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INVENTORY OF IXODIDEA CATTLE TICK POPULATIONS IN THREE BIOCLIMATIC STAGES OF CÔTE D'IVOIRE

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ABSTRACT

In In order to improve ticks campaign fight and ticks borne diseases, an inventory of Ixodideacattle tick populations was realized in three bioclimatics (subsudanese, preforest and forest) zones of Côte d'Ivoire. This study focused particularly 8 sub-prefectures regularly crossed by transhumants cattle coming from Mali and from Burkina Faso. So, from June till August 2012, a total of 480 cattle infested by ticks were sampled. Ticks established in pastures used by the cattle of selected farms of this survey were also collected according to the "flag technic". A total of2407 ticks were harvested during this study. Their identification gave five genus and eight species of ticks which were *Amblyommavariegatum*, *Haemaphysalisleachi*, *Hyalommatruncatum*, *Rhipicephalusmuhsamae*, *Rhipicephalussanguineus*, *Rhipicephalussenegalensis*, *Rhipicephalus (Boophilus) annulatus* and *Rhipicephalus(Boophilus) microplus*. The spatial distribution of all these species seemed uneven in the three studied agro-ecological zones. Two new tickspecies (*Haemaphysalisleachi* and *Rhipicephalusmuhsamae*) were identified for the first time in Côte d'Ivoire during this study. This discovery and the changes observed in ticks' spatial distribution raise the interest of the monitoring and ticks populations control in farms on one hand, and on the other hand by sanitary strengthening measures implemented for the transhumant cattle.

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INTRODUCTION

The ticks are hematophageacarids, compulsory parasites of vertebrates which can occasionally bite humans (Parola, 2001). In bovine production, ticks are considered as the most harmful parasites and responsible of a big diversity of health problems worldwide. In the world, approximately 80% of cattle are exposed to ticks infestations and ticks borne diseases (Pegram, 1993). Their only infestation can induce grave irritations and cutaneous traumas which endamaged cattle skin and depreciate their market values. Furthermore, they induce a reduction of the milk yield and animals gain weight, thus causing significant economic losses. Some tick species such as *Rhipicephalus (Boophilus) microplus*, each female engorged is responsible of a daily milk yield loss of 8.9 ml and 1 g of weight gain over 15 weeks (Jonsson, 1998).

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As vector of pathogen, ticks are ranked in second position behind mosquitoes in the transmission of protozoa, rickettsia, bacteria or viruses to animals (Keating, 1983). They are in humans, the second vector of diseases after mosquitoes (De la Fuente, 2008). Tick-borne diseases are a global public health problem (Lowbridge, 2011). The global annual cost of tick control and productivity losses has been estimatedat around USD 13-18 billion (De Castro, 2011) while those losses are estimated at 92 USD million (Mapholi, 2014). In West African area, the most cattle breeding system practiced is the cross-border transhumance. In that breeding system, Côte d'Ivoire receive cross-border transhumant cattle from Mali, Burkina and even Niger whose cattle breeders migrate looking for pastureland (Diallo, 1995). These animal movements also allow transhumant herders to destock part of their livestock in cattle markets in Côte d'Ivoire's main urban centers. In addition, the strong willingness of local breeders to improve the productivity of their herd leads them to import exotic cattle, which in most cases are reared in an

extensive breeding system. These animal movements toward Côte d'Ivoire encourage the introduction and spread of many tick species. Furthermore, due to its development in recent decades, cattle farming have expanded from its traditional area production in the north to the central and southern parts of the country. However, the multiplication of extensive breeding and the exploitation of large areas of community pastures in less controlled biotopes contribute to the enhancement of tick biodiversity (FAO, 2012). In Côte d'Ivoire, works showed the presence of ticks among cattle throughout the coutry (Aeschlimann, 1967 and Yapi, 1990). Recent studies, reported the introduction of *R. (B.) microplus* into the humid rainforest area located at 50 km in the north of Abidjan (Madder, 2007). More recentlythe distribution of ticks among cattle in different parts of Côte d'Ivoiredescribed but (Tuo, 2013 and Toure, 2012) did not relate it to livestock transhumance. Only one workrealised on ticks in northern Côte d'Ivoire have taken into account cattle transhumance (Diaha-Kouamé, 2017). The availabledatas do not help to make effective campaigns against ticks and their transmissing diseases in Côte d'Ivoire. The present study relating to the inventory of cattle Ixodidea ticks species in three bioclimatic stages of Côte d'Ivoire fills this void. It aims to identify ticks presence on cattle and pastures, and study their distribution in three agro-ecological zones (subsudanese, preforest and forest), particularly in eight departments crossed by transhumant.

MATERIAL AND METHODS

Study area: This cross sectional study was conducted in three (3) agro-ecological zones of Côte d'Ivoire respectively in the North, the Centre and the South of the country. The subsudanese zone of Côte d'Ivoire is situated between 9° and 10.5° of North latitude and 4° and 6° West longitude. The climate of that area is very hot and dry. The daily and annual temperature ranges are relatively important reaching 20°C with a humidity rate varying from 40% to 70%. This zone has two seasons. A dry season from November to June, punctuated with some rains in April and a rainy one, from July to October. The annual accumulated hydric deficit varies between 700 and 800 mm and is felt on seven (7) to eight (8) months. The average rainfall is 1200 mm. The vegetation is constituted of clear forests and savannas. The central zone belongs to the pre-forests sector between 7° to 9° North Latitudes and 4.4° to 5°Wlongitudes. This zone is a part of Guinea savannas or wet savannas characterized by very important temperature variations (from 14 to 33°C) with a hygrometry which oscillates from 60% to 70%. The pre-forest sector has 4 season's climate. Two dryseasons: from November to March and from July to August, and two wet seasons: from June to October, and from March to May. The annual pluviometry is between 1000 and 1500 mm, with a hydric deficit varying from 300 mm to 500 mm/year. The vegetation is essentially made of an arboreous savanna and a forest. The South sector of this study area is the forest sector or Guinea domain, between 5° to 6°N Latitudes and 4° to 4.3°Wlongitudes. The climate is characterized by a low temperature amplitude oscillating between 25° and 30°C, a strong rate of relative humidity (80 in 90%) and plentiful precipitation which reach 1700 mm per year. Guinea domain has two (2) dry seasons (a long one from December to April and a short one from August to September) and two rainy seasons (a long one from May to July and a short one from October to November). The vegetation is typicallyforest. The herbaceous layer is rare and grass grows only in clearings, fallows and roadsides.

Sampling

For this study 8 sub-prefectures have been choice in three (3) zones of investigation. Their number and their distribution took into account the importance of transhumant cattle roads and the importance of the local breeding. So, for sub-sudanese and pre-forest zones, 3 sub-prefectures were chosen for each. Whereas, for the forest zone that counts fewer herds, only two sub-prefecture was taken into account (Figure 1). In the north and the center zones, three (3) farms possessing more than 50 cattle were selected in every chosen sub-prefecture, because being on the main transhumances axes between Côte d'Ivoire, Mali and Burkina Faso. On the other hand, in Agboville and Azagui sub-prefectures, also three (3) farms of the same size were randomly chosen in each of them. A total of 24 bovine farms were selected for this study and in each farm, 20 cattle of any age and sex, presenting a visible ticks infestation were also randomly selected. That approach has permitted to obtain a study population of 480 cattle (Table 1).

Collection, preservation and ticks identification

Ticks were collected by extraction on one side of animal's body, in *decubitus lateral* position. For each animal, harvested ticks were then stored in ethanol at 70 ° C in plastic bottles and identified (farm number, sex, age, breed, date of harvest). The same approach was used for ticks collected on the pastures according to "flag technic'' described by Short &Norval (1981). Tick identification was performed in the laboratory using a stereoscopic binocular microscope. It was made on the basis of their morpho-anatomical characteristics according to the identification key proposed by Walker *et al*. (2003).

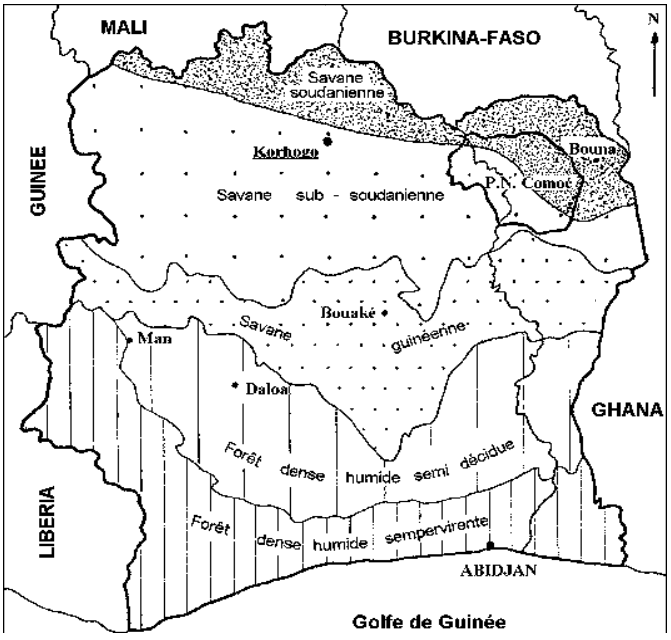

Figure 1. Geographic situation of sitessampled

RESULTS

Ticks collected were 2482 including 65 larvae, 387 nymphs and 2030 adults (Tables 1 and 2) from 480 cattle examined.

Ticks species inventory

The examination of the 2482 collected ticks identified five genus and eight tick species, belonging to ixoxidae family. Three of these genus are represented by a single tick specie per each as following genus *Amblyomma* with *Amblyommavariegatum*, *Haemaphysalis* with *Haemaphysalisleachi* and *Hyalomma* with *Hyalommatruncatum*. The others tick species were from two types such as the genus *Rhipicephalus* with *R. muhsamae, R. sanguineus* and *R. senegalensis* and the genus *Rhipicephalus* (*Boophilus*) with *R. (Boophilus) annulatus* and *R. (Boophilus)*

microplus. Two tick species, never identified in Côte d'Ivoire were collected: *Rhipicephalusmuhsama* and *Haemaphysalisleachi*.

Relative abundance of tick species collected

According to study results, *Amblyommavariegatum* was largely predominant (47.82%). It was followed by *Rhipicephalus (Boophilus) annulatus* (27.07%), *Rhipicephalus (Boophilus) microplus* (16.00%) and *Hyalommatruncatum* (Tables 2). However, *Rhipicephalussenegalensis* (0.93%), *Rhipicephalussanguineus* (0.73%), *Haemaphysalisleachi* (0.20%) and *Rhipicephalusmuhsamae* (0.16%) were poorly represented.

(0.41%). Data from the study show that tick abundance is close to the same as in the pre-forest zone with the exception of *A. variegatum* (20.79%). *R. (Boophilus) microplus* was slightly higher (33.18%) and *R. (Boophilus) annulatus* was in first position (46.03%) in the forest zone.

Spatial Distribution and relative Abundance of tick species in the agro-ecological zones

The distribution by agro-ecological zones of collected tick species is represented in table 4, 5 and 6.

Table 1. Distribution of animals selected according to agro-ecological zones

Agro Ecologicalzones	Regions	Sub-prefectures	localities	Number of cattle	Size of cattlesampled
Subsudanese zone	Region of Tchologo	Ferké	Koumbala, Naniévogo, Tiékpè	60	180
	Region of Poro	Korhogo	Guéfienkaha Kassélé Tawara	60	
		M'Bengué	Sandrigué Sindougou Nambira	60	
Preforest zone	Region of Gbêkê	Bouaké	Yapikro Oléonou Monastère	60	180
	Region of Hambol	Katiola	Foroforo Niara Darakokaha	60	
		Dabakala	Nondougou Boniéré Souleimankaha	60	
Forest zone		Azaguié	Azaguié gare Azaguié INTA Azaguié Km 42	60	120
		Agboville	Sossorobougou Arrikoville Amakebou	60	
	Total		480		480

Table 2. Genus and species of ticks collected according to stage and sex

Genus	Species	Larvas	Nymphs	Adults		Total	Proportion (%)
		(N)	(N)	Females (N)	Males (N)	(N)	
Amblyomma	*variegatum*	65	360	191	571	1187	47.82
Hyalomma	*truncatum*	*0*	0	57	119	176	7.09
R.(Boophilus)	*annulatus*	*0*	27	575	70	672	27.07
	microplus	*0*	0	186	211	397	16.00
Rhipicephalus	*senegalensis*	*0*	0	23	0	23	0.93
	sanguineus	*0*	0	9	9	18	0.73
	muhsamae	*0*	0	0	4	4	0.16
Haemaphysalis	*leachi*	*0*	0	3	2	5	0.20
Total		65 (2.62%)	387 (15.59%)	1044 (42.06%)	986 (39.73%)	2482	100

Table 3. Identification and distribution of ticks according to the agro-ecological zone

Zones	Species of ticks	Number of animals examined	Number of ticks collected	pourcentage
North	*A. variegatum*	180	863	65,63%
	H. truncatum		176	13,38%
	R. (Boophilus) annulatus		185	14,07%
	R. (Boophilus) microplus		57	4,33%
	R.sanguineus		13	0,99%
	R.senegalensis		15	1,14%
	R.muhsamae		4	0,30%
	Haemaphysalisleachi		2	0,15%
Centre	*A variegatum*	180	170	23,00%
	R. (Boophilus)annulatus		355	48,04%
	R. (Boophilus) microplus		198	26,79%
	R.sanguineus		13	1,76%
	H.leachi		3	0,41%
South	*A.variegatum*	120	89	20,79%
	R. (Boophilus) annulatus		197	46,03%
	R. (Boophilus) microplus		142	33,18%
TOTAL		480	2482	

Tick species distribution according to bioclimatics stages: According to the results only the following species were found both in the three agroecological zones, *A. variegatum*, *R. (Boophilus) annulatus* and *R. (Boophilus) microplus*. However, their importance varies from one bioclimatic zone to another (Table 3). So, in the sub-sudanese zone, *A. variegatum's* abundance was estimated to 65.63% against 14.07% and 13.38% respectively for *H. truncatum* and *R. (Boophilus) annulatus*. The other tick species like *Haemaphysalisleachi (*0.15%) and *Rhipicephalusmuhsamae* (0.30%) were more poorly represented. Otherwise, in the pre-forest zone, *R. (Boophilus) annulatus* and *R. (Boophilus) microplus* were more abundant respectively 48.04% and 26.79% than *A. variegatum* (23%) and *Haemaphysalisleachi* In the sub-sudanese zone, the eight (8) species of inventoried ticks seem to present an unequal spatial distribution and abundance. *A. variegatum species* remains majority in all the investigated sub-prefectures. It represents respectively 80.47%, 65.38% and 57.96% of the ticks collected and was the most plentiful species meet in Korhogo, M'Bengué and Ferké sub-prefectures. It is followed by *H.truncatum* that represents 23.77% and 9.39% of the ticks collected to Ferké and to M'Bengué. On the other hand, it is *R. (Boophylus) annulatus* species which is the second taxon the most represented in tick species collected in Korhogo whereas those species comes in third position in two (2) other sub-prefectures of sub-sudanese zone. *R. (Boophylus) microplus* is the fourth species of ticks found in all the north. It occupies the 4th

rank of ticks abundance in all the sub-prefectures visited at the exception of Korhogo where it comes on 5th rank after *H. truncatum* (5.55%). During that investigation, five (5) species of ticks were inventoried in Ferké sub-prefecture against seven (7) in Korhogo and 4 inM'Bengué. *R.senegalensis* and *R.muhsamae* species seem absent in Ferké stations whereas, besides these 2 taxons, the species *R.sanguineus* was not observed in ticks groups coming from M'Bengué stations. In the pre-forest zone of Dabakala, *R. (Boophylus) annulatus* specie was the most plentiful species in three visited sub-prefectures. It represents 46.49%, 47.90% and 45.12% of tick's species sampled respectively in Dabakala, Katiola and Bouaké localities.

species of tick collected on the cattle-rearing of Agboville and Azaguié sub-prefectures. In these two visited sub-prefectures, *R. (Boophilus) microplus* occupied the second rank of abundance with respectively (28.42%) and (36.74%) whereas*A. variegatum* taken the last position with respectively (22.95%) and (19.18%).

Ticks collected on pasture

The table 7 presents ticks collected during the free stages of their development cycle on pastures of various farms investigated during this study. The used collection technique for ticks allowed to capture a total of 785 ticks.

Table 4. Bovine ticks spatial Distribution and relative Abundance in sub-Sudanese zone

	Ferké	Korhogo	M'Bengué	Sub-sudaneseZone
Species	Total (%)	Total (%)	Total (%)	Total (%)
A. variegatum	273 (57, 96%)	153(65, 38%)	437 (80, 47%)	863 (69, 15%)
H. truncatum	112 (23, 77%)	13 (5, 55%)	51(9, 39%)	176 (14, 10%)
R. (Boophilus) annulatus	39 (8, 28%)	34 (14, 52%)	47 (8, 65%)	120 (9, 61%)
R. (Boophilus) microplus	37 (7, 85%)	12 (5, 12%)	8 (1, 49%)	57 (4, 56%)
R.senegalensis	0	15 (6, 41%)	0	15 (1,20%)
R.sanguineus	10 (2, 14%)	4 (1, 70%)	0	14 (1,12%)
R.muhsamae	0	3 (1, 32%)	0	3 (0,26%)
TOTAL	471	234	543	1248

Table 5. Bovine ticks spatial Distribution and relative Abundance in pre-forest zone

	Dabakala	Katiola	Bouaké	pre-foresterZone
Species	Total (%)	Total (%)	Total (%)	Total (%)
A. variegatum	80 (29,52%)	47(15, 13%)	98 (35, 37%)	225 (26, 19%)
R. (Boophilus) annulatus	126 (46,49%)	149 (47, 90%)	125 (45,12%)	400 (46, 56%)
R. (Boophilus) microplus	57 (21,03%)	115 (36, 97%)	51 (18, 41%)	223 (25, 96%)
R.sanguineus	8 (2, 96%)	0	0	8 (0,93%)
H. leachi	0	0	3 (1, 1%)	3 (0,36%)
TOTAL	271	311	277	859

Table 6. Bovine tick spatialdistribution and relative Abundance in the forest zone

Species	Agboville	Azaguié	Total
A. variegatum	42 (22, 95%)	47 (19, 18%)	89 (20, 80%)
R. (Boophilus) annulatus	89 (48, 63%)	108 (44, 08%)	197 (46, 02%)
R. (Boophilus) microplus	52 (28, 42%)	90 (36, 74%)	142 (33, 18%)
TOTAL	183	245	428

Table 7. Number of ticks collected on pastures fequented by the cattle

Species of Ticks	Stages of development	ZAE	pasture	Size/ Frequency (%)
B. annulatus	Larvas	Subsudanese	Guéfienkaha	65 (86%)
R.senegalensis	Adult	North	Guéfienkaha	3 (4%)
	(Female)	Center	Darakokaha	5 (6,66%)
Haemaphisalis leachi	Adult (Male)	North	Guéfienkaha	2 (3,34%)

In Dabakala sub-prefecture, *R.(Boophylus) annulatus* is followed by *A. variegatum* and *R. (Boophylus)microplus* which represent respectively 29.52% and 21.03% of the ticks this zone. On the other hand, in Katiola sub-prefecture, *R. (Boophilus) microplus* (36.97%) was in the second position and followed by *A. variegatum* (15.13%). To Bouaké, we observe the same abundance classification of those 3 tick species than Dabakala's. However, these are respectively 35.37% for *A. variegatum* and of 18.41% for *R. (Boophilus) microplus*. All the sub-prefectures investigated in preforest zone were infested by 4 tick species at the exception ofKatiola sub-prefecture which counted 3. These species are present in all the visited sub-prefectures in preforest zone. It is a about *A. variegatum*, R. (Boophilus) annulatus and of *R. (Boophilus) microplus*. However, *R.Sanguineus* (2.96%) has been observed in Bouaké sub-prefecture and *Haemaphisalisleachi* (1.1%) in Dabakala's. In the South, in the forest zone, *R. (Boophilus) annulatus* was the species the most collected in all visited sub-prefectures. It represents (48.63%) and (44.08%)

These ticks were obtained only on Guefienkaha (subsudanese zone) and Darakoha (preforest zone) naturals pastures. The ticks collected by this technique were either adults or larvas. The collected larvas belonged exclusively to the species *R. (Boophilus). Annulatus* and represented (86%) of the population of the collected ticks. The collected grown-up ticks consisted of species *R.Senegalensis*of female sex (10.66%) and *Haemaphisalis Leachi* of male sex (3.34%). The larvasof *R.(Boophilus). Annulatus* and the male adults of the species *HaemaphisalisLeachi*were harvested to Guefienkaha (sub-sudanese zone). On the other hand, the adults of *R.Senegalensis*was collected at the same time in Darakokaha (pre-forest zone) and in Guefienkaha (bum around sub-sudanese).

DISCUSSIONS

This study provides an overview of the distribution of cattle ticks in three bioclimatic stages of Côte d'Ivoire, namely the sub-

sudanese, pre-forest and forest zones. In these different zones, 2482 ticks were taken from cattle during the rainy season from June to August 2012. At the end of the diagnosis, 8 tick species belonging to 5 genus were identified. These are: *Amblyommavariegatum, Rhipicephalus (Boophilus) annulatus, Rhipicephalus (Boophilus) microplus, Rhipicephalus Senegalensis, Rhipicephalussanguineus, Rhipicephalusmuhsamae, Hyalommatruncatum* and *Haemaphysalisleachi*.In this set of species, only the *Amblyommavariegatum, Rhipicephalus (Boophilus) annulatus* and *Rhipicephalus (Boophilus) microplus* taxa were observed in the three agro-ecological zones of this study. This survey also revealed that the tick *Amblyommavariegatum* is the most abundant species (46.61%) of all ticks collected. This observation confirms those of previous works carried out respectively at the Center, North and South of Côte d'Ivoire (Knopf, 2002; Gragnon, 2005 and Achi, 2012). These same observations have been made in other West African countries such as Ghana (Koney, 1994). Burkina Faso (Kabore, 1998) and Benin (Farougou, 2006; Farougou, 2007 and Farougou, 2007). *A.variegatum* specie was found in the three bioclimatic stages selected for this study but with a very high abundance in the sub-sudanese zone (69.15%). Indeed, in this zone, it is the most observed tick whereas its abundance seems to regress more when its approaches coastal zones. In the same order, it appears to rank the second and the third position of tick relative abundance in the pre-forest area and forest area. In addition, *Rhipicephalus (Boophilus) annulatus*specie is the second most observed taxon in all collected ticks. This tick species was observed as *Avariegatum* in the three agroecological zones of Côte d'Ivoire and accounted for 27.07% of the inventoried tick populations. These results are consistent with those of Knopf [19] in Central Côte d'Ivoire and those obtained in the North by Sangne [27, 14]. *Rhipicephalus (Boophilus) annulatus* has been reported in Togo [24, 25, 26]and northern Algeria [28, 29].

*Rhipicephalus (Boophilus) microplus*specie was harvested from the three bioclimatic stages of Côte d'Ivoire selected for this study. It represents 16% of ticks collected in all stations and appears to have a decreasing relative abundance from south to north. Thus, in the forested zone, it represented 33.18% of the tick subpopulation against 25.96% and 4.56% respectively for tick subpopulations of the pre-forest zone and the sub-sudanese zone. This decreasing gradient of its relative abundance from South to North seems to confirm the fact that colonization of the different agroecological zones was made from the southern region of the country. Indeed, this tick species has been identified for the first time in West Africa specifically, in Azaguié (southern of Côte d'Ivoire) by Mader *et al*. (2007). This study revealed that *Rhipicephalus (Boophilus) microplus* occupies, following its abundance, third place behind Amblyommavariegatum and *Rhipicephalus (Boophilus) annulatus* in forest and pre-forest areas. However, it ranks 4th in the sub-Sudanese region. This position appears to be due to the relatively recent introduction of this species of tick in this agro-ecological zone. This assertion is supported by the fact that *R. (B) microplus* was not observed on livestock in the savanna district in 2009 (Toure, 2012). However, work carried out in the same region in 2011 raised its presence (Kouassi, 2012). This observation suggests that this invasive tick was introduced in northern Côte d'Ivoire between 2009 and 2011. As far as we are concerned, the observation of this species in 2011 in the sub-Sudanese zone and the evolution of the composition of the tick population appears to be related, and these changes could be related to intensive livestock movements (local and transhumant cattle) and to anthropogenic changes in the environment. In other words, the transhumance and grazing of animals on community pastures favor the spread of ticks over long distances.

In contrast, misuse (under-dosing, inadequate frequency of use) contributes to the selection and proliferation of more resistant and prolific tick species. This idea is partly shared by many authors who have demonstrated the tendency *of Rhipicephalus (Boophilus) microplus* to colonize and occupy favorable spaces (Estrada-Pena, 2006 and Barré, 2010) and to replace ticks of the same genus (Tonnesen, 2004) This seems to be confirmed in Côte d'Ivoire, where ticks have been cropped in most of the areas concerned by recent studies (Touré, 2014). Indeed, according to the work of Baffi (Baffi, 2008) the resistance of *Rhipicephalus (Boophilus) microplus* to acaricides constitutes for her an advantage over other species.

In contrast to *A. variegaum, R. (Boophilus) annulatus* and *R. (Boophilus) microplus*, the other inventoried tick species showed localized distribution. This is the case of *Hyalommatruncatum* (7.31%), which was only found in the northern zone. This dryland tick is increasingly encountered in the eastern, western and humid central areas of Côte d'Ivoire due to livestock imports from the Sahelian regions (FAO, 2012 and Touré, 2014). However, our work has noted that its relative abundance seems to be declining. Indeed, according to Tuo (Tuo, 2013), it was 36.07% and 37.61% respectively in Korhogo and Ferké in 2009 against 5.55% and 23.77% in these same localities, according to our work. The tick species Rhipicephalussanguineus was collected in the north and center where it has a relative abundance of 1.12% and 0.93%. That tick appears on cattle when it is in contact with dogs. In contrast, *Rhipicephalussenegalensis* was harvested only in the northern part of the country with a relative abundance of 0.62%. This proportion is consistent with those found in the center (Madder, 2007) and in the south (Madder, 2011). The least common tick species were *Rhipicephalusmuhsamae* (0.62%) and *Haemaphysalisleachi* (0.15%). The tick *Rhipicephalusmuhsamae* was harvested in the north, in the subsudanese zone of Côte d'Ivoire. That tick is observed for the first time in Côte d'Ivoire and probably owes its presence to cross-border movements of cattle from the Sahelian regions. Indeed, according to Morel and Vassiliades (Morel, 1964), this species is distributed in West Africa west of the Nile and the Congo Basin to Senegal. These authors indicated that it is associated with tropical, subtropical and sometimes subequatorial savannas, as well as with the southern Sahelian steppes. That tick has already been described and reported by these same authors, in Senegal, Guinea Bissau, Benin and Upper Volta (Burkina Faso) in the 60s. As for the tick *Haemaphysalisleachi* which was cropped at the center in Guinean savanna she had already been identified by Aeschlimann (1967) who described it as a tick of forest regions but able to adapt to the savanna zone. It lives mostly on dogs, in clearings, near edges and plantations.

Conclusion

In addition to the tick species commonly collected in Côte d'Ivoire, *A. variegaum, H. truncatum, R. (Boophilus) annulatus* and more recently *R. (Boophilus) microplus, Rhipicephalussenegalensis*, this study identified *Haemaphisalusleachi. And R. Muhsamae*. The decreasing abundance of *R. (Boophilus) microplus* from south to north and the presence of *R. Muhsamae*, a species from the Sahelian regions, would be a consequence of cross-border transhumance movements of cattle. *Haemaphisalusleachi* is a parasite of domestic and wild carnivores. Its presence on livestock presupposes frequent contact with wildlife. These results show the enrichment of the biodiversity of the tick population in Côte d'Ivoire, favored by the multiplication of extensive breeding and the exploitation of large areas of community pastures. Given the vector potential of these mites for human and animal diseases, this study is part of an ecological monitoring program. It recommends,

to be more complete, other longitudinal studies to better understand climatic and environmental variability and to identify the periods at risk for the emergence of an epidemiological situation.

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