

Identification of Encountered Bovine Tick Species in and Around Gambela Town

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Abstract: A cross sectional study was conducted from December, 2016 to June, 2016 in and around Gambela town to identify different tick species infesting cattle, and host related risk factors for infestation. Adult ticks were collected from 286 cows and both physical and microscopical examination was performed. Host related risk factors such as age, sex and body conditions were also investigated. The encountered identified tick species were *Amblyomma variegatum*, *Boophilus decoloratus*, *Hyalomma Marginatum*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus preaxtatus* and *Hyalomma truncatum* in descending order of prevalence. *A. variegatum* was the most prevalent (97.55%), while *H. truncatum* were the least abundant (0.35%) with sex prevalence towards female except *A. variegatum* in which both male and female equally infested. But only *H. Marginatum* ($p < 0.05$) and *B. decoloratus* ($p < 0.05$) were significantly associated with sex categories of cattle. Although, the association was not statistically significant ($p > 0.05$), the proportion of tick infestation was higher in adult animals in the study area. All of tick species, except *H. truncatum* and *R. preaxtatus*, were significantly associated with poor body condition of animal ($P < 0.05$). Overall, the present study revealed high prevalence of tick infestation that could potentially hamper the productivity of cattle in the study area, hence a serious measure should be put in place to control and reduce the adverse effect of tick infestation.

Keywords: Cattle, Gambela, Prevalence, Tick Species

1. Introduction

Ethiopia has the largest livestock population in Africa. There are huge number of cattle, sheep, goats, horse, donkeys, mules, camels, poultry and beehives in the country. Among livestock, cattle play a significant socio-economic role in the livelihoods of the Ethiopian people [7]. Despite the large population of animals, livestock productivity in Ethiopia is low and even below the average for most countries in Eastern and sub-Saharan African countries. This is due to prevailing animal diseases, poor nutrition, reproduction insufficiency and management constraints. Tick and tick-borne diseases are among the major health problems constraining livestock productivity and have been the stumbling block against the full utilization of this resource for foreign currency through export of live animals, skin and

hides [1, 3].

Ixodid ticks are one of the most common and harmful blood sucking ectoparasite of cattle worldwide. They are responsible for a wide range of livestock health problems in several countries of the world. They reduce cattle productivity, milk yield and skin and hide quality and increase susceptibility to other disease [29]. Approximately, 80% of cattle populations of the world are at risk of tick infestation and tick born diseases. In addition to sucking large volume of blood, ticks inject pathogens such as viruses, bacteria, protozoa and toxins into their hosts [9].

Tick species are widely distributed around the world but they tend to flourish more in countries with warm, humid climates which are suitable to undergo their metamorphosis [14]. Ticks are especially common and varied in tropical countries, where they cause considerable harm to livestock

by transmission of many species of pathogens and causing direct parasitic damage. For an ecosystem to support ticks, the population density of the host species in the area must be high enough, and humidity must be high enough for ticks to remain hydrated [15].

Different tick species are widely distributed in Ethiopia and a number of researchers reported the distribution and abundance of tick species in different parts of the country. There are 47 species of ticks found on livestock [2]. Studying ticks on livestock under their natural conditions without any control measure is also useful for understanding the host parasite relationship and variation of tick population in different agro-ecological zone. Even though there are some studies on ticks and tick borne diseases in other parts of Ethiopia, there is no information on prevailing tick species infesting cattle in and around Gambella town. Therefore, relevant data on the distribution of ticks different tick species and factors predisposing cattle infestation is essential for the development of effective tick and tick borne disease control strategies. Therefore, this study was carried out to identify different tick species and host related risk factors with tick infestations.

2. Material and Methods

2.1. Description of The Study Area

This study was conducted in Gambella Region, which is found at 777km distance from Addis Ababa in the Western part of Ethiopia. It extends between 7°N to 8.17°N latitude and 33°E to 35.02°E longitude. The area comprises of diversified topography features with altitude ranges between 300-2300 meters above sea level. The average annual rainfall and temperature range from 800-1200mm and 30.7-37°C, respectively. The Region has wet season (May-October) and dry season (November-April). The region has an area of 34,063km² and divided into three zones and eleven districts [3].

2.2. Study Design and Study Population

A cross-sectional study was conducted to identify the tick species on local cattle from December, 2016 to June, 2016. The age of animals was grouped as young (between 1 and 3 years) and adults (>3 years) [5]. Likewise, the body condition scores (good, medium and poor) were used [18]. All cattle sampled for this study were kept under extensive management system and local breed.

2.3. Sample Size and Sampling Method

There are five kebeles in Gambela town and 32 kebeles around Gambela town, of these cattle production practiced in 4 kebeles and 8 kebeles, respectively. Animals presented to animal clinic of Gambela town for any disease were subjected to detail examination for the presence of ectoparasites. The animals were selected purposively (based on the existence of at least one tick on their body as the aim of the study is determination of different tick species. Sample

size was determined using 50% expected prevalence and 95% confidence interval with a 5% desired absolute precision is considered [24]. The formula used to calculate the sample size is:

$$n = \frac{(Z_{\frac{\alpha}{2}})^2 P(1-P)}{Sd^2}$$

Where, P= is the expected prevalence, Sd = is standard deviation (desired absolute precision).

n = is the minimum sample size.

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Accordingly, a total of 384 cattle expected to participate in this study but due to security problem during the end of data collection, 286 cattle were sampled.

2.4. Tick Sampling

The entire body surface of the host was inspected for ticks. After fully restraining the animal, all visible adult tick species were removed by hands and using special forceps holding the basis capitulum so as not to lose the mouthparts of the ticks. Collection of ticks was done on brisket, back, side, ventral (abdomen), under tail and ano-vulval areas. Ticks from each animal and from each site were collected and placed in separate universal bottles containing 70% ethyl alcohol that had been pre-labeled. Required information like date of collection, age of animal, sex of animal, site of collection were recorded. Tick species identification was done using a stereomicroscope at the Sebeta National Animal Health Diagnostic and Investigation Centre (NAHDIC).

2.5. Tick Identification

Investigation procedure required both field works and laboratory investigation of collected sample. Tick species were identified by the shape and length of the capitulum, the color of the body, the color of legs, position and presence or absence of punctuations on the body, shape of the eyes and length of the mouth parts according to [30].

2.6. Statistical Analysis

The collected data was recorded and coded in Microsoft excel spread sheets and analyzed by using Stata v. 13.0 for Windows (Stata Corp., USA). Prevalence was determined as the rate of number of infested animals and total number of sampled animals [24]. Associations between explanatory variables (age, sex, body condition score and area) and outcome variable (infestation status with specific tick species) was done using chi-square (χ^2) test. In all analysis, all statistics were considered significant at $p < 0.05$ and 95% confidence interval.

3. Results

3.1. Prevalence of Identified Tick Species

In this survey, a total of 286 tick infested cattle were examined. Six different tick species in three genera were

identified in which two species belonged to the genera *Rhipicephalus*, two species belonged to the genus *Hyalomma* and each of the left species belonged genera of *Amblyomma* and *Boophilus*. The tick species identified were *Amblyomma variegatum*, *Boophilus decoloratus*, *Hyalomma Marginatum*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus preaxtatus* and *Hyalomma truncatum* in descending order of prevalence as shown in (Table 1). *A. variegatum* was the most prevalent (97.55%), while *H. truncatum* were the least abundant (0.35%). A total of 2605 collected ticks were subjected to species assignment, accordingly *A. variegatum* was the highest prevalent tick species (83.72%) and *H. truncatum* was least prevalent (0.04%) tick species (Table 2)

Table 1. Prevalence of Identified Tick Species.

Tick species	No. of infested animals	Prevalence (%)
<i>A. variegatum</i>	279	97.55
<i>H. truncatum</i>	1	0.35
<i>H. marginatum</i>	45	15.73
<i>B. decoloratus</i>	83	29.02
<i>R. evertsievertsi</i>	22	7.69
<i>R. preaxtatus</i>	4	1.04

Table 2. Distribution of Tick Species.

Tick species	Total tick count	Prevalence (%)
<i>A. variegatum</i>	2181	83.72
<i>H. truncatum</i>	1	0.04
<i>H. marginatum</i>	121	4.64
<i>B. decoloratus</i>	250	9.6
<i>R. evertsievertsi</i>	44	1.7
<i>R. preaxtatus</i>	8	0.3

3.2. Prevalence of Tick Species According to Sex and Age Categories of Animal

The prevalence of tick species is higher in female animal than in male except *A. variegatum* in which both male and female equally infested. But only *H. Marginatum* ($p < 0.05$) and *B. decoloratus* ($p < 0.05$) were significantly associated with sex categories of cattle; meaning female animals has higher probability to be infected with *H. Marginatum* and *B. decoloratus* than male animals (Table 3). Although, the association was not statistically significant, the proportion of tick infestation was higher in adult than younger animals in study area (Table 4).

Table 3. Prevalence of Tick Species According to Sex.

Tick species	Sex category of Animal		x2(p)
	Male (%)	Female (%)	
<i>A. variegatum</i>	162/164(98.78)	98.78/122(95.90)	2.42(0.119)
<i>H. truncatum</i>	-	1/122(0.82)	1.34(0.245)
<i>H. marginatum</i>	12/164(7.32)	33/122(27.05)	20.54(0.000)
<i>B. decoloratus</i>	36/164(21.95)	47/122(38.52)	9.32(0.002)
<i>R. evertsievertsi</i>	8 /164(4.88)	14/122(11.48)	4.28(0.038)
<i>R. preaxtatus</i>	1/164(0.61)	3/122(2.46)	1.73(0.188)

Table 4. Prevalence of Tick Species According to Age Categories of Animal.

Tick species	Age category of Anima		x2(p)
	Adult (%)	Young (%)	
<i>A. variegatum</i>	142/145(97.93)	137/141(97.16)	0.17(0.674)
<i>H. truncatum</i>	-	1/141(0.71)	1.03(0.310)
<i>H. marginatum</i>	23/145(15.86)	22/141(15.60)	0.01(0.952)
<i>B. decoloratus</i>	43/145(29.66)	40/141(28.37)	0.05(0.811)
<i>R. evertsievertsi</i>	12/145(8.28)	10/141(7.09)	0.14(0.707)
<i>R. preaxtatus</i>	1/145(0.69)	3/141(2.13)	1.07(0.301)

3.3. Prevalence of Tick Species According Body Condition Categories of Animal

In the current study, generally animals with poor body condition were highly infested than the other body condition groups by species of ticks (Table 5). All of tick species, except *H. truncatum* and *R. preaxtatus*, significantly associated with poor body condition of animal ($P < 0.05$).

Table 5. Prevalence of Tick Species According body Condition Categories of Animal.

Tick species	Body condition category of Animal			x2(p)
	Good (%)	Medium (%)	Poor (%)	
<i>A. variegatum</i>	196/198(98.99)	63/66 (95.45)	21/22(95.45)	6.99(0.030)
<i>H. truncatum</i>	-	1/66 (1.52)	-	3.34(0.188)
<i>H. marginatum</i>	13/198(6.57)	17/66 (25.76)	15/22(68.18)	63.19(0.000)
<i>B. decoloratus</i>	46/198(23.23)	22/66 (33.33)	15/22(68.18)	20.19(0.000)
<i>R. evertsievertsi</i>	8/198(4.04)	7/66 (10.61)	6/22(27.27)	22.54(0.000)
<i>R. preaxtatus</i>	2/198(1.01)	1/66 (1.52)	1/22(4.55)	1.80(0.406)

4. Discussion

In the present study we found that *A. variegatum* were the most abundant tick species encountered in and around Gambela town (97.55%). Similar to this study, reports from different parts of Ethiopia such as in Asela [26], in Holeta [28], in Awassa [20, 17], indicated that *A. variegatum* as the most abundant tick species in the respective study areas. However, *R. evertsi evertsi* was the most prevalent in and around Gonder town [10], and in and around Sebeta Town [11]. *A. variegatum* causes the greatest damage to hides and skins because of its long mouth part, which renders the commodity valueless on world market if the infestation was high [22]. The abundance of *A. variegatum* in study area may be associated with massive damage to hides and skin. *B. decoloratus* was the second prevalent tick species of cattle in the study area (29.02%). In the same way, higher prevalence of *B. decoloratus* was reported in and around Asosa [6]. *B. decoloratus* is the commonest and most wide spread tick in Ethiopia, collected in all administrative regions except in the Afar region [21, 27] and also in Humbo district, Southern Nations [19] and in Asela [23]. *B. decoloratus* reported as the highest prevalence. This variation may be due to the change in environmental conditions, geographical location with the result of global warming that highly affect the ecology of ticks. Change in temperature and rainfall have been reported to affect the distribution of diseases of vectors and tick species [25].

The prevalence of *H. Marginatum* was 15.73% and it was the third tick species of this study in and around Gambela town. This is not in agreement with different report from different part of the country; *H. marginatum rufipes* was the least abundant tick species in and around Sebeta Town [11], in Bako [13], in Assella [23] and in and around Holeta [28]. The high prevalence of this tick species in the study area as stated could be due to the fact that *H. marginatum rufipes* is mostly found in arid parts of tropical Africa [12] and as the study area is one of the arid parts of the country it may be the reason why its prevalence is high in the study area.

As far as sex of the animal is concerned prevalence tick species higher in female animal than in male animal except *A. variegatum* in which both male and female equally infested. But only *H. Marginatum* ($p < 0.05$) and *B. decoloratus* ($p < 0.05$) were significantly associated with sex categories of cattle; meaning female animals has higher probability to be infected with *H. Marginatum* and *B. decoloratus* than male animals. Other authors reported a higher tick infestation in male animals than females [13, 19]. The minor difference may be contributed to difference in sample size.

Although, the association was not statistically significant, the proportion of tick infestation was higher in adult than younger animals in study area. This finding agrees with the other finding who reported a higher proportion of infestation in adult cattle than the younger ones [8, 26, 28]. A relatively higher proportion of infestation in adult may be due to outdoor management and long distant movement of adult

animals to search for food and water as compared to younger animals, so the chance of exposure is higher [19].

In the current study, generally animals with poor body condition were highly infested than the other body condition groups by species of the ticks. All of tick species, except *H. truncatum* and *R. preaxatus*, significantly associated with poor body condition of animal ($P < 0.05$). This finding is in line with the work of [4] and [31] who reported cattle with poor body condition were significantly ($P < 0.05$) infested more than that of cattle with normal body condition. This may be due to the fact that poorly conditioned animals were least resistant to tick infestation and lack enough body potential to build resistance whereas over-conditioned animals showed reasonable combat to the infestation [16]. Alternatively, tick infestation might be a cause for poor body condition; hence high prevalence was computed in this group of animals. Well-fed animals could be very resistant to any kind of diseases including ticks infestation, when they grazed in the field or are kept at home [22].

The present study revealed high prevalence of ixodid tick species infestation in the study area. The main tick species identified in the area includes *A. variegatum*, *H. marginatum*, *B. decoloratus* and *R. evertsievertsi*. The prevalence of tick species is higher in female animal than in male except *A. variegatum* in which both male and female equally infested. Although, the association was not statistically significant, the proportion of tick infestation was higher in adult than younger animals in study area. On the other hand, animals with poor body condition were highly infested than the other body condition groups by species of ticks. These pose huge economical and health constraint to the farmers and the animals in the study area. The identification of several tick species in this study indicates the economic importance of the ticks and potential existence of tick borne diseases in the area. This warrants study on the economic importance of tick and the surveillance of tick borne diseases in the area. Despite the important findings, the result of this study should be interpreted with the context of its limitation in that all the study animals were obtained using purposive sampling. These could compromise representativeness of the sample and hence inference of the result to the target population.

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