

TICKS IN THE SOUTH AFRICAN ZOOLOGICAL SURVEY
COLLECTION - PART IX - "THE AMBLYOMMA
MARMOREUM GROUP".

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INTRODUCTION

In this article the tortoise ticks, mainly of the *Amblyomma marmoreum* group, are reviewed. This is a group in which more confusion has arisen than in any other in the genus. Final clarity has been reached by the careful study of type material wherever possible associated with a vast number of specimens from all available sources.

ACKNOWLEDGMENTS

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"A. MARMOREUM"

Historical Review

Koch, 1844, gives a brief description of a male* *Amblyomma marmoreum* from South Africa. In 1847 he enlarges the description and gives a drawing of the type specimen (fig. 1).

In 1899 Neumann repeats Koch's description, in 1901 he redescribes and draws a male and describes the female for the first time. He draws attention to the fact that with Koch's type male there is also a female* which undoubtedly belongs to the same species as the male. The female description is inadequate but he mentions that the punctations are as in the male, i.e. according to Koch "sehr fein gepunktelt, uerbies mit ungleich zerstreuten und ungleich grossen Hohlpunkten oder Grübchen, in solchen en Körnchen". Of the specimens listed by Neumann the specimens of Koch,* Lounsbury,* Delalande,* of Brauns* and of Audinet Serville* from the Hamburg, Berlin and Paris Museums are from South Africa and are *A. marmoreum*. We have not seen the Marx collection. For the first time we find material listed: A—German East Africa, from Tanga; one male, locality and host unknown (not seen, Neumann Coll.); and off a rhinoceros, Schillings collection,* all three in the Berlin Museum. (Schillings also collected in German East Africa.) Neumann also doubtfully lists a female off a tortoise, from Zanzibar, Stuhlmann* collection [*nuttalli*], Hamburg Museum. B—one male from the Haut Zambesie, collected by Foa,* in the Paris Museum. This specimen was first reported by Neumann in 1899, p. 272, as *A. hassalli* (= *hebraeum*) but transferred in 1901, p. 311, to *A. marmoreum* [= *A. sparsum*].

* Specimens seen and studied.

Neumann, 1899, describes three further species connected with the *marmorium* group:—

- (a) *A. rugosum* N. sp (page 253), from a variety of collections and localities; this species he sinks as *A. marmorium* in 1901. Six* specimens are from the Delalande and Audinet Serville collection from the Cape of Good Hope and Caffraria (Paris Museum) as listed above; two are off a tortoise from the Belgian Congo, Smithsonian Institution (not seen) and one female from a tortoise, locality unknown, Hamburg Museum. This unknown locality tick is possibly the one which he subsequently identified as *A. devium** [= *A. marmorium*].
- (b) *A. sparsum* N. sp., p. 247. One male* off *Spilotes variabilis*, from the menagerie of the Museum of Paris, Lucas coll., Paris Museum (type studied). Despite his adequate description he himself was not able to recognize his own species subsequently. In the Neumann collection in the Berlin Museum he labels six specimens as *A. sparsum*, of which one male,* Marangua, Kilimandjaro, 15.10.95, Coll. Kretschmer, is *A. sparsum*; two males, one female,* elephant, Matumba, Kameroun, Coll. Ziemann, are *A. paulopunctatum*; and two males*, Gelbelandschildkröte, Bagamayo, Coll. Vosseler, are *A. nuttalli*.
- (c) *A. devium* Koch 1844, p. 225. Two females from Kitui,* British East Africa, Coll. Hildebrand, Berlin Museum; and a smaller specimen from Campos Geraes (?), Paris Museum. In 1901, p. 309, he sinks these specimens as *A. marmorium*. These two Kitui females are *A. sparsum*. [The Campos Geraes (?) material we have not seen.] The description given is thus the first description of *A. sparsum* female.

Briefly reviewing the material identified by the end of 1901 we find that the classification of the *marmorium* group is somewhat confused and that Neumann is not certain anymore as to what Koch's original *marmorium* looks like and is not at all clear as to his own *sparsum* male, and has not associated his female "*devium*" with his *sparsum* male. For *A. marmorium* he states: "d'après les diverses spécimens que j'ai eu en mains, que les mâles sont susceptibles de varier dans d'assez grandes limites sous le rapport de la profondeur et des dimensions des punctations, ainsi que par la netteté des dessins et l'intensité du fond de l'écusson." His *A. hassalli**, Foa's specimen, he has sunk as *A. marmorium* [= *A. sparsum*]. His *A. rugosum* he has sunk as *A. marmorium* [= *proparte marmorium*] *proparte* his own male Hamburg Museum, *devium* [= *marmorium*]. Here it may be stated that Koch's 1844 *Hyalomma devium** female, drawn, and the description enlarged in 1847, is the female of his male *Hyalomma latum* 1844-47, a South African tortoise tick described as *A. sylvaticum* by De Geer, 1778, off a tortoise collected by Sparmann in his travels at the Cape. Neumann at this stage considers Koch's *devium* as a synonym of *A. marmorium*.

Howard, 1908, undoubtedly had *A. marmorium* before him, but copied a lot of his information from Neumann's publications.

Dönitz, 1909, describes a smaller tick, *A. nuttalli*, which obviously fits into the *marmorium* group. The female only is figured (fig. 21). The specimens available were one female from Dar-es-Salaam; one female from Umtali,* Southern Rhodesia; one female from the Cameroons; three males from East Africa, Dar-es-Salaam and Bagamayo; off tortoises and a *Varanus*. Two of these specimens are in the Berlin Museum, a female off a tortoise,* Umtali (illustrated), and a male off a *Varanus*,* Dar-es-Salaam.

Dönitz, 1910, redescribes and figures what he considers to be *A. marmoreum* basing his determination possibly on the large punctations with the central tubercle—so characteristic of *A. marmoreum*—and which he delineates so well in fig. 3, plate XV (fig. 11). In the Berlin collection there are: Two males, two females* off rhinoceros (one male used for his fig. 3), Schirate; one male* off a tortoise, Tirga; and a male* and a female* off a buffalo, German East Africa. All these specimens are *A. sparsum*, of which Dönitz' fig. 3 (fig. 11) can be taken to represent a typical male. Once again we have *A. sparsum* confused with *A. marmoreum*.

Robinson, 1926, redescribes and draws *A. nuttalli* (fig. 22). Of the specimens listed we have studied more than half and they are all *A. nuttalli*. It is surprising that despite Dönitz' and Robinson's good descriptions this tick should still have been confused by subsequent writers with other ticks in the *marmoreum* group.

That Robinson was misled by Neumann and by Dönitz as to Koch's *A. marmoreum* is shown by his description, by his drawings and by his list of material studied, for he does not differentiate between *A. marmoreum* and *A. sparsum*. Of the 24 tubes of ticks identified as *A. marmoreum* we have been able to examine 12; we have classified them as:— *A. marmoreum* 3; *A. sparsum*, 6; and *A. nuttalli* 3; the description given fits *A. sparsum* most nearly and may be regarded as based on *A. sparsum* but modified by his knowledge of the South African tortoise ticks, which species he considers to be at the coarse end of the range of variations of what to him was *A. marmoreum*. The male sketch represents a somewhat atypical *sparsum* male, the female sketch is also *A. sparsum*. To him consequently the synonym of *A. marmoreum* was: *A. sparsum* Neumann 1899, *A. rugosum* Neumann 1899 and *A. devium* (nec. Koch) Neumann 1899.

Schulze, 1932, realises that the East African tick was not the same as the South African *A. marmoreum*. He redescribes and draws *A. marmoreum* using Koch's very narrow type specimen for the male, and describes and draws the female from the specimen accompanying the type male in the Berlin Museum collection. This female can be taken to represent the type, so that Schulze's description and drawing can be taken to represent the first authentic description of the *A. marmoreum* female.

He describes the East African tick under the name of *A. schlottkei*, basing his description and drawing on two males, host?, Usumbiwa, German East Africa, V.1908, coll. Hamerstein (fig. 3). Female unknown.

After his redescription of the type *A. marmoreum* he gives a lengthy discussion showing that neither Dönitz' nor Robinson's drawings and sketches are the true *marmoreum*. He recognizes Dönitz' drawing as representing a tick closely allied to his newly created *A. schlottkei*. Of Robinson's drawings and descriptions he could make nothing and states that it is a species different from both *marmoreum* and *schlottkei*. Neumann's figure and description he recognizes as *marmoreum*.

It is a pity that Schulze had but two *schlottkei* specimens and that of Neumann's material he did not see *A. sparsum*. We have not seen Schulze's material, but from his drawing and his descriptions of the two males it is quite obvious that he is dealing with *A. sparsum*. Had he had a greater number of specimens showing a greater range of variations he would have recognized (a) Dönitz' drawings as coming within the range of his *schlottkei* [= *sparsum*] and (b) Robinson's drawings as representing specimens at the extreme edge of the *schlottkei* [= *sparsum*] range of variations. Having studied Koch's material it is both surprising and disappointing that he did not study Dönitz' which is also at the Berlin museum.

He resuscitates the name *A. rugosum* for a male, off tortoise, German South West Africa, giving a drawing and a very brief description and stating that it agrees with Neumann's (p. 253) description. We have not seen all of Schulze's material, but he is quite satisfied that it agrees with Neumann's *rugosum* which species we have shown (page 48) to be *A. marmoreum*. This finding is supported by the specimen* from Schulze's collection in the Rocky Mountain Laboratory which is *A. marmoreum*.

On page 466 Schulze, 1932, describes *A. weneri*, one male off *Cinyxis*, Talodi, Sudan, Coll. Dr. Werner-Wien, noting that it is closely allied to *A. nuttalli*, and that it differs in but a few (minor) respects. We have not seen Schulze's specimens but comparing his figure and description with our abundant material we find that his *A. weneri* falls well within the range of variations of *A. nuttalli*.

In the addendum, page 475, he discusses two males* collected off *Diceros bicornis* originally determined as *A. marmoreum* by Oudemans, coll. 7.5.31, in the Zoological Gardens, Amsterdam, the rhinoceros, ex "Meru gebiet", Kilimandjaro, Ostafrika, specimens in the Amsterdam Museum. In this discussion he gets a bit muddled, he first states that the two males agree in pattern completely with *A. schlottkei*, and then goes on to say that the one male shows a wonderful coppery, partly green, iridescence—in the other male the colouring was somewhat disturbed—and then quite gaily proceeds to make it a sub-species of *weneri*! giving it the sub-specific name of *poematium*! Lower down on the page he again comments on the close association between *weneri* and *nuttalli* (there is a lapse of some words in the script) and indicates that *poematium* may yet prove to be a sub-species of *nuttalli*.

We have studied these two specimens and find that Schulze's statement that the two males "stimmen in der zeichnung völlig mit *schlottkei* überein", is correct, both specimens fall well within the range of variations shown by Miss Walker's F.1 generation. That he should have switched over to *weneri* can only be explained as a *lapsus calami*. His *A. weneri poematium* is thus another synonym of *A. sparsum*.

M. Tonelli-Rondelli, 1935, adds another species to the *marmoreum* group—*A. falsomarmoreum*, basing her descriptions and drawings (figs. 31 and 32) on specimens from Algoi Barière, Italian Somaliland, collected Taramasso; and two males and one female off a tortoise, coll. Prof. Tedeschi; both lots in the Turin Museum. We have not seen the type specimens but from the material to hand we have no hesitation in agreeing that *A. falsomarmoreum* is a valid species.

She comments on the possibility that Paoli's 1916 *marmoreum*, five males and one female, off *Testudo pardalis*, Sahaierò, Italian Somaliland, could agree with *A. rugosum* [= *marmoreum*] as illustrated by Schulze. We have not seen the specimens, nor are Paoli's figures or descriptions very helpful; but from what we know of the distribution of the tortoise ticks the specimens, as illustrated, are either *A. sparsum*, *A. falsomarmoreum* or *A. nuttalli*. A restudy of the specimens is indicated.

After Rondelli, 1935, no taxonomic papers on the *marmoreum* ticks were published for quite a while. From the classified material kindly put at our disposal by the various institutions and workers it seems quite evident that systematists were uncertain of their species and the name "*marmoreum*" was a coverall for *sparsum*, *falsomarmoreum*, *marmoreum* and in a few instances even for *nuttalli*.

Travassos Santos Dias, 1949, redescribes *A. nuttalli** male and female and describes the nymph and the larva for the first time from a laboratory reared F.I generation,* from a female off a tortoise, Maputo, Moçambique. In 1951 he establishes *A. silvai* from one female, host (?), from Moçambique, collected J. M. Silva. In a footnote to the same paper he sinks *silvai* as a parviscutate sub-species of *A. nuttalli*. We have seen the specimen and consider it to fall well within the range of variability of *A. nuttalli*. T. S. Dias, 1951, establishes *A. faiai*,* from one male off *Syncerus caffer*, from Dambacua, Inhambane, collected A. Faia. Dias, 1954, redescribes Schulze's *A. wernerii poematium* under the name of *A. poematium* and shows *A. faiai* to be a synonym of *A. poematium*. We have seen the specimen and consider it to be *A. sparsum*. In his discussion he is at great pains to show that *poematium* is not a sub-species of *A. wernerii* (quite overlooking Schulze's own *lapsus calami*) but that it connects up with *schlottkei* [= *sparsum*]. In view of the fact that he has seen *poematium* and not *schlottkei* he gives *poematium* priority.

T. S. Dias, 1955, commenting on material in the Hamburg Museum, correctly identifies the *A. devium*, male as *A. marmoreum*. He uses the Braun's, Port Elizabeth, specimens off a tortoise as a basis for his description of *A. marmoreum*. In his discussions on: (a) *A. marmoreum*, he questions whether Dönitz' figure represents the true *marmoreum* but takes no decision on its specificity, on p. 486; he comments that Dönitz' figure reminds one of *A. schlottkei*. He also questions whether Robinson was dealing with *A. marmoreum* but makes no further comments on Robinson's "*marmoreum*"; (b) *A. sparsum* he comes to the conclusion that because Neumann, 1905, considers *A. paulopunctatum* a sub-species of *A. sparsum*, that *sparsum* must have the same dentition as *paulopunctatum*, i.e. $3\frac{1}{2}.3\frac{1}{2}$ which is the same as *marmoreum*, and argues that, therefore, *sparsum*=*marmoreum*; (c) *A. rugosum*, he correctly identifies the one Hamburg male as *A. marmoreum*; (d) *A. falsomarmoreum* he sinks as a synonym of *A. marmoreum*. Later in a personal communication he regards *falsomarmoreum* as a valid species. In the same paper T. S. Dias, 1955, correctly identifies a female* determined as *A. marmoreum* by Kramer off a tortoise, Zanzibar, 1899, collected Dr. Stuhlman, as *A. nuttalli*.

In private correspondence 22.9.56, T. S. Dias states that after studying the type one male and two females of *A. hebraeum magnum* Neumann 1909, off rhinoceros, Solai-see, British East Africa, Collector F. Seyd, Museum Wiesbaden, he comes to the conclusion that it is a synonym of *poematium* [= *sparsum*].

Having sorted out the species muddle to a certain extent, Dias unfortunately reintroduces the original confusion by uncritically listing all previous tortoise tick records as *A. marmoreum* records, apparently even forgetting his own *A. poematium*!

In this brief historical review and in the study of type material wherever possible, the study supported by an examination of a large series of specimens, we have once again been forcibly reminded of some truisms—that it is dangerous to describe a species from one specimen only, that it is dangerous to set out with preconceived ideas and to make the facts fit one's theories; that once a mistake appears in literature it is copied from publication to publication and is difficult to correct or eradicate.

COMMENTS ON VARIATIONS OF THE ENAMELLED PATTERN

In any one species of *Amblyomma* allowance has to be made for a certain range of variation in the enamelled pattern, as well as in the colour and brilliance of this enamelling. The confusion which has arisen in the *marmoreum* group is mainly due to the fact that individual workers have allowed for different ranges of variations.

The variation in the degree of enamelling, or in the degree of visibility of enamelling, is dependent on several factors. In any one large collection of living specimens, or in specimens from an F.1 generation, intermixed with individuals showing a typical pattern with a typical brilliance, specimens showing a poorly developed pattern, or lacking in brilliance are liable to be present. This initial full, or partial pattern, as also the initial brilliant or dull appearance, may be further influenced by the method of preservation. Thus *Amblyomma marmoreum*, which, alive, shows a rather dull yellow pattern, keeps this appearance when kept dry, the appearance if anything becoming even a little duller. Koch's type specimen still retains its original colour even after 112 years, as do Dönitz' East African specimens of *A. sparsum* (his *marmoreum*), the original male of fig. 3, plate XV looking as clear cut and neat as its reproduction. When kept in alcohol the dull yellow tends to become, and to show up as, slightly more orange and somewhat brighter.

It is common knowledge that coloured objects when viewed under water, alcohol, etc., show up more clearly and more brightly. Use is frequently made of this phenomenon to enhance the pattern in a dull, indistinct, specimen. In this manner one can frequently pick out details not seen in the dry specimen.

In how far the pattern ever fades or becomes washed out in dry kept specimens is difficult to say. Koch's pinned specimens seem to have retained their original clarity.

Some living specimens of *A. marmoreum* at Onderstepoort kept in the hot room (temperature about 90° F, R.H. about 80 per cent) and allowed to die in the tubes tended to die with faint or washed out patterns; whereas specimens from the same batch killed by immersing in alcohol or left to die in the much drier atmosphere of the laboratory, tended to keep the colour pattern.

It is our experience that the colouring is retained more naturally in formalin than in alcohol-preserved specimens. In the alcohol specimens there is a tendency for the colour to take on an added brilliancy, to take on an exaggerated development of the coppery sheen, edged by the iridescent green. This increase in gayness and exuberance of colour is frequently well seen in *A. hebraeum* and in *A. variegatum* and is well expressed in Schulze's *poematium*. Specimens kept in 70 per cent alcohol plus 5 per cent glycerine lose their colour and look washed out and faded. Associated with the diminishing clarity of the enamelled pattern there is frequently also a loss in clarity of outline to the brown stripes. In some species these stripes are raised, in others they are sunken and hence tend to retain their individual appearance regardless of the lack of clarity of the enamelled portions. Very frequently, however, the brown of the integument lacking its enamelling takes on the same intensity of colour as is customary for the stripes and spots, so that it becomes difficult to make out the details of the nature of the stripes and spots.

It is here where differences of opinion are observed, i.e. workers fail to differentiate between brown unenamelled integument and the brown stripes and spots; too frequently the mere absence of enamel has been taken to be an enlargement of an existing stripe or spot—or has unconsciously been interpreted as a new one. Thus in identifying specimens it is better to attach the greater importance to the stripes and spots rather than to the enamelling.

Confirmation of identification by pattern, be it by enamelling or by stripes and spots, can always be made by a careful study of the punctations. The large punctations with the central tubercle are a feature of the *marmoreum* group, but there the similarity ends. Each species has its own punctation pattern—the pattern varying within limits, but it is sufficiently stable, as in the Rhipicephalids, to serve for specific diagnosis.

The variations displayed by each member of the *marmoreum* group are discussed under its specific description.

A. MARMOREUM KOCH 1844

Male (Fig. 1, 2 and 3)

Large. 9.4×6.0 mm. average; range, 4.4×3.2 mm. to 10.8×7.1 mm. Widest portion is just posterior to centre of conscutum. Width at eye level to widest portion is as 3.6 to 6. Brown. Ornate. Convex.

Conscutum

Broad, ovoid. Eyes brown or yellow, flush with surface. Emargination deep and narrow. Cervical pit deep, narrow and crescentic. Cervical groove absent, or indicated by a shallow divergent depression. Lateral groove absent. Marginal groove deep, inner edge slopes down fairly gradually, outer edge rises sharply to marginal ridge, lined by an irregular row of large punctations, continuous, nearly reaches to level of eyes. Festoons pronounced, longer than broad. Fovea in centre of conscutum, on the enamelled patch anterior to the end of postero-median stripe. Punctations: Numerous, fine interstitial punctations scattered over whole conscutum. Numerous medium to large punctations present with a small tubercle rising from the floor with sides sloping steeply, shallow to deep. Groups of medium and large punctations occur in the cervical field, on the scapulae, scattered on the marginal folds and on the festoons. A somewhat diffuse group of large punctations occurs posterior to the cervical pits; more concentrated groups occur on the lateral band, also on the enamelling between and in front of the postero-median and postero-accessory stripes. Single large punctations are scattered over the rest of the conscutum.

Enamelling

The full pattern. In living and in dry-kept specimens the enamelling is clear yellow to buff and the stripes are light to dark brown. Cervical stripe long, extends back to falciform stripe. Lateral spots more or less fused to form lateral band, also fused with cervical stripe. Postero-medial stripe long, slightly clubbed at its anterior end; an enamelled patch separates it from the falciform stripe; postero-accessory stripes shorter than postero-medial stripe, also tend to be thicker at their anterior ends, they are inclined inwards so that if produced they would meet in the centre of the conscutum, anterior to the end of the postero-medial stripe. The festoons and marginal folds are blotched with yellow enamelling in a somewhat irregular manner. The pattern of the conscutum is fairly clear-cut round the periphery, but in the central area it tends to be somewhat indefinite and smudged. The lateral bands and posterior stripes are slightly raised, though usually the postero-medial stripe is depressed just posterior to its tip.

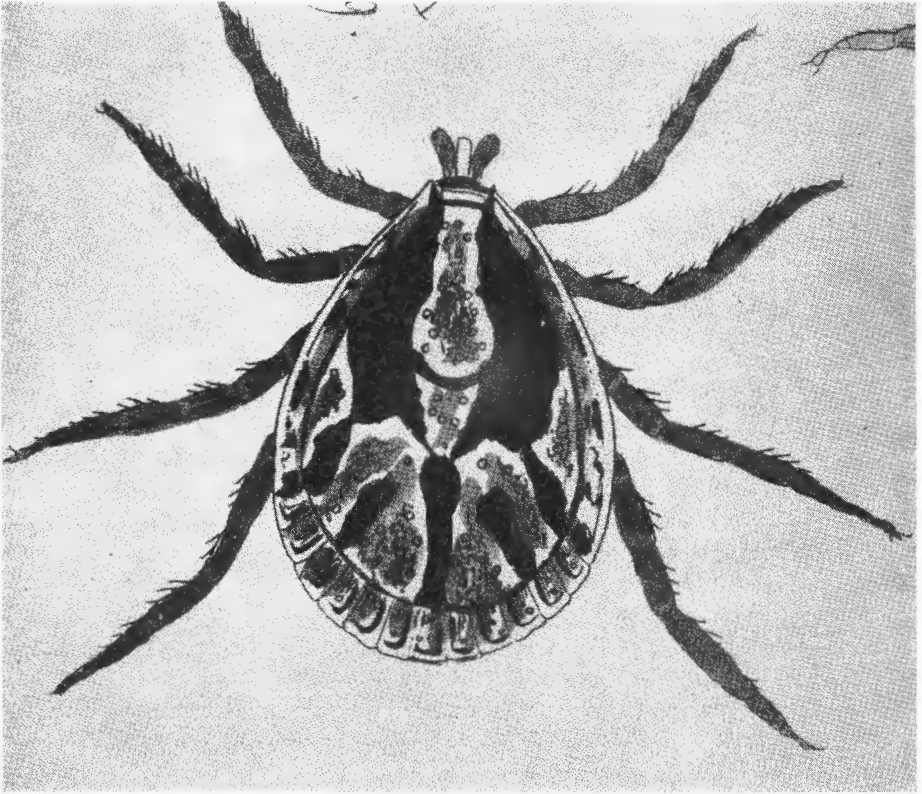


FIG. 1.—*Amblyomma marmoreum* Koch 1844. M—Dorsal view, after Koch, 1847, Plate 8, Fig. 29.

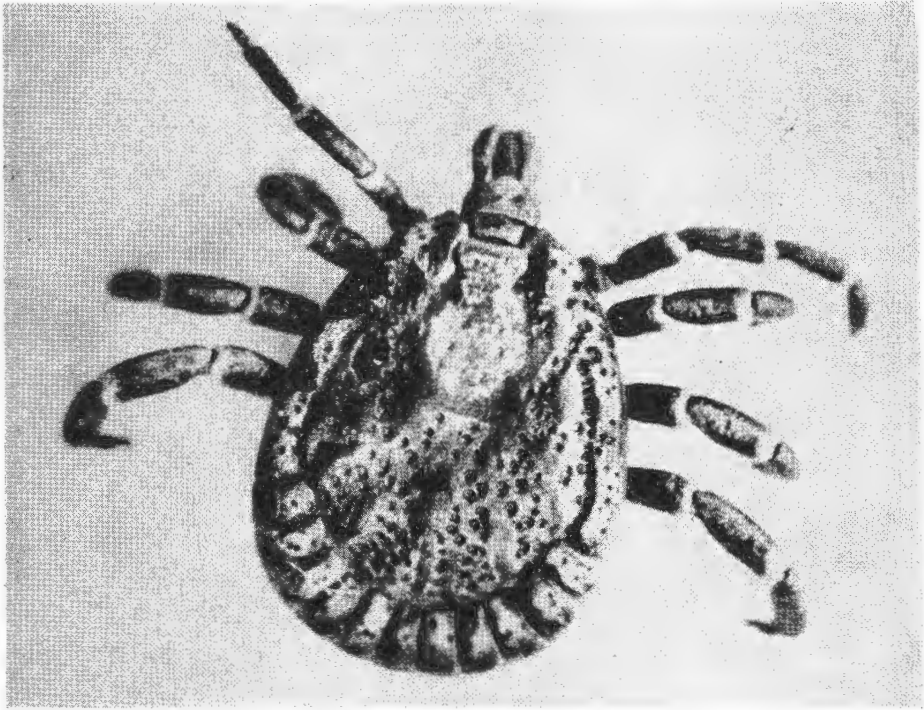


FIG. 2.—*Amblyomma marmoreum* Koch 1844. M—Photograph, L. Brinkman.

Sub-collare

Present, enamelled.

Rostrum

From one-and-a-half times to nearly twice as long as broad.

Basis capituli

About twice as broad as long. Posterior margin concave, cornua rounded—only very slightly developed, lateral margins convex. A number of fine punctations present. Patch of yellow enamelling present, between bases of palps, sometimes reaching to posterior margin.

Palps

Fairly stout. Article II more than twice as long as article III and more than twice as long as broad, it is slightly constricted at its distal extremity. Article III is about as broad as long. The distal and internal edges are rounded. A number of white hairs is present. There are irregular blotches of yellow enamelling on the dorsal surfaces of articles II and III.

Hypostome

$3\frac{1}{2}/3\frac{1}{2}$, the $\frac{1}{2}$ row usually consists of 2 to 4 very small teeth. It is occasionally absent.

Ventral surface of basis capituli smooth and rounded.

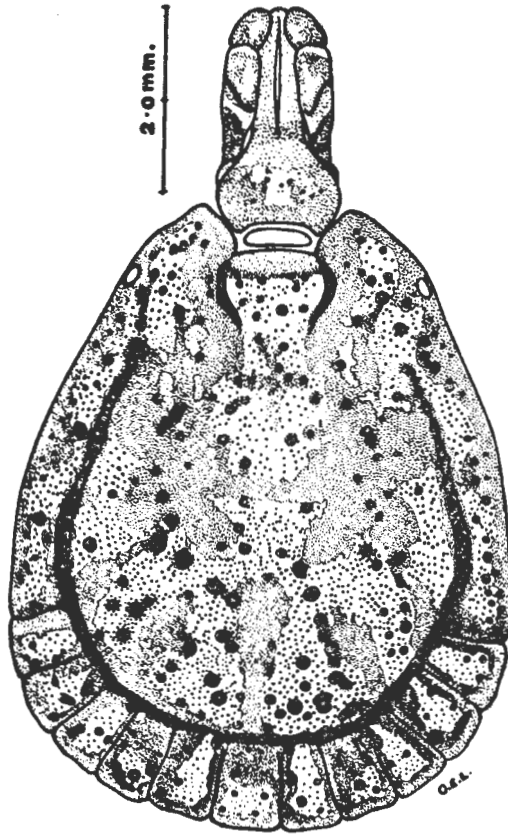


FIG. 3.—*Amblyomma marmoreum* Koch 1844. M—Scutum, dorsal view. G. E. Laurence del.

Ventral Surface

Brown. Genital pore opposite coxa II. Fестоons slightly longer than wide. Punctated, with five central plaques, small and narrow, the centre one being larger than the lateral ones.

All coxae are about the same size.

Coxa I bears a pair of short spurs of which the outer one is narrower and usually slightly longer. Tips of spurs rounded, inner spur blunter than outer spur. Coxae II to IV with a broad blunt spur, narrowing and lengthening from Coxa II to IV.

Legs

Light to darkbrown, narrow, pale yellow enamelled annulations at distal extremities of all segments except tarsus. Dorsal enamelling may be present on last two segments of legs 3 and 4. Numerous white hairs present.

Female (Fig. 4 and 4a).

Unengorged: 8.3×5.2 mm. average; range, 3.3×2.6 mm. to 10.1×6.1 mm.. Engorged: very large, up to 28×18 mm.

Scutum

Ornate, sub-triangular, slightly wider than long, average 3.5×3.2 mm.; range, 1.8×1.5 mm. to 4.3×3.9 mm. Postero-lateral margins slightly convex, antero-lateral margins convex. The flat yellow or brown eyes are situated at the widest part of the scutum, at a distance of about one-third of the length of the scutum, from the anterior end. Emargination wide and very deep. Cervical pits deep and crescentic. Cervical grooves deep and wide, diverging behind level of eyes. Lateral grooves absent. Punctations: Fine interstitial punctations are regularly scattered over the whole scutum. A group of large deep punctations extends from scapula to behind the level of the eye; these sometimes tend to coalesce, especially the small group behind the eye. A group of medium punctations occurs in the cervical field; large punctations widely scattered on the posterior central field. Large punctations as in the male but these tend to be slightly deeper.

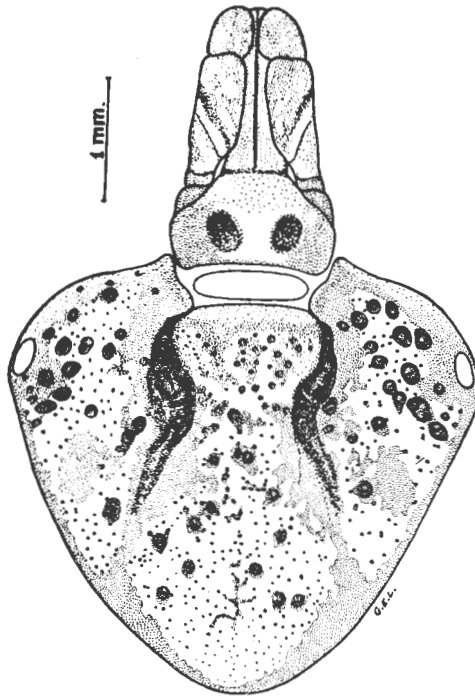


FIG. 4.—*Amblyomma marmoreum* Koch 1844. F—Scutum, dorsal view. G. E. Laurence del.

Enamelling

The full pattern. The entire scutum is enamelled in yellow with the stripes in brown, e.g. ocular spot, cervical stripe which follows the cervical groove back to the limiting spot, narrow border edging entire scutum, isolated frontal spot; each small punctation is marked in brown. In the female the enamelled pattern tends to remain clear and does not blur or fade as often as it does in the male.

Sub-collare

Present, enamelled.

Rostrum

Rather more than $1\frac{1}{2}$ times as long as broad.

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Page 114.—Add below Table 2:

Hosts: Rhinoceros, 23; buffalo, 10; dromedary, 7; elephant, 1; giraffe, 1; tortoise, 13; *Bitis arietans*, 6; *Bitis lachesis*, 1; python, 1; varanus, 4; agamid, 2; lizard, 1.

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Hosts: Tortoise, 28; varanus, 9; *Bitis gabonica*, 1; hedgehog, 4; warthog, 1; bovine, 1, human, 1.

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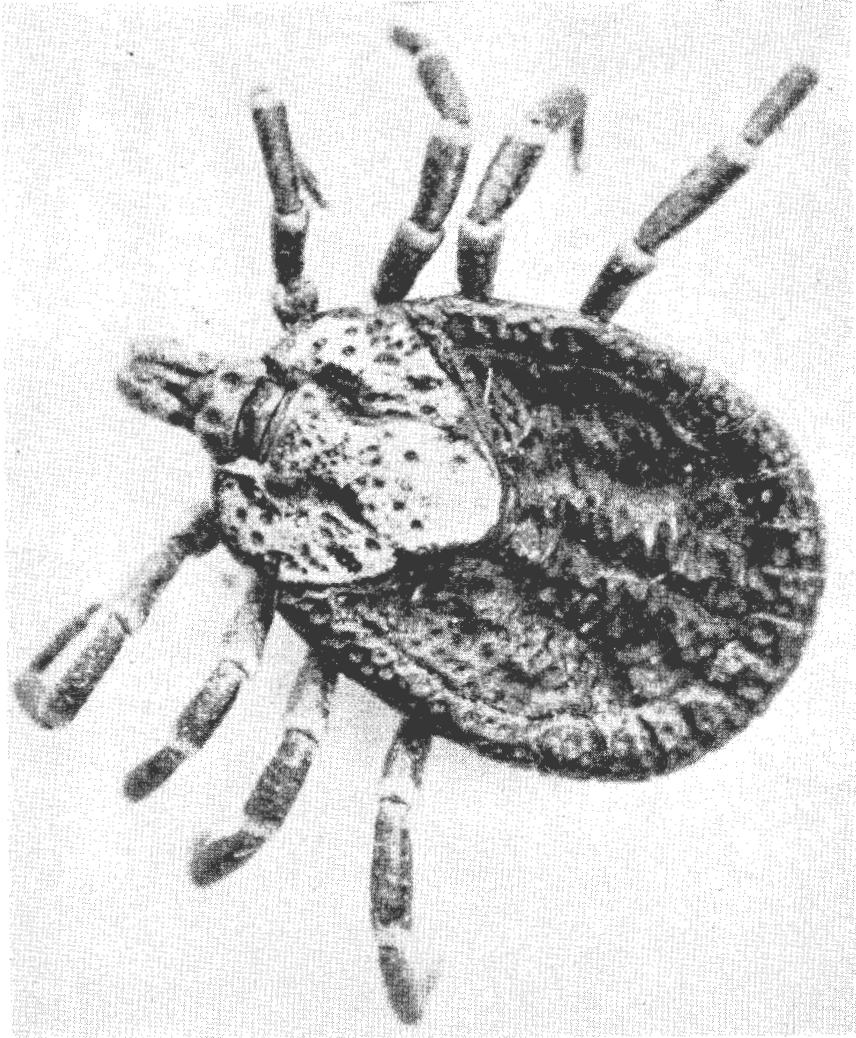


FIG. 4a.—*Amblyomma marmoreum* Koch 1844. F—Photograph. L. Brinkman.

Basis capituli

Twice as broad as long. Posterior margin a straight line, no cornua, lateral margins slightly convex. *Areae porosae* oval, diverge anteriorly, separated by a distance equal to their longest diameter. Central area enamelled, lateral margins brown.

Palps

Fairly stout. Article II twice as long as article III and twice as long as broad. Article II about as broad as long, the distal and internal edges are rounded. A number of white hairs is present, irregular blotches of yellow enamellign on articles II and III.

Hypostome

$3\frac{1}{2}/3\frac{1}{2}$, the $\frac{1}{2}$ row usually consists of 2 to 4 very small teeth. It is occasionally absent.

Dorsum

Brown, fine hairs present in the punctations.

Ventral Surface

Brown. Genital pore opposite coxa II; all coxae about the same size. Coxa I bears a pair of short spurs of which the outer one is narrower and usually slightly longer. Tips of spurs rounded. Inner spur blunter than outer spur. Coxae II to IV with broad blunt spur, narrowing and lengthening from coxa II to IV.

Legs

Light to dark brown; narrow, pale annulations at distal extremities of all segments except tarsus. Numerous white hairs present. Less stout than in male. Dorsal enamelling may be present on the last two segments of legs III and IV.

Nymph (Fig. 5, 6 and 7)

Unengorged: 2.55×1.74 mm. average.

Scutum

Inornate. Wider than long, average, 0.95×0.83 mm. Difference less than in drawing. Posterior angle broadly rounded. Postero-lateral margins almost rectilinear, antero-lateral margins convex. The eyes flush with the surface, at the widest part of the scutum. Emargination wide and fairly deep. Cervical pits deep, crescentic. Cervical grooves, deep, converge anteriorly, and then diverge. Lateral grooves absent. Numerous large, deep punctations occur on lateral fields. Those beside and behind the eyes are larger and more numerous than those on the shoulders and near the cervical grooves; medium punctations in cervical field, more numerous medium punctations occur on postero-median field.

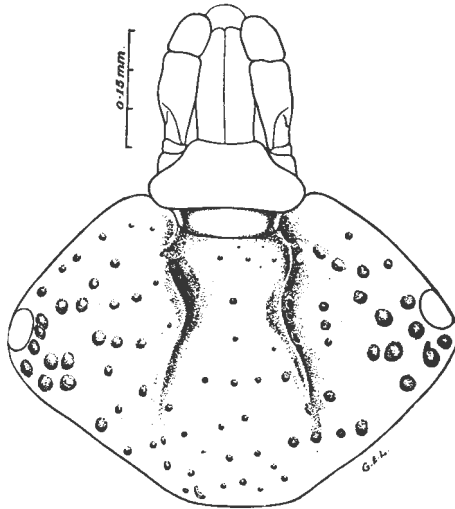


FIG. 5.—*Amblyomma marmoreum* Koch 1844.—Nymph: Scutum, dorsal view.
G. E. Laurence del.

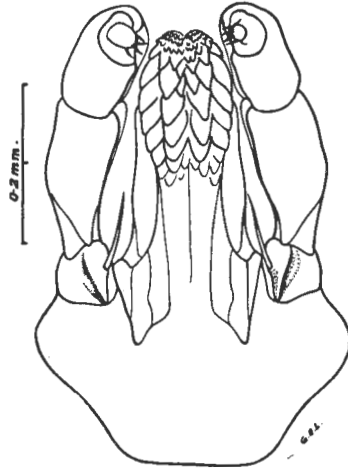


FIG. 6.—*Amblyomma marmoreum* Koch 1844. N—Rostrum, ventral view.
G. E. Laurence del.

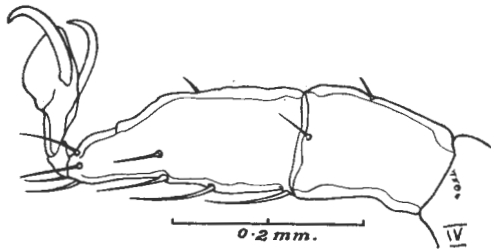
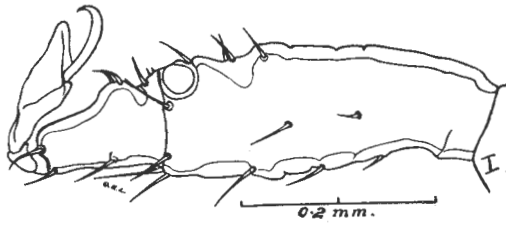


FIG. 7.—*Amblyomma marmoreum* Koch 1844. N—Tarsi I-IV. G. E. Laurence del.

Sub-collare

Present.

Rostrum

Slightly longer than wide as 5:4.

Basis capituli

More than twice as wide as long, sub-triangular. Posterior margin rectilinear (drawing shows it slightly sinuous). Lateral margins almost rectilinear to slightly convex.

Palps

Article II less than twice as long as article III and just less than twice as long as broad. Article III rounded and about as long as broad (drawing shows it longer than broad).

Hypostome

2/2.

Ventral Surface

All coxae about the same size. Coxa I bears a pair of short spurs of which the outer one is slightly longer. Coxae II, III and IV bear single short spurs.

Legs

Stout.

Larva (Fig. 8, 9 and 10)

Unengorged: 0.66×0.91 mm. average.

Scutum

Inornate. About $1\frac{1}{2}$ times as wide as long; average 0.52×0.34 mm. Posterolateral margin nearly rectilinear. Antero-lateral margin slightly convex. The eyes, large, flush with the surface at the widest part of the scutum. Emargination wide and deep. Cervical pit deep. Cervical groove deep, slightly sinuous, reaches to the level of the eyes. Punctations as in the sketch.

Sub-collare

Absent.

Rostrum

Slightly longer than wide, 0.21×0.19 mm.

Basis capituli

Triangular. Posterior margin slightly convex. Antero-lateral margins rectilinear or slightly concave.

Palps

Article II about twice as long as article III (drawing shows them almost equal) and twice as long as broad. Article III slightly longer than broad.

Hypostome

2/2.

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Page 117.—Add below Table 4:

Hosts: Tortoise, 9; varanus, 1; camel(?), 1.

Ventral Surface

All coxae about the same size. Coxa I a pair of short spurs of which the outer one is longer. Coxae II and III single short spur.

Description

Based on the material reared in the Laboratory at Onderstepoort from a female, off Tortoise kept in the Albany Museum grounds (Onderstepoort collection 2989 and 2990).

Type Specimen

One male, South Africa, Berlin Museum (type studied) (fig. 1).

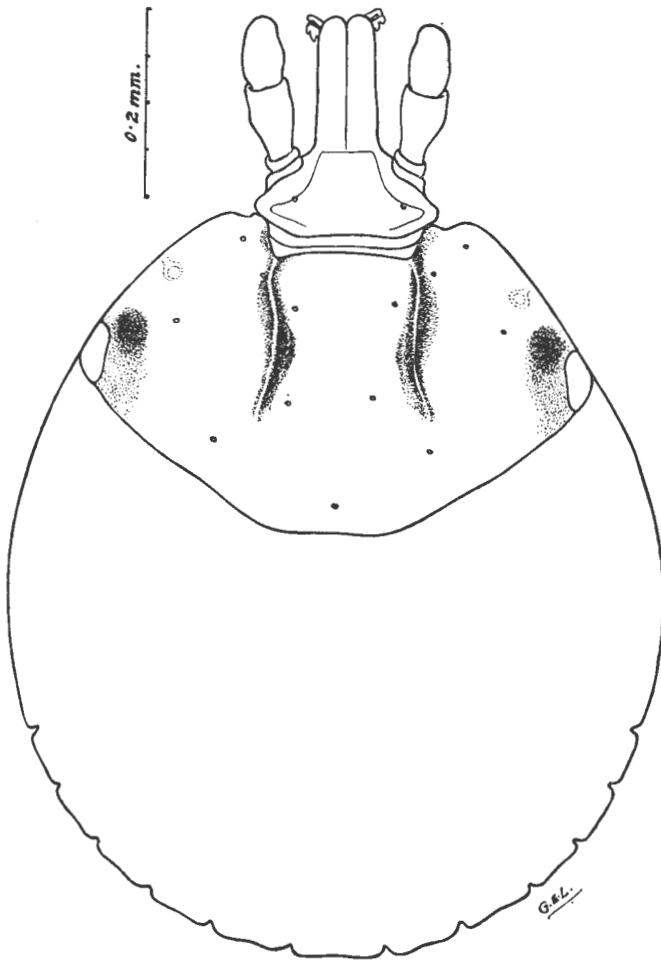


FIG. 8.—*Amblyomma marmoreum* Koch 1844. Larva—Dorsal view. G. E. Laurence del.

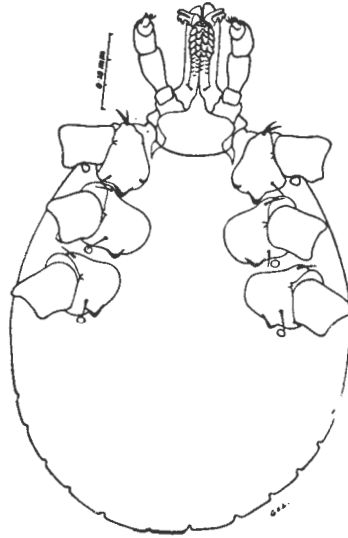


FIG. 9.—*Amblyomma marmoreum* Koch 1844. L.—Ventral view. G. E. Laurence del.

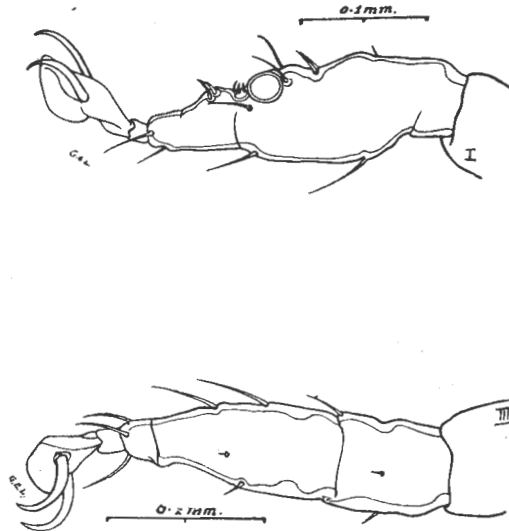


FIG. 10.—*Amblyomma marmoreum* Koch 1844. L.—Tarsi I-III. G. E. Laurence del.

*Variations of the Enamelled Pattern**Male*

But few specimens of this species show the full pattern as exhibited by the specimen drawn. A few show no enamelling at all, but most specimens have a greater or lesser amount of yellow colour. To some extent it can be said that the enamel extends to the different parts of the conscutum in a definite order. Specimens with very little enamel at all, almost invariably show what enamel they have around the edges, on the scapulae and in the central field. It is very rare to find a tick with a very little enamelling only on say, the festoons. Ticks with enamel on the festoons nearly always also have it elsewhere. The enamel extends to the different parts in roughly the following order: Emargination, scapulae, central field, marginal folds, between and behind falciform stripes, festoons and areas between posterior stripes, around the lateral band. It is usually found that when the enamelling appears on parts of the conscutum low down in the above list, then the enamel on the parts higher up in the list is present as a fairly solid patch.

Female

A few specimens show the full colour, and a few show no enamelling at all. As in the male the enamelling tends to extend to the different parts in a definite order as follows: Emargination, scapulae and central field, posterior margin of scutum, posterior central field from behind forward, posterior lateral fields. The majority of ticks in this species have some enamel on each of the parts mentioned, but it tends to be dotted about and not in solid blocks of colour.

A. marmoreum. Type male (Fig. 1).

This specimen is unusually long and narrow, the scutum being 7.6 mm. long and 5.8 mm. broad. The full enamelled pattern is shown. The cervical stripes are broad, fused with the frontal spots and the falciform stripes, this broad stripe is also fused with the antero-accessory stripe and the jointed lateral spots. The postero-median stripe is long and widens slightly in its anterior third, the postero-lateral stripes are shorter and broader.

A. rugosum types

We have examined five of the nine specimens from which Neumann described *A. rugosum*. They are all typical males of *A. marmoreum*, though none show the full enamel pattern. In most cases the enamel is confined to patches on the shoulders, marginal folds and festoons, and the basis capituli. One or two have small patches of enamel between the dark raised stripes in the centre of the conscutum.

A. marmoreum host list.

Bovine, 1; sheep, 2; tortoise, 48; Varanus, 2; python, 1; mamba, 1; puff adder, 5; ringhals cobra, 2.

Geographical Distribution of A. marmoreum

A. marmoreum is confined to the Union of South Africa and the adjacent territories. It is fairly common in the Eastern Cape Province, where tortoises are particularly plentiful; it has also been recorded not infrequently from other parts of the Union, Swaziland and Basutoland. It is present in the southern tip of Moçambique and Eastern Bechuanaland; we have two records from Plumtree and Bulawayo in Southern Rhodesia and a single record from Gobabis, South West Africa.

Synonymy

Amblyomma marmoreum

A. marmoreum Koch 1844.

A. marmoreum Koch 1847, p. 54, fig.

A. marmoreum Neumann 1899, p. 266.

A. rugosum Neumann 1899, p. 253 = *A. marmoreum* Neumann 1901, p. 311 (*pro parte*, South African specimens).

A. marmoreum Neumann 1901, p. 309, fig. (*pro parte*, South African specimens (see Tables I to VIII).

Nec H. devium Koch 1844 [= *A. sylvaticum*].

A. devium Neumann Tick No. 23267, Hamburg Museum — *A. marmoreum* Neumann 1901, p. 309.

Nec A. devium Neumann 1899, p. 255, Coll. Hildebrand, Berlin Museum = Neumann, 1901, p. 309, *A. marmoreum* [= *A. sparsum*].

Nec A. marmoreum Neumann 1901, p. 311, Foa's specimen (originally identified as *A. hassalli*) [= *A. sparsum*].

Nec A. marmoreum Neumann 1901, p. 311, Stuhlmann's specimen [= *A. nuttalli*].

A. marmoreum Howard 1908 (*pro parte*, South African specimens).

Nec A. marmoreum Berlin Museum, Dönitz' East African material [= *A. sparsum*].

Nec A. marmoreum Dönitz 1910, pl. XV, fig. 3 (East African material).

A. marmoreum Dönitz 1910, p. 444 (South African records).

A. marmoreum Robinson 1926, p. 89 (*pro parte*, South African material).

Nec A. marmoreum Robinson 1926, p. 89, figs. (*pro parte*, not South African material).

Nec A. marmoreum Robinson 1926, p. 86, synonyms *A. sparsum* and *A. devium*.

A. marmoreum Schulze 1932, p. 459, figs.

A. rugosum Schulze 1932, p. 465, figs.

Nec A. marmoreum A. Paoli 1916, p. 291, figs.

A. marmoreum Santos Dias 1956 (1955), p. 480 (*pro parte: nec* Dönitz, fig. p. 490; *nec A. sparsum*, pp. 488 and 494; *nec A. falsomarmoreum*, p. 495).

A. devium Santos Dias 1956 (1955), p. 478 (Hamburg Museum specimen).

Nec A. marmoreum Santos Dias 1956 (1955), p. 496 (*nec* all specimens listed except the Moçambique record).

[*A. marmoreum* group Hoogstraal 1956, p. 225, figs. (= *A. sparsum*).]

A. SPARSUM NEUMANN 1899

Male (Fig. 11, 12 and 13)

Large, 9.2 × 6.1 mm.; average (8.6 × 5.8 mm. type, Neumann gives 8.5 × 5.5 mm.) range, 9.8 × 6.6 to 5.5 × 3.7 mm. Widest portion is at level of posterior third of conscutum. Width at eye level to widest portion is as 3.7:6.1. Ornate. Convex.

Conscutum

Broad ovoid. Eyes yellow to black, flush with surface. Emargination deep and fairly narrow. Cervical pit deep, crescentic. Cervical groove absent. Lateral group absent. Marginal groove variable, sometimes deep and continuous, lined by a row of large to medium punctations, and with both inner and outer edges sloping down fairly steeply; sometimes the groove is very shallow in places or interrupted by short spaces where there is no groove at all, or where it is merely indicated by a row of punctations. Groove extends from festoons to a short distance behind the eye. In Neumann's type specimen the groove is deep and well marked posteriorly, but becomes merely a row of punctations in its anterior portion. Festoons pronounced, longer than broad. Fovea in centre of conscutum on the enamelled patch between the falciform and the postero-medial stripes.

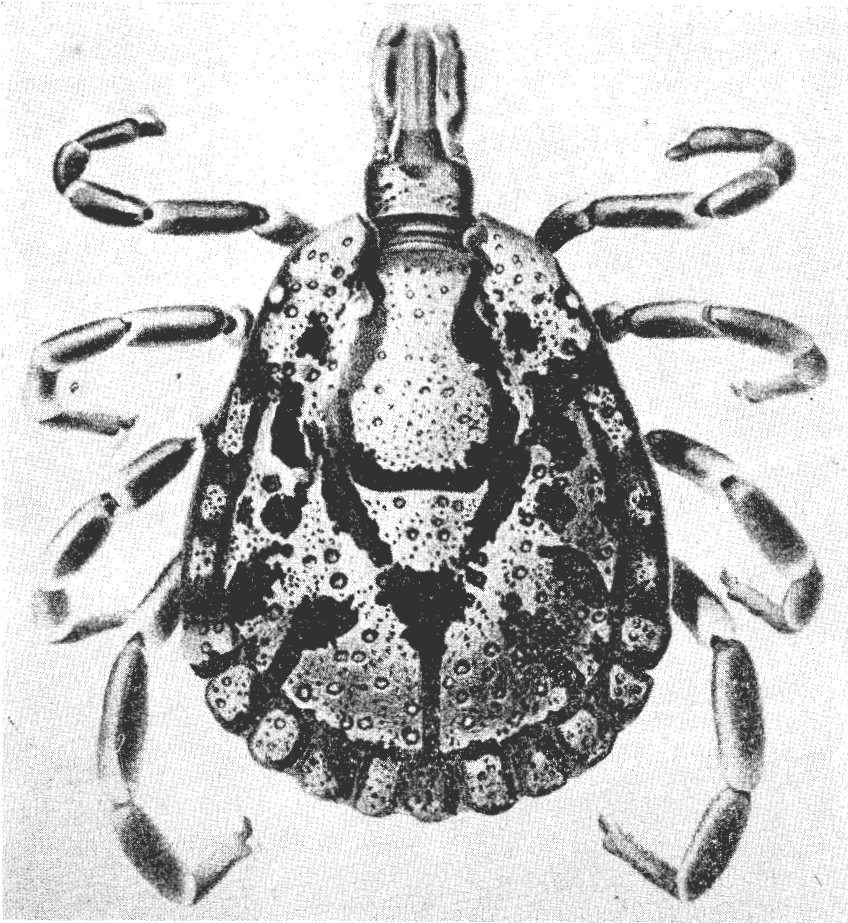


FIG. 11.—*Amblyomma sparsum* Neumann 1899. M—Dorsal view, after Dönitz 1910, Plate 15, Fig. 3 (as *A. marmorum*).

Punctations: Numerous fine interstitial punctations scattered over whole conscutum. Less numerous medium to large punctations; sparsely distributed over whole conscutum with the exception, usually, of the brown stripes; they tend to be more numerous on the shoulders and between the first and second lateral spots and the antero-accessory stripe; they are less numerous on the enamelled patch between the cervical stripes and on the festoons. Each punctation has a small tubercle in its centre.

Enamelling

The full pattern. Enamel coppery or yellow, spots and stripes dark brown to black. Cervical stripes short, very rarely meet falciform stripe. Frontal spot merely indicated by a group of spots. Falciform usually unbroken in mid-line, anterior arms short. Lateral spots more or less discrete. Antero-accessory stripe short, rectilinear, may or may not touch falciform stripe; sometimes separated from it by a thin line of enamelling. Postero-median stripe long and slender with anterior end clubbed, does not reach falciform stripe. Postero-accessory stripes shorter than postero-median; point towards centre of conscutum, usually unevenly swollen at anterior end. Four enamelled marginal spots present of which first is not closed on its dorsal side, spots two to three are bounded on all sides by dark areas. Enamelled patch present on each festoon. Patches on central and third festoons small. All punctations are dark brown.

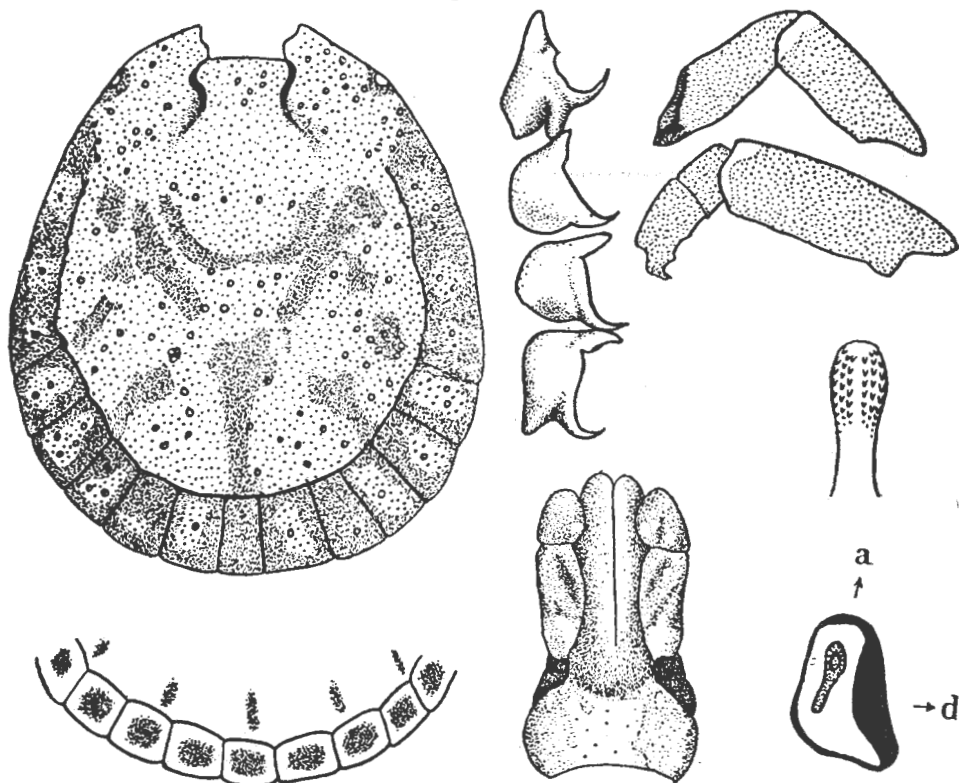


FIG. 12.—*Amblyomma sparsum* Neumann 1899. M—Dorsal view, after Schulze 1932.
Fig. 3 (as *A. schlotkei*).

Sub-collare

Present.

Rostrum

Nearly twice as long as broad.

Basis capituli

About twice as broad as long, posterior margin concave, lateral margin convex. Finely punctate. Patch of enamel present in centre of basis capituli, often reaches to posterior margin.

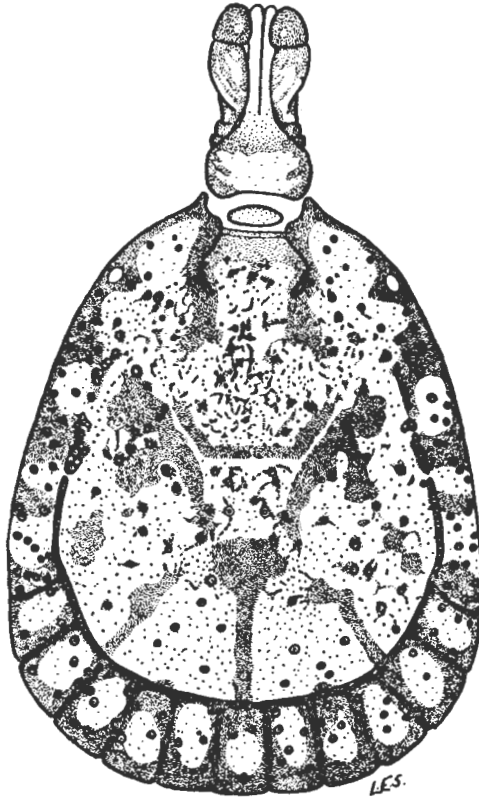


FIG. 13.—*Amblyomma sparsum* Neumann 1899. M—Dorsal view. L. E. Salisbury del.

Palps

Article II more than twice as long as article III, and nearly three times as long as broad, it is constricted at the inner edge of its distal extremity. Article III is slightly longer than broad and rounded on its distal and internal edges. Dorsal surfaces of articles II and III may have irregular patches of enamel.

Hypostome

$3/3$ to $3\frac{1}{2}/3\frac{1}{2}$. The $\frac{1}{2}$ row is often very small, consisting of 2 to 3 tiny teeth, it may be absent.

Ventral Surface

Yellow-brown. Genital pore opposite coxa II. Fестоons about as wide as long, punctate. Five small narrow ventral plaques present, of which the central one is the largest. All coxae are about the same size. Coxa I bears a pair of short spurs of which the outer one is longer and sharper. Coxae II and III with short broad spurs. Coxa IV with a short blunt spur.

Legs

Strong, dark brown, narrow yellow annulations at distal extremities of all segments except tarsus.

Female (Fig. 14).

Unengorged. 10×6.6 mm., average.

Engorged 20×12 mm. in the largest seen.

Scutum

Ornate, subtriangular, slightly wider than long. 4×3.8 mm. Postero-lateral margins straight to slightly convex, antero-lateral margins convex. The flat yellow or brownish eyes are situated at the widest part of the scutum, rather less than $\frac{1}{3}$ of the length of the scutum from the anterior end. Emargination wide and deep. Cervical pits deep and crescentic, floor rugose. Cervical grooves fairly deep, divergent, do not reach postero-lateral margin. Lateral grooves absent. Punctations: fine interstitial punctations scattered over entire scutum; medium punctations, each with a small tubercle in its centre, in groups between the cervical pits and on the shoulders. These latter occasionally coalesce in a group behind the eye; a few medium punctations scattered on the posterior central field.

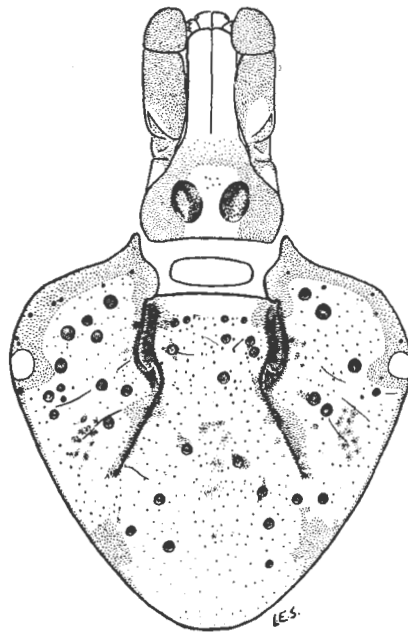


FIG. 14.—*Amblyomma sparsum* Neumann 1899. F—Scutum Dorsal view. L. E. Salisbury del.

Enamelling

The full pattern. The entire scutum is enamelled with coppery sheen, ocular spot present; the cervical stripe follows cervical groove but peters out before reaching the limiting spot; sometimes a group of dots indicates the position of the frontal spot; narrow border edges entire scutum, except sometimes at the posterior angle. All punctations are black.

Sub-collare

Present.

Rostrum

Less than twice as long as broad.

Basis capituli

About twice as broad as long.

Posterior margin slightly concave, lateral margin slightly convex. Areae porosae oval, diverge slightly anteriorly, separated by a distance equal or less than their shortest diameter. Central area enamelled.

Palps

Article II more than twice as long as article III and nearly three times as long as broad. Article III slightly longer than broad, distal and internal edges rounded. Palps may show enamelling.

Hypostome

$3/3$ to $3\frac{1}{2}/3\frac{1}{2}$.

Dorsum

Dark brown, fine hairs present in the punctations.

Ventral Surface

Dark brown. Genital pore opposite coxa II. Coxae sub-equal. Coxa I bears a pair of short spurs of which the outer one is longer and sharper. Coxae II and III with short broad spurs. Coxa IV — a single short blunt spur.

Legs

Brown. Narrow yellow annulations at distal extremities of all segments except tarsus.

Nymph (Fig. 15 and 16)

Unengorged 2.14×1.43 mm. average.

Scutum

Inornate. Slightly wider than long, average 1.04×0.85 mm. Posterior angle flattened. Postero-lateral margins slightly concave. Antero-lateral margins very round. The eyes are flat, flush with the surface, situated at the broadest part of the scutum at approximately the level of the anterior $1/3$. Emargination wide and deep. Cervical pits deep with rugose floor; cervical grooves shallow, divergent. Lateral grooves absent. Scattered large deep punctations present laterally, smaller punctations in the postero-median field, a few medium punctations between the cervical grooves. Punctations with clear-cut perpendicular edges.

Dorsum

Has a pitted appearance in the unengorged specimens; being studded by many small punctations.

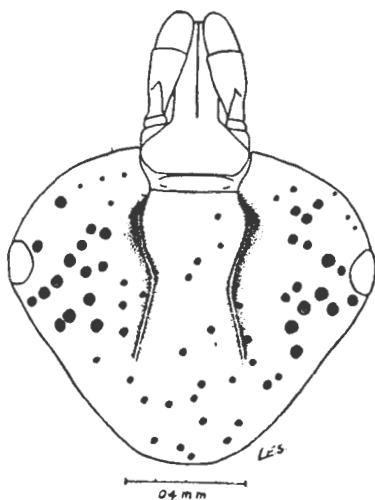


FIG. 15.—*Amblyomma sparsum* Neumann 1899. Nymph—Dorsal view. L. E. Salisbury del.

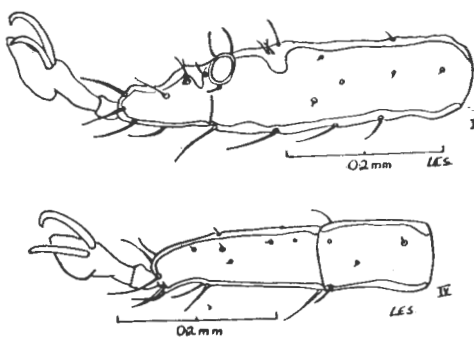


FIG. 16.—*Amblyomma sparsum* Neumann 1899. N—Tarsi I-IV. L. E. Salisbury del.

Sub-collare

Present.

Rostrum

Longer than wide, width = approximately $\frac{2}{3}$ length.

Basis capituli

More than twice as wide as long. Sub-triangular. Posterior margin rectilinear. Lateral margins convex.

Palps

Article II about twice as long as article III and more than twice as long as broad. Article III slightly longer than broad.

Hypostome

2/2.

Ventral Surface

Coxae subequal. Coxa I — 2 spurs, outer one longer; all other coxae—1 spur.

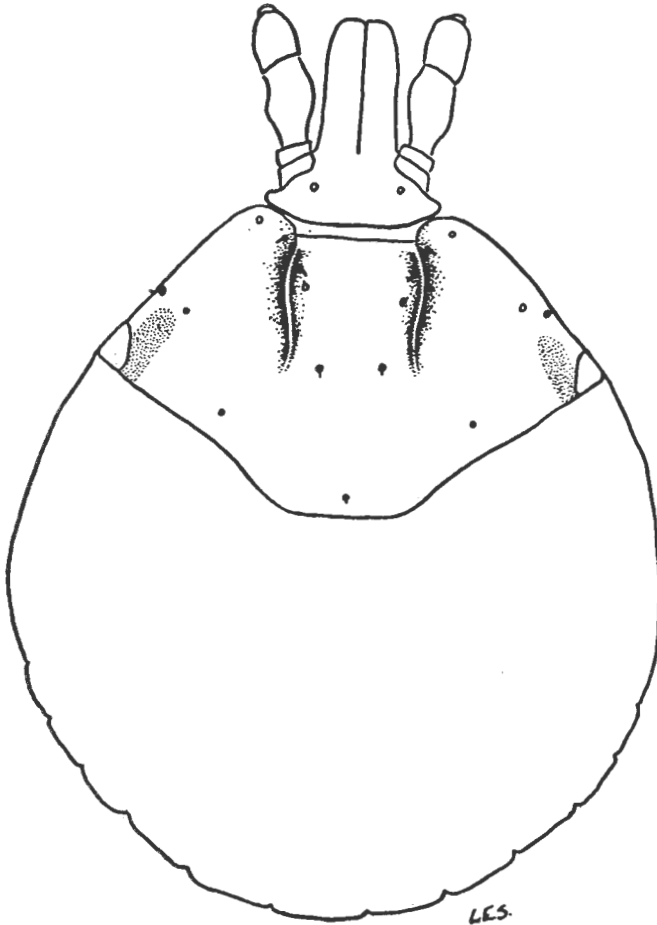


FIG. 17.—*Amblyomma sparsum* Neumann 1899. Larva—Dorsal view. L. E. Salisbury del.

Larva (Fig. 17, 18, 19, 20)

Unengorged. 0.80×0.57 mm. Average.

Scutum

Inornate. Width: length = 5:3.

0.48×0.29 mm. average. Postero-lateral margin slightly concave, antero-lateral margin sinuous. Eyes are at widest part of scutum, half way back. Emargination wide. Cervical groove reaches to the level of the eyes. Punctations as in the sketch.

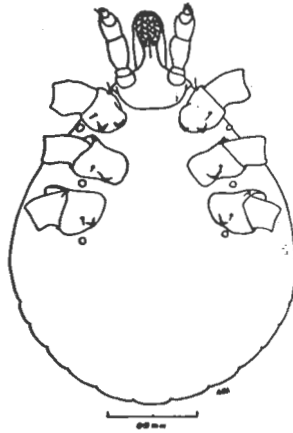


FIG. 18.—*Amblyomma sparsum* Neumann 1899. L.—Ventral view. L. E. Salisbury del.



FIG. 19.—*Amblyomma sparsum* Neumann 1899. L.—Rostrum ventral view. L. E. Salisbury del.

Sub-collare

Absent.

Rostrum

Longer than wide, 0.21 × 0.16 mm. average.

Basis capituli

Triangular. Posterior margin slightly convex.

Palps

Article II about $1\frac{1}{2}$ × as long as article III, and $1\frac{1}{2}$ × as long as broad. Article III slightly longer than broad.

Hypostome

2/2.

Ventral Surface

Coxae subequal. Coxa I bears a pair of spurs of which the outer one is slightly longer. Coxae II and III — single short spurs.

Type specimen

One male off *Spilotis variabilis*; coll. Lucas in the menagerie of the Paris Museum. Paris Museum (Type studied).

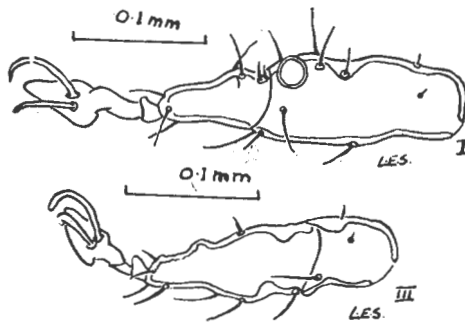


FIG. 20.—*Amblyomma sparsum* Neumann 1899. I.—Tarsi I-III. L. E. Salisbury del.

Description

Mainly based on the material reared in the laboratory by Miss J. B. Walker from a female, off Tortoise, Makueni District, coll. W. Botha, 25 VII 50.

The female placed by Santos Dias in the tube with the type male, and which he thought might be an *A. sparsum* is a female *A. deminutivum* Neumann 1899, a South American species.

Variations of the enamelled pattern

The full enamelled pattern was seen in the majority of the specimens studied, showing the usual range from dull yellow to coppery, edged with iridescent green, according to age and the preservatives used. Often the enamel has dull patches, where it may be greyish. Sometimes patches of the enamel appear to be missing as in the type, and in these the full pattern of spots and stripes cannot always be discerned. Also in relatively fresh specimens there is a considerable range of variation in colouring, from the brightly enamelled ticks with a clear pattern to the dull brownish specimens whose pattern is very indistinct.

In the male the falciform stripe may be divided in the mid-line, though this is unusual. The falciform stripe touches the anterior accessory stripe in more than half the specimens examined. The second lateral spot often, and the first lateral spot sometimes, fuses with the antero-accessory stripe. The posterior stripes usually end freely, but in more than a quarter of the specimens examined these stripes are joined at their tips to each other and the hind end of the antero-accessory stripe.

In the female the frontal spot varies from the usual pattern of a group of small black spots to a solid black patch which may or may not reach the hind border of the scutum. The cervical stripe usually ends freely but in a few specimens it joins the limiting spot.

A. sparsum: Type male.

The enamel pattern is incomplete in this specimen, enamel is only present round the periphery and the central part of the scutum is damaged by scratches and abrasions. Coppery enamel is present on the shoulders, the 4 marginal spots and the festoons; there are long patches of enamel on the dorsal sides of the marginal grooves and small patches posteriorly between the postero-median and postero-accessory stripes. The characteristic spots and stripes which cannot be distinguished when the tick is dried, become visible when it is immersed in alcohol.

A. weneri poematum: Type male.

A typical specimen of *A. sparsum* with full enamelled pattern as given in the description; the enamel is coppery with green iridescence.

A. sparsum: Host list.

Buffalo 10; Dromedary 1; Eland 1; Elephant 1; Giraffe 1; Rhinoceros 19; Tortoise 13; Agama 1; Varanus 4; Puff adder 7; Python 3.

Geographical distribution of A. sparsum

A. sparsum seems to be fairly common in Central and Southern Kenya and to a lesser extent in Tanganyika. There are also records from Ruanda Urundi, Uganda and Southern Sudan. The other records are more scattered and include Khartoum (possibly introduced on a pet tortoise), Eritrea, Ethiopia, Nyasaland, Northern and Southern Rhodesia and Moçambique. There is an isolated record from Grootfontein in South West Africa and three records from Senegal in West Africa.

ONDERSTEPSPOORT JOURNAL OF VETERINARY RESEARCH.

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ERRATA.

Page 59.—Third last line should read: Article III about as broad . . .

Page 63.—Under heading *Type Specimen* add: Description based on F, generation of a female off a tortoise kept in the Albany Museum grounds (Onderstepoort Collection 2989 and 2990).

Page 77.—Seventeenth line from top, read: ?*A.marmoreum* Paoli 1916, p.291, figs.

Page 114.—Add below Table 2:

Hosts: Rhinoceros, 23; buffalo, 10; dromedary, 7; elephant, 1; giraffe, 1; tortoise, 13; *Bitis arietans*, 6; *Bitis lachesis*, 1; python, 1; varanus, 4; agamid, 2; lizard, 1.

Page 116.—Add below Table 3:

Hosts: Tortoise, 28; varanus, 9; *Bitis gabonica*, 1; hedgehog, 4; warthog, 1; bovine, 1, human, 1.

Page 117.—Add below Table 4:

Hosts: Tortoise, 9; varanus, 1; camel(?), 1.

Synonymy

Amblyomma sparsum.

A. sparsum Neumann 1899, p. 247.

A. rugosum Neumann 1899, p. 253 = *A. marmoreum* Neumann 1901, p. 309 (*Pro parte* East African specimens).

A. hassalli Neumann 1899, p. 272 = Neumann 1901, p. 311 *A. marmoreum*, Foa's specimen.

A. devium Neumann 1899, p. 255 = Neumann 1901, p. 311 *A. marmoreum*, Hildebrandt's specimen.

A. sparsum, Berlin Museum, Kretschmar Coll.

Nec A. sparsum, Berlin Museum, Ziemann Coll. [= *A. paulopunctatum*]

Nec A. sparsum, Berlin Museum, Vosseler Coll. [= *A. nuttalli*]

A. marmoreum, Berlin Museum, Dönitz' Coll.

Nec A. sparsum paulopunctatum Neumann 1905, p. 233 [= *A. paulopunctatum*]

A. hebraeum magnum Neumann 1909. Wiesbaden Museum.

A. marmoreum Donitz 1910, plate XV, fig. 3 (*pro parte*. E. African records).

A. marmoreum Paoli 1916, p. 291, figs.

A. marmoreum Robinson 1926, p. 89—90, figs. (*pro parte* not S. African specimens. See tables.)

A. schlotkei Schulze 1932, p. 463, figs.

A. weneri (schlotkei) poematium Schulze 1932, p. 475.

A. faifai Santos Dias 1951, p. 87, figs. = Santos Dias 1954, p. 131 *A. poematium*.

A. poematium Santos Dias 1954, p. 123, figs.

A. marmoreum group Hoogstraal 1956, p. 225, figs.

A. NUTTALLI DÖNITZ 1909

Male (Fig. 22—23)

Medium sized. 5.7×4.0 mm. average. Range 4.9×3.2 mm. to 7.1×5.0 mm. Widest portion is just posterior to centre of conscutum. Width at eye level to widest portion is as 2.3:4.0. Brown, ornate, convex.

Conscutum

Broad, ovoid. Ratio, length: width varies between 1.28:1 and 1.10:1. Eyes yellow or dark brown, flush with surface, not always readily seen. Emargination narrow and deep. Cervical pit short, deep, curved. Cervical groove absent. Lateral grooves absent. Marginal groove deep, outer edge slopes down more steeply than inner edge, lined by a row of large punctations; towards the anterior end the groove becomes less definite and is usually marked by a broken line of punctations, it reaches to a little way behind the eye. Fестоons pronounced, longer than broad. Fovea a little behind the centre of the conscutum on the enamelled patch anterior to the postero-median stripe. Large punctations with steeply sloping sides, each bearing a small tubercle in its centre, scattered over the conscutum, tending to cluster in some specimens, usually confined to the enamelled parts, or to the areas corresponding to the enamelled parts in specimens with no enamel. Fine, interstitial punctations all over the conscutum; these are largest at the anterior end and become so fine as to be almost invisible posteriorly.

Enamelling

The full pattern. In dry specimens the enamel is pale yellow and the stripes very dark brown. The cervical stripe usually extends back to join the falciform stripe and may join the frontal spot. The falciform stripe is almost always divided in the midline, and is fused with the antero-accessory stripes to form a characteristic double crescent pattern. The posterior stripes are always separate. The postero-median stripe becomes broader at its anterior end but is not clubbed. The postero-accessory stripes are short and broad. The lateral spots are usually separate but adjacent spots are sometimes joined by a narrow "bridge". The ocular spot and three marginal spots are present. The festoons each have a patch of enamel, smaller in the central and 4th festoons than in the others. The enamelled pattern when present is sharp and clear.

Sub-collare

Present.

Rostrum

More than $1\frac{1}{2}$ times as long as broad.

Basis capituli

Nearly twice as long as broad. Posterior margin concave, lateral margins convex. Patch of enamel in centre.

Palps

Article II. Slightly more than twice as long as Article III and slightly more than twice as long as broad. Article III is as long as broad. Small patches of enamel may occur on the dorsal surface.

Hypostome

3/3.

Ventral surface

Pale grey-yellow. Genital pore opposite coxa III. Festoons vary in shape but are more or less square. Ventral plaques small and broad, centre one is the largest. All Coxae subequal. Coxa I bears a pair of very short, rounded equal-sized spurs. Coxae II and III have broad, very rounded, short spurs often giving the appearance of salient ridges. Coxa IV — spur longer and narrower than on Coxae II and III.

Legs

Brown with narrow pale annulations at the distal extremities of the segments.

Female (Fig. 21—24)

Unengorged. 7.4×5.0 mm. average. Range 6.6×4.4 mm. to 9.2×5.6 mm.

Scutum

Sub-triangular, convex. Slightly wider than long. Average 3.1×2.8 mm. Postero-lateral margins slightly convex, antero-lateral margins convex. The flat yellow or brown eyes at the widest part of the scutum at a distance of less than $\frac{1}{3}$ of the length of the scutum from the anterior end. Emargination deep and fairly wide. Cervical pits crescentic with finely rugose floor. Cervical grooves shallow, smooth, diverge posteriorly, do not reach posterior margin. Lateral grooves absent. Large punctations, each bearing a small tubercle in its centre,

are scattered over the conscutum. They are mostly confined to the enamelled parts and are few or absent in the centre of the scutum between the anterior part of the cervical grooves. The large punctations do not coalesce. Numerous very fine punctations occur all over the scutum.

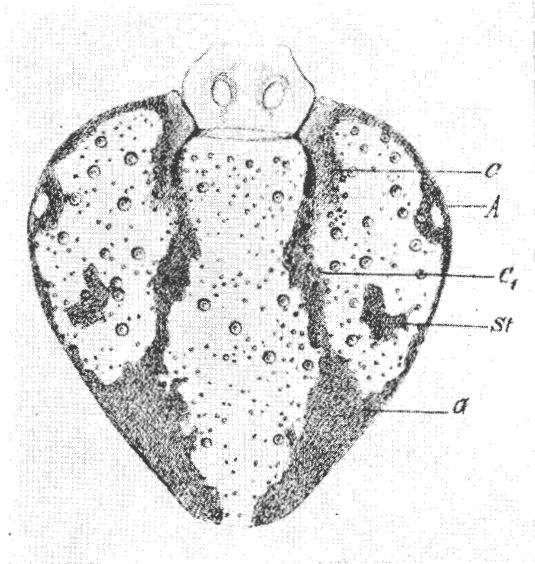


FIG. 21.—*Amblyomma nuttalli* Dönitz 1909. F—Scutum, dorsal view, after Dönitz 1909, Fig. 4.

Enamelling

The full pattern. The enamel is yellow and spots and stripes are brown. The cervical stripe follows the cervical groove and joins the limiting spot. This is very large and constricts the posterior part of the pale median field to a point. Frontal spot present and usually joined to the edge of the scutum, though in some specimens it is separate. Ocular spots are present and the entire scutum has a dark edge with the exception of the posterior angle between the limiting spots.

Sub-collare

Present.

Rostrum

$1\frac{1}{2}$ times as long as broad.

Basis capituli

Rectangular, less than twice as broad as long. Posterior margin very slightly concave. Lateral margins convex. *Areae porosae* broad oval, diverge slightly anteriorly, separated by a distance less than their shortest diameter. A patch of enamel occurs in the centre.

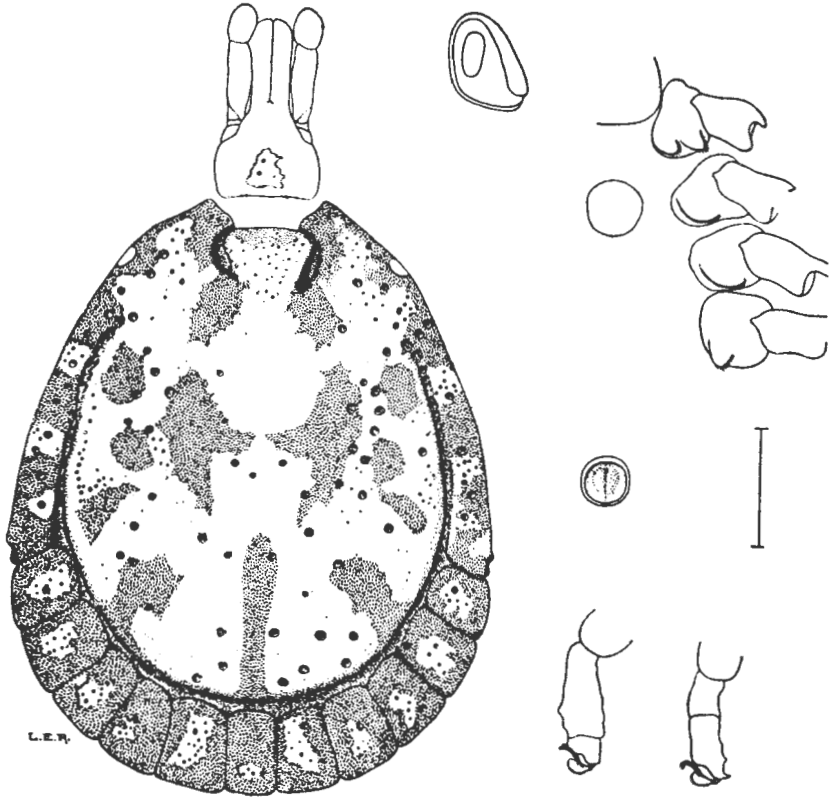


FIG. 22.—*Amblyomma nuttalli* Dönitz 1909. M—Dorsal view, after Robinson 1926, Fig. 40.

Palps

Article II more than twice as long as article III and more than twice as long as broad. Article III about as broad as long. Irregular patches of enamel may be present.

Hypostome

3/3.

Dorsum

Brown, shallow, medium sized punctations, widely spaced.

Ventral surface

Brown. Genital pore opposite coxa II. All coxae about the same size.

Coxa I bears a pair of very rounded, equal-sized spurs.

Coxae II and III have broad very rounded short spurs often giving the appearance of salient ridges.

Coxa IV—spur longer and narrower than on coxae II and III.

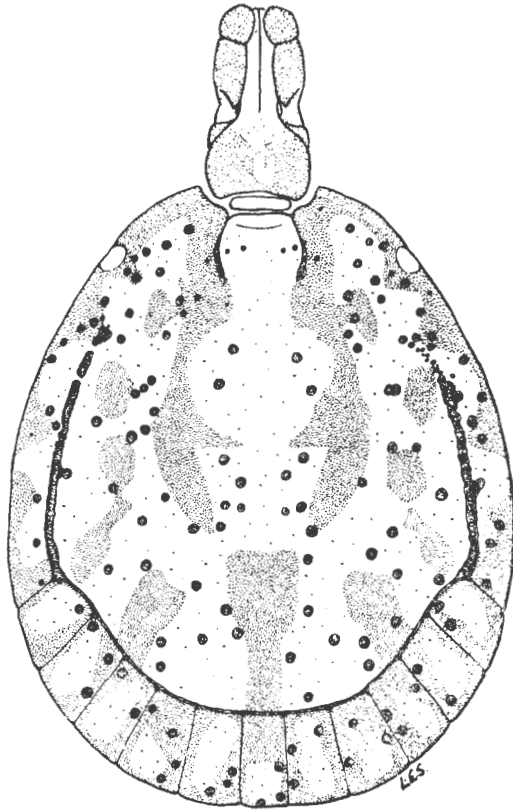


FIG. 23.—*Amblyomma nuttalli* Dönitz 1909. M—Dorsal view. L. E. Salisbury del.

Legs

Brown with narrow and feeble pale annulations at distal extremities of segments.

Nymph (Fig. 25, 26, 27)

Size Unengorged. 2.36 mm. × 1.64 mm. average.

Scutum

Inornate, central field pale, slightly wider than long. 1.11 × 0.86 mm. Posterior angle rounded.

Postero-lateral margins slightly convex. Antero-lateral margins straight to slightly convex. Eyes large, situated at widest part of scutum. Emargination wide. Cervical pit deep, narrow, rugose floor. Cervical grooves shallow, divergent, do not reach posterior margin. Large punctations scattered over scutum. Fewer in central field and on shoulders where they are shallower with sloping sides. More numerous and tending to cluster near eyes, where they are larger and deeper than elsewhere, with steep upright sides.

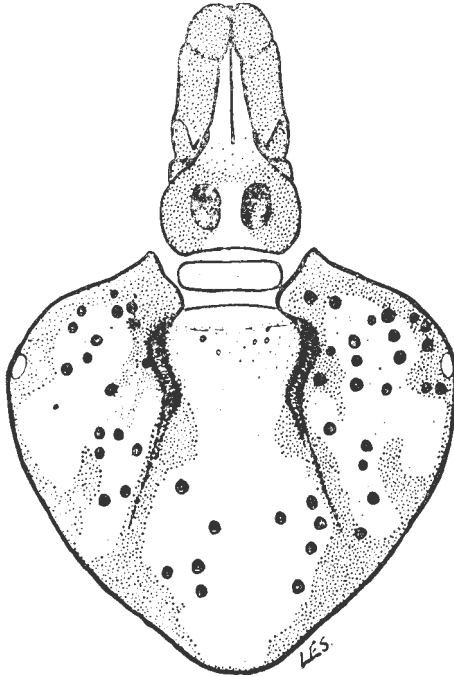


FIG. 24.—*Amblyomma nuttalli* Dönitz 1909. F.—Dorsal view. L. E. Salisbury del.

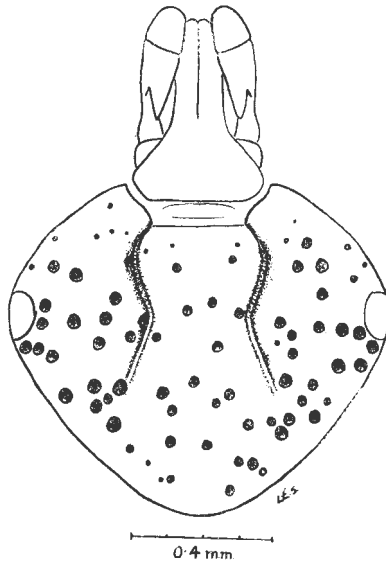


FIG. 25.—*Amblyomma nuttalli* Dönitz 1909. N.—Dorsal view. L. E. Salisbury del.

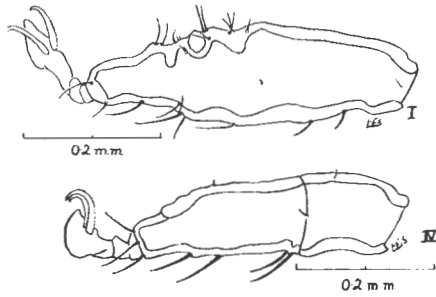


FIG. 26.—*Amblyomma nuttalli* Dönitz 1909. N—Tarsi I-IV. L. E. Salisbury del.

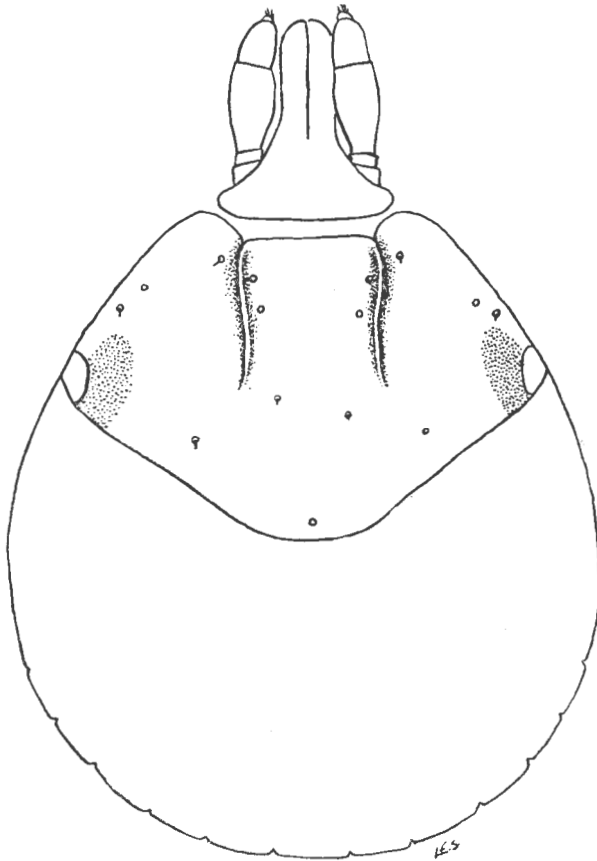


FIG. 27.—*Amblyomma nuttalli* Dönitz 1909. L—Dorsal view. L. E. Salisbury del.

Sub-collare

Present.

Rostrum

Slightly longer than wide, width approximately $\frac{3}{4}$ length.

Basis capituli

More than twice as wide as long. Sub-triangular. Posterior margin rectilinear. Lateral margins convex.

Palps

Article II nearly twice as long as article III and nearly twice as long as broad.

Hypostome

2/2.

Ventral surface

Coxae are of equal size. Coxa I bears a pair of small equal spurs. Other coxae one spur, short and blunt.

Larva (Fig. 27, 28, 29, 30)

Size. Unengorged. 0.82 mm. \times 0.58 mm. average.

Scutum

Inornate. Width: length = 2:3. Postero-lateral border slightly concave to rectilinear. Antero-lateral border convex, posterior broadly rounded. Eyes are at widest part of scutum. Emargination wide. Cervical groove short. Punctations as in sketch.

Sub-collare

Absent.

Rostrum

Slightly longer than wide, 0.19 mm. \times 0.17 mm. average.

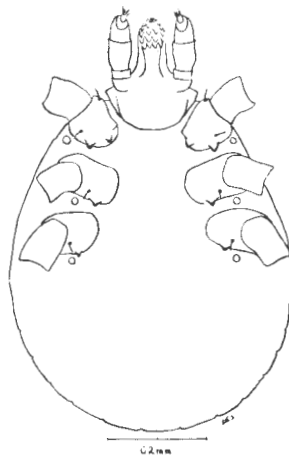


FIG. 28.—*Amblyomma nuttalli* Dönitz 1909. L—Ventral view. L. E. Salisbury del.

Basis capituli

Triangular, posterior margin rectilinear.

Palps

Article II about twice as long as article III and twice as long as broad.

Hypostome

2/2.

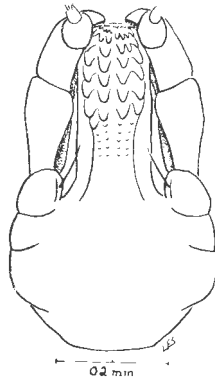


FIG. 29.—*Amblyomma nuttalli* Dönitz 1909. L—Rostrum ventral view. L. E. Salisbury del.

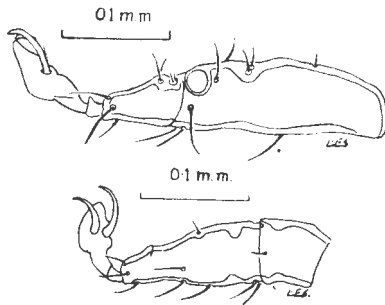


FIG. 30.—*Amblyomma nuttalli* Dönitz 1909. L—Tarsi I-III. L. E. Salisbury del.

Ventral surface

Coxae are of equal size. Coxa I bears a pair of short spurs of which the outer one is longer. Coxae II and III have single spurs.

Type specimens

- 3 males from East Africa (Dar-es-Salaam, Bagamojo).
- 1 female, Dar-es-Salaam.
- 1 female, Umtali.
- 1 female, Kamerun.

Description

Based on the material reared in the laboratory by Santos Dias from a female from Maputo.

Variations of the enamelled pattern

Male

The full pattern with bright enamel filling the spaces between the dark elements of the pattern is unusual in the material that we have examined, though it is sometimes seen.

In the male the enamel is usually confined to patches on the shoulders and on the marginal folds. The spots and stripes are dark reddish-brown and are often only weakly defined against their background of lighter brown; in some specimens they cannot be distinguished. In specimens with an intermediate type of pattern, the dark elements may be edged with enamel, although the actual enamel patch may be missing. The dark elements of the pattern, when visible, are fairly constant, and do not deviate much from the arrangement given in the description of the full pattern. (Compare Fig. 23 with Robinson, p. 91, fig. 40.)

Female

The distribution of enamel in the female is usually also incomplete and varies from small patches on the shoulders to the full pattern. The frontal spot is joined to the edge of the scutum in three-quarters of the specimens examined, and mostly the narrowed posterior point of the pattern can be seen, even if it is with great difficulty.

A. nuttalli. Type female (Fig. 21)

(We take the female off Schildkröte, Umtali, Berlin Museum, which is illustrated by Dönitz, 1909, to be the type.) This specimen is pinned; the enamel is clear yellow; spots and stripes dark brown. The pattern is clear and full, with frontal spots separate from the dark border.

A. nuttalli. Host list.

Bovine 1; Hedgehog 4; Human 1; Warthog 1; Tortoise 27; Varanus 7; Puff adder 1; Python 1.

Geographical distribution of A. nuttalli.

This tick is widely distributed, but nowhere does it appear to be common, excepting possibly in Moçambique and Zululand. We have records of *A. nuttalli* from several states in West Africa, and isolated records from the Northern and Southern Congo, Uganda, Kenya, Tanganyika, Nyasaland and Angola.

Hoogstraal 1956 gives several records from the Southern Sudan. There are several records from Southern Rhodesia, Moçambique and Zululand and three other isolated records in South Africa.

*Synonymy**Amblyomma nuttalli*.

- A. nuttalli* Dönitz 1909, p. 469, fig.
A. marmoreum Neumann 1901, p. 311, Stuhlman's specimen.
A. sparsum, Berlin Museum, Vosseler Collection.
A. nuttalli Robinson 1926, p. 90, figs.
A. marmoreum Robinson 1926, p. 89—90, (*Pro parte*: See tables).
A. wernerii Schulze 1932, p. 466, figs.

Nec A. wernerii (schlotkei) poematium Schulze 1932, p. 475, [= *A. sparsum*].

- A. nuttalli* Santos Dias 1949, p. 51, figs. 1955, p. 2277.
A. silvai Santos Dias 1955 (1951), p. 104 — Santos Dias 1955 (1957), p. 110
 a parviscutate sub-species of *A. nuttalli*.
A. nuttalli Santos Dias 1956 (1955), p. 499 (*pro parte*, specimens listed).
A. nuttalli Hoogstraal 1956, p. 233, figs.
A. paulopunctatum Rageau 1951, p. 112 (*pro parte*, specimens off tortoises).

A. FALSOMARMOREUM TONELLI—RONDELLI 1935

Male (Fig. 31 to 33)

Large 8·6 × 5·6 mm. average. Widest portion is a little behind the middle of the scutum. Width at eye level to widest portion is as 3·3 : 5·6. Brown, ornate, convex.

Conscutum

Broad ovoid. Eyes orange-brown to dark brown, flush with the surface. Emargination medium. Cervical pit deep, crescentic. Cervical groove — a short shallow depression. Lateral groove absent. Marginal groove deep and rugged, continuous, reaches to a short distance behind the eye, may be continued forwards by a short uneven row of punctations. Both inner and outer edges slope down steeply to the groove, the outer more so than the inner. The groove is pitted with large punctations. Festoon pronounced, longer than broad. Fovea anterior to the end of the posterior median stripe. Punctations: Numerous, fine, shallow, interstitial punctations scattered over whole conscutum. Very large, deep punctations with a central tubercle, bearing a hair, unevenly dispersed over the scutum; may be up to 0·2 mm. in diameter; however they are variable in size and tend to become smaller, anteriorly and on the lateral folds and festoons. Edges upright to slightly sloping. The large punctations are most numerous in the area in front of and between the posterior median and postero-accessory stripes. An irregular row of punctations follows the line of the lateral spots. A group of usually somewhat smaller punctations occurs between the cervical stripes. Mixed large and medium punctations occur in the central field and on the shoulders. Fairly numerous medium punctations occur on the marginal folds and festoons. The line of demarcation between the posterior part of the conscutum and the festoons is usually somewhat irregular.

Enamelling

Full pattern. No dry-kept specimens have been examined and only about six of the specimens seen have a relatively full pattern. The enamelling is usually coppery-orange in colour with traces of green round the edges. The stripes are brown to dark brown and in some instances tend to be depressed, especially the postero-laterals.

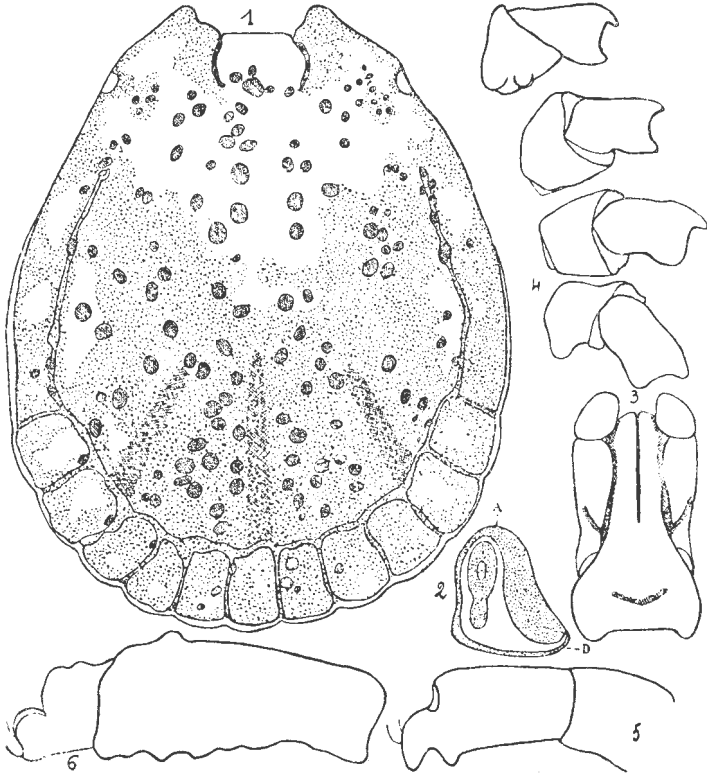


FIG. 31.—*Amblyomma fulsomarmoreum* Tonelli-Rondelli 1935. M—Dorsal view, after Tonelli-Rondelli 1935, fig. 3.

The cervical stripes may or may not join the falciform stripe and may or may not touch the frontal spot, which is rather weakly developed. The falciform stripe is variable, always divided in its mid-line and may be rather indistinct. It sometimes touches the anterior accessory stripe. The latter is usually joined to the first lateral spot; the 1st, 2nd and 3rd lateral spots are sometimes joined. The postero-median stripe is long and slender, it is sometimes dilated at its anterior end. The postero-accessory stripes are stouter, and may also be clubbed; four marginal spots present, usually clearly defined. Enamel patches occur on the festoons. The patches on the centre festoon and No. 3 are smaller than the others. In no specimen that has been examined is the pattern sharp and very clearly defined and the contrast between the orange enamel and brown stripes is not very great.

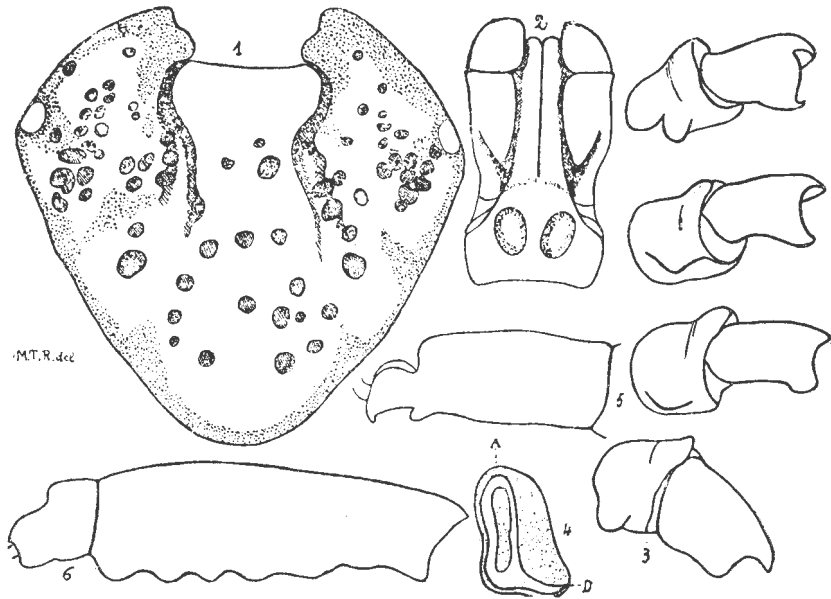


FIG. 32.—*Amblyomma falsomarmoreum* Tonelli-Rondelli 1935. F—Scutum view, after Tonelli-Rondelli 1935, fig. 4.

Sub-collare

Present, inornate.

Rostrum

Nearly twice as long as broad.

Basis capituli

$1\frac{1}{2}$ times as broad as long. Posterior margin concave. Cornua very bluntly rounded. Lateral margin convex. Surface may show enamelling, rugose.

Palps

Article II more than twice as long as article III and more than twice as long as broad. Article III is as broad as long and rounded at its distal end.

Hypostome

3/3, 5—7 teeth per row. Some specimens have 1—2 very small teeth level with the proximal end of the other rows but placed nearer the mid-line of the hypostome thus forming a rudimentary 4th row.

Ventral surface

Pale brown to gray-brown. Genital pore opposite coxa II. Fестоons broader than long. Five weakly developed, small, narrow ventral plaques present, of which the central one is the longest. All coxae are about the same size. Coxa I bears a pair of short spurs of which the outer one is usually slightly narrower and longer than the inner one.

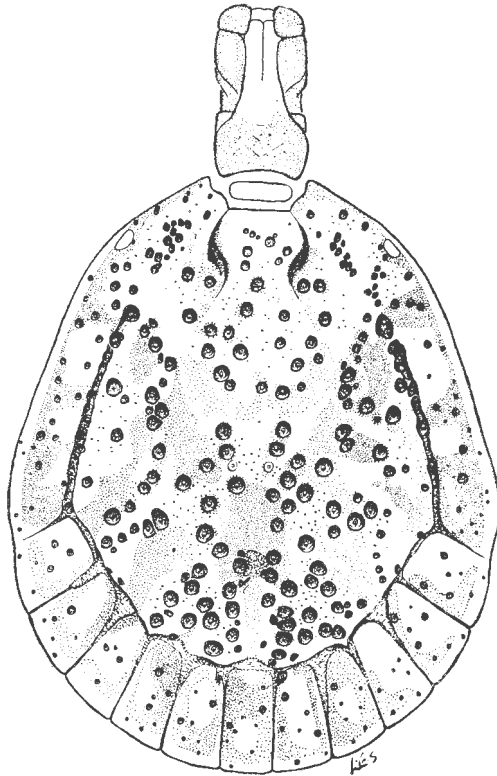


FIG. 33.—*Amblyomma falsomarmorium* Tonelli-Rondelli 1935. M—Dorsal view.
L. E. Salisbury del.

Coxae II--IV with a single, very broad, internal spur, narrowing progressively from II to IV.

Legs

Brown. Cream annulations at distal extremities of segments.

Female (Fig. 32--34)

Large, unengorged 10.5 × 6.6 mm., average of 7 specimens.

Scutum

Ornate, sub-triangular, slightly wider than long, 3.8 × 3.6 mm. average. Postero-lateral margins slightly convex, antero-lateral margins convex. Eyes flat, situated about $\frac{1}{3}$ of the length of the scutum from the anterior end. Emargination wide and deep. Cervical pits broad, deep and crescentic, floor pitted and rugose. Cervical grooves broad, divergent. Lateral grooves faintly indicated on some specimens.

Punctations: Numerous, fine, shallow, interstitial punctations scattered over whole scutum. Medium, large and very large punctations with steeply sloping sides each with a central hair-bearing tubercle present; usually most numerous beside the eyes, where they are sometimes very closely arranged and may coalesce. Large punctations of various sizes also occur in the central field. In this area there is usually a concentration of punctations in the posterior median field where they sometimes coalesce. Large punctations occur in the cervical groove and in the depressed area bounded by the cervical groove and the lateral groove (if any).

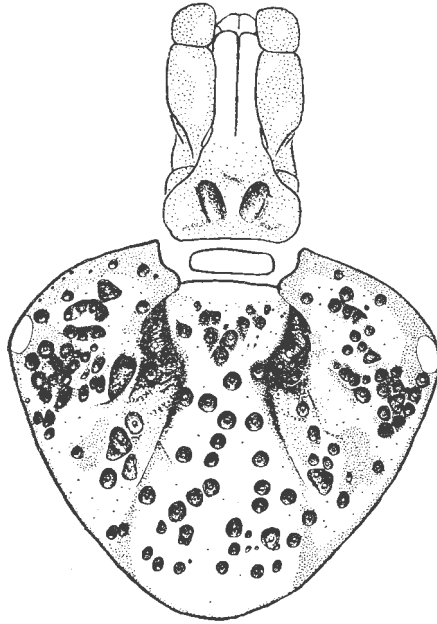


FIG. 34.—*Amblyomma falsomarmoreum* Tonelli-Rondelli 1935. F—Dorsal view.
L. E. Salisbury del.

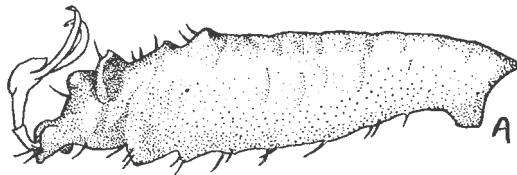


FIG. 35a.—Adult tarsus I. *A. marmoreum*. L. E. Salisbury del.

Enamelling.

The full pattern.

Enamel is coppery, with traces of green at the edges, spread over the entire scutum, interrupted by the narrow stripes, dark brown. The scutum is edged with dark brown. The cervical stripe usually reaches the limiting spot. Frontal spot not well developed, sometimes joins edging. Ocular spot present.

Punctations are sometimes brown.

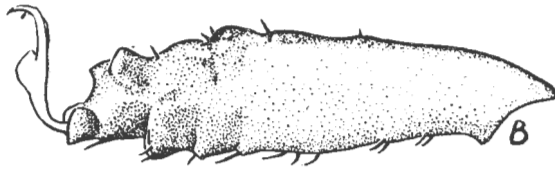


FIG. 35b.—Adult tarsus I. *A. sparsum*. L. E. Salisbury del.

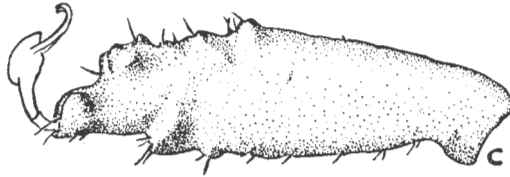


FIG. 35c.—Adult tarsus I. *A. nuttalli*. L. E. Salisbury del.



FIG. 35d.—Adult tarsus I. *A. falsomarmorum*. L. E. Salisbury del.

Sub-collare

Present, inornate.

Rostrum

Less than twice as long as broad.

Basis capituli

Less than twice as wide as long. Posterior margin very slightly concave. Lateral margin convex. Areae porosae oval, diverge slightly anteriorly, separated by a distance of $\frac{2}{3}$ of their shortest diameter. Enamelling vaguely indicated.

Palps

Article II more than twice as long as article III, and more than twice as long as broad. Article III about as long as broad, rounded. Enamelling may be vaguely present.

Hypostome

$\frac{3}{3}$, 6 rows of teeth. $\frac{1}{2}$ row indicated on one specimen by 2 very small teeth.

Dorsum

Brown.

Ventral surface

Brown. Genital pore opposite coxa II. All coxae about the same size. Coxa I bears a pair of short spurs of which the outer is usually somewhat longer and narrower than the inner one. Coxae II-IV with single, very broad internal spur, narrowing progressively from II to IV.

Legs

Brown, narrow cream annulations at distal extremities of segments.

Type

Male and female: Collected by Taramasso at Algoi Bariré (Italian Somaliland). Turin Museum (not seen). (Fig. 31--32).

Description

Based on Miss. J. B. Walker's material off Tortoise, Koboko, 9.1.53. Coll. R. Smith.

Variations of the enamelled pattern

As but few specimens were available for study it is difficult to reach definite conclusions as to the range of variations. Nearly half (14) of the male specimens seen have a damaged conscutum, with abraded patches in the central area. These damaged specimens show patches of coppery enamel on the shoulders and marginal folds only. Eight undamaged specimens have similar enamelling, with the stripes showing up indistinctly as dark brown lines against the lighter brown background. Six specimens have a more or less full pattern as given in the description, and in five others the full pattern is faintly marked due to the weak development of the enamel between the stripes in the central area.

The females examined are all undamaged and the full pattern can be seen more or less clearly in six, while two specimens have enamel on the shoulders only.

A. falsomarmoreum. Host list.

Camel 1?; Tortoise 8; Varanus 1.

Geographical distribution of A. falsomarmoreum.

A. falsomarmoreum is a rare East African Tick. We have four records from Dire Dawa and its environs in Ethiopia and four records from around Kilimandjaro in Kenya and Tanganyika. There is a single record from British Somaliland, two from Somalia and an isolated record from Northern Turkana in Kenya. The type was collected in Somalia, making a total of three records for that country.

*Synonymy**Amblyomma falsomarmoreum*

A. falsomarmoreum Tonelli-Rondelli 1953, p. 239, figs.
?, *A. marmoreum* Paoli 1916, p. 291, figs.

AMBLYOMMA PAULOPUNCTATUM NEUMANN 1899

In view of the fact that Neumann had mixed up this tick with his male *A. sparsum*, and in view of the fact that the descriptions of the pattern are possibly somewhat misleading, we here give a revised description based on what material has been available.

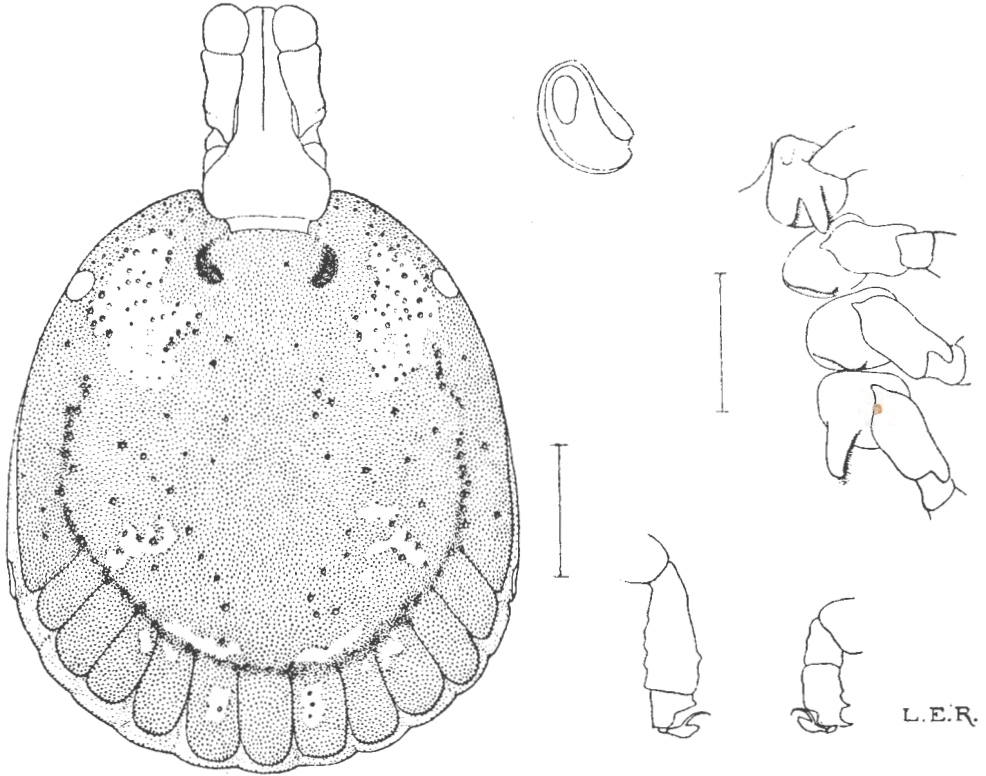


FIG. 36.—*Amblyomma paulopunctatum* Neumann 1899. M—Dorsal view, after Robinson 1926, Fig. 36.

Male (Fig. 36—37)

The cervical spot, the cervical stripe and ocular spot are well developed and clear cut. In one specimen there is an indication of a frontal spot (shown lightly stippled in Robinson's drawing). The three lateral spots are large and fused into a lumpy arch; the posterior accessory is short, squat and round, the posterior median is short, broad, longer and narrower than the postero-accessory.

The central portion of the tick is pale and colourless and it is difficult to distinguish either the brown stripes or any enamelling in it, but the falciform, the anterior accessory and the posterior portion of the frontal stripe appear to be absent.

The enamelled pattern consists of a pair of irregular spots between the cervical pits, a large, irregular, pale patch in each anterior lateral field; this patch joins up, by means of a thin narrow strip of enamelling edging the arch of the lateral spots, with a patch opposite festoon one and separating lateral spot 3 from the posterior accessory patch opposite festoon 3 (indicated by Robinson, Tendeiro, 1952 and Rousselot). In most instances the patch opposite festoons 4 and 5 remains as a short narrow strip; in one specimen, however, it extends anteriorly

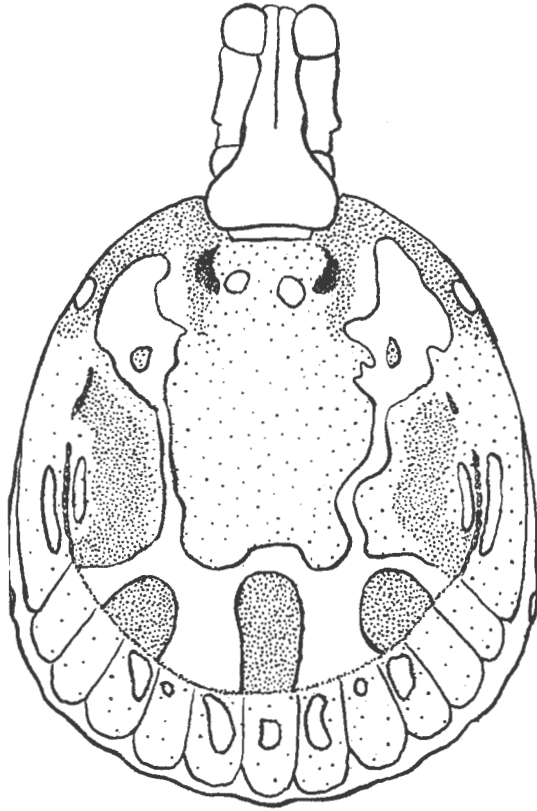


FIG. 37.—*Amblyomma paulopunctatum* Neumann 1899. M—(Full?) Enamelled pattern, diagrammatic. L. E. Salisbury del.

and comes to surround the postero-median and joining with the patch opposite festoon 1 encloses the postero-accessory. Lying in the arch of the three lateral spots is a longitudinal, narrow patch, divided along its length by the marginal groove (mentioned in the text by Robinson); in Rousselot's and Tendeiro's sketches the patches are indicated by the presence of their external half only; (Rousselot draws them too far forward). Festoons 3 to 6 with patches. Of the enamelling the irregular anterior patches are the most prominent and the most persistent, and are so shown in all the sketches.

In the material examined we have seen no definite enamelling on the rostrum.

The enamelling on the legs is confined to a narrow, pale, ring.

The palps show a slight keeling at the postero-external margin of article 2.

Female (Fig. 38)

The description given by Robinson, 1926, p. 84, is adequate.

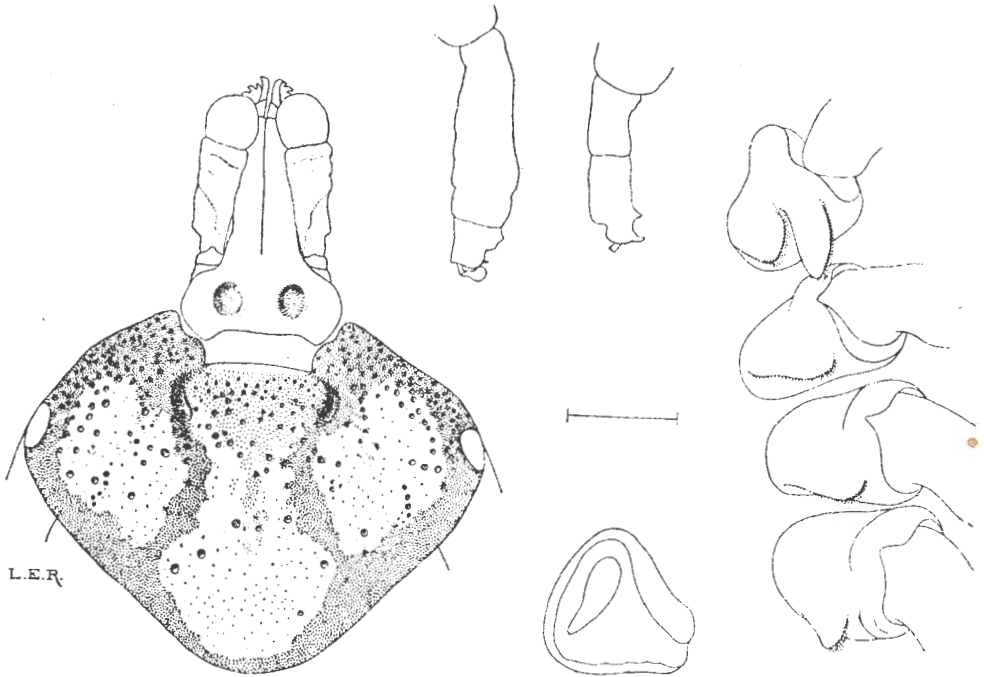


FIG. 38.—*Amblyomma paulopunctatum* Neumann 1899. F—Scutum, after Robinson 1926, Fig. 37.

Records

Bequaert, 1931; mm. ff. *Hylochoerus meinertzhageni ituriensis*, Medje, Belgian Congo. Coll. Lang-Chapin.

mm. ff. Wild pig sp. ? Haut Laporé, Belgian Congo. Coll. J. Ghesquière.

mm. ff. *Potamochoerus porcus*. Arebi and Bolobo. Belgian Congo. Coll. H. Schouteden.

Fain, 1949 off *Potamochoerus porcus*. Banningville, Belgian Congo.

Neumann, 1899; 1 m., host?, Konakry (Guinée française) coll. Maclaud (Mus. Paris).

Neumann's Collection; 1 m. (labelled *A. sparsum*) Elephant, Kamerun, Dr. Ziemann (Berlin Museum).

Neumann, 1908; 1 f. (as *trimaculatum*) Robertsport Liberia, Coll. Demery, (Mus: Nat. History, Leyden).

Robinson, 1926; mm. + ff. West Africa Coll., Dr. Seymour Hadwen [? Nuttall Collection at B.M. (N.H.)?]. 1 f Grass, Daro Forest, Toro, Uganda, X. 1911, Coll. S.A. Neave [I.B.E. at B.M. (N.H.)?]. 1 f Grass Bewama, Sierra Leone 13. IX. 1912. Coll. J. J. Simpson [I.B.E. at B.M. (N.H.)].

- Rageau, 1951. off *Phacochoerus*, Batouri, Muélé, Cameroons. Coll. Jonchère (Specimens seen). Numerous on Tortoise at Yaoundé. French Equatorial Africa. (Specimens seen and identified as *A. nuttalli*).
- Rageau collection 1 f off *Bos indicus*. Yaoundé 19. III. 52 (*A. paulopunctatum*). Pig. Yaoundé, 4. VI. 52.
- Schouteden, 1929 off *Potamochoerus porcus*, Bambili, Belgian Congo.
? Niangara, Belgian Congo.
- Tendeiro, 1952, Hippopotamus. Portuguese Guinea.
- Tendeiro, 1952, *Potamochoerus porcus, mansabaj*; *Phacochoerus aethiopicus africanus*, Cacheu; Pig Bijagos; Portuguese Guinea.
- J. B. Walker (private correspondence) 7 m, 4 f. Giant Hog, Masindi, Uganda. Coll. Fazal Hak. 5. VII. 56.
- Heinrich Coll. 1 m 1 f; *Koiroptomus porcus*, Canzele, Angola 17. II. 55. Coll. Heinrich. (Chicago Mus: Nat. Hist.) (specimens seen —).
- Rousselot, 1953. mm *Potamochoerus*. Carnot. Oubangui-Chari; II. 52. Coll. M. Griebine (2 m seen). ? Human, Mayama in a forest.
- Zumpt's Collection. 1 m (specimen seen).
- Aellen Collection. 1 m, Human, Gapo. Ivory Coast. 6. VII. 53. (Mus. Nat. Hist. Genève.) (Specimen seen.)

According to the above meagre records it is difficult to say much about the habits of the tick, except that apparently it is not a tortoise or a Rhinoceros tick, but possibly prefers the Suidae.

Synonymy

Amblyomma paulopunctatum

- A. paulopunctatum* Neumann 1899, p. 248.
A. sparsum paulopunctatum Neumann 1905, p. 233.
A. trimaculatum Neumann 1908, p. 84, figs.
A. sparsum, Berlin Museum, Ziemann Collection.
A. paulopunctatum Robinson 1926, p. 82, figs.
A. paulopunctatum Bequaert 1931, p. 223.
A. paulopunctatum Rageau 1951, (*pro parte, nec specimens off tortoises [= A. nuttalli*]).
A. paulopunctatum Tendeiro 1952, figs.
A. paulopunctatum Rousselot 1953, p. 112, figs.

AMBLYOMMA BREVISUTATUM NEUMANN 1899

- A. breviscutatum* Neumann 1899, p. 214 was described from one female from the Congo, collected by Thollon (Paris Museum). Theiler and Robinson, 1954, in the "Check list of ticks recorded from the Belgian Congo" listed it under *A. paulopunctatum*. Santos Dias 1956, (*An Inst. Med. Trop.* 13, p. 199—208) upon studying the type shows it to be the same as *A. cyprium*, an Indonesian species. He postulates a change of labels.

AMBLYOMMA CRENATUM NEUMANN 1899

According to Bequaert 1933, Anastos 1950, and Kraneveld 1956 *A. crenatum* is an Indo-Malayan tick, having been found associated with rhinoceros in Malakka, Sumatra, Bantam, West Java. Neumann's type female was reported to be off a rhinoceros, Cape of Good Hope, Paris Museum. From the above records it would appear that Neumann's type female was incorrectly labelled, not as to host, but as to locality. That *A. crenatum* is not found in Africa, as surmised by Bequaert, Anastos and Kraneveld, is borne out by the present study. In all the collections, off rhinoceros, studied we have found no *A. crenatum*, nor have we found any other African record besides Neumann's original one.

AMBLYOMMA SYLVATICUM (DE GEER 1778)

Besides five males under the double label of *H. devium*, type Koch, and *latum* type Koch, this tick did not figure in any one of the collections sent in as coming off tortoises or off rhinoceros. It would seem to be much rarer than *A. marmoreum*; like *marmoreum* it is somewhat localised, and appears to be confined to the Eastern and Western Cape Province and to Namaqualand in South Africa, with various species of tortoises as host. Onderstepoort has one record off a mole snake *Pseudaspis cana*.

New records since Theiler, 1943

Zumpt, 1956. 1 female off a tortoise, Cape Agulhas, 31. XII. 1950; 10 males, 2 females, 2 nymphs off a tortoise, 10 miles East of Bredasdorp, 2. 1. 1951.

Onderstepoort records: 5 males off Tortoise, Fonteintje, Van Rhijsdorp, Cape; 2 males, 1 nymph, Tortoise, Kommetje, Cape Peninsula; 8 males, 2 females, off tortoise, Grootjongensfontein, Still Bay, Cape, 11. XI. 42; 1 male, off tortoise, Still Bay, Cape, II. 44.

SUMMARY

1. The types of *A. marmoreum*, *A. sparsum*, *A. rugosum*, *A. devium*, *A. nuttalli*, *A. weneri* (*Schlottkei*) *poematium* have been studied and their validity reassessed.

2. The descriptions of *A. marmoreum*, *A. sparsum*, *A. nuttalli*, *A. falsomarmoreum* and *A. paulopunctatum* have been brought up to date; the female *A. sparsum*, the larvae and nymphae of *A. marmoreum* and *A. sparsum* are described for the first time.

3. The synonymy of each species is given; including *A. marmoreum*, *A. sparsum*, *A. rugosum*, *A. devium*, *A. schlottkei*, *A. weneri*, *A. weneri* (*schlottkei*) *poematium*, *A. faiai*, *A. silvai*, *A. hebraeum magnum*, *A. peulopunctatum*.

4. The host list and geographical distribution is brought up to date.

5. *A. sylvaticum* is shown to be localised and confined to South Africa; the accumulated evidence shows *A. crenatum* to be an Indo-Malayan and not an African Rhinoceros tick.

COMMENTS ON THE "AMBLYOMMA VARIEGATUM" GROUP

A. variegatum first described by Fabricius 1794, has figured in the standard works of Neumann 1899, Dönitz 1909-1910 and Robinson 1926. Although somewhat variable there is no difficulty in identifying this species, the figures given by these three workers are excellent.

Dönitz 1909 described *A. pomposum* from Urungu, Southern end of Lake Tanganyika. His description of both the male and the female is excellent and one has no difficulty in differentiating this species from *A. variegatum*. The punctations are coarse, in the male the main feature is "Der Sternfleck ist in ganzer Länge mit dem Cervicalfleck verschmolzen; gegenüber dieser Stelle zieht ein dunkler Streif quer durch des Mittelfeld, und vor diesem ist der grösste Teil des Feldes hinter dem Kragenausschnitt dunkel ausgefüllt." The female he gives as more acutely shield-shaped, the sides often convex, punctations much coarser than in *variegatum*, largest punctations in the lateral fields, partly aligned close together in short rows. Punctations also large in the central field between the cervical grooves.

Robinson 1911 described *A. variegatum* var. *nocens* from two males collected by Mr. Jarvis from Southern Rhodesia, who gave its distribution as Umtali, Inyanga, Makoni, and Melsetter in Southern Rhodesia, and as Baruwe, Manica and Zambesi Co's territory in the adjoining Portuguese East Africa, the main differences from *A. variegatum* being in the very much coarser punctations and in slight differences in the colours in the pattern. The only description which he gives for the female is "The donor or the specimen gave a short verbal description of the female of this variety, from which it may be presumed that it conforms very closely to the type".

In the Monograph on Ixodoidea 1926 Robinson gives *A. variegatum* var. *nocens* as synonymous with *A. pomposum*.

For the male he figures his male *A. variegatum* var. *nocens*; for the female, however, it would appear he figured and described a specimen from another collection.

Subsequent workers have accepted his finding that var. *nocens* is the same as *pomposum*.

In checking over some tubes of ticks from Lounsbury's collection which were presented to Onderstepoort by the Division of Entomology recently, we came across two lots labelled *A. variegatum* from Umtali collected by Jarvis in Feb. 1902 and in Jan. 1904. These specimens coincide in every respect with Robinson's 1911 description of var. *nocens*, and undoubtedly are the tick that was also sent to Robinson.

Upon checking this material against *Amblyomma pomposum* material from Nteka, Abercorn district, at the bottom end of Lake Tanganyika, it was soon seen that the two ticks were different and that *A. variegatum* var. *nocens* was not the same as *A. pomposum*. Once again, as in the instance of *A. marmoreum* and of *A. sparsum*, a mix-up has been introduced into the literature in that a supposedly synonymous tick has been described as though it were the type.

This mix-up has led to further confusion as can be seen in recent literature:—

Santos Dias 1950 describes *A. variegatum* var. *govurensis* which differs from the type species by its large punctations and its coarse appearance; he gives figures for *A. variegatum*, *A. v. var. govurensis* and *A. pomposum* (with the central field separated by a dark band from its anterior portion).

In 1953 Santos Dias attempts a revision of the " Variegatum Group " and gives as his findings:—

1. *A. variegatum* retains its status; a list of accepted literature references is given.

2. His 1950 variety *govurensis* he finds agreed with Robinson's 1911 description of *A. v. var. nocens*; he thus synonymises it with *A. pomposum* Dönitz 1909.

3. For *A. pomposum* (as figured by him in 1950) he creates the new name of *A. superbum* and synonymises with this the Belgian Congo and Angola records, and gives as his type one male from Quipungo, Angola.

Santos Dias 1953 has been misled by Robinson 1926. Upon checking specimens of *govurensis* against the Umtali-Jarvis material it is found that they agree entirely.

We have not seen Dönitz' type material but the material from Nteka, Abercorn district, not far distant from Urungu on the Southern end of Lake Tanganyika, agrees so well with Dönitz' excellent and detailed description that one can safely assume that one is dealing with the same tick.

The group *A. variegatum* is thus seen to contain the three species*—

A. variegatum Fabricius 1794.

A. pomposum Dönitz 1909.

**A. nocens* Robison 1911 (new name combination).

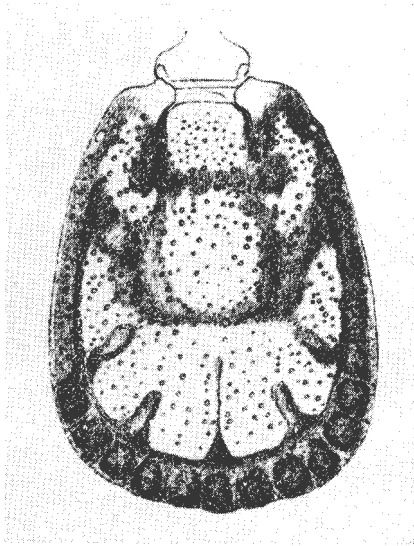


FIG. 39.—*Amblyomma pomposum* Dönitz 1909. M—Dorsal view, after Dönitz 1909, Fig. 14.

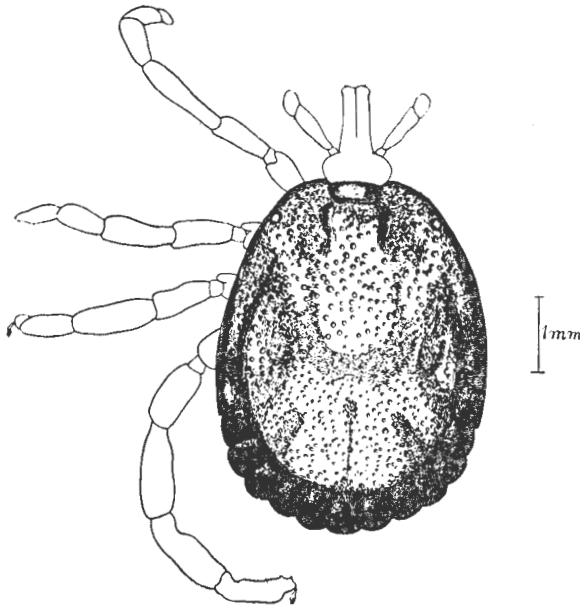


FIG. 40.—*Amblyomma nocens* Robinson 1911. M—Dorsal view, after Robinson 1911, Fig 2.

Synonymy

Amblyomma pomposum Dönitz 1909.

<i>A. pomposum</i>	Dönitz, 1909.....	Urungu.....	S. Tanganyika.
	Robinson, 1926.....	Benguella.....	Angola.
		Katanga (district).....	Belgian Congo.
		Msofa River, Ulala.....	N. Rhodesia.
		Mwengwa, Namwala.....	N. Rhodesia.
		Kafui River, Namwala.....	N. Rhodesia.
<i>Nec</i>	Robinson, 1926.....	Umtali, Inyanga, Makoni, Melsetter	S. Rhodesia.
		Manica, Baruwe, Zambesi Co. Territory	Mocambique.
	Sousa Dias, 1950... ..	Numerous localities, more especially	Angola.
		on the plateau rather than along	
		the coast. (<i>See Map</i>).	
	Santos Dias, 1950... ..	Merely repeats existing records.....	
	Schwet, 1927.....	Kundelungu, Katanga, Elizabethville	Belgian Congo.
	Schoenaers, 1951... ..	Katentania, Katanga.....	Belgian Congo.
	Leitaõ, 1942.....	Cubal do Hanho, Alto Catumbela..	Angola.
	Theiler & Robinson,	Nteka Abercorn, Namwala.....	N. Rhodesia.
	1954	Elizabethville.....	Belgian Congo.
<i>A. superbum</i>	Santos Dias, 1953... ..	Repeats the above 1927–1951 records	
		for pomposum	

Geographical Distribution

The records are still a bit scanty, but it would appear that the tick is widespread, but confined to the Rhodesian Highland vegetation, extending from Angola through the Kantanga of the Belgian Congo into Northern Rhodesia, dying out at the southern end of Lake Tanganyika.

Synonymy

**Amblyomma nocens* Robinson 1911

<i>A. variegatum</i> var. <i>nocens</i>	Robinson, 1911....	Umtali; Inyanga, Makoni, Melsetter, Baruwe, Manica, Zambesi Co. Terri- tory	S. Rhodesia. Mocambique.
<i>Pro parte. A. pom- posum</i>	Robinson 1926....	The above 1911 records.	
<i>A. variegatum</i> var. <i>govurensis</i>	Santos Dias, 1950...	The 1950 Govuro material.....	Mocambique.
	The Onderstepoort Collection	Umtali. Feb. 1902, Jan., 1904, don-Jarvis, Lounsbury Collection	S. Rhodesia.
<i>A. nocens</i>	—	Tacuane Estates, Quelimane.....	Mocambique.
<i>Pro parte. A. variegatum</i>	Santos Dias, 1947...	Machanga.....	Mocambique.

Geographical Distribution

From these few records it would appear that the tick is never abundant in the somewhat localised area in which, thus far, it has been found i.e. approximately between Latitudes 18° and 20° South. Nor is it possible at this stage to indicate its locality preferences. It is impossible to find out exactly where, in the Inyanga-Umtali-Melsetter districts, Jarvis collected his material. The region has a relatively high rainfall, is mountainous falling rapidly towards the East, and broken up by deep river valleys. The collections may be from the foot of the mountains rather than from the top of the ranges. It is thus difficult to find the common factor between the Rhodesian records, the inland Portuguese records of Manica and Baruwe and the more coastal records from the Zambezi Co. territory, the Tacuane estates, Machanga and Govuro.

SUMMARY

*1. *Amblyomma variegatum* var. *nocens*, Robinson 1911, is re-established as a valid species with the new name combination of *Amblyomma nocens*.*

2. A list of synonyms is given for *A. nocens* and *A. pomposum*.

3. *A. pomposum* is shown to be distributed in the Rhodesian Highland type of vegetation; **A. nocens*, according to present records appears to be confined approximately between latitudes 18–22° S. and between the Drakensberg and the coast.

LITERATURE REFERENCES

Only those publications giving new records or which are useful
compilations are listed

- BEDFORD, G. A. H. (1932). A synoptic check-list and host-list of the ectoparasites found on South African Mammalia, Aves and Reptilia. (Second edition.) *18th Rep. Vet. Res. S. Africa*, pp. 223–523. [New *A. marmoreum* record.]
- BEQUAERT, J. C. (1930). Entomology. Medical and economic entomology. In: R. P. Strong, ed., *The African Republic of Liberia and the Belgian Congo* (based on the observations made and materials collected during the Harvard African Expedition 1926-1927). *Contr. Dep. Trop. Med. Harv. Inst. trop. Biol. Med.*, pp. 797-1001, No. 5, Vol. 2. [3 records of *A. marmoreum* (= *A. sparsum*), 2 records of *A. nuttalli*.]

* Since going to press our studies have shown that the *A. variegatum* punctation pattern varies from the finely punctate in West-Africa to the very coarsely punctate in East-Africa, and that *A. nocens* (*govurensis*) represents the coarse end of the range. It thus falls into the synonymy of *A. variegatum*.

- BEQUAERT, J. C. (1931). Synopsis des tiques du Congo Belge. *Rev. Zool. Bot. Afr.*, Vol. 20, No. 3, pp. 209-251. [1 new record of *A. nuttalli*.]
- CHARTERS, A. D. (1946). Tick-typhus in Abyssinia. *Trans. R. Soc. trop. Med. Hyg.*, Vol. 39, No. 4, pp. 335-342. [1 record of "*A. marmoreum*".]
- CURSON, H. H. (1928). Metazoan parasites from Zululand. *S. Afr. J. Nat. Hist.*, Vol. 6, No. 3, pp. 181-187. [2 records of *A. marmoreum* and *A. nuttalli*.]
- DÖNITZ, W. (1909). Über das Zeckengenus Amblyomma. *S. B. Ges. naturf. Fr. Berl.* Vol. 8, pp. 440-482. [Description of "*A. marmoreum*", original description of *A. nuttalli* with drawing of the female and 3 records.]
- DÖNITZ, W. (1910). Die Zecken Südafrikas. L. Schulze Forschungsreise, Bd. 4, *Jen. Denkschriften*, Bd. 16, pp. 27-124. [Description of *A. marmoreum* (= *A. sparsum*) with excellent drawing of the male, description of male & female *A. latum* (= *A. sylvaticum*).]
- FAIN, 1949. Contribution à l'étude des Arthropodes piqueurs dans la territoire de Banningville. *Rev. Zool. Bot. Afr.*, 42 (2), pp. 145-182. [Record of *A. paulopunctatum*.]
- HIRST, (A.) S. (1909). Ruwenzori expedition reports. 6. *Arachnida. Tarns. Zool. Soc. Lond.*, Vol. 19, No. 1, pp. 57-58. [1 record of *A. marmoreum* (= *A. sparsum*).]
- HOOGSTRAAL, H. (1954). Noteworthy African Tick records in the British Museum (Natural History) collections. *Proc. ent. soc. Wash.*, Vol. 56, No. 6, pp. 273-279. [3 records listed as *A. marmoreum*.]
- HOOGSTRAAL, H. (1956). African Ixodoidea Vol. 1. Ticks of the Sudan. *U.S. Naval Medical Research Unit No. 3, Cairo, Research Report MM005, 050.29.07.*
[Useful compilation and several new records listed as "*A. marmoreum* group" and *A. nuttalli*.]
- HOWARD, C. W. (1909). A list of the ticks of South Africa, with descriptions and keys. *Ann. Transv. Mus.*, Vol. 1, No. 2, pp. 73-172. [1 new record of *A. marmoreum*.]
- FRICK GERDA, (1936). Das Zeichnungsmuster der Ixodiden. *Z. morph. & Okol. der Tiere*, Vol. 31, Part 3, pp. 411-430. [General discussion of enamelled pattern.]
- JACK, R. W. (1942). Ticks infesting domestic animals in Southern Rhodesia. *Rhod. agric. J.*, Vol. 39, No. 2, pp. 95-109, No. 3, pp. 202-219. [General record of *A. marmoreum* and *A. nuttalli*.]
- KING, H. H. (1908). Report of economic entomology. 3rd. *Rep. Wellcome trop. Res. Lab.*, pp. 201-248. [General record of *A. marmoreum* (= *A. sparsum*) with illustration.]
- KOCH, C. L. (1844). Systematische Uebersicht über die Ordnung der Zecken. *Arch. Naturgesch.*, Jahrg. 10, Bd. 1, pp. 217-239. [Original descriptions of *A. marmoreum*, *H. devium* and *H. latum*.]
- KOCH, C. L. (1847). Übersicht des Arachnidensystems. *Heft 4, Nürnberg.*
[Redescriptions of *H. devium* and *A. marmoreum* with drawing of the male *A. marmoreum* & female *A. devium* and female *H. latum*.]
- KRANEVELD, F. C. & KEIDEL, H. J. W. (1956). Rhinoceros sondarius een gastheer voor *A. crenatum* op Java. *Hemera Zoa LXIII*, 9/10, p. 364-372 figs. [Confirms Bequaert 1933, Anastos 1950 that *A. crenatum* is an asiatic Rhinoceros tick, Indomalay.]
- LEWIS, E. A. (1931). Observations on ticks and Tick-borne diseases. *Bull. Dep. Agric. Kenya*, No. 2 of 1931, 15 pp. [General record of *A. marmoreum* (= *A. sparsum*).]
- LEWIS, E. A. (1932). Some tick investigations in Kenya Colony. *Parasitology*, Vol. 24, No. 2, pp. 175-182. [General record with hosts of *A. marmoreum* (= *A. sparsum*).]
- LEWIS, E. A. (1934). A study of the ticks in Kenya Colony. The influence of natural conditions and other factors on their distribution and the incidence of tick-borne diseases. Part III. Investigations into the tick problem in the Masai Reserve. *Bull. Dept. Agric. Kenya*, No. 7 of 1934, 67 pp. [2 records of *A. marmoreum* (= *A. sparsum*).]

- LOVERIDGE, A. (1928). Field notes on vertebrates collected by the Smithsonian-Chrysler East African expedition of 1926. *Proc. U.S. Nat. Mus.*, Vol. 73, No. 17, pp.1-69. [2 records of *A. marmoreum* (= *A. sparsum*).]
- METTAM, R. W. M. (1932). Appendix 1A (Ticks of Uganda). *Ann. Rep. Vet. Dept. Uganda*, 1931, p. 19. [General records of *A. marmoreum* (= *A. sparsum*) and *A. nuttalli*.]
- MOREL, P. (1956a). Rapport de tournée de M. le Vétérinaire Inspecteur P. Morel, Chef du Service d'Entomo-Protozoologie au Laboratoire Fédéral de L'Élevage. Dakar. Typed correspondence received Nov. 1956. [3 records of *A. nuttalli*.]
- MOREL, P. (1956b). Enquête entomologique des Tiques. Typed correspondence received Nov. 1956. [1 record of *A. schlotkei* (= *A. sparsum*) 1 record of *A. nuttalli*.]
- NEUMANN, L. G. (1899). Révision de la famille des Ixodidés. 3e mémoire *Mém. Soc. Zool. de France*, Vol. 12, pp. 107-294. [Original descriptions of *A. sparsum*, *A. paulopunctatum*, *A. crenatum* and *A. rugosum*. Redescription of *A. devium*, Koch's description of *A. marmoreum* Male repeated.]
- NEUMANN, L. G. (1901). *Idem*, 4e mémoire, *Ibid*, Vol. 14, pp. 249-372. [Redescription of *A. marmoreum* male and female. 1 record of *A. sparsum*.]
- NEUMANN, L. G. (1902). Notes sur les ixodidés. *Arch. Parasit. Paris*, Vol. 6, No. 1, pp. 109-128. [1 record of *A. sparsum*?.]
- NEUMANN, L. G. (1907). Ixodidae, pp. 17-30, in: *Wissen. Ergebn. schwed. Zool. Exped. Kilimandjaro, Meru, Deutsch-Ostafrikas 1905-1906 (Sjöstedt) Abt 20: Arachnoidea, 2 ixodidae, Uppsala*. [2 records of *A. marmoreum* (= *A. sparsum*).]
- NEUMANN, I. G. (1908). Notes sur les ixodidés VII. *Notes from the Leyden Museum*, Vol. 30, pp. 73-91. [Description and drawings *A. trimaculatum* female (= *A. paulopunctatum*).]
- NEUMANN, L. G. (1909). Le pou d' *Orycteropus afer* et une nouvelle sousespèce d' *Amblyomma*. *Jb. Nassau. Ver. Naturk, Wiesbaden*, Jahrg. 62, reprint 6 pp. [Original description of *A. hebraeum magnum*.]
- NEUMANN, L. G. (1911). Ixodidae. *Tierreich, Lieferung* 26, 169, pp. Berlin. [Redescription of "*A. marmoreum*" with a few new records.]
- NEUMANN, L. G. (1912). Ixodides (collected by the Swedish zoological expedition to British East Africa, 1911). *Ark Zool.*, Vol. 7, No. 3, pp. 4-8. [1 record of *A. marmoreum* (= *A. sparsum*).]
- NEUMANN, L. G. (1922). Acariens, Résultats Sci., Artic. 1st part, pp. 108-125, in: *Voyage de M. le Baron M. de Rothschild en Ethiopie, etc. Paris*. [2 records of *A. sparsum*, 2 records of *A. marmoreum* (= *A. falsomarmoreum*?).]
- NUTTALL, G. H. F., WARBURTON, C. (1926). *Monograph of the Ixodoidea, part 4, Robinson, L. E. Cambridge*. [Descriptions with drawings of "*A. marmoreum*", *A. nuttalli* and *A. paulopunctatum*.]
- PAOLI, G. (1916). Ixodidi raccolti nella Somalia Italiana meridionale. *Redia*, Vol. 11, Nos. 1-2, pp. 269-297. [2 records of *A. marmoreum* (= *A. falsomarmoreum*?).]
- RAGEAU, J. (1951). Ixodidés du Cameroun. *Bull. Soc. Path. exot.*, Vol. 44, Nos. 7-8, pp. 441-446. [3 records of *A. paulopunctatum* (pro parte, = *A. nuttalli*).]
- RAGEAU, J. (1953). Note complémentaire sur les Ixodidae du Cameroun. *Bull. Soc. Path. exot.*, Vol. 46, No. 6, pp. 1090-1098. [1 record of *A. nuttalli*.]

- ROUSSELOT, R. (1953). Notes de Parasitologie Tropicale. Ixodes. Tome II, Vigot Frères, Editeurs. [Records *A. paulopunctatum*.]
- SANTOS DIAS, J. A. TRAVASSOS (1949). Mais um ixodideo do género *Amblyomma* para a fauna de Moçambique. *Docum. Moçambique, No. 59, Junho & Setembro*, pp. 51-75 (Issued 1950). [Redescribes *A. nuttalli* adults. First description of larva and nymph, a few records given.]
- SANTOS DIAS, J. A. TRAVASSOS (1950). Contribuição para o conhecimento da fauna Ixodológica de Moçambique. *Ibid, No. 61, Março*, pp. 113-170. (1 record of *A. nuttalli*.)
- SANTOS DIAS, J. A. TRAVASSOS (1951 a). Descrição de uma nova espécie de carraça (Acarina-Ixodoidea) de Moçambique: *Amblyomma faiai* n. sp. *Ibid, No. 66, Junho*, pp. 87-98. [Original description of *A. faiai*.]
- SANTOS DIAS, J. A. TRAVASSOS (1951 b). (Issued 1955). Acerca de alguns ixodídeos parasitas do javali Africano (*Phacochoerus aethiopicus aethiopicus* Pallas, 1766) em Moçambique. *An. Serv. Vet. Ind. An., No. 4*, pp. 103-111. [Original description of *A. silvai*.]
- SANTOS DIAS, J. A. TRAVASSOS (1951 c). (Issued, 1956). Lista das carracas de Moçambique e respectivos hospedeiros, II. *Ibid, No. 4*, pp. 121-166. [A few new Moçambique records of *A. marmoreum* and *A. nuttalli*, includes records S. Dias 1950.]
- SANTOS DIAS, J. A. TRAVASSOS (1952). Resultados de um reconhecimento zoológico no alto Limpopo efectuado pelos Drs. F. Zumpt e J. A. T. Santos Dias. I Organização da expedição, prospecção glossínica, fauna ixodológica e lista dos animais hospedeiros. *Docum. Moçambique, No. 70, Junho*, pp. 43-104. [1 new *A. marmoreum*, 2 new *A. nuttalli* records.]
- SANTOS DIAS, J. S. TRAVASSOS (1954). Acerca de uma espécie muito pouco conhecida do "Grupo *Marmoreum*" (Acarina, Ixodoidea), *Amblyomma poematium*, Schulze, 1932. *Docum. Moçambique, No. 77, Março*, pp. 121-134. [Author considers *A. poematium* type male a species in its own right with synonymy: *A. werneri poematium*, = ? *A. schlottkei*; *A. faiai*.]
- SANTOS DIAS, J. A. TRAVASSOS (1955). (Issued 1956). Estudo de alguns ixodídeos do "Grupo do *Amblyomma marmoreum*" em coleção do museu de Hamburgo. *An. Inst. Med. trop., Lisboa, Vol. 12, No. 3*, pp. 477-503. [Descriptions of *A. devium*, *A. marmoreum* and *A. nuttalli* specimens from the Hamburg Museum.]
- SCHOUTEDEN, 1929. Voyage au Congo de S.A.R. Prince Leopold de Belgique, 1925. Arachnides 2. Acariens. *Rev. Zool. Bot. Afr. 17.(1)*, 19-20. [Record of *A. paulopunctatum*.]
- SCHULZE, P. (1932a). Neue und wenig bekannte Arten der Zeckengattungen *Amblyomma* und *Aponomma*. *Z. Parasitenk. Bd. 4, Heft 3*, pp. 459-476. [Description of *A. marmoreum* types, with drawings. Original descriptions of *A. schlottkei*, *A. werneri*, *A. werneri poematium*, all with drawings. Note on *A. rugosum* with drawing.]
- SCHULZE, P. (1932b.) Über das Zustandekommen des Zeichnungsmusters und der Schmelzfärbung in der Zeckengattung *Amblyomma*, *Z. morph. und Okol. der Tiere*, Vol. 25, Nos. 2/3, pp. 508-533.
- SCHULZE, P. (1936). Das Schmelzmuster des Scutum von *Amblyomma*. *Z. morphol. & Okol. der Tiere*, Vol. 31, No. 3, pp. 431-432.
- SCHWETZ, J. (1927). Études et notes d'entomologie médicale sur le Katanga (élevage, tsé-tsé, tiques et moustiques). *Comité spécial du Katanga, Bruxelles*. [3 records of *A. nuttalli*.]
- SIMPSON, J. J. (1912). Entomological research in British West Africa. II Northern Nigeria. *Bull. ent. Res.*, Vol. 2, No. 4, pp. 301-356. [1 record of *A. nuttalli*.]

TICKS IN THE SOUTH AFRICAN ZOOLOGICAL SURVEY COLLECTION IX.

- TENDEIRO, (1952). Ixodídeos da Guiné Portuguesa. Chaves para a identificação das carraças guinéenses. Listas de hospedeiros e de espécies. *An. Inst. Med. Trop. Lisboa*. Vol. 9, No. 1, pp. 195-263. [3 records *A. paulopunctatum*; 1 record *A. nuttalli*, useful compilations for Portuguese Guinea.]
- THEILER, G. & ROBINSON, B. N. (1954). Tick survey (Part) VIII. Check-lists of ticks recorded from the Belgian Congo and Ruanda Urundi, from Angola, and from Northern Rhodesia. *Onderstepoort J. Vet. Res.*, Vol. 26, No. 3, pp. 447-461. [1 record of *A. nuttalli*.]
- THEILER, G. (1943). Ticks in the South African Zoological Survey collection. Part II. *Onderstepoort Int. Vet. Sc. & Anl. Ind.*, Vol. 18, Nos. 1-2, pp. 85-89 figs. [Redescription of *A. sylvaticum*.]
- TONELLI-RONDELLI, M. (1935). Ixodoidea del Fezzan e della Somalia italiana raccolti dal Prof. E. Zavattari e dal Prof. C. Tedeschi. *Att. Soc. ital. Sci. nat.*, Vol. 74, No. 3, pp. 239-252. [Original description of *R. falsomarmoreum* and drawings of male and female.]
- VILLIERS, A. (1955). Note sur quelques Ixodidae et Gammasidae parasites des vertébrés rencontrés en Afrique Occidentale Française. *Bull. Inst. franc. Afr. noire*, Vol. 17A, No. 2, pp. 444-454. [1 record of *A. nuttalli*.]
- WILSON, S. G. (1950 a). A Check-list and host-list of Ixodoidea found in Nyasaland, with descriptions and biological notes on some of the Rhipicephalids. *Bull. ent. Res.*, Vol. 41, No. 2, pp. 415-428. [1 record of *A. marmoreum* (= *A. sparsum*).]
- WILSON, S. G. (1950 b). Research — *Rep. Vet. Dep. Uganda*, 1949, pp. 16-29. [1 record of *A. nuttalli*. 1 record of *A. marmoreum* (= *A. sparsum*).]
- ZUMPT, 1956. In Bertil Hanström, Per Brinck, Gustaf Rudebeck. *South African Mammals*, Vol. 3, pp. 7-11. Almquist & Wiksell, Stockholm. [2 records *A. sylvaticum*, 2 records *A. marmoreum*.]

“ A. VARIEGATUM GROUP ”

1. DÖNITZ, (1909). Über das Zeckengenus *Amblyomma*. *Sitzber. Ges. Natf. Freunde. Berlin* 8, pp. 440-482, fig. [*A. pomposum* described.]
2. ROBINSON, (1911). New species of ticks. *Parasit.* IV, p. 478-489, fig. [*A. v. var nocens*.]
3. ROBINSON, (1926). Ticks — A Monograph of the Ixodoidea. Part IV, the Genus *Amblyomma*. [*A. pomposum* redescribed.]
4. SANTOS DIAS, (1950). Contribuição para conhecimento da Fauna Ixodologica de Moçambique. *Documentario Moçambique* 61, p. 113-170, figs. [*A. v. govurensis*.]
5. SANTOS DIAS, (1953). Sobre a posição sistematica de Algumas espécies africanas do Genero *Amblyomma*. *Documentario Moçambique* 73, pp. 119-139, figs. [*A. superbum* established.]
6. SOUSA DIAS, (1947-48). Subsídios para o Estudo dos Ixodideos de Angola, *Pecuaria* 2, p. 127-281, (figs.). [*A. pomposum* recorded.]
7. THEILER & ROBINSON, (1954). Tick Survey VIII, Check-lists of Ticks recorded from the Belgian Congo and Ruanda Urundi, from Angola and from Northern Rhodesia. *Onderstepoort Journal Vet. Research* 26, pp. 447-461, *Maps*. [*A. pomposum* recorded.]

TABLE 1.
A. marmoreum Material Examined

Locality	Host	Collection	Date	Specimens	Collector
S. RHODESIA— Plumtree..... Bulawayo.....	Tortoise..... Tortoise.....	O.P..... O.P.....	Aug., 1937. 25/7/1938.	1 male or 1 female.. 1 male or 1 female..	— —
MOCAMBIQUE— Maputo.....	<i>Kinixys belliana zuluensis</i> ...	Santos Dias.....	1953.....	2 males, 2 females...	Santos Dias.
SOUTH AFRICA— South Africa.....	<i>T. leopardinus</i>	BM(NH) 1952.8.29.4 — ⁵	—	2 males.....	—
South Africa.....	<i>T. leopardinus</i>	BM(NH) Nuttall 1659.	10/1/1914	1 male.....	—
ZULULAND— St. Lucia Estuary.....	<i>Kinixys</i>	OP2777 (iv).....	Jan., 1943..	4 males.....	J. H. Power.
Mkuzi Game Reserve.....	Tortoise.....	OP2777 (vi).....	Jan., 1948..	15 males.....	Dr. Ewer.
Umfolosi Game Reserve.....	Ground.....	OP2777 (v).....	Oct. 1948..	1 male, 1 female....	Tick Survey.
Masimba, Umfolosi Game Reserve	Ground.....	OP2739 (iii).....	3/3/1947..	1 female.....	J. J. Steyn.
SWAZILAND— Swaziland.....	Tortoise.....	OP2777 (iii).....	5/12/1945.	4 males, 1 female...	G.V.O., Swaziland.
Goedgedun.....	Tortoise.....	OP2777 (ii).....	29/10/1948	1 female, 8 males N.	Tick Survey.
Goedgedun.....	Python.....	OP2628 (vi).....	July, 1948.	1 male.....	Tick Survey.
BASUTOLAND— Teyateyaneng.....	Tortoise.....	OP2718 (i).....	Jan., 1933..	1 male, 1 female....	G. Theiler.
NATAL— Allerton.....	Tortoise.....	OP2753 (iv).....	30/3/1945.	3 males, 1 female....	Tick Survey.
Durban.....	Tortoise.....	RML17551.....	1941.....	1 male, 1 female....	R. F. Lawrence.
TRANSVAAL— Pietersburg (District).....	<i>T. pardalis</i>	OP2506 (i).....	—	2 females.....	—
Shingwedzi, Sibasa.....	Tortoise.....	OP2977 (ii).....	Aug., 1953.	1 female.....	J. R. Ivy.
Rustenburg.....	OP 2611 (ii).....	6/10/1942.	4 males, 1 female....	Tick Survey.

TABLE 1 (continued)

Locality	Host	Collection	Date	Specimens	Collector
Woodhope, Rustenburg....	Mamba.....	OP.....	24/12/1956	4 N.....	Tick Survey.
Pretoria Zoo.....	<i>T. pardalis</i>	OP 2507 (iii).....	6/2/1929..	2 males.....	R. Bigalke.
Germiston.....	Tortoise.....	B(MNH) Nuttall 228 + 229	4/3/1907..	7 males, 2 females...	Dr. B. Brock..
Machadodorp.....	Sheep.....	OP 2506 (iii).....	13/5/1953.	1 male.....	Tick Survey.
Nelspruit.....	—	OP 2506 (iv).....	—	1 female.....	Tick Survey.
Onderstepoort.....	Tortoise.....	OP 2506 (ii).....	—	1 male.....	G. A. H. Bedford.
Pretoria.....	Tortoise.....	OP 2611 (iii).....	13/2/1945.	5 males.....	Tick Survey.
Lombard Game Reserve, Bloemhof	<i>Varanus niloticus</i>	OP.....	13/11/1955	2 males, 5 nymph...	J. N. Swart.
Christiana.....	<i>Varanus</i>	OP 2629 (iv).....	28/12/1954	13 males, 5 females NN	Tick Survey.
ORANGE FREE STATE— Jammersdrift.....	Tortoise.....	OP 2983, 2984.....	2/3/1943..	2 males, 2 females...	Tick Survey.
Wepener.....	—	OP 2611 (v).....	—	LL, NN, adults bred at OP from 1 female	—
Haartbeestfontein, Faure- smith	<i>T. pardalis</i>	OP 2753 (iii).....	4/1/1953..	1 male, 2 females...	Tick Survey.
Wildelsnek, Zastron.....	Tortoise.....	OP 2729, 2733-34, 35- 36, OP 2721	2/6/1941..	LL, NN, adults bred at OP from eggs	O. A. Breytenbach.
Phillipolis.....	<i>C. pardalis</i>	OP 2979, 2980, 2985, OP 2986	1/12/1944.	1 female, LL, NN, adults bred at OP	Police.
CAPE PROVINCE— Cap de Bonne-Espérance....	—	Paris Museum.....	—	1 male.....	Audinet-Serville.
Cap de Bonne-Espérance....	—	Paris Museum.....	—	2 males.....	Delalande.
Glen Loch, Miller, C.P.....	<i>T. pardalis</i>	OP 2574 (ii).....	Nov. 1941.	8 males, 4 females...	N. E. Featherstone.
Durbanville.....	<i>T. pardalis</i>	OP 2574 (v).....	10/3/1954.	1 male.....	J. P. Kriek.
Hout Bay.....	<i>T. pardalis</i>	OP 2611 (vi).....	Sept., 1946.	2 males.....	Brink.
Calvinia.....	Tortoise.....	OP.....	1940.....	1 female.....	M. Richmond.

TABLE 1 (continued)

Locality	Host	Collection	Date	Specimens	Collector
Calvinia.....	Tortoise.....	RML 17552.....	1941.....	1 female.....	R. F. Lawrence.
Oortlogskloof, Calvinia.....	Sheep.....	OP 2574 (iii).....	June-Sept.....	1 female.....	Tick Survey.
Rietvlei, Montagu.....	<i>T. pardalis</i>	OP 2574 (iv).....	10/12/1942.....	6 males, 2 females.....	Tick Survey.
Knyana.....	<i>T. pardalis</i>	OP 2507 (i).....	8/4/1950.....	1 female.....	Tick Survey.
Kadenga, Jamestown District	<i>Homopus femoralis</i>	OP 2977 (i).....	Jan., 1944.....	3 males, 3 females, 2 nymph. LL	J. R. Hewitt.
Steynsburg.....	<i>H. femoralis</i>	OP 2718 (vi).....	9/2/57.....	1 male.....	C. J. Skead.
Botha's Hoop, Camdeboo	Mountain tortoise.....	OP 2718 (iv), (v).....	6/12/1954.....	33 males, 9 females, 14 nymph.	S. Stampa.
Mountains, Graaff-Reinet	Tortoise.....	OP.....	—	6 males, 1 female.....	S. Stampa.
New Bethesda.....	Tortoise.....	Paris Museum.....	—	1 male.....	Delalande.
Cafrerie.....	Tortoise.....	OP 2507 (ii).....	Dec., 1942.....	1 male, 2 females.....	Tick Survey.
Whitlsea, Queenstown.....	Tortoise.....	OP.....	Aug., 1950.....	4 males.....	F. Zumpt.
Speldon, Bedford	Tortoise.....	OP 2630 (ii).....	July, 1899.....	14 males, 1 female..	Mr. Davidson.
Adelaide.....	Tortoise.....	OP 2629 (v).....	12/5/1953.....	2 females.....	C. J. Skead.
King William's Town.....	Puff adder.....	OP 2978 (i).....	Feb., 1951.....	1 female.....	B. Bowker.
Carlisle Bridge.....	Puff adder.....	OP 2977 (vi).....	2/3/1917.....	3 males.....	C. P. Lounsbury.
Grahamstown.....	Ringhals.....	OP 2978 (ii).....	6/12/1948.....	1 male.....	G. A. Whitehead.
Kasouga, Albany.....	Ox.....	OP 2977 (iii).....	13/2/1948.....	2 males, 1 female, moulted from NN	Dugmore.
Grahamstown.....	Turkeys (as NN).....	OP 2977 (v).....	Oct., 1947.....	3 males, 1 female, N	Nel Bros.
Beaumont.....	Tortoise.....	OP 2686 (ii).....	Jan., 1941.....	1 male, 3 females....	T. Drury.
Albany Museum, Grahamstown	<i>Megachersine pardalis</i>	OP 2989, 2990.....	June, 1942.....	1 female, PLL, NN, adults bred at OP	J. R. Hewitt.
Albany Museum, Grahamstown	<i>Megachersine pardalis</i>	OP 2628 (i).....	15/11/1906.....	2 males, 1 female....	C. P. Lounsbury.
Grahamstown.....	Puff adder.....	OP 2628 (viii).....	28/3/1947.....	1 female.....	C. J. Skead.
Highland Rails Gameston, Grahamstown	Ringhals cobra.....	OP 2630 (iv).....	17/9/1942.....	2 males and Nymphal skins	J. R. Hewitt.
Albany Museum, Grahamstown	—				

TABLE 1 (continued)

Locality	Host	Collection	Date	Specimens	Collector
Grahamstown.....	Turkeys (as NN).....	OP 2630 (v).....	16/3/1948.	1 male, 1 female (moulted from nymphs)	Dugmore.
Southwell Farm, Grahamstown	<i>T. pardalis</i>	OP 2507 (iv).....	15/10/1938	7 males, 1 female....	Tick Survey.
Heatherton Towers, Albany	Tortoise.....	OP 2630 (iii).....	21/3/1900.	2 males.....	C. P. Lounsbury.
Humansdorp District.....	<i>T. pardalis</i>	OP 2507 (v).....	24/12/1938	13 males, 1 female..	E. du Toit.
Port Elizabeth District.....	<i>Bitis arietans</i>	Zumpt.....	21/11/1950	2 males, 1 female....	F. Zumpt.
Port Elizabeth District.....	<i>Bitis arietans</i>	Zumpt.....	April, 1950	1 male, 2 females....	F. Zumpt.
Port Elizabeth District.....	<i>T. angulata</i>	OP 2718 (ii).....	May, 1936.	2 males.....	G. Theiler.
Port Elizabeth District.....	<i>T. angulata</i>	OP 2718 (iii).....	—	1 male, 2 females....	G. Theiler.
Snake Park, Port Elizabeth.	Puff adder.....	OP 2628 (iv).....	July, 1941..	2 females, NN.....	Mr. Pringle.
Port Elizabeth.....	Landschildkröte	Hamburg Museum.....	15/11/1898	4 males, 6 females...	Dr. H. Brauns.
East London Museum.....	Tortoises.....	OP 2975 & 2976.....	1949.....	5 males, 7 females...	W. H. Archer.
East London Museum.....	<i>C. pardalis</i>	OP 2981-82.....	26/6/46...	1 female, LL, NN, adults bred at OP	W. H. Archer.
Andalusia.....	Tortoise.....	Zumpt.....	Oct., 1951..	1 female.....	F. Zumpt.
Kimberley.....	<i>T. pardalis</i>	OP 2753 (iii).....	Dec., 1952.	12 males, 14 females	J. H. Power.
Frigicalous, Vryburg.....	Geometric tortoise.	OP 2987.....	2/11/1946.	1 female, LL, NN, adults bred at OP	G. Collen.
Kuruman.....	<i>T. pardalis</i>	RML 33520.....	Jan., 1938..	7 males, 1 female....	—
BECHUANALAND — Macloutsie.....	Tortoise.....	BM(NH) Nuttall 95..	Jan., 1906..	2 males.....	Dr. B. G. Brock.
Serowe.....	Tortoise.....	OP 2978 (iii).....	14/1/1956.	9 males, 3 females, 6 nymphs	F. Zumpt.
SOUTH WEST AFRICA — Gobabis.....	Tortoise.....	OP.....	Oct., 1952..	9 males, 5 females...	Theo Meyer.
Africa.....	<i>T. leopardinus</i>	BM(NH) 1932.8.29.12	—	1 male.....	—
Loréer Zoo.....	<i>Testudo</i>	Bequaert.....	—	3 males.....	—

Hosts.—Tortoise 50; Snake 8; Varanus 2; Sheep 2; Bovine 1.

TABLE 2
A. sparsum Material Examined

Locality	Host	Collection	Date	Specimens	Collector
SENEGAL— (Delestre)..... Casamance..... Sangalkam.....	Python?..... <i>Bitis arietans</i> <i>Bitis lachesis</i>	Paris Museum..... Dr. Morel..... Dr. Morel.....	±1900..... 1955..... 1948.....	1 male..... 1 male, 1 female..... 1 male.....	— Dr. Morel. Dr. Morel.
SUDAN— Juba.....	<i>Kinixys belliana</i>	HH.....	10/12/1952	20 males, 5 females, 6 nymphs	H. Hoogstraal.
Torit..... Torit..... S. Soudan..... Khartoum.....	<i>Kinixys belliana</i> <i>Varanus niloticus</i> — From captive tortoise?.....	HH..... HH..... BM(NH) Nuttall 89.. BM(NH) Nuttall 240..	13/1/52... 8/12/1949. ±1909..... 1908.....	1 female, 1 male.... 1 male..... 2 males..... 2 males.....	H. Hoogstraal. H. Hoogstraal. H. H. King. H. H. King.
ERITREA AND SOMALILAND— Banne..... Ganala Doria..... Guildessa..... Nefasit.....	<i>T. pardalis</i> — Land tortoise..... Dromedary.....	RML 17699..... RML 17697..... BM(NH) Nuttall 1155. Kohls RML.....	10/5/39... — 30/7/1911. 23/3/1930.	1 male..... 1 male..... 1 female..... 2 males.....	(Dr. E. Stella, don.) (Dr. E. Stella, don.) Dr. H. Brumpt. H. Compere.
KENYA— Ithanga Hills..... Mitto Andei..... Makueni.....	Buffalo..... <i>Agama agama caudospina</i> Meck Tortoise.....	Bequaert..... Bequaert..... JBW.....	— — 27/7/1950.	5 males, 1 female... 1 male..... 19 males, 1 female, 2 nymphs	— A Loveridge. W. Botha (lab. bred series from female from this collection). J. Williams. J. Williams. Dr. E. Burt.
E. Tana..... Isiolo..... Sumba Island, Lake Victoria	Rhino..... <i>Bitis arietans</i> <i>Varanus niloticus</i>	JBW..... JBW..... BM(NH) 1951 6-5-12- 21	27/11/1951 1951..... 22/3/1949.	12 males, 4 females.. 1 male..... 17 males, 3 females..	D. Roberts. — —
Baringo..... Game Department..... Kedong Valley.....	Leopard tortoise..... Tortoise..... Python.....	JBW..... BM(NH) Lewis AM5. BM(NH) Lewis AM6..	1955..... 13/6/1931. 10/5/1931.	2 males, 1 female... 5 males..... 2 males.....	— — —

TICKS IN THE SOUTH AFRICAN ZOOLOGICAL SURVEY COLLECTION IX.

TABLE 2 (continued)

Locality	Host	Collection	Date	Specimens	Collector
Ndoto Range.....	Rhino.....	BM(NH) Lewis AM6..	16/8/1931.	2 males.....	—
Kiango.....	Buffalo.....	BM(NH) Lewis AM7..	—	1 male.....	—
Voi.....	Elephant.....	BM(NH) Lewis AM8..	14/11/1931	1 female.....	—
Mt. Mbololo, near Voi.....	<i>Varanus ocellatus</i>	Bequaert.....	—	1 female, 7 males (with <i>A. falsomarmoreum</i>)	A. Loveridge.
Mt. Mbololo, near Voi.....	<i>Varanus ocellatus</i>	Bequaert.....	—	2 males.....	A. Loveridge.
Mt. Mbololo, near Voi.....	<i>Testudo pardalis babcocki</i>	Bequaert.....	—	1 male.....	A. Loveridge.
Ziwaranie.....	Rhino.....	BM(NH) Lewis AM9..	21/11/1931	7 males.....	—
Rumuruti.....	Rhino.....	BM(NH) Lewis AM11	8/9/1932..	1 male.....	—
Lucanicu Hills, Athi Plains..	Rhino.....	C.N.H.M.....	—	1 female.....	C.N.H.M. Expedition
Athi Plains, foot of Donya Sebank	Python.....	BM(NH).....	3/5/1913..	3 males.....	W. McMillan.
Kenya.....	Grass.....	BM(NH) Nuttall 3926.	29/11/1932	1 female.....	E. A. Lewis.
Isiolo.....	<i>Giraffa reticulata</i>	HH.....	13/1/1937.	10 males, 5 females..	—
Masai Reserve.....	Buffalo.....	HH.....	20/1/1935.	34 males, 4 females..	—
Embu.....	<i>Ribicornis holmwoodi</i>	HH.....	5/1/1935..	8 males, 2 females... 1 male + 1 male....	—
Yatta Plains.....	Puff adder.....	RML & BM (NH) Nuttall 1747	April, 1912	—	—
Yatta Plains, Ukamba Province, British East Africa	Rhino.....	BM(NH) Nuttall 1438.	16/8/1910.	2 males, 1 female... 2 females.....	S. W. J. Scholefield. Hildebrand (as A. devium).
Kitui.....	—	Berlin (Neumann).....	—	—	—
Kiboko.....	Tortoise.....	JBW.....	9/1/1953..	1 female.....	R. Smith.
Rongai.....	Tortoise.....	BM(NH) Lewis AM 10	23/4/1952..	2 males (with <i>A. falsomarmoreum</i>)	E. A. Lewis.
Upper Tana River near foot Mt. Kenya	—	Bequaert.....	—	1 male.....	—
British East Africa.....	Rhino.....	BM(NH) Nuttall 959.	1900.....	1 male.....	Col. A. Alcock.
British East Africa.....	Rhino.....	BM(NH) Nuttall 3215f	1916.....	3 males.....	Dr. J. O. Shircow.
Afr. Or. Angl. Entre la riv. Cana et le cours du Guada Nyero	Rhino.....	Paris Museum.....	1911.....	1 male.....	G. Vasse.

TABLE 2 (continued)

Locality	Host	Collection	Date	Specimens	Collector
UGANDA..... Karaiza Karamoja.....	Rhino..... <i>Synceros caffer</i>	BM(NH) Nuttall 13953. OP 2739 (iii).....	Oct., 1934. 14/6/1942.	1 male, 2 females.... 2 males, 1 female....	— Chorley LXXXXVI.
BELGIAN CONGO AND RUANDA URUNDI— Rutshuru.....	—	61405-61422 R. G. Mus., Congo Bequaert.....	8/1/1934.. 31/3/1927. 15/4/1927.	2 males..... 2 males, 1 female.... 1 male, 1 female....	Dr. de Wulf. — —
Mai Iwji, near Rutshuru... Ishasa River, Congo.....	<i>Bitis arietans</i> <i>Synceros caffer</i>	C.N.H.M..... JBW..... JBW..... Berlin (Dönitz)..... Amsterdam Museum..	1929..... 24/7/1952. 1954..... July, 1953. — 9/5/1931..	1 male..... 1 male..... 44 males, 6 females.. 1 male..... 1 male, 1 female.... 2 males.....	— A. C. Brooks. S. M. Moore-Gilbert. S. M. Moore-Gilbert. — Coll. Zoo (<i>A. werneri</i> <i>poematium</i> type). Kreischmer. A. Loveridge. Hoogstraal and Kohls
TANGANYIKA— Tanganyika..... Yaida Plain..... Manyoni District..... Uhambingeto Iringa District German East Africa..... Kilimandjaro to Zoo.....	Rhino..... Eland..... Rhino..... Rhino..... Buffalo..... <i>R. bicornis</i>	Berlin (Neumann)..... Bequaert..... E.A. Tick Conference. Bequaert..... E.A. Tick Conference. Bequaert.....	15/10/1895 3/6/1926.. 25/7/1956. 1926..... 3/8/1956.. 21/12/1929	1 male..... 1 male, 1 female.... 5 males, 1 female, 1 nymph 10 males (with <i>A.</i> <i>falsomarmoratum</i>) 1 female.....	A. Loveridge. Hoogstraal and Kohls A. Loveridge. —
Kilimandjaro Marangua... Manyoni..... Tengeru, Arusha.....	— <i>Bitis arietans</i> <i>Testudo</i>	Bequaert..... E.A. Tick Conference.	1926..... 3/8/1956..	1 male..... 10 males (with <i>A.</i> <i>falsomarmoratum</i>) 1 female.....	A. Loveridge. Hoogstraal and Kohls A. Loveridge.
Dodoma..... Temi River, Arusha..... Kikuyu Dodoma.....	<i>Bitis arietans</i> <i>Testudo</i> —	Bequaert..... E.A. Tick Conference. Bequaert.....	1926..... 3/8/1956.. 21/12/1929	1 male..... 10 males (with <i>A.</i> <i>falsomarmoratum</i>) 1 female.....	A. Loveridge. Hoogstraal and Kohls A. Loveridge.
NYASALAND— Deep Bay, N. Nyasa..... Wovivi R, N. Nyasa.....	Rhino..... Monitor.....	BM(NH) Nuttall 1088 BM(NH) Nuttall 1095.	2/11/1909. 5/11/1909.	2 males, 1 female.... 1 male.....	Dr. J. B. Davey. Dr. J. B. Davey.

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TABLE 2 (continued)

Locality	Host	Collection	Date	Specimens	Collector
NORTHERN RHODESIA— Haut Zambeze..... Nawalla, N.E. Rhodesia.... Kariba Gorge..... Gota Gota, Urunguie.....	— Rhino..... Black Rhino..... Rhino.....	Paris Museum..... BM(NH) Nuttall 1934. OP..... OP 2752 (ii).....	— 6/8/1912.. 6/9/1955.. 24/1/1954.	1 male..... 1 male..... 9 males, 1 female.... 1 male, 1 female.....	— Dr. A. King. C. J. Shiff. J. H. Power.
SOUTHERN RHODESIA— Mateisi?..... Zambesi River, at Mana Pools..... Lomagundi..... Lomagundi.....	— Buffalo..... Buffalo.....	OP..... OP..... OP..... OP.....	—, 1936. Aug., 1936. Sept., 1928. Dec., 1928.	1 male..... 3 males, 2 females.. 4 males..... 6 males, 20 females..	— Col. E. Capell. — —
MOCAMBIQUE— Mungau (Manica Sofala).... Dambacua (Govuro).....	<i>Synceros caffer</i> <i>Synceros caffer</i>	Santos Dias..... Santos Dias.....	May, 1954. 16/6/1951.	4 males..... male.....	— A. Faia (holotype A. <i>faia</i>). GVO, Grootfontein.
SOUTH WEST AFRICA.....	Black Rhino.....	OP 2752 (i).....	4/8/1933..	1 male.....	—
COUNTRY UNKNOWN— Schirati..... Iringa.....	Rhino..... Tortoise.....	Berlin Museum..... Berlin Museum.....	— —	2 males, 2 females... 1 male.....	— —

TABLE 3
A. nuttalli Material Examined

Locality	Host	Collection	Date	Specimens	Collector
SIERRA LEONE— Ninkintumania..... Kaballa..... GOLD COAST— Accra.....	Tortoise..... Tortoise..... Hedgehog..... Hedgehog.....	BM(NH) Nuttall 2326 BM(NH) Nuttall 3042 BM(NH) Nuttall 3085 (i) (i)	28/6/1913. 23/9/1914. 20/10/1914 18/11/1914	1 female..... 4 males..... 1 female..... 5 females.....	Dr. J. C. Wood. Dr. J. G. Wood. Dr. J. W. S. Macfie. Dr. J. W. S. Macfie.
DAHOMY— Abomey.....	Hérisson.....	Paris Museum.....	22/2/1910.	2 males + NN.....	A. Chevalier.
NIGERIA— N. Nigeria..... Abinsi, N. Nigeria..... Ilorin, N. Nigeria..... Offa, S. Nigeria..... Offa, S. Nigeria..... Offa, S. Nigeria.....	<i>V. exenthematicus</i> <i>V. exenthematicus</i> Hedgehog..... Iguana..... Iguana..... Iguana.....	BM(NH) Nuttall 2196. BM(NH) Nuttall 2199. BM(NH) Nuttall 1838. BM(NH) Nuttall 1421. BM(NH) Nuttall 1443. BM(NH) 1911-12-5-7.	1912..... Nov. 1912. 26/2/1912. 29/9/1910. 29/9/1910. 29/9/1910.	2 males..... 4 males..... 2 males..... 1 male..... 1 female..... 1 male.....	Dr. Dalziel. Dr. Dalziel. Dr. J. W. S. Macfie. R. C. Hiscock. R. C. Hiscock. R. C. Hiscock.
FRENCH CAMEROONS— Cameroons..... Yaoundé.....	<i>Kinixys belliana</i> <i>Tortue terrestre</i>	Geneva Museum..... Bequaert.....	5/1/1947. 20/6/1949.	2 males, 2 females... 1 male.....	Yadeen. J. Rageau
KENYA— Ajigo..... Soko Forest..... Soko, near Mida.....	Tortoise..... <i>V. abigularis</i> <i>V. abigularis</i>	JBW..... BM(NH) Nuttall 3953. BM(NH) Lewis AV 78	19/4/1950. 4/7/1932.. 4/7/1932..	2 males..... 3 males, 1 female... 14 males, 1 female..	K. P. Bailey. E. A. Lewis. E. A. Lewis.
UGANDA— Bussu..... Bussu..... Bussu..... Uganda..... Mabuswera Bureli KIXVII. Near Masindi, Bunyoro.....	<i>Bitis gabonica</i> Tortoise..... Tortoise..... Tortoise..... Tortoise..... Tortoise.....	BM(NH) Nuttall 940 (i) BM(NH) Nuttall 681. BM(NH) Nuttall 939a. BM(NH) Nuttall 958. OP 2732 (i) OP 2732 (ii).....	1909..... Mar., 1909. Oct., 1909. 1/12/1900. 2/5/1941. 20/8/1941.	4 males, 1 female... 7 males, 1 female... 1 female..... 1 male..... 5 males, 2 females... 1 male.....	Dr. Bayon. Dr. Bayon. Dr. Bayon. Col. Alcock. G. H. E. Hopkins. G. H. E. Hopkins.
BELGIAN CONGO— Bosobolo Ubangi..... Kipumbu, Sakania..... Mahagi.....	Bovine..... <i>Kinixys belliana</i>	Tervuren 69460. OP 2732 (iii)..... Bequaert.....	1951..... Feb., 1947. 25/5/1925.	1 female..... 1 female..... 1 female.....	Dr. Vachaudex. Dr. Colback. Schouteden.

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TICKS IN THE SOUTH AFRICAN ZOOLOGICAL SURVEY COLLECTION IX.

TABLE 3 (continued)

Locality	Host	Collection	Date	Specimens	Collector
TANGANYIKA— Zanzibar..... Dar es-salaam..... Kilosa..... Ujiji..... Makindani.....	Landschildkröte..... <i>Varanus</i> <i>Kinixys belliana</i> <i>Kinixys belliana</i> <i>Kinixys belliana</i>	Hamburg Museum..... Berlin (Dönitz)..... Bequaert..... Bequaert..... Bequaert.....	27/4/1889..... —..... 15/1/1921..... —..... —.....	1 female..... 1 male..... 6 males..... 2 males, 2 females... 2 males.....	Dr. Fr. Stuhlmann..... —..... A. Loveridge..... A. Loveridge..... A. Loveridge.....
NYASALAND— Upper Shire Valley..... Upper Shire Valley..... Mtimbuka S. end of Lake Nyasa.....	Tortoise..... Tortoise..... <i>Kinixys spekii</i>	BM(NH) Nuttall 3093..... BM(NH) 1914-12-2..... Bequaert.....	18/10/1911..... 18/10/1911..... Nov., 1949.....	1 male..... 1 male..... 1 male, 1 female.....	Dr. J. B. Davey..... —..... A. Loveridge.....
S. RHODESIA— Kezi Matobo District..... Hartley..... Silukwe..... Umtali..... Umtali.....	Tortoise..... Human..... —..... Schildkröte..... <i>Python sebae</i>	OP..... OP..... Paris Museum..... Berlin (Dönitz)..... OP.....	Oct., 1938..... Nov., 1910..... 1911..... —..... 9/1/1957.....	1 female..... 1 male..... 1 female..... 1 female..... 3 males.....	Blake..... —..... Ellenberger..... —..... D. G. Broadley.....
MOCAMBIQUE— Chicalacuála..... Maputo.....	<i>Kinixys</i> , sp. —.....	Zumpt..... Santos Dias.....	May, 1951..... —.....	3 males, 2 females... 11 males, 19 females	F. Zumpt..... Santos Dias (bred in laboratory). J. M. Silva (holotype <i>A. silvai</i>). F. Zumpt..... (Santos Dias, don.)
Machanga.....	<i>Phacochoerus aethiopicus</i>	Santos Dias.....	28/7/1949.....	1 female.....	F. Zumpt.....
Mapai..... Mutuali Niasso.....	<i>Georchelone pardalis</i> <i>Kinixys belliana</i>	Zumpt..... Bequaert.....	May, 1951..... 16/11/1950.....	1 male..... 7 males, 4 females...	F. Zumpt..... (Santos Dias, don.)
SOUTH AFRICA— Tetepan, Zululand..... Melmoth, Zululand..... Umfolozi Reserve..... Kuruman..... Onderstepoort..... Onderstepoort..... Grahamstown.....	Tortoise..... Tortoise..... Mountain Tortoise..... <i>Testudo pardalis</i> Tortoise..... From NN off goat..... Mountain tortoise.....	Zumpt..... OP 2509 (ix)..... OP 2732 (iv)..... RML 33520..... BM(NH) Nuttall 3709..... OP 2508 (ii)..... OP 2508 (i).....	29/4/1955..... Nov., 1934..... Dec., 1949..... Jan., 1938..... 1931..... 25/2/1929..... 17/9/1942.....	1 male..... 1 female..... 1 female..... 1 male..... 1 female..... 1 male, 1 nymph... 2 males.....	F. Zumpt..... —..... (atypical). —..... R. du Toit..... —..... —.....
ANGOLA— Gauca Bihé.....	<i>V. albigularis</i>	H.H. & C.N.H.M.....	10/1/1939.....	3 males.....	R. Boulton.....

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TABLE 4
A. falsomarmorum Material Examined

Locality	Host	Collection	Date	Specimens	Collector
ABYSSINIA— Dire Daoua.....	<i>Tortue</i>	Paris Museum.....	1905.....	4 males.....	M. de Rothschild.
SOMALILAND— Guildessa, Somaliland.....	Land tortoise.....	BM(NH) Nuttall 1155.....	30/7/1911.....	1 female.....	Dr. H. Brumpt.
Guildessa, Somaliland.....	Land tortoise.....	RML Nuttall 1155.....	—.....	1 male.....	—
Mantera, Somaliland.....	Camel?.....	OP 2777 (i).....	1944.....	2 males, 1 female.....	Dr. A. D. Charters.
Brava.....	Tortoise.....	RML 17696.....	1933.....	1 male, 1 female.....	(Dr. E. Stella, don.)
Caschel, Italian E. Africa.....	—.....	RML 17691.....	—.....	1 male.....	(Dr. E. Stella, don.)
Burao, British.....	—.....	Bequaert.....	—.....	1 male, 1 female.....	P. E. Glover.
KENYA— Kiboko.....	Tortoise.....	JBW.....	9/1/1953..	2 males, 5 females... 3 males (with A. <i>sparsum</i>)	R. Smith. E. A. Lewis.
Rongai.....	Tortoise.....	BM(NH) Lewis AM10	23/4/1932..	7 males.....	V. E. Fuchs.
Northern Turkana.....	Tortoise.....	BM(NH) 1952-5-3- 155-160	June, 1934.	4 males (with A. <i>sparsum</i>)	A. Loveridge.
Mt. Mbololo, near Voi....	<i>Varanus ocellatus</i>	Bequaert.....	—.....	4 males.....	M. de Rothschild.
(Tedecha).....	<i>Tortues</i>	Paris Museum.....	26/4/1904.	3 males (with A. <i>sparsum</i>)	Hoogstraal and Kohls
TANGANYIKA— S. of Arusha, Temi River..	<i>Testudo</i>	E.A. Tick Conference.	3/8/1956..		

TABLE 5.—Material Recorded in the literature as *A. marmoratum*

Author and Date of Publication	Locality	Host	Collection	Date	Specimens	Collector	Seen and Identified as:	Not Seen: Probable Identification
Koch, 1844	South Africa	—	Berlin Museum	—	1 male	—	<i>A. marmoratum</i>	<i>A. marmoratum</i>
Neumann, 1899, p. 226	South Africa	—	—	—	4 males, 2 females	Lounsbury	—	<i>A. marmoratum</i>
Neumann, 1901, p. 309	Cape of Good Hope	Tortoise	—	—	1 male	O. Neumann	<i>A. marmoratum</i>	<i>A. sparsum</i> or <i>A. nuttalli</i>
	Tanga, German E. Africa	—	Hamburg Museum	—	—	Dr. H. Brauns	—	<i>A. marmoratum</i>
	Algoa Bay, Cape Colony	—	Hamburg Museum	—	—	Dr. H. Brauns	<i>A. marmoratum</i>	—
	Port Elizabeth	—	Berlin Museum	—	—	Schillings	—	<i>A. sparsum</i>
	Zanzibar	<i>Rhinoceros lucertus</i>	Hamburg Museum	—	1 female	Stuhlman	<i>A. nuttalli</i>	—
	Haut-Zambeze [erroneously reported as <i>A. hebraeum</i> (<i>A. hassallii</i>) in 3e mém., p. 272	—	Paris Museum	—	—	Foa	<i>A. sparsum</i>	—
Neumann, 1907	Meru (Niederung)	<i>Rhinoceros bicornis</i>	—	26/6/1905	3 males, 2 females	Sjöstedt	—	<i>A. sparsum</i>
Howard, 1908	Meru, Kilimandjaro	Snakes LLNN feed on ox, goat, birds, lizards	—	1/12/1905	2 males	Sjöstedt	—	<i>A. sparsum</i>
Hirst, 1909	Transvaal	Puff-adder	—	1906	5 males	Ruwenzori Expedition	—	<i>A. marmoratum</i>
Neumann, 1911, p. 78	Mokia, S.E. Ruwenzori, 3400 ft.	—	—	—	—	—	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
	Mocambique	—	—	—	—	—	—	<i>A. marmoratum</i> or <i>A. nuttalli</i>
	Congo	—	Paris Museum	—	<i>A. inopinatum</i> S. Dias Paratype, 1955	—	<i>A. sparsum</i>	or <i>A. sparsum</i> ?
	Senegal	—	—	—	—	—	<i>A. sparsum</i>	?
King, 1911	Sudan	<i>Genetta pardina</i>	—	—	—	—	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
Neumann, 1912	Nord du Guaso Nyiri, British E. Africa	Python sp.	—	—	—	—	—	<i>A. sparsum</i>
Paoli, 1916	Sahaireöi, Italian Somaliland	<i>T. pardalis</i>	—	1911	1 female	Prof. E. Lönnberg	—	<i>A. sparsum</i>
Neumann, 1922	Dirré Daoua, Ethiopia	<i>Testudo pardalis</i> and Zampé	—	—	—	—	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
	Somaliland	—	Paris Museum	1905	5 males	—	—	<i>A. falsomarmoratum</i>
	Khartoum, Sudan	—	BM(NH)	—	—	M. de Rothschild	<i>A. falsomarmoratum</i>	—
	Guellessa, Somaliland	—	BM(NH) N. 240	1908	—	—	—	<i>A. falsomarmoratum</i>
	Artaud, Somaliland	—	Dr. Brumpt	—	males	H. H. King	<i>A. sparsum</i>	—
	Bussu, Uganda	Tortoise	Dr. Brumpt	—	males and females	Dr. Brumpt	<i>A. falsomarmoratum</i>	—
	Bussu, Uganda	Tortoise	N. 681	Dec., 1909	males and females	Dr. H. Bayon	<i>A. falsomarmoratum</i>	—
	Bussu, Uganda	Tortoise	N. 744	April, 1909	females	Dr. H. Bayon	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
	Bussu, Uganda	—	N. 939a	Oct., 1909	males	Dr. H. Bayon	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
	Uganda	—	Col. Alcock	—	—	Col. Alcock	<i>A. nuttalli</i>	—
Robinson, 1926	Uganda, Bussu	<i>Bitis gabonica</i>	N. 940	Oct., 1909	males, females, NN	Dr. H. Bayon	<i>A. nuttalli</i>	—
	Kenya, Simba and Muto	Off grasses	IBE 259a, 264b	Mar. and April, 1911	males	Dr. A. S. Neave	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
	Kenya, Nairobi	Rhino	N. 249	Mar., 1907	males	Dr. P. Ross	—	<i>A. sparsum</i>
	Kenya, Yatta Plains, Kitui	Rhino	N. 1428, 1438, IBE 322 and 316d	July Aug., 1910	males and females	S. W. J. Scholefield	<i>A. sparsum</i>	—
	Kenya, Yatta Plains	<i>Bitis arietans</i>	N. 1747	—	males	—	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
	Kenya, Kavirondo Border, Lumbwa District	Tortoise	N. 1814	Mar., 1912	males and females	O. M. Dobbs	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
	Kenya, Punda Milia	Rhino	Cooper C17, 21a, 28	3/8/1909	males	W. F. Cooper	—	<i>A. sparsum</i>
	Kenya, Tana River	Rhino	Cooper C28f	Aug., 1909	—	W. F. Cooper	—	<i>A. sparsum</i>
	Kenya	Eland	C52 and 32	Aug., 1909	males	W. F. Cooper	—	<i>A. sparsum</i>
	Kenya	Buffalo	—	—	—	—	—	<i>A. sparsum</i>

TABLE 5 (continued)

Author and Date of Publication	Locality	Host	Collection	Date	Specimens	Collector	Seen and Identified as:	Not Seen: Probable Identification
Robinson, 1926.....	Nyasaland, Deer Bay, N. Nyasa	Rhino.....	N. 1088.....	Nov., 1909.	males and females...	Dr. J. B. Davey.....	<i>A. sparsum</i>	—
	Nyasaland, Wovwi River, N. Nyasa	Monitor.....	N. 1095.....	Nov., 1909.	males.....	Dr. J. B. Davey.....	<i>A. sparsum</i>	—
	Nawalia, N.E. Rhodesia.....	Rhino.....	N. 1934.....	Aug., 1911.	male.....	Dr. A. Kinghorn.....	<i>A. sparsum</i>	—
	Bechuanaland, Macloutsie.....	Tortoise.....	N. 95.....	Jan., 1906..	males.....	Dr. B. G. Brock.....	<i>A. marmoreum</i>	—
	South Africa, Germiston, Tvl.	Tortoise.....	N. 228 and 229.....	1906.....	males and females...	Dr. B. G. Brock.....	<i>A. marmoreum</i>	—
	South Africa.....	<i>Testudo leopardinus</i>	N. 1659, Z. S19, ZS21831	10/1/1912..	males.....	—	N. 1659 <i>A. marmoreum</i>	—
	South Africa, Sandflats Albany	Tortoise.....	C. 262.....	15/2/1906..	males and females..	G. C. Woodbury...	—	<i>A. marmoreum</i>
Loveridge, 1928.....	Tanganyika, near Docōma...	<i>T. pardalis</i>	Bequaert.....	5/9/1926..	—	A. Loveridge.....	<i>A. sparsum</i>	—
	Tanganyika, Manyoni.....	<i>Bitis arietans</i>	Bequaert.....	3/6/1926..	—	A. Loveridge.....	<i>A. sparsum</i>	—
Curson, 1928.....	Zululand.....	White Rhino.....	—	1921-23.....	—	—	—	—
Bequaert, 1930, p. 800..	Congo, Ishasa River.....	<i>Syncerus caffer</i>	Bequaert.....	15/4/1927.	1 male, 1 female....	R. P. Strong.....	<i>A. sparsum</i>	<i>A. marmoreum</i> or <i>A. nuttalli</i>
	Congo, Mai Iwvi, N. of Rutshuru	<i>Bitis arietans</i>	Bequaert.....	31/3/1927.	2 males, 1 female....	R. P. Strong.....	<i>A. sparsum</i>	—
	Kenya, Ithanga Hills, near L. Naivasha	<i>Syncerus caffer</i>	Bequaert.....	—	several.....	W. R. Zappey.....	<i>A. sparsum</i>	—
Lewis, 1931.....	Kenya.....	—	—	—	—	—	—	<i>A. sparsum</i>
Mettam, 1931, p. 19.....	Uganda.....	Guinea fowl, Puff adder, Tortoise	—	—	—	—	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
Bedford, 1932, p. 305.....	South Africa, Pietersburg, District Transvaal	<i>Testudo pardalis</i>	OP 2506 (i).....	—	—	—	<i>A. marmoreum</i>	—
Lewis, 1932.....	Kenya.....	Rhino, reptilia, celonia.....	—	—	—	—	—	<i>A. sparsum</i>
Lewis, 1934, p. 44.....	Kenya, Ke-long Valley.....	<i>Python sebae</i>	BN(NH) A.M. 6..	—	many.....	E. A. Lewis.....	<i>A. sparsum</i>	—
	Kenya, Narosura.....	Grass.....	—	—	1 male.....	E. A. Lewis.....	Male illustrated is <i>A. nuttalli</i>	<i>A. sparsum</i>
Jack, 1942.....	S. Rhodesia.....	Buffalo, Rhino, Tortoise	—	—	—	—	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
Charters, 1946.....	Abyssinia, Babile, 5,000', 17 miles from Harar	Tortoise and Puff adder, Man	—	3/6/1943..	—	A. D. Charters.....	—	<i>A. falsomarmoreum</i>
Wilson, 1950 (b), p. 21..	Uganda.....	Tortoise.....	—	—	—	—	—	<i>A. sparsum</i>
Wilson, 1950 (a).....	Nyasaland.....	Tortoise.....	—	—	—	—	—	<i>A. sparsum</i>
Santos Dias, 1951 (c), p. 12	Mocambique, Mapai.....	<i>Geochelone pardalis</i>	—	—	—	—	—	<i>A. marmoreum</i>
	Mocambique, Mapai.....	—	—	—	—	—	—	<i>A. marmoreum</i>
	Mocambique, Maputo.....	—	—	—	—	—	—	<i>A. marmoreum</i>
	Mocambique, Sabie.....	—	—	—	—	—	—	<i>A. marmoreum</i>
	Mocambique, Alto Limpopo (Sul do Save)	—	—	—	—	—	—	<i>A. marmoreum</i>
Santos Dias, 1952.....	Mocambique, Mapai.....	<i>Geochelone pardalis</i>	Santos Dias.....	8/5/1951..	2 males.....	Santos Dias and F. Zumpt	—	<i>A. marmoreum</i>
Hoogstraal, 1954.....	London Zoological Gardens, Mouth of Lurio River, Mocambique	African puff adder.....	BM(NH).....	13/9/1904.	1 female.....	—	—	<i>A. sparsum</i> or <i>A. marmoreum</i>
	Sierre Leone, Ninkinkumania	Tortoise from bush.....	N. 2326.....	28/6/1913.	1 female.....	J. Vincent.....	—	<i>A. sparsum</i>
	Mocambique.....	<i>Varanus niloticus</i>	Santos Dias.....	1947.....	—	—	<i>A. nuttalli</i>	—
Santos Dias, 1955.....	Sudan, Equatoria Prov. Torit	<i>Varanus n. niloticus</i>	Hoogstraal.....	8/12/1949.	1 male, 4 nymphs..	Hoogstraal.....	<i>A. sparsum</i>	<i>A. marmoreum</i>
Hoogstraal, 1956.....	Sudan, Equatoria Prov. Torit	<i>Kinixys b. belliana</i>	Hoogstraal.....	13/1/1952.	1 male, 1 female....	Hoogstraal.....	<i>A. sparsum</i>	—
	Sudan, Equatoria Prov. Juba	<i>Kinixys b. belliana</i>	Hoogstraal.....	10/12/1952	20 males, 5 females, 6 nymphs	Hoogstraal.....	<i>A. sparsum</i>	—
	Uganda, Atiambo.....	—	Sudan Government	—	—	—	—	<i>A. sparsum</i>
Zumpt, 1956.....	Hout Bay, Cape Peninsula...	Human.....	Lund University..	28/12/1950	1 male.....	Lund University Expedition	—	<i>A. marmoreum</i>
	Trompsburg, Orange Free	Tortoise.....	Lund University..	13/10/1950	1 male, 3 nymphs...	Lund University Expedition	—	<i>A. marmoreum</i>

TABLE 6.—Material Recorded in the Literature as *A. sparsum*

Author and Date of Publication	Locality	Host	Collection	Date	Specimens	Collector	Seen and Identified as:	Not Seen: Probable Identification
Neumann, 1899, p. 249.	Menagerie of Paris Museum.	<i>Spilotes variabilis</i>	Paris Museum.....	—	1 male.....	Lucas.....	<i>A. sparsum</i>	—
Neumann, 1901, p. 305.	Kilimandjaro.....	—	Berlin Museum...	—	1 male.....	Kretschmer.....	<i>A. sparsum</i>	—
Neumann, 1902, p. 109.	Tlelat, Oran.....	<i>Testudo mauritanica</i>	—	—	1 male.....	Doumergue.....	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
Neumann, 1922.....	British East Africa.....	<i>Tortue mauritanique</i>	—	—	1 male.....	Rothschild.....	—	<i>A. sparsum</i> or <i>A. nuttalli</i>
	Mpapua, Tanganyika.....	—	BM(NH).....	—	—	—	—	—

TABLE 7.—Material Recorded in the Literature as *A. nuttalli*

Author and Date of Publication	Locality	Host	Collection	Date	Specimens	Collector	Seen and Identified as:	Not Seen: Probable Identification
Dönitz, 1909.....	Dar-es-Salaam and Bagamojo	<i>Varanus</i>	Berlin Museum	—	3 males, 1 female...	—	<i>A. nuttalli</i>	—
	Umtali, S. Rhodesia	Tortoise.....	Berlin Museum...	—	1 female.....	—	<i>A. nuttalli</i>	—
	Cameroons.....	—	Berlin Museum...	—	1 female.....	—	—	?
Simpson, 1912, p. 320.	Offa, Nigeria.....	Large monitor lizard (Iguana)	Nuttall (see below)	—	—	Dr. R. C. Hiscock..	<i>A. nuttalli</i>	<i>A. nuttalli</i> or <i>A. sparsum</i>
Robinson, 1926.....	Tanganyika.....	<i>Varanus</i> or <i>Emys</i>	N. 996, 997.....	—	males.....	from W. Dönitz....	—	—
	Offa, S. Nigeria.....	—	N. 1421, 1443.....	Nov., 1910.	males, females.....	R. C. Hiscock.....	<i>A. nuttalli</i>	—
	Bussu, Uganda.....	Tortoise.....	N. 681.....	Mar., 1909	males, 1 female...	H. Bayon.....	<i>A. nuttalli</i>	—
	Accra, Gold Coast.....	Hedgehog.....	N. 3088e.....	18/11/1914	males, females.....	Dr. J. W. S. Macfie.	<i>A. nuttalli</i>	—
	Parombo, White Nile Prov., Uganda	Tortoise.....	I.B.E. 1212.....	27/8/1921.	—	Dr. R. E. McConnell	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
Schwetz, 1927.....	Katanga, Gribier, Congo.....	<i>K. b. belliana</i>	see Bequaert below	May, 1925.	1 male, 1 female....	Schouteden.....	<i>A. nuttalli</i>	<i>A. nuttalli</i> or <i>A. sparsum</i>
	Mahagi (Ituri).....	—	—	—	1 adult.....	—	—	<i>A. nuttalli</i> or <i>A. sparsum</i>
Curson, 1928.....	District Lomami, Congo.....	Tortoise.....	—	1921-23...	Several.....	—	<i>A. nuttalli</i>	<i>A. nuttalli</i>
Bequaert, 1930, p. 801...	Zululand.....	<i>Kinixys belliana</i>	—	1/3/1921,	—	Loveridge.....	—	—
	Kilosa, Tanganyika.....	—	—	15 and	—	—	—	—
	—	—	—	23/1/1921	—	—	—	—
Bequaert, 1931, p. 223...	Mito Andei, Tanganyika.....	<i>Agama agama caudospina</i>	—	—	1 male.....	Loveridge.....	<i>A. sparsum</i>	—
Mettam, 1931, p. 19.....	Maha gi, Congo.....	<i>Kinixys belliana</i>	Bequaert.....	—	1 female.....	H. Schouteden.....	<i>A. nuttalli</i>	—
Jack, 1942.....	Uganda.....	Tortoise.....	—	—	—	—	—	<i>A. nuttalli</i>
Santos Dias, 1949, p. 68	S. Rhodesia.....	Tortoise.....	—	—	—	—	—	<i>A. nuttalli</i>
(original record only)	Maputo Mocambique.....	<i>Kinixys belliana zuluensis</i>	Santos Dias.....	9/6/1949..	2 males.....	—	<i>A. nuttalli</i>	—
	Moamba (Sabie), Mocambique	—	—	—	—	—	—	<i>A. nuttalli</i>
	Maputo, Mocambique.....	<i>Geochelone pardalis</i>	—	—	—	—	—	<i>A. nuttalli</i>
	—	<i>Kinixys belliana zuluensis</i>	—	—	—	—	—	<i>A. nuttalli</i>
	—	<i>Pelusios s. sinuatus</i>	—	—	—	—	—	<i>A. nuttalli</i>

TABLE 7 (continued)

Author and Date of Publication	Locality	Host	Collection	Date	Specimens	Collector	Seen and Identified as:	Not Seen: Probable Identification
Santos Dias, 1950.....	Govuro, Mocambique.....	<i>Kinixys belliana</i>	Santos Dias.....	June, 1949.	5 males, 1 female, 3 nymphs	Santos Dias.....	—	<i>A. nuttalli</i>
Wilson, 1950 (b), p. 21...	Uganda.....	Tortoise.....	—	—	—	—	—	<i>A. nuttalli</i> (Listed under <i>A. paulopunc-</i> <i>tatum</i>)
Rageau, 1951.....	Baturi, Cameroons.....	Phacochère.....	—	—	—	Jonchère.....	<i>A. nuttalli</i>	(Listed under <i>A. paulopunc-</i> <i>tatum</i>)
	Myéle-W., Cameroons.....	—	—	—	—	Jonchère.....	<i>A. nuttalli</i>	(Listed under <i>A. paulopunc-</i> <i>tatum</i>)
	Yaoundé, Cameroons.....	Tortoise.....	Bequaert.....	—	Many.....	Rageau.....	<i>A. nuttalli</i>	(Listed under <i>A. paulopunc-</i> <i>tatum</i>)
Tendeiro, 1951.....	Fulacunda, Portuguese Guinea	<i>Varanus exanthematicus</i>	Tendeiro.....	1950.....	—	S. Marques.....	—	<i>A. nuttalli</i>
Santos Dias, 1951 (c)....	(Sul do Save), Sabie.....	<i>Sylvicapra grimmia caffra</i>	—	—	—	—	—	<i>A. nuttalli</i>
	Malema, Niassa.....	—	—	—	—	—	—	<i>A. nuttalli</i>
Santos Dias, 1952.....	Mapai, Mocambique.....	<i>Geochelone pardalis</i>	Santos Dias and F. Zumpt.....	8/5/1951..	1 male, 1 female....	Dias and Zumpt....	<i>A. nuttalli</i>	—
	Chicualacuala, Mocambique..	<i>Kinixys belliana zuluensis</i>	Santos Dias and F. Zumpt.....	13/5/1951..	3 males, 2 females...	Dias and Zumpt....	<i>A. nuttalli</i>	—
Rageau, 1953, p. 1093...	Yaoundé, Cameroons.....	<i>Kinixys belliana</i>	Bequaert.....	20/6/1949.	—	—	<i>A. nuttalli</i>	—
Theiler and Robinson, 1954, p. 449	Kipumbu, Sakania, Congo..	Bovine.....	OP 2732 (iii).....	Feb., 1947.	1 female.....	Dr. Colback.....	<i>A. nuttalli</i>	—
Santos Dias, 1955, p. 499	Swaziland.....	<i>Geochelone pardalis</i>	Santos Dias.....	—	—	—	—	<i>A. nuttalli</i>
Andre Villiers, 1955.....	Bignona V, Casamance.....	<i>Varanus exanthematicus</i>	see Morel.....	—	—	—	—	det. Bequaert as <i>A. nuttalli</i>
Morel Report, 1956 (a)..	Dahomey, Hountagbé (Athémé)	<i>Python regius</i> (head).....	Morel.....	3/7/1956..	1 female.....	Morel.....	—	<i>A. nuttalli</i>
	Dahomey Segboroué (Ouidah)	<i>Varanus niloticus</i>	Morel.....	27/7/1956.	1 nymph.....	Morel.....	—	? <i>A. nuttalli</i>
	Dahomey, Yérémarou (Farakou)	sur termitière.....	Morel.....	29/7/1956.	1 nymph.....	Morel.....	—	? <i>A. nuttalli</i>
Morel Report, 1956 (b)..	Bignona, Senegal.....	<i>Varanus exanthematicus</i>	see A. Villiers.....	—	1 female.....	—	—	<i>A. nuttalli</i>
Hoogstraal, 1956, p. 234.	Farajok, Sudan Equatorial Province	<i>Kinixys b. belliana</i>	Hoogstraal.....	March.....	7 males.....	—	—	<i>A. nuttalli</i>
	Torit, Sudan Equatorial Pro- vince	<i>Kinixys b. belliana</i>	Hoogstraal.....	August.....	3 males, 1 female...	—	—	<i>A. nuttalli</i>
	Meridi, 50 miles NE of Torit, Sudan Equatorial Province	<i>Kinixys b. belliana</i>	Hoogstraal.....	Oct., S.V.S.	3 males.....	—	—	<i>A. nuttalli</i>
	Torit, Sudan Equatorial Pro- vince	<i>Varanus n. niloticus</i>	Hoogstraal.....	Dec.....	1 nymph.....	—	—	? <i>A. nuttalli</i>
	Torit, Sudan Equatorial Pro- vince	<i>Varanus e. exanthematicus</i> ...	Hoogstraal.....	January....	1 nymph.....	—	—	? <i>A. nuttalli</i>
	Torit, Sudan Equatorial Pro- vince	<i>Ourebia ourebia aequatoria</i> ..	Hoogstraal.....	February..	1 nymph.....	—	—	? <i>A. nuttalli</i>
	Torit, Sudan Equatorial Pro- vince	<i>Francolinus clappertoni gedgii</i>	Hoogstraal.....	January....	1 nymph.....	—	—	? <i>A. nuttalli</i>
	Ossa River, Uganda.....	—	Sudan Govern- ment	1913.....	—	H. H. King.....	—	<i>A. nuttalli</i>

TABLE 8.—Material Recorded in the Literature as:—

Author and Date of Publication	Locality	Host	Collection	Date	Specimens	Collector	Seen and Identified as:	Not Seen: Probable Identification
<i>A. ruqosum</i> — Neumann, 1899.....	Cape of Good Hope. Kafirrie.....	—	Paris Museum.... Paris Museum.... Smithsonian Inst.. Hamburg Museum	— — — —	6..... 2..... 1.....	Delalande and Audinet-Serville Marx?.....	<i>A. marmorium</i> — <i>A. marmorium</i>	— <i>A. nuttalli</i> or <i>A. sparsum</i> —
Neumann, 1901 p. 305	(sp. suppressed see <i>A. marmorium</i>) German S.W. Africa.....	Tortoise..... Tortoise.....	— —	— —	1 male.....	— —	— <i>A. marmorium</i>	<i>A. marmorium</i>
Schulze, 1932.....	South Africa.....	—	Berlin Museum.... Berlin Museum.... Paris Museum....	— — —	— — —	— — —	<i>A. sylvaticum</i> <i>A. sparsum</i>	— — ?
<i>A. devium</i> — Koch, 1844.....	Kitui, Equatorial Africa.....	—	—	—	—	—	—	—
Neumann, 1899, p. 255..	Campos Geræes (<i>d.</i>).....	—	—	—	—	—	—	—
Neuman, 1901, p. 307.	(sp. suppressed see <i>A. marmorium</i>)	—	—	—	—	—	—	—
<i>A. hebraicum magnum</i> — Neumann, 1909, p. 6..	Solai-See, British E. Africa..	Rhinoceros.....	Wiesbaden Museum	—	1 male, 2 females...	F. Seyd.....	<i>A. sparsum</i>	—
<i>A. schlottker</i> — Schulze, 1932.....	Usumbiwa, Tanganyika.....	—	Stettin Museum... Morel.....	May, 1908. 1948.....	1 male..... 1 male, 1 female....	Morel.....	— <i>A. sparsum</i>	<i>A. sparsum</i> —
<i>A. werneri</i> — Schulze, 1932.....	Talodi, Kordofan, Sudan....	<i>Kinixys</i>	Berlin Museum....	—	1 male.....	Prof. Werner.....	—	<i>A. nuttalli</i>
<i>A. werneri poemati</i> — Schulze, 1932.....	Meru District, East Africa...	Rhinoceros.....	Amsterdam Museum	7/6/1931..	2 males.....	via zoo.....	<i>A. sparsum</i>	—
<i>A. falsomarmorium</i> — Tonelli-Rondelli, 1935.	Algoi Barre, Italian Somaliland	—	Turin Museum....	—	—	Taramasso.....	—	<i>A. falsomarmorium</i>
<i>A. faiai</i> — Santos Dias, 1951 (<i>a</i>), p. 92	Dambacua, Govuro, Sul do Save, Mocambique.....	Tortoise.....	Turin Museum....	—	2 males, 1 female...	Tedeschi.....	—	<i>A. falsomarmorium</i>
<i>A. silvai</i> — Santos Dias, 1951, p. 103	Machanga, Manica and Sofala, Mocambique	<i>Syncerus caffer caffer</i>	Santos Dias.....	16/6/1951.	1 male.....	A. Faia.....	<i>A. sparsum</i>	—
		<i>Phacochoerus aethiopicus aethiopicus</i>	Santos Dias.....	28/7/1951.	1 female.....	J. M. da Silva.....	<i>A. nuttalli</i>	—