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RELATIONSHIP BETWEEN TICKS AND ZEBU CATTLE IN SOUTHERN UGANDA

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SUMMARY

Tick populations were observed on zebu (Bos indicus) *cattle over a period of 2 years at Entebbe, Uganda where the climate was thought to be highly favourable for the free-living stages of ticks. Collections of all instars of ticks were made from the body surfaces of the cattle at intervals of between 1 and 5 weeks. The species recorded in order of decreasing abundance were* Rhipicephalus appendiculatus, Amblyomma variegatum, Boophilus decoloratus, Rhipicephalus evertsi evertsi, Rhipicephalus simus, Rhipicephalus compositus *and* Hyalomma marginatum rufipes. *The rankings of the cattle based on burdens of any particular species of tick were always correlated with their rankings for other species; animals that carried more adult stages of a species also carried more of its immature stages. There were more adult males than females of* R. appendiculatus, A. variegatum *and* R. e. evertsi *even when the cattle had had all ticks removed 1 week previously; several possible mechanisms are suggested to explain the biased sex ratio. It is concluded that there is promise for improvement in control of 3-host ticks by increasing the resistance of herds of zebu cattle by culling or selective breeding.*

INTRODUCTION

Census data on tick populations on cattle in East Africa have been collected in Uganda (Smith, 1969), Tanzania (Yeoman, 1966; McCulloch, Kalaye, Tungaraza, Suda and Mbasha, 1968) and Kenya (Newson, 1978). These authors used the data to investigate relationships between the sizes of tick populations, seasonal weather conditions and vegetation.

The present 2 year study was carried out to define the relationship between ticks and their zebu (*Bos indicus*) hosts in a climatic zone with regular high rainfall and moderate temperatures throughout the year. The study also provided information on the relative abundance and distribution on the host of the different species of ticks present on the cattle at the same time. Such information on tick–host relations is needed to build tick population models and to devise tick control strategies in the event of progress in the prevention or treatment of debilitating tick-borne diseases such as East Coast fever (ECF).

MATERIALS AND METHODS

Observation site

The observation site was on the shores of Lake Victoria near Kigungu village, Entebbe district, Uganda (32° 26′ E and 0° 02′ N; alt. 1,171 m). Entebbe is in an ECF epidemic area and its climate and vegetation are representative of Pratt and Gwynne's (1977) eco-climatic zone II (humid to dry subhumid), 1 of the 2 major ecological zones in Uganda. Meteorological data was recorded at Entebbe airport adjacent to the observation area. Yearly rainfall is well distributed averaging 1,400 mm and temperatures vary little during the year with average daily maxima and minima of 23° and 15°C respectively.

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Cattle

The study was started with 18 small, humped East African zebu bulls and bullocks and 1 cow that were selected from about 400 animals with moderate to high ECF antibody titres as determined by the IFA test. The cattle were originally from the North Teso and Central Karamoja districts but had been previously kept at Bukaleba, Busoga District for periods of 2 to 12 months where they were dipped every 2 to 4 days. The cattle were put into the paddock at Kigungu in April 1975 and were closely watched for disease (ECF) symptoms which arose despite their high IFA titres because the Entebbe area has a different immunological strain of *T. parva*. Any rise of temperature was followed by oxytetracycline (Terramycin) treatment (15 ml/100 kg body weight for 5 days). Although several animals recovered after this treatment others died mainly of ECF infection. Of the original animals only 12 survived for the duration of the experiment. The dead animals were replaced by Ankole (*Bos indicus*)–zebu crosses originally from Aswa Acholi Ranch, Northern Province. Fourteen replacement animals were used of which 7 survived until the end of the experiment. The cattle grazed unimproved pasture on the communal grazing area in Kigungu between 08.30 and 16.30 hours and were confined in an adjacent fenced paddock during late afternoon and night. They were watered twice daily at the shore of Lake Victoria at 09.00 and 16.00 hours together with native herds.

Tick collections

The programme of tick collections began on 29 May 1975 and continued until March 1977. Every week 10 animals were picked clean of all stages of ticks on a schedule designed to provide collections from 5 cattle that had been picked clean 1 week earlier, 2 from 2 and 3 weeks earlier and 1 from 4 or 5 weeks earlier.

Ticks from the following body zones were kept separate:

Ear: Both sides of ear including hairy edges and auditory meatus.

Head: Poll, forehead, eyelids, muzzle and jaws.

Dewlap: Neck below the line extending from ear base to shoulder point (throat and dewlap) and brisket.

Back: Outerside of whole body including upper neck, back and outer side of legs above dewclaws.

Abdomen: Abdominal side (area between elbow points and flanks including chest floor, udder, axillae and inner sides of legs above dewclaws) also the usually slightly hairy and dry parts of the rump.

Anus–vulva: Anus, vulva and the bare triangle on the inner side of the tailbase and the usually moist rear area between thighs just below pinbones.

Tail: Tail stalk and switch.

Hoof: Area between and above hoofs, pastern and area between dewclaws.

Collections usually started at 09.00 hours and ended between 16.00 and 18.00 hours: on rare occasions a heavy workload or rain forced collections to be resumed the following day but these always ended before noon. Selected animals were mustered in a crush and thrown down using ropes. Four personnel and 1 supervisor per animal collected all sizes and stages of ticks in vials pre-labelled with date, animal number and body zone. Collections off each animal took 1·5 to 2·5 h and all the ticks were preserved in 68% alcohol.

Ticks were identified and counted in the laboratory and counts were recorded by date of collection, animal number, body zone, tick species, sex and stage. The numbers of engorged females and nymphs were also noted separately but due to the low reliability associated with sampling of these stages which detach from the host at different times of the day they were excluded from the statistical analyses. It was not possible to collect all larvae and the collections which included engorged larvae provide an index only of the size of the populations on the cattle. Where correlations of tick counts were calculated the data were transformed to logarithms to normalise their distribution. The significance levels quoted are approximate as random sampling was assumed in the analyses.

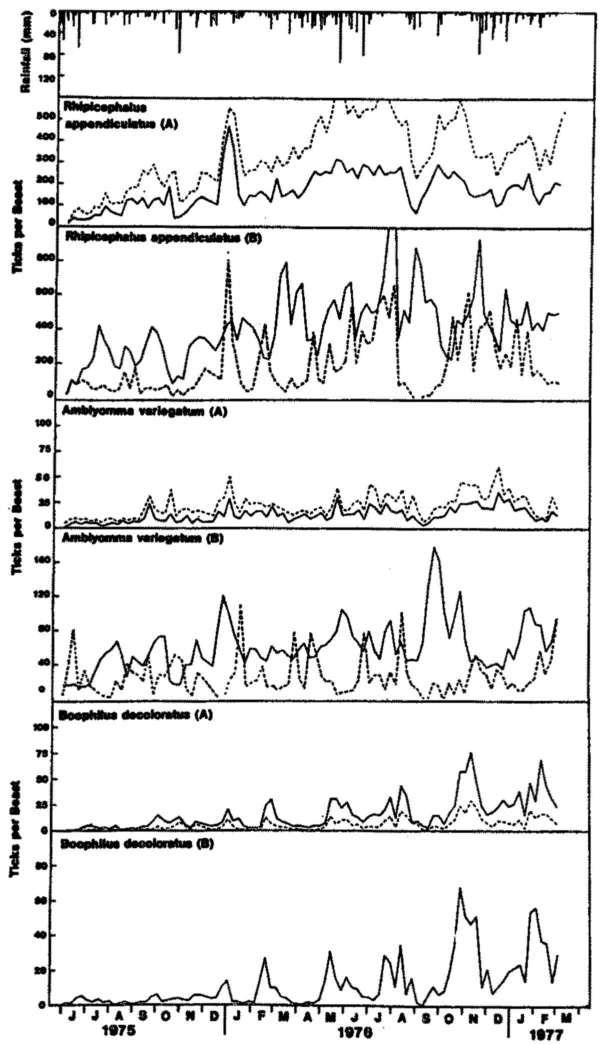

FIG. 1. The mean numbers of (A) adult females (——) and males (- - - -) and (B) larvae (- - - -) and nymphs (——) of *R. appendiculatus*, *A. variegatum* and *B. decoloratus* collected per animal. Daily rainfall is also shown.

RESULTS

Tick populations

Seven species of ixodid ticks were found in varying numbers on the cattle during the 2 years of observations. These were, in order of abundance, *Rhipicephalus appendiculatus*, *Amblyomma variegatum*, *Boophilus decoloratus*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus simus*, *Rhipicephalus compositus* and *Hyalomma marginatum rufipes*. Figure 1 shows the mean numbers of each instar of *R. appendiculatus* and *A. variegatum* and the adults and nymphs of *B. decoloratus* collected per animal each week. In Fig. 2 the data for the 2 less common species *R. e. evertsi* and *R. simus* are presented as monthly averages of the tick counts. Only 25 males and 16 females of *R. compositus* and 2 males of *H. marginatum rufipes* were collected during the period. The mean weekly numbers of ticks per animal were computed from the data for all animals used in each collection. This pooling of data from different collection intervals caused underestimation of the absolute numbers of adults of *A. variegatum* and males of *R. e. evertsi* since the numbers of these 2 species increased with increasing intervals between tick collections but relative changes with time were not affected. The numbers of different instars of the same species are not directly comparable because they spend different lengths of time on the host.

Data on the 5 most common species are summarised in Table I. In the case of *A. variegatum* and *R. e. evertsi* only data from cattle picked clean of ticks more than 4 weeks previously were used to avoid underestimating their numbers. Data for the 1-host tick *B. decoloratus* were not used if ticks had been removed from the steers 1 or

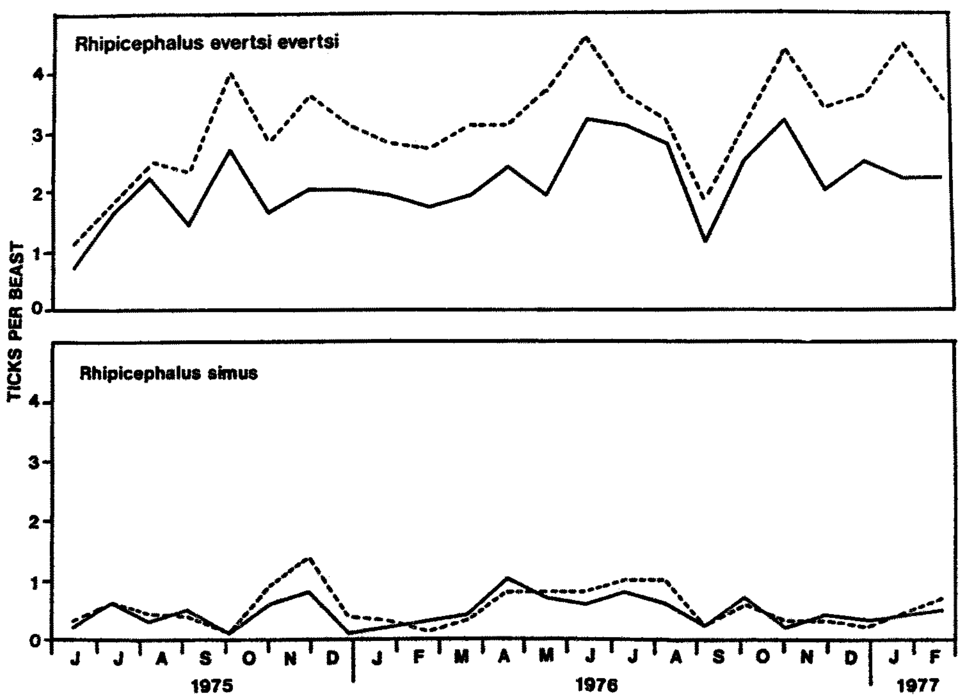

FIG. 2. The mean numbers of adult males (- - - -) and females (——) of *R. e. evertsi* and *R. simus* collected per animal each 4 weeks.

2 weeks prior to the collection since removal of immature stages would have affected the later adult count. *R. appendiculatus* was the most abundant species adults, being about 10 times more common than *A. variegatum* and *B. decoloratus* and about 100 times more numerous than *R. e. evertsi; R. simus* occurred in very small numbers. The populations of the common species appeared to build up during the first 6 months of observations (Fig. 1). This was thought to have been related to the low numbers of ticks in the night paddocks which were stock-free at the start of the observations.

TABLE I

Populations (adjusted mean numbers of ticks per animal) of the 5 most common species of ticks collected off zebu cattle at Entebbe estimated from all counts from January 1976 to March 1977

Instar	*R. appendiculatus*	*A. variegatum*	*B. decoloratus*	*R. e. evertsi*	*R. simus*
Males	422	42·7[1]	7·2[2]	5·0[1]	0·5
Females	212	20·0[1]	19·9[2]	2·3	0·5
Nymphs	506	72·0	16·3	—	—
Larvae	244	29·0	—	—	—

[1,2] Estimates exclude data from animals on which collections were made less than 3 weeks earlier[2] and less than 4 weeks earlier[1].

The numbers of *B. decoloratus* fluctuated regularly with a frequency of about 3 months (Fig. 1) but no seasonal pattern of incidence of the 2- or 3-host species of ticks was evident as expected in such a constant environment. However, the rainfall appeared to affect each instar and species except *R. simus* similarly. The correlations of counts between species for each instar were positive and small but were significant ($P<0{\cdot}001$) indicating that fluctuations in their populations sizes were to some extent synchronised (Table II).

TABLE II

Correlations of mean tick counts for each week of 3 instars of the more common species of ticks ($r>0{\cdot}34$ is significant at $P<0{\cdot}001$ for 93 weeks). The correlations indicate the degree of synchronisation of the numbers of each instar of each species with the others

	Males					Females					Nymphs		
	R.a.	*A.v.*	*B.d.*	*R.e.*	*R.s.*	*R.a.*	*A.v.*	*B.d.*	*R.e.*	*R.s.*	*R.a.*	*A.v.*	*B.d.*
R. appendiculatus	1	0·65	0·49	0·68	0·09	1	0·62	0·50	0·59	0·07	1	0·58	0·47
A. variegatum		1	0·58	0·54	0·02		1	0·65	0·45	−0·05		1	0·42
B. decoloratus			1	0·40	−0·03			1	0·49	−0·06			1
R. e. evertsi				1	0·12				1	0·10			
R. simus					1					1			

The effect of the interval between tick collections

The frequent tick collections provided information about the duration of the parasitic phase of each instar of each species. There were large and significant increases in the numbers of both sexes of *A. variegatum* and of males of *R. e. evertsi* on cattle when the collection intervals were increased but this did not occur with the other instars or species (Table III). This suggests that adults of the affected species were accumulating on the host during and possibly after 4 weeks. The presence of many adults of the 1-host tick *B. decoloratus* on cattle from which ticks had been collected 1 week earlier demonstrated the small proportions of immature stages collected and enabled the data on adults from the different intervals to be pooled for other analyses.

TABLE III

Effect of time between tick collections on populations (ticks per animal) of common species of ticks

Species	Collection interval (weeks)	Adults		Nymphs	Larvae	Sex ratio (males/females)
		Males	Females			
R. appendiculatus	1	389	211	513	246	1·8
	2	427	204	524	255	2·1
	3	489	217	480	221	2·2
	4+	457	218	488	245	2·1
A. variegatum	1	12[1]	5[1]	72	28	2·3
	2	18	11	71	29	1·6
	3	36	25	73	30	1·4
	4+	43	30	71	30	1·4
B. decoloratus	1	5·6	14·2	16·1	0·7	0·4
	2	5·5	16·9	15·8	0·2	0·3
	3	7·9	20·6	16·5	0·4	0·4
	4+	6·3	19·2	17·9	0·6	0·3
R. e. evertsi	1	2·5[1]	2·3			1·1
	2	3·7	2·3			1·6
	3	4·4	2·4			1·8
	4+	5·0	2·2			2·3
R. simus	1	0·4	0·4			1·0
	2	0·8	0·7			1·1
	3+	0·4	0·5			0·8
	4+	0·5	0·5			1·0

[1] Significant linear trend ($P<0 \cdot 05$).

There were no differences in numbers of the other instars of the 2- and 3-host ticks collected indicating that such ticks completed feeding in 1 week or less.

The observed sex ratios of the tick collections varied depending upon the species and intervals between collections (Table III). The numbers of males of *R. appendiculatus* exceeded the numbers of females by 2:1 but there were fewer males of *B. decoloratus*. With *A. variegatum*, the surplus of males was greatest in the first week after an earlier collection and then declined. The apparent accumulation of males of *R. e. evertsi* produced an increasing sex ratio for this species up to 4 weeks after an earlier collection.

Each species of tick consistently favoured different zones of the body but the preferences were stronger in some species than in others as shown in Table IV. *B. decoloratus* showed less preference than the other species.

Differences between tick burdens on different animals

(a) *Distribution of ticks on the herd*

The favourability of each animal as a host for each species of tick was investigated by comparing the mean counts of female ticks on 19 animals used between January 1976 and March 1977. For each species the range of the mean counts for individual animals was divided into 5 equal classes. These class intervals are shown in the frequency distribution of the 5 main species on the cattle (Fig. 3).

The range of mean counts of *R. appendiculatus* on the animals was relatively small in relation to its magnitude and the number of animals in each class was fairly constant.

TABLE IV

Proportions of the 5 most common species of ticks on different body zones (proportions less than 0·02 are not shown)

Species and instars	Ear	Head	Dewlap	Back	Abdomen	Anus–vulva	Tail	Hoof
R. appendiculatus								
Adult Males	0·65[1]	0·15	0·03	0·04	0·06	—	0·03	—
Females	0·68[1]	0·08	0·03	0·05	0·09	0·03	0·03	—
Nymphs	0·11	0·13	0·30	0·11	0·11	—	0·04	0·20
Larvae	—	0·08	0·71[1]	0·08	0·08	—	—	0·03
A. variegatum								
Adult Males	—	—	0·04	—	0·78[1]	0·09	—	0·06
Females	—	—	0·04	—	0·76[1]	0·10	—	0·08
Nymphs	—	—	0·10	0·06	0·67[1]	—	—	0·13
Larvae	—	0·04	0·29	0·45	0·18	—	—	—
B. decoloratus								
Adult Males	—	—	0·21	0·28	0·41	—	0·06	—
Females	—	—	0·09	0·36	0·50	—	0·03	—
Nymphs	—	—	0·18	0·37	0·38	—	0·04	—
Larvae	—	—	0·10	0·70	0·11	0·03	0·04	—
R. e. evertsi								
Adult Males	—	—	—	—	—	0·95[1]	—	—
Females	—	—		—	—	0·94[1]	—	—
R. simus								
Adult Males	—	—	—	—	—	0·08	0·16	0·71[1]
Females	—	—	—	—	0·04	0·05	0·18	0·70[1]

[1] Indicate areas from which total counts may be estimated.

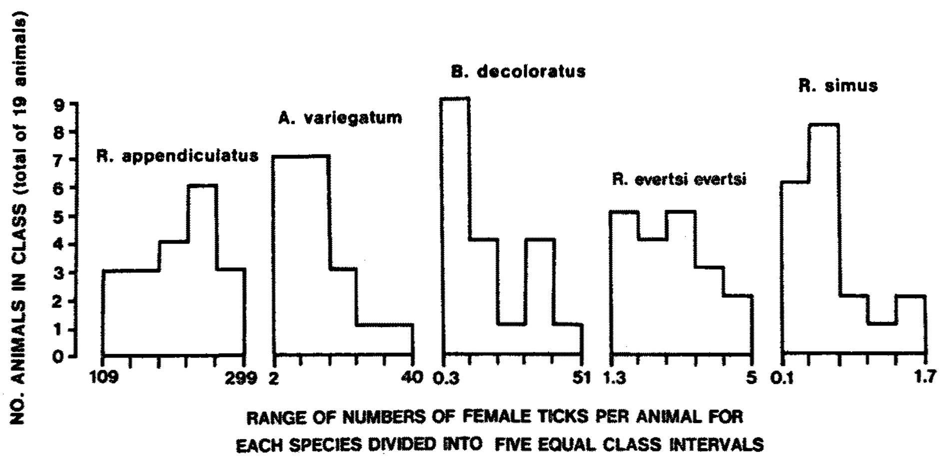

FIG. 3. The frequency distribution of numbers of females of the 5 most common species of ticks on 19 zebu cattle.

In contrast, with *B. decoloratus* and *A. variegatum* there was a greater spread of values and a tendency for some individuals to carry a disproportionate number of ticks. By accumulating counts of the more common species in order of decreasing numbers per animal the proportions of the herd carrying half the adult female tick population were:

R. appendiculatus	30%
A. variegatum	25%
B. decoloratus	20%

The use of counts of total adult ticks is not a good indicator of differences in the numbers of ticks successfully engorging on different animals. This is because the numbers of recently attached ticks are nearly equal on each animal and are much greater than the numbers of more mature ticks. The differences in numbers engorging on different hosts are thus obscured; this results in the degree of skewness of the distribution of ticks on a host population being underestimated (Dicker and Sutherst, 1981). Greater discrimination between animals is therefore possible if only "standard sized" ticks which are expected to complete engorgement and detach in the next 24 h (Wharton and Utech, 1970; Wagland, Roberts and Sutherst, 1979) are counted. Such a sampling system provides a measure of the numbers of ticks feeding on a host daily but standard sizes had not been defined for African tick species at the time the collections were made. The finding that the percentage of the herd carrying half the population of adults of *B. decoloratus* was smaller than those for the 3-host species was not unexpected; in the latter the redistribution of each instar between the available host population masks the cumulative effects of variation between hosts which exist for 1-host ticks.

(b) *Consistency of ranking within species*

The mean counts over time of instars of the 3 main species of ticks on the 19 animals were used to calculate the correlation coefficients of the numbers of each instar within and between species (Tables V and VI). The extremely high correlation between concurrent numbers of males, females and nymphs of *B. decoloratus* (Table V) reflects the cumulative effects of the host resistance on the larvae and later instars. All correlations for instars of *R. appendiculatus* and *A. variegatum* were significant although less so than *B. decoloratus*. Cattle which were more resistant to adults of these species were therefore also more resistant to the immature stages.

TABLE V

The within-species correlations (r)[1] *of mean counts on 19 zebu cattle for each instar for the 3 main species of ticks*

	Species										
	R. appendiculatus				*A. variegatum*				*B. decoloratus*		
	M	F	N	L	M	F	N	L	M	F	N
Adult Males (M)	1	0·97	0·58	0·83	1	0·99	0·69	0·63	1	0·95	0·94
Females (F)		1	0·60	0·81		1	0·69	0·65		1	0·96
Nymphs (N)			1	0·71			1	0·67			1
Larvae (L)				1				1			

[1] $r > 0{\cdot}69$ is significant at 0·1% level.

(c) *Consistency of rankings between species*

Some animals consistently carried more ticks than others. The correlations between the 5 most common species for both males and females were significant ($P < 0{\cdot}05$) (Table VI) except for the males of *B. decoloratus* which were probably more difficult to collect due to their small size. Thus some animals were more favourable than others for all the common species of ticks present.

TABLE VI

The between-species correlations (r)[1] *of mean counts on 19 zebu cattle for each instar for the 5 most common species of ticks*

	Males					Nymphs		
	R.a.	*A.v.*	*B.d.*	*R.e.*	*R.s.*	*R.a.*	*A.v.*	*B.d.*
R. appendiculatus	1	0·53	0·37	0·65	0·67	1	0·06	0·08
A. variegatum		1	0·62	0·75	0·64		1	0·67
B. decoloratus			1	0·64	0·67			1
R. e. evertsi				1	0·80	—	—	—
R. simus					1	—	—	—

	Females					Larvae	
	R.a.	*A.v.*	*B.d.*	*R.e.*	*R.s.*	*R.a.*	*A.v.*
R. appendiculatus	1	0·60	0·57	0·56	0·69	1	0·34
A. variegatum		1	0·71	0·55	0·65		1
B. decoloratus			1	0·47	0·58		
R. e. evertsi				1	0·80		
R. simus					1		

[1] $r > 0{\cdot}58$ is significant at 1% level.

Animal condition and deaths

At the end of the trial in March 1977 the cattle were grazed on improved pastures and given a strict tick control programme for about a year. During that time their condition changed rapidly as they put on weight in response to their improved environment. This observation raised the question of whether those animals which died during the experiment were those which had the most ticks. In fact only 3 animals carried more than 400 female *R. appendiculatus* prior to their death. Of the other animals which died 1 carried fewer ticks than average, 4 died in the first 9 weeks with average counts of less than 40 adult females of *R. appendiculatus* and the remaining 7 had average counts prior to their death. It may be significant that the 3 more heavily infested animals which died did so following the brief period without rain in July 1976. Most deaths were attributed to ECF.

DISCUSSION

Resistance is manifested by cattle against all instars of the 1-host tick, *Boophilus microplus* (Wagland, 1975) and the 3-host tick *Haemaphysalis longicornis* (Sutherst, Roberts and Wagland, 1979). All instars of the species of ticks in Entebbe are therefore likely to have been affected to varying degrees by host resistance which would have been acquired prior to these observations. Such resistance probably explains the low overall population levels and contributes to the relative differences in numbers of each species of ticks. A shortage of non-bovine hosts for the immature stages of the less common species was also likely to have been a significant limiting factor (Norval, 1979) and differential mortality of the free-living stages of the different species cannot be excluded without direct observation.

In this and all previous studies on 3-host ticks (McCulloch *et al*, 1968; Yeoman, 1966; Smith, 1969; Garris, Stacey, Hair and McNew, 1979) total counts were made including all sizes of parasitic instars; unfortunately such data do not permit the numbers of ticks completing engorgement to be estimated. In our analyses of the total tick counts there were nevertheless consistent differences between tick burdens on different animals. Although the redistribution of each instar of 3-host ticks makes the range and skewness of the distribution of resistance of a host population less evident than in the case of 1-host ticks the net effect will be similar. The relatively large numbers of *R. appendiculatus* compared to other species recorded on these zebu cattle suggest however that resistance of zebu cattle to this species is not strong.

The significant correlations between the rankings of the cattle in terms of counts of ticks within and between species illustrate that some animals show greater resistance than others to all instars and species of ticks. Table VII shows the differences in mean counts of female ticks per animal when the 19 animals at Kigungu are divided into herds with high or low resistance to *R. appendiculatus*.

TABLE VII

Mean and range of tick numbers (means of female ticks per animal from January 1976 to March 1977) of 2 groups of animals with assumed high and low resistance (based on numbers of females of R. appendiculatus)

	R. appendiculatus	*A. variegatum*	*B. decoloratus*	*R. e. evertsi*	*R. simus*
High resistance group (10 animals)					
Mean	166	9	9	2·5	0·5
Range	109–208	2–18	0·3–33	1·3–4·1	0·1–1·0
Low resistance group (9 animals)					
Mean	250	18	25	3·4	0·9
Range	224–299	5–40	3–51	1·7–5·0	0·3–1·7

If the correlations are partially genetic as with *B. microplus* (Wharton, Utech and Turner, 1970; Seifert, 1971)selection of tick resistant hosts will reduce populations of all tick species concurrently. Further information on heritabilities, genetic correlations and relative economic values of each species would be needed if combined counts of all species were to be used to obtain maximum economic improvement in a breeding programme.

The relatively small numbers of immature ticks which were recovered reflects their shorter (about 4 days) parasitic feeding time, the formidable sampling problems involved and the possibility that a proportion of larvae and nymphs fed on hosts such as calves which were not sampled. The accuracy of estimates of populations of immature ticks needs to be assessed before meaningful comparisons can be made of the numbers of different instars feeding on cattle.

Ticks shared the surfaces of their hosts remarkably well with each species having a preference for a different zone in an apparent evolutionary adaptation to reduce competition. The results above agree with those of other workers (Thomas, 1962; Baker and Ducasse, 1967; MacLeod, 1975; MacLeod, Colbo, Madbouly and Mwanaumo, 1977; Londt, Horak and De Villiers, 1979). Apart from its use in increasing the efficiency of control methods investigation of the distribution of ticks on the host may facilitate future sampling programmes. If the proportion of the total population of ticks and its variation on a given area of the body is known it can reduce the sampling required. For example an ear could be sampled for adults of *R. appendiculatus* and the abdomen for *A. variegatum* (Table IV). Using the variation of the proportions found in this study it was estimated that an increase of approximately 20% in the numbers of animals sampled would be required to match the precision obtained by collecting from the entire animal. Based on the above observations subsampling techniques for estimating the numbers of each of the 3-host ticks look encouraging but whole side counts seem unavoidable for *B. decoloratus*.

The proportions of males to females of *R. appendiculatus* and *A. variegatum* agree with previous reports (Londt *et al*, 1979) but the existence of a ratio of 2:1 only 7 days after the hosts had been picked clean of ticks indicates the need for detailed experiments to explain the phenomenon. Several possibilities exist; a substantial proportion of females may engorge in less than 7 days or be preferentially rejected by the host within the first week of feeding, or more males than females may succeed in finding a host, or males might find a second host after leaving the first.

Both males and females of *A. variegatum* accumulated on the host for 4 weeks whilst Hoogstraal (1956) observed males remaining on the host for some months after females had left. The possible role of pheromones (Woods, Leahy, Galun, Prestwich, Meinwald, Purnell and Payne, 1975) would need to be considered in any investigation of these sex ratios. The increasing sex ratio of *R. e. evertsi* also needs further study but it suggests that males of this species remain on the host for longer periods than the females. The ratio of 1:3 with *B. decoloratus* probably reflected the relative difficulty in finding the smaller males.

The results show that all species of ticks were present throughout the year with no seasonal variation in abundance of the 2- and 3-host species. They confirm the lack of seasonality observed by Smith (1969) in Eastern Uganda and contrast with the strong seasonal variation observed where monomodal rainfall occurs (Wilson, 1946; MacLeod *et al*, 1977).

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RELATION ENTRE LES TIQUES ET LES ZEBUS DANS LE SUD-EST DE L'OUGANDA

Résumé—Des populations de tiques ont été observées sur des zébus (*Bos indicus*) pendant 2 ans à Entebbe, en Ouganda où le climat est connu pour être très favorable aux stades libres des tiques. Des collections de tous les stades de tiques présentes sur le corps des animaux ont été faites à des intervalles allant de 1 à 5 semaines. Les espèces suivantes ont été recueillies dans l'ordre d'abondance décroissante: *Rhipicephalus appendiculatus*, *Amblyomma variegatum*, *Boophilus decoloratus*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus simus*, *Rhipicephalus compositus* et *Hyalomma marginatum rufipes*. Le classement du bétail basé sur la charge en une espèce de tique a toujours été en corrélation avec la charge dans les autres espèces de tiques. Les animaux porteurs du plus grand nombre d'adultes d'une espèce étaient également porteurs du plus grand nombre de stades préimaginaux. Il y avait beaucoup plus de mâles que de femelles de *R. appendiculatus*, *A. variegatum* et *R. e. evertsi* même lorsqu'on avait prélevé toutes les tiques sur le bétail une semaine auparavant. Plusieurs mécanismes possibles sont suggérés pour expliquer le déséquilibre dans le pourcentage des sexes. La conclusion porte sur les promesses d'amélioration de la lutte contre les tiques trixènes par l'accroissement de la résistance des troupeaux de zébus par élevage sélectif.

RELACION ENTRE GARRAPATAS Y GANADO CEBU EN EL SUR DE UGANDA

Resumen—Se observaron las poblaciones de garrapatas en ganado cebú (*Bos indicus*) en Entebe, Uganda, donde el clima parecía favorecer a los estados libres de las garrapatas. Las observaciones duraron dos años. Las colecciones de los estadios larvales se realizaron con intervalos de 1 a 5 semanas. Las especies identificadas en orden numérico decreciente fueron *Rhipicephalus appendiculatus*, *Amblyomma variegatum*, *Boophilus decoloratus*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus simus*, *Rhipicephalus compositu* and *Hyalomma marginatum rufipes*. Los rangos del ganado basados en la carga de garrapatas de una especie en particular, tuvieron correlación en rangos para otras especies en los animales que tuvieron una carga mayor de etapas maduras de una especie se observaron tambień más ejemplos de las etapas no maduras. Hubo más machos adultos que (hembras de *R. appendiculatus*, *A. variegatum* y *R. e. evertsi* aun cuando todas las garrapatas del ganado habían sido removidas 1 semana previamente; se sugieren varios mecanismos para explicar este fenómeno. Se concluye que existe una posibilidad para controlar garrapatas de 3 huéspedes, incrementando la resistencia de ganado cebú mediante selección y cruzamiento de animales resistentes.