

# Abundance and Nest behavior of Werstern lowland gorilla (*Gorilla gorilla gorilla*) in Lobéke National Park (Cameroun): Implications for conservation

Samuel C. Tsakem<sup>1,2\*</sup>, Martin N. Tchamba<sup>3</sup>, Robert B. Weladj<sup>4</sup>

<sup>1</sup>Ecole Régionale Post-Universitaire d'Aménagement et de Gestion Intégrés des Forêts et Territoires Tropicaux (ERAIFT), B.P. 15373 Kinshasa, RDC.  
<sup>2</sup>Ecole de Faune de Garoua, B.P. 271, Garoua, Cameroun. \*Auteur correspondant: [tsakem@yahoo.fr](mailto:tsakem@yahoo.fr)  
<sup>3</sup>Department of Forestry, Faculty of Agronomy and Agricultural Sciences, University of Dschang, B.P. 222, Cameroun,  
<sup>4</sup>Department of Biology, University of Concordia, 7141 rue Sherbrooke Ouest, Montréal, QC, H4B 1R6, Canada.

**ABSTRACT**

Disruption and fragmentation of habitat, and commercial hunting are among the main threats to gorilla populations in the forests of the Congo Basin. These threats are more marked in the Lobéke national park (LNP) in south-east Cameroon, located in the cross-border landscape Tri-National Sangha between Cameroon, Congo and Central African Republic. Basic information is lacking on gorillas in the park. To overcome this deficiency data were collected over 75km of permanent transects in the dry and rainy season, giving respective estimate of 0.75 and 2.56 gorillas / km<sup>2</sup>. About the Biodiversity Information Standards, we have a large database on gorilla nests counting, collected in 2002, 2006, 2009 and 2013 in this park. This database can be digitized and shared with researchers interested by the standards of TDWG for future use. Standard data on environmental conditions of the site Lobéké will allow to develop the map of suitable habitat.

**Keywords:** Gorillas, Abundance, Habitat use, Lobéke National Park, Tri-national Sangha

**RESUME**

La perturbation et la fragmentation de l'habitat, ainsi que la chasse commerciale sont parmi les principales menaces qui pèsent sur les populations de gorilles dans les forêts du Bassin du Congo. Ces menaces sont plus marquées dans le parc national de Lobéké (PNL) Cameroun, situé dans le paysage transfrontalier du Tri-national de la Sangha. Il manque des informations de base sur les gorilles de ce parc. Pour pallier à cette carence, les données ont été collectées sur 75km de transects permanents en saison sèche et pluvieuse, donnant une estimation respective de 0.75 et de 2.56 gorilles/km<sup>2</sup>. Concernant la Biodiversity Information Standards, nous avons une importante base de données sur le comptage des nids de gorille, collectée en 2002, 2006, 2009 et 2013 dans ce parc. Cette base de données peut être numérisée et partagée avec des chercheurs intéressés selon les normes de TDWG pour une utilisation future. Les données standards sur les conditions environnementales du site de Lobéké devront permettre d'élaborer la carte des habitats convenables.

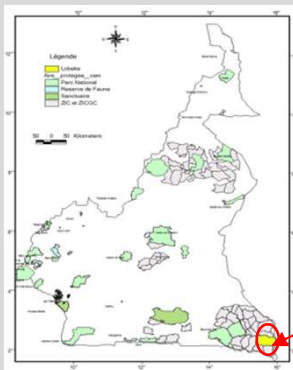
**Mots clés:** Gorilles, abondance, Utilisation Habitat, Parc national Lobéké, Tri-national de la sangha

## Introduction

The forests of the Congo Basin are the refuge of high biodiversity, especially endangered species. Human pressure is clearly growing on large wildlife and its habitat. The annual rate of deforestation is 0.17, unevenly distributed across countries (De Wasseige et al., 2012). Poaching, a major threat to wildlife will grow more because of the dependence of rural people to satisfy their needs animal protein. Twenty-six percent of the area of the Congo Basin forests is intended for the conservation of biodiversity, however, the gorillas also live beyond the protected areas and they are more vulnerable to human activities. Because of these threats, the densities of great apes in the LNP has been a significant decline in recent years, from 2.92 individuals/km<sup>2</sup> in 2002 to 2.58 in 2006, falling to 1.24 individuals/km<sup>2</sup> in 2009 (Nzoo-Dongmo 2009). Moreover, recent data on the abundance and breeding behavior of gorillas remain relatively unknown. This motivated the realization of this research so the goal is to provide the data for the management of gorilla populations in the LNP.

## Study site

The Lobéké National Park (PNL) was created in 2001 on an area of 217,854 hectares. It is located between the northern latitude 2° 05' to 2° 30' and east longitude 15° 33' to 16° 11'. Its buffer zone is divided between Community Hunting areas (ZICGC), the Hunting areas (ZIC) and Forest Management Units (FMU). It is part of the network of protected areas in Cameroon (Figure 1)



- Cameroon Protected areas**
- 17 national park
  - fauna reserve
  - 3 fauna sanctuary
  - 46 Hunting areas
  - 3 zoological garden
  - 1 botanical garden

A total area of 170260 km<sup>2</sup>

Lobéke National Park

Figure 1: The Lobéke national park in the protected areas of Cameroon

## Results

According to Peter Walsh in White & Edwards (2001), the values calculated in the data analysis parameters are recorded in Table 1 below.

Tableau I : Parameters and densities estimated

Parameters	Value in dry saison	Value in rainy saison
n (nest site)	13	47
L (Length of transect)	75 km	75 km
DCD	0,00298 km	0,0062 km
Nest site densities	47.91 sites / km <sup>2</sup>	83.25 sites / km <sup>2</sup>
Nmoy ± Ecart type (N= number of nest)	1,231 ± 0,599 nest / site	2,40 ± 7,2 nest / site
Nest densities	59 nests / km <sup>2</sup>	200.17 nests / km <sup>2</sup>
Nest construction rate	1 day	1 day
Nest degradation rate	78 days	78 days
Gorilla densities	0,75 gorilla/km <sup>2</sup>	2,56 gorillas/km <sup>2</sup>
Probability	0,607	0,607

Estimated densities of 0.75 Gorilla / km<sup>2</sup> against 0.93 gorilla / km<sup>2</sup> in the dry and rainy season respectively

## Gorilla distribution

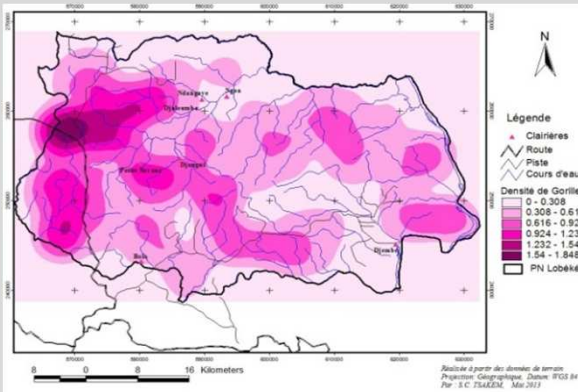


Figure 3 : Map of Gorilla distribution in Lobéke National Park

High densities of gorillas (1.2 to 1.8 ind / km<sup>2</sup>) are noted to the west and center, with a few islands to the east of the park. Average densities (0.3 and 1.2 ind / km<sup>2</sup>) are all around raw unevenly located within the park. Low densities (> 0.3 ind / km<sup>2</sup>) are reported to the north and south-east.

## Nest type

Tableau II : Frequency distributions of nest types depending on the type of habitat

Habitat type	Tree		Herbaceous		Wood		Detached wood		Minimum		Mixte		Zero		Total	
	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%
FMA	-	-	35	28,5	-	-	-	-	-	-	87	70,7	1	0,8	123	73,2
FGD	-	-	1	33,3	-	-	-	-	1	33,3	1	33,3	-	-	3	1,8
FLR	-	-	-	-	-	-	-	2	50	2	50	-	-	4	2,4	
FDM	1	2,8	7	19,4	-	-	9	25	1	2,8	17	47,2	1	2,8	36	21,4
FMR	2	100	-	-	-	-	-	-	-	-	-	-	-	2	1,2	
Total	3	1,8	43	25,6	-	-	9	5,4	4	2,4	107	63,7	2	1,2	168	100

Mixed and herbaceous nest types are very represented. The wood type is absent in the LNP and the detached wood type is present only in FDM. Nearly 95% of nests are built in the Marantaceae forests (FMA) and dense Mixed Forests (FDM). Nests are built low in the swamp forests (FMR) and *Gilbertiodendron dewevrei* (FGD).

## Nest age

Tableau III : Age nests observed for different types of nests

Nest Types	Age	Percentage
Tree(1,7%)	Fresh	0,6
	old	1
	Recent	10
Herbaceous (26%)	Fresh	10
	Recent	8
	old	3
Detached wood (5%)	Fresh	4
	Recent	1
Minimum (2%)	Fresh	1
	Recent	1
Mixte (64%)	Fresh	13
	Recent	24
	old	18
Zero (1%)	Fresh	9
	Very old	0,6

Herbaceous type (26%) and mixed (64%) includes all classes of age freshness. Fresh and recent nests represent 30% and 34% respectively. Very old nests represent almost 15% of all nests found

## Discussion

Gorilla densities in LNP are down compared to the work of Nzoo-Dongmo (2009). Human pressures are increasingly growing are the cause of this decrease. These densities vary with the seasons, this means that this factor affect their distribution. The analysis revealed a negative correlation (R = -0.089, P = 0.64) between the distribution of gorilla and signs of human activities. Very high densities of gorillas are noted in the west of the park, about 10 km from the village Mambéle, headquarter of conservation office. This high density is due to an abundance of wild fruit and the influence of the presence of the conservation staff. The proximity of villages was behind gorilla attacks the crops in the fields (Tsakem et al., 2013). The important observation of mixed and herbaceous nests during the study corroborates the results of Hurez (2011) in Gabon, however, no nests of wood type from the LNP is a discrepancy in these results. The analysis of height classes shows that in the LNP, nests height greater than 4 meters are missing. This contrasts with a Hurez (2011) and White and Edwards (2001). The study of nest sites shows that nearly 60% of the observations made are for loners. What may constitute a risk about the management of this population. It becomes important to consider the season for the best monitoring gorilla population in the park.



Photo 6: Baka peoples who live in the forest and in the hamlets around the villages depend entirely products of the forests for their livelihood

## Methods

We used the technique of "marked nest counts" (Furuichi et al., 2001) for the evaluation of gorilla nests during two passages on the same permanent reces transects established in the park during the study. This network consists of 30 linear transects of 2.5 km each and 28 reces of about 2 km each linking line transects. The first time in a dry season, all nests were counted and marked, on the second passage after three months (rainy season), only unmarked nests were counted. Each observation of a nest, the data was collected on the type of nest, habitat type, geographic location and the extent of perpendicular distances (see Figure 2). Taking these parameters requires good examination of these nests (Photos below). Calculate the perpendicular distance from the line transect to the center of the nest site is done using the following equation (White et Edwards, 2001).

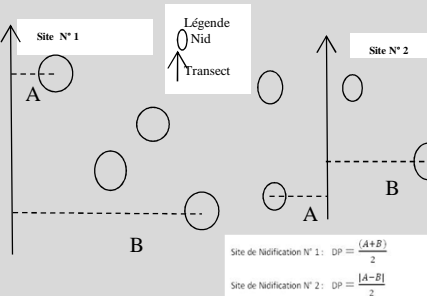


Figure 2: Diagram and equation for calculating the perpendicular distance from the center of the nest site



Photo 1: Taking measurements of the perpendicular distance used for estimating densities gorilla



Photo 2: During inventories, the droppings are also noted to assess the distribution of gorillas

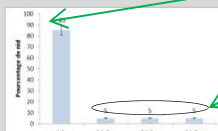


Photo 3: The nests are the parameters used usually to estimate gorilla densities in the rainforest. They should be well examined in order to observe all the necessary informations



Photo 4 & 5 : A family of gorillas found in the clearing "small savannah" during the study. The dominant silverback leads the group. Clearings are also excellent viewing of wildlife in the forest areas.

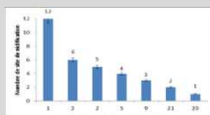
## Nest height



NP Lobéke, nearly 85% of nests are observed within one meter above the ground. What appears to be a feature of this park.

Nests that are between 3 and 4 m in height are generally on bushes or on trunks of dead trees.

## Size of nest site



The number of nests per site ranges from 1 (solitary nest) to 39 nests. Apart from solitary nests (12 nest sites of the 80 characterized, nearly 15% of observations), nesting sites are composed on average of 3.76 nests.

Figure 5 : Distribution of absolute frequencies of the number of nests per nesting site 1

## Database Management

According to Biodiversity Informations Standards, data available on gorillas nest is :

- 2002: 227 nest site for a total of 466 nests
- 2006: 116 nest site for a total of 171 nests
- 2009 : 152 nest site for a total of 221 nests
- 2013 dry season: 27 nest site for a total of 34 nests
- 2013 rainy season: 53 nest site for a total of 134 nids

## Database organisation

These database contains the local name of the species, the scientific name, date of collection, GPS location, habitat type, the study site, season, the number of nest etc.

Here there is a need for standard data on environmental conditions for the development habitat suitability maps.

## Acknowledge

We thank the organizations who finance this research on field aspects and the participation on the conference in Jönköping, Sweden. Some logo are above.

## Bibliographie

- De Wasseige C., De Marcken P., Bayol N., Hiol Hl F., Mayaux Ph., Desclée B., Nasi R., Billand A., Billand A., Defourny P. & Eba'a Atyi R. 2012. Les forêts du Bassin du Congo- Etat des forêts 2010. Office des publications de l'Union Européenne. Luxembourg. 276P. ISBN: 978-92-79-22717-2 doi: [10.2788/48830](https://doi.org/10.2788/48830)
- Nzoo-Dongmo, Z. L. 2003. Suivi écologique dans le Parc National de Lobéke et sa zone périphérique : données de base sur la dynamique des populations de grands et moyens mammifères et des activités anthropiques. Rapport WWF CPO. 220 p + annexes
- White L. & Edwards A., 2001. Conservation en forêt pluviale africaine: Méthodes de recherche. Conservation Society, New York. USA. ISBN 0-9632064-5-1.
- Hurez B., 2011. Interactions entre les gorilles de plaine de l'ouest (*Gorilla gorilla gorilla* Savage & Wyman) et l'exploitation forestière. Implications sylvoécologiques pour une forêt du centre du Gabon. Mémoire de Master. Gembloux (Belgique).
- Tsakem S.C., Tchamba M. & Weladj R.B., (sous presse). Les gorilles du parc national de Lobéké : Interactions avec les populations locales et Implications pour la conservation. Article soumis dans la revue *Tropicicultura* en septembre 2013
- Furuichi 2001
- Furuichi T., Hashimoto, C. and Tashiro, Y. 2001. Extended application of a marked-nest census method to examine seasonal changes in habitat use by chimpanzees, *International Journal of Primatology* 22:913-928