

Ticks Infesting Domestic Animals in Southern Rhodesia.

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The following article aims at placing in the hands of stockmen, and others connected with the cattle industry, a popular guide to the ticks which infest stock and domestic animals generally in this Colony, together with an account of their habits, life histories, relation to animal disease and measures employed for their control. It is felt that a handy pamphlet of this nature is likely to prove useful for purposes of reference in view of prevailing legislation and the great influences that these parasites exercise on the stock industry throughout the sub-continent.

Ticks are very clearly divided into two families. There are a number of points by means of which the members of either family may be distinguished, but for our purposes it is sufficient to note that in the family (*Ixodidae*) to which the common cattle ticks belong there is a hard shield on the back of the tick, which in the male covers practically the whole of the back and in the female a smaller area close behind the head (see illustrations of male and female ticks on Plate I.). In the other family (*Argasidae*), of which the Spinose Ear Tick, the Tampan and the Fowl Tick are representatives (see Plate II.), this hard shield is altogether lacking. Also in the *Argasidae*, except in the larval stages, the mouth-parts are invisible when the tick is viewed from above, whilst these parts project in front of the body in the *Ixodidae*.

Not only do the members of these two families differ in appearance, but also in life history and habits. Ticks of the family *Ixodidae* all have a similar life history, which is illustrated in the diagram on Plate IV. The minute tick, as it first hatches from the egg, possesses only six legs, in contrast

to the eight borne by the later stages, and is termed a *larva*. This larva crawls up to the top of the herbage or other convenient point of vantage and is brushed off by its host (*i.e.*, the animal on which it feeds). It then inserts its mouth-parts into the skin and commences to fill itself with blood. Its skin is capable of distention, and as it feeds the larva swells up, finally becoming completely engorged. It now stops feeding and may either drop off on to the ground or remain attached to its host by its mouth-parts. In either case, the second stage of the tick gradually forms within the loose skin of the larva, the skin is finally ruptured or *moulted* and out crawls the tick in its second stage. It is now seen to possess eight legs instead of six, and is termed a *nymph*. If the moult has taken place on the host the tick has only to wait until it is sufficiently hardened before "biting in" and commencing to feed again. If the moult has taken place on ground the nymph repeats the performance of the larva, crawling up to a place of advantage waiting until it is brushed off by one of its hosts, when it once more attaches itself and commences to feed. Like the larva, it feeds to engorgement and becomes greatly swollen. Again the tick may detach itself or remain on the host and the moulting process is repeated. The ticks which emerge from the nymphal skin are now in the adult stage and for the first time the sexes are distinguishable, as already pointed out, by the back of the male being covered by the horny shield and the much smaller shield borne by the female. Shields similar in proportion to those of the females are as a matter of fact borne by both the larva and nymph, and presumably serve some purpose, such as supporting the head whilst leaving the bulk of the tick's skin soft and capable of great distention. Both the male and female attach themselves to their hosts and suck blood, but the male feeds comparatively little and does not gain conspicuously in size, whereas the female becomes greatly swollen and finally fully engorged. The female then detaches herself and falls to the ground, crawls into a convenient shelter, and soon commences to lay eggs. Several thousand eggs are produced, and in the process the female tick gradually shrivels and dies. After an interval the eggs hatch, producing larval ticks, and the life cycle recommences.

The common cattle ticks have thus three distinct stages after leaving the egg, namely, the *larva*, the *nymph*, and the *adult*. From what has been said concerning the fact that some species drop off for each moult, whilst others remain on the host for one moult or both, it is obvious that some species may feed upon three different animals during the course of their development, others on two and some only on one. It is usual to speak of them as having a one host, two host, or three host cycle. This difference in habit has, as will be seen, an important bearing on disease-transmission and on the results secured from dipping.

Having thus touched lightly on the fundamental points in the life history of the common cattle ticks, we are now in a position to deal separately with the various species prevalent in this territory and their respective peculiarities in regard to disease-transmission. The species differ from one another not only in size, form and coloration, but also in various minor characteristics, very important amongst which is the length of mouth-parts, these organs being very much longer in proportion to the body in some species than in others. This variation in the mouth-parts is clearly shown on Plate I.

The Bont-leg Tick (*Hyalomma aegyptium impressum*, C. I. Koch).—This tick, of which the male is illustrated at fig 1 on Plate I., is probably the best known of all in the territory. Unfortunately, there is a tendency to use the name "Bont Tick" in reference to it, but this name should be reserved for the species to be considered next. The Dutch word "Bont," meaning "parti-coloured" or "piebald," obviously applies only to the legs of this species, the body of the tick being dark brown. The species is readily distinguished by its banded legs and dull brown body, the surface on the male being closely shagreened all over. The unfed female is very similar in appearance to the male—in fact in this species the sexes are rather difficult to distinguish without the aid of a hand lens, as the female shield, with its rough surface, merges somewhat inconspicuously into the remainder of the tick's back, with which it is uniform in colour. The males and unfed females measure up to nine thirty-seconds of an inch in length, including the mouth-parts. The fully engorged female may measure some three-quarters of an inch in length by five-eighths of an inch in breadth.

The life history of the Bont-leg tick is of the two host type, the moult between the larval and nymphal stages being passed on the host, and that between the nymphal and adult on the ground.* Although the adults are common parasites of cattle and other stock, the larvæ are not known to attach themselves to these animals, but have been reared successfully on rabbits and fowls. To these hosts they attach themselves in the region of the head. The common hare is no doubt a great factor in keeping up the numbers of these ticks on cattle runs, but other rodents must play a part, and in any case the range of hosts of the tick in its early stages is imperfectly known.

The Bont-leg tick has not as yet been found guilty of transmitting any specific disease. Its attack, in the adult stage has, however, a notorious tendency to cause abscesses and sloughing of the skin, and spots affected in this manner are believed to be specially liable to form the starting points for the so-called "Screw Worm" (*Chrysomyia bezziana*, Villen.) which has caused so much trouble amongst cattle of recent years.

The African hosts recorded for the adults of this species include the domestic ox, Cape buffalo, dromedary, rhinoceros, horse, ass, giraffe, sheep, goat, pig, dog, cat, man, domestic fowls and ostriches. The larvæ and nymphs are recorded from hares, rabbits, fowls, ostriches and other birds.

The Bont Tick (*Amblyomma hebraeum*, Koch).—The male of this species is easily recognised by the pattern on the shield, the dark markings being dark brown, nearly black, and the lighter portions pale green in the middle merging into pale yellow towards the edges (see Plate I., fig. 2). The legs are banded as in the preceding species. In the female the markings on the shield are more variable. The plan of the markings on a specimen in the Departmental collection is shown at fig. 9 on Plate I. Prof. Neumann, the French authority on ticks, described the shield as exhibiting a large light spot towards the hinder end, and other small ones

*It has been shown that this species may or may not drop off for the first moult, so that its cycle is of either the two host or three host type. Individual variation in habit of this nature has not been noted in connection with other ticks.

The Variegated Bont Tick (*Amblyomma variegatum*, F.)—

The handsome male of this species is shown at fig. 3 on Plate I., and a diagram of the female illustrating the shield markings at fig. 10. Although the shield markings of the male are on very much the same plan as those of the preceding species, there is no risk of confusing the two. The edges of the shield in the Variegated Bont Tick are dark, whereas those of the Bont tick are pale. Furthermore, the light markings on the shield in the present species are coppery red instead of pale green shading into yellow towards the edges as in the case of the true Bont tick. Entomologists also find a distinction in the "eyes," which are flat in the Bont tick but prominent and provided with a slight orbit in the "Variegated" species. The dark markings are also distinctly raised above the general surface of the shield, and there is a green tinge at the edges of these markings. The markings on the female shield are very variable, and frequently the whole shield is dark without any light patches. In size and life history, as far as the latter is known, this species resembles the Bont tick, although the engorged females are recorded as attaining even greater dimensions. This tick is found in certain parts of Southern Rhodesia, notably in the region near the Victoria Falls (Matetsi, etc.) and along the eastern border of the Colony.* It appears to be absent from the central plateau.

This species has been shown to be able to transmit Heart-water. It is also reported to be very apt to cause abscesses and sloughing of skin in the host, as also is the true Bont tick. This tendency, in fact, seems to be common to the large species of ticks furnished with long mouth-parts.

The Tortoise Tick (*Amblyomma marmoratum*, Koch).—The male of this species is shown at fig. 14 on Plate I., and the female shield at fig. 13. The adults are common on reptiles, particularly tortoises, hence the popular name; but they also attack warm-blooded animals. The larvæ and nymphs feed very readily on warm-blooded animals. This species was reared at Cape Town during the time the present writer was

*Robinson describes this species from the eastern part of the Colony as a distinct variety—*A. variegatum* var. *nocens*. In a popular article it appears unnecessary, however, to distinguish between the variety and type, as the former conforms to the brief description given above.

assistant to Mr. C. P. Lounsbury, and the life history was found to be similar to the Bont tick, each stage dropping from the host for the moults. The engorged females may attain a considerably greater size than those of the Bont tick, and the unfed males and females also average rather larger. The Tortoise tick occurs in this Colony, but does not appear to be very abundant. It is recorded from the Cape up the east coast to the Congo and in West Africa (Senegal). Neumann records rhinoceros and genet as warm-blooded hosts, as well as tortoise and python.*

Another species of *Amblyomma*, namely, *A. gemma*, Donitz, has been found on a bull in the Umtali district (1932). It is recorded on cattle, rhinoceros, eland, zebra and lion in Kenya.

Two relatively rare species of ticks recorded of recent years on domestic animals are: (1) *Rhipicentor nuttalli*, Cooper and Robinson, found on a dog in the Makoni district (1934). This species is recorded on kudu, hedgehog and dog in the Union of South Africa.

(2) *Rhipicentor gladiger*, Neumann, was taken on a dog in Gutu district in 1933.

The Brown Tick (*Rhipicephalus appendiculatus*, Neum.) and its Relatives.—The Brown Tick, well known in connection with the transmission of East Coast Fever, is shown on Plate I., the male at fig. 4, the unfed female at fig. 8, and the fed female at fig. 11. There are, however, a number of different species of this genus in the Colony, and most of them resemble the Brown Tick so closely that none but those who have made a study of ticks are likely to distinguish one from the other. With many species even specialists experience considerable difficulty, particularly with the females. The writer has therefore thought it unprofitable to figure more than one species. The Brown Tick is, generally speaking, the commonest cattle parasite of the genus, although the "Black-pitted Tick" (*R. simus*, Koch) is also common on this host, as also is the "Red-legged Tick" (*R. evertsi*, Neum.). The latter is an easily recognised species owing to its saffron

*This species has since been taken in numbers from rhinoceros in Southern Rhodesia.

coloured legs, the legs of the other representatives of the genus being dark brown. The adults of the *Red-legged Tick* attach themselves by preference under the tail of the host, whilst nymphs are mainly found deep in the ears. On this account the nymphs have frequently reached the writer with a request for a statement as to whether they are specimens of the Spinose Ear Tick or not. The adults of the Brown Tick are also found on the ears of their hosts, although they do not penetrate so deeply as the Red-legged Tick nymphs, and are also sometimes suspected of being Spinose Ear Ticks. As will be seen later, both forms are very distinct from this latter species, which belongs to the other family of ticks (*Argasidae*).

Both males and females (unfed) of the Brown Tick and its local relations (excluding the Red-legged Tick) are of a uniform dark brown colour. The size is variable. The male from which fig. 4 on Plate I. was drawn measures almost exactly three-sixteenths of an inch in length, and this is about the maximum size. Many specimens are much smaller. It is noteworthy that specimens taken from antelope and other wild animals all appear to be on the small side. The specimen figured was taken, in company with others of similar dimensions, from cattle at Salisbury, the unfed females of the same batch being rather smaller.

The name *appendiculatus*, given to this species by Prof. Neumann, refers to the prominent projection on the hinder margin of the male. This may develop, but does not always do so, as the tick feeds, being absent in unfed specimens. Other species of the genus also develop projections, but usually less prominent than that of the Brown Tick. This peculiarity is also found in the genus *Boophilus*, which includes the Blue Tick, to be dealt with later.

The life history of the Brown Tick and several other members of the same genus has been worked out in detail. The other members include the Black-pitted Tick (*R. simus*, Koch), the Cape Brown Tick (*R. capensis*, Koch), and the Red-legged Tick (*R. evertsi*). The Cape Brown Tick is not known to occur in this Colony. Of the four species mentioned, three show life histories of the three host type, falling from

the host for both moults. The Red-legged Tick has, however, a two host cycle, remaining on the animals for the first moult, but falling off for the second.

The Brown Tick larva may occupy as little as three days in feeding to repletion, but frequently takes considerably longer. When full fed it is about the size of a pin's head, and drops off for its moult, which may take a fortnight or more, depending on the temperature, etc. The resulting nymph, after attaching itself to an animal, feeds to engorgement in some 4—6 days or longer, and again falls off for the moult, being now about the size of a lentil. The female, providing she meets a male at once, swells to repletion in about nine days, and drops off to lay her eggs on the ground. The swollen female may be distinguished from the Blue Tick female by its dark brown legs and bluer colour, the Blue Tick having pale legs and a somewhat greenish tinge. The time occupied by the moults and hatching of the eggs varies greatly with the time of year, and Lounsbury estimates that not more than two full generations can be passed during the year under the most favourable circumstances.

The above notes apply to the other species of the genus which have been studied, with the exception of the Red-legged Tick. In this species the nymphs begin to fall from the ear about ten days after the larvæ have "bitten in," and the larval and nymphal stages are thus passed in a considerably shorter time than in the case of species which fall off for the first moult.

The four species of this genus mentioned above have all been found capable of transmitting East Coast Fever, and it is probable that some, if not all, other members of the genus which feed on cattle are capable of playing a similar part. The method of transmission is similar to that of the Bont Tick and Heart-water. A tick feeding on a sick animal in the larval stage and "biting" a susceptible animal in the nymphal stage may convey the disease, as may also occur if the nymph feeds on a sick animal and the resulting adult feeds on a susceptible animal. The disease does not pass through the egg stage, and recovered animals have under test invariably failed to infect ticks. It is noteworthy that if a larva feeds on a sick animal and the resulting nymph engorges on an animal,

such as a dog, hare, goat or sheep, which is immune to the disease, the infection is lost and the adult is not capable of infecting a susceptible animal.

The **Brown Tick** has been shown to transmit Redwater in cattle either as an adult, which fed on an infected animal in the nymphal stage, or as a larva, whose mother fed on an infected animal. It can also transmit the form of gallsickness in cattle caused by the organism *Gonderia mutans*, but the mode of transmission in this case is not stated.

The **Red-legged Tick** can also transmit gallsickness caused by *Gonderia mutans*. It plays a more important role, however, in transmitting biliary fever of the horse. These diseases are transmitted by the adults which have fed on infected animals in the larval and nymphal stages, both of which, as already stated, are passed on one host. In addition to the above, the larvæ can transmit ordinary Redwater in cattle and the disease known as *Spirillosis* caused by *Spirochæta Theileri*, affecting cattle, sheep and horses, when the mother tick has fed on an infected animal.

The **Black-pitted Tick** can transmit ordinary gallsickness (*anaplasmosis*) amongst cattle.

The **European Brown Tick** has been shown in India to transmit biliary fever of the dog, which it may do in three ways, at least:—(1) adult females feed on an infected animal and the nymphs of the next generation are infective; (2) nymphs feed on an infected animal and the adults are infective; and (3) adult females feed on an infected animal and the adults of the next generation are infective.

It will be seen, therefore, that ticks of the genus *Rhipicephalus* are amongst the most important in regard to disease transmission.

The following is a list of the species of the genus which have been collected in Southern Rhodesia and identified, together with the African hosts recorded in respect to each:—

(1) *Brown Tick* (*R. appendiculatus*, Neum.).—Ox, sheep, goat, horse, ass, Cape buffalo, dog, koodoo, sable antelope, wart-hog.

(2) *Black-pitted Tick* (*R. simus*, Koch).—Dog, lion horse, ox, Cape buffalo, dromedary, S.A. river-hog, wart-hog, porcupine, bush-pig, sable antelope, koodoo, cat.

(3) *Red-legged Tick* (*R. evertsi*, Neum.).—Ox, horse, ass, mule, zebra, sheep, goat, giraffe, dog, jumping shrew, sable antelope.

(4) *European Brown Tick* (*R. sanguineus*, Latr.).—Dog, jackal, civet-cat, lynx, cat, lion, man, hare, hedgehog, dromedary, waterbuck, sheep, goat, ox, scaly ant-eater, ostrich, owl, ibis, tortoise. This tick is very common on dogs at Salisbury and in other parts of Mashonaland.

(5) *R. sulcatus*, Neum.—Dog.

(6) *R. supertritus*, Neum.—A number of specimens were collected in 1910 off the grass near Gatooma, but the host is not known to the writer.

The Blue Tick (*Boophilus decoloratus*, Koch).—This species is readily distinguishable from other common cattle ticks by its pale legs. The male and unfed female are considerably smaller than the species already dealt with, although the fully engorged female is not so markedly inferior in size to the engorged Brown Tick female. The male measures roughly about one-eighth of an inch in length, and is of a greenish blue colour, with a well developed "tail" when fed, as in the Brown Tick. The points of the plates on the under surface of the body frequently show when the fed male is viewed from above (see Plate I., fig. 5). The fed female is somewhat greenish blue in colour in contrast to the slaty blue of the Brown Tick female, and the shield is smaller. The easiest guide lies, however, in the pale legs.

The life cycle of the Blue Tick is confined to a single host, the tick remaining in position for *both* moults. The cycle is a rapid one compared with most other ticks, as the natural heat of the host causes the tick to be much less influenced by the weather during the moults. The fully fed females usually commence to fall about twenty-one days after the larvæ have "bitten in," but the bulk appear to mature between the twenty-third and the twenty-fifth day. The female, of course, lays her eggs, like other ticks, on or in the