Grauer's Gorilla numbers increasing in Kahuzi-Biega National Park highlands: 2015 Census in Tshivanga sector

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C. Spira[1], G. Mitamba[1], A. Kirkby[1], T. Kalikunguba[2], R. Nishuli[2] and A. Plumptre[1]

[1] Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, New York 10460, USA
[2] Institut Congolais pour la Conservation de la Nature, 34 ave. P.E. Lumumba, Bukavu, DRC

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Front page photo: Adult male Grauer's gorilla in Kahuzi-Biega National Park.

SUMMARY

Kahuzi-Biega National Park (KBNP), located in eastern Democratic Republic of Congo (DRC), is the most important protected area for the conservation of the endemic Grauer's gorilla (*Gorilla beringei graueri*), having been identified in 1994-95 as protecting about 86% of the global population together with the adjacent Kasese region of forest. With the onset of civil war in 1996, the Congolese wildlife authority, the *Institut Congolais pour la Conservation de la Nature* (ICCN), lost control of the park as armed groups settled within its boundaries. While the park is already located in one of the most densely populated region on the continent, this exacerbated natural resource extraction from within the park, including hunting of wildlife for subsistence and trade.

The Wildlife Conservation Society (WCS) conducts gorilla censuses with the ICCN in the high altitude sector of KBNP every 5 years to monitor changes in the gorilla population to adapt conservation efforts and evaluate their impacts in this sector of the park. In December 2015, WCS and ICCN survey teams used reconnaissance walks to survey 500 x 500 m blocks of forest. When a fresh gorilla nest site was encountered (1-5 days old) its GPS coordinates were recorded and the trail made by the gorilla group was followed until the previous nest site was found. At each nest site, nests were counted and dung size measurements taken to establish the age-sex composition of the group.

A total of 17 gorilla groups and 8 solitary males were found during the census. Together with the data from the close monitoring of 1 additional group by the ICCN, and by correcting the gorilla numbers obtained from the census with the number of infants missed, we estimate a minimum of **213 individuals** to be present in the high altitude sector of KBNP. This represents an 18% increase since the previous census conducted by WCS in 2010, and a 64% increase since the drop observed between 1996 and 2000 when DRC civil war caused a major decline in gorilla numbers. However, this is a minimum estimate as it is possible that other wild groups occur where survey teams could not visit due to insecurity.

This survey took place shortly after WCS and ICCN teams conducted a biodiversity transect survey across the same sector of KBNP, through which gorilla numbers were estimated at 325 individuals through distance sampling, occurring at 0.79 individuals/km². Meanwhile, a more comprehensive WCS study conducted recently estimated gorilla numbers at 200 individuals in the same sector through encounter rate data and density analysis. While the global Grauer's gorilla population plummeted across its range by 77% to 93% over the last 20 years due to civil war, with an estimated 3,800 individuals remaining in the wild, the high altitude sector of KBNP is showing a promising increase in gorilla numbers thanks to significant conservation resources and efforts and adequate ICCN presence. However, other sectors of the park are not faring so well and more needs to be done to halt the Grauer's gorilla decline.

The most urgent need for the subspecies conservation is to demilitarize artisanal mines within and around the edge of KBNP to reduce bushmeat hunting and enable the ICCN to enforce conservation laws effectively inside the entire park. Support from the DRC government is necessary to achieve this, particularly supporting efforts to make armed groups exit protected areas. Community awareness and support of gorilla conservation should be built to establish social norms against gorilla hunting. Sustainable and revenue-generating livelihoods should also be promoted to reduce the reliance of communities on the park natural resources.

The results presented here are very encouraging given the dire situation of the Grauer's gorilla across its range and show that where there is sufficient investment this great ape can be saved from extinction.

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ACRONYMS AND ABBREVIATIONS

DRC	Democratic Republic of Congo	USAID	United States Agency for International Development
ICCN	*Institut Congolais pour la Conservation de la Nature*	WCS	Wildlife Conservation Society
KBNP	Kahuzi-Biega National Park	WHS	World Heritage Site
Recce	Reconnaissance		

1. INTRODUCTION

Kahuzi-Biega National Park (KBNP), located in eastern Democratic Republic of Congo (DRC), is not only the most important protected area for the conservation of the endemic Grauer's gorilla (*Gorilla beringei graueri*), but also harbors other endangered species including elephants (*Loxodonta cyclotis*), eastern chimpanzees (*Pan troglodytes schweinfurthii*) and many others that are endemic to the Albertine Rift (Plumptre et al. 2007). In 1994-95, KBNP and the adjacent Kasese region of forest were identified as protecting about 86% of the global Grauer's gorilla population (Hall et al., 1998). KBNP was first gazetted in 1970 and established the current highland sector which was extended in 1975 to include the lowland sector, creating a 6,728 km² protected area (Figure 1). It was recognized as a World Heritage Site (WHS) by UNESCO in 1980 and categorized as a WHS in danger in 1994, following the genocide in Rwanda and the settlement of many refugees in the vicinity of the park.
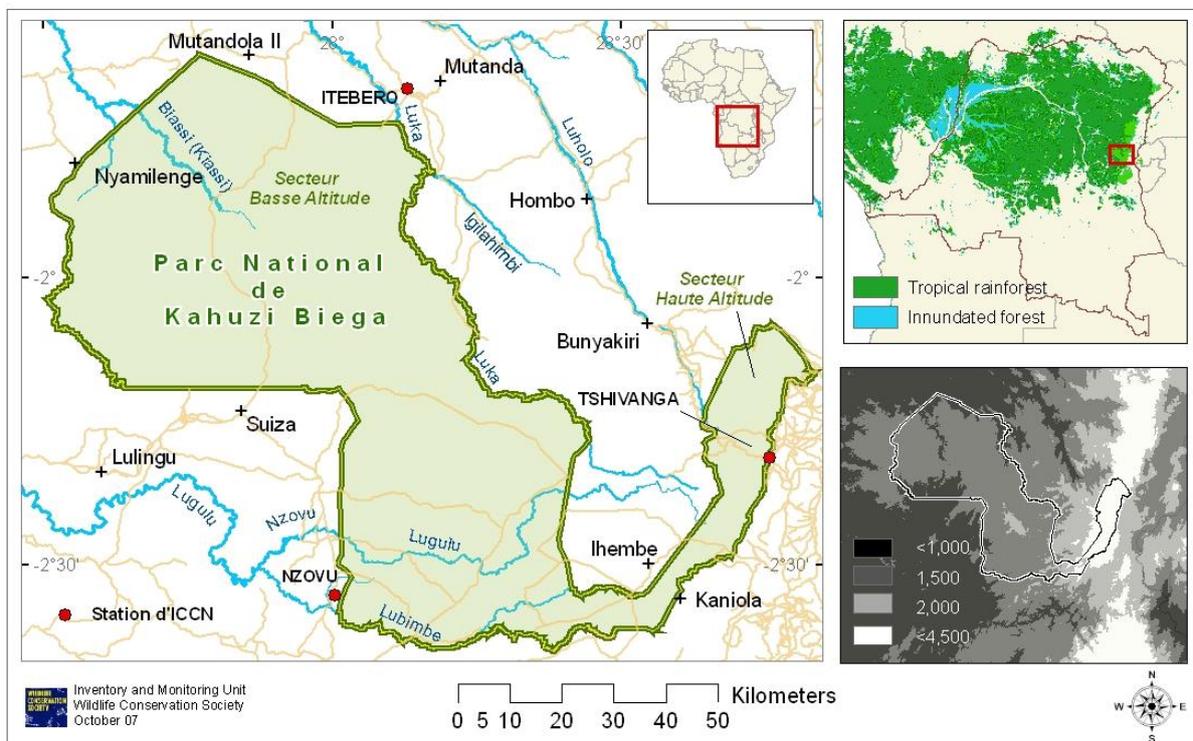
Figure 1. Map of Kahuzi-Biega National Park in Eastern Democratic Republic of Congo.

With the onset of civil war in DRC in 1996, the Congolese wildlife authority (the *Institut Congolais pour la Conservation de la Nature*, ICCN), which is responsible for the management of the country's protected areas, lost control of the park as armed groups settled within its boundaries. While the park is already located in one of the most densely populated regions on the continent, this exacerbated natural resource extraction from within the park, including hunting of wildlife for subsistence and trade (Amsini et al., 2008; Basimine et al., 2014; Kirkby et al., 2015). Rates of poaching are still high, with gorillas being killed as recently as June 2013.

WCS conducts gorilla censuses together with the ICCN in the high altitude sector of KBNP, Tshivanga, every 5 years (or when security allows) to monitor changes in the gorilla population through gorilla numbers and group composition in order to adapt and evaluate conservation efforts in this sector of the park.

2. METHODS

This survey used reconnaissance (recce) walks to access the park and enter every 500 x 500 m block of forest in the highland sector where the security permitted field teams to operate. When a fresh gorilla nest site was encountered (1-5 days old) its GPS coordinates were recorded and the trail made by the gorilla group was followed until the three previous nest sites were found. At each nest site, nests were counted and dung size measurements were made (Figure 2), along with noting the presence of silver hairs, to establish the age-sex composition of the group, a method used for mountain gorillas (McNeilage et al., 2001).

Figure 2. ICCN ranger measuring dung in a fresh gorilla nest.

The survey teams aimed to find three nest sites for each group to confirm the group composition, since individual nests or dung could be missed at one nest site or at some sites gorillas may move and construct a second nest at night. Measurements were taken across the broadest part of dung which was not crushed or disintegrated. As no data were available on dung size classes for KBNP gorillas, the dung size classes established by Schaller (1963) were used (Table 1).

Table 1. Gorilla age-sex classes and associated dung sizes.

Category	Dung size	Age class
Infant	< 4cm (sleeping in mother's nest)	Birth to 3.5 years
Juvenile	< 5.5 cm (sleeping in own nest)	3.5 to 6 years
Sub adult		6 to 8 years
Adult female	5.5 to 7.2 cm	From 8 years onwards
Blackback male		8 to 12 years
Adult male (silverback)	> 7.2 cm (with silver hairs)	From 12 years onwards

Dung size alone is not a sufficiently accurate measure to distinguish between the immature age classes: infant, juvenile and sub-adult. Consequently, young individuals constructing their own nest were always considered as the combined category juveniles/sub adults, and smaller dung found within the nest of an older individual was always recorded as that of an infant (McNeilage et al., 2001). In the absence of infant dung, adult female nests could not be distinguished from those of a comparable sized (blackback) male. However in presence of infant dung, surveyors were able to identify adult female nests.

From December 15 to 31, 2015, five survey teams were deployed in 500m x 500m grids within the high altitude sector of KBNP, of which 499 out of 1,479 were covered (Figure 3). Team members included a team leader who took notes on observations made at nest sites, two observers, 4 ICCN rangers for security purposes and one tracker. Teams targeted areas where there were known gorilla groups from regular monitoring by ICCN rangers and then made recce walks into other areas to assess the presence of any old sign of gorillas. If an old sign was found, the team would spend time searching the area looking for a fresh sign. This method was adopted because of insecurity in the northern part of the highland sector of the park and because the area to survey was large.
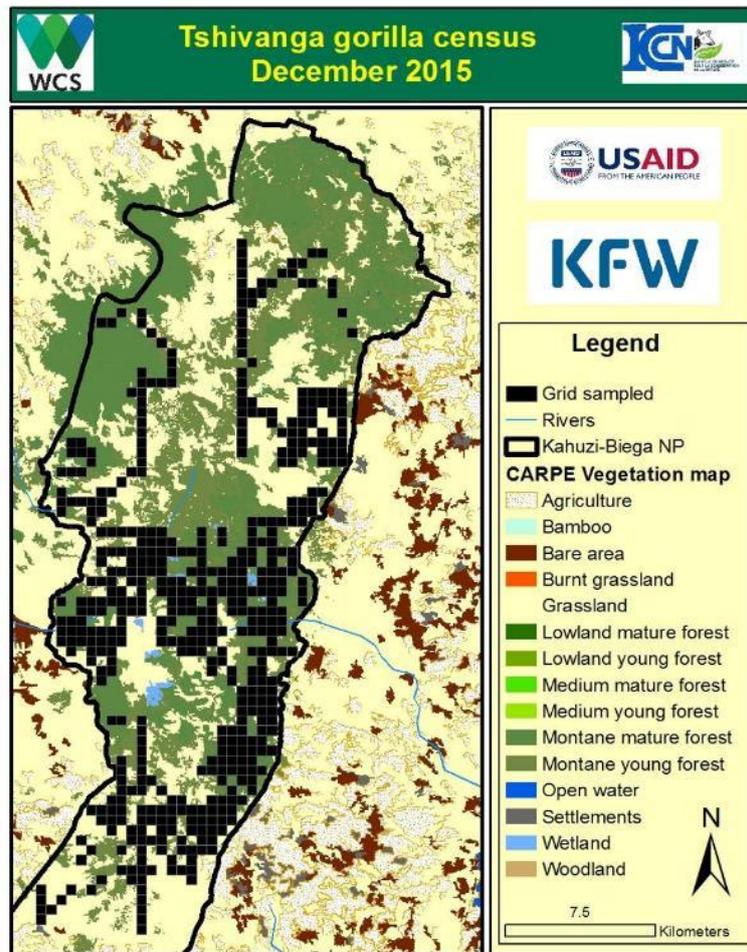

Figure 3. Map showing the grids covered by the survey teams in the Tshivanga sector of KBNP

Maps were produced with the ArcGIS software 10.3.

3. RESULTS

A total of 17 gorilla groups and 8 solitary males were found during the census (Table 2). Together with the data from the close monitoring of 1 additional gorilla group by the ICCN, our results indicate that there are at least 208 individual gorillas in the high altitude sector of KBNP (Figure 4). Note that all gorilla groups in KBNP are wild, only monitored groups are named and we use 'Wild' to refer to unmonitored groups.

Table 2. Composition and size of the gorilla groups surveyed in December 2015.

| Gorilla groups	Silverback	Blackback or adult female	Adult female	Sub adult/ Juvenile	Infant	Total
Observed by survey teams						
Bonane	1	0	0	0	0	1
Chibulula	1	6	-	0	0	7
Chimanuka	1	7	3	8	3	22
Ganywamulume	1	4	-	3	0	8
Langa	1	6	1	1	1	10
Mpungwe	2	10	1	1	1	15
Mufanzala I	1	4	1	1	1	8
Mufanzala II	1	4	1	4	0	10
Mugaruka	1	0	0	0	0	1
Namadirhiri	2	14	-	5	1	22
Wild 1	1	3	2	0	2	8
Wild 2	1	13	0	1	0	15
Wild 3	1	7	1	8	1	18
Wild 4	1	11	0	3	0	15
Wild 5	1	1	1	0	1	4
Wild 6	1	3	2	2	2	10
Wild 7	1	1	0	1	0	3
Wild 8	1	2	0	0	0	3
Solitary 1	1	0	0	0	0	1
Solitary 2	1	0	0	0	0	1
Solitary 3	1	0	0	0	0	1
Solitary 4	1	0	0	0	0	1
Solitary 5	1	0	0	0	0	1
Solitary 6	1	0	0	0	0	1
Monitored by the ICCN but not observed by survey teams						
Mankoto	1	2	13	4	2	22
TOTAL	**27**	**98**	**26**	**42**	**15**	**208**
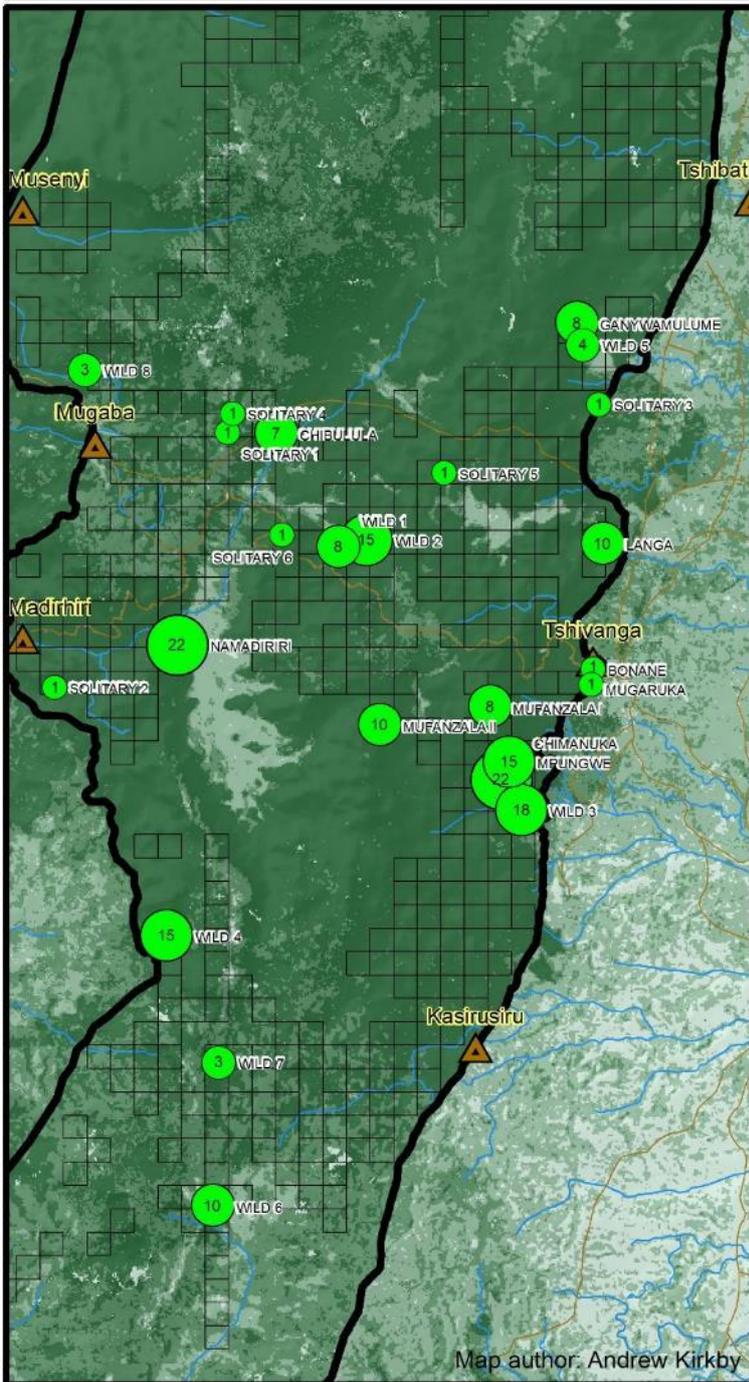
Figure 4. Distribution and size of the gorilla groups surveyed in December 2015 in the high altitude sector of KBNP.

Group size ranged from 2 to 22 individuals, with a mean of 10.5 ± 6.2 individuals per group (Table 3).

Figure 5. Immature Grauer's gorilla in Kahuzi-Biega National Park.

Of the 12 groups that ICCN monitors closely, 11 were identified during the census. The ICCN data indicate there are 20 infants among these 11 groups, while we only found 7 through the census. This means that at least 65% of infants were missed during the census. Assuming that the same proportion of infants was missed in the nest counts of the non-monitored groups, if we correct the total count by this percentage of missed infants we would estimate 5 additional infants in the number of gorillas. This brings the proportion of immature gorillas (i.e. infants, juveniles and subadults) in the population to 30% (Figure 5).

Percentage of infants missed × number of infants detected = number of infants missed

This brings the total number of Grauer's gorillas to 213 individuals in the highland sector of the park, which represent an 18% increase since the previous WCS-ICCN census conducted in 2010, and a 64% increase since the drop observed between 1996 and 2000 when the DRC civil war caused a major decline in gorilla numbers (Table 3). It indicates the population is growing on average at 4.3% per year. However, the number of gorilla families identified has not increased since 2010. This estimate of 213 individuals shows that gorillas are nearly reaching pre-war numbers in the high altitude sector of KBNP (Figure 6). This is a minimum estimate as it is possible that other wild groups occur where survey teams could not visit due to insecurity.

Table 3. Summary statistics of Grauer's gorilla surveys in KBNP highland sector since 1978. Adapted from Kujirakwinja et al. (2011).

Year	Number of gorilla groups	Number of gorillas	Mean group size	Percentage of infants	Number of solitary males
1978	14	223	15.6	17	5
1990	25	258	10.8	8.4	9
1996	25	245	9.8	12.7	2
2000	13	130	9.6	9.3	4
2004	15	168	10.7	15.9	2
2010	17	181	9.9	14.2	2
2015	17	213	10.5	9.6	8
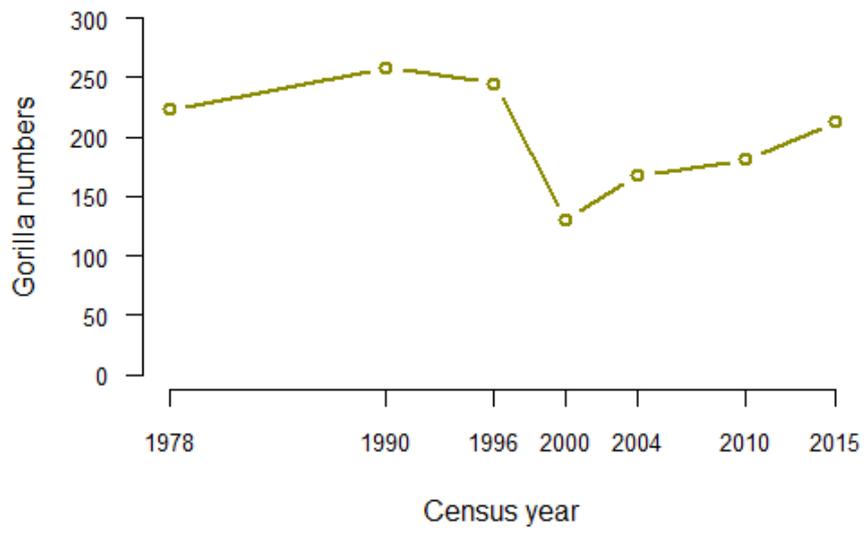
Figure 6. Gorilla numbers estimated through censuses since 1978 in the high altitude sector of KBNP.

4. DISCUSSION

This survey took place shortly after WCS and ICCN teams conducted a biodiversity transect survey across the high altitude sector of the park. Using distance sampling methods, gorillas were then estimated to number 325 individuals, occurring at 0.79 individuals/km² (Spira et al., 2016). A more comprehensive study conducted by Plumptre et al. (2015) to re-evaluate the status of Grauer's gorilla in eastern DRC estimated gorilla numbers at 200 individuals in the same sector from encounter rate data and density analysis. The minimum estimate of 213 individuals obtained through the gorilla census lies within these two estimates and is therefore consistent with the other methods.

Plumptre et al.'s (2015) study found that the global Grauer's gorilla population plummeted by 77% to 93% across its range over the last 20 years due to civil war, with an estimated 3,800 individuals remaining in the wild (Plumptre et al., 2015). The study provided significant justification to classify the gorilla subspecies as Critically Endangered by the IUCN and calls for targeted protection to prevent it from disappearing within much of its range. Among the threats that Grauer's gorillas face is artisanal mining, as numerous active mining sites are present in KBNP, fueling conflict and armed groups who control most of the mines, and putting great pressure on wildlife through bushmeat hunting (Kirkby et al., 2015). Gorillas are particularly targeted for their large size and ease in tracking in the forest (Wilkie and Carpenter, 1999).

The results of the 2015 gorilla census in the high altitude sector of KBNP presented here can be seen as a huge success and example for conservation, with gorilla numbers gradually increasing towards pre-war time levels at a time when numbers are declining rapidly elsewhere. This success can be attributed to sufficient, strategically targeted conservation resources and efforts, including (i) the close monitoring of gorilla groups, (ii) high numbers of ranger patrols, (iii) veterinarians who are available in case of emergencies such as gorillas being caught in snares set for bushmeat, and (iv) strong constituency building with communities and key stakeholders around the park. This combination of conservation efforts has proven to work well in other National parks too, notably in Bwindi National Park in Uganda and Volcanoes National Park in Rwanda (Blomley et al., 2010; Plumptre, 2003).

However, an increasing population of Grauer's gorillas means that they are more at risk of leaving the park to find food. Combined with a dense human population at the edge of the park (Basimine et al., 2014), this can lead to potential conflicts with communities through crop raiding and/or make gorillas more exposed to diseases from humans (Wallis, 2000; Woodford et al., 2002). The closest sector to Tshivanga is Nzovu-East, in which WCS conducted transect surveys in November 2015 and found no sign of gorilla, indicating that the Tshivanga population is isolated (Spira et al., 2016). Moreover, the northern part of the Tshivanga sector is still occupied by armed groups, highlighting the need to improve security in the highland sector of KBNP.

As recommended by Kirkby et al. (2015) and Plumptre et al. (2015), the most urgent need for Grauer's gorilla conservation is to demilitarize artisanal mines within and around the edge of KBNP as well as other protected areas in the subspecies range. This would reduce bushmeat hunting and enable the ICCN to enforce conservation laws effectively inside the entire park as security improves. Support from the DRC government is necessary to achieve this, particularly supporting efforts to make armed groups exit protected areas. Communities living around and inside the park must become aware and supportive of gorilla (and wildlife more generally), conservation through targeted communication efforts using different media and messages to establish social norms against gorilla hunting, which already exist in some parts of the region (Plumptre, 2003). Sustainable and revenue-generating livelihoods should also be promoted and projects developed aiming to reduce the reliance of communities on the park natural resources.

While success stories in conservation are often hard to come by, the results presented here from Tshivanga are greatly encouraging to conservationists and donors and show that where resources are sufficient and focused these great apes can be protected despite a major decline across their global range.

Figure 7. Grauer's gorilla family in the Tshivanga sector of Kahuzi-Biega National Park.

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