



Gorilla Journal

Journal of Berggorilla & Regenwald Direkthilfe

No. 52, June 2016

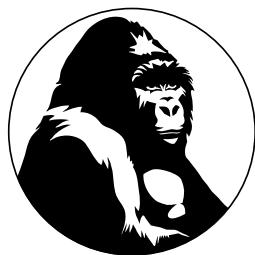


**Grauer's Gorilla
Population
Reduced
Dramatically**

**Development
Activities near
Sarambwe and
Mt. Tshiaberimu**

**Bwindi Apes
Conservation
Education
Partnership**

**Seed Dispersal by
Western Lowland
Gorillas**



BERGGORILLA & REGENWALD DIREKTHILFE

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Gorilla Journal 52, June 2016

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Cover: Grauer's gorilla female resting in her nest in Kahuzi-Biega National Park. Photo: Christian Kaiser

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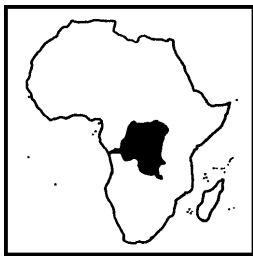
Dr. Kristen Lukas is director of conservation and science at Cleveland Metroparks Zoo, and chair of the Association of Zoos and Aquariums Gorilla Species Survival Plan.

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Grauer's Gorilla Population Reduced Dramatically

Grauer's gorillas are a subspecies of eastern gorillas and live in eastern Democratic Republic of the Congo – an area where fighting between various rebel groups and the national army has been going on for 20 years now. Since then efficient conservation work has only been possible in some regions and/or during certain time periods. Regional surveys already have shown that wildlife has suffered terribly under these extreme conditions, especially large mammals. A team of researchers, led by WCS and FFI, has published a report on the status of the complete Grauer's gorilla population: *Status of Grauer's Gorilla and Chimpanzees in Eastern Democratic Republic of Congo*. They concluded that probably only about 3,800 Grauer's gorillas are still alive (confidence range:

1,280 to 9,050). This means that the population was reduced by almost 80% within 20 years.

From the start we have supported projects for Grauer's gorillas, but during the past 20 years it has been especially difficult – all conservation NGOs working in that region had this same experience and some of them withdrew from eastern Congo. But we will do all we can to improve the conservation of these gorillas in the future, in cooperation with other organisations.

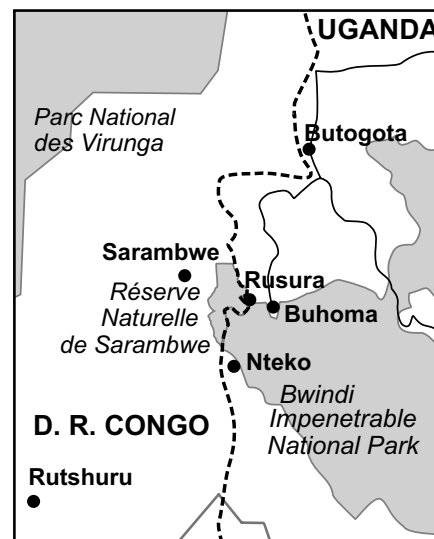
For the exact reference, see the Reading page in this journal (p. 21). Download: <http://dx.doi.org/10.19121/2015.Report.DMX3094100000>

A video explains the report: <https://www.youtube.com/watch?v=dliUjyGJfvs&feature=youtu.be>

Development Activities in the Vicinity of the Sarambwe Reserve and Mount Tshiaberimu

Located close to Virunga National Park, the Sarambwe Reserve and Mount Tshiaberimu are two threatened sites where gorillas still occur. As ecotourism is not yet practical here, these two sites receive only minimal support from the national authority in charge of conservation and tourism. The situation is exacerbated by the remoteness of the sites from the main road and by the insecurity created every now and then by outlaws and armed groups. At Sarambwe, for instance, the park rangers are often recalled to park headquarters due to insecurity – as is the case at the time of writing. At these times, the monitoring of the reserve is under the sole responsibility of the trackers supported by Berggorilla & Regenwald Direkthilfe.

Activities at these two sites are often supported by partner organisations whose agendas include gorilla conservation. Without their support, the sur-

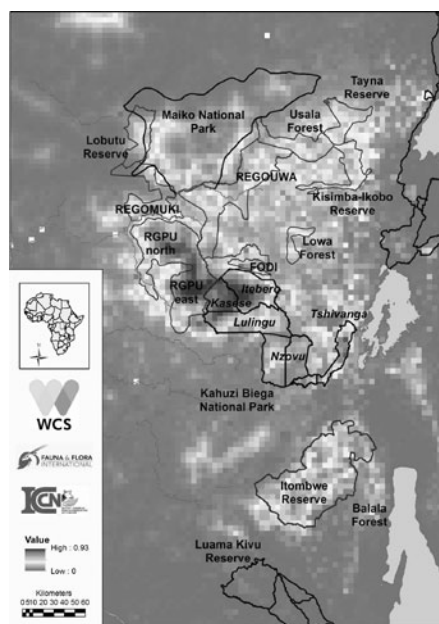


vival of the gorillas at these sites seems highly unlikely as the national authority in charge of conservation is not adapting its strategy for these sites, in spite of the special circumstances. The Gorilla Organization, which used to work at Mount Tshiaberimu with Berggorilla & Regenwald Direkthilfe (B&RD), has recently pulled out. The International Gorilla Conservation Programme (IGCP) is also no longer active in Sarambwe or Mikeno. Only B&RD is still active in the Sarambwe Reserve and on Mount Tshiaberimu.

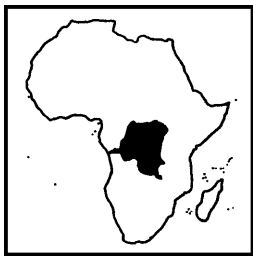
The development measures carried out in the vicinity of Sarambwe and Mt. Tshiaberimu are described below.

Ongoing Activities in the Sarambwe Reserve

The Sarambwe Reserve is managed by ICCN, the Congolese Institute for Nature Conservation. This state institution has assigned one guard officer to Sarambwe, who is assisted by five park rangers. The insecurity in the area sometimes forces ICCN to withdraw all its staff from the reserve for periods of time ranging from two months to over two years, during which time the area remains without any presence of ICCN. In addition,



Occupancy probability map for Grauer's gorilla using the significant covariables and spatial effects



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even when ICCN staff members are at their posts, their effectiveness is reduced because they need to conduct monitoring, fight against poaching, maintain the trails in the reserve and sensitize the population. This is where Berggorilla & Regenwald Direkthilfe comes in: the organisation pays for five trackers, provides sufficient rations for the rangers on patrol, ensures the maintenance of trails and the ranger camp, assists the sensitization of the community living around the reserve, and facilitates the implementation of other donor-funded activities in the vicinity of the reserve. The trackers remain in the reserve even during times of trouble, ensuring the uninterrupted monitoring of the reserve.

Many primate species occur in the Sarambwe Reserve, among them mountain gorillas, chimpanzees, baboons, blue monkeys, red-tailed monkeys and black-and-white colobus. In addition to these primates, there are bush pigs and giant forest hogs, rodents and several bird species also living in Bwindi Impenetrable National Park. Duikers are no longer mentioned in the patrol reports. Buffaloes have disappeared.

In addition to the activities of the rangers and trackers mentioned above, development measures are being carried out in the vicinity of the Sarambwe Reserve and consist of reforestation using seedlings from tree nurseries maintained by schools and others kept by the trackers' wives. Emphasis is put on the maintenance of formerly reforested areas and their valorisation. The maintenance of reforested areas is an important contribution to carbon sequestration and is eligible for REDD+ financing.

Reforestation Project near Sarambwe

Reforestation around the Sarambwe Reserve started in 2010. It was one of the components of the Sarambwe Reserve Integrated Management Support Project initiated by VONA (Voix de la Nature). This project was funded by B&RD and the French Committee of the IUCN. A total area of 89 ha was reforested, 65 ha under an agroforestry scheme and 24 ha as micro-forestation with native species. Subsequent to this project, a school reforestation project was initiated in order to increase the reforested area, using



Students with tree seedlings in their nursery

Photo: Constantin Batarira

seedlings from school tree nurseries. Before the project was suspended due to insurgency of armed groups, 30 ha had been reforested.

The current reforestation project consists of two components: the first deals with the maintenance of some of the older reforested areas; the second aims to increase the area of reforestation.

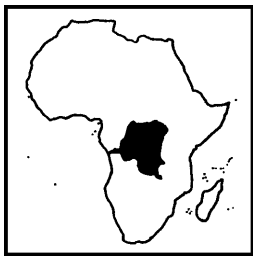
Maintaining existing reforested areas: The current project aims to conserve previously reforested areas, especially those with large trees that are vulnerable to being cut down for charcoal. The strategy is to create revenue from passion fruit, a climbing plant that needs the forest trees as a surface to grow on. At Mount Tshiaberimu, a pilot project that has planted passion fruit in the reforested areas has had spectacular results. In Vuswagha Village, near Mount Tshiaberimu, families can earn 240 US dollars per month from their passion fruit, which, in this region, is a high income. This motivates the villagers not to cut the reforested areas but instead to use them to enlarge their passion fruit plantations. This project has thus supported the conservation of 100 ha of reforested area near Mount Tshiaberimu.

At Sarambwe Reserve, a passion fruit nursery, which is tended by the trackers' wives, has produced 33,723 passion fruit seedlings, of which 9,723



Students of Kisharu Technical Agricultural and Pedagogic Institute planting tree seedlings that they have grown in their own nursery

Photo: Constantin Batarira



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have already been distributed and planted. By the time the project comes to an end in June 2016, 21 ha of reforested area will have been saved. The trackers' wives' association also keeps a nursery of *Eucalyptus* and *Grevillea* seedlings. To date, this nursery has produced 50,000 plants which will allow the reforestation of 31.25 ha. Currently, 30,000 plants have been distributed. Another 20,000 are still in the nursery, about to be distributed.

Two schools, the Technical Agricultural and Pedagogic Institute and the Kisharu Primary School, also own nurseries producing tree and passion fruit seedlings. The numbers of seedlings produced will be available in May 2016, but they seem even higher than those for the nurseries of the trackers' wives.

Assuming similar production rates for all the nurseries, it will be possi-

ble to reforest 94 ha, while another 63 ha will be protected from cutting. It is expected that a minimum of about 20 families will be able to generate incomes of at least 100 US dollars per month from December 2016.

Ongoing Activities near Mount Tshiaberimu

At the moment, only one project is being implemented in the vicinity of Mount Tshiaberimu. This is a fish-farming project, where fish are raised in ponds. The objective of the project is as follows: Lake Edward is an integrated part of the Virunga National Park. Its shores follow the base of Mt. Tshiaberimu. We should remember that the population on Mt. Tshiaberimu lives on agriculture and the raising of poultry (chicken and ducks), but is little developed. Rabbits are also raised, but fish farming is still in its infancy. Frequently, there are



Diversion ponds in Kitevya

Photo: André Katembo

signs that animals are being poached in the forest on Mount Tshiaberimu. Mostly using traps, the poachers target terrestrial mammals such as duikers, giant forest hogs and Gambia giant rats. However, gorillas are frequently caught in these traps.

Help for Mount Tshiaberimu

With its unique mountain forest, Mt Tshiaberimu is part of the Virunga National Park, but despite its great importance for conservation it remains at high risk. Human population density in its vicinity is very high and the people are poor and utilize the forest in their struggle for survival.

For a long time now we have been supporting the local population in the development of alternative sources of income, aiming to prevent the further destruction of the forest and to conserve the gorillas' habitat. Claude Sikubwabo has now sent us a list of proposed projects that have forest conservation and the support of the human population as objectives. These projects are as follows:

- planting of bamboo by communities and individuals in the vicinity of Mt Tshiaberimu: 8,700 US dollars;
- maintenance of patrolling trails and boundary demarcation using cy-presses: 5,400 US dollars;
- extension of the fish pond project: 5,760 US dollars;
- increasing the number of patrols and the level of monitoring over a one year period: 9,575 US dollars;
- beekeeping for communities in the vicinity of the mountain: 6,220 US dollars.

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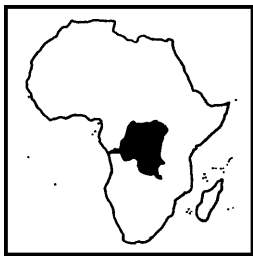
If you would like to fund a particular project, please contact Angela Meder (meder@berggorilla.org). We would be very happy to discuss the best way of using your support.

Please assist us in the attempt to fund as many of these projects as possible. Your support is urgently needed!

You are also welcome to donate via PayPal if you prefer this: <http://www.berggorilla.org/en/help/donate/>

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View of Lake Edward and the Semliki River from Vurusi Hill and a valley with fish ponds

Photo: André Katembo

The development of fish-farming will help to reduce the level of poaching and will be a source of income and animal protein, which is currently lacking. It will also sensitize the population concerning the conservation of gorillas and other animals in the park.

The project has the following objectives:

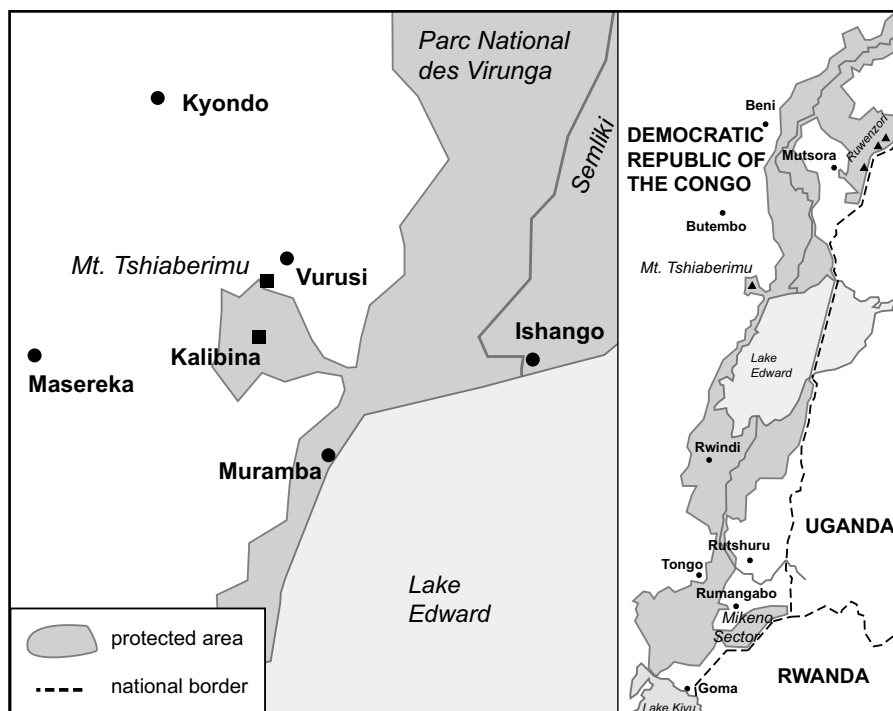
- train the population in fish-farming using ponds;
- teach the population how to build or adapt a pond and how to maintain it to guarantee a good yield;
- instruct the population in the natural history of *Tilapia*, its life cycle, growth, food requirements, and the capture and transport of fry;
- build or adapt six pilot ponds, stock them with fry and monitor their growth until they are ready for harvest;
- monitor activities for a duration of at least 6 months and at the end of this time facilitate the harvest and distribution of fry.

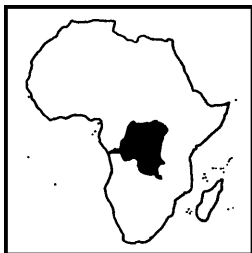
In July 2015, the first training was carried out in Vurusi: fifteen fish-farmers were trained from four sites (Vurusi, Kitevya,

Vulambo and Kasimbi) selected for the development of fish farms. Two pilot fish ponds were selected for development for each of the latter three sites. Training was delivered before the ponds were developed in the three pilot sites.

The six ponds were created between September and November 2015; they were stocked with fry and the fish grew well and fast. A first trial capture of fry from two ponds is planned for June 2016; the fish should be ready for harvesting in September 2016.

A campaign to sensitize the population on the potential for fish farming took place in September 2015. Another campaign was carried out in January 2016. As a result, many people have been attracted to the project. Although initially only 6 fish ponds and about 15 family ponds had been planned, the population mobilized itself to construct more (at the beginning of May, they had constructed 59 family ponds). They were advised to construct diversion ponds in order to make use of the





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hill streams. The population worked together to dig ponds: about 10 people joined together to dig a pond for one of the group; once that was done they moved on to dig a pond for another group member, and so on until every member of the group had their own pond. Aside from the funds used for the 6 pilot ponds, the groups were supported with materials for digging and pond construction.

The current situation is as follows:

- Kitevya: There are two pilot ponds and 37 family ponds, 13 of which were dug before the end of December 2015; 24 were constructed between January and the beginning of April 2016. Twenty ponds are diversion ponds.

- Kasimbi: The youth of this region has the target of establishing 40 ponds. A fish-farming group consisting of 10 people are mobilised to sensitise others. They had nine ponds, but unfortunately, three ponds were destroyed by landslides. Six ponds remain including two pilot ponds.
- Vulambo has 15 ponds including two pilot ponds. A large community pond was being developed, but the work has stopped due to a land dispute. Even so, 15 ponds are currently being stocked with fry.
- Vurusi: Five ponds have already been constructed and stocked with fry.

After September 2016, the fish-farming activities will be sustainable as they are



Ponds near Mt. Tshiaberimu

Photo: André Katembo

cost-effective. The fish-farming groups have united and agreed on fixed prices: one fry costs 100 Congolese Francs (equivalent to 0.1 US dollar), one medium fish sells for 500 Congolese Francs and a 1 kg fish sells for 1,000 Congolese Francs.

Claude Sikubwabo Kiyengo

Two Rangers Die in a Rebel Attack in Virunga National Park

Two rangers were killed and a third ranger is missing after raids on ranger posts on the south side of Lake Edward, in the Central Sector of the park, on 12 and 13 March 2016. The attack was led by two Mai Mai rebel groups who are involved in illegal fishing in the lake. Including these two rangers, more than 150 rangers were killed in a decade in Virunga National Park.

Four ranger positions on the shores of Lake Edward were attacked by Mai Mai militia. The coordinated attacks were carried out by over 120 rebels, beginning in the early hours of Saturday morning. The number represents an unprecedented cooperation amongst Mai Mai rebels to kill Virunga's rangers. Both rangers were captured by the rebels before being summarily executed.

The park's positions were recovered by Virunga's rangers in a joint counter offensive with the Congolese National Army. During this process, one Mai Mai rebel was killed and one arrested. The bodies of both the fallen rangers were recovered and returned to their families. On March 14th, the search still continued for the third ranger.

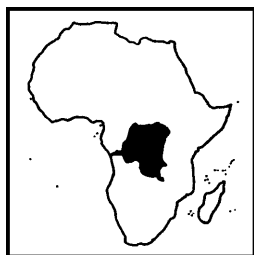
The rangers who died while protecting the park are Fidèle Mulonga Mulegalega and Venant Mumbere Muvesevise. Fidèle grew up in Goma and was 25 years old at the time of his death. Ranger Venant was from the village of Mbingi in the Lubero territory and was 35 years old at the time of his death. He held the rank of Brigadier and was the leader of his ranger unit. He leaves behind his wife, Jeanne, and four children. Venant was a known as great storyteller and was loved and respected by his rangers.

Summary of a press release and blog postings of the Virunga National Park

Ape Dung to Restore Degraded and Fragmented Forest Habitats

Though restoring forest is not a substitute to preserve intact forest, for sites where large parts of the forest have already been cleared, restoring degraded areas can help to re-establish both ecosystem services and biodiversity (Holl 2013). Interest in restoring tropical forest has grown substantially in the past few years with increasing efforts to reduce anthropogenic carbon emissions caused by deforestation and forest degradation, as well as increase carbon stocks by restoring and better managing forests (Elias & Lininger 2010).

Most reforestation in the tropics utilized exotic tree genera (e.g. pine, eucalyptus), but in the past decade or two there has been extensive research on both screening and developing propa-



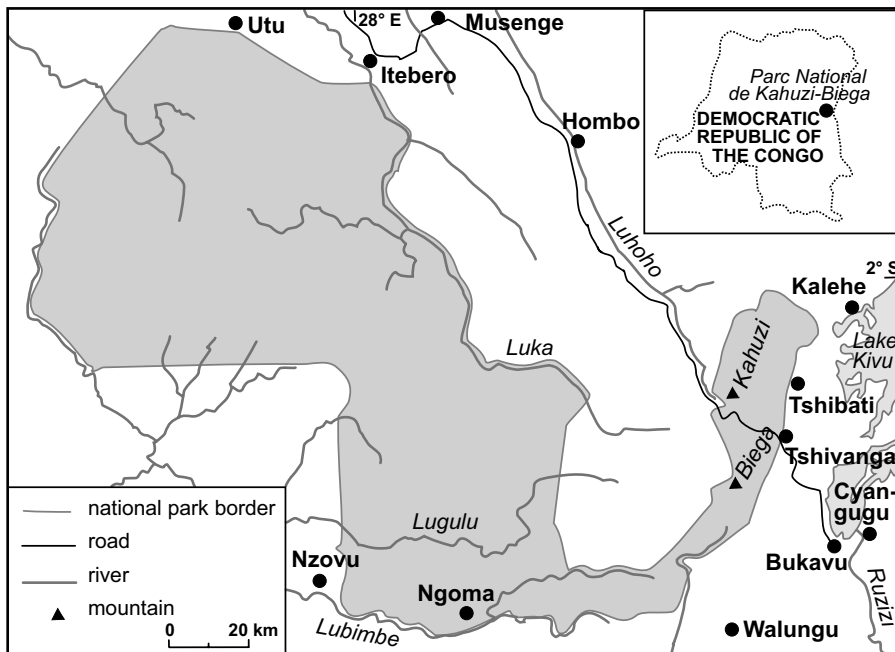
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Seeds from dung
 Photo: Augustin K. Basabose

gation methods for native species suitable for inclusion in restoration efforts (Holl 2013).

Fruits, including fleshy fruits and nuts, are consumed by a wide range of animals, including birds and mammals which are the principal seed dispersers of fleshy-fruited plant species in forest ecosystems (Hickey et al. 1999; Wilson 1993). Seed dispersal by animals is the primary dispersal mechanism for tropical trees (Holl 2013), but most seed-dispersing animals are unlikely to move from forest into open agricultural lands. It is believed that some fruit species may have their germinating capacity boosted after transiting through an animal's gut (e.g. Fedriani & Delibes 2009).



Map of the Kahuzi-Biega National Park

Map: Angela Meder

In tropical African forests where they live, great apes (gorillas and chimpanzees) consume a lot of fleshy fruits, swallowing them without cracking their seeds, which they disperse within their home ranges, thus contributing to the maintenance of plant species diversity. We have been conducting research on great apes in Kahuzi over more than two decades, collecting their dung to describe their frugivorous diet. A large amount of intact seeds of fleshy fruits are found in their faeces.

Very few if any remnant natural forests still exist around Kahuzi-Biega National Park and it is therefore very difficult to find seeds of native plant species outside the park.

Around Kahuzi, all the native forests have been completely cleared, and people in need of fire wood, timber and medicines are entering into the park to collect these resources threatening the protected wildlife including the endangered great ape species. Entering the park for seed collection from fruiting trees is not allowed, to avoid disturbance of park biodiversity.

Planting native tree seedlings is the most common strategy for restoring tropical forests. Several other approaches to restoration have been tested in scientific experiments, but these approaches rarely have been applied at a larger scale and have met with mixed success (Holl 2013). Using intact seeds found in gorilla and chimpanzee faeces may be applied as a cost effective and non-invasive strat-

The tree species from gorilla dung included in the study

Species	Origin of seeds	Number of intact seeds put in nursery	Germination rate (%)*
<i>Allophyllus kivuensis</i>	ape faeces	157 (134)	85.35
<i>Myrianthus holstii</i>	ape faeces	105 (9)	8.57
<i>Syzygium parvifolium</i>	ape faeces	83 (36)	43.37
<i>Syzygium parvifolium</i>	chimp wadges	112 (101)	90.18

* Preliminary results do not take into account the differentiation between the two apes and the age of tested seeds. Figures in brackets are the numbers of seeds which successfully germinated.



RWANDA



Germination experiments

Photo: Augustin K. Basabose

egy to restore native forested habitats outside the apes' range.

We tested the germination rate of seeds of three tree species (*Allophylus kivuensis*, *Myrianthus holstii* and *Syzygium parvifolium*) found in ape wadges and faeces. Intact seeds of each species found in ape faeces were used in this assay to assess the germination rate of each tested species.

These preliminary results will be combined with expected results from a more systematic study using seeds from several tree species in a number of replicates to get a good average of germinating rates of different tested

seeds. The overall aim of this study is to assess the effectiveness of a non-invasive approach to restore degraded and fragmented natural forested habitats using intact mature seeds found in ape dung.



Seeds in gorilla dung

Photo: Augustin K. Basabose

We expect the results of the study to determine the dispersal effectiveness and, thus, the contribution of Kahuzi apes to the forest processes – and later we want to use successful fruit species with good germination rate and fast growing native species in a large-scale reforestation program around Kahuzi-Biega National Park.

Augustin K. Basabose

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New Twins in the Volcanoes National Park

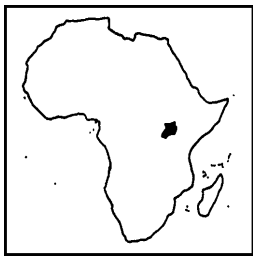
On 18 January, 2016 twins were born to 16-year-old Isaro in the Isabukuru group. She is an experienced mother who already raised two offspring and is now caring for her new offspring perfectly. At the beginning of April, they were looking healthy and both have been growing at the same rate.

More than 270 births have occurred in the Karisoke gorilla groups over the last 50 years, and three have involved twins. The first set of twins born in 1986 survived only nine days, and those born in 2008 died the day they were born as a result of infanticide. Among the groups the Rwanda Development Board monitors, there have also been three sets of twins, of which two sets have survived.

In mid-June, as both twins were growing bigger, Isaro had more difficulties to carry them, but she was very creative.

Summary of blog entries by the Dian Fossey Gorilla Fund

For more details and updates, check the DFGF blog and facebook page:
www.gorillafund.org/gorilla_blog
www.facebook.com/savinggorillas



UGANDA

Bwindi Apes Conservation Education Partnership

The Bwindi Apes Conservation Education Partnership (BACEP) is a collaborative project of the Max Planck Institute for Evolutionary Anthropology (MPI-EVAN), Cleveland Metroparks Zoo (CMZ), North Carolina Zoo (NCZ) and UNITE for the Environment. The project is designed to increase awareness about mountain gorillas and chimpanzees in four primary schools surrounding Bwindi Impenetrable National Park, Uganda, home to nearly half of the world's 880 remaining mountain gorillas. The project was inspired by prior collaborations between participating organizations and a joint commitment to the conservation of Uganda's great apes.

Local people living in the communities on the edge of Bwindi Impenetrable National Park may know little about the environment, conservation issues, and the critically endangered mountain gorillas living nearby. Furthermore, there is a great need to improve the educational standards as well as the infrastructure of the schools, as many schools lack electricity and running water, and basic supplies (such as paper, pens, chalk, and portable blackboards) are always in short supply. BACEP partners recognized the opportunity to work with local communities to address these issues by empowering teachers and schools with additional knowledge and materials specific to their needs. We also provide support for other activities in conservation education that engage primary school children and their families.

Founded in late 2014, BACEP combines conservation education strategies previously implemented by MPI-EVAN in Ruhija, a small village bordering Bwindi, and UNITE in Bigodi, a small village near Kibale National Park

– an area of importance for Uganda's chimpanzee populations – to create a new model of outreach and evaluation targeted to the needs of these local communities. As a result, BACEP provides a range of activities including field trips, debate and music competitions, teacher training, and classroom lessons for schools located in and near Ruhija village. Evaluation strategies include teacher observations, student surveys, and home visits that are designed to promote evidence-based approaches to conservation education that maximize efficiency and impact.

Currently, two Ugandan staff members coordinate BACEP programming in Ruhija under the supervision of the partners. In 2015, BACEP held two teacher training workshops on biodiversity (reaching 57 teachers), took 480 students on field trips to Bwindi Impenetrable National Park, and con-

ducted a variety of conservation activities designed to further students' understanding of the environment. Students maintained tree nurseries at the primary schools, resulting in the distribution of nearly 6000 tree seedlings to the families of the school children. In addition, BACEP organized a training workshop on fuel efficient stoves with local community members.

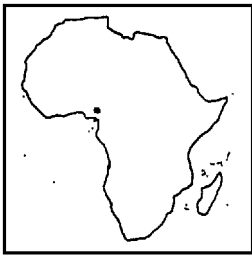
Kristen Lukas, Corinne Kendall and Martha Robbins

None of this work would be possible without the support and engagement of the Uganda Wildlife Authority, the local schools and communities, MPI-EVAN, NCZ, UNITE, CMZ, and a number of generous donors. Please consider helping BACEP advance the mission of conserving endangered great ape species of Bwindi Impenetrable National Park by learning more and donating at: <http://www.clevelandzoo.org/bacep> or emailing us at bacep-uganda@gmail.com.



BACEP staff member Emily Turinawe conducts student evaluations in the local language of Rukiga to help assess the progress and effectiveness of our programs.

Photo: Kristen Lukas



CROSS RIVER

Improving Law Enforcement Monitoring in the Afi Mountain Wildlife Sanctuary

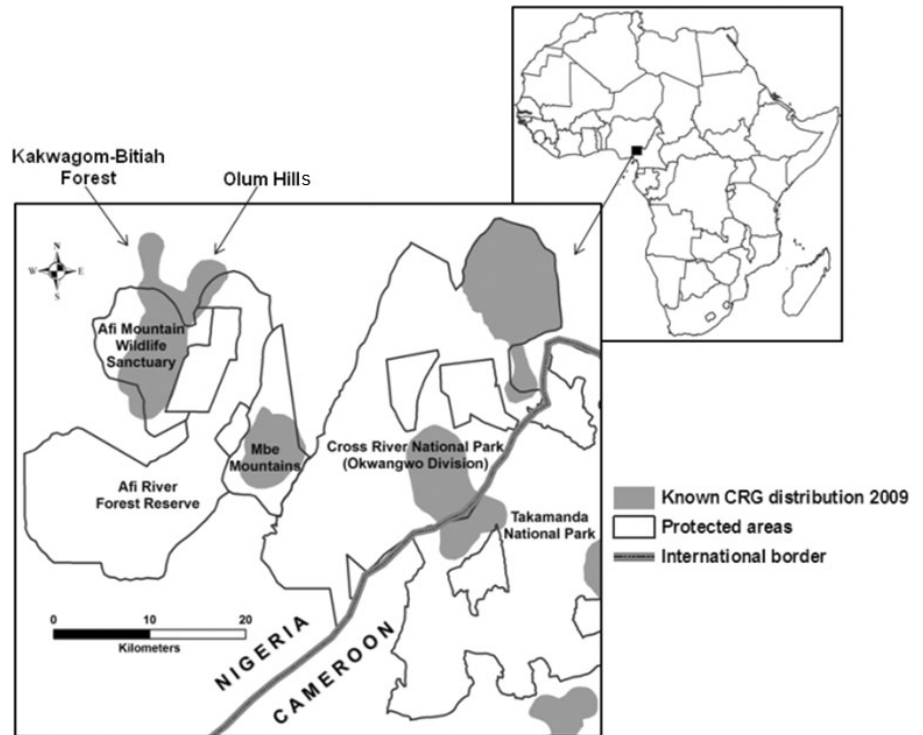
The Afi Mountain Wildlife Sanctuary (AMWS) in Nigeria is the western-most Cross River gorilla site and home to about 10% of the total Cross River gorilla population (Dunn et al. 2014). Due to previously poor protection, levels of hunting and other human activities in the sanctuary are high. However, basic support for ranger patrols, new partnerships and improved monitoring technology has helped reduce hunting in AMWS from 2.07 wire snares per km in 2012 to 0.53 wire snares per km in 2015.

In 2011, with support from the US Fish and Wildlife Service, WCS in collaboration with North Carolina Zoo helped reorganize and reinvigorate the ranger program at Afi, introducing an improved law enforcement and wildlife monitoring system based on CyberTracker (a software that can be used on a handheld computer or Smartphone to record automatically georeferenced observational data). This new system allowed more efficient anti-poaching patrol planning and monitoring and has significantly improved law



Afi rangers recording data with SMART system

Photo: WCS



Location of AMWS and the Olum Hills and Kakwagom-Bitia forest and the approximate Cross River gorilla distribution

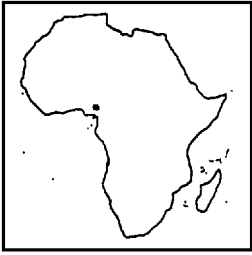
Map: WCS

enforcement effectiveness. Building on the success of the CyberTracker system, WCS in collaboration with North Carolina Zoo introduced SMART (Spatial Monitoring and Reporting Tool) at Afi in late 2015. SMART is a new and improved tool for measuring, evaluating and improving the effectiveness of wildlife law enforcement patrols and site-based conservation activities. SMART has improved data analysis, intelligence and planning and automated reporting functions compared to CyberTracker.

During 2015 with support from WCS, Cross River State Forestry Commission (CRSFC) rangers completed 47 long-distance foot patrols of the AMWS. The patrols which also covered the adjoining Olum Hills and Kakwagom-Bitia community forest covered a total distance of 1,830 km.

Levels of hunting were high both within the sanctuary and in the adjoining areas. Six hunters were apprehended, six shotguns and 1009 wire snares were confiscated, and 45 hunting camps were destroyed. With an improved law enforcement monitoring system hunting in AMWS (measured as encounter rate of wire snares and hunting camps) has continued to decline. However, hunting with wire snares and shotguns is still widespread in AMWS and remains a major threat to the wildlife including gorillas. Although protected by law, Cross River gorillas are still occasionally hunted, especially at sites where protection is weak.

In addition to hunting, the survival of the Afi gorillas is threatened by habitat loss due to farming and logging. Many new farms and evidence of illegal logging were discovered within the sanc-



CROSS RIVER

tuary and in the Olum Hills and Kakwagom-Bitiah forest by rangers during patrols in 2015. Although most of the farms within the sanctuary were located around the boundary, many were expanding deeper into the sanctuary threatening to destroy much of the sanctuary soon if not checked. Urgent action is needed to tackle the issue of illegal farming and logging within the sanctuary and in the adjacent Afi River Forest Reserve to protect the habitat corridor linking the AMWS to the Mbe Mountains and the Okwangwo Division of Cross River National Park. In addition to law enforcement, increased community support and participation is essential for the long-term protection of Afi.

Reorganizing the ranger programme at Afi based on the CyberTracker system (and now SMART) has proved to be a worthwhile endeavor with encouraging results already recorded. The ability to gather geo-referenced field data quickly and analyze and share information simply and in a timely manner is a key strength and advantage of the system. The system has en-

hanced monitoring of wildlife, threats and law enforcement performance. By making it easy to direct patrols to hot-spots of human activity recorded by previous patrols and keeping rangers accountable the system has enhanced patrol planning and effectiveness, much needed to significantly reduce the hunting threat at Afi and keep the gorillas safe. In collaboration with North Carolina Zoo, WCS has also introduced CyberTracker and SMART at other Cross River gorilla sites in both Nigeria and Cameroon.

During these patrols gorillas were observed directly on two occasions and a total of 21 gorilla nest sites, 2 chimpanzee and 3 unidentified nest sites were recorded. The presence of gorillas was also recorded in the Olum Hills, but not in the Kakwagom-Bitiah forest where levels of human activity including hunting, farming, and logging were especially high. The presence of gorillas had been previously recorded in the Kakwagom-Bitiah forest.

Though known to be used by gorillas, the Olum Hills and the Kakwagom-Bitiah forest have received little atten-

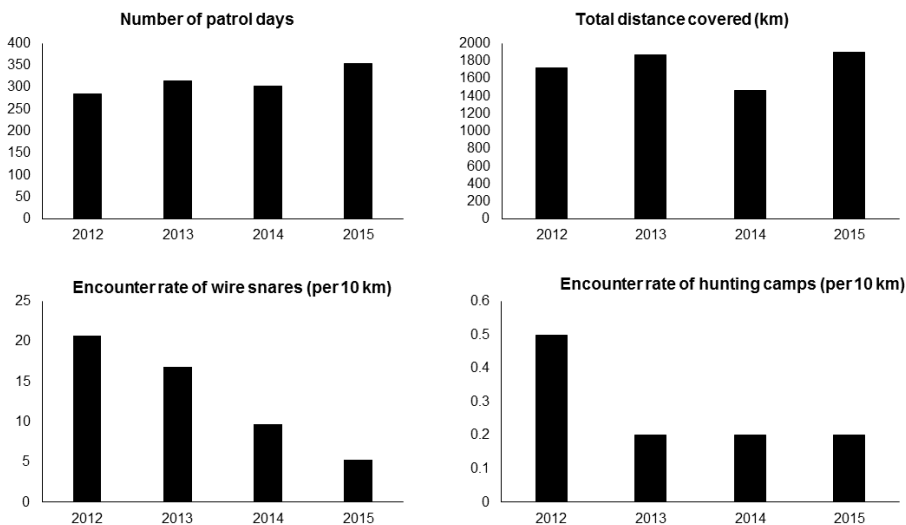
tion over the years. In 1997, the Olum Hills suffered substantial fire damage which forced the gorillas to abandon the area for about a decade. Evidence of their return to the area was recorded only in 2005 when the vegetation started to recover. In 2006, following reports of crop-raiding by gorillas in nearby farms in the Kakwagom-Bitiah forest, WCS conducted a survey which confirmed use of the area by gorillas, and noted the rapid loss of habitat in the area.

With the government often delaying payment of the salaries of the Afi rangers for many months, support from WCS and our donors and partners including North Carolina Zoo, Berggorilla & Regenwald Direkthilfe, the U.S. Fish and Wildlife Service, the U.S. Forest Service and Taronga Zoo, Kolmården Zoo, and Puma has been crucial to maintaining patrols to protect gorillas and other endangered primates at Afi.

Inaoyom Imong, Emmanuel Bassey, Andrew Dunn and Richard Bergl

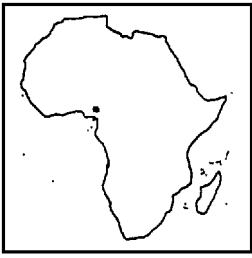
Clean Water for Cross River Conservation; Rangers on the Frontlines

In a previous article, we documented bushmeat trafficking out of West/Central Africa for sale in underground markets in Europe and North America (see Gorilla Journal 48). Currently, we are working on tracking how these meats move out of Africa and into developed world countries. However, this work occurs when the animal has already been killed – a point when it is already too late for trafficked individuals. In the case of small populations of vulnerable species such as the Cross River gorilla, the removal of even a few individuals for consumption can have a serious impact on population survival. That is why strategies that protect populations *before* their removal from a habitat are important.



Patrol effort and encounter rate of hunting signs in AMWS and the adjoining Olum Hills and Kakwagom-Irruan/Bitiah community forest

Drawing: WCS



CROSS RIVER

Ranger programs are present in many protected areas and can be highly effective in helping to preserve vulnerable species *in situ*. Rangers are the individuals *on the frontlines* of species conservation, and play a direct role in the conservation of at risk populations. In Africa, hunting is one of the most immediate threats to species survival; rangers help to capture and prosecute hunters and others who exploit natural resources inside the parks. They also have the added advantage of being able to have an impact on stopping trade *before* wildlife is killed and taken out of the parks; rangers protect species by their very presence in an area and through patrols which discourage hunters from entering areas.

A ranger's work is not easy; often, it is physically rigorous, involving long days trekking through difficult terrain. For this reason, a healthy body is essential and clean drinking water can play an important role in a ranger's ability to maintain the strength to carry out effective patrols. In the Cross River Region, Tengwood Organization (www.tengwood.org) is carrying out a 'Clean Water for Conservation' project with materials provided by another Swiss NGO: Aqua-pura (www.aqua-pura.org). Aqua-pura designs and provides water cleaning systems, free of charge, for worthwhile projects. Their systems purify water using UV-C light, destroying bacteria as well as viruses without the use of chemicals, and allowing essential minerals to remain present in the water. The systems run easily with a solar panel and 12 volt battery. Two designs exist; the first is known as the 'waterdrop' system and consists of a small handheld device that purifies water in a 1.5 l PET bottle. The second is known as the 'waterflow' system; the UV-C light and filtration components can be mounted on a wall, and with access to a water source (i.e. a stream/river, borehole, or rain water) and the addition of a storage

tank and pump, the waterflow system can purify 400–600 l of water per hour. Aqua-Pura's water purification systems were designed for simple and efficient use in Africa and are being successfully utilized in a number of hospitals, schools, and other forums in Togo, Cameroon, Congo, Kenya, Uganda, Madagascar and Peru. For our 'Clean Water for Conservation' project, Tengwood Organization proposed the novel idea of combining water purification with a conservation objective.

The project has two main goals: the first is to provide ranger programs with clean, safe drinking water in order to enhance ranger health, and by extension, patrols. The second is to combine the provision of clean drinking water with an environmental education component. We are testing the feasibility of using these water purification systems for conservation purposes in two protected areas in Cross River State, Nigeria: the Afi Mountain Wildlife Sanctuary

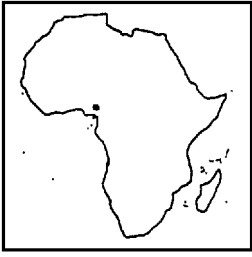
(AMWS) and the Cross River National Park (CRNP), Okwangwo Division. These two protected areas are located within a larger region of mountainous and forested terrain that is part of an important watershed, providing drinking water for plants, wildlife, and people alike. Numerous communities and community lands can be found in the surrounding lowlands. The humans in these communities, by their very presence, become a part of the watershed system. Human disturbance via farming, hunting and urbanization is having an increasing impact on the water sources in this region; they are altering and changing natural structures within and around the parks and because of this, are having a growing impact on the natural environment upon which they depend for sustenance.

Educational materials designed to address the importance of watersheds for school programs and communities living near vulnerable wildlife areas will



An inspection visit by Tengwood Organization to the Okwangwo Ranger station as a proposed site for the 'waterflow' system.

Photo: Tengwood Organization



CROSS RIVER



The only functioning borehole in the community is hand-pumped, experiences long daily lines, and causes conflict within the community.

Photo: Tengwood Organization

help to achieve our environmental education objective. By addressing the interdependence of natural structures within a watershed (i.e. waterways, forest trees, plants and wildlife) we can show how natural structures impact watersheds. By addressing the links between natural structures (i.e. waterways, forest trees and plants and wildlife) and human activities, we can bring a greater awareness to communities about the importance of watersheds to the entire ecosystem and how they are *directly* impacting these watersheds. We will also present some of the alternative actions that could help to create a more sustainable future for their water sources.

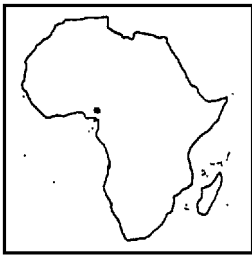
The Afi Mountain Rangers patrol Afi Mountain Wildlife Sanctuary (AMWS), a mountainous region of approximately 100 km² that is a part of the range of

the Cross River gorilla (*Gorilla gorilla diehli*) and harbours a small population of this important subspecies, as well as populations of the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*) and other endangered primates such as the drill monkey (*Mandrillus leucophaeus*). The Afi Ranger Program is managed by the Cross River State Forestry Commission, with support from WCS Nigeria. With technical assistance from North Carolina Zoo, WCS manages a CyberTracker-based law enforcement monitoring system at Afi. In July of 2012, a series of landslides occurred, hitting especially hard on Afi Mountain (Gorilla Journal 47). It is thought that a combination of heavier than normal rains coupled with the presence of a growing number of illegal farms may have resulted in soil erosion and consequently, a series of

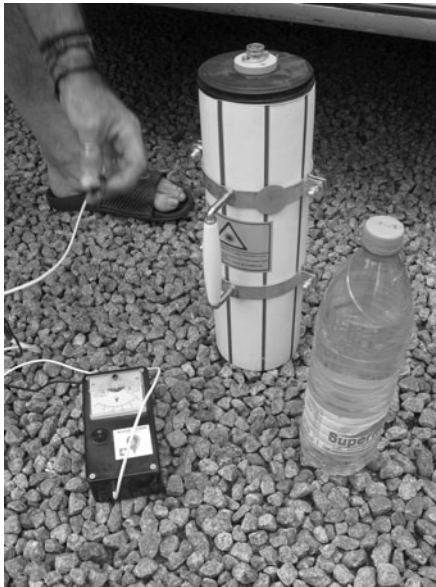
landslides that occurred on the mountain. These landslides impacted the watershed to the extent that formerly potable water sources for several communities disappeared or became silted and polluted. The impact of these landslides on drinking water sources persists even into the present day – many water sources formerly utilized by the local communities are no longer potable.

Near the summit of Afi Mountain, the rangers maintain a base camp, from which patrols are carried out. The stream that supplied this camp was also affected by the mudslide. To start our project, water from the stream was tested before and after purification with the waterdrop system in order to detect the presence of potential water pathogens. *Escherichia coli* is a fecal coliform bacterium, mainly found in the gut of warm-blooded mammals, including humans, and is used in water quality testing as it is one of the best indicators that other harmful pathogens are likely to be present (Edberg et al. 2000). Levels of *E. coli* in the Afi base camp stream were found to be above acceptable levels for drinking water and the Afi Ranger Program was then selected to test the hand-held waterdrop system. In March of 2016, training sessions on how to use the system were carried out with the Afi Rangers and WCS staff and materials were then transported to the base camp. The rangers will be able to use the system to purify drinking water before heading out on patrols. The waterdrop system will be monitored for the next 3 months to periodically test water quality and to determine the feasibility of its usage for ranger patrols.

The second part of our project is slated to take place in the Cross River National Park, Okwango Division, where populations of Cross River gorillas and other primates can also be found and where the watershed is also in jeopardy from human disturbance. The Okwango Division of CRNP is approxi-



CROSS RIVER



The handheld 'waterdrop' system, which easily purifies water in a 1.5 liter PET bottle

Photo: Tengwood Organization

mately 1000 km² and is contiguous with the Takamanda National Park in Cameroon. The Okwangwo and Oban Divisions of the park are managed together by National and Cross River State Governments. One of the ranger stations, located near the northwestern boundary of the CRNP, Okwangwo Division, is supplied by a perennial stream. This stream formerly provided enough water for the workings of the ranger station as well as the needs of the nearby community in the village of Butatong, with a population of roughly 1800 people. However, community forests around the park are being heavily farmed as populations grow.

Farming in this region typically involves clear-cutting a plot of land. If large trees are present, they are burned at the base and felled, and trees and brush are removed before planting. The removal of natural vegetation in the farms above the stream has resulted in a decrease in the flow downstream. A pool, which provides water

to both rangers and community members, has been steadily decreasing in size each year. During a WWF project in the late 1990s, a concrete wall was placed in the stream in an unsuccessful attempt to create a reservoir. The collective result of these human disturbances is a very small pool which must provide water to the rangers and park staff, as well as to the community. Rangers told us they must visit the pool very early in the morning as the community is permitted to enter the station and collect water; during the course of a day, the pool becomes depleted to a point where it becomes no longer possible to extract drinkable water. This pool is one of only 2 sources of drinking water for the Butatong community; the second is a hand-pumped borehole in the village that incurs long lines as people try to meet their daily water needs. We are currently working on the details of installing the waterflow system for this ranger station in tandem with creating an educational program for the community, local schools, and visitors to the station.

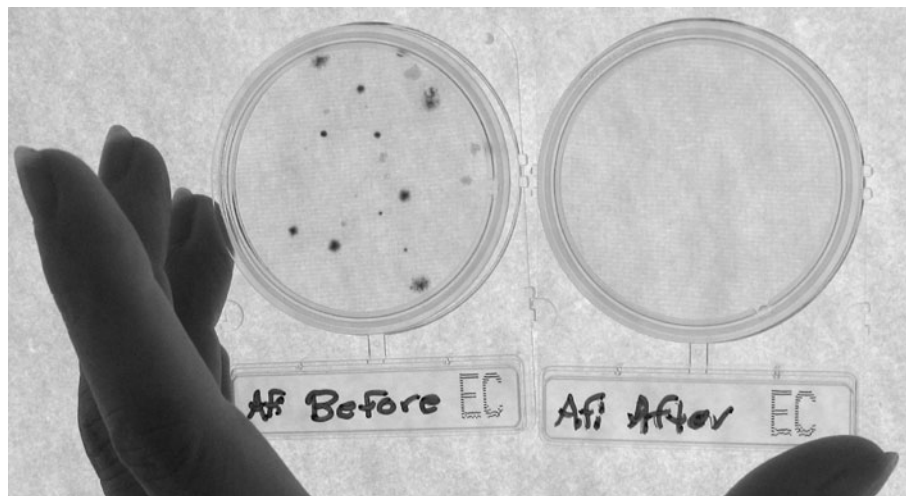
Overall, these water systems should improve working conditions for ranger programs in the parks of Cross River

by providing fresh drinking water for ranger patrols. They will also provide an opportunity to educate local communities to be more aware of their *direct* impact on the environment around them. Specifically, how their actions directly impact their watershed; the rivers and streams, the forests and wildlife, and ultimately themselves. The Butatong community's awareness of ongoing water shortages provide us with an ideal opportunity for environmental education. Our results will determine if the systems may be useful for other ranger programs and also for other local communities who can have a direct impact on helping to save wildlife habitats in the process of maintaining their own natural water resources.

Kathy L. Wood and Bruno Tenger

References:

Edberg, S. C. et al. (2000): Escherichia coli: the best biological drinking water indicator for public health protection. *Journal of Applied Microbiology* 88, 106S–116S



Water test results for E.coli before and after purification

Photo: Tengwood Organization



GORILLAS

The Story of Two Pioneers in the Habituation of Eastern Gorillas

Scientifically, there are four subspecies of gorillas: *Gorilla beringei beringei*, *Gorilla beringei graueri*, *Gorilla gorilla gorilla* and *Gorilla gorilla diehli*. These four subspecies are further divided between two species, in two geographic regions: eastern gorillas and western gorillas. The eastern gorillas comprise two subspecies: (1) the eastern lowland gorillas or *Gorilla beringei graueri*, also known as Grauer's gorilla and (2) *Gorilla beringei beringei* or mountain gorillas.

I have more than 33 years of experience with gorillas as an outcome of my involvement in tourism and the habituation of the Grauer's gorillas in the Kahuzi-Biega National Park (KBNP) in the Democratic Republic of the Congo (DRC). I also have experience with mountain gorillas in the Virunga National Park in the DRC. In addition, I am acquainted with the western lowland



John Kahekwa in the Pole Pole Foundation office

Photo: Christian Kaiser

gorillas in the Moukalaba Doudou National Park in the Republic of Gabon.

I have learned a great deal about this subject from the earliest years of

my childhood, since I am a nephew of Agnes Bujiriri M'Rwankuba, the wife of Adrien Deschryver, the co-founder of the Kahuzi-Biega National Park.

Since the 1960s, two people have gained much prominence in the approach of the two subspecies of gorillas in the heart of Africa in the neighbouring countries of Rwanda and the DRC. These two individuals are very different personalities with origins in two continents and countries. They investigated two subspecies of gorillas in neighbouring countries in the heart of Africa, Rwanda and the DRC. I am referring to a Belgian man called Adrien Deschryver and an American woman named Dian Fossey. Over the course of my entire life, I have respected and admired both of them for their determination and their inspirational initiative in approaching wild gorillas, even when the two were accompanied by trainers.

Deschryver approached the gorillas in the KBNP in mid-1960s for tourism. He was accompanied on a daily basis by two trackers of the Pygmy tribe,

The different methods, several similarities and the results in approaching gorillas

Adrien Deschryver in the Kahuzi-Biega National Park, Democratic Republic of the Congo	Dian Fossey in the Volcanoes National Park, Republic of Rwanda
1. He always stood up in front of the silverback Casimir.	1. She always knelt down in front of Digit.
2. He always looked in the eyes of Casimir.	2. She always looked aside to avoid the face to face contact with Digit.
3. He spoke a few words to Casimir, "Come, come Casimir".	3. She did not speak to Digit.
Similarities	
4. He always beat his chest like a gorilla in front of Casimir.	4. She always beat her chest like a gorilla in front of Digit.
5. He always ate some leaves like a gorilla in front of Casimir.	5. She always ate some leaves like a gorilla in front of Digit.
Results	
6. Casimir habituated to Deschryver's gestures.	6. Digit habituated to Fossey's gestures.



GORILLAS

Two gorilla world's pioneers in different positions in front of gorillas



Adrien Deschryver in habituation (eastern lowland gorillas) in Kahuzi-Biega National Park (1960s)

Pili Pili Purusi and Mishebere Patrice. Pygmies are natives of the forest, who lived there before the Zairian government made the Kahuzi-Biega area a National Park. Pygmies do not need a compass or a GPS to make their way through the forest. Rangers call them "natural compasses". They tracked the first gorilla group, which Deschryver named Casimir.

Dian Fossey visited the Volcanoes National Park in Rwanda and approached a gorilla group she called "Group 4" with a male she later named Digit. She was also accompanied by native trackers who knew the park well. One of the trackers was called Sembagare. Fossey approached mountain gorillas with the goal of long-term research.

The two pioneers inspiringly provided good jobs in each site without knowing or consulting each other.

Wild gorillas are 'hot' during the first contacts with a human being. Both courageous people showed strength in using signs which finally made the gorillas accept the presence of people around them in these natural habitats.

I decided to illustrate Dian Fossey's and Adrien Deschryver's different methods of habituating the two subspecies of eastern gorillas in re-



Dian Fossey in habituation (mountain gorillas) in Volcanoes National Park (1960s)

Drawings: John Kahekwa Munihuzi

membrance of the people who lived their experiences in the field and for the benefit of the generations who did not know them. Their tremendous work in the DRC and Rwanda have been a great resource for the governments' economies, research and, in the future,

for the communities affiliated with the gorillas. These two pioneers of gorilla habituation passed away in the 1980s. Dian Fossey was murdered in 1985 by people who have not been identified and she was buried at the Karisoke Research Center. Adrien Deschryver died of a heart attack in 1989 and was buried at the Tshivanga headquarters. May their souls rest in peace forever.

The silverback gorilla Digit was slain by poachers in 1977 and Digit was also buried at the Karisoke Research Center. The silverback gorilla Casimir died of old age after a severe fight with a young male in his group in 1975. Casimir's corpse was brought to the CRSN-Lwiro's scientific center where his skeleton is preserved.

John Kahekwa Munihuzi

Another Gorilla Orphan Rescued

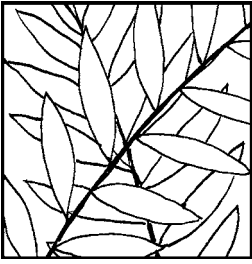
On 29 February, 2016 the Kahuzi Biega National Park director was informed by Lulingu and Nzovu ranger stations about reports of a captive baby gorilla. Local community leaders had negotiated carefully with rebels in the forest who had recently captured her. She was named Lulingu after the place from which she was rescued.

Most likely Lulingu is a Grauer's gorilla, but her subspecies still has to be confirmed. Judging by her size and her teeth, she is 8–12 months old. In March, she was taken to the Senkwekwe Center at Virunga National Park headquarters. If the test shows that she is a Grauer's gorilla, she will be transferred to the Gorilla Rehabilitation and Conservation Education Center (GRACE) in eastern Democratic Republic of the Congo after a 6-month quarantine period, where she will join the other Grauer's gorillas in their spacious natural enclosure.

Source: Reports of the Gorilla Doctors and the Virunga National Park

At the GRACE Center, the 10-year-old female Dunia died in June after a sudden onset of a severe intestinal illness. Sadly, her illness was aggressive and did not respond to treatment. Her death reduces the number of gorillas at GRACE to 11.

Source: Blog entry at www.gracegorillas.org



RAIN FOREST

Seed Dispersal by Western Lowland Gorillas: from Fruits to Seedlings

African tropical rainforests, the second most important biodiversity refuge after the Amazonian basin, host a multitude of plant species. The majority of them (from 50 to 95 %) produce fleshy fruits that are adapted to vertebrate consumption, and hence animal-mediated seed dispersal. Indeed, forest wildlife species ensure important ecological functions for the dynamics of Congo Basin forests through their roles as seed dispersers, seed predators, browsers and grazers, and so on. But many animal species, especially large mammals, are facing sharp declines and local extinctions, caused by anthropogenic disturbances such as commercial hunting and habitat degradation.

The western lowland gorilla is one of the largest African forest animals, and it is supposed to act as an important seed disperser, and indeed this critically endangered species has a highly frugivorous diet and consumes a wide variety of fruit species, whose seeds are swallowed, and excreted intact and viable. Gorillas deposit more than half of their faeces, and therefore half of the seeds they disperse, at their nesting sites. As these sites are preferentially installed in areas of the forest with open canopy, gorilla-dispersed seeds potentially benefit from high light availability. For this reason, western lowland gorillas are thought to provide directed dispersal to many plant species, but the different components of seed dispersal by gorillas were still poorly known until recently.

In the last 7 years, two scientific studies have been conducted in the tropical forest of Cameroon and Gabon. In Cameroon, La Belgique is a 40 km² research site located in the

northern periphery of the Dja Reserve. The site has never been logged but human-made modification of the forest is evident locally by the presence of emergent palm oil trees (*Elaeis guineensis*, *Arecaceae*), which suggests abandoned village sites, and old cocoa plantations. In Gabon, the study site is located within a sustainably-managed logging concession in the southeast of the country (*Precious Woods Gabon* logging concession). A first timber harvesting cycle occurred from 1987 to 2014 in the concession, and the second rotation was underway during our study.

Both sites are covered mainly by secondary forest, and to a lesser extent flooded areas, and harbour western lowland gorilla populations that are not habituated to human presence. The aims of these studies were (1) to document the variety of dispersed species at both study sites, and particularly to identify potential tight plant-gorilla relationships; (2) to assess the viability of dispersed seeds and determine the impact of gut passage on seed germination; (3) to evaluate the contribution

of western lowland gorilla in the dispersal of a timber and non-timber forest product tree, *Dacryodes normandii* (*Burseraceae*); and (4) to test the effect of seed deposition conditions (presence of faecal matrix and deposition at open-canopy nest sites) on seedling development. As most seeds are deposited close to nests, nest sites were characterised (in terms of vegetation types, canopy openness and dung beetle community) at both study sites. Research activities focusing on gorilla seed dispersal were undertaken from 2009 to 2014 in Cameroon, and from 2011 to 2014 in Gabon.

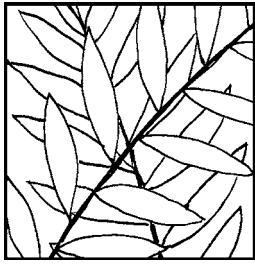
Gorilla Seed Dispersal in Cameroon

At La Belgique Research site in Cameroon, faecal collection and analysis were done in order to identify the species dispersed by gorillas and quantify the number of seeds per faecal unit. Whenever possible, comparative germination trials were undertaken to evaluate the impact of passage through the gut on seed germination success and germination latency (number of days from deposition to



Barbara Haurez marks a gorilla nest for her study

Photo: Jean-Louis Doucet



RAIN FOREST

emergence). In order to provide gut-passed seeds for those trials, feeding sessions with captive western lowland gorillas were undertaken in Limbe Wildlife Centre (Cameroon). They also allowed estimation of the retention time of ingested seeds, and testing of its effect on germination success.

Our results showed that gorillas disperse a wide variety of species, which are highly diverse in terms of size, shape, fruit type, life-form (including large, medium and small trees, lianas, herbs) and regeneration guild. At this study site, the seeds of at least 58 species were found in gorilla faeces. Most of the seeds belonged to trees (44 species, 75.9%). Dispersed seeds originated mainly from fleshy fruits, but some species with fibrous fruits and pods, such as *Tetrapleura tetraptera*, were also found in gorilla faeces. Gorilla seed load was dominated by a few taxa (e.g. *Uapaca* spp., *Landolphia* spp., *Cissus dincklagei*, *Marantochloa filipes*), probably reflecting patterns of seasonal fruit availability and diet preferences. One third of the seed load belonged to the genus *Uapaca*.

Seed gut retention time was assessed for five species: *Antrocaryon klaineanum*, *Pseudospondias longifolia*, *P. microcarpa* and *Trichoscypha acuminata* (Anacardiaceae) and *Myrianthus arboreus* (Moraceae). It varied from less than 8 to as much as 188 hours, and averaged 50.6 ± 28.2 h. Most seeds were excreted after 32 to 48h. The length of retention in the gorilla gut increased germination success for only one out of five tested species (*M. arboreus*), and had no effect for the other species. Considering the effect of gut passage, it was positive for three of the five tested species, and negative for one of them. Seed germination latency was not influenced by gut retention time, but the passage of seeds through the digestive tract affected germination latency, with those passed through the gut germinating faster in

the case of two species (*M. arboreus* and *T. acuminata*) and more slowly in the case of one species (*P. longifolia*), only because of pulp removal.

At this study site, gorilla nest sites were characterized by a more open, less dense and more disrupted canopy. They displayed higher densities of light demanding species, in particular pioneers, and “young” trees with diameters of 10–19.9 cm. They were mostly installed in young secondary forest and canopy gaps, although all habitat types were used for nesting. Seedlings that developed from faeces deposited at gorilla nest sites had a higher probability of recruitment/establishment and a higher growth rate than those from other sites.

Gorilla Seed Dispersal in Gabon

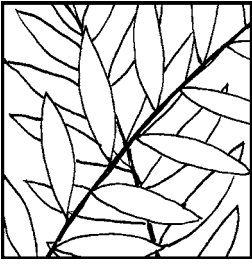
In Gabon, direct (with binoculars) and indirect (with camera-traps) observations were realised in order to identify the animal species that were implicated in the predation and the dispersal of the seeds of the timber species *Dacryodes normandii* (Burseraceae), and specifically to assess the contribution of gorillas in seed dispersal process.

The western lowland gorilla is identified as the main disperser of this species, as it displayed the highest frequency of consumption (88% of gorilla visits involved fruit consumption and seed swallowing) and the longest visit duration (83 minutes on average). Seeds passed through the gorilla gut were excreted intact in faeces. They exhibited a high germination success (68% on average), which was not significantly different from that of seeds extracted from fresh fruits (average germination success = 73%). The chimpanzee (*Pan troglodytes troglodytes*) is also an important disperser of *D. normandii* seeds, while the African forest elephant (*Loxodonta cyclotis*), the putty-nosed monkey (*Cercopithecus nictitans nictitans*), the white-crested hornbill (*Tropicranus albocristatus*) and the

great blue turaco (*Corythaeola cristata*) are dispersers of lesser importance.

We selected four tree species typical of the study area in Gabon to assess the impact of faecal matrix and deposition site on seedling development: *D. normandii* and *S. trimera* (Burseraceae), *Plagiostyles africana* (Euphorbiaceae) and *Chrysophyllum lacourtianum* (Sapotaceae). These species are evergreen, shade-bearing (*S. trimera*, *D. normandii* and *C. lacourtianum*) or non-pioneer light-demanding species (*P. africana*). They all provide valuable non-timber forest products for food, medicinal or cultural purposes. *C. lacourtianum* and *D. normandii* are also harvested by industrial companies for timber production. To assess the effect of faecal matrix on seedling growth, seeds of *S. trimera*, *C. lacourtianum* and *P. africana* collected from gorilla faeces were sown in a nursery with and without faecal matrix. Seedlings of *S. trimera* and *D. normandii* were installed at nest sites and at closed canopy forest sites to evaluate the impact of seed deposition, and especially of light availability, on seedling development.

Seedlings of *S. trimera* and *C. lacourtianum* showed no increase in growth rate but a light increase in foliation rate in relation to the presence of a faecal matrix. A positive effect of presence of a faecal matrix on seedling growth and foliation rate was observed for *P. africana*. Considering the effect of deposition site, this influenced the growth and foliation rates for both tested species (*S. trimera* and *D. normandii*). Actually, growth rate and foliation rate of *S. trimera* seedlings were ten and two times higher, respectively, at nest sites than in closed canopy forest. For *D. normandii*, seedlings deposited at nest sites had growth rates about five times faster than in closed canopy forest, while foliation rate was approximately ten times higher at nest sites than in closed canopy forest. This positive effect of deposition at nest sites on



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seedling growth was probably linked to the light availability at nest sites, as growth and foliation rates were positively correlated to canopy openness for both tested species.

Gorilla nests at the study site in Gabon were preferentially installed in open-canopy forest, as has been observed in other research sites all over the Congo Basin. Their canopy was significantly more open than is observed on average at the study site.

Conclusions and Implications for the Dynamics of Tropical Forests

The combined results of these scientific researches highlight the importance of the western lowland gorilla in the regeneration and dynamics of Congo Basin forests. Indeed, gorillas were observed to be implicated in the dispersal of the seeds of a high number of varied plant species. The seeds are excreted intact and viable, and some of them benefit from the passage through the digestive tracts of gorillas. Moreover, the long gut retention time, large home range and daily travel distance of western lowland gorillas

offer potentially effective long-distance dispersal, a phenomenon which adds to the potential effectiveness of its seed dispersal services.

At both sites, gorilla nest sites were observed to be preferentially installed in habitats characterized by an open canopy. Our results confirmed that the seedlings of gorilla dispersed plant species display enhanced development at nest sites, because of the favourable light conditions. In this regard, the western lowland gorilla provides directed seed dispersal, an important but rare process among vertebrate dispersers. In Gabon, we highlighted the impact of gorilla seed deposition, *i.e.* presence of faecal matrix and open canopy at deposition sites, on seedling development of four tree species, characteristic of the forest of the Gabonese forest and economically valuable.

The results from Cameroon and from other study sites show that a number of additional species, exploited for their timber and non-timber forest products, also rely on gorillas for seed dispersal (e.g. *Pseudospondias microcarpa* and *Trichoscypha* spp. (Anacardiaceae),

Nauclea didderrichi (Euphorbiaceae), *Dialium* spp. (Fabaceae), *Myrianthus arboreus* (Moraceae)). The gorilla was observed to be the main disperser of the timber species *Dacryodes normandii*, and could possibly play a similar role for other commercially important trees. Thus, the dispersal services performed by gorillas within the forest ecosystem are both environmentally and economically essential. They seem to be particularly important in the context of logged forest and sustainable forest management. These studies encourage the implementation of gorilla conservation strategies as critical to ensuring the preservation of tropical forest ecosystems.

Barbara Haurez

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Haurez, B. et al. (2013): Impacts of logging and hunting on western lowland gorilla (*Gorilla gorilla gorilla*) populations and consequences for forest regeneration. A review. *Biotechnology, Agronomy, Society and Environment* 17 (2), 364–372

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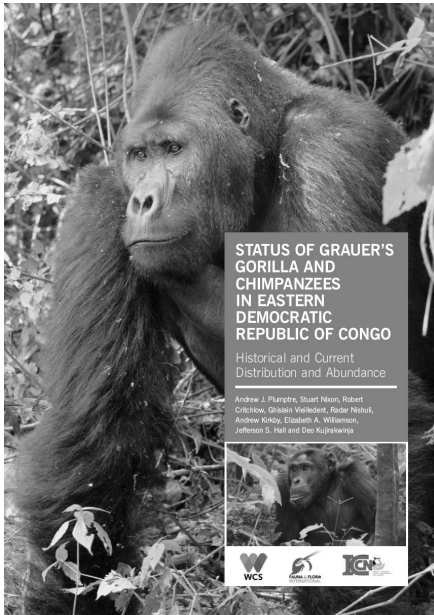


Collection of seeds from gorilla dung

Photo: Jean-Louis Doucet



READING



Andrew J. Plumptre, Stuart Nixon, Robert Critchlow, Ghislain Vieilledent, Radar Nishuli, Andrew Kirkby, Elizabeth A. Williamson, Jefferson Hall and Deo Kujirakwinja
Status of Grauer's gorilla and chimpanzees in eastern Democratic Republic of Congo: Historical and current distribution and abundance. Report to Arcus Foundation, USAID and US Fish and Wildlife Service 2015. ISBN 978-0-9792418-5-7. Download PDF (4.7 MB): www.albertinerift.org/Admin-Plus/Docustore.aspx?Command=Core_Download&EntryId=31357

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BERGGORILLA & REGENWALD DIREKTHILFE

Finances

Income in 2015

Subscriptions	19,103.22 euro
Donations	123,657.53 euro
Sales	509.00 euro
Currency differences	55.50 euro
Refund from meeting	126.80 euro
Total	143,425.05 euro

Expenses in 2015

Administration	1,514.22 euro
<i>Gorilla Journal</i>	2,506.86 euro
Items for sale	168.89 euro
Postage	1,994.75 euro
Website	14,608.83 euro
Pay/top-ups	5,239.00 euro
Virunga National Park	
Communication	25,000.00 euro
Sarabwwe	
Support of patrols, training ...	30,416.67 euro
Mt. Tshiaberimu	
Fish pond project	9,723.40 euro
Itombwe	
Patrol equipment, training	9,421.52 euro
Bwindi	
ITFC employees	9,300.00 euro
Cross River area, Nigeria	
Afi anti-poaching patrols	9,658.76 euro
Tengwood (bushmeat)	2,000.00 euro
Loango	
Camp construction	20,000.00 euro
Total	141,552.90 euro

Our Donors

From November 2015 to April 2016 we received major donations by ajoofa, Ravid Aloni, Arkon Metallbau, Marion Arnoldi, Edwin Artho, Fabrice Braun Manella, Ingrid and Burkhard Bröcker, defacto BE/ONE Hamburg, Angelika Dickmann, Druckpartner, Marianne Famula, Flint Group Germany, Peter Günther, Helga Innerhofer, Michael Jähde and Angelika Jähde-Stöckle, Götz Kauschka, Hartmann Knorr, Barbara Maier, Helga Maiwald, Hannelore Merker, Michael and Regina Möhring, Ralf Bernhard Neuhaus, Hanna Otte, Manfred Paul, Anne Pfisterer, Pieterella Pols Fonds, Birgit Reime, Geraldine Reischl, Wolfram Rietchel, Alfred Roszyk, Gabriele Russ, Wolfgang and Sabine Schatte, Andreas Schröter (Kong Island), Eva Schweikart, Schwabenpark-Kaisersbach, Elke Seeger, Frank Seibicke, Andrea Spahn, Julia Stoppel, Hans-Christian Ströbele, Nele Thoma, Tipp 4, Evelin Tittmann, Christof Wiedemair, Wigwam Naturreisen & Expeditionen, Wilhelma, Heinz and Elisabeth Zaruba, Zoo Krefeld, Zoo Rostock and Zoo Saarbrücken.

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!

Report on the General Meeting of Berggorilla & Regenwald Direkthilfe 2016

On 16 and 17 April, our biannual meeting was held at the Hannover Zoo. With about 50 members and guests it was very well attended. The event started at 2 pm on Saturday with Angela Meder reporting on the current status of individual gorilla areas supported by the organisation.

This year's lecture, entitled "Crop Raiding Gorillas of Bwindi", was given by Nicole Seiler, who has carried out field research as part of her PhD thesis. The objective of her study was to determine the factors that influence gorillas to leave the national park and enter neighbouring agricultural areas – and how this might be prevented in the future. The finding was that the gorillas do not leave the park because of a lack of food but for convenience. They are enticed out of the park by the attractive food that is on offer outside, such as the pith of banana stems and the bark of eucalyptus trees. This situation might be remedied if the people living next to the national park focused

New Address

At our members' meeting in April, a new Board of Directors was elected. Rolf Brunner, who was one of the founding member of our organisation, resigned because of his age. We are happy that we found a competent successor for Rolf, Burkhard Broecker. We have known him for many years and he already took over Rolf's tasks successfully.

**Berggorilla & Regenwald
Direkthilfe e. V.
c/o Burkhard Broecker
Juedenweg 3
33161 Hoevelhof
Germany
broecker@berggorilla.org**



Nicole Seiler during her presentation

Photo: Angela Meder



BERGGORILLA & REGENWALD DIREKTHILFE



Good bye to Rolf Brunner with gorilla wine

Photo: Udo von Alten

on cultivating plants that gorillas do not like. This would have to be monitored.

Afterwards Angela Meder gave an overview of the projects for western gorillas funded by the organisation in 2014 and 2015 and an outline of the current year's financial plan.

The meeting concluded with a very moving slide show in memory of Paul-Hermann Bürgel who recently passed away. His friend and fellow campaigner Manfred Hartwig acknowledged Bürgel's lifelong involvement with many very personal images and stories. Paul-Hermann Bürgel founded "Berggorilla Patenschaft", which later developed into Berggorilla & Regenwald Direkthilfe. (It was named "Direkthilfe" – direct aid – because long-standing personal contacts with people active in the gorilla areas make it possible to channel aid directly where it is needed, and because it is possible to monitor how funds are used. As everybody in the organisation volunteers their time, administrative costs are very low.)

The day came to an end with a din-

ner and many interesting conversations in the comfortable surroundings of the zoo restaurant.

At 10 am on Sunday the formal part of the event commenced with the ac-

ceptance of the accounts and new elections. As long-term Board member Rolf Brunner did not want to continue because of his age, Burkhard Bröcker was elected as a new Board member.

Afterwards we were given a guided tour of the zoo's ape enclosure. Great ape keeper Klaus Meyer started by explaining and demonstrating the safety features that allow for caretakers to enter the inside areas for cleaning or to provide the animals with food and water. Standing in front of the enclosures of the individual species (gorillas, orang-utans and chimpanzees) he then provided insights into the species' differing psyche and social behaviour, giving examples from his professional life and sharing some of his wealth of experience. His commitment to caring for the animals and his attachment to them were unmistakable. After this interesting guided tour most participants started on their journey home.

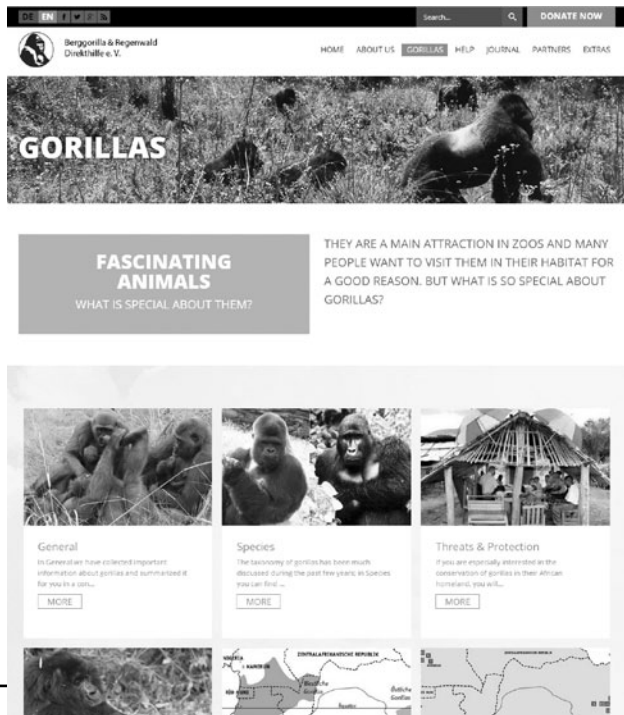
Overall it was another entirely successful event for which we would like to express our heartfelt thanks to the organisers and participants.

Ingrid Bröcker



The new Board of Directors: Angela Meder, Burkhard Bröcker, Peter Zwanzger

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