

Ticks in the South African Zoological Survey Col- lection. Part III.—The Ornate Aponommas.

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“ APONOMMA EXORNATUM ” KOCH 1844—THE LEGUAAN TICK.

Male (Figs. 1-4).

Average $2\frac{1}{2}$ mm. \times $2\frac{1}{2}$ mm. to 3 mm. \times 3 mm. measured from the emargination to the posterior extremity. In outline a very broad oval, narrowing slightly anteriorly, about as broad as long; surface shiny, ornate; metallic green to coppery markings on a dark brown background.

Conscutum.—Eyes absent, emargination deep with rather pointed scapula. Cervical groove short, deep and shaped like an inverted comma; no lateral groove; no posterior grooves; eleven festoons clearly marked though not so well-defined in fully engorged specimens. Punctuation largest and most closely clustered in the lateral groove area and in the area bordering the anterior edge of the festoons, becoming finer and more scattered towards the middle of the anterior part. Ornamentations in the form of nine iridescent green coppery markings on a brown background, the green in some instances shews bluish, much the colour of a blue-green alga. The green markings are (a) one central; (b) one in each of the scapulae; (c) one lateral on each side extending from a level just behind the cervical grooves to the fourth pair of legs; (d) one internal to each lateral, commencing at a level just behind the commencement of the lateral, running approximately parallel with it for some distance and then bending somewhat outwards to end near the margin at a level behind the lateral; anteriorly it may be joined to the lateral by a short diagonal stripe; (e) one on each side of the posterior median line, triangular in shape, with the posterior margin forked. Besides these definite ornamentations the conscutum may be edged with a lighter band. As characteristic of the species as its iridescent pattern, is its pattern of deeply-pigmented brown areas made up of:—posterior median stripe; posterior paramedian stripe; the three lateral spots fused to form a curved lateral stripe; a small posterior accessory paramedian; an anterior paramedian stripe running into a short piece of falciform stripe; anteriorly the anterior paramedian fuses with the fused mass of the cervical stripe, the cervical and the ocular spots, so that the green scapular ornamentation is surrounded by a solid brown field. Posteriorly the surfaces of these deeply pigmented areas are usually devoid punctations; further forward the finer punctations may encroach on them. The margins do not appear to be pigmented and, as stated above, usually are more lightly coloured. In the general discussion at the end of this description the variations in the ornamentations will be commented upon.

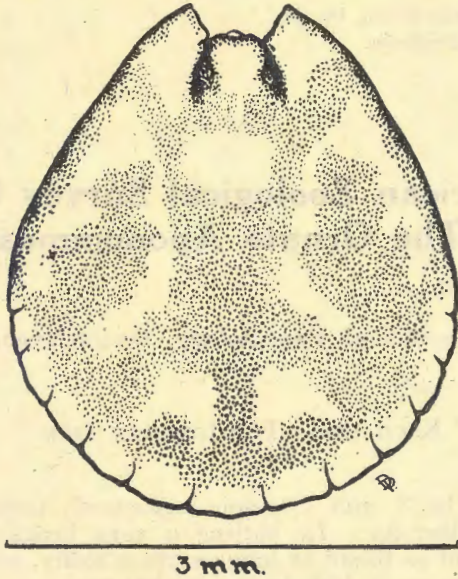


Fig. 1.

Fig. 1.—*A. exornatum*. Male, dorsal view showing enamelled pattern.

Fig. 1A.—*A. exornatum*. Male. Rostrum.

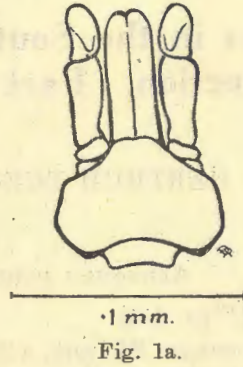


Fig. 1A.

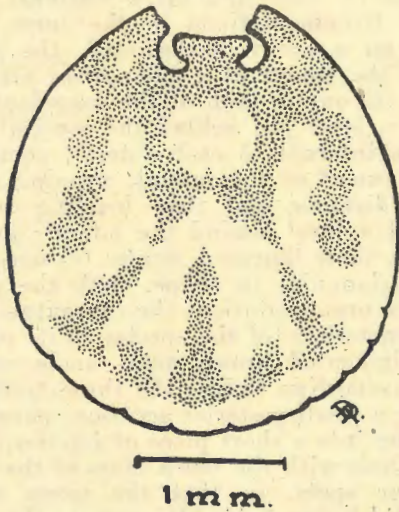


Fig. 2.

Fig. 2.—*A. exornatum*. Male. Dorsal view, showing deeply pigmented brown pattern.

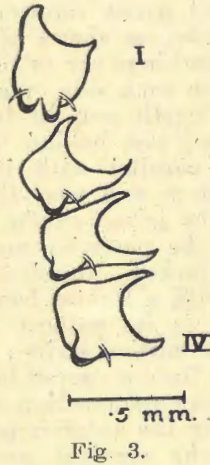


Fig. 3.

Fig. 3.—*A. exornatum*. Male. Ventral view.

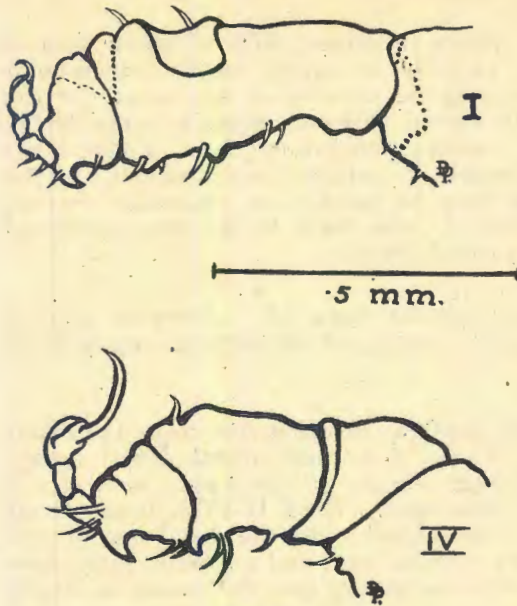


Fig. 4.

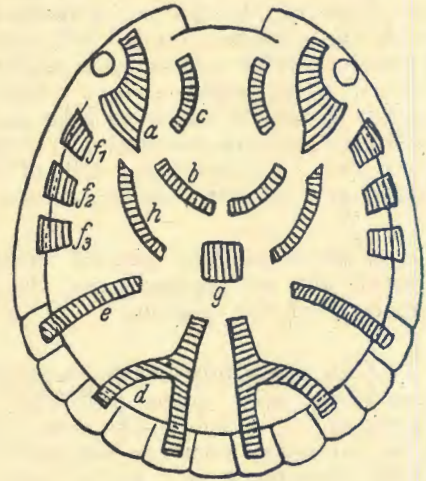


Fig. 5.

Fig. 4.—*A. exornatum*. Male. Tarsus I and Tarsus 4.
 Fig. 5.—Scheme of an ixodid enamelled pattern; after G. Frick 1936. Fig. 1.

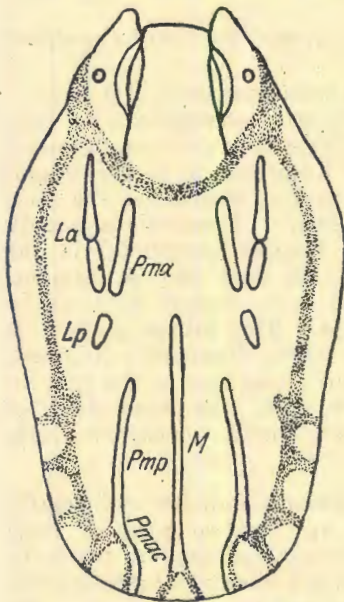


Fig. 6.

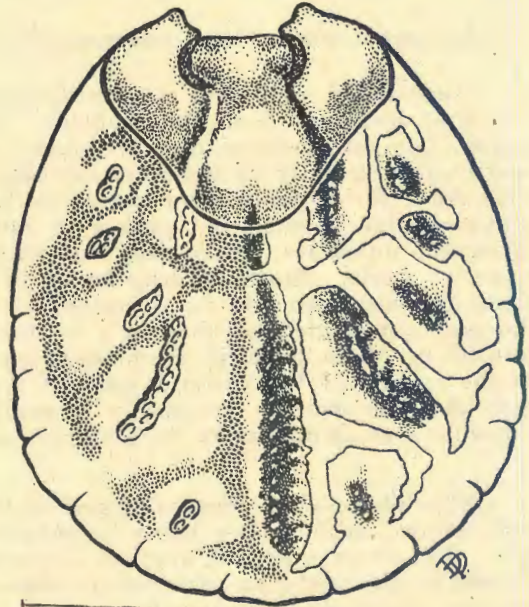


Fig. 7.

Fig. 6.—Schema of Dorsal grooves of an ixodid. Sulci outlined, strigae stippled. *Pmac* belongs to both systems. After Schulze 1932. Fig. 1.
 Fig. 7.—*A. exornatum*. Female. Dorsal view showing scutal ornamentation; dorsal grooves; intestinal caecae shining through.

Rostrum.—*Basis capituli* deep brown in colour, with a lighter area at the base of the palps; somewhat variable in shape, mostly rectangular with the corners rounded off; sides may be parallel or somewhat convex; posterior border varies from slightly curved without cornua to more deeply curved with, usually, very broad cornua; punctations few. *Palps* long; article 2 almost twice as long as article 3; article 3 only slightly longer with the corners rounded off; sides may be parallel or somewhat convex; than broad. *Hypostome* 3/3, of eight to nine teeth to the row, continued posteriorly as crenulations; corona present distally.

Ventral surface genital orifice opposite coxa II. *Stigmata* comma shaped but not markedly so, the stem coming off at varying angles from the body of the comma.

Legs uniformly brown, segments swollen; in dried specimens the distal free edges may appear yellowish. *Tarsus* I a small distal dorsal hump, preceded by a saddle-like area, sloping steeply to the apex; ventrally a terminal spur; caruncle but poorly developed. *Tarsi* II-IV a large dorsal hump, sloping steeply to the apex, two ventral spurs the distal one longer. *Coxae* squarish. *Coxa* I with a larger external spur and a smaller inner spur closely applied to it. *Coxae* II-IV with one strong spur increasing in length from II-IV.

Female (Figs. 7-8).

Average 4 mm. × 4 mm. unengorged; 8 mm. × 6 mm. partially engorged.

Scutum 1.8 mm. × 2.3 mm. measured from emargination; 2.1 mm. × 2.5 mm. measured from the shoulder. Heartshaped; emargination deep; scapula pointed; posterior margin sinuous. Cervical groove deep and curved; continued posteriorly by a shallow depression which appears to be continuous with the anterior paramedian groove of the alloscutum; sometimes the mid-posterior edge is somewhat sunken or even notched. Punctations evenly dispersed, numerous, fairly deep but tending to become superficial in the posterior angle. Brown to deep brown in colour; the dark brown pigment, when present, seems to be deposited evenly all over, except perhaps in the posterior angle and anteriorly on the scapula. The colour pattern is formed by three metallic markings: one large spot, frequently bilobed, in the middle of the posterior part of the scutum; and one large spot in each shoulder region; frequently a small brown spot, the equivalent of a frontal spot, is present in the posterior part of the shoulder ornamentation.

Alloscutum.—The grooves formed by the muscle attachments are usually well-defined, each groove being accentuated by one or two rows of deep pits. The grooves present are: an elongate posterior median; the posterior accessory; the posterior paramedian, three somewhat elongate laterals; the anterior paramedian apparently running into the scutum and forming the depression behind the cervical groove, this scutal depression, however, in all probability, represents a true cervical stripe rather than a continuation of the anterior paramedian. These grooves parallel the deeply pigmented areas in the male conscutum, where, however, the attachment areas are hardened, raised and smooth, and not sunken and pitted.

Rostrum.—*Basis capituli* shows the same variations as in the male; the *areae porosae* are well-defined, deep, roundly oval, slightly at an angle to each other, less than their shortest diameter apart. *Palps* and *hypostome* as in the male.

Ventral surface.—Genital orifice opposite coxa II. Grooves show the same deeply pitted appearance as those on the dorsal surface and are arranged as in figure 8. *Stigmata* as in the male. *Legs* and *coxae* as in the male.

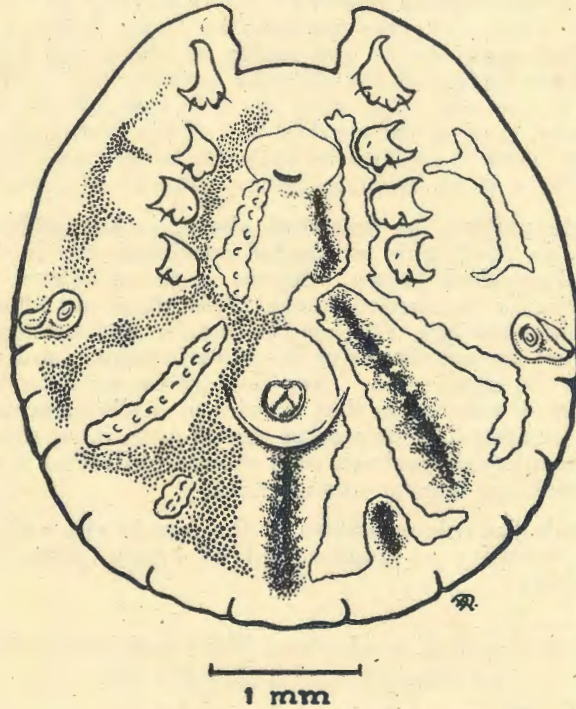


Fig. 8.—*A. ezornatum*. Female. Ventral view showing arrangement of ventral grooves.

Discussion of the colour patterns.

Gerda Frick (1936) shows the pattern in the ornate ticks to be made up of: (a) guanin deposits, giving an enamelled effect in the dried ticks, these deposits are often associated with (b) structural modification of the chitin giving a metallic green to coppery iridescent sheen; (c) areas of dark brown pigmentation. These three elements are arranged on an otherwise uniformly coloured surface. Both the guanin and the brown pigment deposits are influenced by the dispositions of the intestinal branches and of the muscle attachments. The amount of either deposited may vary considerably in a series of ticks from the same species; the encroachment being made upon the uniformly coloured scutal chitin.

Upon comparing the guanin pattern in the male of *A. exornatum* with her outline of a typical ixodid ornamentation (fig. 5) it is found that some of the postulated stripes or spots are not represented. Thus *c* and *b* are entirely lacking; *a* is represented by the anterior portion only; *f.1*, *f.2* and *f.3* show fusion; *h* and *e* have become joined; and *h* may be joined to *f.1* anteriorly; *g* is present, though placed somewhat more anteriorly; *d* has become consolidated into a triangular mass but retains the posterior bifurcation.

Fitting into this enamelled pattern are the deeply pigmented, brown stripes or areas: the posterior median between the two *d*'s; the posterior paramedian accessory in the fork of *d*; the paramedian lying between *d* and *e*; the fused three lateral spots lie to the inside of the fused *f.1*, *f.2* and *f.3*, and show the same lobing as the *f*'s; the anterior paramedian lies to the inside of *h* and to the side of *g*, with the falciform process almost meeting behind *g*; the fused mass of the cervical and of the ocular elements surround *a*; posteriorly this mass is continuous with the laterals and with the anterior paramedians. There is no evidence of any pigmented marginal spots.

The complete pattern, as described above, is but seldom seen in any one tick. Thus, in the highly enamelled specimens the intervening spaces all appear a uniform dark brown, whereas in the specimens with but little enamelling the deeply pigmented brown areas stand out clearly from their more yellowish surroundings. Further the guanin, and the pigment deposits, in the various areas are not always of the same intensity, and very frequently whole areas may be suppressed. Nor does there seem to be any definite order of deposition of guanin, in that interior or posterior or median elements may be selected for attention, or may be passed over, in an equally haphazard manner. One exceptional specimen even showed unilateral markings, though generally the markings appear symmetrical.

As in the male the colour pattern of the female also varies considerably both as to the intensity of guanin and of brown pigment, and in the suppression of areas.

The colour patterns of A. neglectum, Hirst and Hirst 1910 and of A. arcanum, Karsch 1879 (Fig. 10).

In describing the male of *A. neglectum* off *Varanus albigularis* from Deelfontein, Cape, Hirst and Hirst 1910, were undoubtedly dealing with a specimen of *A. exornatum* in which most of the enamelling was suppressed, except for the scapular and for the central impair-spots, and in which the brown stripes were fairly heavily pigmented. They draw attention to the median and to the paramedian stripes noting the absence of punctations on them. They give the paramedians as partly sunken areas: more generally these are raised slightly, though several specimens have been met with in which they tend to be below the general surface level. In every other respect their excellent description is that of a well developed *A. exornatum*. Hence *A. neglectum* cannot be considered a valid species, but falls into the synonymy of *A. exornatum*.

Judging by the illustration given by Schulze in 1935, of Karsch's type specimen of *A. arcanum* from Loango, West Africa, this tick is also a specimen of *A. exornatum*. In this instance, there is a heavy deposit of brown pigment, whereas the guanin deposits are but slight, the edges of the lightly enamelled areas merging with the general background, which

is yellowish in dried specimens. The main pattern thus is not that of the enamelled areas (*Schmelzmuster*) usually associated with *A. exornatum*, but that of the lesser known deeply pigmented brown areas. (Compare fig 2).

It is thus seen that the differences as to the ornamentation between the males of *A. arcanum* and of *A. exornatum*, which Schulze discussed in 1936, do not really exist. The statement that the coxal spurs in *A. exornatum* tend to be scalelike, is certainly not borne by the study of the abundant material available. Nor are the stigmata always as he describes them, there certainly is a tendency for the tail of the comma to come away in a straight line from the body, but this is not invariably so, the tail may come off at an angle. The other morphological differences thus also fall away. So that *A. arcanum* can no longer be considered a valid species and also falls into the synonymy of *A. exornatum*.

The specimen described as the female of *A. neglectum* is undoubtedly an *A. exornatum* female in which the scapular guanin deposits seem to be but very slight. The "eye" mentioned by Hirst and Hirst is an unpigmented spot on the anterior edge of the scutum.

Nymph (Fig. 9, 9a).

1.4 mm. \times 1.3 mm. to 1.5 mm. \times 1.5 mm. Howard gives 2.3 mm. \times 2 mm., flat, almost orbicular.

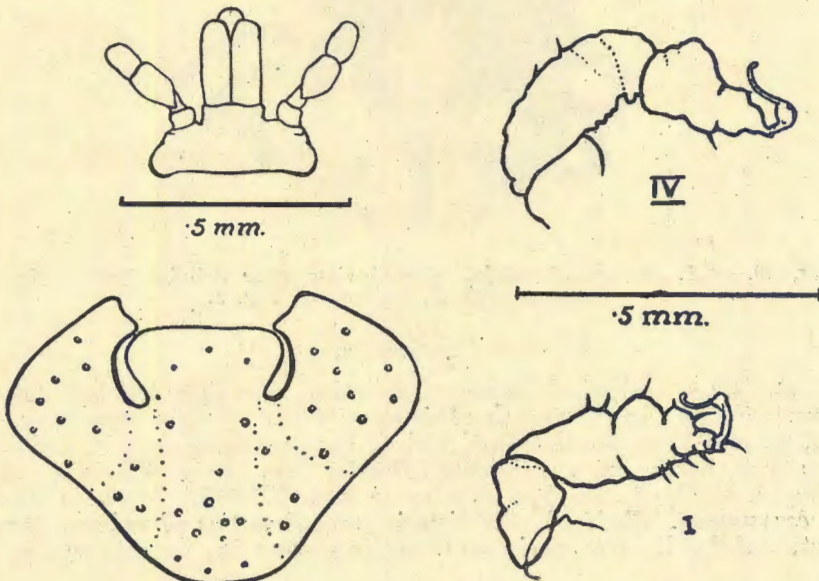


Fig. 9.

Fig. 9a.

Fig. 9.—*A. exornatum*. Nymph. Dorsal view.

Fig. 9a.—*A. exornatum*. Nymph. Tarsus I and Tarsus IV.

Scutum .56 mm. \times .88 mm. broadly heart-shaped; emargination wide and deep; posterior margin very slightly sinuous, widely rounded posteriorly. Cervical grooves deep at first, then shallow and diverging towards the postero-lateral margins. Punctations few, large, evenly distributed, occurring also in the shallow prolongation of the cervical groove. Colour deep brown, paler on the shoulder and in the posterior field.

Rostrum.—*Basis capituli*: same light colour as the posterior field. Broader than long; five sided, posterior margin practically straight, lateral margins slightly curved to straight and almost parallel; antero-laterals longer than the laterals; postero-lateral angle a right angle. *Palps* elongate, but broader than in the adults; Article 1 clearly visible; article 2 one and a half times as long as article 3; article 3 one and a half times as long as broad. *Hypostome* 3/3, teeth continued posteriorly as crenulations, small corona distally.

Alloscutum.—Grooves much the same as in the female.

Legs stout. *Coxae* as in the adults; *coxa* I, the smaller internal spur not always clearly visible. *Tarsi* much the same as in the adults, but without the ventral spurs. *Pulvillus* fairly well developed.

Ventral surface as in the female, except for the genital orifice and groove.

Larva.—Much the same as the nymph; up to 1 mm. \times 0.75 mm. when fully engorged.

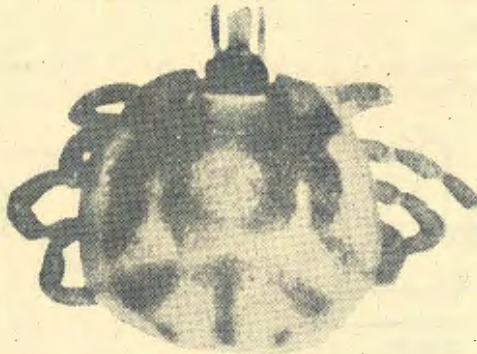


Fig. 10.—“*A. arcanum*.”—Male. Dorsal view after Schulze 1935. Fig. 2. Compare with *A. exornatum*, Fig. 2.

Occurrence.

Host.—The zoological survey collection contains batches taken off *Varanus niloticus* and *Varanus albigularis* from all four provinces of the Union, as also from South West Africa, Bechuanaland and Ngamiland; as well as one batch off a crocodile, Domba Isle, Lake Victoria. I have identified a batch of nymphae off a snake from Victoria, Southern Rhodesia, as *A. exornatum*. Bedford 1936 lists it from *Acontias plumbeus*, Sorghwana district, Zululand. No specimens have been sent in, as yet, off any other hosts.

Howard's statement that the species is very common in the Transvaal on snakes and large lizards, is not borne out by the present finding nor by the experience of museum herpetologists and acarologists, nor by my personal experience in examining numerous zonurids and agamids.

The indications are that the varanids are the normal hosts, and that the crocodile, sharing its habitat with the water-leguaan, is a second choice. The records from: *Python sebae* (Lucas, Paris Museum); dogs (Holub, Paris Museum); snake, Southern Rhodesia; Blind Lizard, Zululand; represent cases of purely accidental hosts.

Geographical Distribution.

A. exornatum has been listed by Neumann (1911) from Senegal, Algeria and the Belgian Congo; by Schwetz (1927) (Crocodyle) and by Nuttall (1916) from the Belgian Congo; by Bequaert (1930) from Tanganyika; by Aneurin Lewis (1932) from East Africa; by Warburton (1922) and by Sigwart (1914) from South West Africa. It would thus seem to have the same distribution as the two African varanids.

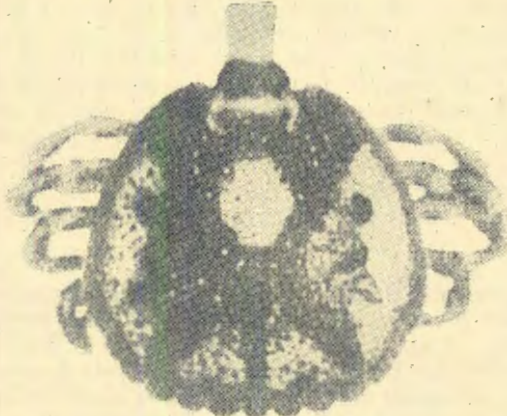


Fig. 11.

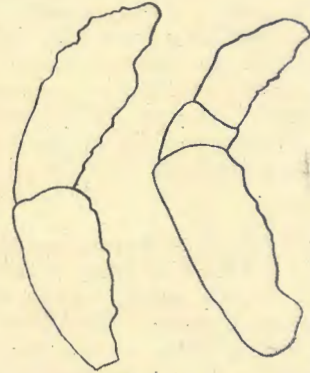


Fig. 11a.

Figs. 11 and 11a.—*A. fraudigerum*. Male; and Tarsi 1 and 4. After Schulze 1935. Figs. 4 and 5.

Classification.

Neumann 1899 in his "Revision de la famille des Ixodidés" puts this species into his new genus *Aponomma*, and gave the list of synonyms as:—

Amblyomma exornatum Koch 1844.

Ixodes flavomaculatus Lucas 1846.

Ophiodes flavomaculatus Murray 1879.

Ixodes varani Lewis 1892.

To this list may now be added:—

Aponomma arcanum Karsch 1879.

Aponomma neglectum Hirst and Hirst 1910.

Two other ticks, reported from *Varanus griseus*, concern us here:—*Aponomma crassipes* Neumann 1901 and *Aponomma fraudigerum* Schulze 1935; as also the tick *Aponomma ochraceum* Neumann 1901 reported from *Mabya striata*.

"*APONOMMA CRASSIPES*" Neumann (1901).

Male (Fig. 12).

4 mm. without rostrum, body subquadrangular, with the sides and posterior border rounded, twice as broad in the posterior third (3.5 mm.) as anteriorly.

Conscutum; convex cervical grooves short and deep; no lateral groove; festoons short not deeply marked off; punctations numerous; irregular, scattered over entire surface. General ground colour reddish, yellowish at the margin, with green iridescent spots on the scapulae, in the centre, and as two longitudinal stripes in front of the festoons. Roubaud and Colas Belcour 1935 give the colour pattern as follows: Two longitudinal stripes, irregular; greenish white with a metallic shine, starting from the penultimate festoon following the contour of the scutum and ending in the anterior third; these bands mark the site of the absent lateral groove and accentuate the large punctations, which are also more numerous in this region. Two arciform markings present on either side of the median line, stretching from the edge of the median festoon and embracing in their concavity the three adjacent festoons. These arciform stripes may be absent as in Neumann's type specimen, or the scutum may be devoid of all ornamentation. Schulze 1936 points out that Roubaud and Colas Belcour's description and figure do not give the complete colour pattern in that the central marking is left out and the two "arciform" markings are too narrow.

Rostrum.—According to Neumann, 1 mm.; *basis capituli* quadrangular, twice as broad as long; cornua not pronounced. *Hypostome* margins parallel; 3/3. *Palps* short. *Legs* short. *Legs* stout. *Coxae*: *Coxa* 1 with two very small spurs. (Roubaud and Colas Belcour give them as well developed) one spur similar to the spur on the other three coxae. *Tarsi* short, 2 and 3 humped towards the middle of their length. *Tarsus* 4 only slightly humped.

Female.—12.5 mm. × 9 mm. when engorged. *Scutum* cordiform, cervical groove short and deep, extending into shallow depressions posteriorly. Punctations unequal scattered over entire surface. No ornamentations, dark brown in colour, shiny. Schulze 1936 gives the ornamentation as three green spots. *Rostrum* shorter than in male. *Basis capituli* subquadrangular, posterior angle well marked without, however, forming definite cornua; *areae porosae* oval, well separated, diverging. *Hypostome* 3/3. *Legs* more slender than in male. *Coxae* two short stout spurs, external hardly stouter than internal; single similar spur on the other coxae. *Tarsi* with a slight hump, the middle tarsi swell slightly distally and then end abruptly. *Ventral surface*: genital pore between coxae I and II.

Nymph.

Engorged 3.2 mm. × 2.6 mm. *Scutum* subcordiform, light brown, large punctations over entire surface. Cervical grooves short and deep. *Hypostome* 3/3 as base, 202 nearer corona. *Coxa* I two spurs; *coxae* II to IV one spur. *Tarsi* already show a decided swelling.

Larva.

Freshly hatched, circular in outline, .762 × .676 μ ; engorged 1.311 μ × 1.173 μ . *Rostrum* short. *Hypostome* as in nymph. *Scutum* very large subcordiform; posterior margin in unengorged larvae reaching to middle of body. *Coxae* each one spur, all alike; *Festoons* well pronounced.

Host: *Varanus griseus* Neumann 1901. Type specimen Berlin Museum.

Varanus bivittatus—Indo China—Roubaud and Colas Belcour 1935.

Affinities.

According to Roubaud and Belcour 1935 *A. crassipes* shows its closest relationships with *A. pattoni* Neumann 1910, parasitic on Indian snakes, and *A. quadratum* Cooper and Robinson 1908, parasitic on an Australian leguaan. It differs from *A. pattoni*, in that *A. pattoni* has coxa I with stout external spur longer than broad, with internal spur punctiform. Punctations only at the periphery; only small punctations in central portion of scutum.

It differs from *A. quadratum* in that in *A. quadratum*, which also has two spurs on coxa I, the posterior part of the *scutum* shows nine depressions arranged in parallel rows in front of the festoons. *Tarsi* with medium sized hump as in the other two species.

Schulze 1936 is inclined to consider *A. crassipes* as a synonym of *Aponomma fuscolineatum* Lucas 1857 or possibly as a subspecies of it. He, however, points out that in *A. fuscolineatum* the basis capituli is triangular with the corners rounded, rather than quadrangular, as Roubaud and Belcour give for *A. crassipes*.

Geographical distribution.

This is essentially an Asiatic species which apparently has been found in North Africa, having accompanied its host *A. grisedus* thither; and like *A. ochraceum* it may reach East Africa via Zanzibar and via the other eastern and Arabian trade routes.

"APONOMMA FRAUDIGERUM" SCHULZE 1935.

Male (Fig. 11).

Length 4 mm. rostrum included. The distribution of the iridescent ornamentation and of the deep brown ground colour is well seen in the figure. Punctations very irregular coarse and fine. *Basis capituli* with broad well developed cornua. *Palps* article 3 leaning inwards rather more than in *A. omissum*. *Hypostome* slender 3/3. *Legs* uniformly yellowish. *Coxa I* with shorter internal and longer external spur. *Coxae II-IV* with strong spur. *Tarsi I* and *IV* see figure. *Peritrema* broad, comma-shaped.

Female.

Unknown.

Host *Varanus griseus* ex Africa. Museum Hamburg.

Affinities of A. fraudigerum.

This species quite apparently bears no resemblance to *A. exornatum*. Schulze places it into the *gervaisi* group, which has its other representatives in Asia.

We thus have *Varanus griseus*, a Mesopotamian leguaan which has become established in Africa, North of the Sahara, being parasitised by its own Asiatic *A. fraudigerum*, and *A. crassipes*.

"APONOMMA OCHRACEUM" NEUMANN 1901.

Male (Fig. 13).

A short oval, 2.7 mm. (without rostrum) \times 2.4 mm.

Scutum a reddish brown; with a white lateral border which reaches to the last festoons "et sur les bords des festons"; a narrow strip of red to the inside of this white border; cervical grooves short; lateral groove absent; festoons broader than long; punctations numerous, very fine, larger towards the margins. *Ventral surface* a dirty yellow; festoons well marked. *Rostrum* short, narrow. *Hypostome* 3/3. *Legs*. *Coxa I* two short spurs, subequal, black; one spur resembling that on *Coxae II-IV*. *Tarsi* fairly long; tapering gradually to the extremity [Tarsi without a dorsal protuberance, tapering to the talus, 1911].

Female.

A short oval, 3.8 mm. without rostrum, \times 3.2 mm. yellowish.

Scutum reddish yellow, broader than long, subtriangular (Cordiform 1911); the postero-lateral margin slightly concave; posterior angle wide; cervical grooves large, very superficial, except anteriorly. Punctations deep, unequal, absent in the posterior third (deep in the lateral fields, 1911). A red brown marking (scutiform 1911) in the lateral angles.

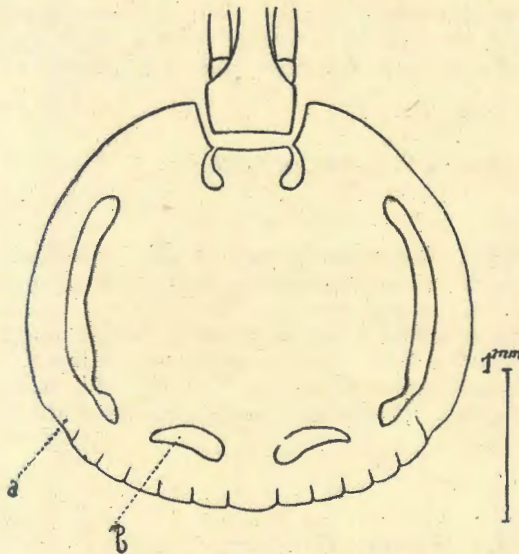


Fig. 12.

Fig. 12.—*A. crassipes*. Male. Dorsal view. After E. Roubaud and Colas-Belcour 1935. Fig. 1.

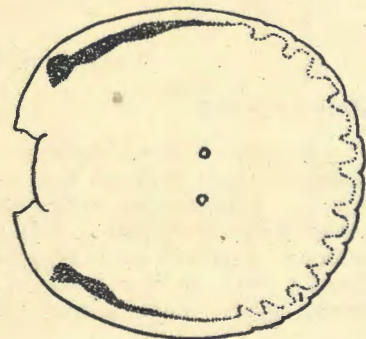


Fig. 13.

Fig. 13.—*A. ochraceum*. Male. Dorsal view, showing disposition of the deeply pigmented brown (red) stripe. After G. Frick 1936. Fig. 16.

Alloscutum very finely striated; hairs very short, fine and scarce; festoons present. *Ventral surface* glabrous; stigmata comma-shaped, with narrow prolongation, almost longitudinal. *Rostrum*: *Basis capituli* twice

as broad as long. *Hypostome* spatulate, 3/3. *Palps* narrow, article 3 almost as long as article 2. (*Porose areas* circular, near together 1911). *Legs* as in the male, stouter.

Host.—*Mabuya striata*, Zanzibar (Neumann, Berlin Museum).

2 ♂ and 2 ♀ East Africa (Stuhlmann, Hamburg Museum).

Description taken from Neumann 1901 and supplemented from Neumann 1911.

Affinities of A. ochraceum.

This tick quite obviously also belongs to the Asiatic *gervaisi* group, having the lateral band and the posterior blotches, but lacking the central markings. It differs from both *gervaisi* and *fraudigerum* in the nature of its punctations in the (apparent ?) lack of dorsal hump on the tarsi.

Mabuya striata is a fairly common African skunk, with a wide distribution extending from the South up into East Africa. That it should be found in Zanzibar and that it should there become infested with an asiatic *Aponomma* is not unexpected, since the island of Zanzibar has been on the trade route between Asia and East Africa from time immemorial. Its reintroduction plus acquired parasite into Africa would follow along the same lines.

SUMMARY.

1. The full colour pattern of *Aponomma exornatum* is described, and the range of variations within the species discussed.

2. *A. arcanum* and *A. neglectum* are put into the synonymy of *A. exornatum*.

3. The conclusion is drawn that the varanids are the normal hosts, with the crocodile as a second choice. All others are but accidental hosts.

4. The descriptions are given of the two ticks parasitic on *Varanus griseus*; *A. crassipes* and *A. fraudigerum*; of the tick parasitic on *Mabuya striata*; *A. ochraceum*; and their affinities are discussed.

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