscope. Measurements for the male conscutum and female scutum are given in millimeters (mm), and those for the various structures of the immature stages in micrometers (μm). The measurements are arranged as follows: minimum-maximum (average ± standard deviation, n = number of specimens measured), and their schematic layout is to be found in Apanaskevich (*2003*), and Apanaskevich and Horak (*2006*).

Species descriptions

***Hyalomma* (*Euhyalomma*) *truncatum* group (Figs. 1–21)**
Species composition: *H. truncatum* Koch, 1844, *H. albiparmatum* Schulze, 1919, *H. nitidum* Schulze, 1919. It is probable that *H. impressum* Koch, 1844 also belongs to this group of species, but the following diagnosis applies only to the first three species.

Male (Figs. 1–3, 8–10 and 15–17)
Conscutum (Figs. 1, 8 and 15): dark, from reddish-brown to nearly black in colour, pale marbling absent; narrowly oval in shape; widest slightly posterior to mid-length; pronounced narrowing in region of spiracular plates (less than in *H. impressum*, but more than in any other *Hyalomma* species); cervical and lateral grooves shallow, 1/3 length of conscutum; marginal grooves long, almost reaching eyes (sometimes interrupted); posteromedian and paramedian grooves shallow; caudal field conspicuous, depressed, covered with very dense medium-sized, often contiguous, punctations. *Genital structures* (Figs. 2A, 9A and 16A) as illustrated. *Anal shields* (Figs. 2B, 9B and 16B): 3 pairs; adanal plates long, broad, narrowing slightly towards posterior margin, lateral margin slightly convex, anteromedian margin concave, posteromedian margin straight, median projection modest; subanal plates variable in both size and shape, usually medium sized and longitudinally aligned. *Spiracular plate* (Figs. 2C, 9C and 16C): dorsal prolongation long and clearly distinct from body of plate; perforated portion of dorsal prolongation reasonably broad, straight, curving at its apex. Circumspiracular setae sparse.

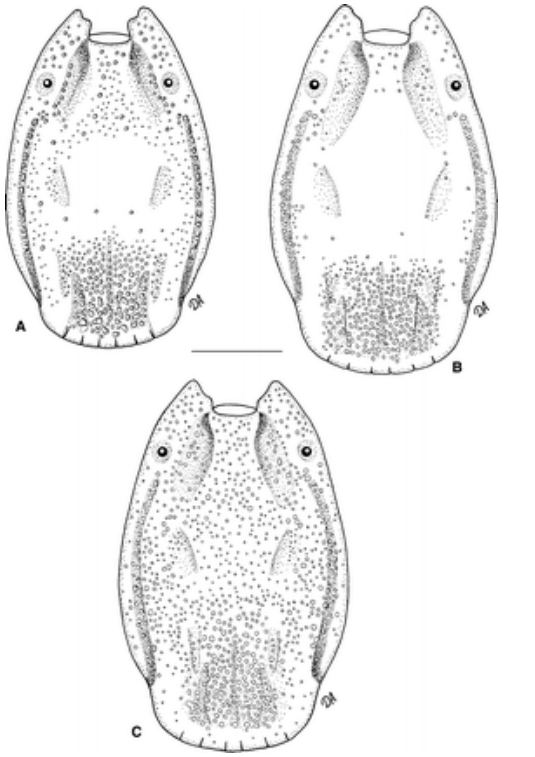

Fig. 1 *Hyalomma truncatum*, male, conscutum. Scale bar = 1 mm

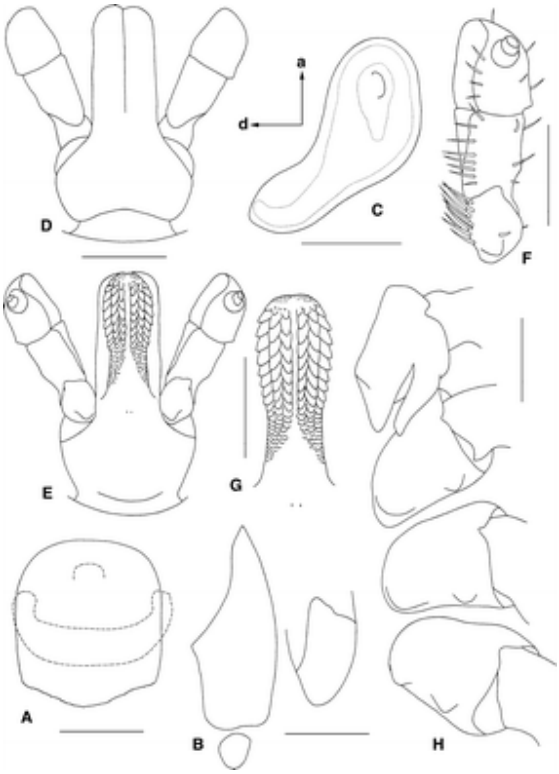

Fig. 2 *Hyalomma truncatum*, male. (**A**) genital structures; (**B**) anal plates; (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) palp ventrally; (**G**) hypostome; (**H**) coxae. Scale bars: A = 200 μm; B, D, E, H = 500 μm; C, F, G = 400 μm. All setation is omitted except drawing F where only setae of segment IV are omitted

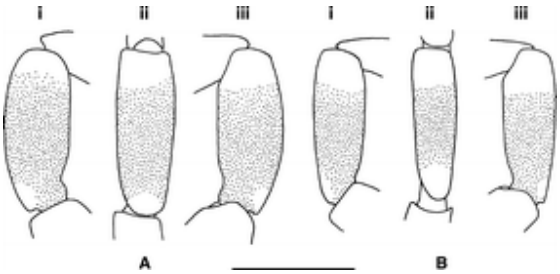

Fig. 3 *Hyalomma truncatum*, genu IV. (**A**) male: (i) lateral view, (ii) dorsal view, (iii) medial view; (**B**) female: (i) lateral view, (ii) dorsal view, (iii) medial view. Scale bar = 1 mm

Basis capituli (Figs. 2D, E, 9D, E and 16D, E): without lateral projections; dorsal posterior margin concave; cornua moderate. *Palpi* (Figs. 2F, 9F and 16F): segment I with more than 5 ventromedian setae. *Hypostome* (Figs. 2G, 9G and 16G): club-shaped; denticulate portion slightly longer than denticle-free portion (small scale-like projections posterior to last large denticle are not considered denticles).

Coxae (Figs. 2H, 9H and 16H): posteromedian and posterolateral spurs on coxa I long, subequal in length or posterolateral spur slightly longer than posteromedian spur, close together, tapering to apices; posterolateral spur on coxae II–IV distinct, triangular; posteromedian spur on coxae II and III indistinct, broadly arcuate; posteromedian spur on coxa IV distinct, triangular.

Female (Figs. 3–5, 10–12 and 17–19)
Scutum (Figs. 4, 11 and 18): dark, from reddish-brown to nearly black in colour, pale marbling absent; slightly longer than broad; posterolateral angles of scutal margin modest; cervical and lateral grooves moderately deep, reaching posterior margin of the scutum. *Genital structures* (Figs. 5A, 12A and 19A): genital aperture wide, deep, rounded (U-shaped); vestibular portion of vagina bulging to some extent. *Spiracular plates* (Figs. 5C, 12C and 19C): perforated portion of dorsal prolongation fairly broad. Circumspiracular setae sparse.

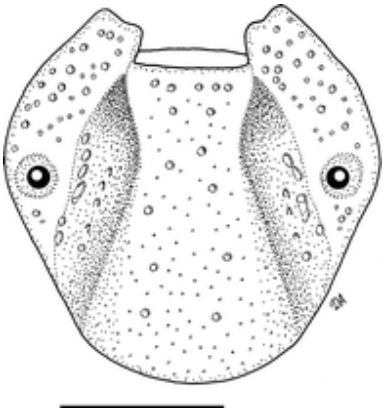

Fig. 4 *Hyalomma truncatum*, female, scutum. Scale bar = 1 mm

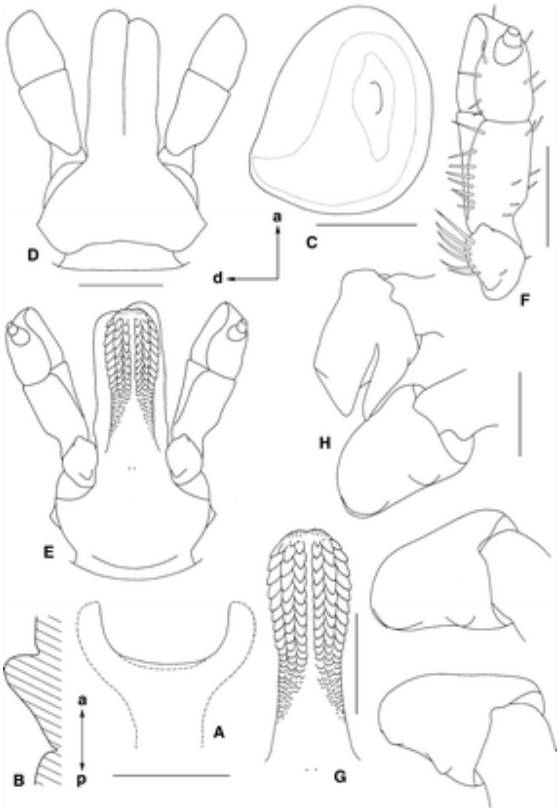

Fig. 5 *Hyalomma truncatum*, female. (**A**) genital structures; (**B**) longitudinal section through preatrial fold of genital aperture (schematically); (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) palp ventrally; (**G**) hypostome; (**H**) coxae. Scale bars: A = 200 μm; C, F, G = 400 μm; E, D, H = 500 μm. All setation is omitted except drawing F where only setae of segment IV are omitted

Basis capituli (Figs. 5D, E, 12D, E and 19D, E): dorsally lateral projections short, absent ventrally; posterodorsal margin straight or slightly concave; dorsal cornua inconspicuous.

Palpi (Figs. 5F, 12F and 19F): segment I with more than 5 ventromedian setae. *Hypostome* (Figs. 5G, 12G and 19G): club-shaped; denticulate portion slightly longer than denticle-free portion.

Coxae (Figs. 5H, 12H and 19H): posteromedian and posterolateral spurs of coxa I long, subequal in length or posterolateral spur slightly longer than posteromedian spur, close together; tapering to apices; posterolateral spur of coxae II–IV well developed, broadly triangular; posteromedian spur of coxae II and III indistinct, broadly arcuate; posteromedian spur of coxa IV distinct, broadly triangular.

Nymph (Figs. 6, 13 and 20)
Scutum (Figs. 6A, B, 13A and 20A): posterior margin broadly rounded; posterolateral indentations clearly visible. *Setae of alloscutum* (Figs. 6C, 13B and 20B): narrowing to apex with denticles. *Spiracular plates* (Figs. 6D, E, 13C and 20C): oval; submarginal row of perforations complete, or with short anterior gap.

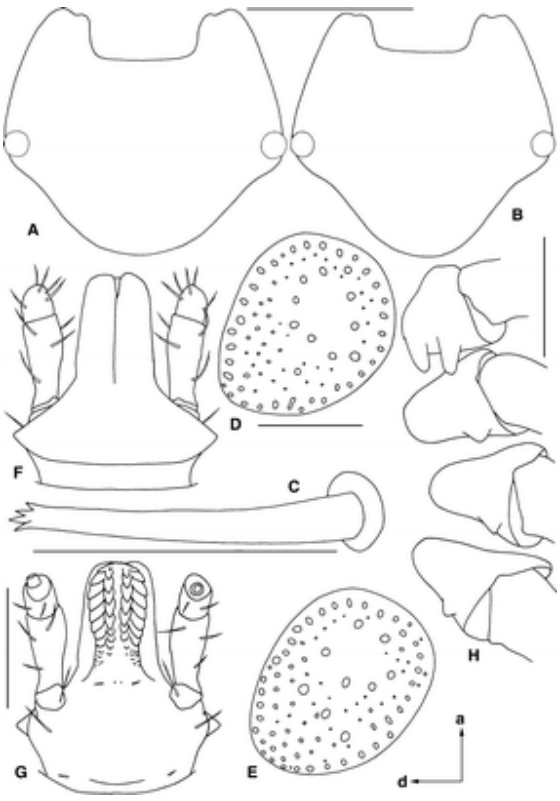

Fig. 6 *Hyalomma truncatum*, nymph. (**A**, **B**) scutum; (**C**) seta of alloscutum; (**D**, **E**) spiracular plate a, anterior; d, dorsal; (**F**) gnathosoma dorsally; (**G**) gnathosoma ventrally; (**H**) coxae. Scale bars: A, B = 400 μm; C, D, E = 50 μm; F, G, H = 200 μm. All setation is omitted except drawing G where only setae of segment IV are omitted

Basis capituli (Figs. 6F, G, 13D, E and 20D, E): as illustrated, dorsally hexagonal. *Palpi* (*segment II*) (Figs. 6F, G, 13D, E and 20D, E): proximally narrow, gradually expanding distally. *Hypostome* (Figs. 6G, 13E and 20E): club-shaped; transition of denticulate

portion to denticle-free portion smooth; median file with 7 or 8 large denticles; denticulate portion twice as long as denticle-free portion.
Coxae (Figs. 6H, 13F and 20F): spurs of coxa I long, tongue-shaped, approximately equal in length; spurs of coxae II–IV moderate, decreasing conspicuously in size from coxa II to coxa IV.

Larva (Figs. 7, 14 and 21)
Scutum (Figs. 7A, 14A and 21A): Portion of scutum posterior to eyes slightly shorter than 1/2 of scutal length; posterior scutal margin broadly rounded with distinct posterolateral indentations on either side of apex.

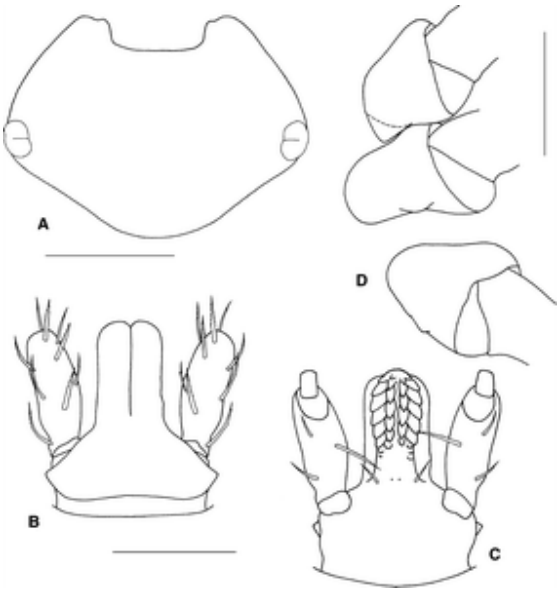

Fig. 7 *Hyalomma truncatum*, larva. (**A**) scutum; (**B**) gnathosoma dorsally; (**C**) gnathosoma ventrally; (**D**) coxae. Scale bars: A = 150 μm; B, C, D = 100 μm. All setation is omitted except drawing C where only setae of segment IV are omitted

Basis capituli (Figs. 7B, C, 14B, C and 21B, C): dorsally hexagonal; tips of lateral projections directed laterally or slightly anteriorly; lateral projections distinct and appear acute from ventral view. *Hypostome* (Figs. 7C, 14C and 21C): large denticles in median files of 5 or 6; transition of denticulate portion to denticle-free portion abrupt; denticulate portion approximately 2/3 of hypostome length.

Coxae (Figs. 7D, 14D and 21D): coxa I with large, subtriangular spur, spurs of coxae II and III moderate; spur of coxa II broadly arcuate, spur of coxa III broadly triangular.

Hosts
The preferred hosts of the adult ticks are large domestic and wild ungulates; they occasionally infest carnivores and other smaller animals. The immature stages parasitize hares and rodents.

Zoogeography
With the exception of some regions of West Africa, in which it is scarce or absent because of high humidity, the distribution of the *H.* (*E.*) *truncatum* group of species encompasses almost the entire Afrotropical zoogeographic region.

Disease relationships
Ticks of this group of species are vectors of a number of disease causing agents and also transmit a toxin. Their vector relationships will be discussed in greater detail under each of the species.

***Hyalomma* (*Euhyalomma*) *truncatum* Koch, 1844 (Figs. 1–7)**
Type specimens: original description based on ♂ (unquantified) from Senegal (Koch *1844*). Holotype: 1♂ (ZMB 1072, Senegal, Mion leg.) deposited in the NHMB (Germany).

Synonyms (Camicas et al. *1998* with corrections):

Hyalomma aegyptium impressum f. *transiens* Schulze, *1919*

Hyalomma planum Schulze, 1919

Hyalomma zambesianum Schulze & Schlottke, 1930

Hyalomma rhinocerotis Schulze & Schlottke, 1930

Hyalomma impressum transiens Schulze, 1919 *sensu* Schulze & Schlottke, 1930

Hyalomma impressum planum Schulze, 1919 *sensu* Schulze & Schlottke, 1930

Hyalomma impressum luteipes Schulze & Schlottke, 1930

Hyalomma lewisi Schulze, 1936

Hyalomma impressum planum f. *rhinocerotis* Schulze & Schlottke, 1930 *sensu* Kratz, 1940

Hyalomma savignyi typica Rousselot, 1946

Hyalomma transiens Schulze, 1919 *sensu* Delpy, 1949

The type specimen of *H. aegyptium impressum* f. *transiens* Schulze, 1919 (1♂, Type, Kamerun, Garua, Ziemann leg.; ZMB 10068) is housed in the NHMB, and DAA has identified it as *H. truncatum*. Furthermore there is a collection lot (64♂, 17♀, Kamerun, Garua, Prof. Ziemann J.G., Dez. 06; USNTC 49679) in the Schulze collection in the USNTC identified as "*impressum transiens*" by Schulze. This collection lot is probably part of the original type series. DAA has identified all of them as *H. truncatum*.
The type specimens of *H. planum* Schulze, 1919 (1♂, 1♀, Type, Deutsch Ost Africa, ZMB 10072) are housed in the NHMB and have been identified as *H. truncatum* by DAA. There is also a collection lot (1♂, 1♀, Deutsch Ost Africa, USNTC 49687) in the

Schulze collection housed in the USNTC originally identified as *H. planum*. DAA has identified these specimens as *H. truncatum*.

We discovered specimens of *H. impressum luteipes* Schulze & Schlottke, 1930 (3♀, Sennar, Sudan, II.14, Werner) in the Schulze collection in the USNTC. DAA identified 2♀ as *H. truncatum* and 1♀ as *H. rufipes*. In the same collection we also came across specimens of *H. lewisi* Schulze, 1936 (2♂, 1♀, Tanganjika, 8.VI.35) and DAA has identified all three as *H. truncatum*. The abovementioned specimens of *H. impressum luteipes* and *H. lewisi* most probably come from the original type series.

The adults of *H.* (*E.*) *truncatum* have been described and illustrated in several publications. The most comprehensive descriptions and illustrations are given by Hoogstraal and his co-workers (Hoogstraal *1956*; Hoogstraal et al. *1981*). The larva has been described by Camicas (*1970*), but the nymph has not been described.

Material studied

A total of more than 5,000 males, 5,000 females, 1,000 nymphs, and 1,000 larvae from Angola, Benin, Botswana, Burkina Faso, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Ivory Coast, Kenya, Mali, Mozambique, Namibia, Nigeria, Saudi Arabia, Senegal, Somalia, South Africa, Sudan, Swaziland, Tanzania, Zambia and Zimbabwe have been examined. Both field-collected and laboratory-reared specimens were examined. The holotype specimen has also been examined by DAA.

Male (redescription) (Figs. 1–3)
Conscutum (Fig. 1A–C): length 3.60–4.55 (4.09 ± 0.23, n = 100), width 2.30–3.00 (2.64 ± 0.15, n = 100), ratio length:width 1.40–1.71 (1.55 ± 0.06, n = 100); parma not obvious; 5 well-defined festoons along the posterior margin of conscutum; with the exception of the caudal field (see description for *H. truncatum* group), conscutum very sparsely to densely covered with fine and medium-sized punctations. Sclerotized plaques present ventrally on median and paramedian festoons, or the median plaque may be absent.

Ivory-coloured enamel band encircles distal portion of each segment of legs; proximally small dorsal ivory-coloured enamel spot (Fig. 3A).

Female (redescription) (Figs. 3–5)
Scutum (Fig. 4): length 1.79–2.60 (2.16 ± 0.14, n = 100), width 1.72–2.44 (2.09 ± 0.12, n = 100), ratio length:width 0.91–1.12 (1.04 ± 0.04, n = 100); fine and medium-sized punctations very sparse to dense. Preatrial external fold of genital aperture humped anteriorly and flat to slightly concave posteriorly (Fig. 5B).

Ivory-coloured enamel band encircles distal portion of each segment of legs; proximally small dorsal ivory-coloured enamel spot (Fig. 3B).

Nymph (first description) (Fig. 6)
Scutum (Fig. 6A, B): length 468–625 (526 ± 28.78, n = 118), width 537–742 (608 ± 34.81, n = 116), ratio length:width 0.78–1.01 (0.87 ± 0.04, n = 115), distance between posterior margin of eyes and posterior margin of scutum 176–249 (205 ± 14.28, n = 117), width:length of posterior portion of scutum 2.56–3.50 (2.96 ± 0.17, n = 115). *Spiracular plates* (Fig. 6D, E): dorsal tail poorly developed, relatively broad, blunt at tip. *Basis capituli* (Fig. 6F, G): length 322–420 (368 ± 21.21; n = 42), width 287–400 (330 ± 16.94, n = 122) ratio length:width 1.05–1.22 (1.12 ± 0.04; n = 42). *Palpi* (*segment II*) (Fig. 6F, G): length 137–199 (158 ± 9.96, n = 122), width 55–77 (61 ± 3.71, n = 122), ratio length:width 2.33–3.04 (2.59 ± 0.13, n = 122). *Hypostome* (Fig. 6G): length 175–240 (204 ± 13.42, n = 108), width 56–94 (72 ± 7.84, n = 119), ratio length:width 2.23–3.57 (2.88 ± 0.32, n = 108).

Coxal pore present or absent in nearly equal proportions (53 specimens examined with a pore and 40 specimens without a pore) (Fig. 6H).

Larva (redescription) (Fig. 7)
Scutum (Fig. 7A): length 215–265 (248 ± 9.16, n = 113), width 330–380 (357 ± 9.63, n = 125), ratio length:width 0.63–0.75 (0.69 ± 0.02, n = 113), distance from posterior margin of eyes to posterior margin of scutum 70–97 (87 ± 4.93, n = 113), width:length ratio of posterior portion 3.69–4.71 (4.08 ± 0.20, n = 113).

Basis capituli (Fig. 7B, C): width 120–151 (138 ± 7.06, n = 125). *Palpi* (*segments II–III*) (Fig. 7B, C): length 84–120 (104 ± 7.72, n = 125), width 31–38 (36 ± 1.66, n = 125), ratio length:width 2.31–3.58 (2.87 ± 0.32, n = 125). *Hypostome* (Fig. 7C): length 77–106 (92 ± 0.70, n = 121), width 25–31 (29 ± 0.16, n = 122), ratio length:width 2.46–4.09 (3.24 ± 0.04, n = 121).

Genu I: length 106–139 (127 ± 0.64, n = 125), width 41–50 (46 ± 0.25, n = 87), ratio length:width 2.43–3.35 (2.79 ± 0.02, n = 87).

Hosts
The list of hosts of *H*. (*E*.) *truncatum* is extensive. The main hosts of the adults are larger domestic and wild ungulates of the orders Artiodactyla and Perissodactyla. Smaller animals including carnivores, rodents, hares, hedgehogs, birds and reptiles, as well as primates and humans are rarely infested. The hosts of the immature stages are hares and rodents (Hoogstraal *1956*; Hoogstraal et al. *1981*; Norval *1982*; Walker *1974*; Yeoman and Walker *1967*; our data). Most reports of the immature stages on birds are probably misidentifications and should be rechecked. The hosts from which adult and immature *H*. (*E*.) *truncatum* have been collected in South Africa are listed in Table 1 as an example of the very wide host spectrum of this tick.

Table 1 Hosts of adult and immature *Hyalomma* (*Euhyalomma*) *truncatum* in South Africa

Tick life stage and hosts	Number of hosts examined	Total number of ticks collected	Mean number of ticks
Adult ticks			
Cattle, *Bos* spp.	758	1645	2.2
Sheep, *Ovis aries*	4272	2613	0.6
Goats, *Capra hircus*	1141	185	0.2
Dogs, *Canis familiaris*	395	23	0.06
Humans, *Homo sapiens*	15 (tick bites)	24	1.6
Eland, *Taurotragus oryx*	28	2352	84
Greater kudus, *Tragelaphus strepsiceros*	120	38	0.3
Gemsbok, *Oryx gazella*	36	228	6.3
Black wildebeest, *Connochaetes gnou*	24	146	6.1
Blue wildebeest, *Connochaetes taurinus*	47	6	0.1
Giraffes, *Giraffa camelopardalis*	6	153	25.5
Cape mountain zebras, *Equus zebra zebra*	14	205	14.64
Burchell's zebras, *Equus burchelli*	34	37	1.1
White rhinoceroses, *Ceratotherium simum*	4	22	5.5
Black rhinoceroses, *Diceros bicornis*	9	39	4.3
Warthogs, *Phacochoerus africanus*	92	24	0.3
Cheetahs, *Acinonyx jubatus*	3	1	0.3
Lions, *Panthera leo*	22	1	0.05
Immature ticks			
Cape hares, *Lepus capensis*	66	3138	47.5
Scrub hares, *Lepus saxatilis*	656	51085	77.9
Smith's red rock hares, *Pronolagus rupestris*	28	14	0.5
Bush Karoo rats, *Otomys*	38	4	0.1

Tick life stage and hosts	Number of hosts examined	Total number of ticks collected	Mean number of ticks
unisulcatus			
Four-striped grass mice, *Rhabdomys pumilio*	576	1596	2.8
Namaqua rock rats, *Aethomys namaquensis*	424	18	0.04
Bushveld gerbils, *Tatera leucogaster*	51	43	0.8

Zoogeography

Hyalomma (*E.*) *truncatum* is widely distributed in *Africa*: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Djibouti, Egypt (mainly introduced), Eritrea, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Madagascar (introduced), Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles (may have been introduced), Somalia, South Africa, Spain (Canary Islands), Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe (Hoogstraal *1956*; Kolonin *1983*; Theiler *1962*; our data). This species is generally rare or absent in the moister regions of West and Central Africa and the southern and eastern coastal regions of southern Africa. We could find no records from Congo, Gabon, Equatorial Guinea, Liberia, Sierra Leone and Lesotho. *Hyalomma* (*E.*) *truncatum* is thus present almost throughout sub-Saharan Africa. It has also been reported extralimitally from southwestern *Asia*: Saudi Arabia and Yemen (Hoogstraal *1956*; Hoogstraal et al. *1981*; our data).

Disease relationships

Hyalomma (*E.*) *truncatum* is a vector of the virus causing Crimean-Congo haemorrhagic fever in humans, but would appear to be a less efficient vector than *Hyalomma rufipes* (Hoogstraal et al. *1981*; Swanepoel and Burt *2004*). Other viruses isolated from *Hyalomma truncatum* are Bhanja, Dugbe and Jos (Hoogstraal et al. *1981*). It is also a vector of *Babesia caballi* the causative organism of equine piroplasmosis (De Waal *1990*). The females of certain strains of this tick transmit an epitheliotrophic toxin to calves and susceptible older cattle causing a condition colloquially known as sweating sickness (Bezuidenhout and Malherbe *1981*). The attachment of adult ticks to the interdigital clefts and fetlocks of lambs frequently results in lameness (Kok and Fourie *1995*), and clusters of these ticks on dogs often cause painful, deep, necrotic lesions around their site of attachment (Burr *1983*). *Hyalomma truncatum* can also transmit the causative organism of Q-fever as well as certain *Theileria* species (Hoogstraal et al. *1981*).

***Hyalomma* (*Euhyalomma*) *albiparmatum* Schulze, 1919 (Figs. 8–14)**
Type specimens: original description based on ♂ and ♀ (unquantified) from Tanzania (Schulze *1919*). Syntypes: 1♂ and 1♀ (ZMB 16667, German East Africa) deposited in the NHMB (Germany).

Synonyms (Camicas et al. *1998*):

Hyalomma aegyptium albiparmatum Schulze, *1919*

Hyalomma impressum brunneiparmatum Schulze & Schlottke, 1930

Hyalomma impressum albiparmatum Schulze, 1919 *sensu* Schulze & Schlottke, 1930

Hyalomma planum albiparmatum Schulze, 1919 *sensu* Kratz, 1940

Hyalomma brunneiparmatum Schulze & Schlottke, 1930 *sensu* Hoogstraal, 1956

We think that the synonymy of *H. impressum brunneiparmatum* Schulze & Schlottke, 1930 with *H. albiparmatum* may be questionable. The type locality for *H. i. brunneiparmatum* is Togo, which is too far removed from the restricted East African distribution of *H. albiparmatum*. Unfortunately the type specimen(s) of *H. i. brunneiparmatum* seems to be lost and the descriptions of Kratz (*1940*) and Schulze and Schlottke (*1930*) are too poor to reach a definite conclusion.
Descriptions and illustrations of adult *H.* (*E.*) *albiparmatum* are provided in Schulze (*1919*), Schulze and Schlottke (*1930*), Kratz (*1940*), Hoogstraal (*1956*) and Matthysse and Colbo (*1987*). The immature stages have neither been described nor illustrated.

Material examined
A total of 596 males, 390 females, 500 nymphs, and 300 larvae from Kenya and Tanzania have been studied. Both field-collected and laboratory-reared specimens were examined. All the type specimens have been examined by DAA.

Male (redescription) (Figs. 8, 9 and 10)
Conscutum (Fig. 8): length 2.98–4.34 (3.89 ± 0.02, n = 100), width 2.00–2.88 (2.52 ± 0.01, n = 100), ratio length:width 1.42–1.81 (1.54 ± 0.01, n = 100); parma conspicuous, large, ivory-coloured to light brown; 4 well-defined festoons along the posterior margin of the conscutum; with the exception of the caudal field (see description for *H. truncatum* group), conscutum usually sparsely covered with fine and medium-sized punctations. Sclerotized plaques present ventrally on paramedian festoons but absent on median festoon.

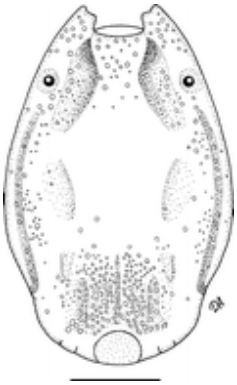

Fig. 8 *Hyalomma albiparmatum*, male, conscutum. Scale bar = 1 mm

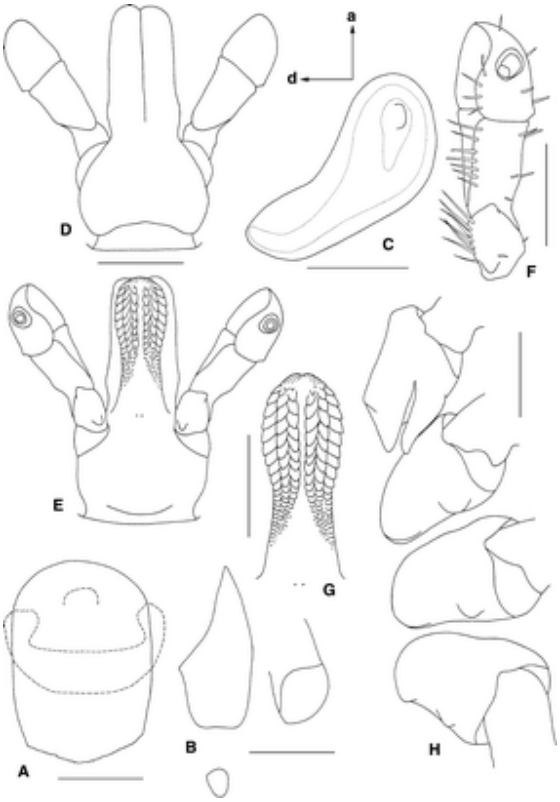

Fig. 9 *Hyalomma albiparmatum*, male. (**A**) genital structures; (**B**) anal plates; (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) palp ventrally; (**G**) hypostome; (**H**) coxae. Scale bars: A = 200 μm; B, D, E, H = 500 μm; C, F, G = 400 μm. All setation is omitted except drawing F where only setae of segment IV are omitted

Ivory-coloured enamel band encircles distal portion of each segment of legs; proximally small dorsal ivory-coloured enamel spot (Fig. 10A).

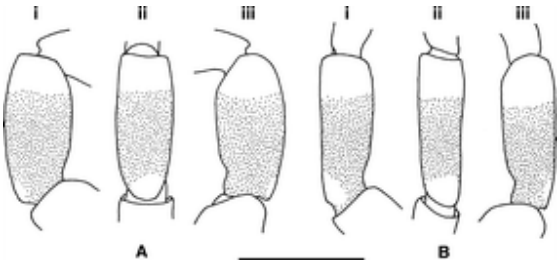

Fig. 10 *Hyalomma albiparmatum*, genu IV. (**A**) male: (i) lateral view, (ii) dorsal view, (iii) medial view; (**B**) female: (i) lateral view, (ii) dorsal view, (iii) medial view. Scale bar = 1 mm

Female (redescription) (Figs. 10–12)

Scutum (Fig. 11): length 1.71–2.51 (2.16 ± 0.02, n = 41), width 1.64–2.29 (2.08 ± 0.02, n = 41), ratio length:width 0.97–1.11 (1.04 ± 0.01, n = 41); fine and medium-sized punctations usually very sparse. Preatrial external fold of genital aperture humped anteriorly and flat to slightly concave posteriorly (Fig. 12B).

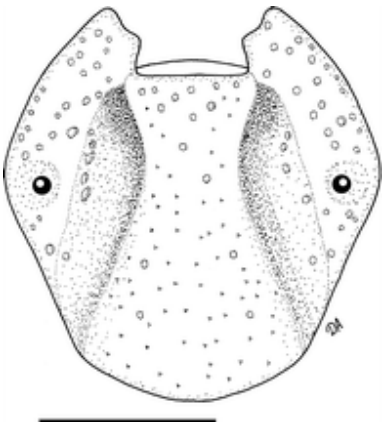

Fig. 11 *Hyalomma albiparmatum*, female, scutum. Scale bar = 1 mm

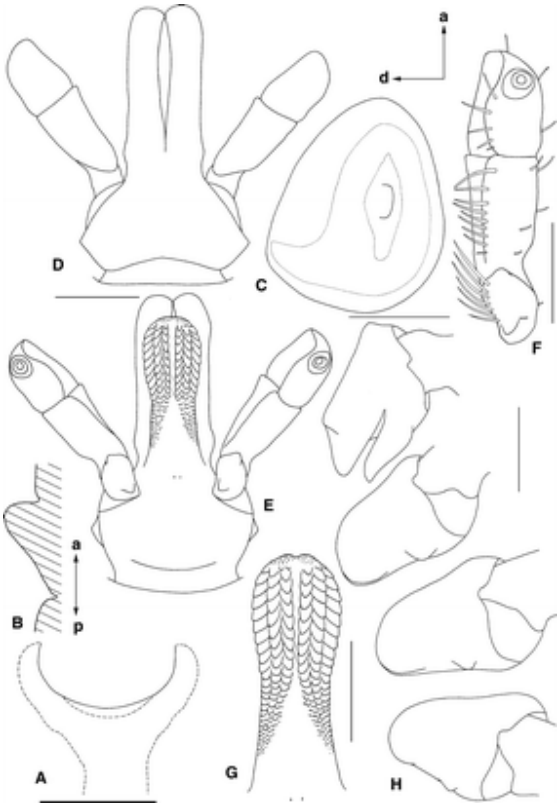

Fig. 12 *Hyalomma albiparmatum*, female. (**A**) genital structures; (**B**) longitudinal section through preatrial fold of genital aperture (schematically); (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) palp ventrally; (**G**) hypostome; (**H**) coxae. Scale bars: A = 200 μm; C, F, G = 400 μm; E, D, H = 500 μm. All setation is omitted except drawing F where only setae of segment IV are omitted

Ivory-coloured enamel band encircles distal portion of each segment of legs; proximally small dorsal ivory-coloured enamel spot (Fig. 10B).

Nymph (first description) (Fig. 13)
Scutum (Fig. 13A): length 454–595 (541 ± 24.80, n = 68), width 547–732 (617 ± 31.19, n = 68), ratio length:width 0.75–1.00 (0.88 ± 0.04, n = 68), distance between posterior margin of eyes and posterior margin of scutum 156–244 (219 ± 14.88, n = 68), width:length of posterior portion of scutum 2.46–3.81 (2.82 ± 0.19, n = 68). *Spiracular plates* (Fig. 13C): dorsal tail well developed, relatively broad, blunt at tip.

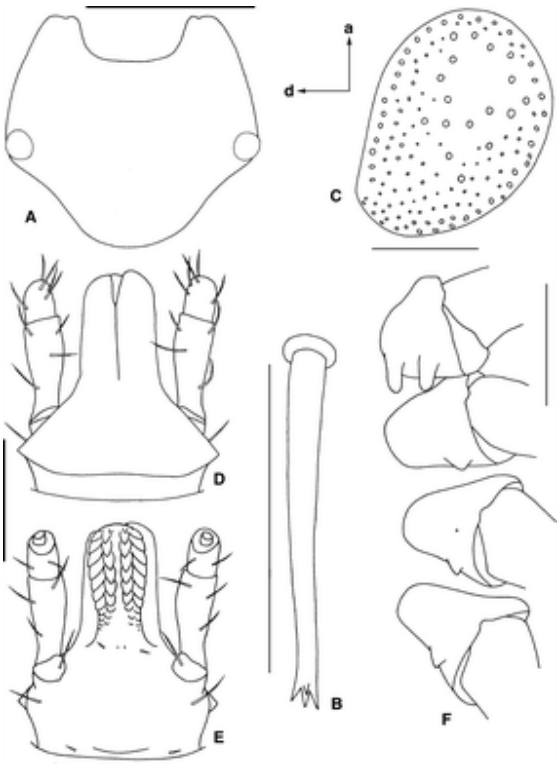

Fig. 13 *Hyalomma albiparmatum*, nymph. (**A**) scutum; (**B**) seta of alloscutum; (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) coxae. Scale bars: A = 400 μm; B, C = 50 μm; D, E, F = 200 μm. All setation is omitted except drawing E where only setae of segment IV are omitted

Basis capituli (Fig. 13D, E): length 365–415 (387 ± 14.64; n = 41), width 300–380 (345 ± 16.97, n = 68), ratio length:width 1.04–1.20 (1.10 ± 0.04; n = 41). *Palpi* (*segment II*) (Fig. 13D, E): length 149–197 (172 ± 10.83, n = 68), width 53–67 (60 ± 2.50, n = 68), ratio length:width 2.46–3.32 (2.87 ± 0.18, n = 68). *Hypostome* (Fig. 13E): length 180–240 (215 ± 11.79, n = 60), width 58–79 (68 ± 4.75, n = 68), ratio length:width 2.59–3.66 (3.20 ± 0.27, n = 60).

Coxal pore usually present (Fig. 13F).

Larva (first description) (Fig. 14)
Scutum (Fig. 14A): length 227–252 (241 ± 0.80, n = 62), width 330–375 (351 ± 0.97, n = 92), ratio length:width 0.65–0.71 (0.68 ± 0.002, n = 62), distance from posterior margin of eyes to posterior margin of scutum 85–100 (91 ± 0.47, n = 62), width:length ratio of posterior portion 3.58–4.12 (3.89 ± 0.02, n = 62).

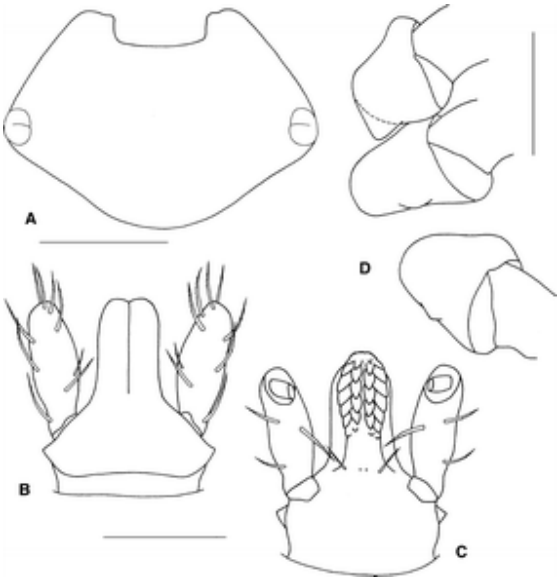

Fig. 14 *Hyalomma albiparmatum*, larva. (**A**) scutum; (**B**) gnathosoma dorsally; (**C**) gnathosoma ventrally; (**D**) coxae. Scale bars: A = 150 μm; B, C, D = 100 μm. All setation is omitted except drawing C where only setae of segment IV are omitted.

Basis capituli (Fig. 14B, C): width 125–144 (136 ± 0.37, n = 92). *Palpi* (*segments II–III*) (Fig. 14B, C): length 90–110 (97 ± 0.40, n = 92), width 34–38 (36 ± 0.10, n = 92), ratio length:width 2.44–3.29 (2.72 ± 0.02, n = 92). *Hypostome* (Fig. 14C): length 74–96 (85 ± 0.42, n = 92), width 26–31 (28 ± 0.10, n = 92), ratio length:width 2.46–3.54 (3.02 ± 0.02, n = 92).

Genu I: length 113–137 (126 ± 0.42, n = 92), width 43–49 (46 ± 0.11, n = 84), ratio length:width 2.54–3.00 (2.75 ± 0.01, n = 84).

Hosts

Adults of *H*. (*E*.) *albiparmatum* have been recorded from domestic cattle, sheep, goats, and dogs, and from larger wild mammals such as African buffalo, *Syncerus caffer* (Sparrman), gemsbok, *Oryx gazella* (Linnaeus), hartebeest, *Alcelaphus buselaphus* (Pallas), blue wildebeest, *Connochaetes taurinus* (Burchell), eland, *Taurotragus oryx* (Pallas), greater kudu, *Tragelaphus strepsiceros* (Pallas), impala, *Aepyceros melampus* (Lichtenstein), giraffe, *Giraffa camelopardalis* (Linnaeus), desert warthog, *Phacochoerus aethiopicus* (Pallas), black rhinoceros, *Diceros bicornis* (Linnaeus), Burchell's zebra, *Equus burchellii* (Gray), lion, *Panthera leo* (Linnaeus) and leopard, *Panthera pardus* (Linnaeus). There are records of infestations that are probably accidental of humans and ostrich, *Struthio camelus* Linnaeus by adults. Nymphs have been reported from Cape hare, *Lepus capensis* Linnaeus (Hoogstraal *1956*; Mertins and Schlater *1991*; Walker *1974*; Yeoman and Walker *1967*; our data).

Zoogeography
The distribution of *H. albiparmatum* is confined to *East Africa*: Kenya and Tanzania (Walker *1974*; Yeoman and Walker *1967*; our data). There is one record of this species as *H. impressum brunneiparmatum* from Togo (Schulze and Schlottke *1930*), but this record or synonymy should be checked. The record from Ethiopia (Morel and Rodhain *1972*) later proved to be unconfirmed (Morel *1976*). Theiler (*1962*) placed this species in Somalia, but Morel (*1976*) believed that it does not occur in that country. It has also been recorded from the former Ruanda-Urundi (Chodziesner *1924*), but this record should be rechecked.

Disease relationships
Hyalomma (*E.*) *albiparmatum* is a vector of *Rickettsia conorii* (Heisch et al. *1962*).

***Hyalomma* (*Euhyalomma*) *nitidum* Schulze, 1919 (Figs. 15–21)**
Type specimens: original description based on ♂ and ♀ (unquantified) ex buffalo from Gora in the former German colony New Cameroon (Schulze *1919*). Today the territory of New Cameroon is a part of south-western Chad, western Central African Republic, northern Republic of Congo and Gabon, but not of modern Cameroon. Unfortunately we have been unable to trace a locality named Gora in these countries. It is possible that the name has since been altered or that Schulze misspelled it on the label. We suspect that the type locality could most probably be either in Chad or in the Central African Republic. There are records of *H. nitidum* from both these countries, in which there are also localities that sound similar to Gora, namely Goro, Gore or Gara. Syntypes: 1♂ and 1♀ (ZMB 10071, Gora, Neu-Kamerun, ex Büffel, Honny leg.) deposited in the NHMB (Germany).

Synonym (Camicas et al. *1998*):
Hyalomma impressum nitidum Schulze, 1919 *sensu* Schulze & Schlottke, 1930
Descriptions and illustrations of the adults have been provided by Schulze (*1919*), Schulze and Schlottke (*1930*), Kratz (*1940*) and Tomassone et al. (*2005*). The immature stages have neither been described nor illustrated.

Material examined
The total number of specimens studied includes 594 males, 206 females, 60 nymphs and 250 larvae from Benin, Burkina Faso, Cameroon, Central African Republic, Gambia, Ghana, Guinea, Ivory Coast, Mali, Nigeria and Senegal. Both field-collected and laboratory-reared specimens were examined. All the type specimens have been seen by DAA.

Male (redescription) (Figs. 15, 16 and 17)
Conscutum (Fig. 15): length 2.98–4.46 (3.90 ± 0.25, n = 100), width 1.92–2.78 (2.43 ± 0.15, n = 100), ratio length:width 1.51–1.69 (1.60 ± 0.04, n = 100); parma not obvious; 5 well-defined festoons along posterior margin of conscutum; with the exception of the caudal field (see description for *H. truncatum* group), conscutum usually sparsely covered with fine and medium-sized punctations. Sclerotized plaques present ventrally on median and paramedian festoons.

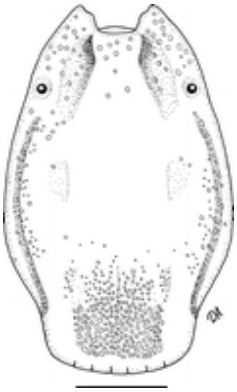

Fig. 15 *Hyalomma nitidum*, male, conscutum. Scale bar = 1 mm

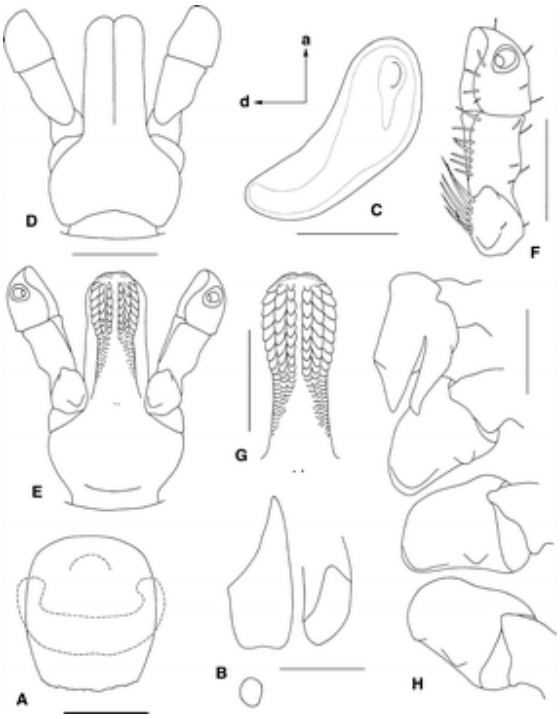

Fig. 16 *Hyalomma nitidum*, male. (**A**) genital structures; (**B**) anal plates; (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) palp ventrally; (**G**) hypostome; (**H**) coxae. Scale bars: A = 200 μm; B, D, E, H = 500 μm; C, F, G = 400 μm. All setation is omitted except drawing F where only setae of segment IV are omitted

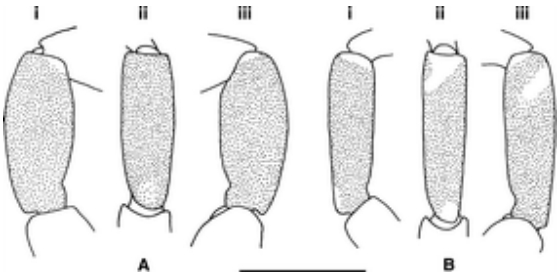

Fig. 17 *Hyalomma nitidum*, genu IV. (**A**) male: (i) lateral view, (ii) dorsal view, (iii) medial view; (**B**) female: (i) lateral view, (ii) dorsal view, (iii) medial view. Scale bar = 1 mm

Segments of legs without ivory-coloured enamelling, uniformly brown, or with greatly reduced pale ivory-coloured enamel band distally and small pale dorsal enamel spot proximally (Fig. 17A).

Female (redescription) (Figs. 17–19)
Scutum (Fig. 18): length 1.72–2.57 (2.06 ± 0.15, n = 100), width 1.81–2.51 (2.07 ± 0.12, n = 100), ratio length:width 0.89–1.08 (1.00 ± 0.04, n = 100); fine and medium-sized punctations usually very sparse. Preatrial external fold of genital aperture humped throughout its length (Fig. 19B).

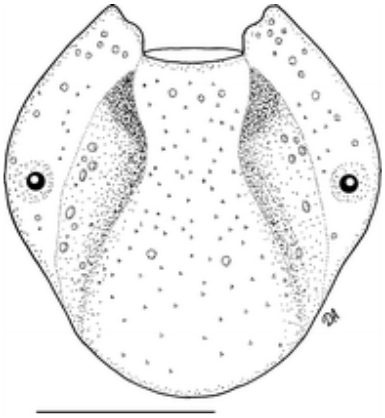

Fig. 18 *Hyalomma nitidum*, female, scutum. Scale bar = 1 mm

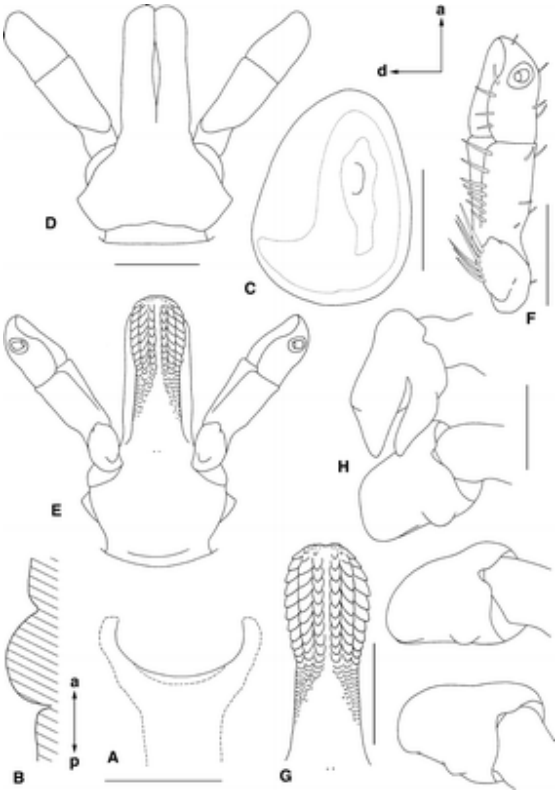

Fig. 19 *Hyalomma nitidum*, female. (**A**) genital structures; (**B**) longitudinal section through preatrial fold of genital aperture (schematically); (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) palp ventrally; (**G**) hypostome; (**H**) coxae. Scale bars: A = 200 μm; C, F, G = 400 μm; E, D, H = 500 μm. All setation is omitted except drawing F where only setae of segment IV are omitted

Segments of legs usually with markedly reduced pale ivory-coloured enamel band distally and small dorsal pale enamel spot proximally (Fig. 17B).

Nymph (first description) (Fig. 20)

Scutum (Fig. 20A): length 485–572 (543 ± 21.36, n = 17), width 548–628 (603 ± 19.04, n = 17), ratio length:width 0.84–0.96 (0.90 ± 0.03, n = 17), distance between posterior margin of eyes and posterior margin of scutum 183–230 (214 ± 10.63, n = 17), width:length of posterior portion of scutum 2.46–3.30 (2.83 ± 0.20, n = 17). *Spiracular plates* (Fig. 20C): dorsal tail clearly developed, relatively narrow, blunt at tip.

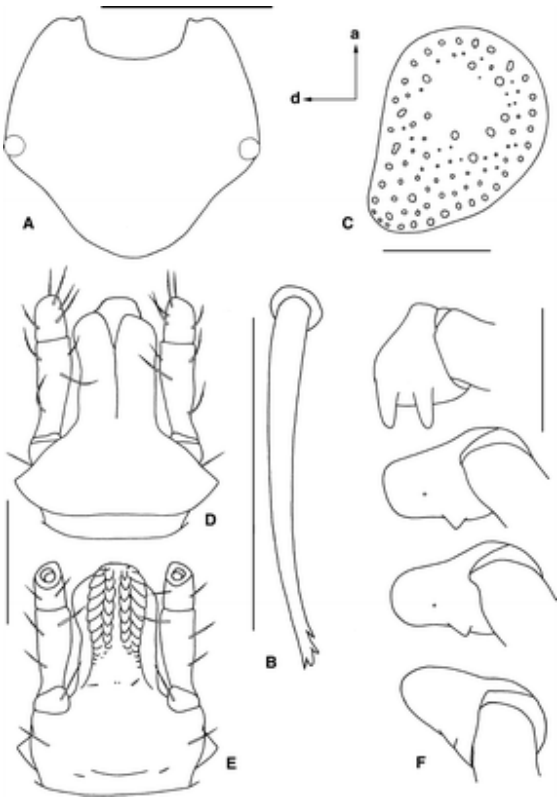

Fig. 20 *Hyalomma nitidum*, nymph. (**A**) scutum; (**B**) seta of alloscutum; (**C**) spiracular plate a, anterior; d, dorsal; (**D**) gnathosoma dorsally; (**E**) gnathosoma ventrally; (**F**) coxae. Scale bars: A = 400 μm; B, C = 50 μm; D, E, F = 200 μm. All setation is omitted except drawing E where only setae of segment IV are omitted

Basis capituli (Fig. 20D, E): length 304–352 (334 ± 20.78, n = 4), width 292–356 (324 ± 15.44, n = 17), ratio length:width 1.04–1.08 (1.06 ± 0.02, n = 4). *Palpi* (*segment II*) (Fig. 20D, E): length 136–180 (158 ± 10.33, n = 17), width 52–60 (57 ± 2.79, n = 17), ratio length:width 2.53–3.04 (2.75 ± 0.16, n = 17). *Hypostome* (Fig. 20E): length 164–188 (178 ± 10.29, n = 7), width 56–84 (73 ± 8.16, n = 16), ratio length:width 2.47–3.07 (2.68 ± 0.21, n = 7).

Coxal pore present (Fig. 20F).

Larva (first description) (Fig. 21)
Scutum (Fig. 21A): length 245–274 (261 ± 1.05, n = 44), width 338–367 (357 ± 1.00, n = 44), ratio length:width 0.70–0.76 (0.73 ± 0.003, n = 44), distance from posterior margin of eyes to posterior margin of scutum 93–108 (101 ± 0.58, n = 44), width:length ratio of posterior portion 3.32–3.79 (3.52 ± 0.02, n = 44).

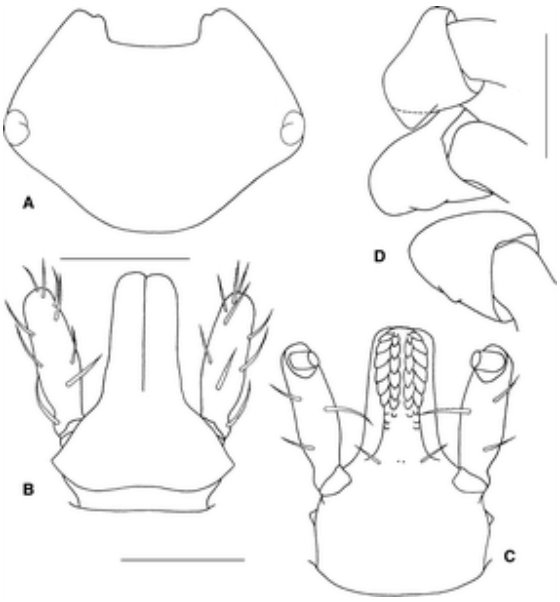

Fig. 21 *Hyalomma nitidum*, larva. (**A**) scutum; (**B**) gnathosoma dorsally; (**C**) gnathosoma ventrally; (**D**) coxae. Scale bars: A = 150 μm; B, C, D = 100 μm. All setation is omitted except drawing C where only setae of segment IV are omitted

Basis capituli (Fig. 21B, C): width 137–154 (147 ± 0.60, n = 44). *Palpi* (*segments II–III*) (Fig. 21B, C): length 108–121 (115 ± 0.47, n = 44), width 33–37 (34 ± 0.11, n = 44), ratio length:width 3.13–3.52 (3.34 ± 0.02, n = 44). *Hypostome* (Fig. 21C): length 97–113 (106 ± 0.50, n = 44), width 28–30 (29 ± 0.14, n = 44), ratio length:width 3.46–3.92 (3.68 ± 0.02, n = 44).

Genu I: length 126–143 (135 ± 0.53, n = 44), width 46–51 (47 ± 0.20, n = 44), ratio length: width 2.68–3.05 (2.86 ± 0.01, n = 44).

Hosts

Adults of *H.* (*E.*) *nitidum* have been collected from domestic cattle, horses and goats and from larger wild mammals such as African buffalo, *S. caffer*, roan antelope, *Hippotragus equinus* (Desmarest), waterbuck, *Kobus ellipsiprymnus* (Ogilby), kob, *Kobus kob* (Erxleben), red river hog, *Potamochoerus porcus* (Linnaeus) and warthog, *Phacochoerus africanus* (Gmelin). There are records from humans and golden jackal, *Canis aureus* Linnaeus, of apparently accidental infestations, and one record from an African savanna hare, *Lepus victoriae* Thomas. Immature stages have been collected from African savanna hare, *L. victoriae* and the striped grass mouse, *Lemniscomys striatus* (Linnaeus) (Tomassone et al. *2005*; our data).

Zoogeography

Hyalomma (*E.*) *nitidum* is present in the humid regions of *West and Central Africa*: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Equatorial Guinea, Guinea, Ivory Coast, Mali, Nigeria and Senegal (Tomassone et al. *2005*; our data).

Disease relationships
Our knowledge of the vector capacity of *H*. (*E*.) *nitidum* is limited to a report that the virus of Crimean-Congo haemorrhagic fever has been isolated from it in the Central African Republic (Sureau et al. *1976*).

Discussion

To date persons involved in the identification of ticks have made use of lists of valid species names to designate the taxa with which they are working. Hoogstraal and his coworkers were mainly responsible for compiling the list of valid species names for ticks within the genus *Hyalomma*. By so doing they resolved much of the chaos that existed within the nomenclature of this genus. However, it would seem as if practically no one has subsequently attempted to critically re-evaluate the taxonomic status of some taxa within this genus.

Before we embark on a discussion of our results we wish to emphasize that we have decided to retain the current species ranking of *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum*. However, the weight of evidence that we wish to discuss leads us to suspect that *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum* might only be geographic variants of *H*. (*E*.) *truncatum* or nascent species. We therefore consider that a comprehensive molecular study of these species as well as crossbreeding experiments should be undertaken to assist in clarifying their taxonomic status more objectively.

We also wish to emphasize the fact that our study is based on a qualitative and quantitative examination of a very large number of specimens of all life stages of all three ticks, originating from various regions within their respective distribution ranges. This has the advantage in that it takes into account both individual and geographic variation within each of the species.

Our conclusions are based on the following observations:

(1) We could find no reliable characters on the larvae or nymphs that can be used to distinguish between *H*. (*E*.) *truncatum*, *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum*. In fact the converse is true in that the immature stages of all three taxa possess a number of shared characters, by means of which they can be distinguished from all other *Hyalomma* species.

(2) We could find no diagnostic characters for *H*. (*E*.) *albiparmatum* females that distinguish them from those of *H*. (*E*.) *truncatum*. While the only characters distinguishing females of *H*. *nitidum* from the other two species are the colouration of the legs and the shape of the cuticular preatrial fold of the genital operculum. The colouration of the legs is perhaps a useful character when no colour is present, but is unreliable for those specimens of *H*. (*E*.) *nitidum* that have more or less pronounced ivory-coloured bands on the segments of their legs. As is the case with the immature stages, the females of *H*. (*E*.) *truncatum*, *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum* share a large number of characters that

distinguish them from other *Hyalomma* species.

(3) Our examination of male ticks supports the findings of previous workers. Unlike other *Hyalomma* species the males of *H*. (*E*.) *albiparmatum* have a prominent ivory-coloured to light-brown parma. This character is very conspicuous and is accepted as diagnostic for the species. The colouration of the legs of male *H*. (*E*.) *nitidum* is the same as that of the females and when absent can be used to differentiate this species from the other two, but not when it is present. Thus the males of *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum* each have only one diagnostic character that distinguishes them from each other and from *H*. (*E*.) *truncatum*. Like the immature stages and the females they share more characters that set them apart from other *Hyalomma* species than from each other.

One of the anomalies in the nomenclature of the genus *Hyalomma* is that representatives of the *H*. (*Euhyalomma*) *marginatum* complex such as *H*. (*E*.) *marginatum* Koch, 1844, *H*. (*E*.) *rufipes* Koch, 1844, *H*. (*E*.) *isaaci* Sharif, 1928 and *H*. (*E*.) *turanicum* Pomerantzev, 1946 have a large number of diagnostic characters on most developmental stages that distinguish them from each other, and yet until recently these taxa have been considered to be subspecies. On the other hand the three representatives of the *H*. (*E*.) *truncatum* group have only a single diagnostic character on a single life stage and yet they are considered to be separate species. In addition we do not know of other closely related species within the genus *Hyalomma* that share as large a number of characters as those that all stages of development of *H*. (*E*.) *truncatum*, *H*. (*E*.) *albiparmatum* and *H*. (*E*.) *nitidum* do. Furthermore, there is no grouping within the genus *Hyalomma* in which the taxa are distinguished from one another by a single character on a single life stage. In summary there are three species in the *H*. (*E*.) *truncatum* group of ticks within which *H*. (*E*.) *albiparmatum* is recognizable by the presence of a conspicuous ivory-coloured parma in the male, and *H*. (*E*.) *nitidum* is usually recognizable by the absence of pale bands on the segments of the legs of both sexes and the shape of the external preatrial fold of the genital operculum in females.

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