

## Hard Ticks (Ixodidae): Species Composition, Seasonal Dynamics and Body Site Distribution on Cattle in Chilga District, Northwest Ethiopia

<sup>1</sup>Nibret Moges, <sup>2</sup>Basaznew Bogale and <sup>3</sup>Tewodros Fentahun

<sup>1</sup>Department of Veterinary Clinical Studies,

<sup>2</sup>Department of Veterinary Paraclinical Studies,

<sup>3</sup>Department of Veterinary Basic Sciences, Faculty of Veterinary Medicine, University of Gondar, P.O. Box 196, Gondar, Ethiopia

**Abstract:** A study was carried out from Sept. 2010-June 2011 to identify the tick species (Ixodidae) found on cattle and their seasonal population dynamics and body distribution in Chilga district, northwestern Ethiopia. From the total 922 adult ticks collected, eight species from four different genera were identified. *Amblyomm variegatum* was the most abundant tick species encountered (51.19%) followed by *R. evertsi evertsi* (18.22%) with *A. lepidum* (1.95%) being the least abundant. Months significantly ( $p < 0.05$ ) affected ticks infestation rate in cattle. The smallest number of ticks per cattle was observed during the driest month (February) (16.70%), whereas the highest was recorded in the wettest month (June) (34.27%). *A. variegatum* and *R.e. evertsi* were abundant throughout the study period with a peak during June. Ticks were widely distributed in different parts of the host body such as ear, neck, tail, mammary gland, udder, groin and anal area region of which udder, dewlap, anal area and tail regions were the most infested parts of the body and face and neck were the least. Any strategy intended to mitigate problems of tick infestation of cattle in this area should take into account the identified tick species and their season of abundance.

**Keywords:** Cattle, chilga, Ethiopia, hard tick, predilection site, season

### INTRODUCTION

Ticks are obligate, blood-feeding ectoparasites of vertebrates (particularly mammals and birds) (Wall and Shearer, 2008) belonging to the class Arachnida, Order Acari. Ticks are responsible for severe losses caused either by the effect of blood loss, tick worry, damage to hides and skins and the injection of toxins or through mortality and morbidity caused by the disease transmitted (Morel, 1989). It has been estimated that 80% of the world's cattle are infested with ticks (Minjauw and McLeod, 2003) and the production of over 1000 million cattle and a similar number of sheep around the world is affected (Estrada-Pena, 2001). De Castro (1997) estimated that the annual global cost associated with tick and tick-borne diseases in cattle to range between 13.9 and 18.7 billion USD. Several tick species are widely distributed throughout the world particularly in tropical and sub-tropical countries (FAO, 1984) and more than 60 tick species are known to exist in East Africa alone (Walker, 1970). In Ethiopia, ticks and tick-borne diseases cause considerable losses to the livestock economy, ranking third among the major parasitic diseases, after trypanosomosis and end parasitism (Pegram *et al.*,

1981). Numerous studies have been conducted on the ticks and tick-borne diseases of cattle in various parts of Ethiopia and several species of ticks belonging to genus *Amblyomma*, *Boophilus*, *Rhipicephalus*, *Hyalomma* and *Haemaphysalis* have been reported (Pegram *et al.*, 1981; Walker *et al.*, 2007). However, current information on ticks infesting cattle in the study area is limited. Therefore, the current study aimed at identifying tick species and their seasonal population dynamics in Chilga district, northwestern Ethiopia.

### MATERIALS AND METHODS

**Study area:** The study was conducted in selected sites of Chilga district, northwestern Ethiopia from Sept. 2010-June 2011. The majority of the area is made up of a plateau of hilly highlands deeply traversed by steep walled river valleys. The altitude of the area ranges from 1050-2200 M.A.S.L. The agro-ecological zone of the study area includes about 78.3% midland and 21.7% lowland areas. The livestock population of the study area is comprised of 198,403 cattle, 14,854 equines, 2,932 sheep, 38,461 goats and 305,684 poultry (Chilga District Agricultural and Rural Development Office, 2009).

**Study animals:** Cattle found in the study area were the target animals. One hundred and sixty nine local breed cattle, infested with ticks, were purposively selected based on the accessibility and owner's willingness to cooperate for this study and examined for the distribution and abundance of ticks. All cattle sampled for this study were kept under extensive management system. The sampled animals were not treated with any acaricide for all the months at the time of study.

**Study design and sample size determination:** A study was conducted to identify the tick species, population dynamics of tick species and their predilection sites. The sample size was determined by assuming the expected prevalence of 50% tick infestation (no previous prevalence of cattle tick infestation in the study area). The desired sample size for the study was calculated using the 95% confidence interval and at 5% absolute precision (Thrusfield, 2005). Cattle were categorized based on location (midland and lowland).

**Tick collection and identification:** Nine hundred twenty two adult hard ticks were collected from randomly selected infested cattle from all parts of the body by hand picking and smeared around the tick to loosen attachment of the tick from the body surface with ethanol and care was taken to avoid decapitulation. The adult ticks collected from each body regions were kept in a separate sample bottles containing 70% ethanol, labeled and then transported to Bahar-Dar regional veterinary laboratory. Labeling for all specimens included date, locality, host and site of attachment. Tick identification was performed based on identification keys adopted by Soulsby (1982) and Walker *et al.* (2007) and reference ticks which had been brought from Sebeta National Animal Health and Disease Investigation Center.

**Data analysis:** The data collected from each study animal were recorded properly in a format prepared for this purpose. These data were uploaded into Microsoft Excel 2007 computer program, then data analyzed by SPSS version 18 and summarized by using tables. The differences in the relative proportions of tick species were analyzed by using Chi-square test, A P value less than 0.05 at 95% confidence interval was considered for significance.

## RESULTS

Of the total 922 adult ticks collected 4 genera and 8 species were identified. The ticks collected belong to 4

Table 1: Tick genera identified in the study area

Genus	No. tick collected	(%)
<i>Amblyoma</i>	490	53.14
<i>Rhipicephalus</i>	325	35.35
<i>Hyalomma</i>	74	8.04
<i>Boophilus</i>	33	3.57
Total	922	100

Table 2: Proportion and body distribution of identified tick species in the study area

Tick species	No. ticks collected	(%)	Predilection sites
<i>A. variegatum</i>	472	51.19	Scrotum, brisket, belly, dewlap, vulva
<i>R.E. evertsi</i>	168	18.22	Udder, tail, vulva, anus
<i>R. simus</i>	95	10.30	Ear, tail tuft, udder, dewlap, brisket
<i>R. sanguineus</i>	62	6.71	Ear, udder, dewlap, under, tail
<i>H.M. rufipes</i>	44	4.77	Under, tail, anus
<i>B. decoloratus</i>	33	3.58	Dewlap, ear, scrotum, brisket, udder, flank
<i>H. truncatum</i>	30	3.25	Udder, under tail, scrotum, anus
<i>A. lepidum</i>	18	1.95	Udder, vulva, dewlap

different genera, namely *Amblyomma*, *Boophilus*, *Rhipicephalus* and *Hyalomma*. *Amblyomma* (53.35%) was the most abundant and widely distributed genus followed by *Rhipicephalus* (35.35%) in all study sites and *Boophilus* (3.57%) was the least (Table 1). *Amblyomma variegatum* (51.19%) was the most abundant tick species identified in all study sites followed by *R. evertsi-evertsi* (18.22%) while *A. lepidum* (1.95%) was the least abundant tick species and it was collected from restricted area (Table 2). Ticks were widely distributed in different parts of the host body such as ear, neck, tail, mammary gland, udder, groin and anal area region of which udder, dewlap, anal area and tail regions were most infested parts of animal body and face and neck was the least. The most favorable predilection sites for *Amblyomma* species were the ventral body parts (udder/scrotum, belly brisket, dewlap). *R.E. evertsi* and *H.M. rufipes* had a strong predilection for smooth skin under the tail as well as anal area and vulval areas and udder. *B. decoloratus* was collected mostly from dewlap, head and back but was also present on the rest of the body (Table 2). Months significantly ( $p < 0.05$ ) affected ticks infestation rate in cattle. The density of ticks was recorded to be 34.27% in June (rainy season), 25.37% in September-October (late wet season), 23.64% in November-December (early dry season) and 16.70% in February (dry season). *Amblyomma variegatum* was the most abundant tick followed by *R.E. evertsi* and both were present throughout the study period with a peak during June (Table 3).

Table 3: Monthly distribution of different tick's species in the study area

Month	Tick species identified								Total
	A. <i>variegatum</i>	R. <i>evertsi</i>	R. <i>simus</i>	R. <i>sanguineus</i>	H. <i>msufipes</i>	B. <i>decoloratus</i>	H. <i>truncata</i>	A. <i>lepidum</i>	
Sept-Oct. (late wet season)	107 (45.73%)	28 (11.96%)	73 (1.19%)	20 (8.55%)	1 (0.43%)	2 (0.85%)	3 (1.28%)	-	234
Nov-Dec (early dry season)	66 (30.28%)	57 (26.15%)	20 (9.13%)	36 (16.51%)	12 (5.51%)	3 (1.38%)	17 (7.80%)	7 (3.21%)	218
February (dry season)	66	44	-	6	17	-	10	11	154
June (wet season)	233	39	2	-	14	28	-	-	316

## DISCUSSION

The current study revealed that the major genera of ticks infesting cattle in Chilga district of belong to *Amblyomma rhipicephalus*, *Hyalomma* and *Boophilus* in order of predominance. Reports of similar composition for majority of these species were indicated by previous studies (Sileshi *et al.*, 2007; Abebe *et al.*, 2010). In the present study, the identified species of ticks were *A. variegatum*, *A. lepidum*, *R.E. evertsi*, *R. simus*, *R. sanguineus*, *H.M. rufipes*, *H. truncatum* and *B. decoloratus*. *A. variegatum* was the most abundant tick species (51.19%) and similar results had been reported by Assefa (2004) and Tessema *et al.* (2010) in different parts of Ethiopia. *Amblyomma. variegatum* is the most widely distributed cattle tick in Ethiopia and has a great economic importance, because it is an efficient vector of *Cowdria ruminatum*, the organism causing cowdriosis or heart water in cattle (Morel, 1980; Pegram *et al.*, 1981). *R.E. evertsi* (18.22%) was the second most abundant and widely distributed tick species in the area. This is in agreement with Tessema *et al.* (2010) in Assela. Morel (1980) affirmed that the native distribution of *R.E. evertsi* in Ethiopia seems to be connected with middle height dry savannas and steppes in association with Zebra and ruminant and it is widely distributed throughout Ethiopia. This tick species shows no apparent preference for particular altitude, rainfall zones or seasons Pegram *et al.* (1981). *R.E. evertsi* appears to occupy a wide range of climatic and ecological conditions (Morel, 1980). In this survey in order of abundance it is just second to *A. variegatum*. This tick was constantly present throughout all collection dates except September and October where few collections were undertaken.

In the whole of Ethiopia, Pegram *et al.* (1981) found *A. lepidum* throughout the 500-2000 m altitude zone and the 250-1000 mm rainfall zone and rare in wetter areas. Morel (1980) regards this species as not abundant but common overlapping with *A. gemma* in the wettest habitat and with *A. variegatum* in the driest

habitat. In previous records *H.M. rufipes* has been found in low population densities throughout Ethiopia between 500-3500 m altitudes except in some areas (Western Ethiopia), which have a wet climate most of the year (Pegram *et al.*, 1981). Warm moderately dry lowlands are its preferred habitat (De castro, 1997). In this survey *H.M. rufipes* was found in most localities of the study areas. In all study months this species was present almost in similar numbers. Ticks were widely distributed in different parts of the host body such as ear, neck, tail, mammary gland, udder, groin and anal area region of which udder, dewlap, anal area and tail regions were most infested parts of animal body and face and neck was the least. L'Hostis *et al.* (1994) reported that attachment sites were the axilla, udder/groin, neck, dewlap and flank. Kabir *et al.* (2011) reported that ticks were distributed in different parts of the host body such as ear, base of the horn, neck, tail, ventral abdomen, mammary gland, udder, groin and anal area region. A verity of factors such as host density, interaction between tick species, time and season and inaccessibility for grooming determine the attachment site of ticks (Gebre *et al.*, 2001).

Months significantly ( $p < 0.05$ ) affected ticks infestation rate in cattle. Maximum infestation (34.27%) was recorded in June (rainy season), 25.37% in September-October (late wet season), 23.64% in November-December (early dry season) and 16.70% in February (dry season). This explains the association of an enhanced tick's activity with increased hotness and dampness of the environment. Stuti-Vatsya *et al.* (2008) reported that the animals were infested with ticks throughout the year, with maximum infestation during the rainy season then during summer and the least during winter. Khan (1996) and Das (1994) reported a similar trend for tick's activity in which tick infestation was influenced by temperature and humidity. Generally tick population remains low during drought (Urquhart, 1996). Differences in the relative abundance of the tick species might be attributed to the

ecological variations between areas. The most important ecological factors influencing the occurrence of ticks in a biotope include temperature and relative humidity (Morel, 1989). Even if the same factor affects the survival of all tick species to varying degrees, each species has its particular threshold temperature and moisture below those diapause occurs in all in-stars. Obviously, field development periods will vary according to the temperature (FAO, 1984; Morel, 1989).

### CONCLUSION

It is well known that ticks cause severe economic losses either by transmitting a variety of diseases or by their evident damage to hides and skins. The result of this survey indicates that economically important ticks are widespread throughout the study areas and their presence in abundance is alerting. In order to minimize losses attributed to ticks and tick borne disease cost effective control strategy should be designed.

### ACKNOWLEDGMENT

The authors are highly thankful to Chilga district Agricultural and Rural Development Office and Bahir Dar Regional Veterinary Laboratory Center for all sorts of logistic and technical assistance provided during this study.

### REFERENCES

- Abebe, R., T. Fantahun, M. Abera and J. Bekele, 2010. Survey of ticks (Acari: Ixodidae) infesting cattle in two districts of somali regional state. Ethiopia. Vet. World, 3(12): 539-543.
- Assefa, B., 2004. A survey of ticks and tick-borne blood protozoa in cattle at Assela, Arsi Zone. DVM Thesis, FVM, AAU, Debrezeit, Ethiopia.
- Chilga District Agricultural and Rural Development Office, 2009.
- Das, S.S., 1994. Prevalence of Ixodid tick infestation on farm animals in pantnagr: Terai of utter pradesh. J. Parasitol. Appl. Anim. Biol., 3(1): 31-73.
- De Castro, J.J., 1997. Sustainable tick and tick-borne disease control in livestock improvement in developing countries. Vet. Parasitol., 71: 77-97.
- Estrada-Pena, A., 2001. Forecasting habitat suitability for ticks and prevention of tick-borne diseases. Vet. Parasitol., 98: 111-132.
- FAO, 1984. Ticks and tick-borne disease control. A practical field manual, Vol. 1. Tick control. FAO, Rome, pp.1-299.
- Gebre, S., M. Nigist and B. Kassa, 2001. Seasonal variation of ticks on calves at Sebeta in western Shewa Zone. Ethiopian Vet. J., 7(1, 2): 17-30.
- Kabir, M.H.B., M.M.H. Mondal, M. Eliyas, M.A. Mannan, M.A. Hashem, N.C. Debnath, O.F. Miazi, C. Mohiuddin, M.A. Kashem, M.R. Islam and M.F. Elahi, 2011. An epidemiological survey on investigation of tick infestation in cattle at Chittagong District. Bangladesh frican J. Microbiol. Res., 5(4): 346-352.
- Khan, M.H., 1996. Studies on Hyalomma Kumari Sharif, on goats. J. Vet. Parasitol., 10(2): 165-169.
- L'Hostis, M., O. Diarra and H. Seegers, 1994. Sites of attachment and density assessment of female Ixodes ricinus (acari: ixodidae) on dairy cows. Exp. Appl. Acarol., 18(11-12): 681-689.
- Minjauw, B. and A. McLeod, 2003. Tick-borne diseases and poverty. The impact of ticks and tick-borne diseases on the livelihood of small-scale and marginal livestock owners in India and eastern and southern Africa. Research Report, DFID Animal Health Programme, Center for Tropical Veterinary Medicine, University of Edinburgh, UK, pp: 1-116.
- Morel, P., 1980. Study on Ethiopia ticks (Acarida, Ixodidae): Republic of France, Minister of Foreign affairs, Feench Vet. Mission, Addis Abeba, C.J.E.M.V.T, pp: 7-332.
- Morel, P., 1989. Manual of Tropical Veterinary Parasitology: Tick-Born Disease of Livestock in Africa. CAB International, UK, pp: 299-460.
- Pegram, G., H. Hoogstraal and H.Y. Wassef, 1981. Ticks (Acari Ixodidae) of ethiopia Distribution: Ecology and host relationship of species infecting livestock. Bull. Entomol. Res., 71: 339-359.
- Sileshi, M., L.G. Pegram, G. Solomon, M. Abebe, J. Yilma and Z. Sileshi, 2007. A synthesis review of Ixodid (Acari: Ixodidae) and Argasid (Acari: Argasidae) ticks in Ethiopia and their possible roles in disease transmission. Ethiop. Vet. J., 11(2): 1-24.
- Soulsby, E.J.L., 1982. Helminths, Arthropods and Protozoa of the Domesticated Animals. 7 Edn., Bailliere Tindall and Cassel Ltd., London.
- Stuti, V., C.L. Yadav, R.R. Kumar and G. Rajat, 2008. Prevalence of ixodid ticks on bovines in foothills of Uttarkhand state: A preliminary report. Indian J. Anim. Sci., 78(1): 40-42.
- Tessema, T. and G. Abebaw, 2010. Prevalence of ticks on local and crossbred cattle in and around Asella town, Southeast Ethiopia. Ethiop. Vet. J., 14(2): 79-89.

- Thrusfield, M., 2005. *Veterinary Epidemiology*. 3rd Edn., Blackwell Publishing, Incorporated, Ames, Iowa.
- Urquhart, G.M., 1996. *Veterinary Parasitology*. 2nd Edn., Backwell Science Ltd., Cambridge, pp: 307, ISBN: 0632040513.
- Walker, J.B., 1970. Notes on the Common Tick Species of East Africa. 3rd Edn., Cooper, McDougall and Robertson, Nairobi, pp: 23.
- Walker, A.R., A. Bouattour, J.L. Camicas, A. Estrada Pena, I.G. Horak, A.A. Latif, R.G. Pegram and P.M. Preston, 2007. Ticks of domestic animals in Africa: A guide to identification of species. *Bioscience Report*, pp: 1-221.
- Wall, R. and D. Shearer, 2008. *Veterinary Ectoparasites: Biology, Pathology and Control*. 2nd Edn., John Wiley & Sons, Chichester, pp: 304, ISBN: 0470680229.