



Gorilla Journal

Journal of Berggorilla & Regenwald Direkthilfe

No. 50, June 2015



**The Status of
Grauer's Gorillas
in the Usala
Forest**

**Ranging on
Community Land
and Crop Raiding
Bwindis Gorillas**

**Community-led
Conservation
Action in Ebo**

**Using Remote
Video Camera
Traps in Gabon**



BERGGORILLA & REGENWALD DIREKTHILFE

CONTENTS

D. R. Congo	3
Can the Gorillas of Mt. Tshiaberimu Survive?	3
The Status of Grauer's Gorilla in the Usala Forest	4
Tracking of Grauer's Gorillas in North Kivu	7
GRACE Forest Enclosure	9
Mountain Gorilla Genetics	10
Uganda	11
Ranging on Community Land and Crop-Raiding by Bwindi Gorillas	11
Rukina – Life Summary	13
Gorillas	14
Community-led Conservation Action in the Ebo Forest, Cameroon	14
Using Remote Video Camera Traps for Multi-Species Assessments in Gabon	17
New Action Plan for Western Lowland Gorilla Conservation	20
Reading	22
New on the Internet	22
Berggorilla & Regenwald Direkthilfe	23

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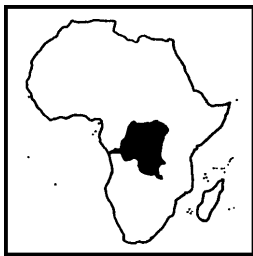
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D. R. CONGO

Can the Gorillas of Mt. Tshiaberimu Survive?

In previous articles we have documented the invaluable support Berggorilla & Regenwald Direkthilfe has provided over the years to gorilla and habitat conservation on Mt. Tshiaberimu and in the Sarambwe Reserve. With the help of entrusted staff members, the organisation supports both the neighbouring human populations and the actual protection of the animals and their habitats. Effective conservation of the environment, particularly within protected areas, needs to include both of these aspects: while the fauna and their habitats must be protected, the populations need to be targeted in order to increase their awareness of the protected areas, improve their living standards and reduce or, better, halt their dependence on the resources found within these protected areas.

Initially Berggorilla & Regenwald Direkthilfe focussed particularly on the raising of awareness concerning the gorillas and the Mt. Tshiaberimu habitats, funding surveys, capacity-building projects and monitoring. All these activities were accompanied by subsidies and procurement of various materials and field equipment such as boots, waterproof clothing, sleeping-bags, water bottles, GPSs and digital cameras, and by provision of field rations and also bonuses to motivate temporary staff, non-ICCN staff or staff from other partners who carried out activities in the field.

The support provided by Berggorilla & Regenwald Direkthilfe is mostly determined by the requirements of the people responsible for individual sites – it may be the sole source of support for an activity or a contribution. These activities may be once-off or recurring: once-off as in the case of provision of field equipment and materials, recurring as in the case of bonuses to temporary staff involved in field activities

(trackers) or provision of field rations. For example, in 2014 the Mt. Tshiaberimu rangers were equipped with field gear (boots, waterproof clothing, jackets, sleeping bags); between April and July 2014, an activity to re-demarcate the boundaries was carried out and the trackers/trail cutters employed in the process received small monthly bonuses to boost their motivation.

The infrastructure of Burusi patrol post was improved with the building of a wooden house with six rooms, improving the rangers' living conditions and enabling them to receive visitors.

Since 2008, Berggorilla & Regenwald Direkthilfe has continuously supported tree plantation and agroforestry activities in the vicinity of Mt. Tshiaberimu, benefitting local organisations and associations such as churches, schools and health centres. As a result, 1,165,510 plants have been produced in the Mt. Tshiaberimu area – 35,000 by SAGOT (Solidarity with the Friends of the Tshiaberimu Gorillas) and 1,130,510 by schools, health centres and churches. This is enough to replant about 800 hectares. Thanks to the afforestation effort, the destruction of the park's forest seems to have been halted – deforestation has not recently been mentioned in various reports by GO (Gorilla Organization) and ICCN (Congolesse Institute for Nature Conservation).

Not all of the produced plants could be used for tree plantation, however, as people in Vuswagha, Ngitse, Burusi, Kitolu and Kyondo Mowa also require the trees as support structures for passion fruit plants. Four seedbeds, each with a capacity to hold 10,000 plants, were prepared in the latter 4 villages with funds provided by Berggorilla & Regenwald Direkthilfe for two seasons. These 80,000 plants will permit the conservation (i.e. non-cutting) of about 80–100 ha of plantation and allow the target households to generate more income. Over 200 people are participat-

ing in a passion fruit cultivation project, having planted the seedlings in their reforestation plots. Those people who received passion fruit plants in 2011 and 2012 now earn about 240 USD per month (information by Jean Claude Kyungu). We hope that this project will continue to contribute to the well-being of the population and also to the conservation of the Mt. Tshiaberimu gorillas, as the project itself constitutes a powerful sensitization.

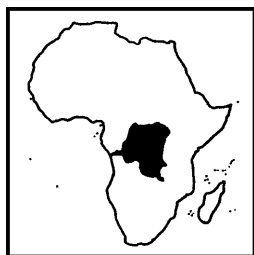
The strategy for distributing the plants to the resident communities has followed that utilized by the school tree nurseries: the children are sensitized at school and they, in turn, sensitize their parents. At the same time, information is disseminated in the churches after worship and in health centres.

Berggorilla & Regenwald Direkthilfe is not the only organisation working at Mt. Tshiaberimu. For 15 years, permanent staff of the Gorilla Organization has also been based there. Unfortunately this organisation started to leave in December 2014 and will pull out completely at the end of December 2015. While GO worked at Mt. Tshiaberimu, the monitoring of the gorillas was assured. The track leading to Mt. Tshiaberimu was regularly maintained and sensitization sessions were carried out with the local population, in addition to other forms of support such as a project to grow passion fruit plants



Children with passion fruit plants

Photo: Jean Claude Kyungu



D. R. CONGO

and potatoes, and one for apiculture. GO issued warnings when there were cases of disease among the gorillas, which meant that vets were able to be brought in to treat them.

What Future Do the Gorillas of Mt. Tshiaberimu Have?

As demonstrated, Mt. Tshiaberimu has received various forms of support: infrastructure has been built, capacity has been developed, and the population has received support. However, the survival of the Mt. Tshiaberimu gorillas still poses a challenge. In view of the current constraints, the question remains as to whether the gorillas can survive in the long-term.

Firstly, the Mt. Tshiaberimu gorillas number only 6 individuals, travelling in two groups. The Katsavara group has 2 male gorillas, one female and a baby. The Kipura group includes only 2 males. The only female on Mt. Tshiaberimu is already quite old and it would be difficult for her to maintain a pregnancy. As there is a lack of females, the risk that the Mt. Tshiaberimu gorillas will disappear is very real. The threat from traffickers is low as there are no young gorillas that traffickers would be interested in.

Secondly, at some point, an armed group called Maï Maï had claimed the area. The salient message here is that if the gorillas were killed, there would no longer be any point in conserving Mt. Tshiaberimu, the ICCN would not have sufficient reason to base staff in this area, and the local population could recover it for agriculture. Without strong advocacy and a strong presence on the ground, the risk that the gorillas will disappear is increasing and imminent.

The big questions that need to be answered, if we do not want to watch helplessly as the Mt. Tshiaberimu gorillas disappear forever, are as follows:

- What do we need to do to prevent this from happening?

- Would it be possible to find females elsewhere and relocate them to Mt. Tshiaberimu?
- Should Mt. Tshiaberimu be left without support from partner organisations?

With this article, I ask all friends of the gorillas to think about these questions.

Claude Sikubwabo Kiyengo

The Status of Grauer's Gorilla in the Usala Forest

The Usala forest sits at the heart of the 30,000 km² Maiko Tayna region of eastern Democratic Republic of the Congo, and is among the most intact, remote, roadless and inaccessible expanses of tropical rainforest remaining on the African continent. Situated between the Maiko National Park to the west and north, the Tayna and Kisimba-Ikoba natural reserves to the east and bordered by chain of rugged mountains to the south the Usala forest remains largely unexplored.

Like much of the Maiko Tayna region, historical records of gorillas in Usala are sparse. In 1935 a single adult male skull was collected by Belgian mine prospectors near Kilimamesa and deposited in the Tervuren Museum, Brussels. Although they did not visit Usala itself during their pioneering surveys of eastern gorillas in 1959,



Nkomo mountain which supports gorillas, taken from Rama village

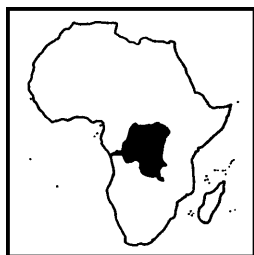
Photo: Stuart Nixon

John Emlen and George Schaller (1960 supplementary notes) provide anecdotal reports of gorillas in Usala, stating that gorillas were perceived locally as “Common” on both sides of the Lindi River.

Later in the 1990s a range wide assessment of Grauer's gorilla conducted by Jefferson Hall and colleagues (1998a) largely omitted Usala and the forest east of Maiko National Park (including the Tayna and Kisimba regions) from their analysis due to a lack of knowledge about the area.

In 2003, communities from the villages of Rama and Kongomani, in the far east of Usala contacted the Dian Fossey Gorilla Fund International (DFGFI) and UGADEC (Union of Community Based Gorilla Conservation Associations in East Congo) with reports of the continued existence of gorillas west of the river Lindi and south of Rama towards Walikale. Between 2003 and 2007 with some small support from DFGFI and UGADEC, community members from these villages were able to collect limited but highly important data on the presence of gorillas in this region. This initial data also revealed the presence of other important flagships for eastern DRC, notably the elusive okapi and Congo peafowl, eastern chimpanzees and forest elephants.

However, it was not until April 2007 that the first attempt to assess the status of Usala's wildlife was made by DFGFI (Nixon et al 2007) with the Rama and Kongomani communities. Funded with support from USAID, the Columbus Zoo and Busch Gardens these reconnaissance surveys walked 240 km over an area of approximately 850 km² revealing a sparse but locally concentrated gorilla population over an area of 340 km² between the Tamarika and Lindi Rivers. During the survey 34 fresh and recent gorilla nest sites were recorded and some relatively large gorilla groups were encountered (up to 24



D. R. CONGO

individuals). Although no precise abundance estimates could be calculated from this survey, a highly tentative estimate of 240–410 weaned gorillas was given for the survey site by converting recce encounter rates (fresh nest sites/km) into expected transect encounter rates following Hall et al. (1998b). In addition, the survey revealed relatively low levels of armed hunting (hunting was limited primarily to snares) and active artisanal mining compared to other forests in the region. Given these positive results recommendations were made to provide further support for the Usala communities to safeguard their highly important wildlife.

Based on a number of factors including the remoteness of the site this support did not arrive for the Usala communities but in the 2012 IUCN Conservation Action for Great Apes in eastern DRC (Maldonado et al. 2012). Usala was put forward and recognised by the participating stakeholders as a priority region for the conservation of great apes.

A primary recommendation emerging from the 2012 action plan workshop was the urgent need for fieldwork to establish the current range wide status of Grauer's gorilla, and to identify priority populations on which to focus conservation action. Further engagement with communities was also prioritized, although it was agreed that such activities must be targeted around the highest priority ape populations. Thus, a thorough field assessment of gorilla populations within historically important regions of their range was recommended as a priority for both landscape- and site level conservation planning.

As part of the implementation of the recommended CAP activities and with financial support from the ARCUS foundation, FFI initiated a status assessment of great apes in the Usala forest in September 2013, starting with initial meetings with communities in the village of Rama. During these largely successful consultations the team was welcomed by the community, however, they strongly expressed

their frustration at the lack of support provided since 2007. Despite this, the community remained keen to engage with the FFI team and share information on gorilla presence and threats. The community members who attended these meetings reported gorillas were still present south of Rama and in the south west towards the river Oso, however they also reported sporadic hunting of forest elephant, okapi and apes by armed groups, including an entire group of 9 gorillas shot in the region of Kilimamesa in 2012. Following these meeting plans were made with the communities for the FFI team to return in spring 2014 to carry out participatory surveys.

In March 2014 the FFI survey project team made their way to Mohangha, meeting with Usala inhabitants and organising porters to transport 100 kg of equipment and over 250 kg of ration 150 km by foot to Rama, a logistical challenge of epic proportions! After arriving in Rama 5 days later, the team along with traditional leaders from

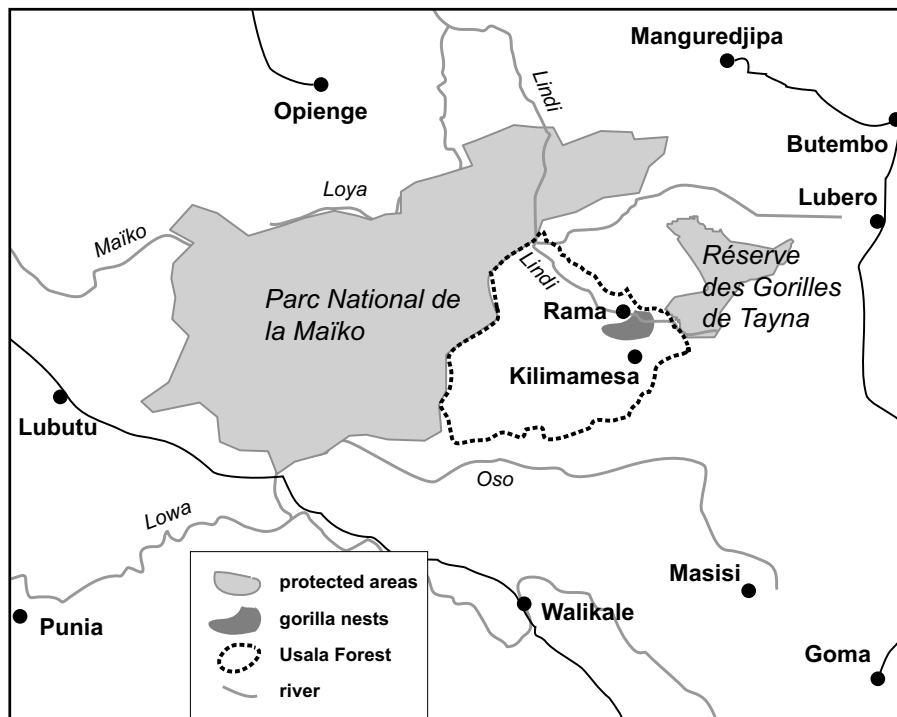


Usala communities

Photo: Chrysostome Kaghoma



D. R. CONGO



The dashed line denotes the extent of the “Usala forest”

Map: drawn by Angela Meder, original map by Stuart Nixon

Rama visited the villages of Baraza and Mbekini informing them of the planned surveys, recruiting trackers and porters and sensitizing them about great ape conservation issues.

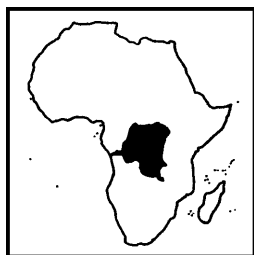
Following this two teams entered the forests conducting a total of 42 days of field work in the forest south of Rama, walking approximately 200 km of guided reconnaissance walks across the zone of gorilla distribution identified in 2007. These surveys revealed that western Usala forest still supports a significant gorilla population, with teams observing a total of 28 fresh/recent nest sites. Average gorilla nest group size was also highly similar to 2007. These results suggest, despite a complete lack of active protection or protected areas status, that this important population has remained relatively stable during the past 7 years. Our results also reveal relatively low levels of armed hunting, mining and forest set-

tlements all highly similar to 2007. This is remarkable in the current DRC context especially when surveys in other priority regions have recorded precipitous declines and local extinctions (Nixon et al. 2010, Hart et al. 2009). It is almost certain that the apparent stability of this gorilla population is a function of its remoteness from roads, navigable rivers, large villages and towns. While the inaccessibility of Usala presents a serious logistical challenge to the implementation of conservation activities, it also offers great potential for the long term protection of its gorillas and other wildlife.

Despite these promising results there is no time for complacency. Increasing land pressure and insecurity to the east is resulting in large scale displacement and resettlement along the entire western Albertine rift escarpment. The Rama communities expressed that the threat of new and un-

controlled settlement in this area was a principal concern about their future. The Rama community suffers extreme poverty, living in almost complete isolation and relying on shifting agriculture, subsistence hunting, low level artisanal mining and the transport of commercial materials from Mohangha to Oninga (a major mining settlement approx. 75 km west of Rama) as principal sources of income. Affordable alternatives to bushmeat are scarce and access to medical care and education are practically non-existent. Current human population densities along the Albertine Rift region of eastern DRC are among the highest on the entire continent and land shortages continue to be a major source of conflict. As security improves, immigration and settlement in the forests of eastern Congo is predicted to rise substantially over the next few decades. This predicted expansion should be taken as a serious warning that the Usala forest will become increasingly threatened over the coming years and its gorilla populations should not be considered safe from extirpation.

Unfortunately since August 2014 security has deteriorated considerably south and west of Rama severing foot access to the region and as a consequence FFI has been unable to revisit Usala to continue its planned participatory surveys. However, the team has remained in continual remote communication with the Usala communities and is working closely with its partners, The Jane Goodall Institute DRC and UGADEC, to develop a holistic strategy for the conservation of Usala as security improves. Chester Zoo, UK is also providing technical support and input towards this strategy. Further engagement with the Usala communities to improve basic environmental and health education, develop realistic alternatives to bushmeat dependency, establish community based wildlife monitoring programs, and identify appropriate



D. R. CONGO

incentives for the conservation of the Usala forest will be essential in protecting this highly important gorilla population in the future.

Stuart Nixon, Chrysostome Kaghoma and Magloire Vyalengerera

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Tracking of Grauer's Gorillas in North Kivu

The effective protection of a gorilla population requires a solid knowledge of the demography, ecology and behaviour of their social groups. The density of gorilla groups (number of groups per km²) and the distribution of group size can be measured using the transect method. Exchanges of individuals between social groups can be studied through non-invasive genetic sampling of faecal matter. However, the majority of data required for the knowledge and protection of gorilla populations can only be collected

by following identified groups over a period of several months, sometimes several years.

Tracking gorilla groups allows us to collect accurate information on their diet, their preferred forest habitat, the distances the groups cover every day, the size of the groups' home ranges, the degree to which home ranges of neighbouring groups overlap, and the seasonality of diet or the gorillas' movements.

In 2012, the Dian Fossey Gorilla Fund International (DFGFI) set up a research station in the low-altitude sector in the east of the Democratic Republic of the Congo. This station serves the dual purpose of studying and protecting the Grauer's gorillas (*Gorilla beringei graueri*). Located in a non-protected forest between the Kahuzi-Biega and the Maiko National Parks, the Nkuba-Biruwe station allows the DFGFI gorilla trackers and researchers to study and protect the gorillas and their habitat over an area of 700 km². Since 2014, the tracking of three gorilla groups ranging south of the study area has been the main project activity. The aim is to collect essential data about the way the gorilla groups utilize their habitat (diet, group movements, seasonal variations) while at the same time protecting them from poaching.

Tracking involves following the gorilla tracks from one nest site to the next by following the traces left behind by the animals – such as trampled vegetation, foot or hand prints, food remains and faeces. Tracking is easier in dense vegetation and when the gorillas travel short distances. Mountain gorillas (*Gorilla beringei beringei*) and certain populations of Grauer's gorillas live in upland forests characterized by abundant terrestrial vegetation, which makes tracking relatively easy. On the other hand, western lowland gorillas (*Gorilla gorilla gorilla*) and Grauer's gorillas living at low altitudes generally occur in forests with little or no un-

dergrowth, with herbaceous vegetation occurring only in patches. The ground is covered by dead leaves, which make gorilla tracks very difficult to spot. Only the most experienced hunters are capable of tracking the animals in such a habitat.

The trackers of Nkuba-Biruwe station all originate from neighbouring villages and they know the forest very well. Several among them are former hunters, now re-directed toward conservation. Even so, the trackers needed several months of practice before they were able to follow a group of gorillas at a distance over several weeks without losing them.

The objective of the DFGFI trackers is to follow a particular gorilla group for several weeks at a time, ensuring that they stay one day behind the group. This means that each day, the trackers start tracking at the nest site the gorillas left the day before and finish tracking at the most recent nest site, which the gorillas had left on the morning of the same day. In this way, the trackers do not encounter the gorillas, so they do not influence their movements and do not cause them any stress. The absence of contact with the gorillas also prevents them from being habituated to the presence of humans. In an area where poaching, mining and armed bands are present in the forest, habituating the gorillas to people would make them more vulnerable. Their fear of hu-



A camera trap placed in the forest caught a group of Grauer's gorillas.



D. R. CONGO



Gorilla trackers Wasso and Jadot identify plant species eaten by the gorillas they follow (here, *Palisota ambigua*).

Photo: Damien Caillaud, DFGFI

mans is their best protection.

When tracking starts in a new area, the trackers first need to locate a gorilla group. The geographical coordinates of several points about 3 km apart are entered into their GPSs. Using their compasses, teams of trackers go to these points and then walk in an approximate circle with a diameter of 800–1000 m around these points. The trackers concentrate on those areas where plants that gorillas eat are located. They look for signs of gorillas that are 1 to 3 days old. This technique allows the trackers to find a fresh track faster than if they searched randomly in the forest. Once a fresh track has been found, it is followed until the most recent nest site has been located.

A tracking team consists of 3–4 trackers and a team leader. Each team member has a defined role. For example, tracker Lumumba is specialized in the detection of signs and the determination of their age. Mokoley can differentiate and interpret the signs of all the animal species in the forest. Jadot,

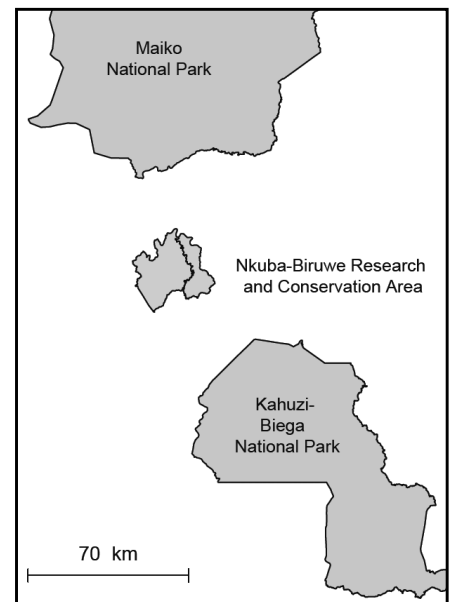
another tracker, knows the names of all the plants eaten by the apes. The team leader stays on the gorilla track with his GPS turned on at all times. He records everything the team discovers in a notebook. Many data are collected in this way. Every 50 m, the GPS automatically records the coordinates. The trackers identify and record all the plant species eaten by the gorillas and collect GPS point data at the feeding sites. The vegetation type characteristic of the feeding site is also recorded. Finally, the nests the trackers find at the end of the day are counted and described.

In spite of the trackers' expertise, the gorilla trail can be lost. The risk of losing the trail is greater when the group of gorillas being followed is small. Another problem is that sometimes the group splits up into small sub-groups, which move separately, 10 m or more from each other, making their tracks much less visible. In addition, rain during the night might wipe out the tracks left by the gorillas during the previous day. Sometimes, two gorilla groups en-

counter each other, which makes deciphering the tracks particularly difficult. When the trail has been lost, the trackers return to the last place where the tracks were seen. Then they split up, walking in circles around the tracks at a distance of about 100–200 m. The trackers use walkie-talkies to stay in contact with each other during these searches, which may take an hour or more. These small units have proved to be extremely useful for the coordination of these searches.

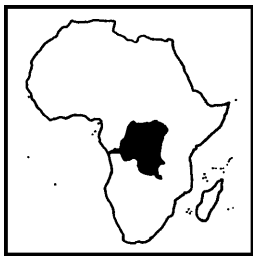
Tracking is the foundation of any research activity on gorillas. Well-equipped and well-trained in the use of GPSs and compasses, the trackers can learn in a few months how to follow a group of about 10 gorillas over a long period of time. In this way, the trackers put their traditional knowledge of the forest to good use in the service of research and conservation.

Escobar Binyinyi, Urbain Ngobobo and Damien Caillaud



The Nkuba-Biruwe Research and Conservation Area is located between Maiko National Park and Kahuzi-Biega National Park.

Map: Damien Caillaud, DFGFI



D. R. CONGO

GRACE Forest Enclosure

Located in the Kasugho region of North Kivu, eastern Democratic Republic of the Congo (DRC), near the Tayna Nature Reserve, the Gorilla Rehabilitation and Conservation Education (GRACE) Center is the world's only facility providing rehabilitative care for Grauer's gorillas (*Gorilla beringei graueri*) rescued by wildlife authorities after being illegally captured by poachers and traders. GRACE's primary mission is to provide a safe, naturalistic environment and excellent care for rescued gorillas to ensure their welfare and to maximize their chances for successful reintroduction, if that conservation strategy is pursued.

GRACE received its first gorillas in 2010 and is currently home to 13 individuals, ranging in age from 3 to 13 years. The gorillas, all orphans, are managed in a single integrated social group, with the older females acting as surrogate mothers for the younger individuals. Around 90% of the gorillas' diet consists of plants (over 45 species) that gorillas typically eat in the wild. Until recently, over 300 kg of vegetation was collected each day by GRACE staff for the gorillas. However, now the gorillas are able to forage on their own inside a newly built forest enclosure that recently opened at GRACE.

As part of its master plan, in February 2012, GRACE began building a 10-hectare enclosure for the gorillas in a forested area on the GRACE property. This new space, which includes mature trees as well as dense undergrowth, provides the gorillas with a more wild-like environment for them to practice survival-critical skills such as foraging, nest building, and coordinating group movements.

Though an ideal forest was identified for the enclosure, GRACE's remote, mountainous location made construction a very large challenge. Without access roads available at the construc-

tion site, every piece of equipment and material used had to be carried up the mountain by hand. More than 200 people from local communities – over half of them women – worked with GRACE on building the forest enclosure. Workers cleared forest for the fence perimeter, dug holes into rock for the placement of 370 fence posts, and strung over 26 km of wire for the solar-powered electric fencing. Gorilla experts from the Dallas and Houston Zoos and Disney's Animal Kingdom in the United States were consulted on the enclosure's design, but the entire project was managed by GRACE's Congolese staff, led by Jackson Kabuyaya Mbeke (GRACE Center Manager) and George Kayisavira Kakule (Facility Coordinator). The project was funded by long-term GRACE partners the Dian Fossey Gorilla Fund International and Dallas and Houston Zoos as well as by a grant from the Margot Marsh Biodiversity Foundation.

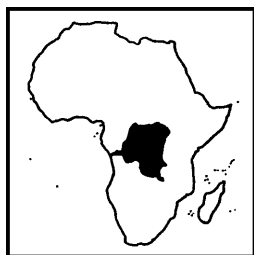
After several starts and stops due to logistical challenges, the GRACE gorilla forest enclosure was finally completed in February 2015. Following final safety checks, the doors were opened for the gorillas in March 2015. The GRACE gorillas had not been in a forest in years. For some of them, it was their first forest experience since being captured from the wild. It was unclear how the group would react to their new surroundings, but upon entering the enclosure, the gorillas – led by the group's dominant female, 13-year-old Pinga – immediately began feeding on vegetation and calmly exploring the forest. Within minutes, the younger gorillas were climbing and playing in trees like they had never left their forest home. The GRACE group now spends over 8 hours each day inside this new habitat, and they are adjusting wonderfully to forest life.

To scientifically assess how the gorillas are adapting to their new envi-



One of the orphans climbs a tree in the new enclosure

Photo: Andrew Bernard



D. R. CONGO

ronment as well as to track general rehabilitation progress for all individuals, GRACE recently launched a behavioural monitoring program. A research team observes the gorillas throughout the day from five towers situated around the enclosure's perimeter. The goal is to track how the group is using the forest and how this new space is impacting individual behaviour and group dynamics.

GRACE's other main mission is to work with local communities on conservation education programs to help protect the remaining wild Grauer's gorillas, the only great ape endemic to eastern DRC. Most people living in the Kasugho region have never seen a live gorilla and know little about these animals, making it difficult to ensure compliance with laws protecting gorillas. The new gorilla forest enclosure will play an important role in GRACE's educational efforts. Local schoolchildren and adults will soon be able to visit GRACE on educational tours and view the gorilla group from a platform outside the enclosure. Our visitor program will aim to teach about Grauer's gorillas and the threats they face and instill pride in visitors for having this magnificent great ape as part of eastern DRC's natural heritage.

GRACE's new forest enclosure is a source of pride for the GRACE staff and the local community, and we hope this habitat helps prepare the gorillas for potentially returning to the wild. In the meantime, it is wonderful to observe the GRACE group having fun in a space that allows them to truly be gorillas again.

Sonya Kahlenberg and Luitzen Santman

For more information about GRACE, please visit www.gracegorillas.org or follow us on Facebook.

Mountain Gorilla Genetics

In a study published in *Science* (see below), an international team sequenced whole genomes of 7 mountain gorillas (Virunga) for the first time and additionally of 6 Grauer's gorillas. They compared these sequences with published sequences of western lowland gorillas. This gave them new insights into the impact of population decline on apes. In eastern gorillas, the genetic diversity was very low; chromosomes were homozygous (contained two identical variants of genes) across 34.5% and 38.4% of their length, while in western lowland gorillas, they were 13.8% homozygous, indicating that the eastern gorillas have a recent history of close inbreeding. The researchers found that in the small gene pool of the mountain gorillas many deleterious mutations had been removed from the population, and that mountain gorillas are genetically adapted to surviving in small populations.

While there are concerns that a low level of genetic diversity may make the apes more vulnerable to environmental change and to disease, the inbreeding has, in some ways, been genetically beneficial. Fewer harmful variants (that stop genes functioning) were found in the mountain gorilla population than in the more numerous western gorilla populations.

By analysing the variations in each genome, the researchers concluded that eastern gorillas experienced a population decline over tens of millennia and mountain gorillas have survived in small numbers far longer than previously thought. According to their calculations, the average population of mountain gorillas has numbered only hundreds for many thousands of years. Obviously, low and high homozygosity are good enough, because both mountain gorillas and western lowland gorillas have survived like this for thousands of generations.

Xue, Y. et al. (2015): Mountain gorilla genomes reveal the impact of long-term population decline and inbreeding. Science 348 (6231): 242–245



Webbed toes of a mountain gorilla; Dian Fossey already mentioned this as a sign for inbreeding. Photo: Wolfram Rietschel



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Ranging on Community Land and Crop-Raiding by Bwindi Gorillas

Conflict between people and animals is one of the main threats to the continued survival of many wildlife species and also represents risks to local human populations. If such conflicts are not addressed adequately, local support for conservation declines drastically. Therefore resolving human–wildlife conflict is a key issue for the future of wildlife conservation (Woodroffe et al. 2005).

In Bwindi Impenetrable National Park, Uganda, critically endangered mountain gorillas sometimes range outside the park and crop-raid. Gorilla crop-raiding and ranging outside pose threats to local communities, such as

crop damage and loss, anxiety, injury and personal danger. On the other hand, gorillas face increased risks of disease transmission from humans and livestock, uncontrolled contact with humans and waste, harassment by local people and even retaliation killing (Goldsmith et al. 2006, Madden 2006, Hockings & Humle 2009). Bwindi is surrounded by one of the highest rural population densities (more than 300 people per km²) worldwide and all the land adjacent to the park is managed by local communities. Once gorillas leave Bwindi, they typically find themselves in people's agricultural plots or uncultivated land. Though gorillas are only one of several species that crop-raid in Bwindi, they draw a lot of attention due to their size, the damage they may cause and the economic value they represent. Furthermore, the den-

sity of gorillas in Bwindi is most likely increasing (Roy et al. 2014) and if ongoing conservation management practices succeed, the population will likely continue to increase. Hence it can be expected that the extent of human–gorilla conflict will exacerbate, presumably leading to some gorilla groups ranging outside the park and placing greater pressure on local livelihoods.

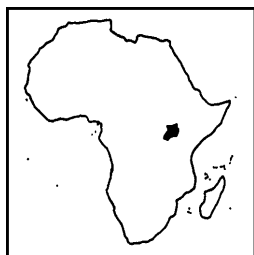
Human–gorilla conflict is one of the major conservation concerns for Bwindi gorillas. The frequency of leaving the park and crop-raiding varies drastically for the different habituated groups. One group, the Nkuringo group, spends more time outside the park than inside and crop-raids more often than any other group. In 2005, a buffer zone was established by the Uganda Wildlife Authority and the International Gorilla Conservation Programme to counteract this group's ranging and crop-raiding behaviour. However, this zone was not well managed, allowing for herbaceous vegetation and fruit trees to regenerate, creating excellent habitat for gorillas (Goldsmith et al. 2006, Kalpers et al. 2010). Ultimately, in June 2013 the buffer zone was cleared for tea plantations.

Many factors have been suggested to cause gorillas to range outside Bwindi, including a lack of food resources inside the forest. Therefore we examined whether food scarcity inside the park or the availability of certain food resources, such as palatable crops, outside Bwindi caused the gorillas to leave the park. We wanted to investigate the behaviour of all habituated groups, not only the groups that were known to crop-raid as we were also interested to know why some groups do not leave the park and do not crop-raid. We examined the ranging and crop-raiding behaviour of 13 habituated groups of mountain gorillas, located in three general locations (Ruhija, Buhoma and Rushaga) throughout the park for a period of 13 months from May 2012 to



Getting ready to start the vegetation sampling outside Bwindi with the vegetation team (Philemon Tumwesigye, Christopher Byaruhanga, Emmanuel Tibenda and Nicole Seiler)

Photo: Nicole Seiler



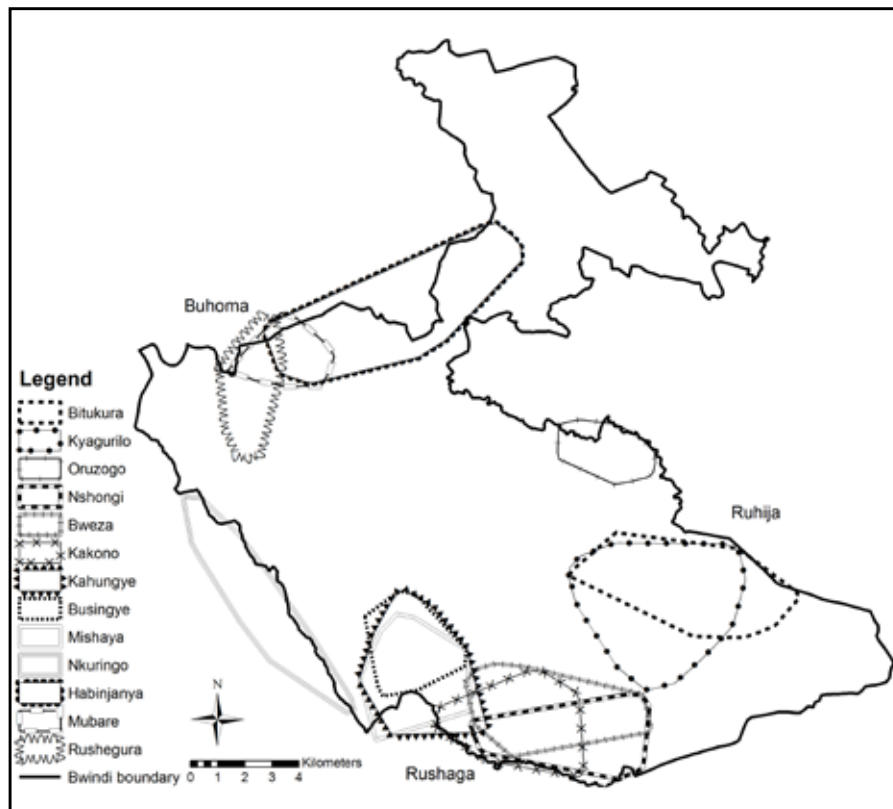
UGANDA

June 2013. To do so, we trained 11 local research and field assistants to collect data on the gorilla groups' ranging, behaviour, diet, and crop-raiding patterns. Additionally, these assistants were trained in monitoring almost 800 tagged trees for fruit every month to calculate an estimate of fruit availability per location.

Besides collecting data on gorilla behaviour, we worked with four field assistants with botany experience, who formed the vegetation sampling team. Over two years, they helped in counting and measuring of ~94,000 plants and trees throughout the gorillas' home ranges to get an estimate of the availability of herbaceous plants for each group inside the forest. As we were also interested in estimating food availability outside the park, we walked ~56 km recording all crops and land-use practices in 50 m parallel to the park boundary. We crossed swamps, walked through herds of cattle and fields of maize, had to avoid steep ravines and cliffs, slid down steep-sided hills and were exposed to either hot sunshine in the dry season or pouring rain and slippery hills in the rainy season.

Our results revealed that Bwindi gorillas leave the park to feed on herbaceous vegetation growing in tea and pine plantations and on uncultivated land outside the forest as well as on palatable crops growing in people's gardens. A lack of food resources within the forest was not causing the gorillas to leave the park or to crop-raid. We found that tea did not deter gorillas from leaving the park. We think this is because tea plantations contain herbaceous foods regularly consumed by the gorillas. Furthermore, these plantations currently do not form a continuous barrier to stop gorillas from venturing further into community land.

The loss of fear of humans by habituated gorillas also has been suggested to play a role in the crop-raiding be-



Map of Bwindi Impenetrable National Park showing the home ranges of the study groups

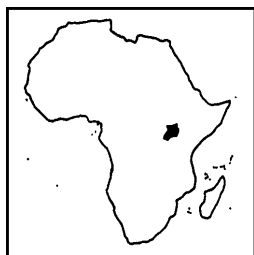
Drawing: Nicole Seiler

haviour of mountain gorillas. However, the Oruzogo group, a group habituated only in the past few years crop-raided, whereas the Kyagurilo group which is habituated since the early 1990s has never been recorded to crop-raid. Additionally, the conservation area manager of Bwindi reported unhabituated groups to crop-raid. Hence, we think that the level of habituation does not play a major role.

To stop gorillas from utilizing areas outside the national park, we recommend turning land adjacent to Bwindi into unattractive habitat. This could be done by planting buffer crops that are high in fiber and secondary compounds, but low in sugar and sodium. Furthermore, we think plantation of crops like bananas or eucalyptus

should be avoided as they seem to attract gorillas. We recommend removing herbaceous foods growing on uncultivated land and plantations and subsequently maintaining the land to keep it clear of foods consumed by the gorillas. If planted continuously around Bwindi and kept clear of herbs, tea plantations might be the best strategy to stop gorillas from travelling into community land. The buffer zone near the Nkuringo group was planted with tea in 2013, which should alleviate much of the problem if the area is properly managed. However, it will be important to assess the effect of tea in the buffer zone on the ranging and crop-raiding behaviour of Nkuringo group.

Implementing park wide wildlife sensitive land-use strategies adjacent to



UGANDA

Bwindi is crucial to prevent this conflict from intensifying. Lastly, this study nicely shows that research and management have to work hand in hand to implement appropriate management strategies to conserve Bwindi mountain gorillas. While many of the results of this study may be specific to Bwindi, this study also emphasizes the importance of using research to guide management decisions for conservation of gorillas and other species.

Nicole Seiler and Martha M. Robbins

We gratefully acknowledge the Uganda Wildlife Authority, the Ugandan National Council of Science and Technology, the Institute of Tropical Forest Conservation, the Berggorilla und Regenwald Direkthilfe e. V., Deutscher Akademischer Austauschdienst, the Max Planck Society, my hard working and dedicated research assistants and all the Bwindi park staff.

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Rukina – Life Summary

We estimate that Rukina was born around 1984. He was well identified as a group member of the Kyagurilo Group in the late 1990s when he was a young silverback. It was at this time that he was named “Rukina”, meaning “playful” in Rujiga, due to his playful nature as a young adult. He became the dominant silverback of the group in August of 2004, following a 3 year struggle for dominance over the previous dominant silverback (Zeus). Through genetic analysis of fecal samples, we confirmed that he sired his first offspring when he was still a subordinate male in 2002. Overall, he likely sired 10 offspring, most of whom are currently still infants. During his 11 year tenure as the dominant silverback he attracted 4 females into his group from neighbouring groups, attesting to his ability to be a good leader. He was a very tolerant silverback, spending a lot of time with the adult females as well as his many infants. At the time of his death, the group was at its largest size, containing 21 gorillas, including 8 adult females. He contributed to our understanding of the ecology and social behaviour of Bwindi mountain gorillas due to the focus of research on his group by the Max Planck Institute of Evolutionary Anthropology since 1998. He helped promote the plight of the critically endangered mountain gorillas around the world by being filmed for several documentary films including one by the BBC.

Martha M. Robbins



Rukina

Photo: Martha Robbins



GORILLAS

Community-led Conservation Action in the Ebo Forest, Cameroon

The Ebo forest in Littoral Region, Cameroon harbours a rich biodiversity of primates, including gorillas and chimpanzees. The government of Cameroon launched the gazettelement of the Ebo forest into a national park in 2006. However, the decree creating the park is still awaited and there is little or no wildlife law enforcement on the ground (Morgan et al. 2011). The proximity of Ebo to major urban centres like Douala, Edea and Yaoundé is a major incentive to the hunting and bushmeat trade, especially as growing agricultural products is not commercially viable given the poor state of the roads around the forest. The forest is thus a main source of livelihood to adjacent communities that depend on unsustainable hunting and the bushmeat trade for protein and

income (Morgan 2004). In addition to running two biological research stations in the west and east of the forest, the Ebo Forest Research Project (EFRP) has been working with local communities, traditional and administrative authorities around the forest to conserve its rich biodiversity and habitats while waiting for the official protection of the forest (Abwe and Morgan 2012). This article is aimed at providing a summary of the community-led conservation initiatives by traditional authorities and communities around the Ebo forest since 2012.

Community conservation outreach around the Ebo forest targets traditional authorities who play an important role in maintaining the cultural, political, social and economic integrity of their communities. They are also recognised as auxiliaries of the administration and thus could play a major role in communicating and lobbying with elites (influential community expatri-

ates) as well as government authorities on issues relating to their communities. Each community member has a stake in the management of resources around them, and their involvement in biodiversity conservation can lead to positive behaviours toward threatened species in particular and biodiversity in general. The “Club des Amis des Gorilles” initiative aims to encourage local communities around the gorilla habitat to be directly involved in monitoring for gorilla signs and threats in the forest around their villages, as well as raising awareness about the significance of gorillas and other species within and outside their communities.

Ebo Traditional Authorities

Since 2011, the traditional authorities of villages adjacent to the Ebo forest have been meeting regularly to adopt strategies to conserve the biodiversity of this forest (Abwe and Morgan 2012). During the second general assembly meeting in June 2013 held at the Limbe Wildlife Centre, the chiefs sought, among other things to: 1) create an official “association” of traditional authorities around the forest with the goal of conserving the biodiversity of the Ebo forest and promoting alternative sustainable livelihoods in their communities, and 2) continue lobbying the government of Cameroon until the decree creating the Ebo National Park is signed.

During the Limbe 2013 Ebo traditional authorities’ meeting, the “Association des Chef Traditionnels Riverains de la Forêt d’Ebo” (ACTRIFE) was created. The chiefs drafted a constitution for the association and applied for the official recognition of the association by the government. The association was finally legalised by the Senior Divisional Officer of the Nkam Division in 2014. The association is headed by His Royal Majesty Dipita Gaston and a bureau of 9 members. The bureau meets quarterly to coordinate the activities of the



ACTRIFE family photo after the general assembly at Douala

Photo: Daniel Mfossa



GORILLAS

association, liaise with the EFRP, local administrators, elites and government officials about the threats to the biodiversity of Ebo and the creation of the Ebo National Park, while the general assembly meets annually. Since 2013, the association's executive has had audiences with the Minister of Forestry and Wildlife (MINFOF), the Secretary General at the Prime Minister's office, as well as the Secretary General at the Presidency of the Republic for the question of the Ebo National Park creation. More meetings with high level government officials are planned in the months ahead.

Given that the government's premise for delaying the creation of the park was on grounds of petitions against the park by elites who hail from ancient villages within the forest (abandoned during the civil strife surrounding the independence of Cameroon in the early 1960s), the administrator of Yingui Sub

Division Michael Nkenemo Atteh with the support of HRM Dipita Gaston organised a meeting for elites from the area on May 19th 2014. This meeting, attended by almost 150 elites, culminated in a petition to the government supporting the creation of the park and was signed by 147 participants. The petition was forwarded to the government by the administrator, Michael N. Atteh.

Club des Amis des Gorilles

Following consultations with the three local communities closest to the Ebo gorilla habitat in the north east of the Ebo forest, a participatory approach to gorilla monitoring and conservation was adopted in 2012 (Abwe and Morgan 2012). This led to the creation of Club des Amis des Gorilles (CAG) in Iboti, Locndeng and Locnanga. The goal of the CAG clubs is to conserve gorillas of Ebo forest and their habi-

tats as well as other species therein. The main objectives of the clubs are to: 1) monitor gorillas and threats towards them within their habitat in order to record the human impact on this fragile population, 2) promote positive behaviours towards gorillas, chimpanzees and other wildlife through sensitisation and conservation education within and outside communities, and 3) promote small-scale, sustainable livelihood activities in communities in order to reduce reliance on the forest.

Membership and inauguration: Membership into the clubs is voluntary and open to all community members without any social, political or religious discrimination. Potential members have to sign an adherence/commitment form that attests the uniqueness of Ebo gorillas, chimpanzees, drills and other species of the forest and the need for members to protect them and their habitats for posterity. The clubs in Iboti and Locndeng were launched on August 1st 2012 by the Divisional Officer (DO) of Yingui Sub Division (Jean Marc Doumbe) in the presence of HRM Dipita Gaston. The Iboti and Locndeng clubs were launched with 34 and 47 members respectively. The club in Locnanga, which currently has more than 50 members, was launched December 13th 2013 by the new DO of Yingui, Michael Nkenemo in the presence of elites of the village who are now based in Douala.

To date, the membership of the three clubs exceeds 200 active members. Each new member receives a badge which is used for voting during CAG annual general assembly meetings. Each club has an executive made up of a president, vice president, secretary, treasurer, financial secretary and monitoring coordinator. The term of the executive bureau is 2 years, renewable once. Second elections for the Iboti and Locndeng CAG bureaus were held in August 2014. The three clubs have been recognised and legalised as as-



Club des Amis des Gorilles monitoring team in the field

Photo: Daniel Mfossa



GORILLAS

sociations by the Senior Divisional Officer of the Nkam Division, in the Littoral Region. In addition to scheduled quarterly meetings, the executive committee meets with monitoring teams after each gorilla monitoring trip to discuss the state of gorillas in the forest as well as threats posed by human activities.

Gorilla monitoring: From their inception to December 2014, the CAG clubs in Iboti and Locndeng have organized over 28 monitoring trips within the gorilla habitat. Between August 2012 and December 2014, 191 individual gorilla nests in 47 groups were recorded. From gorilla nests, trails and feeding sites the monitoring teams recorded and collected 17 gorilla feces for dietary and genetic analyses. Eighty two individual chimpanzee nests in 39 groups were also recorded during the same period. Several chimpanzee termite fishing tools were also observed and collected in the area. During this period, drills and several species of guenons were observed. Hunting signs were observed within the area including hunters, their camps, wire snares, gunshots, discarded cartridge shells, etc. All observations are geo-referenced using the GPS with the goal of producing a map that would depict the gorilla range and thus provide the basis of the proposed “no-go zone” in the gorilla territory. After each monitoring trip, the teams have a briefing with the CAG executive and traditional authorities to report their findings. Recalcitrant hunters are advised and sometimes reported to the administration and MINFOF for appropriate action. The club in Locnanga is engaged in sensitisation within their community as well as surveillance to stem hunting in and around the gorilla habitat by local and immigrant hunters. They intercepted a notorious hunter from a neighbouring community in early 2014.

CAG sensitisation: The CAG clubs are engaged in conservation education



Children from Iboti reading their copies of the handbook

Photo: ZSSD/Malenoh Ndimbe

and sensitisation activities within and outside their respective villages. Conservation education messages in storytelling, songs, on T-shirts, posters, parades, presentations, banners and billboards are widely used. Storytelling sessions where elders tell heroic animal stories to youths and school children are organised regularly in Iboti and Locndeng. During National Youth Day celebrations (February 11th), the CAG organises parades and sensitisations in their respective villages. School pupils are engaged in activities that range from drawings, paintings, poems and songs, with the best pupils rewarded with prizes. During the summer holidays (July–August) the clubs organize inter-village football competitions with adjacent villages to engage the youths and spread the gorilla message through the “Coupe de Gorille” (Gorilla Cup).

Since May 2013, CAG Iboti and Locndeng have been participating in the National Day Celebrations (May 20th) held in Yingui, the administrative head-

quarter of Yingui Sub Division. The parades, posters, banners and songs of CAG have become the highlight of the National Day celebrations in Yingui. The National Day celebrations are presided by the DO and attended by the cream of the Yingui population including external elites. CAG sensitisation and parades during the celebrations have led to wider support of conservation activities as many realize the uniqueness and conservation importance of Ebo biodiversity. The National Day celebrations are also used by EFRP to publicly acknowledge the most outstanding CAG members with certificates and a token prize. The certificates and prizes are handed to recipients by the DO of Yingui Sub Division and Mayor of Yingui Rural Council. During the 2014 National Day celebrations, the CAG clubs played a football game against Yingui-Douala public transporters. The public transporters are the main engine of the bushmeat trade and this encounter was geared at engaging them in biodiversity conservation.



GORILLAS

The promotion of sustainable alternative livelihood activities is a major objective of CAG clubs to reduce reliance on hunting and bushmeat trade for protein and income. With the support of EFRP, high yielding cocoa bean nursery projects have been carried out in Iboti, Locndeng and Locnanga. The seedlings from the nurseries have been transplanted into CAG and other community members' individual farms. The clubs in Iboti and Locndeng as well as the adjacent community of Mosse have been engaged in vegetable gardening to improve the diet and resource base of the local population. Women in the communities engage in the gardening of cabbages, carrots, beans, pepper, huckleberry, okra, etc. Tubers, bananas and plantains are the typical food crops in these communities and this diversification is hoped to improve on local diets and living standards from non-animal protein sources. A poultry project was initiated in the Mosse community in 2014 with more than 300 fowls produced. Unfortunately, due to low demand within the community (population of less than 50 individuals), marketing the fowls was a challenge given the long distances to neighbouring populations and the poor state of roads.

In 2013, the EFRP launched a project to produce a Handbook for Ebo gorillas that will help CAG clubs understand the ecology of the gorillas as well as have a broader perspective on gorillas and their conservation status across Africa. Written in straightforward language, and with the local state-of-knowledge firmly in mind, the final chapter is devoted to Ebo gorillas, and the role of CAG to conserve them. Thanks to funds from Zoo Basel via Berggorilla & Regenwald Direkthilfe, 3000 copies of this handbook were printed in May 2014. The handbook was launched in Iboti and Locndeng villages by HRM Dipita Gaston who wrote the foreword. Copies of the books were

distributed at no cost to CAG and other community members, schools and the administration around Ebo forest. Copies were also distributed to government services and NGOs in the Nkam Division, Littoral Region as well as in Yaoundé.

Ekwoje E. Abwe, Daniel M. Mfossa and Bethan J. Morgan

The Ebo Forest Research Project works in conjunction with the Government of Cameroon (MINFOF and MINRESI) and with WCS. This work is possible due to support from the Zoological Society of San Diego, the Offield Family Foundation, USFWS Great Ape Conservation Fund, the Arcus Foundation and the Margot Marsh Biodiversity Foundation, to whom we are extremely grateful. We also thank Berggorilla & Regenwald Direkthilfe and the Basel Zoo for supporting the production of our Gorilla Handbooks.

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Using Remote Video Camera Traps for Multi-Species Assessments in Gabon

Accurate population assessments of endangered species are of great importance for determining conservation priorities and measuring the success of implemented management strategies, but monitoring elusive species in dense forest habitat is a challenge for researchers. Past approaches to population assessment of elusive species have included line transect and genetic sampling, audio recording and direct observations. However, most of these approaches have some limitations:

they are applicable only to a certain group of species or a specific question, are unable to monitor movements of individuals or rely on indirect signs, all of which increases estimation uncertainty.

Remote camera traps are rapidly gaining popularity among researchers and conservationists as a valuable monitoring tool, because they are reliable, relatively cheap, are not labour intensive, and enable long term spatio-temporal monitoring of specific individuals or populations over many years. To date camera traps have primarily been used to measure species richness or estimate abundance using capture-recapture (C-R) in single species studies. However, increasingly they are being employed to monitor other aspects of ecology and behaviour including activity patterns, feeding ecology and inter-specific competition.

In 2005 we set up a new field site in Loango National Park, Gabon, with the aim of habituating sympatric western gorillas (*Gorilla gorilla gorilla*) and central chimpanzees (*Pan troglodytes troglodytes*) in order to answer ques-



Camera trap

Photo: Josephine Head



GORILLAS

tions about feeding ecology, interspecies competition, ranging behaviour and social structure. In 2009 we began using remote video camera traps to monitor these and other mammal species within the park. The overall aim of this study was to conduct a multi-species population assessment which could be widely applied across rainforest habitats and, in addition to the chimpanzees and western gorillas, we also included forest elephants (*Loxodonta cyclotis*) in the study. Specific objectives were to estimate the density and examine the social and demographic structure of these three sympatric species using spatially explicit capture-recapture (SECR) techniques.

From 2009–2010 we set up 45 remote camera traps in a systematic

1 km² grid covering an area of 60 km². Motion detectors in the cameras were programmed to trigger immediately whenever an animal passed by, both during the day and at night time. We checked the cameras every 2 weeks, changing the batteries and the silica gel which kept them dry; and ensuring that no debris were obscuring the lens. Once we had downloaded the video footage from the camera traps onto a computer, we then began identifying the different individuals through a combination of facial and body characteristics including shape and coloration of ears, nose, face and body, in addition to any body scars or disfigurements.

Overall there were 1045, 471, and 2237 individual chimpanzees, gorillas and elephants respectively captured

on the remote cameras. Of these, 439 (42%), 103 (22%) and 963 (43%) positive identifications were possible for the three species respectively. Gorillas were more difficult to identify due to their heavy brow ridges which often resulted in their facial features being in shadow, and also because they have less variation in skin and hair colour than chimpanzees. They also have much smaller ears which are less frequently damaged than chimpanzee ears, further restricting the potential for positive identifications. Since all identification was done by one experienced observer, we tested the reliability of the identification method by conducting inter-observer reliability testing with both experienced and inexperienced participants. We estimated the density of the three species within the study area using the maximum likelihood based SECR 2.3.2 package (Efford 2012), which is a very user friendly package.

In addition to knowing how many individuals were present in the study area, we also wanted to learn more about the social structure of the three species, and so we assigned group membership to different individuals using the following criteria. Individuals captured together during the same video trigger or within 15 minutes of other individuals on the same camera were considered to be part of the same group. Furthermore, if chimpanzee A was captured with chimpanzee B, and B with C, then A and C were assumed to share group identity.

The inter-observer testing confirmed the reliability of the individual identification method, even among participants who had no experience in identification of those species. Elephants were the easiest species to reliably identify, but both chimpanzees and gorillas were also accurately identified significantly more than expected by chance. In total there were 123, 52 and 139 unique individual chimpanzees, gorillas and elephants identified from the



Evoande, a member of the habituated Atananga group

Photo: Martha Robbins



GORILLAS

video camera trap footage. The SECR model estimated that there were 1.72 chimpanzees, 1.37 elephants and 1.2 gorillas per km². While the chimpanzee and elephant estimates showed precision, there was more uncertainty around the gorilla estimate due to the lower identification rate for this species. The SECR also measured the sex ratio of the three species, which was 1:2.1, 1:2 and 1:3.2 for chimpanzees, elephants and gorillas respectively.

In terms of group membership and social structure, 11 chimpanzees were only ever captured alone but the remaining 112 individuals were assigned to 4 different communities containing 45, 32, 13 and 22 individuals. Gorillas were assigned to 8 groups each with a silverback male and multiple females, and there were 8 solitary males and 6 females only captured alone. Thirty two adult female and 36 adult male elephants were captured alone and the remaining individuals were assigned to 21 core groups composed of multiple adult females and their offspring. Temporary fusing of 2 or 3 core groups was observed among females on 4 occasions, and 14 adult males were observed in bachelor groups of 2 or 3 individuals on 18 occasions but were otherwise solitary.

In terms of the home ranges of these different groups, our results fitted well with what is already known about the social structure of these three species. The chimpanzee communities showed some overlap, while there was high overlap between gorilla group home ranges and between female elephant group home ranges. This makes sense given that chimpanzees are known to be territorial while gorillas and elephants are much less so, regularly sharing their home ranges with other groups. Group composition of female elephants also suggested that they exhibited the same flexible group fission-fusion as seen in savannah elephants.

This study showed that the SECR

method is an effective tool for estimating the density of chimpanzees and elephants, although the lower identification rate for gorillas resulted in less certainty about their precise density. However, when we cross checked our SECR gorilla abundance estimates with other methods we obtained similar results, and so combining SECR and camera trapping still appears to be a very useful approach for gorillas.

Overall our study showed that using remote camera traps enables researchers to effectively make population assessments across multiple species. The methodology and analysis is straightforward to implement, meaning that wildlife managers could continuously monitor population changes to assess conservation effectiveness. In addition, while it was outside the scope of this particular study, our study does suggest that there is potential for long term monitoring of population dynam-

ics of large mammals living in forested habitats. For example, it would be possible to monitor birth/death rate, reproductive success, inter-birth intervals, activity patterns and age/sex structure of multiple species. Furthermore, in our study we monitored three species from a total of 19 mammal species recorded on camera traps in Loango, but the study could have been expanded to include additional species which were individually identifiable such as leopard (*Panthera pardus*), sitatunga (*Tragelaphus spekii*) and forest buffalo (*Syncerus caffer nanus*). Eventually, the results of this study may help standardize both population assessments across regions and evaluation of conservation effectiveness that environmental managers and decision makers are urgently in need of.

Josephine Head, Christophe Boesch, Martha M. Robbins, Luisa Rabanal, Loïc Makaga and Hjalmar Kühl



Iguela and her baby watching

Photo: Martha Robbins



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Original article:

Head, J. S. et al. (2013): Effective sociodemographic population assessment of elusive species in ecology and conservation management. *Ecology and Evolution* 3 (9), 2903–2916

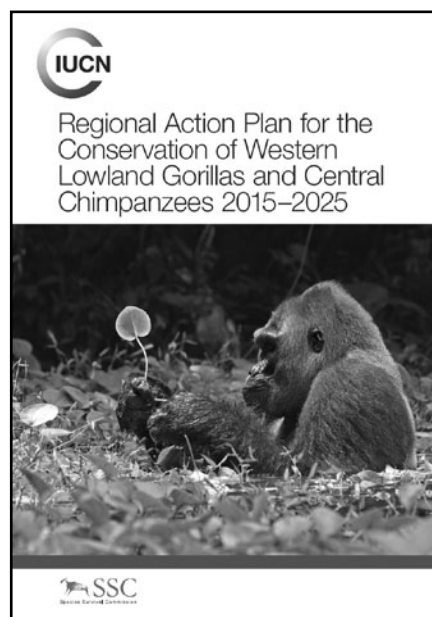
New Action Plan for Western Lowland Gorilla Conservation

Most of the world's gorillas and about one-third of all chimpanzees live in Western Equatorial Africa: Cameroon, Central African Republic, Equatorial Guinea, Gabon, Republic of Congo and Angola (Cabinda enclave). The Critically Endangered western lowland gorilla (*Gorilla gorilla gorilla*) and the Endangered central chimpanzee (*Pan troglodytes troglodytes*) inhabit the rainforests of the six countries listed above. These great apes are undergoing a dramatic decline due to poaching, disease and habitat loss, driven by demands for bushmeat, a lack of law enforcement, by corruption, and by increased access to their once-remote habitat. More recently the forest itself has come under threat from the expansion of industrial agriculture, which will result in massive losses of great ape habitat unless rapid, targeted action is taken. Conservation strategies and actions must be designed to respond to these pressures to maintain great ape populations at their present numbers.

A new Action Plan (IUCN 2014) is the product of the second regional workshop on conservation planning for these two subspecies of great ape, which brought together senior representatives of the wildlife authorities in the six range states, protected area managers, NGOs, scientists, wildlife health experts, industry representatives and donors. These stakeholders assessed great ape conservation needs for the next 10 years, building on an action plan published in 2005 (Tutin et al. 2005), to develop a plan of action that will serve as a guide for range-

state governments, donors and conservation organisations to target conservation investment in the region.

All available survey data collected between 2003 and 2013 were compiled and used to verify, refine and reassess priority areas for great ape con-



servation. Statistical modelling of these survey data was used to create predicted density maps for the entire geographic range of the sympatric western lowland gorillas and central chimpanzees. Priority landscapes were then delineated using a decision support tool and a suite of criteria that included the presence of an existing or planned protected area and a great ape population of at least 2,000 individuals (gorillas and chimpanzees combined). The results produced 18 priority conservation landscapes, six of which were classified as being of exceptional priority as they each harbour more than 5% of the total number of great apes in the region (i.e., 5% of the global population of western lowland gorillas and central chimpanzees). The total area of the 18 landscapes covers 51% of the range of these two taxa, but holds over 77%

of the individual apes. Protected areas alone hold only 21% of these great apes, further underlining the need for effective management and protection of large areas outside formally protected areas in order to maintain their populations.

The action plan lays out a strategy for gorilla and chimpanzee conservation in Western Equatorial Africa. Low birth rates, long periods of infant and juvenile dependence, and late age of maturity mean that great apes are slow to recover from population reduction events when compared to the faster-breeding ungulates and smaller primates with which they co-exist. Since they are threatened with extinction, great apes are completely protected by national and international laws in all countries of their range, and it is, therefore, illegal to kill, capture or trade in live apes or their body parts. Nonetheless, chimpanzees and gorillas are killed by opportunistic poachers, typically to supply an illegal and elitist commercial trade in bushmeat 'delicacies'. Poaching and disease have been responsible for considerable declines in great ape numbers in the region over the last few decades.

Of particular note in Africa was the loss of over 90% of the great apes inhabiting a vast swathe of land stretching from northeastern Gabon to western Congo as a result of successive Ebola virus disease outbreaks between the 1990s and 2005. Population losses from poaching are caused by large numbers of people having access to previously remote ape habitat, facilitated by the construction of open access roads or railroads associated with logging and mining. Infrastructure development generally takes place without regulation and enforcement of reduced impact procedures and has severe impacts on the environment in terms of habitat loss and degradation and wildlife populations which are severely affected by poaching or displacement.



GORILLAS

At the same time, however, the region offers examples of best practice in minimizing some of the negative impacts of extractive industry on great apes from successful collaborations with the private sector – including the creation of protected areas through biodiversity offsets and private–public partnerships for wildlife management in logging concessions. Now the region is also attracting agroindustry, especially palm oil and rubber producers, and the destruction of natural forest to make way for such crops will have a profound effect on great apes and other forest-dwelling species. In addition, the arrival of large labour forces to work in the plantations creates additional pressures on the environment. Careful, integrated land-use planning will be vital to minimise the impacts of new industries on wildlife and the functionality of the region's forests.

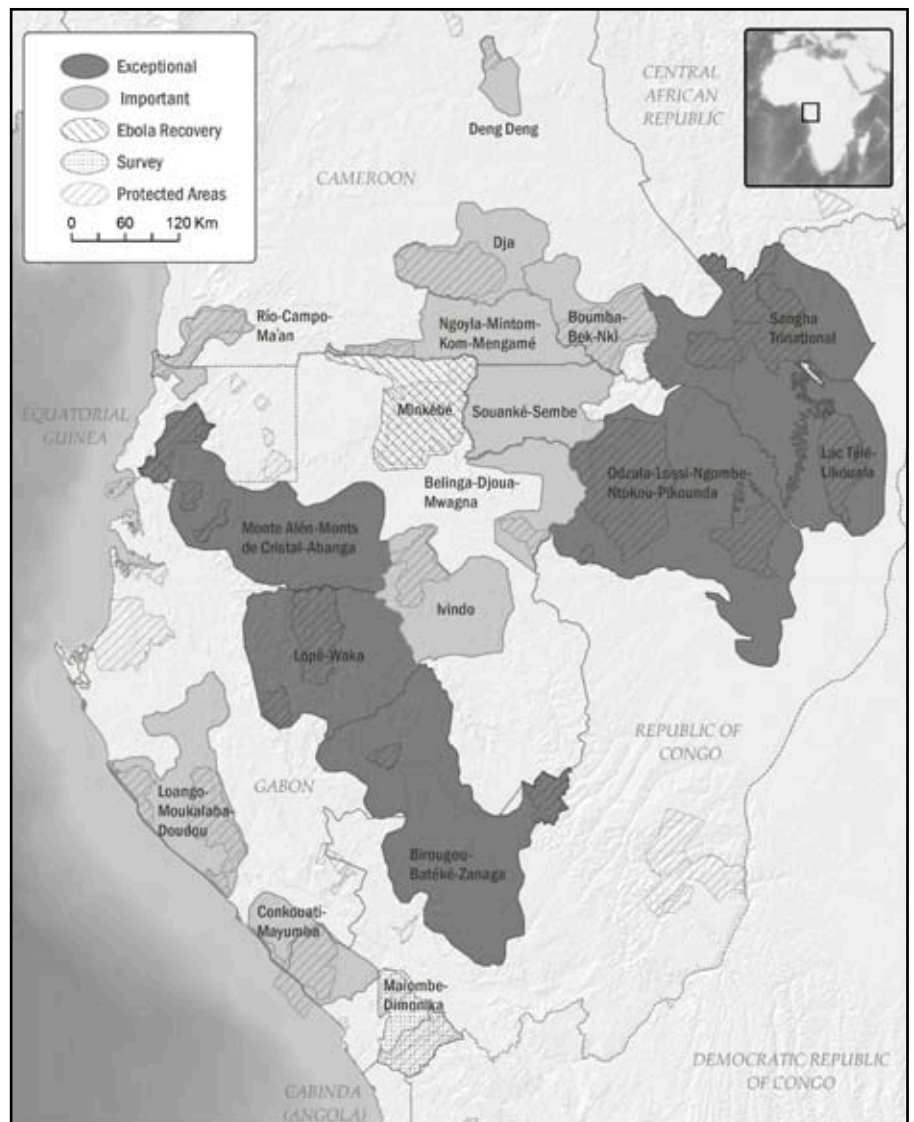
Over the next decade, the main actions needed to ensure the survival of great apes in Western Equatorial Africa will be (I) law enforcement in conjunction with improved regulations and sanctions; (II) careful, holistic national and regional land-use planning; and (III) outreach to and sensitisation of all sectors that deal with land and the protection of natural resources: law enforcement and judiciary, protected area staff, mining, logging, and agricultural industries, tour operators, and local communities. Avoidance of disease transmission from humans to apes can be achieved with outreach and regulations. Prevention of Ebola in great ape populations is still out of reach, but steps to enhance our understanding of the virus will greatly improve our ability to either mitigate or adapt conservation interventions accordingly. At the same time the monitoring of law enforcement efforts, great ape population abundance and distribution and disease prevalence in vulnerable locations, will allow adaptive and more effective management by national wild-

life agencies and protected area authorities. Maintaining large, intact and well-protected areas of forest will be key to maintaining great ape populations in the long term, and this can only be done by a combination of the actions detailed in this plan.

IUCN

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Priority landscapes for western lowland gorilla and central chimpanzee conservation

Courtesy of Danielle LaBruna and Fiona Maisels



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Income in 2014

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Sales	1,007.90 euro
Currency differences	109.90 euro
Refund from meeting	-44.00 euro
Total	64,878.21 euro

Expenses in 2014

Administration	1,126.05 euro
<i>Gorilla Journal</i>	3,391.51 euro
Items for sale	629.00 euro
Postage	1,675.09 euro
Website	6,987.71 euro
Pay/top-ups	5,200.00 euro

Maiko

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Sarambwe

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Bwindi

ITFC employees	8,000.00 euro
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Cross River area, Nigeria

Eco-guards, public awareness	3,632.93 euro
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Loango

Development of a conservation strategy	3,000.00 euro
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Total	64,102.32 euro
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Many thanks to everybody, including all the donors that could not be listed by name here. We are grateful for any support, and we hope that you will continue to support our work!



Members' meeting in Rostock

Our members' meeting was held in Rostock this year. We had a perfect time at the zoo there, listening to various presentations, chatting with our members and visiting the new Darwineum.



Above: the board of directors addresses the participants of the meeting

Photo: Ravid Aloni

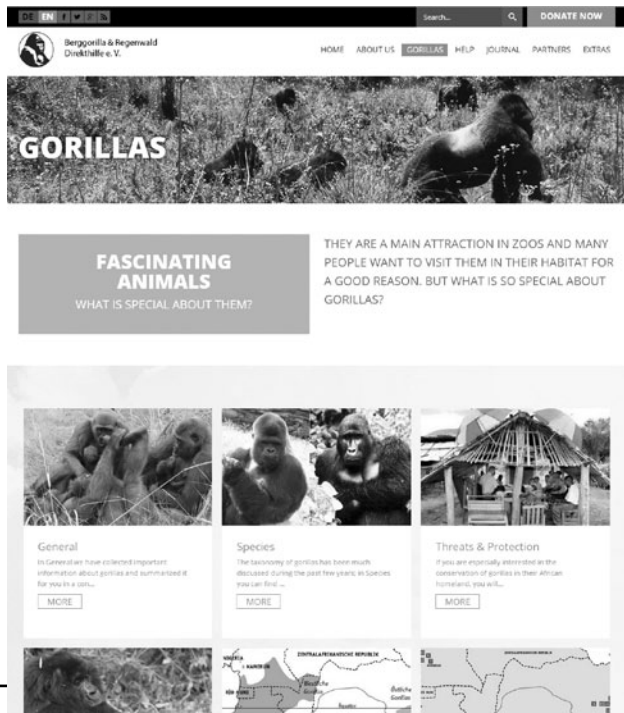
Left: Brunhilde Konradt presents a project for schools with mobile phone collection and a gorilla book for children. Kerstin Genilke guides us through the Darwineum

Below: chats between members at dinner in the Darwineum restaurant

Photos: Angela Meder



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