

## Full Length Research Paper

# Impacts of anthropogenic pressures on wildlife in the northern sector of the National Park of Mbam and Djerem, Adamaoua Cameroon

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The study on the assessment of the scale of human pressure on wildlife in the Mbam and Djerem National Park was conducted between December 2012 and April 2013. This evaluation has relied on a review of seven reports ecological monitoring produced by Wildlife Conservation Society between 2006 and 2012, and direct observations. Results show that: the main causes of the reduction of wildlife are poaching (60.5%), transhumance (16.5%), illegal fishing (10.9%) and uncontrolled bush fires (1.5%). In terms of relative abundance of human activities, it was found that the number of human indexes dropped from 232 in 2006 to 109 in 2009 and 109 to 82 in 2012 as well as wildlife or encounter rate per kilometer species activity signs indicated a high relative abundance of elephants has increased from 1,008 in 2006 to 2.18 in 2009 and 2.18 to 5.80 in 2012 followed by buffalo and hocheur general, activities anthropogenic influences negatively but very weak wildlife ( $r = -0.06$ ). This influence is positive and is higher among *Loxodonta africana* ( $r = 0.9$ ), *Pan troglodytes* ( $r = 0.6$ ), Greater spot-nosed monkey ( $r = 0.4$ ), low in *Syncerus caffer* ( $r = 0.1$ ) and Red river hog ( $r = 0.05$ ) between 2006 and 2012, a reduction of human activities 64.7% was observed. To reduce the impact of human activities on wildlife, it is desirable to strengthen the monitoring of livestock in the park and the fight against poaching device.

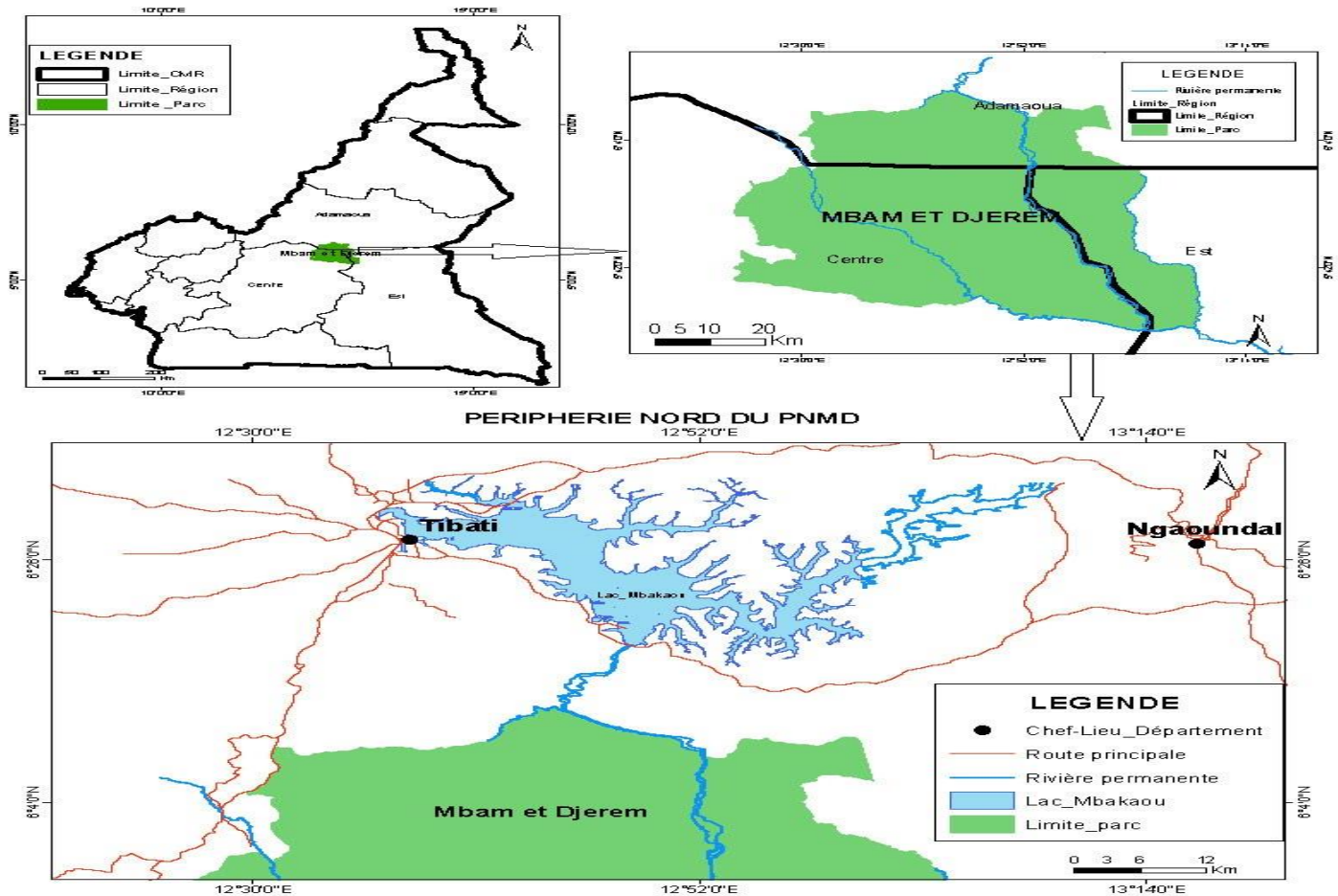
**Key words:** Human activities, Wildlife, Mbam and Djerem National Park, ecological monitoring.

## INTRODUCTION

The loss of biodiversity is among the issues of concern to humanity (Vounserbo, 2011). The evaluation of the Millennium Ecosystem indicates the considerable loss of biodiversity, with about 10 to 30% of mammal species, avian and endangered amphibians, and degradation of 15 of the 24 services provided by ecosystems (Rhodes and Muller, 2005). The consideration of conservation

measures and the implementation of actions to protect the structure, functions and diversity of natural systems become an imperative (Koagne, 2009). In Cameroon, protected areas and hunting areas represent more than 9 million ha or 19.2% of permanent forest estate (Ntsogo, 2011). Unfortunately, while the number and size of protected areas (PAs) increase, biodiversity meanwhile

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**Figure 1.** Map of Cameroon showing MDNP and northern study area Map of Cameroon showing the study area.

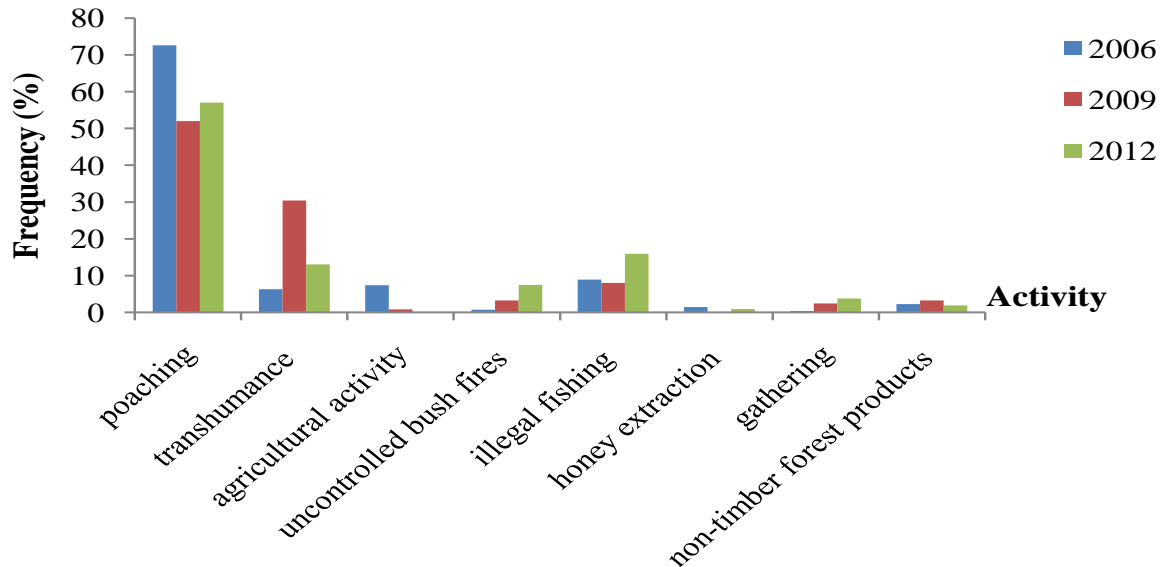
continues to decline (UNEP / CBD, 2008). Hence, the need for the evaluation of the management efficiency. Located at the ecotone forest - savannah, the Mbam and Djerem National Park (MDNP) abounds important biodiversity including both species of forest, savanna and ubiquitous (MINFOF, 2008). This is an undervalued area for tourism and an important fishing area with an annual production of 171.360 tonnes (Dadem, 2011). Unfortunately, it faces many threats: poaching, overgrazing and uncontrolled bush fires (MINFOF, 2008). This study aims to evaluate the influence of human activities on wildlife in the Mbam and Djerem National Park.

## MATERIALS AND METHODS

This study was carried out in the northern sector of the Mbam and Djerem National Park (MDNP) (Figure 1). The climate is Sudano Guinean type, rainfall of 1500 mm/year and the temperature ranges from 23 to 24°C (MINFOF 2008). This park contains the northern boundary of the tropical rainforest, galleries and riparian forests, woodlands, shrublands and marshy meadows. MDNP, due to its location in the contact area forest / savannah, is home to a rich

fauna including species suitable for forest and savanna species characteristics and the complex of species associated with transition between mosaics two zones. About 60 species of mammals have been recorded in MDNP (MINFOF, 2008). More than 360 species of birds belonging to 53 families are present in the MDNP (MINFOF, 2008) Approximately, 33 species fish were observed in the MDNP area (Dadem, 2011)

Data collection method to identify the different activities practiced in the park, a survey was conducted among stakeholders and consulted reports. The surveys were supplemented by direct observation. The choice was based on reports of the 08 areas of intervention of the activity. A total of 7 reports were stripped and thus covering 06 axes tracking because some of the ecological monitoring system activities take place simultaneously. The data collected in each report concerned the methodology used; indicators, logistics. These data were grouped according to their period of realization. The data from the results of all related activities in the database given and annual reports of ecological monitoring activities conducted between 2006 and 2012 were used to calculate the Mileage of Abundance Indices (MAI) of human activities and wild fauna in the study area. The correlations between the abundance of different human activities and the wildlife provided an idea about the type of relationship between the variables of the study. Inventory data associated with those questionnaires provided information on human pressure and other factors that threaten the wildlife in the study area.



**Figure 2.** Evolution of human activities in the park in 2006, 2009 and 2012.

#### Data analysis

The test of Analysis of Variance (ANOVA one way) was used to compare the mean indices MAI (IKA) between years in the Statistica 8.0 software probability level of 5%. The influence of anthropogenic activities on wildlife has been rated according to the Pearson correlation coefficient between AH and MAI wildlife.

## RESULTS

### Activities practiced in the northern part of MDNP

Eight types of human activities in the northern part of MDNP were identified, all of which are forms of pressure on the natural resources of this protected area. Five of them come from extractive activities carried either on wildlife (it comes to hunting and fishing) on flora (collection of medicinal plants, honey extraction, etc.). Two of them fall under the occupation of the protected area and its transformation to anthropogenic purpose, it is: (a) bushfire made as part of agricultural burning to encourage cattle grazing; (b) transhumance herds. These specific activities are legal and the other illegal.

### Legal activities in the park

Fishing and ecotourism are the legal activities taking place in DMNP. This activity is practiced along the river in Djerem MDNP and presents the clauses, sanctions and litigation settlements. Fishing along River Djerem in the park is not always successful in achieving the objectives. They face certain realities (fishing closure period, the complicity of poaching and diversion of materials

belonging to the group.) that constitutes obstacles for their good progress, according to the different clauses.

### Illegal activities in the park

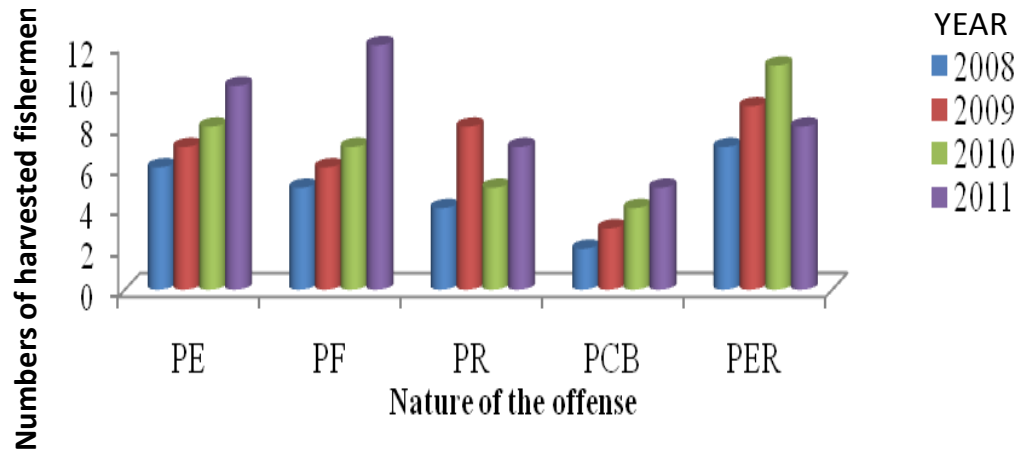
The evaluation of the integrity of the park through the determination of indices human activities encountered. These indexes are shown in Figure 2.

Human activities such as poaching, agricultural activity, honey extraction were high in 2006. Poaching experienced a decrease or disappearance (honey extraction) in 2009 before recovering in 2012. Activities such as pastoral activity, bush fire, removal of bark, gathering and pickups were low in 2006. Despite these movements, these activities have increased in 2009. Activities such as agriculture in completions disappeared in 2012 while poaching and illegal fishing experiencing an increase in new. This could be justified by several reasons: The year 2006 is the year of preparation of the management plan that aims to guide ecological monitoring activities. Monitoring becomes from that moment better organized in the park. The increase in poaching and illegal fishing in 2012 could be due to the reduction of patrol effort during the year following the reduction in the number of eco-guards. Intensification of bushfires would end search of grazing steers which has increased to 2012.

### Influence of human activities in the park

#### *Influence of legal activities*

The evolution of the number of fishermen seized in the



**Figure 3.** Distribution of fishermen calls the park depending on the nature of the offense from 2008 to 2011. PE = Fishermen carrying hunting in the park, PF = Fishermen in the closing period, PR = Fisherman engaged in breeding area, PCB = Fishermen poaching complicit with persons not members of ICG, PER = Fishermen using unregulated gear.

park depending on the nature of the offense from 2008 to 2011 (Figure 3) up between 2008 and 2011 the number of fishermen - poachers in a closed time fishermen, fishermen breeding area, accomplice fishermen poaching has increased. While between 2008 and 2010 the number of fishermen using unregulated gear increased before falling in 2011. The increase in the number of fishermen in the Park offense could be due to the fact they do not have premium when he denounced cases of infringement and non-regularity of eco-guardians along the rivers following the failure of their work force. Faced with the failure of the responsible ICM denounce those responsible infringing or to take appropriate measures, the conservation service decided the suspension of fishing activities for the first year from April to June 2012 (Fotso et al., 2012).

### Influence of illegal activities

The comparison of the abundance of signs of human activity between 2006, 2009 and 2012 (Table 1) shows that the number of human indexes rose from 232 in 2006 to 82 in 2012 representing a 64.65% reduction in this part of the park. In a general way, MAI human activities are increasing in the northern part of MDNP to the periphery. But average variance analysis of MIA of all human activities, it results in a non-significant difference between years (one way ANOVA:  $F_2; 26 = 0.18823$ ;  $P = 0.82955$ ). These averages vary from one year to the next (higher in 2006 (0.700) decreases in 2009 (0.458) and increases in 2012 (0.721). Despite its protected area status, local residents of this park do not prevent from entering and hunting. An MIA human activity has undergone a 2009 increase of 0.263 in 2012. The difference in MAI values between the two years is explained by the fact that there

are more efforts by NGOs to park conservation in this period. But after this success, the conservatives have provided more extra effort, which has resulted in an enhancement of illegal activities in the park in 2012. Comparing pairs MAI of all human activities in different years, the average MAI of all human activities in 2006 (0.700) is not significantly different from that recorded in 2009 (0.458) (Tukey pairwise test:  $p > 0.05$ ). Similarly, the average of MAI human activity in 2006 (0.700) is significantly different from that of 2012 (0.721) (Tukey pairwise test:  $p > 0.05$ ). It is the same, average MIA of all human activities in 2009 (0.458) and those of 2012 (0.721) are also not significantly different (Tukey pairwise test:  $p = 0.05$ ). These statistical analyses, we can say that the people in the study area are aware that MDNP is a protected area, so go there sporadically. MAI human activity throughout the study area in 2012 is 0.721.

### Trends in abundance of wildlife in the MDNP

MILEAGE index of abundance different wildlife groups encountered (seen and heard) in the study area between 2006, 2009 and 2012 (Table 2) shows that in 2006, the most abundant species are composed of *Cephalophus (ogylbi, nigrifons, dorsalis)* with Meter abundance index (MIA) is 2.318. It is followed by *Syncerus caffer* (1.048); followed *Loxodonta africana* (1.008), *Kobuskob* (0.960) *Cephalophus monticola* (0.606). The least represented species *Cercopithecus erythrotis* (0.007) *Vivera civetta* (0.004), *Hippopotamus amphibius* (0.004). In 2009, *Loxodonta africana* (2,180) heads followed *Syncerus caffer* (0.927) and *Pan troglodytes* (0.343) and *Ceropithecus nictitan* (0.342). *Tragelaphus scriptus* (0.008). In 2012, *L. africana* (5.805) leads followed *S. caffer* (0.839), then *C. nictitans* (0.582) and the *P.*

**Table 1.** Abundance of signs of human activity between 2006, 2009 and 2012.

Activity	2006			2009			2012		
	N	DP (Km)	MIA	N	DP (Km)	MIA	N	D P(Km)	MIA
Camp	20	331.18	0.060	1	237.58	0.004	0	113.64	0
Shot	2	331.18	0.006	7	237.58	0.029	3	113.64	0.026
Machete cutting	79	331.18	0.238	0	237.58	0	1	113.64	0.008
Cartridge case	3	331.18	0.009	39	237.58	0.164	33	113.64	0.290
Tree barking	1	331.18	0.003	3	237.58	0.012	4	113.64	0.035
Honey extraction	0	331.18	0	0	237.58	0	1	113.64	0.008
Traps	23	331.18	0.069	0	237.58	0	2	113.64	0.017
Track	56	331.18	0.169	7	237.58	0.029	2	113.64	0.017
Presence shepherds	17	331.18	0.051	38	237.58	0.159	14	113.64	0.123
Abandoned village	1	331.18	0.003	1	237.58	0.004	12	113.64	0.105
Footprint	12	331.18	0.036	0	237.58	0	1	113.64	0.008
Fire	2	331.18	0.006	0	237.58	0	0	113.64	0
Direct observation	10	331.18	0.030	0	237.58	0	0	113.64	0
Pick up and picking	5	331.18	0.015	3	237.58	0.012	2	113.64	0.017
Total	232	331.18	0.700	109	237.58	0.458	82	213.64	0.721

DP, Distance; N, Number of indices; MIA, MILEAGE index of abundance.

*troglodytes* (0.462). The least represented are *T. scriptus* (0.005), *De Cercopithecus neglectus* monkey (0.005), *C. monticola* (0.005) Grivet (0.005), *Cercopithecus ascanus* (0.001). The distribution of the values of the encounter rate per kilometer (MIA) activity signs of these species shows a fairly high relative abundance of elephants, buffaloes and followed hocheur between 2006 and 2012. The other species of large mammals (giant forest dog, black-fronted duiker, Sitatunga, water Chevrotain, water-buck and Kobe are poorly represented and endangered. the sharp decline duikers can be explained by the fact that these species are the most seized during patrols as WCS confirms (2000) shows that around the Bayang-Mbo sanctuary duikers represent about 36% of all animals in the hands of hunters. Based on the comparison of the average attendance indices species recorded by recce made from the analysis of variance, it follows that there is no significant difference between years (One-way ANOVA,  $F_{2, 26} = 0.397$ ,  $p = 0.675$ ). The northern part of MDNP keeps better wildlife potential compared to the rest of the site (MDNP). Study for 48 species of large and medium mammals enumerated on the ecological survival 2009 (Fotso et al., 2009), 22 of these species if found.

2.3. Correlation between human activities and wildlife watching Correlation coefficients were calculated and tested for a threshold of 5%. Correlations between IKA human activities and those of wildlife (Table 3) shows that human activities influence negatively but very weak wildlife ( $r = -0.06$ ). This influence is positive and is higher among *L. africana* ( $r = 0.9$ ), *Pantroglodytes* ( $r = 0.6$ ), Greater spot-nosed monkey ( $r = 0.4$ ), low in *S. caffer* ( $r = 0.1$ ). This may be due to the type tools used for hunting where the type of plant found in the area.

### Correlation between human activity and wildlife observation

Correlation coefficients were calculated and tested at a 5% level in order to know what is the influence of human activities on the presence of wildlife. According to these figures, the correlations between the MIA wildlife and those human activities positive and vary. It there's a very strong positive correlation between the MIA wildlife and human activity between 2012 ( $r = 0.87$ ) and the 2006 ( $r = 0.59$ ). Positive correlations between MIA wildlife and human activity of 2012 ( $r = 0.87$ ) and of 2009 ( $r = 0.29$ ) can be explained by the fact that hunters the study area preferentially operate in areas where game abounds. There is a very low density of animals near villages, who go there are species of primates that refuel in crop fields. As one moves away from the villages, human activities are becoming rarer and wildlife observations increasingly important. Around the poaching camps and in areas of high traffic of livestock, wildlife sightings are rare

## DISCUSSION

### Poaching

Several lines were encountered including traps, son of steels, active or abandoned encampments, abandoned trophies, fingerprints and even poachers seized between 2006 and 2012. It should be noted that all other activities in the park together for poaching because the farmer or the fisherman may have recourse to wild animals for food. Poaching is as one of the most important show the

**Table 2.** Comparison: MIA wildlife MDNP in 2006, 2009 and 2012.

Order	Scientific name	Common name	MIA 2006	MIA 2009	:MIA 2012
Probocidae	<i>Loxodontaafricana</i>	Elephant	1.008	2.180	5.805
Ungulate	<i>Synceruscaffer</i>	Buffalo	1.048	0.927	0.839
Primate	<i>Ceropithecusnictitans</i>	Hocheur	0.375	0.342	0.582
Primate	<i>Pan troglodytes</i>	Chimpanzee	0.166	0.343	0.462
Primate	<i>Papioanubis</i>	Baboon	0.658	0.411	0.389
Ungulate	<i>potamochoerusporcus</i>	Bushpig	0.382	0.414	0.328
Ungulate	<i>Kobuskob</i>	Cob de buffon	0.960	0.131	0.243
Primate	<i>Lophocebusalbigena</i>	Cercojousgrises	0	0	0.197
Ungulate	<i>Tragelophuseuryceros</i>	Bongo	0.439	0.463	0.179
Primate	<i>Colobusguereza</i>	Colobeguezeza	0.185	0.127	0.104
Rodent	<i>Manis gigantea</i>	Giant pangolin	0.032	0.199	0.091
Ungulate	<i>Cephalophus(.ogyibi,. nigrifons,. dorsalis)</i>	Red Ceph	2.318	0.045	0.070
Ungulate	<i>Phacochoerusafricanus</i>	Warthog	0.456	0.074	0.052
Ungulate	<i>Hippopotamus amphibius</i>	Hippopotamous	0.004	0	0.049
Primate	<i>Cercopithecuspogonias</i>	Monkey courroné	0.029	0.067	0.035
Rodent	<i>Atherurusafricanus</i>	Brush-tailed porcupine	0.222	0.082	0.026
Ungulate	<i>Civettavivera</i>	Chive	0.004	0.002	0.023
Ungulate	<i>Cephalophussylvicultor</i>	Ceph has yellow back	0.279	0	0.011
Primate	<i>Miopithecustalapoin</i>	Talapoin	0.010	0	0.011
Rodent	<i>Orycteropusafer</i>	Orycterop	0.050	0.042	0.011
Rodent	<i>Melivoracapensis</i>	Ratel	0	0	0.006
Ungulate	<i>Tragelaphusscriptus</i>	Guibanarche	0.277	0.008	0.005
Primate	<i>Cercopithecusneglectus</i>	Brazza monkey	0.014	0.009	0.005
Ungulate	<i>Cephalophusmonticola</i>	Ceph blue	0.606	0	0.005
Primate	<i>Chlorocebusaethiops</i>	Tantalus	0	0	0.005
Primate	<i>Cercopithecusascanus</i>	Monkey ascan	0	0	0.001
Ungulate	<i>Hylochoerusmeinertzhageni</i>	Giant forest hog	0.010	0.011	0
Ungulate	<i>Tragelaphusspekei</i>	Sitatunga	0.036	0.012	0
Ungulate	<i>Hyemoschusaquaticus</i>	Water chevrotain	0.021	0	0
Ungulate	<i>Kobusellipsiprymnus</i>	Black-fronted Ceph	0.037	0	0
Primate	<i>Cercopithecuserythrotis</i>	Kobe defassa	0.007	0	0
	<b>Total</b>		<b>9.645</b>	<b>5.896</b>	<b>9.547</b>

MIA, MILEAGE index of abundance.

traps, guns and smoked meat seized from the hands of poachers. These hunting objects testify heavy pressure from poaching in the area. The talks held with heads of households and hunters have identified the origin and causes of poaching, the development adheres to three main causes:

1. Easy access to firearms;
2. A great demand for bushmeat and marketing of hunting products;
3. Low income and few opportunities for peripheral populations.

Given these factors favorable to poaching, the responses of park managers are more limited: The human resources are too small (fifteen ecoguards) for an area of (90,620

ha) (the material means of monitoring also insufficient (three motorbikes). It is therefore not surprising place irregular intrusion populations within the park, causing heavy poaching.

#### Pastoral action

The MDNP is covered with lush vegetation that forms an abundant forage and quality. From the transhumance corridor not far from the road, pastoralists are accessing the park. Herds of cattle from Ngaoundere Cameroon and other region are a widespread phenomenon. The number of livestock is increasing every year. This could be explained by: (1) Good control of various animal diseases; (2) The availability of forage with permanent

**Table 3.** Correlation between IKA wildlife and those of human activities.

<b>Specie</b>	<b>Human activity</b>	<b>Correlation coefficient between HA and MAI Specie (r)</b>
Elephant	Human activity	0.983
Buffle	Human activity	0.106
Hocheur	Human activity	0.401
Chimpanzee	Human activity	0.636
Babouin	Human activity	0.090
Potamoche	Human activity	0.050
Cob de buffon	Human activity	-0.4
Cerco jous grises	Human activity	0.020
Bongo	Human activity	-0.166
Colobe guereza	Human activity	-0.330
Pangolin geant	Human activity	-0.290
Ceph roux	Human activity	-0.364
Phacoche	Human activity	-0.580
Hippopotame	Human activity	0.263
Singe couronné	Human activity	0.090
Atherure	Human activity	0.050
Civette	Human activity	-0.080
Ceph a dos jaune	Human activity	-0.330
Talapoin	Human activity	0.020
Orycterop	Human activity	-0.250
Ratel	Human activity	0.020
Guib anarche	Human activity	-0.177
Singe de Brazza	Human activity	-0.070
Ceph bleu	Human activity	-0.580
Tantalus	Human activity	0.070
singe d'ascan	Human activity	0.290
hylochère	Human activity	-0.364
Sitatunga	Human activity	- 0.58
Chevrotain aquatique	Human activity	-0.270
Céph à front noir	Human activity	-0.315
Kobe défassa	Human activity	-0.430
Toute la faune	Human activity	-0.061

waterholes in the park that are all points of attraction for pets. During the course of several signs recce were found in the area: All pastures, areas around pools, water points, the banks of the river shows many traces of passage of these animals (pruned plant species, the pollarded trees, herder camps, etc.). The herds of cattle met in the park between 2006 and 2012 mainly in the dry season reflect the actual presence of the transhumance in the park. The intense trampling of herds compacts the soil and prevents regeneration. This obviously has implications for the wildlife that must undergo disturbances perpetrated by livestock and humans. The grazing pressure is the second activity after poaching (Figure 3) .This is due to the fact that breeding is the second largest economy of the study area (MINFOF, 2008). It is practiced by a Bororo and is essentially extensive type. The results of the ecological monitoring from 2006 to 2012 estimated the total number of cattle

present in the 3536 average headers park, with a minimum of 300 and a maximum of 11,000 head respectively for the years 2012 and 2008 to Inside the park, and the numbers of cattle entered in the livestock service database is 10,000 head for 2012 on the outskirts of the park (MINEPIA, 2012). These results indicate that the protected area is used by farmers as a grazing area.

The presence of livestock in the park is a threat to ecosystems and species due to disturbance of wildlife and flora, competition of wildlife and livestock for food resources, the risk of transmission of Epizooties wildlife, risk of poisoning of large carnivores by breeders, poaching, etc. The penetration of the park by domestic livestock is one of the main activities noted. This pressure significantly disrupts fauna have already experienced the effects of an increase in poaching in the recent past according to several observers (Hassan, 1998; Bene et al, 2007). In the areas most frequented by breeders,

there was a very low frequency of wildlife. The cohabitation between wild and domestic fauna entails the risk of contamination of wildlife rinderpest (Depierre and Vivien, 1992). The invasion seems widespread in the region. The herder camps have been observed in other areas when walking inventories of 2006, 2009 and 2012 (Fotso et al., 2012). Practiced too intensely, it can kill trees and initiate the phenomenon of decrease in vegetation cover. The passage of livestock so not only causes a disturbance to wildlife, but also a deterioration of its space (IUCN, 2009). It seems that farmers are heavy users of fires to encourage young shoots appreciated by their livestock. Thus, tree felling and the use of fire may encourage poaching. The various decentralized services of the area must work in synergy in local development to define a grazing area with permanent water in the locality.

### Bushfires

Bushfires are a phenomenon of the savannas of the entire Far North region. In general, they are lit by man (farmer, hunter) for the following reasons: Herbaceous carpet cleaning to facilitate access for young volunteers, pasture improvement by removing shrubs, opening vegetation for hunting. They represent the third activity from above park. We can report that there are three types of bush fire early fire, fire midseason and late fire. The most destructive and also the most used is the late fire that can travel dozens of kilometers with the result, destruction of vegetation cover. and wildlife, accelerated erosion, especially in areas rugged and strong rainfall, humus destruction leading to loss of soil fertility, depletion of flora by destroying the seeds of annuals.

### Honey extraction

Two main operating techniques are observed in the field. The first is to kill host trees bees (*Uapaca togolinsis*, *Daniellia oliveri*, *Azelia africana*, *Parkia biglobosa*, *Lannea kerstingii*) and laying them on the ground before honey extraction. The second technique is used if the hive is low: The diameter of the hole is increased without cutting down the tree. This activity is the final activity after picking and gathering (Figure 13). But honey collection poses no problem with the use of fire to chase the bees. And these lights are another serious obstacle to the management of habitats and species. Bushfires are a consequence of ignorance of the issues by the residents of peripheral areas and from the fact that this practice is culturally rooted enough. It is often associated poaching.

### Gathering and collection

The collection mainly concerns some bee (*Apis mellifera*) the honey is highly prized and wild yam tubers (*Dioscorea*

sp.) And wine borassus (*Borassus aethiopum*). The collection covers several products: caterpillars, the pepper of Ethiopia (*Xylopiya aethiopica*), mushrooms, pepper Africa (*Piper guineense*), fruits of the Aiélé (*Canarium schweinfurthii*) foliolles bamboo and rattan. This activity is the fifth activity of the park according to the results of ecological followed.

### Bark collection

The collection of medicinal plants: Survey results and observations in the field have shown that local residents use non-timber forest products (roots, bark and leaves) in traditional medicine. Also, the demand for traditional medicines in the study area recorded an increase due to population growth and the high cost of western medicine. This information was given by resource persons (traditional healers) in investigations. According to the results of the recce, this activity represents the fourth activity encountered in the park.

### Impact on wildlife

Referring to previous work in the study area, the trend is generally densities to growth for most species, with the exception of primates It is always demonstrated that poaching pressure (Hassan, 1998) are still a threat to the conservation center. On average 0.72 signs of anthropogenic activities kilometer in the National Park of Mbam and Djerem. Compared to sites outside protected areas, MDNP undergoes less human pressure. Nevertheless, the relatively high intensity of human activities sectors correspond low abundances of animal activities. These areas are found near villages and ease of access by river from Djerem. Pressure poles are oriented sectors relatively high abundance of mammals, and are characterized by high values of IKA human activities. These pressure poles are found to the south and east. Furthermore, the central area have relatively stable. They are characterized by encounter rate of wild fauna high enough superimposed on human pressure.

### CONCLUSION

The Mbam and Djerem National Park compared to other sites in the region is relatively rich in individuals of species of large mammals and means, and undergoes less human pressure. The encounter rate per km of anthropogenic signs of activity and those of all species of mammals combined is respectively 0.72 and 9.547. The spatial distribution of human activities and those of wildlife generally made out shows a correlation between the relative intensity of human activities and that of animal activities. The main cause of the decline of human activities derive from the supervision and control of the



illegal exploitation of wildlife resources from fixed and mobile patrols in the MDNP and its peripheral area between September 2006 and 2012: The patrol effort followed a generally increasing trend; control in fixed barriers was achieved mainly during the day, leading to the development by poachers opportunities for circumvention night. Poaching offenses were more observed in the southern and eastern areas, with an increasing trend in the South. The number of destroyed hunting camps followed a growing trend.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interest.

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