Study on the Prevelece of Tick Speceies and Assosciated Risk Factors in Bambasi District of the Benishangul Gumuz Region, Western Ethiopia

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Abstract: The distribution and abundance of bovine tick species in Bambasi districted was studied from October 2017 to November 2017. Adult tick was collected from eight sites a total of 447 local cattle which were under extensive management system. A total of 3566 adult ticks collected from half body part times two were identified, in which two species belong to Amblyomma, one species belong to genus of Boophilus, two species Rhipicephalus and one species belong to genus Hyaloma, of all the total tick collections, boophylus, Amblyomma, Hyalomma and Rhipicephlus constituted 40.8%, 39.3%,0.30% and 37.82%respectively. The tick species encountered were B. decoloratus (40.8%), *A. variegatum (38.4%) R. evertsi-evertsi (24.02%), R.praetextatus (13.8%) A. cohaerens* (0.09%) and *H.m, rufipes* (0.30). The burden of ticks on cattle by their age group (1<year, 1-3 year and >3 year had statistically significant difference ($p<0.05$), (mean =1.7 tick /head, mean=7.8 tick/head/mean =16.9 tick/head) respectively in the study area. The study result indicates that the favorable predilection sits of *Boophilus* species are dewlap, back and hoof, *Amblyoma* species are found most of the time ventral body part and hoof, because of long mouth part. Adult *R. evertsi–evertsi* had a strong predilection site is under tail as well as ano-vulav areas. The body condition also indicates high infestation in poor body condition and less infestation in good body condition the burden of tick in body condition (poor, medium and good has statically significance ($p<0.05$), (mean=12.9tick/head, mean=8.7tick/head, mean=4.1tick/head) respectively in the study area. In finalize tick should be managed at the level that they cause no more economic loss; since there is no single method that adequately control the problem of ticks and tick borne diseases, combination of available techniques to produce an integrated system of tick management is necessary; further studies on the distribution pattern of tick species and their epidemiology are necessary for the continuous understanding of control strategies thereby bringing the tick number on livestock to numbers that are more manageable.

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1. Introduction

The arthropods contain 80% of all known animal species and occupy almost every-known habitat, as a result of their activity. Arthropod ecto-parasite may have a variety of direct and indirect effects on their hosts (Wall and Shearer, 2001). More than 850 species of ticks exists in the world and 60 different species of ticks are found in eastern Africa (Walker *et al*., 2003).

Ethiopia, Located in the horn of Africa between Latitude 30^0N to 15^0N of the equator and the Longitude from 33^0E to 48^0E is agrarian country with an estimated human population of about 62.9 million and a total Land area of 1,101,000 Km^2. The proportion of a total population in agriculture sector is 82.4% (CSA, 2002). The agricultural sector is characterized to a large extent by mixed farming system in which livestock play a vital role in the faming system of the country. According to (CSA, 2003) estimated livestock population of Ethiopia is about 30 million heads of cattle, 24 million sheep, 18 million goats 72 million equines, 25 thousands pigs, 55.6 million poultry. Nevertheless cattle productivity is low like other developing countries (Solomon *et al*., 2001).

The Ethiopian livestock contributes only 15% to the GDP. Total head meat off- take is estimated at around 7% annually which is perhaps one third lower than the average for tropical Africa. Cattle are a prime resource for the people and government of Ethiopia (CSA, 2003) However, the occurrence of disease and parasites is one of the major contributing factors that have impeded the full exploitation of cattle potential in Ethiopia (Mesele,1989).

Vector and vector born disease (VBD) are the major constraints to the development of viable livestock industries where ever they occur (Mekuria, 1987). Tick and tick born disease (TBD) are widely

distributed throughout the world particularly in tropical an Sub-tropical countries, which cause tremendous economic importance in livestock production (Kettle, 1995). In most Parts of Africa, including Ethiopia tick and TBD, together with tsetse and trypanosomes are economically very important disease (Solomon *et al*., 2001).

The economic Losses caused by tick and TBDs in cattle alone are estimated at US $ 13.9- 18.7 billion annually worldwide (Mekonnen *et al*., 2001). The problem is severe in developing countries where the resource for control and eradication is very limited (FAO, 1984). Among developing countries in Ethiopia, ticks occupy the first place amongst the external parasite, and the economic loss incurred when they infest livestock, particularly cattle is enormous (Feseha, 1983).

According to (walker *et al*., 2003) ticks which are considered to be most important to the health of domestic animals in Africa comprise about seven genera. Among these tick general the main ticks found in Ethiopia include Amblyomma, boophilus, haemaphysalis, hayalomma and Rhipicephalus. And also there are 20 species of ticks exists on livestock, all of which have damaging effect on production and productivity (Kassa, 2005). The most important and wide spread tick species are Amblyomma *varigatum* and Boophilus *decoloratus* (Abebaw, 2004). In addition to transmitting certain protozoan, rickettsia and viral diseases, and predispose the animals to secondary bacterial infection (Bekele, 2002) and they damage hides and skins and interfere with meat and milk production.

The most commonly known TBDs are Anaplasimosis, Babesiosis, Theileriosis. And Heart water, ticks also cause non-specific symptoms like anemia, dermatitis, toxicosis and paralysis (Solomon *et al*., 2001). Extensive surveys have been also carried out on the distribution of tick species on livestock in different regions of the country (Morel, 1989; Jewaro, 1986; Seyoum, 1994; Solomon *et al*, 1996; Seyoum, 2001 and Solomon *et al*., 2001). Boophilus exists in African countries, South of Sahara infecting cattle (Morel, 1980). In Ethiopia, it is prevalent in Gamogofa (Jewaro, 1986), Gondar (Eshetu, 1988), Bale (Dejenu, 1988). The highl and area of Harer and Dire Dawa (Manuri and Tilahun, 1991), in Girana valley of North wello (Seyoum, 2001) and Keffa, Wellaga and Ilubabor (Decastro, 1994).

Amblyomma *varigatuum* is the most widely distributed tick species in Ethiopia (Morel, 1980; Pegram *et al.,* 1981 and Decastro, 1994). Othere tick species such as *R. evertsi*, *Hyalomma marigatum,* rufipes, H*yalomma truncatum*, *Amblyomma coherence*, Amblyomma *gemma*, Amblyomma *lepidum and other Rhipicephalus spp.* are also frequently reported in many tick survey carried out in the country (Solomon *et al*., 2001).

Ticks are common in all agro-ecological zones of Ethiopia (Pegram *et al*., 1981). Therefore, relevant data on the distribution of tick is essential for the development of effective tick and tick borne diseases control strategies. Studying ticks on livestock under their natural condition without any control measure is also useful for understanding the host-parasite relation and variation of tick population in different agro ecological zone. Therefore; this study was intended to determine the prevalence of bovine tick species and associated risk factor; generate base line data for effective control measure and aware the farmers on the significant role of the direct & indirect effect of ticks in the study district.

2. Materials and Methods

2.1. Study Area

The study was conducted in Bambasi district, located in Benishangul Gumuze regional state, and 659 Km west of Addis Ababa 9.45-9.75^{0}N and 34.35-34.88^{0}E.with a minimum and maximum altitude of 1350m and 1770m above sea level. The district is composed of 42 administrative peasant association and 2 bambasi town<<kebeles>>. The total area of the district is 2100km^2 of which the average minimum and maximum rainfall are 900mm and 1200mm; while the average minimum temperature is 23^{0}c and maximum temperature 32^{o}c (CSA,2011).

2.2. Study Population

The livestock population of the area comprises about 40,200 cattle 3439 sheep, 12452 goats, 5560 equines and 39,374 poultry (Animal & fishery Agency, 2010 E.C). The study was carried out on cattle found in Bambasi district. All cattle are included in the study population regardless of their sex, age, physiological and health status condition.

2.3. Study Design

Cross- sectional study design was used to determine the distribution or prevalence of tick species in the study area, predilection site variations and the tick burden within age and body condition group (poor, medium and good) Morihenonen, J.T. (1989). Cattle were categorized based on their age (<1yr, 1-3 yr and >3yr) Lahunta Habel (1986).

2.4. Sample Size

The sample size was determined by assuming the expected prevalence of 50% tick infestation. The desired sample for the study was calculated by setting 95% confidence interval at 5% absolute precision (Thurstfield, 1994).

$n=1.96^2$Pexp (1-pexp)/d^2, n= is required sample size, Pexp is expected prevalence, D is desired absolute precision., N=pexp---- (in this case 50%).

d= (in this case 5%) therefore n=1.96^2*0.5 (1-0.5) / $(0.05)^2$=384 cattle.

The number of animals expected to estimate the prevalence of ticks were 384 cattle and samples were taken from 384 cattle.

2.5. **Study Methodology**

2.5.1. **Tick collection**

Half body tick collections on alternative sides were made. The animals were properly casted and adult ticks were collected from 8 different sites of the body. Adult ticks were collected and coded then it was preserved with prefilled 70% ethanol in universal bottle separately according to their site. Required information were like date of collections, place of collection, body site of collection, species and breed of host were recorded, and then transported to Assosa regional Diagnostic and Research center laboratory and the half body tick counts were doubled to obtain whole body tick burden according to (Keiser, 1987).

2.5.2. **Tick identification**

Investigation procedure requires both field works and laboratory investigation of collected sample which seems the following. Adult ticks were collected from eight half body sites of cattle in to sample bottle containing 70% ethanol (Okello *et al*. 1999 and walker *et al*. 2003). The half site used for collections were dewlap (brisket) and back, udder, scrotum, ano-genital (tail) and leg (Kaiser *et al*. 1987).

Ticks were removed from the host skin whilst retaining their good condition for identification using good steel forceps. The collected ticks from each body site were kept separately for identification in separate sample bottles. Then taken to laboratory to identify tick genera using stereo microscope based on tick identification keys of (Kaiser, 1987, Mathysce and colbo, 1987). Ticks were usually identified by the size and length of the capitulum, the color of the body, site preference and location on the host. Male and Unengorged female ticks were easier to identity than engorged female ticks (Hendrix, 1998).

2.6. **Data Analysis**

All raw data that was recorded from study area and was entered in to Microsoft excel database system and analyzed using stata12 computer program. Was used to determine the significant variation of tick burden among different age and body condition groups? Descriptive statistics were used to show favorable predilection site of tick species.

3. Result

Table 1: 1Overall tick prevalence

Total no of animal	No of positive animal	No of negative animal	Prevalence
447	333	114	74.49%

Table 2:2 Distribution of tick species and favorable predilection site collected in Bambasi

Tick species	no of animal	Out of total	Predilection site
B. Decoloratus	136	40.8%	Dewlap, head & leg, ear, under tail, scrotum & udder
A.cohaerens	3	0.90%	scrotum
R.evertsi-evertsi	80	24.02%	head, undertail and ear
R.praetextatus	46	13.8 %	leg & undertail
A.variegatum	128	38.4%	udder, scrotum, leg, dewlap, head/neck
H.*m,rufipes*	1	0.30%	under tail
Mix	102	30.6%	all most all site
Total	**333**	**100%**	

Distribution of tick species and favorable predilection site by Chi square

Site	Species	X^2=/Chi squre	DF	P vale (p<0.05)
Head/neck	B.dec & A.varig	25.11 & 30.6	8	0.000
Udder	B.dec & A.varig			0.000
Dewlap	B.dec & A.varig			0.002 & 0.000
Scrotum	B.dec & A.varig			0.000
Back	A.varig			0.007
Leg	A.varig			0.000
Under tail & Ear	Ripe.eve-ever & Ripe.prae	30.8	8	0.000

In this study the distribution of Boophilus *decoloratus* was the most abundant tick species 40.8% of the total collection of ticks Amblyoma *variegatum* was the 2nd most abundant and widely distributed tick species, it represented 38.4% of the total collection of ticks, Rhipicephalus *evertsi- evertsi* the 3rd widely

distributed, it represented 24.02%, Rhipicephalus *praetextatus* 4th widely distributed, it represented 13.8%, Amblyomma *cohaerense* was the 5th abundant tick species it also represented 0.90% and also the 6th and the last abundant tick species was Hayalomma*ma marginatum, rufipes*. 0.30% out of total, all ticks collected was from lowland, 1401-1544 M.a.s.l. in this resent study result indicates that the most favorable predilection sites for two Amblyomma species were udder, scrotum, back, dewlap and ear. *B.decoloratus* was collected mostly from dewlap, head and back. And adult H. *marginatum, rufipes,* R. *evrtis–evertsi* &. R. *praetextatus* had a strong predilection site for smooth skin, under tail, ears well as leg areas.

In this study the difference on tick prevalence and burden between age group was founded to be statistically significant (P<0.05) which was higher in age >3 year and low burden of tick seen in the age group <1year, which is Calves are generally has low Exposure to tick infestation, they are more resistant to infection of tick than adult. According to (Solomon G, 2014) Tick can find their hosts by detecting animals' breath and body odors, or by sensing body heat, moisture and vibrations and some species can recognize a shadow.

Table 3:3 Prevalence of tick with in age group and body condition

Variable (age & body condition	**No of animal**	**No of positive**	**No of Negative**	**Prevalence %**	**P value**
<1 year	83(18.5%)	52	31	62.6%	X^2=2.96
1-3 year	130(29%)	94	36	72.2%	P=0.015
>3 year	234(52.3%)	187	47	79.9%	
Poor	91(20.3%)	82	9	90.1%	
Medium	202(45.1%)	160	42	79.2%	X^2=16.8457
Good	154(34.4)	91	63	59.7%	P= 0.000

The infestation level of ticks had statistical significant (P<0.05). between cattle poor body condition medium and good body condition. The prevalence is higher in poor body condition than good body condition.

Table 4: Burden of tick with in age & body condition

	<1year	1-3 year	>3 year	Poor	medium	good
No of animal Examined	83	130	234	91	202	154
Total tick Collected	132	1032	2402	1176	1758	632
Mean of tick Burden	1.6	7.93	10.2	12.9	8.7	4.1
Out of total	3.7%	28.93%	67.35%	32.97%	49.29 %	17.7%

According to this study within Keble & species has a significant as indicate below. B.*decoloratus*. A.*cohearens* & H.*m,rufipes* has no significance but A.*variegatum*, R.*evertsi-evertsi* & R.*praetextatus* as significance.

Table 5: Tick species with in kebele by Chi squre

Spp	Kebele	Pvalue
B.*decoloratus*	All kebele	0.817
A.*variegatum*		0.015
A.*cohearens*	All kebele	0.214
R.*evertsi-evertsi*		0.000
R.*praetextatus*		0.001
H.*m,rufipes*	All kebele	0.094
X^2=9.43 overall p value= P<0.05 df=6		

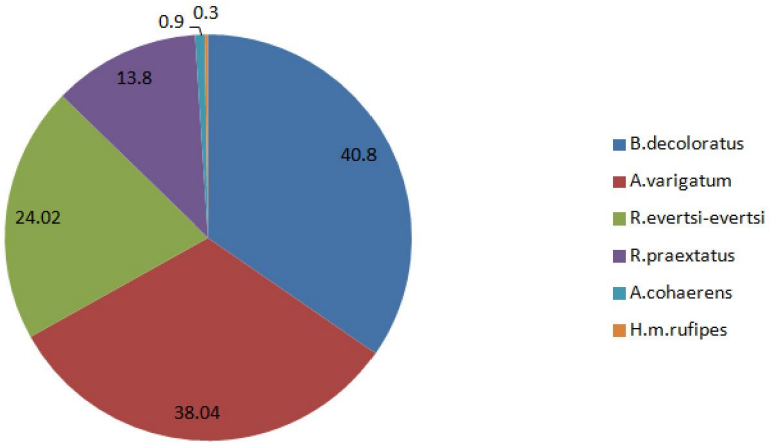

Figure 1: 1Prevalence of tick species in Bambasi District

3. Discussion

The prevalence and distribution of the most common tick species infesting cattle is different from one area to another. In the present study, detailed investigation was carried out to identify and determine the type of species and predilection site of tick infesting cattle in Bambasi district. Although there are different species of ticks, from those:-*B.decoloratus,* A.*varigatum, R.evertsi-evertsi, R.praetextatus, A.cohaerens* and H.*m,rufipes were identified.* 40.8%, 38.4%, 24.02%, 13.8%, 0.90% & 0.30% respectively all ticks collected were from lowland (bambasi). As studied by other authors in Tigray, higher abundance was reported in the lowlands (shire) than highlands (Mesffin, 1996).

In rift valley as studied by (Solomon and kayaa,1996), Hararghe (Gulilat,1985), Bale (Dejenu,1988), Girana valley North wollo (Seyoum,2001) and in the highland area of Harare and Dire Dawa districts (Monnueri and Tilahun,1999) and in all altitudinal zones of Gonder (Morel,1980) stated that *B. decoloratus* often collected in Ethiopia and are not highly abundant anywhere.

The result of this study disagrees with findings of those above mentioned authors.

B.*decoloratus* can transmit Babesia *begimina* and Anaplasma *marginale* to cattle and cause severe tick infestation that leads to tick worry, anorexia and anemia) Mekonnenet *al*., 2001). A.*variegatem* is most common tick species infesting cattle and horse.

In this study A.*variegatem* were found to be the 2nd abundant tick species in the study site (38.4%) and reported by other authors in deferent parts of Ethiopia such as North Omo (Tesfanesh,1993), Bahir Dar (Mesele,1989), Awassa (Mehari,2004) and Assela (Behailu,2004), A.*variegatem* is widely distributed on cattle in Ethiopia (Morel,1980 and pegram *et al*.,1981) and heavy infestation of A.*variegatum* was recorded in Shoa, western part of wallega and in shire lowland of Tigray (Mesfin,1996; Morel,1980). Among the tick species found A.*variegatem* causes the greatest damage to hides and skin because of its long mouth part which renders the commodity value less on world market if the tick are large in number (Solomon *et al*., 2001), ulcer caused by this tick species are favorable sites for secondary bacterial infection like Dermatophyilus *congalenesis* (Kaufman,1989). A.*variegatem* can play in Epidemiology of Epizootic *lymphangitis* in tick infested horses and frequent association of skin abscesses, due to coryene bacterium pyogenes (Morel, 1980). R.*evertsi-evertsi* was the third abundant tick species (24.02%) in the study area. The result agrees with that of B Tadesse and A Sultan (2014) (22.4%), Tamiru (2008) (22.0%) in Assella, Belew (1987) (26.8%) in Nekemte Awraja, and Yussen (2009) (21.5%) in Bako, western Ethiopia. However, slightly higher prevalence (29.3% and 30.5%) was reported by Belew and Mekonnen, (2011) in and around Holetta and Bossena and Abdu, (2012) in and around Asossa respectively. The reason for wide distribution of this species of ticks in different parts of the country could be related with the non-apparent preference for particular altitude, rainfall zones or seasons (Pegram *et al*., 1981).

Predilection sites mentioned in this study result corporate with those reported by other authors (Mesele, 1989; Behail, 2004 and Seyoum, 2001). The 4thabundant tick spp was *R.praetextatus* it repersunts 13.8%.

A. cohaerens was found to be the 5th abundant tick species (0.90%) in the present study; in western Ethiopia, where the climate is humid much of the year. A.*cohaerens* is the most prevalent and abundant tick on cattle (Pegrametal., 1981). in tick survey conducted in western Ethiopia by (Seid, 2004) in mizan teferi and (Yitbarek, 2004) in Jimma was found to be the most prevalence in the area with prevalence of 50.5% and 83.1% respectively and also others

authors like (Tamiru, 2008) in Assela and (Hussen, 2009) in Bako both indicated that the prevalence of *A.cohaerens* was 11.9% and 2% respectively. *A.cohaerens* transmit Erlichiosis, but less important vector than *A.varigatem* (Mekonnen *et al.,*2001). Another authors indicated spontaneous infection of A.*cohaernce* by Rickettia *coroni* in Ethiopia (Morel, 1981). The present study and the above authors result were relatively similar.

H. marginatum rufipes was the 6th abundant tick species with the prevalence of 0.30%. This result is higher than that of Regassa, (2001) (0.08%), this result also less than that of Belew and Mekonnen, (2011) (1.86%), Yussen (2009) (1.20%) and that of Tamiru and Abebaw, (2010) (2.50%) in Borena province, in and around Holetta, Bako and Assella respectively. However, the current result slightly agrees with that of Regassa, (2001) (0.08%), in Eastern Oromia region (Boran).

A variety of factors such as density, interaction between tick species, time and season, and inaccessibility of the attachment site of ticks affect the skin (Solomon *et al.,* 2001). The study also shows that the effect of tick on different body condition, were statistically significant, ($p<0.05$, $x^2=78.463$and df=1). The infestation level of ticks were higher in the poor body condition (mean=16.3 tick/head and df=1 than good body condition (mean =5.8 tick/head and df=1) The observation indicates that poor body conditioned animals are less resistant to tick infestation and lack enough body potential to build resistance with age advancement. Several authors have reported high infestation of tick result poor body condition due to consumption of high amount of blood and fluid by those ticks (Southeast *et al*.,1983) and (Aerts,*et al* 1999) who reported that the British cattle breeds having the lowest body condition score under tropical condition had the highest infestation of tick. (Seid,2004) in Mizan Teferi, (Hussen,2009) in Bako and (Southerst *et al*.,1983) reported that tick load on animal is affected by breed and nutritional stress. Ultimately, these factors affect general body condition/c in turn affects blood composition, respectively rate, appetite and eventually leads to poorer body condition scores. This present study is agreed with previous studies above mentioned.

The effect of age on the burden of ticks were statically significant ($p<0.05$, $x^2=1.210$ and df=2) influenced by the age of the animals with older animals having high tick infestation than younger, (Southerst *et al*.,1983) who observed that adult cattle presented higher burdens of Boophyilus the calves. However, in the study by (Glen, Jams, T.2006) both the climate difference between the two years of the trial, and the cattle rising techniques adopted on the ranch in their study could have contributed to the lower infestation seen on the young animals. The calves were maintained apart from adult animals at population densities and were thus possibly exposed to lower parasite burdens on the pasture (This may be due to the management system, that means in age than one year has less tick infestation and animal with age > 3 years has high tick infestation. However, calves graze around home that means the pasture cannot infested by ticks. No more animal graze around it, and most of the time they are zero grazing. Calves are generally more resistance to infestation of tick than adult (Fiseha, 1983 and Morel, 1989). These present studies agree with the above idea of authors, but disagree with (Tamiru, 2008), at Assela there is no statically significant within any age group. But the effect of sex on the burden of tick were statically significant ($p < 0.05$, $x^2 = 0.183$, df =1). The results also agree with previous research done by other authors like in Bako (Hussen, 2009 and Morel, 1989).

Based on observation during one month gathered from various cattle owners'; infestation rate and tick burden decrease during long dry season from November/January to March and increase after short rainy season. It is possible to indicate the trained of seasonality of tick population by comparing the number of tick collected in this month, there is change from slightly wet month to the dry month, similarly it was reported by (Feseha, 1983; Solomon *et al*., 2001; Alekaw, 1998 and Hassen, 2009) infestation by ticks during the dry month is at very low level and during the rainy season the activity of adult tick becomes high.

4. Conclusion and Recommendation

This study further presented the tick species identified in their veterinary value. The most important and abundant species are of *B. decoloratus* 40.8%, followed by *A. variegatum* 38.4%, *R. evertsi-evertsi* 24.02%, R. *praetextatus* 13.8%, A. *cohaerens* 0.90% and *H. m,rufipes* was the least abundant tick species identified, 0.30%. The overall tick predilection site are mainly on back/neak, dewlap, scrotam/udder, ear, & under tail. They cause suppressing the immunity of animal, degrade the quality of hide & skin and transmit diseases like;- Babesiosis, Anaplasmosis, Ricketsia, Cowdriosis and Erlichosis, Theileriosis, Dermatophylosis, lamp paralysis, Nairobi sheep disease & also cause tick typhus in human. However, a few attempts were made to control the infestation of tick. Acaricide application is the main method of tick control in the region, this result suggested that strategic deepening program using acaricides should be applied to control tick population on animals, but care should be taken not to disturb the desired development of immunity and tick resistance. Currently organophosphate**s** are the most

widely used chemicals for the control of ticks. In finalize tick should be managed at the level that they cause no more economic loss; since there is no single method that adequately control the problem of ticks and tick borne diseases, combination of available techniques to produce an integrated system of tick management is necessary; further studies on the distribution pattern of tick species and their epidemiology are necessary for the continuous understanding of control strategies application thereby bringing the tick number on livestock to numbers that are more manageable.

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