WWF
REPORT
2017

WWF
REGIONAL OFFICE
FOR AFRICA

WWF BIOMONITORING REPORT

The status of Forest Elephant and Great Apes in Central Africa priority sites

Summary Report on

WWF BIOMONITORING activities from 2014 to 2016

Status of Forest Elephant and Great Apes in Central Africa Priority Sites

By:

Dr N'GORAN KOUAME PAUL (WWF Central Africa)

Congo Basin Biomonitoring Coordinator

With the contribution of:

Dr NZOOH DONGMO ZACHARIE LAURENT (WWF Cameroon)

Biomonitoring and Wildlife Management Coordinator

LE-DUC YENO STEPHANE (WWF Gabon)

Information Management Programme Coordinator

TABLE OF CONTENTS

FOREWORD

Considered the second largest forest block after the Amazon, the Congo Basin harbors impressive and diverse wildlife. In this forest wilderness, both small mammals and huge charismatic mega vertebrates like the elephant roam. In the past decade, there has been an avalanche of threats to the existence of some of these species. Habitat loss, poaching for ivory and other threats have caused drastic decline in the population of elephants in some protected areas in the Congo Basin. Nowhere else in Africa is ivory trade more poignant as in Central Africa where up to 60% of the elephant population has been lost.

WWF collaborates with governments, partners and local communities in the Congo Basin to reverse this trend. Over the years, we have carried out wildlife censuses in and around some protected areas in several Congo Basin countries. Our overarching objective has been to obtain reliable data that provide credible estimates of flagship mammal species and human pressure on wildlife. It is in this vein that between 2014 and 2016 we organized standardized wildlife censuses in and around key protected areas in four countries: Cameroon, Gabon, Central African Republic and the Republic of Congo, with a special focus on elephants and great apes (gorilla and chimpanzee), as well as human signs.

The results obtained are shocking and indeed preoccupying, confirming the dramatic trends and calling for an immediate response.

Despite the odds, I remain optimistic about the future of wildlife in the Congo Basin. Though battered to the brink, the elephant has exuded unparalleled resilience. Thousands of elephants still live in the area surveyed. Great ape populations, though declining are relatively stable. This biomonitoring report represents an important source of information on the current state of elephant and great ape populations in the Congo Basin.

It is my fervent wish that decision makers and wildlife managers make maximum use of this scientifically established data to guide elaboration of policies, surveillance plan and strategies to combat poaching. In parallel to law enforcement, we need to ensure local communities are part of the response, as custodians of natural resources and ultimate beneficiaries of a healthy environment. I am confident the findings in this report will contribute immensely to stronger coordinated actions and help in building a world where human and wildlife live in harmony.

Fred Kumah

Director WWF Regional Office for Africa

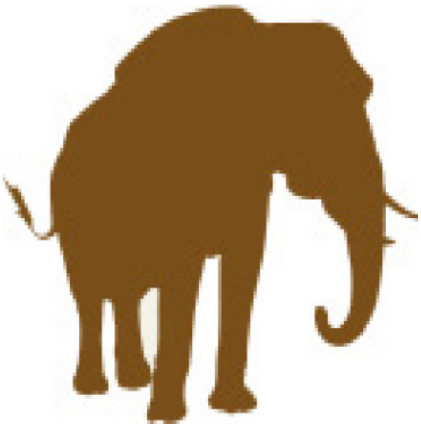
"The "Elephant Crisis" faced by Central African countries is a severe blow to conservation and human wellbeing; it is caused by an unprecedented high level of poaching for ivory fueled by the illegal international trade. The monitoring of the status of elephants is essential to understanding the dynamics of the issue and to support informed decision-making on wildlife management in collaboration with governments and local communities."

Marc Languy

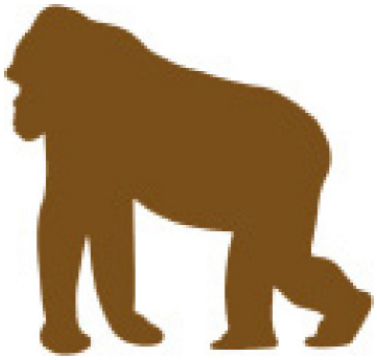
Deputy Director in charge of Central African countries
WWF ROA

SUMMARY

Elephants and great apes are among WWF priority species in the Congo Basin. WWF's work in Central Africa focuses on 12 landscapes and 21 priority sites which are essentially protected areas. WWF is present in five countries, namely Cameroon, Gabon, Central African Republic, Democratic Republic of Congo and the Republic of Congo. It works closely with governments, conservation NGOs and other private partners to implement conservation activities in priority protected areas and their surrounding zones. In a bid to provide up-to-date information to assist managers in decision-making and ultimately to assess the impact of conservation activities, WWF revitalized its biomonitoring program in March 2014.



Within the framework of the biomonitoring program, WWF carried out wildlife inventories covering an area of 5,850,000 hectares between 2014 and 2016. These inventories, organized in seven phases, involved four countries, namely Cameroon, the Republic of Congo, the Central African Republic (CAR) and Gabon. It was conducted in three conservation landscapes: Campo Ma'an, Sangha Tri-National (TNS) and Tri-national Dja-Odzala-Minkébé (TRIDOM). About one quarter of the total area of the landscapes was covered. Cameroon represented 58% of the total area covered, while CAR, Congo and Gabon represented respectively 11%, 22% and 9% of the area surveyed. Forest concessions, community hunting zones and other land use types covered 80% of the area surveyed while protected areas covered 20% .

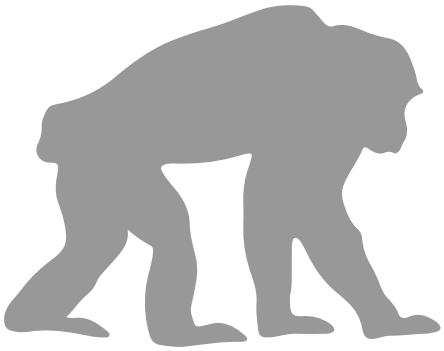


This is the first time wildlife census has been carried out on such a large scale and over a short period of time in Central Africa. The main objective of the inventories was to establish the status of large and medium-sized mammals, as well as anthropogenic pressures in national parks and their peripheral zones, with particular focus on forest elephant (*Loxodonta cyclotis*) and great apes: the chimpanzee (*Pan troglodytes*) and the Western Gorilla (*gorilla gorilla*). These inventories also contribute to enrich the international databases for elephants and great apes. The recent publication by IUCN on the status of African elephants included results of 20 sites surveyed by WWF in 2014 and 2015.

The line transect technique was used in the inventories, which is widely applied and internationally recognized for wildlife inventories throughout the world. The data collection phase covered a total of 2,875 km and involved local communities as well as protected areas managers and biomonitoring specialists under the supervision of WWF. In addition to the euro 575,000 cost, the data collection mobilized 33,560 man-days. The staff were also trained on wildlife survey and data processing techniques.

Gorillas and chimpanzees respectively represent 75% and 25% of great apes in the sampled area. The results show that the area covered contains a population estimated at 59,000 weaned great apes (with minimal and maximal estimates of 50,500 and 72,500 weaned individuals respectively). This corresponds to an average density of 1 individual / km² in the sampled area. The lowest density is found in the Campo Ma'an landscape (0.54 individual / km²) while average densities in TRIDOM and TNS landscapes are twice higher. The elephant population ranges between 7,000 and 13,500 individuals, with a mean estimate of 9,500 individuals. The average density is 0.16 individual / km²; the highest density being in the TNS landscape (0.31 individual / km²) and the lowest in the TRIDOM landscape (0.10 individual / km²).

Trends analysis of population sizes in priority sites show a general stability of great ape populations, whereas those of elephants have declined significantly. While the elephant population remained relatively stable in Campo Ma'an National Park (between 2008 and 2014) and in the Dzanga Sangha Protected Areas (between 2012 and 2016) with not more than 11% variation in the mean estimates, these mean values decreased significantly in Lobéké National Park (51% between 2002 and 2015), Nki National Park (78% between 2005 and 2015) and Boumba-Bek National Park (90% between 2011 and 2015). These large declines are due to the massive killing of elephants for ivory, whose trade has grown disproportionately throughout the world in the last decade.

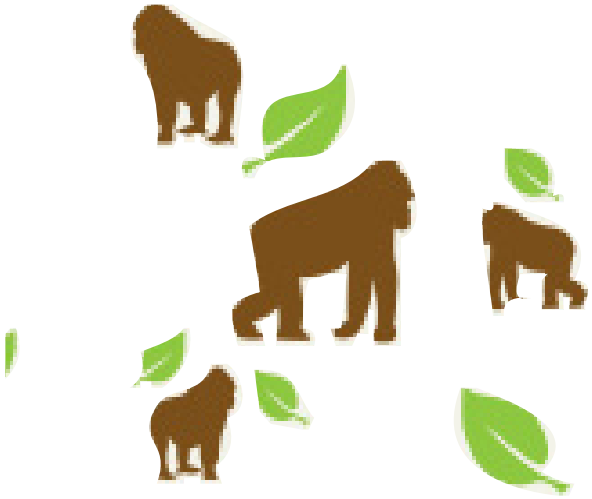


Gorillas and Chimpanzees respectively represent 75% and 25% of great apes in the sampled area

However, it is important to note that conservation efforts have resulted in a significant reduction of human pressure in priority sites as compared to the peripheral zone (other forests), with hunting activities reduced by half in priority sites (national parks). This has resulted in relatively higher elephant density in national parks compared to the surrounding multiple use zones. However, the situation remains preoccupying as funds allocated to conservation remain well below the minimum required for most sites. Conservation efforts must extend to peripheral zones because of the migration of certain animal populations, especially elephants.

Protected areas managers now have up-to-date detailed results for urgent conservation actions to be taken. At the level of Cameroon for example, the results were officially presented to the government and other stakeholders on November 25, 2016, in order to alert the authorities on the gravity of the situation.

This report is, therefore, a special call at national and international levels for the mobilization of all stakeholders and resources to safeguard the megafauna of the Congo Basin through increased conservation efforts. The impact of field activities must be evaluated through an integrated biomonitoring program that is in line with international best practices and up-to-date methodology.

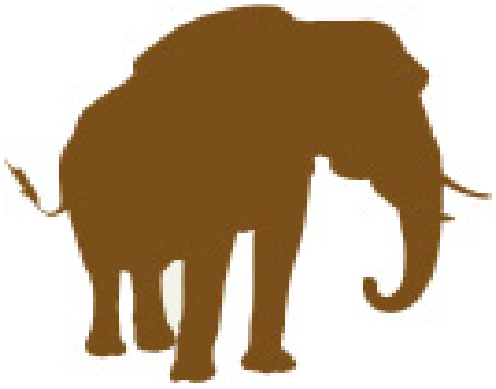


Conservation efforts must extend to peripheral sites because of the migration of certain animal populations, especially elephants

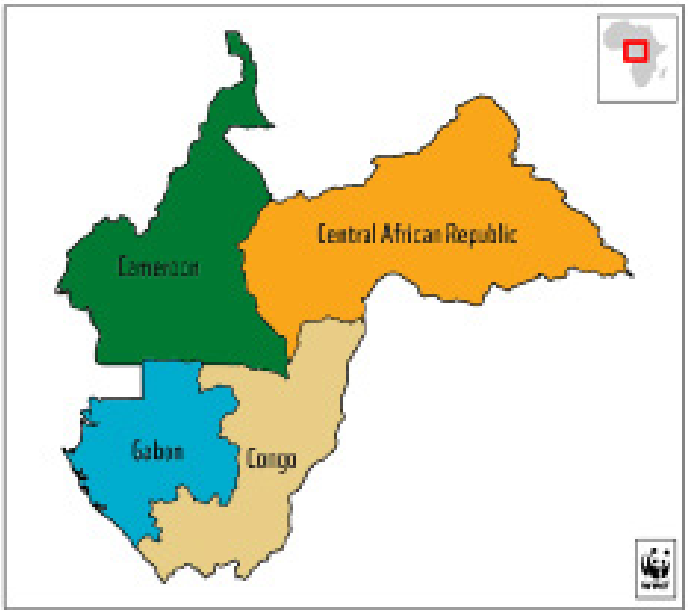
© naturepl.com / Anup Shah / WWF

RESUME

Les éléphants et les grands singes sont parmi les espèces prioritaires pour l'intervention du WWF dans le bassin du Congo où son travail se concentre sur 12 paysages et 21 sites prioritaires qui sont essentiellement des aires protégées. Le WWF travaille dans cinq pays, à savoir le Cameroun, le Gabon, la République Centrafricaine (RCA), la République Démocratique du Congo et la République du Congo. Une collaboration étroite avec les gouvernements locaux, les ONG de conservation et d'autres partenaires privés permet de mener des activités de conservation dans les aires protégées prioritaires et leurs zones périphériques contenues dans les paysages. Afin de fournir des informations à jour pour aider les gestionnaires dans leur prise de décision et finalement pour évaluer l'impact des activités de conservation, le WWF a redynamisé son programme de biomonitoring depuis mars 2014.



Dans le cadre de ce programme, le WWF a réalisé des inventaires de la faune couvrant une superficie de 5 850 000 hectares sur deux ans. Ces inventaires, organisés en sept phases, concernaient quatre pays, à savoir le Cameroun, la République du Congo, la République Centrafricaine et le Gabon, dans trois paysages de conservation, Campo Ma'an, Tri-National de la Sangha (TNS) et Tri-National Dja-Odzala-Minkébé (TRIDOM). En terme d'espace couvert par les inventaires, environ un quart de la superficie totale des trois paysages a été couvert. L'espace couvert au Cameroun a représenté 58% de la superficie totale couverte, tandis que la RCA, le Congo et le Gabon partagent respectivement 11%, 22% et 9% de la superficie étudiée. La plus grande partie (80%) des espaces couverts ont était dans les concessions forestières, les zones de chasse communautaires et d'autres types d'unités de gestion, le reste (20%) étant dans les aires protégées.



L'effort total, en quantité et en intensité, n'a jamais été atteint dans la région à cette échelle et sur une aussi courte période de temps. L'objectif principal de ces inventaires était d'établir le statut des populations de grands et moyens mammifères, ainsi que des pressions anthropiques dans les parcs nationaux et leur zone périphérie, en mettant l'accent sur les éléphants de forêts (Loxodonta cyclotis) et les grands singes: le chimpanzé (*Pan troglodytes*) et le gorille (*Gorilla gorilla*). Ces inventaires contribuent

également à alimenter les bases de données internationales pour les éléphants et les grands singes. La publication récente de l'UICN sur le statut des éléphants d'Afrique comprend les résultats de 20 sites inventoriés par le WWF en 2014 et 2015.

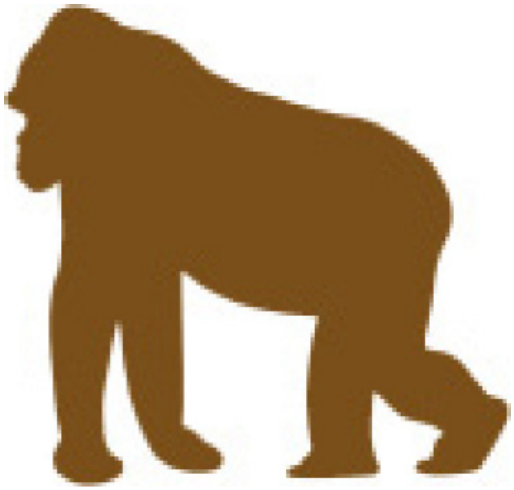
Les inventaires ont été réalisés avec la technique de transects en ligne, largement appliquée et reconnue internationalement pour les inventaires de la faune à travers le monde. La phase de collecte de données a couvert un effort total de 2845 km et a impliqué des communautés locales ainsi que des gestionnaires de zones protégées et des spécialistes de suivi écologique sous la supervision du WWF. En plus des coûts de 575 000 euro, la collecte de données a mobilisé 33 560 hommes-jours. Le personnel a également bénéficié de renforcement de capacités pour la collecte de données sur la faune ainsi que pour le traitement de données.

Les populations de gorilles et de chimpanzés représentent respectivement 75% et 25% des grands

Les populations de gorilles et de chimpanzés représentent respectivement 75% et 25% des grands singes dans la zone échantillonnée

© NATUREPL.COM / ANUP SHAH / WWF

singes dans la zone échantillonnée. Les résultats montrent que la superficie couverte contient une population estimée à 59 000 grands singes sevrés (avec un minimum et un maximum de 50 500 et 72 500 individus sevrés respectivement). Cela correspond à une densité moyenne de 1 individu sevré/km² dans la zone échantillonnée. La densité la plus faible se trouve dans le paysage de Campo Ma'an (0,54 individu/km²), tandis que les densités moyennes dans les paysages TRIDOM et TNS sont deux fois plus élevées. La population d'éléphants varie entre 7 000 et 13 500 individus, avec une estimation moyenne de 9 500 individus. La densité moyenne est de 0,16 individu/km²; la densité la plus élevée étant dans le paysage TNS (0,31 individu/km²) et le plus bas dans le paysage TRIDOM (0,10 individu/km²).



L'analyse des tendances de la taille des populations dans les sites prioritaires montre une stabilité générale des populations de grands singes, alors que celles des éléphants ont considérablement diminué. Bien que les éléphants soient restés relativement stables au parc national de Campo Ma'an (entre 2008 et 2014) et dans les Aires Protégées de Dzanga Sangha (entre 2012 et 2016) avec une variation d'au plus 11% dans l'estimation moyenne, ces valeurs moyennes ont diminué de manière significative au Parc National de Lobéké (51% entre 2002 et 2015), au Parc National de Nki (78% entre 2005 et 2015) et au Parc National de Boumba-Bek (90% entre 2011 et 2015). Ces fortes baisses sont attribuables au massacre massif d'éléphants pour l'ivoire, dont le commerce a augmenté de manière disproportionnée dans le monde au cours de la dernière décennie.

Cependant, il est important de noter que les efforts de conservation ont entraîné une réduction significative de la pression humaine dans les sites prioritaires par rapport à la zone périphérique (autres forêts), les activités de chasse étant réduites de moitié dans les sites prioritaires (parcs nationaux). Il en résulte une densité d'éléphants relativement plus élevée dans les parcs nationaux par rapport à l'extérieur. Cependant, la situation reste préoccupante, car les fonds affectés à la conservation restent bien inférieurs au minimum requis pour la plupart des sites. L'effort de conservation doit s'étendre aux sites périphériques en raison de la migration de certaines populations animales, en particulier les éléphants.

Les gestionnaires des zones protégées ont maintenant des résultats détaillés actualisés pour les actions urgentes

de conservation à prendre. Au niveau du Cameroun par exemple, une restitution officielle des résultats a été faite le 25 novembre 2016 afin d'alerter les autorités gouvernementales sur la gravité de la situation.

Ce rapport est donc un appel spécial aux niveaux national et international pour sauvegarder la grande faune du bassin du Congo grâce à des efforts de conservation accrus. Les activités sur le terrain doivent être évaluées pour leur impact grâce à un programme intégré de biomonitoring qui suit les meilleures pratiques internationales et une méthodologie à jour.

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Since 1978 significant efforts have been made by WWF in Central Africa to conduct wildlife inventories, support government-led anti-poaching and law enforcement, creation of Protected Areas (PAs), the development of community-managed areas, etc. WWF has an ambitious program in the Congo Basin that aims at stabilizing or increasing the population of key species, including great apes (chimpanzees, gorillas and bonobos), elephants and regularly hunted species such as monkeys and duikers. The program recognizes the importance of biomonitoring in the implementation of its activities. WWF lays emphasis on monitoring trends of wildlife populations and to assess the conservation impact of its activities.

In order to ensure better monitoring, assessment and optimization of its conservation activities in the Congo Basin, WWF has committed to engage in a well-structured and coordinated program based on existing capacities in countries as well as on the support of a dedicated biomonitoring coordinator focusing on the Congo Basin. This move has boosted activities under a harmonized survey protocol. It has also increased collaboration with other NGOs, universities and research institutes and contributed in ensuring that inventories are carried out following internationally recognized methods and standards.

This report presents the main achievements of the Congo Basin Biomonitoring Program on wildlife surveys with regards to its priority species and sites, from July 2014 up to June 2016 and the new challenges for the next steps.

METHODOLOGY

In the first semester of 2014, WWF launched a harmonized methodology for wildlife surveys in its priority landscapes in the Congo Basin (N'Goran 2015; N'Goran et al. 2014). Led by the regional biomonitoring coordinator for Central Africa, this improved standardized methodology has been applied in all completed surveys since July 2014.

The survey protocol is similar to the one followed by the Wildlife Conservation Society (WCS) and widely used in Central Africa and in other parts of the world for large mammal surveys (Maisels et al. 2012a; Maisels et al. 2012b; Maisels et al. 2013b). Surveys were conducted using line transect techniques from the Distance Sampling methodology (Buckland et al. 1993; Buckland et al. 2001). These line transect surveys were combined with reconnaissance walk data collection. As compared to the previously used methodology, some adaptations related to great ape nest count were made to the survey protocol after discussions with the Distance Sampling team through the Max-Planck Institute for Evolutionary Anthropology in Leipzig.

In total, seven surveys were completed in three landscapes (TRIDOM: Tri-national Dja-Odzala-Minkébé, TNS: Sangha Tri-National, and Campo Ma'an) in four countries (Cameroon, Gabon, Republic of Congo and Central African Republic) (Figure 1). All seven surveys targeted five WWF priority sites defined in the WWF strategic plan (Campo Ma'an National Park, Lobéké National Park located in TNS-Cameroon, Boumba-Bek and Nki National Parks located in TRIDOM-Cameroon and the Dzanga Sangha Protected Areas located in TNS-CAR) as well as two other areas of interest (the Djoua-Ivindo and the Messok-Dja forests located in TRIDOM-Congo, and the Djoua-Zadié forest in TRIDOM-Gabon).

The extension of the survey coverage to other types of forests used zones including hunting zones, logging concessions and community forests was aimed at taking into account the non-restriction to protected areas of animal ranges across the landscapes. This way of designing surveys increases the precision in the density and abundance estimates in landscapes for elephants and great apes that may range beyond the limit of a specific protected area. In addition, resulting spatial distribution maps can help identify areas of connection between different types of forest, improve management plans and the identification of wildlife corridors.

National Parks (Campo Ma'an, Lobéké, Boumba-Bek, Nki, and Dzanga-Ndoki) covered about 20 % of the surveyed area while other forests represented 80% of the total area (Table 1).

Prior to each survey, a two-week training session was organized for survey team members to ensure quality data collection. Close supervision was carried out to check data quality regularly during and after data collection. An additional training of one week was organised for data analysis. The final objective of these training sessions involving WWF staff, local communities as well as government staff was to strengthen local capacities for the implementation of wildlife surveys.

Table 1. Area covered by type of forest management units

Type of forest (Number of sites)		Area (ha)		Coverage (%)
National Parks	National Parks	1,163,363	1,163,363	19.90
Other forests / sites	Logging Concessions	2,956,987	4,684,117	80.10
	Hunting zones & Communal forests	968,857		
	No formal status	758,273		
Total (Sites were divided into 47 strata during surveys)		5,847,480	5,847,480	100

(Two forest statuses were created: National Parks and Other forests. Other forests are constituted by logging concessions, communal forests, hunting zones and not classified forests).

Density and abundance estimates using the Distance Sampling software (Thomas et al. 2010; Thomas et al. 2014) with 95% confidence interval was made. All data were pooled to get estimates of great apes and elephants at regional level based on all area covered. Three types of strata were considered: (1) survey sites (data from each planned survey), (2) landscapes (data grouped by landscape) and (3) type of forest (data grouped by national parks and non-national parks).

In addition, a summary of survey efforts, encounter rates of human pressure, abundance and density distribution maps, as well as comparison graphs for abundance or densities were made.

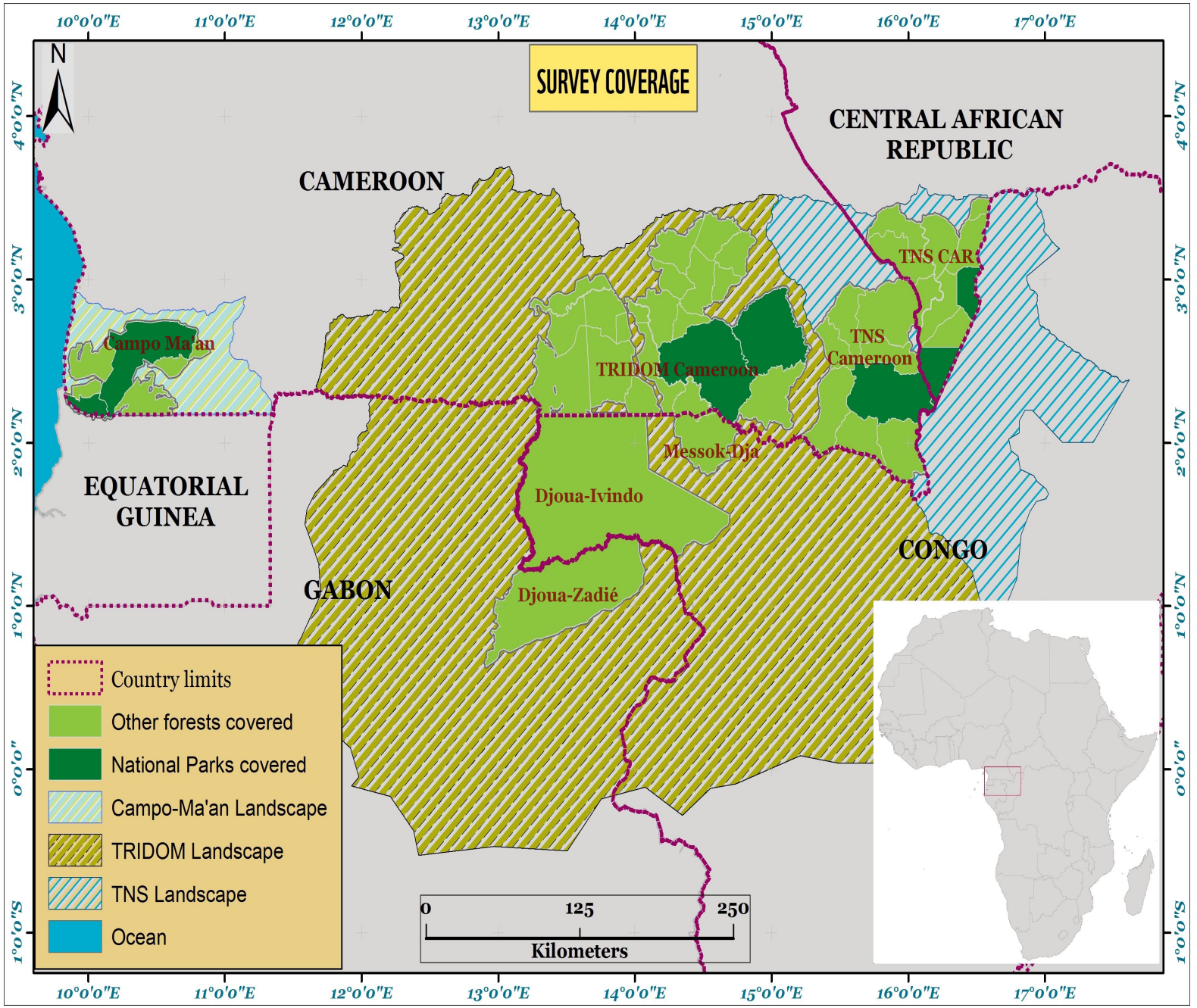


Figure 1. Survey coverage areas in landscapes and countries where WWF works in the Congo Basin

SCALE OF EFFORT MADE

Based on the survey protocol, seven large and medium sized mammal surveys were designed and completed. The total area covered is about 5,850,000 hectares over three priority landscapes and four countries. The first survey was completed in 2014, three others were completed in 2015 and the last three in 2016, with a total effort of 2,875 km of transects walk (Table 2).

Table 2. Survey effort in terms of distance of transects, costs and area covered

Landscape	Country	Completed surveys	Duration	Area covered (ha)	Total length of transects (km)	Budget (Euro)
Campo Ma'an	Cameroon	Campo Ma'an	Jul14 - Nov14	460,960	539	84,000
Sangha Tri-National (TNS)	Cameroon	TNS-Cameroon	Aug14 - Mar15	934,884	797	107,000
	Central African Republic	TNS-CAR	Sep15 - Mar16	639,688	416	74,000
Tri-National Dja-Odza-la-Minkebe (TRIDOM)	Cameroon	TRIDOM-Cameroon	Jan15 - Oct15	1,982,100	728	180,000
	Republic of Congo	Djoua-Ivindo Forest	Sep14 - May15	1,141,460	148	50,000
	Gabon	Djoua-Zadié Forest	Aug15 - Jan16	544,378	113	45,000
	Republic of Congo	Messok-Dja Forest	Oct15 - Apr16	144,010	134	35,000
TOTAL				5,847,480	2,875	

The combined total cost of these surveys was euro 575,000 and involved 33,560 man-days. More than 400 people including WWF staff, local communities and government staff were trained, of which 376 were selected for data collection based on their performance (Table 3). WWF national and regional staff supervised the field data collection, analysed the data and wrote the technical reports.

Table 3. Survey effort in terms of human resources involved and time spent

Completed surveys	Supervision staff	Data collection staff	Number of teams involved	Number of days per team	Number of man-days
Campo Ma'an	3	80	10	56	4,480
TNS Cameroon	4	80	10	90	7,200
TNS CAR	3	40	5	84	3,360
TRIDOM Cameroon	4	120	15	105	12,600
Djoua-Ivindo Forest	3	24	3	120	2,880
Djoua-Zadié Forest	3	16	2	90	1,440
Messok-Dja Forest	3	16	2	100	1,600
TOTAL / MEAN*	14**	376	47	92.14*	33,560

(*) Average / (**) Cumulated total

The survey coverage represents almost 25% of the total area of the three landscapes, with Campo Ma'an and TNS landscapes most widely covered (Table 4). TNS Cameroon and TNS CAR had the highest percentage of areas covered while the lowest survey coverage was in TRIDOM Congo and TRIDOM Gabon (Table 5). However, large areas of TRIDOM Congo were covered by surveys conducted by African Parks (Odzala NP) and WCS (IFO-Ngombe FMU and Ntokou Pikounda NP), while in TRIDOM Gabon ANPN (Agence National des Parcs Nationaux) is carrying out a national inventory covering Minkébé and Mwagna NPs.

Table 4. Area covered by landscape

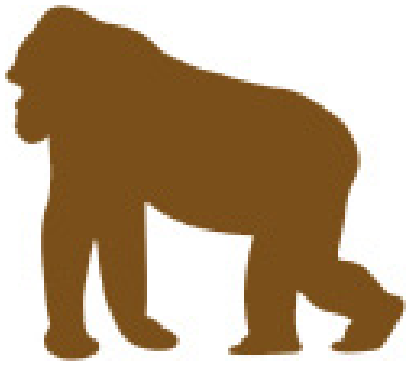
Landscapes	Area (km²)	Covered Area (km²)	Coverage Rate (%)
Campo-Ma'an	10635.43	4609.63	43.3
TRIDOM	181733.11	38119.45	21
TNS	43977.08	15745.72	35.8
TOTAL	236,345.63	58,474.8	24.7

Table 5. Area covered by landscape segment in countries

Landscapes per Country	Area (km²)	Covered Area (km²)	Coverage Rate (%)
TNS Cameroon	14978.27	9348.84	62.4
TNS CAR	7956.47	6396.88	80.4
TRIDOM Cameroon	49487.75	19821	40.1
TRIDOM Congo	65391.3	12854.67	19.7
TRIDOM Gabon	67910.73	5443.78	8
Campo Cameroon	10635.43	4609.63	43.3

RESULTS AT REGIONAL LEVEL FOR PRIORITY SPECIES

GREAT APES



All specific estimates from surveys revealed in survey reports (Allam et al. 2017; Allam et al. 2016; N'Goran et al. 2016; Nzooh Dongmo et al. 2016a; Nzooh Dongmo et al. 2016b; Nzooh Dongmo et al. 2015) give a mean abundance of 57,595 great ape weaned individuals over a total survey area of 5,850,000 ha (Figure 2). All pooled data analyzed by (1) survey site, (2) landscape, and (3) forest type give respectively:

(1) 58,800 [Confidence Interval: 50,900 – 67,900] great ape weaned individuals with an associated density of 1.02 [CI: 0.88 – 1.17] weaned individual / km² and a 7.36% Coefficient of Variation (CV).

(2) 62,445 [CI: 53,790 – 72,490] great ape weaned individuals living at a density of 1.07 [CI: 0.92 – 1.24] weaned individual / km² and a CV of 7.61%.

(3) 59,630 [CI: 51,270 – 69,345] great ape weaned individuals with a density of 1.04 [CI: 0.89 – 1.20] weaned individual / km² and a CV of 7.7%.

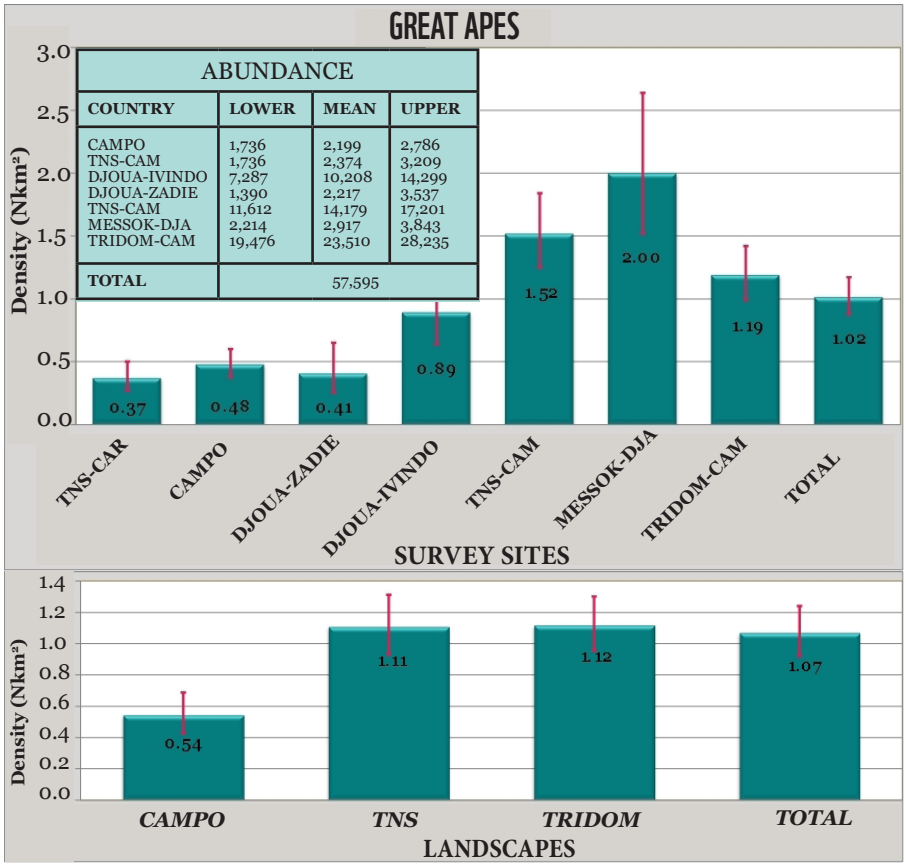


Figure 2. Comparison of Great Apes density between landscapes and survey sites

The above changes in great apes density estimates are due to stochastic effects drawn from the consideration of different base strata (survey sites, landscapes and type of forests); this affected the detection probability function and thus the density estimates.

From these results, we derived a population size of 59,000 weaned great apes ranging from 50,500 to 72,500 weaned individuals in the covered area. The mean density in the region is about 1.03, ranging from 0.87 to 1.24 weaned individual / km^2. This population is mainly made up of gorillas (75%) with a very low density of chimpanzees over the surveyed area. In specific areas such as Campo Ma'an and Djoua-Ivindo, chimpanzee populations were estimated to be almost of the same proportion as gorilla populations; some difficulties in detecting chimpanzee nests in very tall trees may influence their density estimates.

Detailed results show very low densities of great apes, below the general mean density, in Campo Ma'an landscape, TNS CAR and Djoua-Zadié forest. Among the landscapes, Campo Ma'an has the lowest density of great apes, while great apes are relatively abundant in TRIDOM and TNS. As shown in figure 3, the northern part of TNS CAR is devoid of great apes, whereas there is a huge concentration of great ape population in Dzanga Sangha Protected Areas where WWF has been supporting conservation activities for over 25 years alongside Central African Republic Ministry in charge of wildlife.

…a population size of 59,000 weaned great apes ranging from 50,500 to 72,500 weaned individuals in the surveyed area

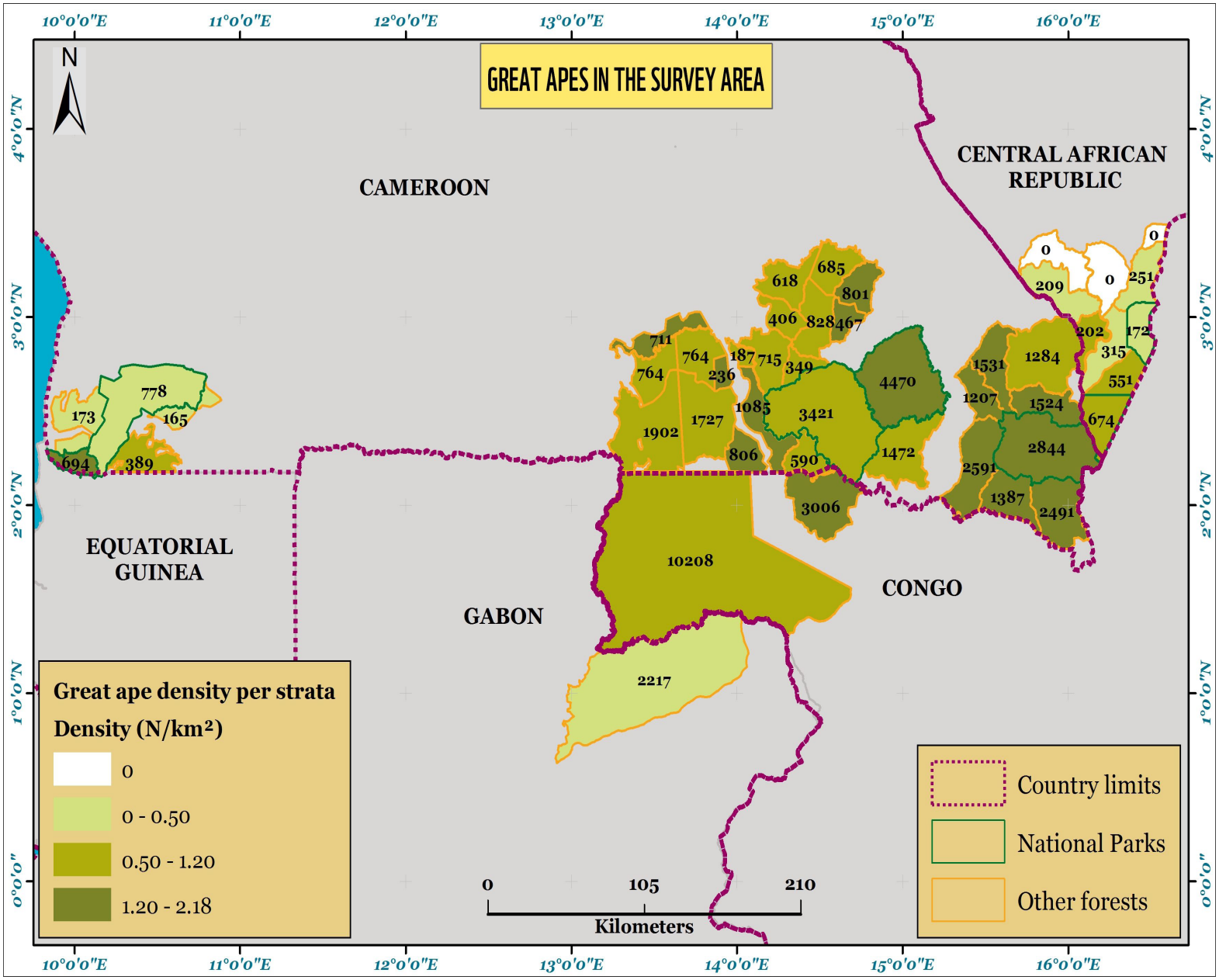


Figure 3. Spatial distribution of Great Ape density and abundance

©Jaap van der Waarde/WWF

ELEPHANTS

Elephant abundance estimation per survey (Allam et al. 2017; Allam et al. 2016; N'Goran et al. 2016; Nzooh Dongmo et al. 2016a; Nzooh Dongmo et al. 2016b; Nzooh Dongmo et al. 2015) showed 8,982 individual elephants by summing all average estimates (Figure 4). Pooled data analyzed per (1) survey site, (2) landscape, and (3) forest type revealed the following densities:

(1) 9,020 [CI: 7,310 – 11,125] elephant individuals with a density of 0.15 [CI: 0.12 – 0.19] individual/km² with a 10.72% CV.

(2) 9,350 [CI: 7,530 – 11,608] individuals living at a density of 0.16 [CI: 0.13 – 0.204] individual/km² and a CV of 11.06%.

(3) 10,700 [CI: 8,540 – 13,430] individuals with a density of 0.18 [CI: 0.15 – 0.23] individual/km² and a CV of 11.58%.

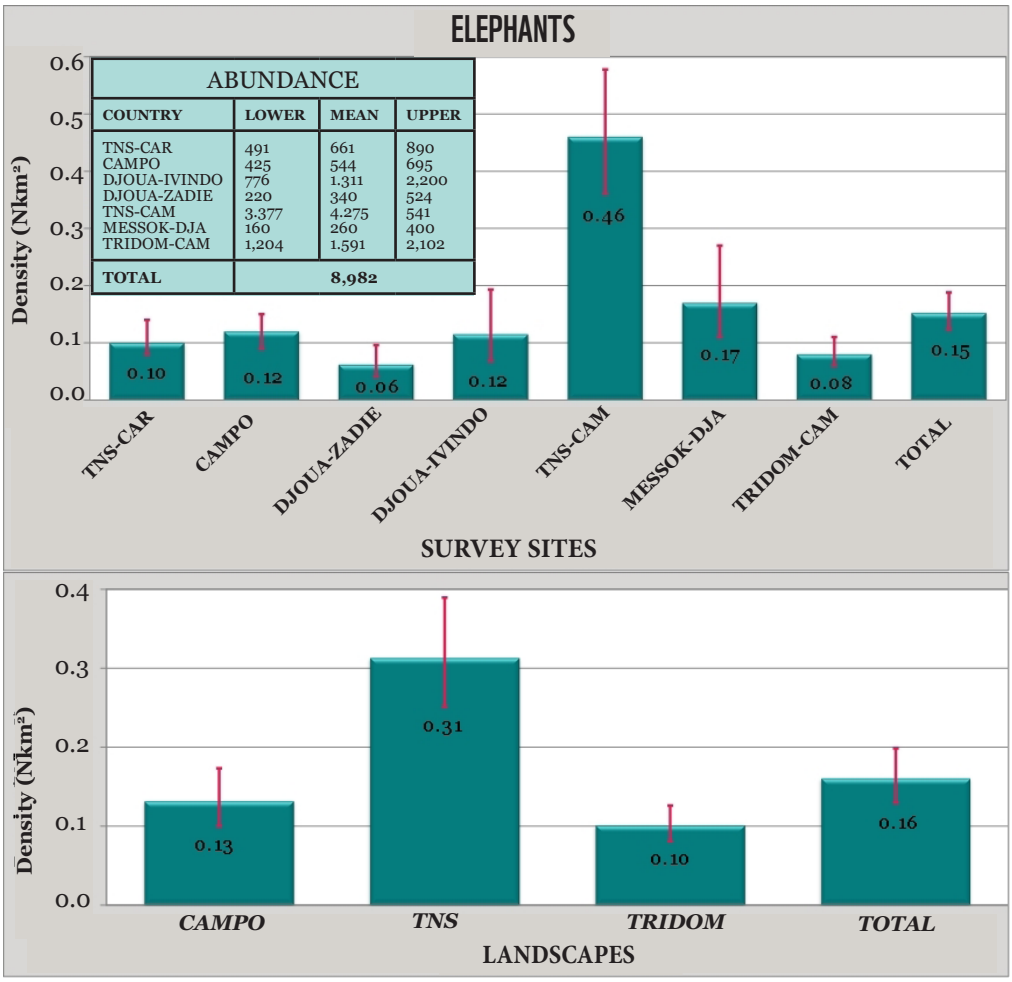


Figure 4. Comparison of Elephant density between landscapes, countries and survey sites

Elephant populations are estimated at 9,500 individuals, ranging from 7,000 to 13,500 individuals, in the total surveyed area. The mean density is 0.16 individual / km² with a lower limit of 0.12 individual / km² and an upper limit of 0.23 individual / km².

Detailed results show lower densities of elephants in TRIDOM Cameroon and the Djoua-Zadié forest in Gabon. In general, the TRIDOM landscape holds the lowest density of elephants while the TNS landscape still contains areas of high densities. Specific reports from surveys indicate a very high poaching rate in TRIDOM, particularly in TRIDOM Cameroon where about three elephants are estimated to be killed per day (Nzooh Dongmo et al. 2016a).

The distribution map also shows few management units where elephant densities are above 0.20 individual / km². As is the case with great apes, there are no elephants in the northern part of TNS CAR (Figure 5).

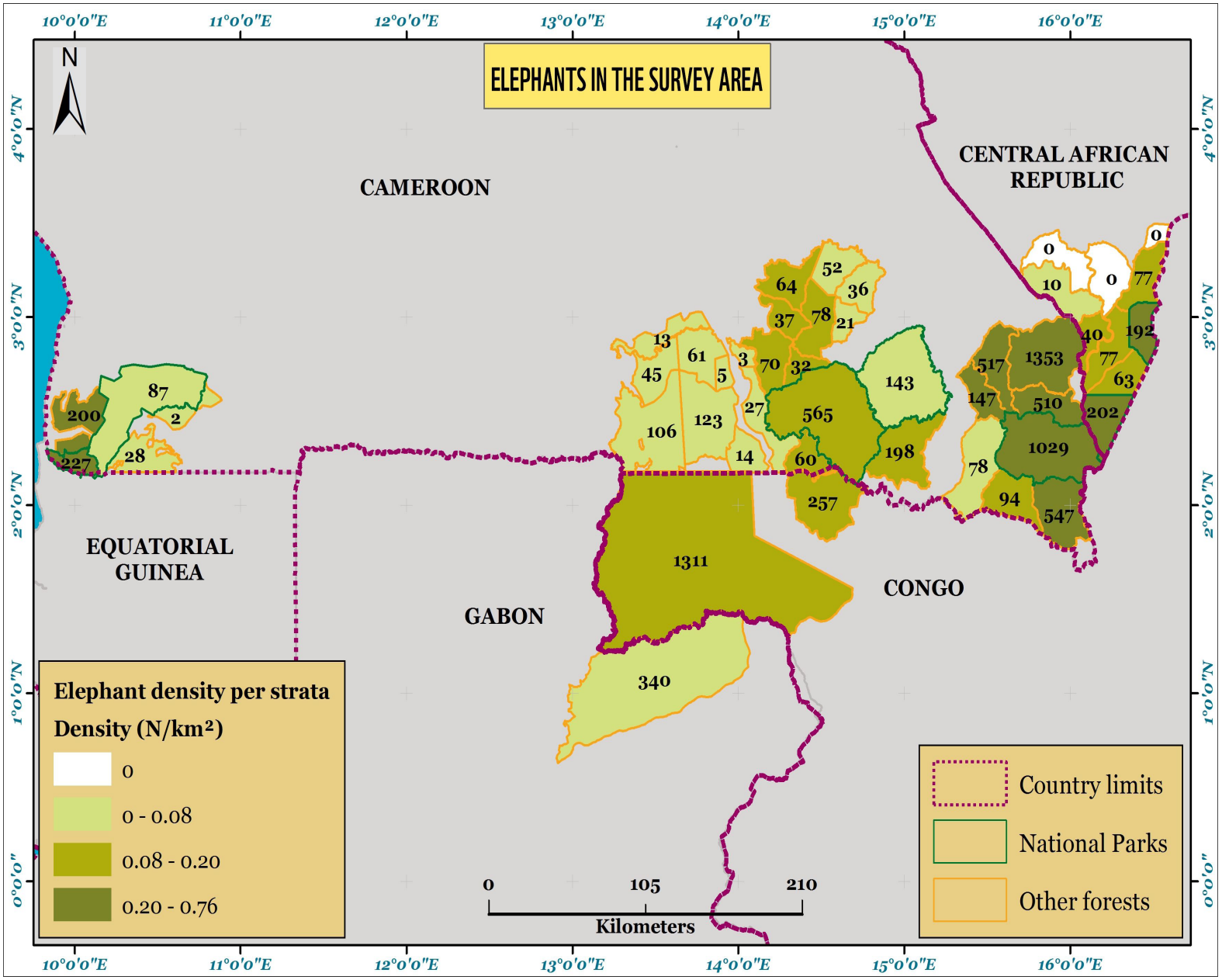


Figure 5. Spatial distribution of Elephant density and abudance


© Michael Goldwater / WWF

HUMAN PRESSURE ON PRIORITY SPECIES

Human activities (such as hunting with guns or traps, illegal mining, illegal logging, etc.) threaten large and medium mammal species. Data collected from different sites indicate disturbing situations that need to be urgently addressed. As presented in table 6, human pressure is very high in all landscapes, with the highest recorded in Campo Ma'an and TNS.

Detailed data show that Campo Ma'an, TRIDOM-Cameroon and TNS-CAR are the most impacted by human activities while the Djoua-Zadié and Djoua-Ivindo forests suffer less pressure (Allam et al. 2017; Allam et al. 2016; N'Goran et al. 2016; Nzooh Dongmo et al. 2016a; Nzooh Dongmo et al. 2016b; Nzooh Dongmo et al. 2015).

Table 6. Hunting and all human activity encounter rates (number/km) in the survey areas (HS SE: standard error for hunting signs; HA SE: standard error for human activities)

MARCO-ZONE CONSIDERED		HUNTING SIGNS	HS SE	HUMAN ACTIVITIES	HA SE
LANDSCAPES	Campo Ma'an	0.721	0.055	3.012	0.153
	TNS	0.490	0.028	3.049	0.133
	TRIDOM	0.306	0.027	2.437	0.133
SURVEY ZONES	TNS-CAR	0.628	0.052	4.830	0.284
	Djoua-Ivindo	0.154	0.054	1.236	0.253
	Djoua-Zadie	0.026	0.015	0.875	0.141
	TNS-CAM	0.415	0.031	2.087	0.111
	Messok-Dja	0.186	0.047	2.153	0.320
	TRIDOM-CAM	0.400	0.038	2.967	0.155
TOTAL AREA		**0.491**	**0.021**	**2.828**	**0.078**

Low hunting pressures were observed only in the Messok-Dja, Djoua-Ivindo and Djoua-Zadié forests. In general, about three human activity signs were found per km walked and one hunting sign was found every 2 km walked.

Distribution maps of both hunting signs and all human pressure signs show an irregular distribution of threats across landscapes (Figures 6 & 7). Very high hunting rates (> 1 sign/km) were found in the northern parts of TRIDOM Cameroon, TNS-CAR, and Campo Ma'an landscapes. As shown in specific survey reports, core protected areas are less impacted by hunting activities as compared to other sites (i.e. logging concessions).

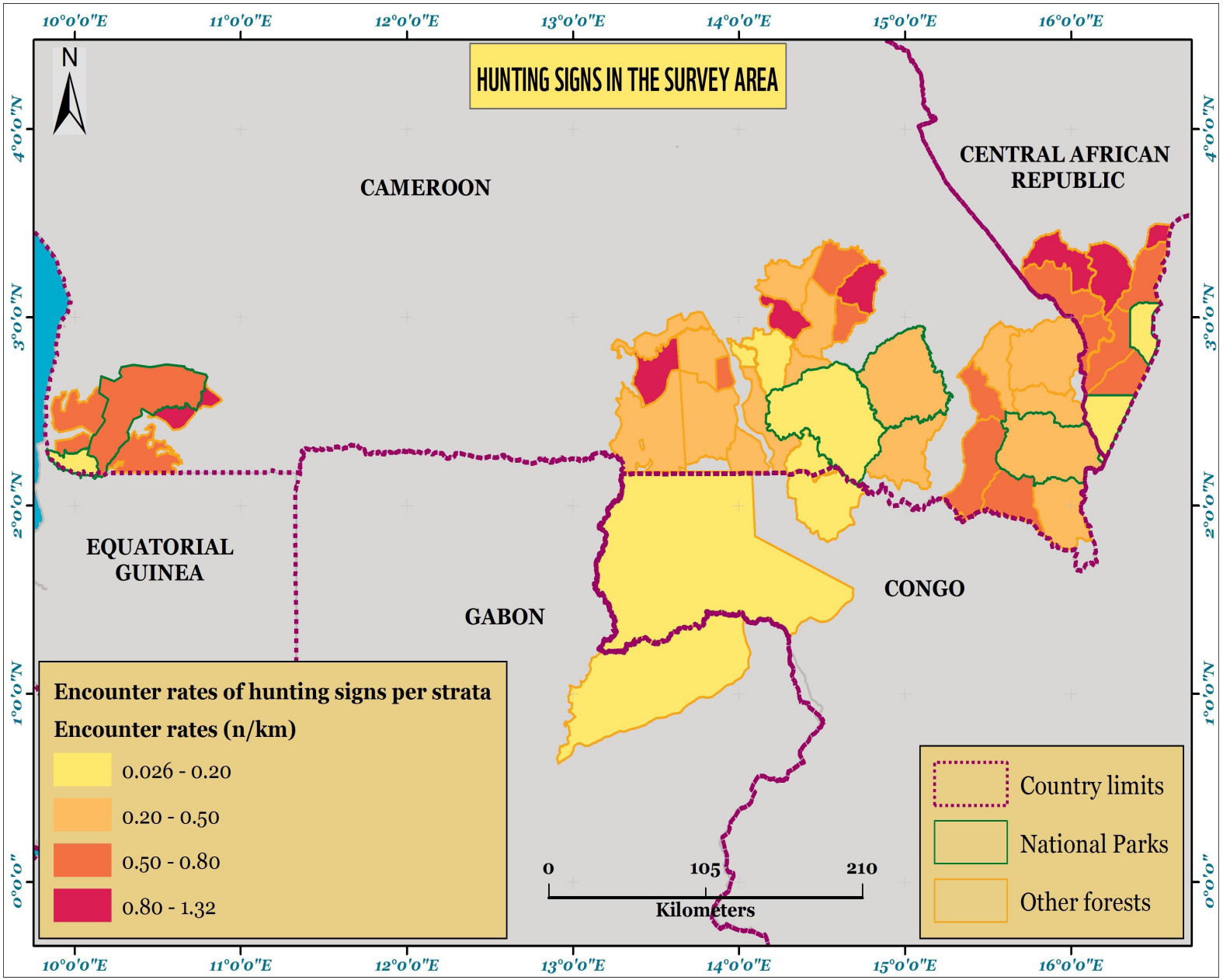


Figure 6. Spatial distribution for the relative abundance of hunting signs

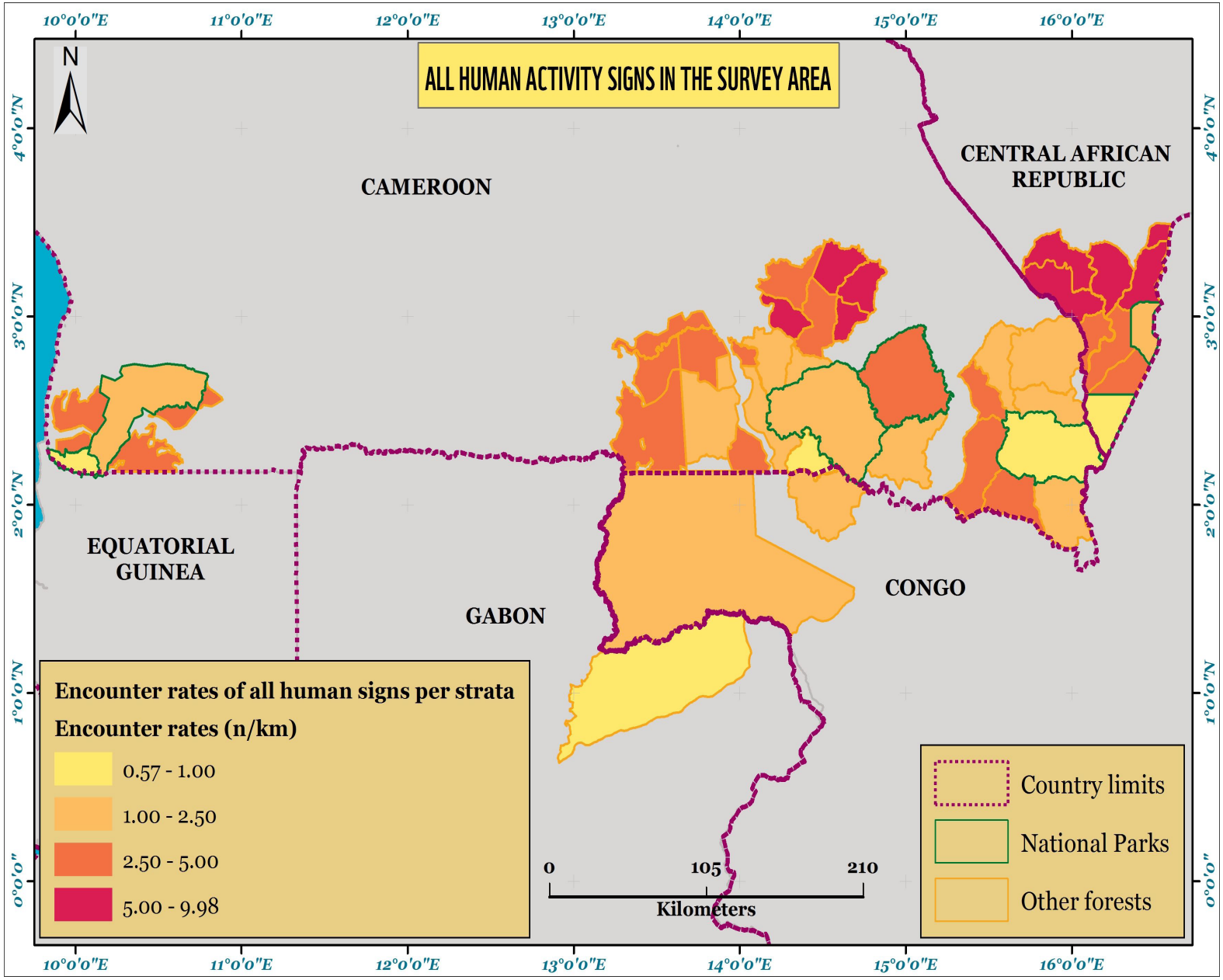


Figure 7. Spatial distribution for the relative abundance of all human activity

RELEVANT CONSERVATION IMPACTS ON PRIORITY SPECIES

Density estimates for national parks and non-national parks reveal the impacts of conservation measures taken by WWF and its partners to protect wildlife in the region (Figure 8). Results show that great ape density is almost the same in national parks as well as in immediate adjacent forests, but elephant density is higher in national parks.

Human pressure and consequently hunting pressure are lower in national parks that are the main targets of conservation activities compared to other forest management units (Figure 9). This positively affects elephant distribution and density, a species currently under high poaching pressure for its ivory as demonstrated by surveys conducted in the region (Nzooh Dongmo et al. 2016a; Nzooh Dongmo et al. 2016b).

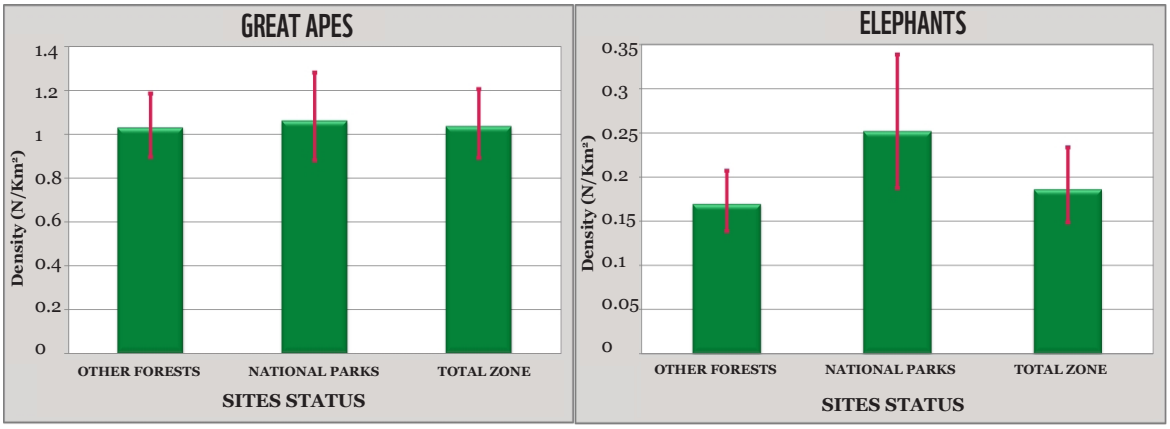


Figure 8. Comparison of Great Ape and Elephant density between National Parks (PN) and other sites

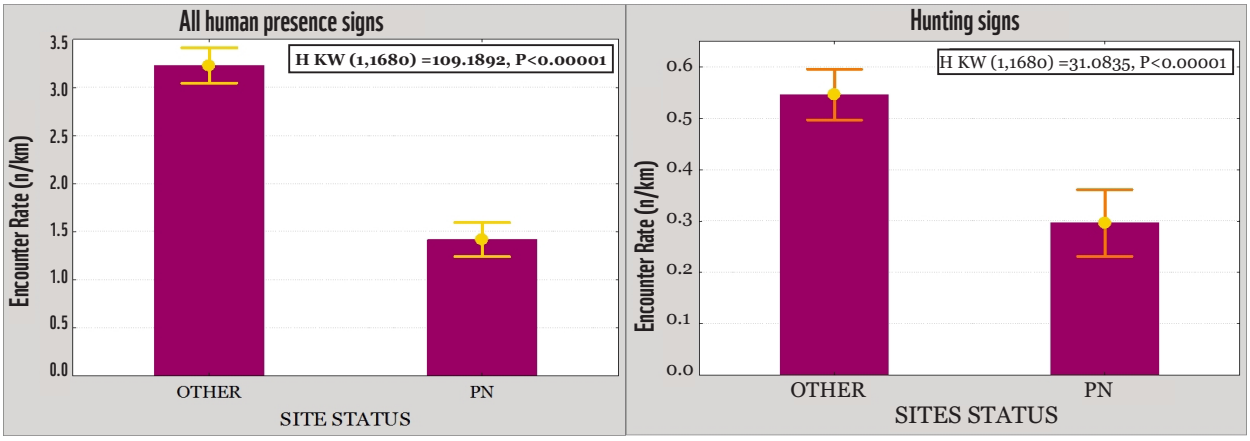


Figure 9. Comparison of human pressure encounter rates between National Parks (PN) and other sites

(H KW: H value for Kruskal-Wallis test by ranks, p: p-value, with in total 1680 values representing encounter rate record per transect)

TREND ANALYSIS IN PRIORITY LANDSCAPES AND SITES

WWF has obtained new estimates of elephant and great apes abundance in its priority sites. From these new estimates, we have analyzed possible trends based on previous estimates. It is important to mention that all estimates are not necessarily fully comparable; we are making comparisons between the results reported from previous surveys and those achieved in current surveys.

Some variations in population estimates may be caused by slight differences in survey techniques as well as non-appropriate use of conversion parameters which are the nest/dung decay rates and their production rates (N'Goran 2015; N'Goran et al. 2014). These two parameters are used to convert the nest/dung densities into great ape/elephant densities after surveys. It is recommended to estimate these parameters during surveys, but this was rarely done because of field and financial constraints. In spite of these methodological constraints, we are sure that current trends give valuable insights on the status of great apes and elephants in the region.

For great apes in particular, less poaching pressure compared to that on elephants was evident during the surveys. Very few great ape carcasses (only four on transects) were discovered during the survey period in the past years, while 31 elephant carcasses were found on transects. This also indicates that fatal epidemic diseases such as Ebola have likely not contributed to significantly reduce great ape population in the region. Observed great ape population decline in some sites may not be correct as it may be the consequence of survey biases. An in-depth analysis of the survey protocol used before recent harmonization in 2014 and the quality of data collected before 2014 revealed the impact of nest count by site or group (several nests considered to belong to great apes group taken as a record), on density estimates due to systematic errors observers may have made; the current protocol considers each individual nest as a record (N'Goran 2015; N'Goran et al. 2014).

These biases can vary according to the observers and may lead to underestimation or an overestimation of the population size according to the type of error created by the observers. This made it difficult to compare density/abundance estimates in great apes over time for several sites. We can however consider current great ape estimates as baseline and carefully observe the population trends in future years. For sites where comparisons reveal large differences in estimates over time, special attention needs to be given to evaluate if these declines could have been indeed due to high poaching rates or other factors (such as diseases) or are rather due to methodological errors in previous surveys conducted.

CAMPO MA'AN: CAMPO MA'AN NATIONAL PARK

In Campo Ma'an National Park, hunting pressure is relatively high, but it decreased by more than 50% from 2008 (1.05 sign/km) to 2014 (0.44 sign/km). Anti-poaching effort led to a relative stability in elephant and great apes populations (Nzooh Dongmo et al. 2015)

(Figure 10).

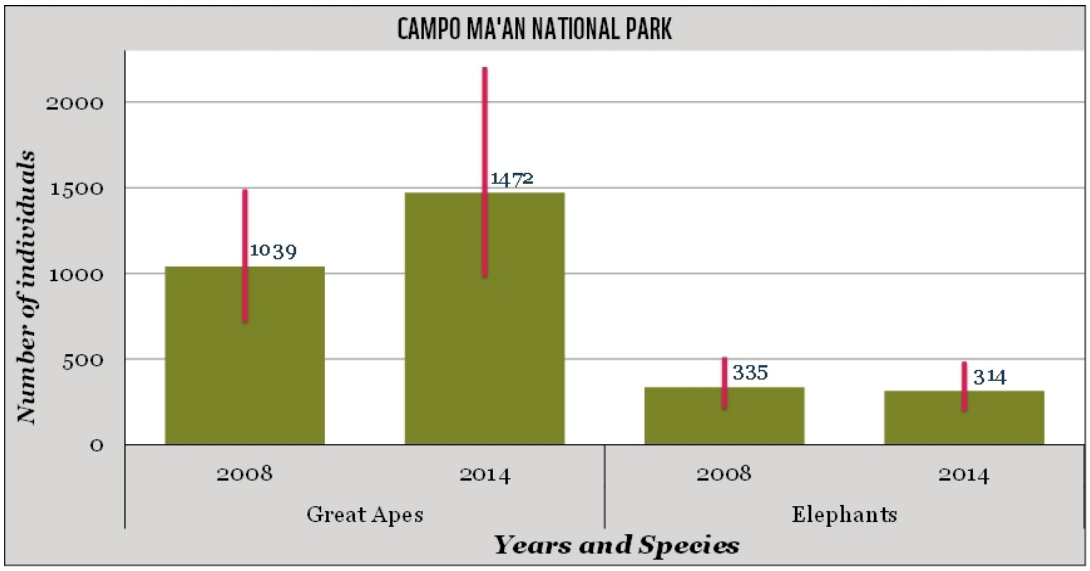


Figure 10. Evolution of great ape and elephant populations in Campo Ma'an National Park

TNS CAMEROON: LOBEKE NATIONAL PARK

In TNS Cameroon, particularly in Lobéké National Park, hunting pressure has been increasing by more than 40% from 2009 (0.17sign/km) to 2015 (0.25 sign/km); but when considering the 2002 encounter rate (0.11 sign/km), we noticed an increase rate higher than 100% (Nzooh Dongmo et al. 2016b).

Such an increase in hunting pressure has had negative impact on large mammal populations. A relative stability of great apes was observed between 2002 and 2006, and between 2009 and 2015 (Figure 11). It is difficult to conclude on any real decrease due to hunting for two

reasons: (1) great apes are not the first target of poaching in the region, and (2) biases were noticed in previous survey techniques as described previously.

On the contrary, elephant populations faced a constant decrease from 2006 to 2015 due to poaching activities evidenced by the number of elephant carcasses recorded during anti-poaching patrols. When considering the 2002 estimate, we noticed a shocking 51% decrease in the mean abundance as compared to new figures (Figure 11).

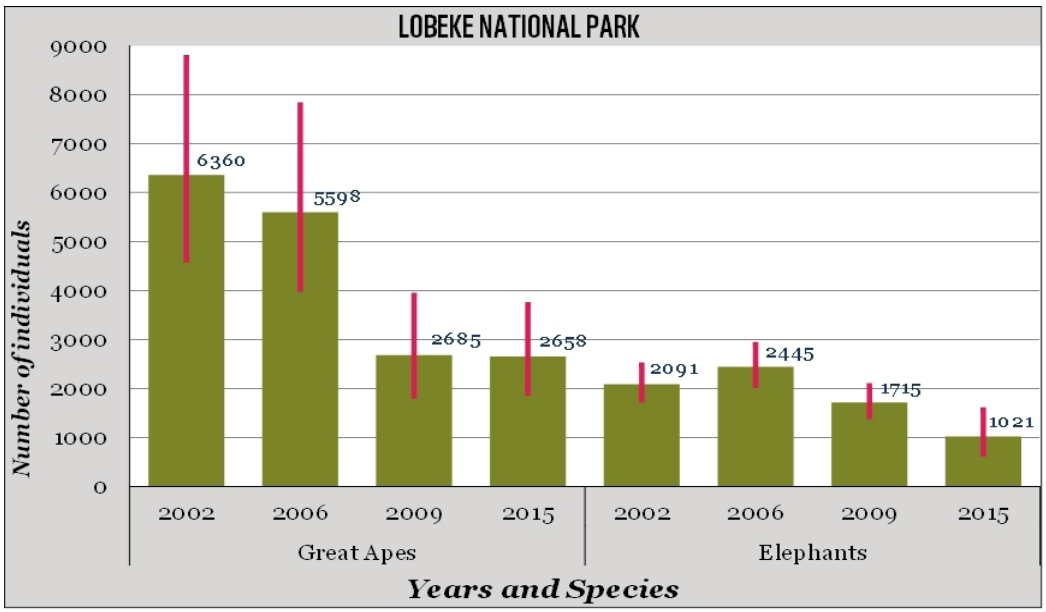


Figure 11. Evolution of great ape and elephant populations in Lobéké National Park

TRIDOM CAMEROON:

BOUMBA-BEK NATIONAL PARK, NKI NATIONAL PARK AND NGOYLA MINTOM FORESTS

From the number of carcasses found during the surveys in 2011/2012 and 2015, we were able to estimate an average of 3 to 4 elephants killed per day in the Cameroon segment of the TRIDOM landscape (Nzooh Dongmo et al. 2016a). The increased rate of human pressure in TRIDOM Cameroon per site ranges from 50% to 200%.

Most hunting activities are focused on elephant

poaching for ivory. Considering the mean estimate, there was a 93% drop in elephant population, in Boumba-Bek National Park from 2011 to 2015 (Figure 12), 78% in the Nki National Park from 2005 to 2015 (Figure 13), and 72% in the Ngoyla Mintom forests from 2011 to 2015 (Figure 14).

Higher decline rates in Boumba-Bek National Park may be due to the higher dung decay rate used in the recent study. Indeed, the 2012 report of Boumba-Bek mentioned 67 days for dung decay mean time (Maisels et al. 2012a); our study used a 96-day dung decay mean time estimate in TNS Cameroon (Nzooh Dongmo et al. 2016b). If we considered a smaller decay rate, the population of elephants would have been 205 individuals, indicating a decrease of about 90%.

There is a relative but not statistically significant increase of great ape populations in Boumba-Bek, and a relative significant decrease in Nki and Ngoyla-Mintom. These trends may be due to possible protocol errors or the effects of conversion parameters such as the nest decay rate used to convert nests density into great apes density. We may retain that current figures represent updated population sizes that will be the basis for comparison in future.

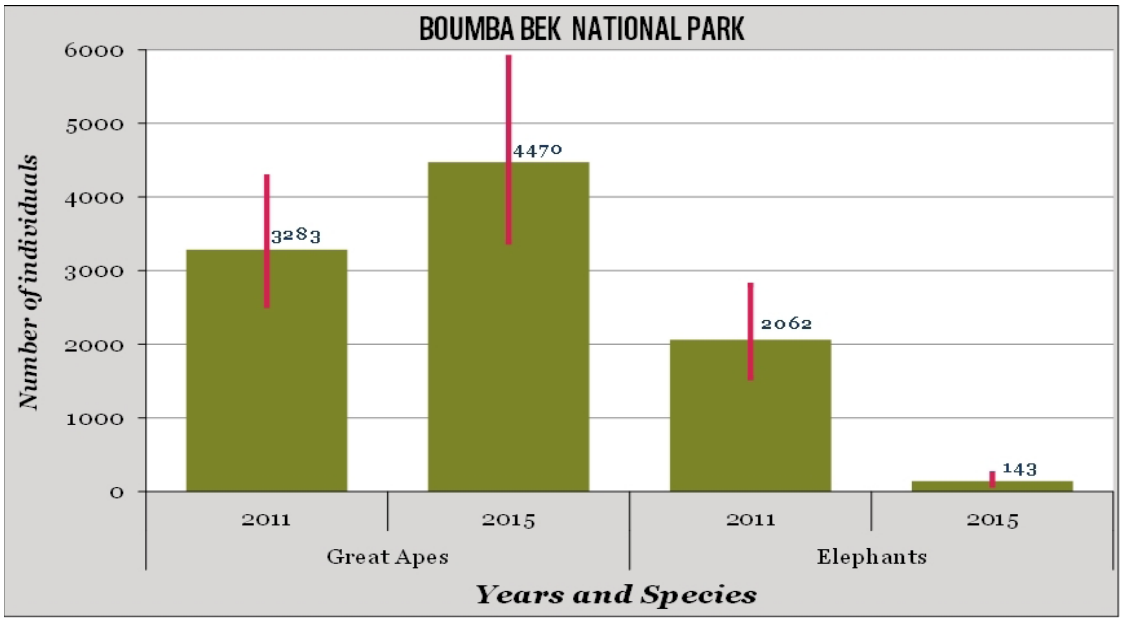


Figure 12. Evolution of great ape and elephant populations in Boumba Bek National Park

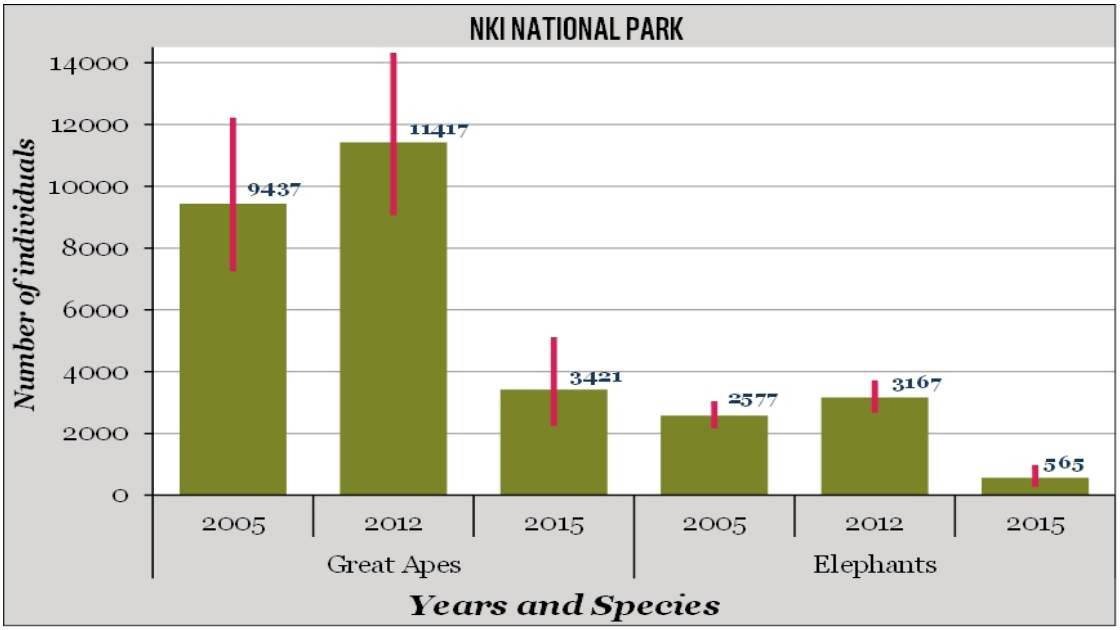


Figure 13. Evolution of great ape and elephant populations in Nki National Park

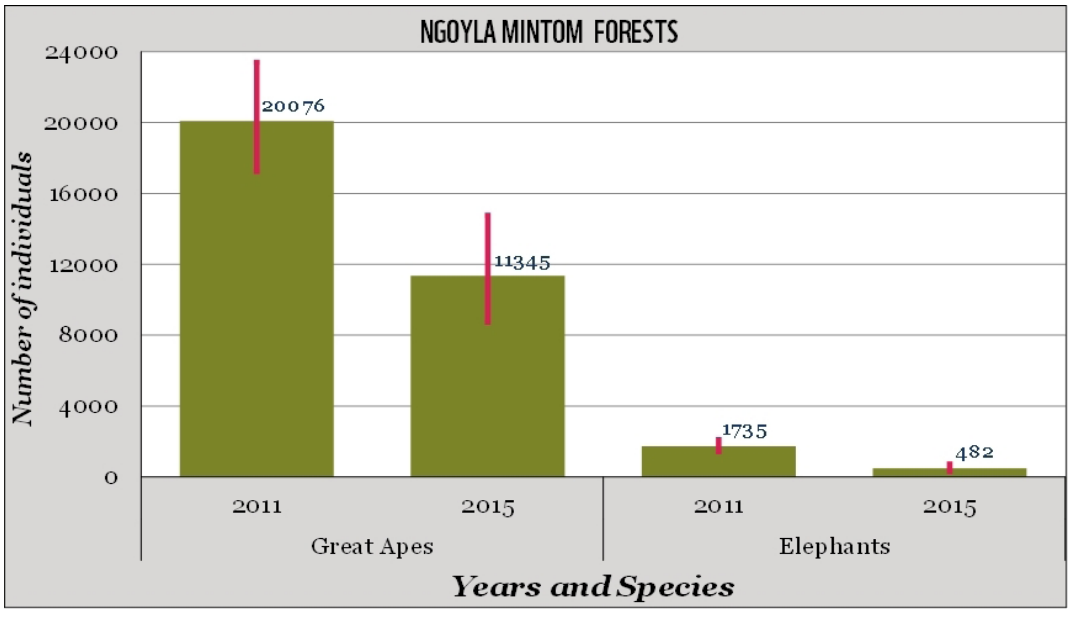


Figure 14. Evolution of great ape and elephant populations in the Ngoyla Mintom forests

TNS CENTRAL AFRICAN REPUBLIC: DZANGA SANGHA PROTECTED AREAS

In TNS Central African Republic, the main area under conservation is the Dzanga Sangha Protected Areas (DSPA) where two sectors are assigned as national parks, one sector as community hunting zone and four other sectors recently assigned as logging concessions (N'Goran et al. 2016).

The recent survey revealed a very high increase in human pressure (70%) from 2011 to 2016; but this increase has not yet impacted the abundance of great apes and elephants. From figures 6 and 7, it is obvious that most human pressure is concentrated in the north, in the relatively empty zone as reported in 2012 (Princée 2013).

Even if the pressure is shifting south, there is still a relative stability in great ape and elephant populations in the DSPA from 2012 to 2016 (Figure 15). The increasing human pressure may slightly affect the mean population estimate that decreased by about 10%.

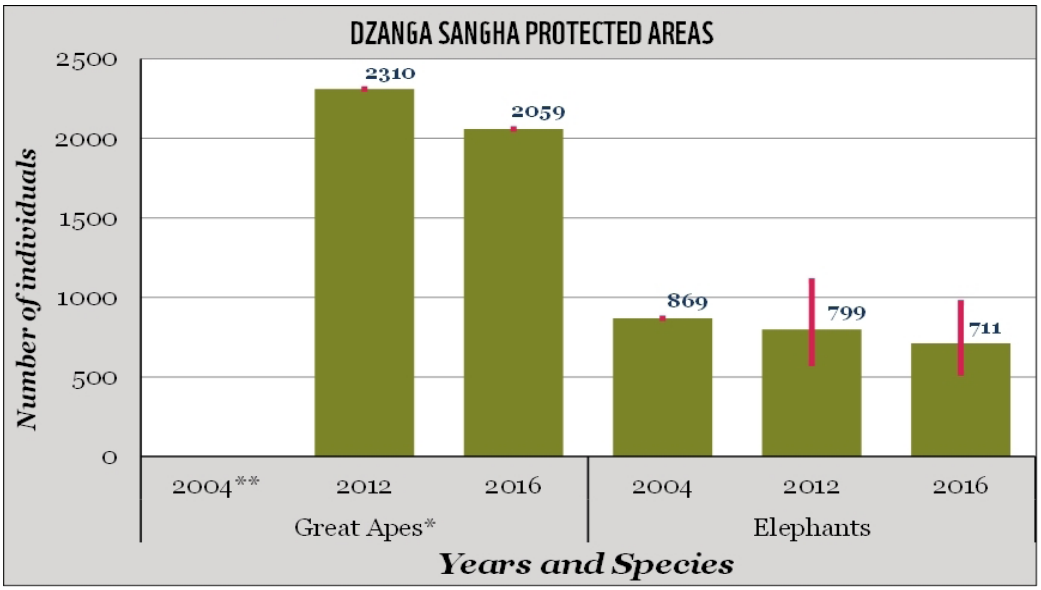


Figure 15. Evolution of great ape and elephant populations in the Dzanga Sangha Protected Areas

TRIDOM CONGO: MESSOK-DJA FOREST

The new survey completed in 2016 may indicate a relative stability in great apes and elephant populations of this forest located in TRIDOM Congo as compared to 2013 estimates (Allam et al. 2017) (Figure 16).

In general, current estimates may be slightly higher if we consider the same conversion rates used in 2013;

these rates would have given about 4,400 great ape individuals and 470 individual elephants. In reality, the conversion rates used in previous studies did not seem realistic since the Messok-Dja forest is dry and hilly, but the rates used came from another forest which is very wet and swampy where decay rates are very low.

New estimates now represent a basis for further trend analysis.

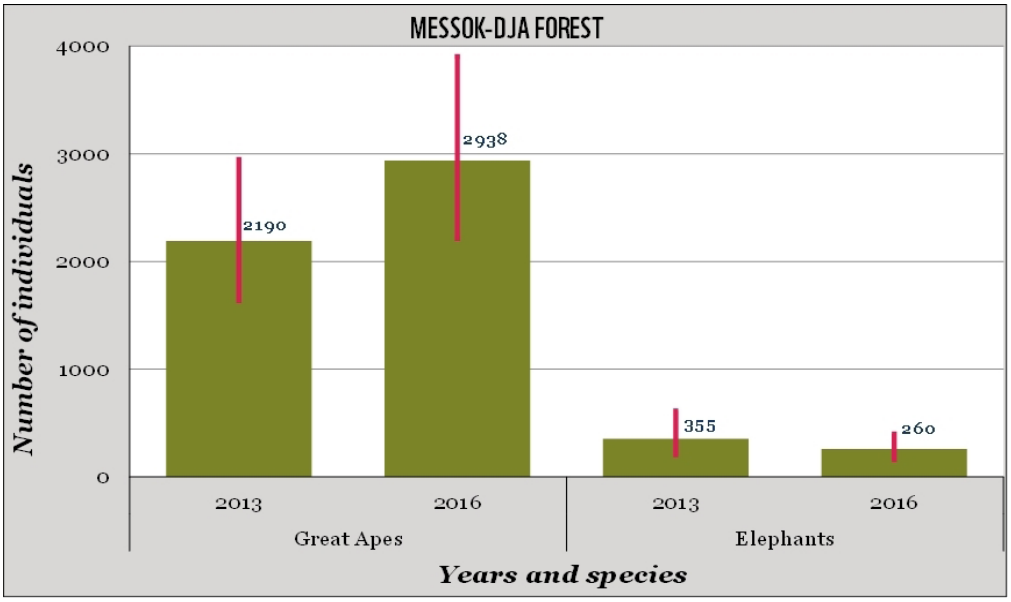


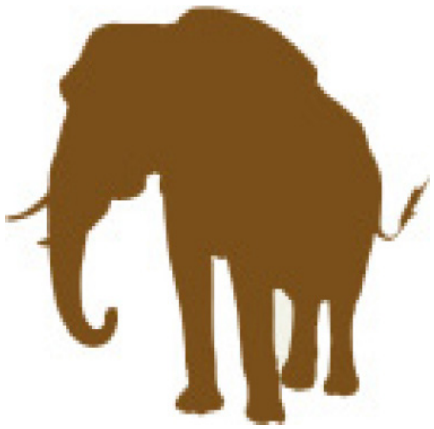
Figure 16. Evolution of great ape and elephant populations in the Messok-Dja forest

From all trend analyses, it is clear elephant populations declined in most of the surveyed sites from 2008 – 2012 abundances to current figures. While considering the total number of elephants in the surveyed area, we noticed a general decrease of 66% of elephant populations during the above mentioned periods. Great ape populations considered in the same periods (2008 – 2012 to 2014 – 2016) seem to have decreased by 36%. As explained so far, this decrease cannot be explained by hunting effects. It may be linked to methodological biases, particularly in Ngoyla Mintom forests (43% probable decrease) and Nki National Park (70% probable decrease). If we take out Ngoyla Mintom and Nki National Park great ape populations from the total number, we will notice a 6% increase in mean abundances of great apes from 2008 – 2012 to 2014 – 2016. Whereas, by taking out the elephant population estimates of Ngoyla Mintom and Nki National Park from the total of elephant abundances, we still notice 56% decrease in general in the same periods. This clearly indicates the relative stability of great apes populations in the surveyed areas.

The current results achieved in 2014 and 2015 were considered in the summary report by IUCN revealing a high loss of elephant populations in central Africa (Thouless et al. 2016). Indeed, forest elephant population decline in Central Africa is not new; between 2002 and 2011 the forest elephant decline was estimated to be 62% (Maisels et al. 2013a); an 80% decrease was recently reported in Minkébé National Park (Poulsen et al. 2017). This shows the critical situation of elephant population due to rising poaching for ivory trade in the last decade.

CONCLUSION, PERSPECTIVES AND CHALLENGES

From July 2014 to April 2016, the WWF biomonitoring program in the Congo Basin achieved relevant outcomes including seven wildlife inventories. The results of the inventories presented in the various reports produced and synthesized here represent an important source of information on the current state of elephant and great ape populations in the Congo Basin. A clear idea and a uniformed inventory of the state of conservation of large and medium sized mammals in general and of elephants and great apes in particular has been made available to both protected area managers and organizations and enterprises working for nature conservation and for the management and exploitation of natural resources. In addition, anthropogenic factors influencing particularly the density and the spatial distribution of species have been identified and mapped so that natural resource conservation actors have basic elements at their disposal to check long term impact.

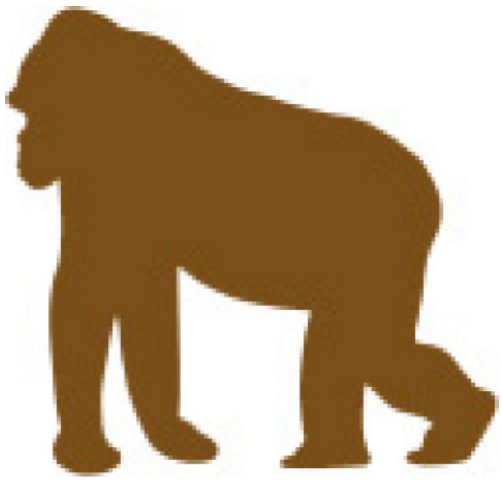


The dire state of forest elephants in the landscapes has been clearly demonstrated from the surveys. Several elephant populations are on their way to extinction and are highly vulnerable to persistent poaching. Conservation efforts need to be stepped up, urgently, in the region to secure key remaining forest elephant populations, whose loss will profoundly impact the larger forest ecosystems and change the Congo Basin forest forever.

In addition to the seven traditional inventories carried out, several capacity building activities and the designing of a strategy to formalize and pursue biomonitoring programs at the various priority sites

have been completed. The new WWF biomonitoring strategy document validated in March 2017 will be implemented in 18 targeted priority sites. The strategy will contribute to the collection of up-to-date data in order to guide, optimize and evaluate conservation activities through its integration into the day-to-day activity management in various sites in line with the revitalization process. This will ensure the sustainable financing of biomonitoring activities through the various conservation projects to be implemented by the field sites, and consequently the implementation of the strategy with the realization of regular wildlife and human pressure inventories, and other related activities to support other thematic programs in achieving their critical contributions to the new WWF Global Goals.

Although this seems realistic and simple, major challenges remain. The success of such biomonitoring activities requires further close collaboration and synergy of actions between stakeholders involved in biomonitoring in different conservation landscapes. In addition, capacity strengthening in quality and quantity will be necessary within a reasonable period of time for the implementation of the WWF biomonitoring strategy together with government institutions, where improved capacities will also benefit WWF activities. The implementation of field activities always requires enormous financial resources. In addition to the cost of capacity building, implementing a strong fundraising strategy, both at regional and international levels will help mobilize resources necessary for the success of the biomonitoring program which will in turn guarantee the success of WWF conservation activities in the Congo Basin.



ACKNOWLEDGEMENTS

We would like to express our sincere thanks to the contributors, collaborators and representatives of the various institutions listed below for their effective partnership, technical and strategic advice, and their financial support for the completed studies including any other person or institution we may not have mentioned here.

COUNTRY	LANDSCAPE : SURVEY SITES	FINANCIAL, INSTITUTIONAL AND OTHER PARTNERS	CONTRIBUTORS AND COLLABORATORS
CAMEROUN	TRIDOM: Nki NP, Boumba Bek NP, Ngoy-la Mintom forests	European Union, NORAD, WWF Sweden, WWF Netherlands, WWF Germany Ministry of Forestry and Wildlife Local Communities	M. Languy, H. Njiforti, R.D. Sprung, Z. L. Nzooh, K.P. N'Goran, N. Sonne, D. Nzene, G. Etoga, L. Defo, J. Lekealem, G. Moucharou, M.D. Toumouksala, N. Tamaffo, E. Fouda, J.P. Belinga, M. Dandjouma, P. Dongmo, all team members
	TNS: Lobéké NP, logging concessions, community hunting zones	USFWS, FTNS, Wildlife Without Borders, Groupe SEFAC Ministry of Forestry and Wildlife Local Communities	M. Languy, H. Njiforti, R.D. Sprung, Z. L. Nzooh, K.P. N'Goran, G. Ngandjui, H. Ndinga, A. Mengamenya, H. Ekodeck, L. Abagui, S. Kobla, M. Sombambo, S. Famegni, all team members
	Campo Ma'an: Campo Ma'an NP, logging concessions	FEDEC, ECOFAC, RAPAC, WIJMA, NORAD Ministry of Forestry and Wildlife Local Communities	M. Languy, H. Njiforti, R.D. Sprung, M. Ter Heegde, B. Sock, Z. L. Nzooh, K.P. N'Goran, N. Sonne, C. Fondja, J. Nkono, C. Kamdem, all team members
REPUBLIC OF CONGO	TRIDOM / ETIC: Djoua-Ivindo forest including Karagoua logging concession	European Union, USFWS, WWF NL, WWF Int.(Adelle) Ministère de l'Economie Forestière et du Développement Durable, CNIAF, ACFAP Local Communities	M. Languy, P. de Wachter, K.P. N'Goran, V. Mbolo, A. Mbalampouom, B. Ikoa, S. Mahoungou, C. Sepulcre, all team members
	TRIDOM / ETIC: Messok-Dja forest proposed as National Park	European Union, USFWS, WWF NL, WWF Int (Adelle) Ministère de l'Economie Forestière et du Développement Durable, CNIAF, ACFAP ; Local Communities	M. Languy, P. de Wachter, V. Mbolo, G.B. Beukou, A. Mbalampouom, K.P. N'Goran, S. Mahoungou, C. Sepulcre, all team members
CENTRAL AFRICAN REPUBLIC	TNS: DSPA (Dzanga-Ndoki NP, Community hunting zone, other sector in logging concessions), logging concessions not included in DSPA	WWF Germany, USFWS, PPECF, FTNS Aires Protégées de Dzanga Sangha ; Local Communities	M. Languy, J.B. Yarissem, K.P. N'Goran, R. Bailleux, B. Tito A.J. Ndadet, K. Esambe, D.L. Ndomba, S. Banzo, G.B. Beukou, E. Fostin, M. Ondeny, A. Ndotar, all team members
GABON	TRIDOM: Djoua-Zadié forest including mining zones and logging zones	European Union, WWF NL Agence Nationale des Parcs Nationaux ; DGFAP-I Direction Provincial des Eaux et Forêts de Makokou Local Communities	M. Languy, M. Mapangou, S. Ratiarison, P. de Wachter, S.Y. Le-duc, K.P. N'Goran, M. Mba II, A. Mounguengui, M.E. Akou, P.C. Ndiba, C.E. Mayomba, A.A. Allogho, Amadou, all team members

REFERENCES

Allam, A., Beukou, G.B., N'Goran, K.P., 2017. Rapport d'inventaire des grands et moyens mammifères dans la forêt de Messok-Dja. Rapport Technique, WWF GCPO - MEFDD, Sembe, République du Congo, Sembe, Congo.

Allam, A., N'Goran, K.P., Mahoungou, S., Ikoa, B., 2016. Rapport d'inventaire des grands et moyens mammifères dans la forêt de Djoua-Ivindo. Rapport Technique, WWF GCPO - MEFDD, Sembe, République du Congo.

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., 1993. Distance sampling: Estimating abundance of biological populations. Chapman and Hall, London.

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., Thomas, L., 2001. Introduction to Distance Sampling: Estimating abundance of biological populations. Oxford University Press, Oxford.

Maisels, F., Bechem, M., Blanc, J., Strindberg, S., Boafo, Y., Mahop, J.P., Mengamenya, A., Bariga, N., Luhunu, S., 2012a. Wildlife and Human Impact Survey in Boumba Bek National Park, Cameroon, p. 62. CITES MIKE.

Maisels, F., Nishihara, T., Strindberg, S., Boudjan, P., Breuer, T., Aczel, P., Sourmail, C., Malonga, R., Twagirashyaka, F., Bakabana, P.C., Iyenguet, F., Kiminou, F., Madzoke, B., Malanda, G.-A., Mbani, O., Moukala, G., Ndzai, C., Nzolani, F., Telfer, P., 2012b. Great ape and human impact monitoring training, surveys, and protection in the Ndoki-Likouala Landscape, Republic of Congo, p. 58 pages. WCS Congo.

Maisels, F., Strindberg, S., Blake, S., Wittemyer, G., Hart, J., Williamson, E.A., Aba'a, R., Abitsi, G., Ambahe, R.D., Amsini, F., Bakabana, P.C., Hicks, T.C., Bayogo, R.E., Bechem, M., Beyers, R.L., Bezangoye, A.N., Boundja, P., Bout, N., Akou, M.E., Bene, L.B., Fosso, B., Greengrass, E., Grossmann, F., Ikamba-Nkulu, C., Ilambu, O., Inogwabini, B.I., Iyenguet, F., Kiminou, F., Kokangoye, M., Kujirakwinja, D., Latour, S., Liengola, I., Mackaya, Q., Madidi, J., Madzoke, B., Makoumbou, C., Malanda, G.A., Malonga, R., Mbani, O., Mbendzo, V.A., Ambassa, E., Ekinde, A., Mihindou, Y., Morgan, B.J., Motsaba, P., Moukala, G., Mounguengui, A., Mowawa, B.S., Ndzai, C., Nixon, S., Nkumu, P., Nzolani, F., Pintea, L., Plumptre, A., Rainey, H., Bokoto de Semboli, B., Serck, A., Stokes, E., Turkalo, A., Vanleeuwe, H., Vosper, A., Warren, Y., 2013a. Devastating Decline of Forest Elephants in Central Africa. PLoS ONE 8, e59469.

Maisels, F., Strindberg, S., Kiminou, F., Ndzai, C., Ngounga, R., Okondza, A., Malanda, G., Suraud, J.-P., le Flohic, G., Yaba-Ngouma, S., Lepale, A., Lepale, J.-B., Ngouma, S., Dzanga, M., Ekoko-Mboungou, D., Lamprecht, L., 2013b. Wildlife and Human Impact Survey 2012, and monitoring 2005-2008-2012. OdzalaKokoua National Park, Republic of Congo, p. 48. Fondation Odzala-Kokoua/ WCS. .

N'Goran, K.P., 2015. Méthodologie de Collecte de Données, Inventaires de Grands et Moyens Mammifères par Distance Sampling. Document de travail, WWF Regional Office for Africa - Yaoundé Hub, Yaoundé, Cameroun.

N'Goran, K.P., Ndomba, D.L., Beukou, G.B., 2016. Rapport de l'inventaire des grands et moyens mammifères dans le segment RCA du paysage Tri-national de la Sangha. Rapport Technique, WWF RCA - APDS, Bayanga, République Centrafricaine.

N'Goran, K.P., Nzooh Dongmo, Z.L., Le-Duc Yeno, S., 2014. Guide Technique pour les Protocoles d'Inventaires Fauniques de Grands et Moyens Mammifères par Distance Sampling. Document de travail, WWF Regional Office for Africa - Yaoundé Hub, Yaoundé, Cameroun.

Nzooh Dongmo, Z.L., N'GORAN, K.P., Etoga, G., BELINGA, J.P., FOUDA, E., BANDJOUMA, M., DONGMO, P., 2016a. Les populations de grands et moyens mammifères dans le segment Cameroun du Paysage TRIDOM: Forêt de Ngoyla-Mintom, PN Boumba Bek et PN Nki et leurs zones périphériques. Rapport Technique, WWF CCPO - Minfof, Yaoundé, Cameroun.

Nzooh Dongmo, Z.L., N'Goran, K.P., Ekodeck, H., Kobla, S.A., Famegni, S., Sombambo, M., Mengamenya, A., 2016b. Les populations de grand et moyen mammiferes dans le segment Lobéké du paysage Tri National de la Sangha. Rapport technique, MINFOF-WWF CCPO, Yaoundé.

Nzooh Dongmo, Z.L., N'Goran, K.P., FONDJA, C., NKONO, J., 2015. Evaluation de la dynamique des populations de grands et moyens mammifères dans le domaine forestier permanent de l'Unité Technique Opérationnelle Campo Ma'an. Rapport Technique, WWF CCPO / Minfof, Yaoundé, Cameroun.

Poulsen, J.R., Koerner, S.E., Medjibe, V.P., Blake, S., Clark, C.J., Akou, M.E., Fay, M., Meier, A., Okouyi, J., Rosin, C., White, L.J.T., 2017. Poaching empties critical Central African wilderness of forest elephants. Current Biology 27, R134.

Princée, F.P.G., 2013. Biomonitoring Survey 2011-2012 in Dzanga-Sangha Protected Areas, p. 65 pages. WWF-CAR, Bayanga.

Thomas, L., Buckland, S.T., Rexstad, E.A., Laake, J.L., Strindberg, S., Hedley, S.L., Bishop, J.R.B., Marques, T.A., Burnham, K.P., 2010. Distance software: design and analysis of distance sampling surveys for estimating population size. Journal of Applied Ecology 47, 5-14.

Thomas, L., Laake, J.L., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Hedley, S.L., Pollard, J.H., Bishop, J.R.B., Marques, T.A., 2014. Distance 6.2, Research Unit for Wildlife Population Assessment. University of St. Andrews, UK. http://www.ruwpa.st-and.ac.uk/distance/.

Thouless, C.R., Dublin, H.T., Blanc, J.J., Skinner, D.P., Daniel, T.E., Taylor, R.D., Maisels, F., L., F.H., Bouché, P., 2016. African Elephant Status Report 2016: an update from the African Elephant Database, p. vi + 309pp. Occasional Paper Series of the IUCN Species Survival Commission, No 60 IUCN / SSC Africa Elephant Specialist Group, Gland, Switzerland.

5,850,000 ha.

The survey covered a total surface area of 5,850,000 ha.

WILDLIFE HAVEN

Poaching pressure is 50% less in protected areas than outside.

59000

Survey results show an estimated 59,000 weaned great apes population.

9500

Elephant population estimated at 9,500 individuals.

66% DROP

Elephant population decreased by 66% between 2008 and 2016 in the surveyed areas.

WWF

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

http://wwf-congobasin.org

CONTACT
WWF Regional Office for Africa
Yaounde Hub
Tel: 237 222 21 70 84 / 83
677 50 00 35
699 50 36 21
Fax: (237) 222 21 70 85
222 21 42 40
Email:PNgoran@wwfafrica.org