Volume 1 • Issue 1 • 2019

Research Article

Archives of Veterinary and Animal Sciences

Infestation of Ruminant Species by Ticks And Lice In Port-Bouët Cattle Market (Abidjan- Cote D'ivoire)

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Received: August 27, 2019; **Published:** September 07, 2019

Abstract

Arthropod-borne diseases are potentially emerging in most countries of the world. However, the first step in assessing the risk of contracting a vector-borne disease in a given area is to know the vector in that area. It is with this in mind that a study was conducted at the livestock market in Port-Bouët in october 2015 to identify ticks on cattle and another one in october 2016 to identify lice on small ruminants of this market. For the collection of these ectoparasites, 100 cattle and 202 small ruminants were examined. Of the 72 ticks collected, 84.7% were adult ticks and 15.3% nymphs. Forty-seven (47) lice were collected from sheep and goats. Morphological identification revealed the presence of eight (8) species of ticks and three (3) species of lice. For ticks, the species Rhipicephalus (Boophilus) microplus was the most abundant with 70.83 individuals, followed by Amblyomma variegatum. For lice, Bovicola limbatus, Bovicola caprae and Linognathus africanus were identified. In addition, the existence of lice was reported for the first time by this study in this market. Further study is needed to identify all ectoparasites and know the prevalence of the causative agent in these ectoparasites.

Keywords: *Ticks; Lice; Ruminant; Cattle market and Port-Bouët*

Introduction

Ticks are considered ectoparasites that have the greatest impact on livestock production worldwide (FAO, 2010). Indeed these ectoparasites are great threat to animal health. Jorgensen *et al.* (1992) relate the importance of ticks with their ability to transmit a broad spectrum of pathogenic organisms such as protozoa, bacteria and viruses. Sores emanating from tick bites are also pathways of bacteria infection and fungi as well as screw-worms (FAO, 2010). In addition, animals may suffer from a considerable blood loss, paralysis or sepsis due to the toxic blood meal of ticks (Drummond, 2004). Although tick-borne diseases represents global scourge, they are nevertheless more numerous and have a greater impact on livestock in the tropics and sub-tropics. The main tickborne diseases in tropical and subtropical cattle are cowdriosis, anaplasmosis, theileriosis and babesiosis (Komoin-Oka et al., 2004 ; OIE, 2005, Rhalem and Sahibi, 2007 ; Abdoulmoumini et al., 2017). They are all economically important diseases, causing not only serious losses every year,

but affects the production of milk and meat, induce abortions, causing mortality and generate considerable cost due to control measures (Teglas et al., 2005, Bouhous et al., 2011, Abah et al., 2017). As a result, they hinder the development and improvement of livestock production in several regions of the world, particularly in African countries.

Despite the enormous effects of ticks on livestock, the impact of other ectoparasites especially lice on animal health and production cannot be neglected. The infestation of domestic animals by some species of lice can cause irritation, dermatoses, anemia and decrease in weight. This can lead to decrease income for the farmer (Pajot, 2000). In addition, some of these lice are vectors of diseases. Malignant anaplasmosis of cattle caused by Anaplasma marginale can be mechanically transmitted to livestock by several species of lice (Pajot, 2000). Theileria sergenti, an agent of bovine theileriosis, has been experimentally transmitted to cattle by Linognathus vituli (Pajot, 2000). Côte d'Ivoire and some tropical countries are facing epizootics of lice borne diseases. Thus, for the fight against ectoparasites such as ticks and lice to be effective, it is necessary to know the species that can be encountered in livestock. In Côte d'Ivoire, few data are available on the relative importance of these ectoparasites in livestock, particularly those of the cattle market in Port-Bouët, especially since most livestock (cattle, sheep and goats) come from different sub-Saharan countries, bordering Côte d'Ivoire. The main goal of this study was to identify the species of ticks and lice on large and small ruminants of the livestock market of Port-Bouët.

Material and Methods

Study zone

The municipality of Port-Bouët where our study site is located is southeast of the district of Abidjan. It is a peninsula located between the Atlantic Ocean and the Ebrié Lagoon, extending from west to east along the coastline for about thirty kilometers (Figure 1). It covers an area of 111 km^2 on a relief made of coastal plain with sandy and hydromorphic textured soil and depressions in certain places (Coulibaly et al. 2004). This municipality includes the municipal slaughterhouse which is the largest slaughterhouse in Abidjan and in the country. This slaughterhouse has three zones: the cattle market, the butchery and the small ruminants park. The livestock market covers 3.2 hectares, where cattle from different sub-Saharan countries and Ivory Coast can be found. The small ruminant stock (sheep and goats) section of the market consist of 600 pens and a slaughter room which cover an area of 1.8 hectares.

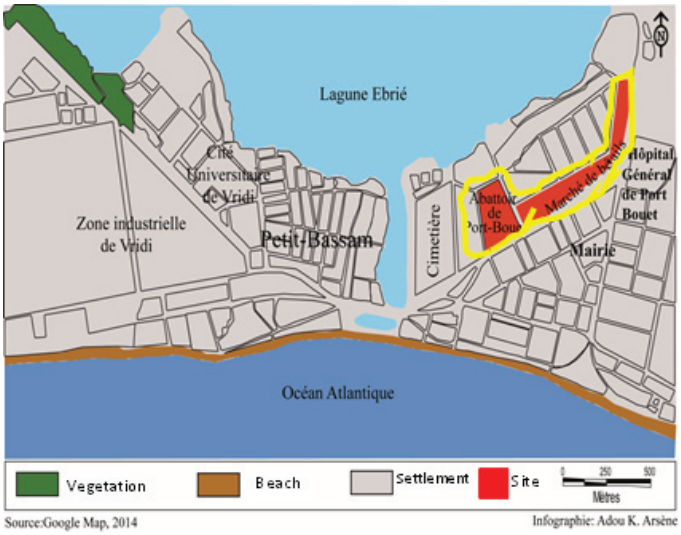

Figure 1: *Study site (encircled in yellow).*

Collection and conservation of ticks and lice

This study was conducted at the livestock market in Port-Bouët in october 2015 to identify ticks on cattle and another one in october 2016 to identify lice on small ruminants of this market. Our target ruminant species consisted of small ruminants (sheep and goats) and large ruminant (cattle). The sheep and goat were randomly sampled from a population in the small ruminant section of the Port Bouet market. Cattle sampling took place in the cattle market and 100 of them used for tick collection. For each of the two small ruminant species available, 101 individuals were sampled by including individuals of three different age groups (lamb, young and adult). A specific number of individuals was chosen for each age group. The selection of goats was carried out in 7 pens with an average of 14 heads per pen; while for sheep, it was carried out in 5 pens with an average of 20 heads per pen. Five (5) minutes was allocated for each animal to thoroughly check for the presence of ticks and lice.

The collection technique consisted of visual examination by searching the different parts of the body of each animal. Collection of ticks and lice was carried out using forceps and stored in collection tubes containing 70° ethanol. For ticks the method described by Parola and Raoult (2001) was used. This method consists of placing the forcep close to the skin and carefully pulling in the axis to remove ticks. It is important to avoid twisting movements that may break some of the mouthparts that could remain in the skin of the animal. Also, the mouth parts are very important for tick identification.

For each animal properly searched, all ectoparasites collected were kept in collection tubes. The collection tubes were labeled with the following information: animal code, date of collection and collection place. In addition to this information, a survey form was sent to the animal owners to know the origin of the animals (country, region, locality), as well as other information such as the different treatments used against ectoparasites.

Identification of ticks and lice

Regarding ticks, identification was carried out at the Ecole de Spécialisation en Elevage et Métiers de la Viande de Bingerville (ESEMV) and the Laboratory of Zoology and Animal Biology for the identification of lice. A dissecting microscope (OPTIKA) with 20 x magnification was used for tick identification using the morphological key of Walker et al. (2003). Identification of lice was carried out following the morphological characters found in the key of Franc(1994) with the aid of a 35x magnification. The identification consisted initially in separating the hematophagous and mallophagous individuals based on the form of their cephalic capsule. Each louse was mounted between slide and coverslip with a few drops of immersion oil.

Data analysis

For the analyzes, the data collected was entered with Microsoft Office Excel version 2013 and the relative abundance of each species was calculated.

Result

Number of ticks and lice collected

Of all the cattle, goats and sheep examined, 119 specimens of ticks and lice were collected. Of this number, 72 (60.5%) ticks were recorded and 47(39.5%) consisted of lice.

Species of ticks and lice identified

Ticks observed on cattle

Of 100 cattle examined 72 ticks were collected and separated into 11 nymphs and 61 adults. The identification revealed the presence of 3 distinct genera notably Amblyomma, Hyalomma and Rhipicephalus. Animal infestation rates by tick genera were 2.78% for the genus Amblyomma, 90.28% for the genus Rhipicephalus and 6.95% for the genus Hyalomma. The subgenus Rhipicephalus (Boophilus) represented 86.11% of all ticks. These three genera were divided into 8 species of ticks. The number of ticks per species and their relative abundance are listed in Table 1. The genus Amblyomma was represented by a single species, A. variegatum. Three (3) species of the genus Rhipicephalus were identified: R. (B.) microplus, R. lunutatus, R. guilhoni, The genus Hyalomma was represented by four (4) species: H. marginatum rufipes, H. marginatum marginatum, H. impressum and H. impeltatum. The species R. (B.) microplus was the most abundant with 70.83 individuals, followed by A. variegatum, R. guilhoni, H. marginatum rufipes with the same abundances each (2.78%).

	Cattle	
Species of ticks	**Number**	**%**
Amblyomma variegatum	2	2.78
Rhipicephalus (Boophilus) microplus	51	70.83
Rhipicephalus lunutatus	1	1.39
Rhipicephalus guilhoni	2	2.78
Rhipicephalus (Boophilus) sp	11	15.28
Hyalomma marginatum rufipes	2	2.78
Hyalomma marginatum marginatum	1	1.39
Hyalomma impressum	1	1.39
Hyalomma impeltatum	1	1.39
Total	72	100

Table 1: *Proportion of the different species of ticks on cattle.*

Lice observed on goat and sheep

A total of 41 lice were collected from the 101 goats examined. Two species were identified: Linognathus africanus (hematophagous lice) (95.12%) and Bovicola caprae (mallophagous lice) (4.88%) (Table 2). Based on the parasitism of lice on sheep, it was noticed that higher number of species of lice were collected from sheep than from goats. Two mallophagous species: Bovicola limbatus (16.67%) and Bovicola caprae (50%) were identified on sheep while one hematophagous species Linognathus africanus (33.33%) was identified on sheep (Table 2).

	Goat		Sheep	
Species	**Number**	**%**	**Number**	**%**
Bovicola caprae	2	4.88	3	50
Bovicola limbatus	0	0	1	16.67
Linognatus africanus	39	95.12	2	33.33
Total	41	100	6	100

Table 2: *Proportion of the different species of lice on goat and sheep.*

Proportion of the developmental stages of ticks identified on cattle

About the 72 ticks collected from cattle, 61 (84.7%) were adults and 11 (15.3%) were nymphs. No larvae were collected. Of the 61 adult ticks collected from cattle, females 53 (86.9%) were more prevalent than males 8 (13.1%).

Species of ticks	Stage				Sexe			
	Nymphs		Adults		Male		female	
	Number	%	Number	%	Number	%	Number	%
Amblyomma variegatum	0	0	2	3.28	1	12.50	1	1.89
Hyalomma impeltatum	0	0	1	1.64	1	2.50	0	0
Hyalomma impressum	0	0	1	1.64	1	12.50	0	0
Hyalomma marginatum marginatum	0	0	1	1.64	0	0	1	1.89
Hyalomma marginatum rufipes	0	0	2	3.28	2	25.00	0	0
Rhipicephalus (Boophilus) microplus	0	0	51	83.61	3	7.50	48	90.57
Rhipicephalus (Boophilus) sp	11	100	0	0.00	0	0	0	0
Rhipicephalus guilhoni	0	0	2	3.28	0	0	2	3.77
Rhipicephalus lunulatus	0	0	1	1.64	0	0	1	1.89
Total	11	100	61	100	8	100	53	100

Table 3: *Proportion of the different developmental stages and sex of ticks collected from cattle.*

Discussion

The results obtained showed that the eight (8) tick species observed on cattle are divided into three genera and one subgenus. The three genera include Amblyomma, Hyalomma, Rhipicephalus and the subgenus Rhipicephalus (Boophilus). These genera and subgenus have also been identified by Achi et al. (2011), Touré et al. (2014) and Diaha-Kouamé (2017) in the breeding areas of Côte d'Ivoire and elsewhere in tropical Africa (Mamoudou et al. 2016). Of all the ticks collected, the subgenus R. (B.) is the most abundant among these Ixodidae infesting cattle at the livestock market of Port-Bouet. This subgenus represents 86.11% of all ticks obtained.

At the species level, the predominant species identified was R. (B.) microplus (70.83%), followed by A. variegatum, R. guilhoni and H. marginatum rufipes with an abundance of 2.78% for each. Majority of livestock present at the Port-bouët cattle market originates from countries of the subregion including Burkina Faso, Mali, Mauritania, Niger and others. Animals in the subregion are more infested with R. (B.) microplus and A. variegatum. Indeed, A. variegatum has the widest distribution in Africa, south of the Sahara and is found throughout West Africa. It occupies all the climatological zones. However, it is limited in the north and central part of Africa by arid conditions (<400 mm) and by the cooler temperatures prevailing in the temperate pre-tropical region of southern Africa. This tick species remains confined to equatorial regions where the upper threshold of tolerated rainfall is near the 2750 mm isohyet (Estrada-Pena et al., 2007, Barré and Uilenberg 2010, Bournez et al., 2015). In Côte d'Ivoire, it is the most frequent species of ticks in cattle breeding zones and in recent times such grounds are being colonized by R. (B.) microplus. R. (B.) microplus was the most encounterd tick species on cattle in our study. After its discovery in Ivory Coast by Madder et al. (2007) in the Azaguié region (southeast), this species has proliferated and is currently found as the predominant species in all major livestock areas in Côte d'Ivoire (Madder et al., 2011, Touré et al., 2014, Amoia, 2015 and Diaha-Kouamé, 2017). This is because it has a great invasive capacity. Species of the genus Hyalomma were obtained in low numbers. According to Walker et al. (2003), these tick species live in dry regions. This explains their low population in Côte d'Ivoire, which is located below the 1000 mm isohyet.

R. guilhoni, is found in climatic regions of the steppe and savannah regions. Although it is most widespread in northern West Africa, R. guilhoni occurs with the geographical belt of 6 ° to 18 ° N across Africa from Senegal in the west to Ethiopia in the East (Walker et al., 2003). This species has been introduced to the cattle market by animals from neighbouring countries.

The larval and nymphal stages of ticks are less prevalent on cattle. In fact, 84.7% of ticks were adults and 15.3% are nymphs and no larvae collected. Of the 61 adult ticks, females were more prevalent than males. These results were observed by Sylla (2012) in Mauritania with females of the subgenus Rhipicephalus (Boophilus) occuring in greater numbers than males while females of the genus Hyalomma were rare. This proportion of females obtained for R. (B.) microplus can be explained by the pronounced sexual dimorphism in species of the subgenus Rhipicephalus (Boophilus) because during sampling, morphologically larger females were more visible than morphologically smaller males.

Regarding the lice of small ruminants, two genera, notably the genus Bovicola and the genus Linognathus were identified. The report of Silué (2015) and Bogni (2015) did not show the existence of lice on small ruminant populations. Our finding on the lice of small ruminants corroborate with those obtained by Tassou (2009) and Salifou et al. (2004) who highlighted two types of lice on cattle and sheep. However, the species of lice identified in the present study are not the same like those signaled by these authors, but they found Damalinia ovis, Linognathus stenopsis and Linognathus pedalis. The genus Damalinia was found only in cattle and sheep, contrary to the results of Salifou et al. (2004), who also found them in goats. Data on the impact of lice on animal health remains fragmented. It is possible that this work will lead to innovative studies on the epidemiology of lice in domestic animals. The species of lice obtained are divided into two genera, the genus Bovicola and the genus Linognathus. These same genera were obtained in small ruminants in northwestern Ethiopia by Dawit et al. (2012). These authors observed 395 small ruminants (280 sheep and 115 goats) and reported a higher prevalence of lice in sheep than in goats. In this study, low prevalence of lice was observed in sheep than in goats.

The low infestation rate of ticks and lice obtained in this study animals was not suprising because cattle, sheep and goats brought to the cattle market for sale or for the renewal of the herd. So these animals are therefore selected where preference are given to cattle with good body condition. The animals are treated with antiparasites to get rid of ectoparasites and to give the animals a good economic value. It is imperative to carryout a study on the economic losses caused by these ectoparasites and the hemoparasites they transmit in order show evidence of the need to implement a sustainable ectoparasite control in Port-Bouët.

Conclusion

The study of ticks on cattle of the cattle market of Port-Bouët has revealed eight species of ticks. These species are divided into three genera: Amblyomma variegatum, Rhipicephalus (Boophilus) microplus, Rhipicephalus lunutatus, Rhipicephalus guilhoni, Hyalomma marginatum rufipes, Hyalomma marginatum marginatum, Hyalomma impressum and Hyalomma impeltatum. In small ruminants (goats and sheep), Mallophaga species of lice (Bovicola limbatus and Bovicola caprae) and hematophagous species of lice (Linognathus africanus) were identified. Since this study is not exhaustive, it would be necessary to carry out a more in-depth study to highlight all the ectoparasites present in in livestock breeding sites and evaluate their role in the transmission of pathogens in order to suggest appropriate control measures.

References

1. Abah S.N., Alexandre M.A., Mamoudou A., Sevidzem S.L., Abdoulkadiri S., Yaya A., Simon D.S. & Tchuinkam T. (2017). Commercial acaricides in pour-on formulation react differently in reducing tick numbers on cattle in extensive and intensive management systems in Bockle, North Cameroon. Direct Research Journal of Agriculture and Food Science 5 (5). 232-238.
2. Abdoulmoumini M., Cyril N., lendzele S., Kingsley M., Njongui J. & Pagnah Z. (2017). Bovine Babesiosis and Anaplasmosis in some Cattle Farms in the Vina Division. International Journal of Livestock Research 7 (6). 69-80.
3. Achi Y.L., Koné P., Stachurski F. & Betschart B., (2011). Impact des tiques sur des bovins métis dans le nord de la Côte d'Ivoire. Experimental and Applied Acarology, (53). 139-145.
4. Amoia C., (2015). Diagnostic des pratiques de lutte anti-tique et distribution spatiale de la tique invasive Rhipicephalus (Boophilus) microplus (Canestrini, 1888) en Côte d'Ivoire. Master, Abidjan, Université Nangui Abrogoua. 77 p.
5. Barré N. et Uilenberg. G., (2010). Propagation de parasites transportés avec leurs hôtes: cas exemplaires de deux espèces de tiques du bétail. Revue Scientifique Technique de l'Office international, 29(1): 135-147.

6. Bogni G. R. (2015). Techniques de collecte et d'inventaire des ectoparasites des ovins, des lapins et des cailles Mémoire de Master, Université Felix Houphouët Abidjan Côte d'Ivoire, 25p.
7. Bouhous A., Aissi M., Harhoura K., (2011). Prevalence of Ixodidae in sheep brought for slaughter in Adrar municipal abattoir, Southwest Algeria. Scientia Parasitologica 12(4): 197-201.
8. Bournez L., Cangi N., Lancelot R., Pleydell D.R.J, Stachurski F., Bouyer J., Martinez D., Lefrançois T., Neves L. and Pradel J., (2015). Parapatric distribution and sexual competition between two tick species, Amblyomma variegatum and A. hebraeum (Acari, Ixodidae), in Mozambique. Parasites & Vectors 8: 14p.
9. Coulibaly L., Diomandé D., Coulibaly A. et Gourène G., (2004) : Utilisation des ressources en eaux, assainissement et risques sanitaires dans les quartiers précaires de la commune de Port-Bouët (Abidjan, Côte d'Ivoire). in VertigO - la revue électronique en sciences de l'environnement [En ligne], Volume 5 Numéro 3 | décembre 2004, mis en ligne le 01 décembre 2004.
10. Dawit T., Mulugeta A., Tilaye D. & Mengistie T. (2012). Ectoparasites of small ruminants presented at Bahir Dar Veterinary Clinic, Northwest Ethiopia. African Journal of Agricultural Research Vol. 7(33). 4669-4674.
11. Diaha-Kouamé A.C.A. (2017). Caractérisation des tiques le long du couloir de transhumance ivoiro-burkinabé et évaluation de l'activité acaricide de quatre (4) plantes locales sur Rhipicephalus (Boophilus) microplus (canestrini, 1888). Thèse de Doctorat, Université Félix Houphouet Boigny, Abidjan 165 p.
12. Drummond R. (2004). Ticks and What You Can Do about Them, 3e ed., p. 23, Berkeley, California, Ed ; Wilderness Press, (ISBN 0-89997-353-1).
13. Estrada-peña A., Pegram R.G., barré N., José M. & venzal, (2007). Using invaded range data to model the climate suitability for Amblyomma variegatum (Acari: Ixodidae) in the New World. Experimental and Applied Acarology, 41: 203–214.
14. FAO. (2010). Allocution de Madame le représentant de la FAO à l'occasion de la signature du projet ORSO/ICV/3301- Appuis à la mise en œuvre d'un programme d'urgence pour la prévention et la lutte des maladies à tiques du bétail dans le nord de la Côte d'Ivoire, 9p.
15. Jogensen W.K., Weilgama D.J., Navaratne M. & Dalgliesh R.J. (1992). Prevalence of Babesia bovis and Anaplasma marginal at selected localities in Sri Lanka. Tropical Animal Health and Production, 24(1). 9-14.
16. Komoin-Oka C., Knopf L., N'Depo A. & Zinsstag J. (2004). Le parasitisme sanguin des bovins de la zone centre de savane humide de la Côte d'Ivoire, Sempervira, (11) 60-63.
17. Madder M., Thys E., Achi L., Toure A. & De Deken R. (2011). Rhipicephalus (Boophilus) microplus: a most successful invasive tick species in West- Africa. Experimental and Applied Acarology 53(2): 139-145.
18. Madder M., Thys E., Geysen D., Baudoux C. & Horak I. (2007). Boophilus microplus ticks found in West Africa. Experimental and Applied Acarology. 43(3): 233–234.
19. Mamoudou A., Nguetoum N.C., ZoliP A., Sevidzem S.L. (2016). Identification and Infestation of Ticks on Cattle in the Peri-Urban Area of Ngaoundere, Cameroon. J Vet Sci Med Diagn 5:4.
20. OIE, (2005). Anaplasmose, Manuel terrestre de l'OIE, 2.3.5, pp 550-563.
21. Pajot F. X. (2000). Les poux (Insecta, Anoplura) de la région afrotropicale. Editions de l'IRD Institut de Recherche pour le Développement Collection Faune et Flore tropicales 37.
22. Porola P. & Raoult D. (2001). Ticks and tickborne bacterial diseases in humans: an emerging infectious threat. Clinical Infectious Diseases (CID) 32(6): 897-928.
23. Rhalem A. & Sahibi H. (2007). Tiques et maladies transmises par les tiques chez les bovins du Maroc. Transfert de technologie en agriculture 151. 4p.
24. Salifou S., Hessa C.C. & Pangui L. J. (2004). Enquête préliminaire sur les acariens et insectesparasites des petits ruminants dans la région de l'Atlantique et de littoral (Sud Bénin). Revue Médecine Vétérinaire, 155(6): 343- 346.
25. Silué G.U. (2015). Identification des ectoparasites chez les bovins et ovins de l'abattoir de PortBouët, Abidjan Côte d'Ivoire. Mémoire de Master, Université Felix Houphouët Abidjan Côte d'Ivoire, 25p.
26. Sylla M., (2012). Contribution à l'étude des tiques dans le Sud-Est de la Mauritanie. Thèse de Médecine Vétérinaire, Université Cheikh Anta-Diop, Dakar (Sénégal), 104p.
27. Tassou W.A. (2009). Infestation des ruminants domestiques par les acariens et insectes dans le nord-bénin : impact et connaissance paysanne de lutte. Thèse de Doctorat d'Etat, Université Cheikh Anta-Diop, Dakar (Sénégal) ,61p

28. Teglas M., Matern E., Lein S., Foley F., Mahan S. M. & Foley J. (2005). Ticks and tick-borne disease in Guatemalan cattle and horses. Veterinary Parasitology 131(1-2): 119-27.
29. Touré A., Diaha C.A., Sylla I. & Kouakou K. (2014). Récente recomposition des populations de tiques prévalent en Côte d'Ivoire. International Journal of Biology and Chemical Sciences 8 (2) : 566-578.
30. Walker A.R., Bouatour A., Camicas J. L., Estrada-Pena A., Horak I. G., Latif A. A., (2003). Ticks of Domestic Animals in Africa: a guide to Identification of Species. Bioscience Reports, 47-221