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Emergency Funding to Virunga

Conservation in Sarambwe: Interventions and Perspectives

Genetic Analysis and Population Size Estimate for Bwindi Gorillas

History of Mountain Gorilla Research

BERGGORILLA & REGENWALD DIREKTHILFE

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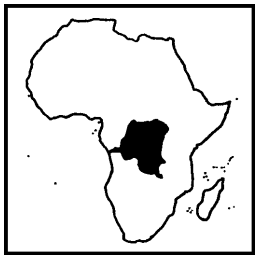
Photo: IGCP



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Report on the Death of Mufanzala

On March 26th, 2009, the rangers and trackers of the Kahuzi-Biega National Park (KBNP) made the tragic discovery of the corpse of the silverback Mufanzala, a 30-year-old male gorilla and leader of a family of 18 individuals. The discovery was made during a daily patrol as part of the regular monitoring of this family. Mufanzala had never shown any sign of disease until the evening before his death, when the trackers say they heard unusual vocalisations from the gorilla. The following day, the male was found dead, with his face against the ground. There were no signs of violence or aggression having been perpetrated upon the body.

The following day, the responsible authorities of KBNP, among them Site Head Radar Nishuli, went to where the corpse had been discovered in order to confirm the death officially. This was an emotional moment for the park staff. Mufanzala was one of the sons of the silverback Mubalala who lived in the KBNP prior to the 1996–1998 war. Towards the end of 1998, Mubalala was killed by armed bands fighting in that region. Although then still a blackback, Mufanzala took over the leadership of the group from his father in 1999. Currently the group consists of 18 gorillas and was monitored regularly, although it was still not completely used to the presence of humans.

The death of Mufanzala is a great loss for the park. He now rests in peace on Buzimba hill in the middle of the park, in the forest where he was born and where he matured into the leader of a large family. Park staff will intensify their contacts with the family to determine if one of Mufanzala's sons will take over the leadership from his dead father, as Mufanzala himself did when his own father Mubalala died.

In order to verify the cause of death,

This is how the ranger patrol found Mufanzala

the responsible authorities at the park decided to draw on the expertise of the vets of the partner organisations *Coopera* and the *Mountain Gorilla Veterinary Project* (MGVP) to conduct an autopsy. In such a case, all possibilities of disease and/or a potential epidemic must be ruled out – so as to protect the rest of the gorilla population in the KBNP. The autopsy found that Mufanzala died of a liver abscess, related to his advanced age. It was a natural death: a great relief to the park staff. The KBNP authorities sincerely thank *Coopera* and the MGVP for their readiness to collaborate, and for the high level of professionalism shown during their work in the park.

As the last refuge of the subspecies *Gorilla beringei graueri*, the KBNP bears a heavy responsibility for the protection and the conservation of these primates. In addition, as a World Heritage Site, the KBNP also has the responsibility of ensuring that the biodiversity of this exceptional part of sub-Saharan Africa is conserved.

The KBNP is one of the World Heritage Sites most at risk. It faces many threats from the most recent conflicts in Kivu, such as the presence of armed groups, illegal mining activities, charcoal burning and poaching. In their endeavours to get the KBNP off the list of sites in danger, the park authorities are doubling their efforts to increase monitoring levels, to improve the quality of monitoring and research, to work more closely with the populations living close to the park in community conservation approaches, and to increase the understanding of the economic importance of the KBNP in the reconstruction of the South Kivu province. The latter is achieved with the help of improved communication concerning the environment, the development of ecotourism and through general lobbying at provincial, national and international levels.

The new leadership team of the KBNP, which has been in place since August 2008, is working hard to overcome this enormous challenge in collaboration with partner organizations (WWF, WCS, MGVP, *Coopera*, the *Born Free Foundation*, the *Frankfurt Zoological Society*, GTZ, *Berggorilla & Regenwald Direkthilfe* and many others that cannot be mentioned here due to lack of space).

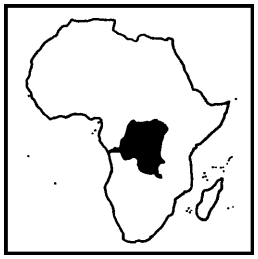
Thanks to all our supporters for helping us to ensure that the descendants of the silverback Mufanzala will continue to prosper in freedom and safety in the Kahuzi-Biega National Park World Heritage Site, the pride of the Democratic Republic of the Congo.

Radar Nishuli

Four Decades of Research on Primates in Kahuzi-Biega

Kahuzi-Biega National Park (KBNP), located in the eastern Democratic Republic of the Congo, is part of the Central Albertine Rift region known for its biodiversity richness, with a high degree of endemism.

The KBNP comprises two distinct parts connected by a narrow corridor of forest today largely encroached for timber exploitation and agriculture.



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The mountainous original section of 60,000 ha, established in 1960 as a forest reserve to protect 200–300 Grauer's or eastern lowland gorillas *(Gorilla beringei graueri)* and the beautiful mountain forest, became a national park in 1970, before being substantially enlarged (tenfold) by the incorporation of a large area of lowland rain forest in 1975, and designated a World Heritage Site in 1980. The highland sector, dominated by montane forest and bamboo forest, covers an altitudinal range of 1,800–3,300 m with two peaks, Mt Kahuzi (3,300 m) and Mt Biega (2,900 m). Most of the studies conducted on primates in KBNP were done in the highland sector, which is located in one of the most densely populated regions in Africa, with a population density of more than 300 inhabitants/km^2.

The climate is characterized by maximum temperatures around 18 °C and minimum temperatures around 10 °C throughout the year. The average annual precipitation is 1,800 mm, with considerable variation between rainy and dry months. The humidity varies between 50 and 85%.

About two thirds of the montane forest area of the park consist of dense forest, mixed with patches of bamboo, especially at high altitudes. At lower altitudes, the vegetation is more open. Alpine grasses and sub-alpine vegetation appear at high altitudes. In the highland sector of the park, a floristic study shows a vegetation stratification with decreasing altitude as follows:

– montane forest (from 2600 to 3400 m), with the dominant species being *Podocarpus* sp., *Ficus* sp., *Chrysophyllum longipes*, *Parinari* sp., *Carapa grandiflora*, and *Symphonia globulifera*,
– bamboo forest (2,350 to 2,600 m) dominated by *Arundinaria alpina*,
– swamp forest (2250 to 2350 m),
– *Cyperus papyrus* wetland in the lower levels.

The habitat diversity in the park results in a wide range of fauna including Grauer's gorilla, the common eastern chimpanzee *(Pan trogodytes shweinfurthii)*, owl-faced monkey *(Cercopithecus hamlyni)*, black and white colobus *(Colobus angolensis)*, red colobus *(Pilicolobus* sp., probably *P. foai)*, elephant *(Loxodonta cyclotis)*, buffalo *(Syncerus* sp., probably *S .nanus* or hybrids with *S. caffer)*, the giant forest hog *(Hylochoerus meinertzhageni)*, and various species of antelopes and duikers. The avifauna is represented by a variety of birds including Rockefeller's sunbird *(Nectarinia rockefelleri)*, the great African green broadbill *(Pseudocalyptomena graueri)* and Grauer's swamp-warbler *(Bradypterus graueri)*.

Kahuzi-Biega National Park was formerly ranked second, after the Virunga National Park, in terms of tourist flows among protected areas of the Democratic Republic of the Congo, the main attraction being the gorilla. In the last two decades, the area has experienced persistant insecurity, with an enormous flux of refugees from Rwanda in 1994 and several consecutive wars, which negatively impacted the environment and KBNP natural resources and tourism activity. As a result of the war, several armed factions now occupy the park making many areas inaccessible to the rangers. In the low altitude areas coltan and gold miners represent a threat to biodiversity. The high human concentration within and outside the park has led to biodiversity loss, habitat depletion, and deforestation, with large chunks of forested regions converted into agriculture.

Key Historical Events in KBNP

Kahuzi-Biega was gazetted as national park in Zaïre by decree 70-316 of 30th November 1970 covering a montane forest area of 600 km^2, aiming to protect the mountain forest-living gorilla population (though belonging to the so-called "eastern lowland" subspecies). In 1971, Michael Casimir, from Germany, started primatological research under a project known as Ecology of Tropical Forest; a research program funded by the Volkswagen Foundation.

Kahuzi-Biega was the first protected area to start gorilla tourism world-wide in 1972, after two years of habituation led by the former first park chief warden Adrien Deschryver.

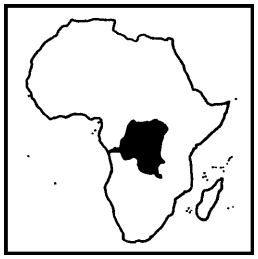
In 1975, under presidential Ordinance No. 75-238 of 22nd July 1975, Kahuzi-Biega National Park was extended from 600 km² to 6,000 km². In 1980, it was designated a World Heritage Site by UNESCO before an international body (GTZ) started its development and conservation activities both inside and outside the park in 1985.

In 1978, Dennis Murnyak conducted the first gorilla census in the highland sector and counted around 223 gorillas living there.

In 1987, after almost 10 years of no research activities, a research team from Kyoto University led by Juichi Yamagiwa launched a multidisciplinary research program in the park, including primatology, botany and anthropology (ethnology). In 1990, he conducted the second gorilla census in cooperation with GTZ and CRSN and counted 258 individuals in the highland sector of KBNP.

In 1991, a riot erupted in Kinshasa followed by violent disturbances which spread all over the country, leading to the suspension of foreign aid in different sectors, including research and conservation. Following the Rwandan genocide, close to 500,000 Rwandan and Burundian refugees were settled by UNHCR in the vicinity of KBNP threatening the park's wildlife.

From January to September 1994 and from April to August 1995, Jefferson Hall and his colleagues conducted another gorilla survey within a 12,770 km^2 region of tropical moist forest in the districts of North and South Kivu and Maniema in eastern Zaïre (as



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the Democratic Republic of the Congo was then called), and made estimates of the total number of Grauer's gorillas.

In 1992 POPOF, a local NGO was established. Its mission is to promote local conservation knowledge, to improve the quality of life in the area's communities, and to reduce conflicts between local people and the park.

The 1996 outbreak of civil war in eastern Congo had the initial objective of dismantling the refugee camps established near the Rwandan border. In the same year another gorilla census was organized by WCS, during which we counted 247 gorillas in the highland sector of the park.

In 1997, massacres of gorillas, elephants and other wildlife began in KBNP. In 1998 another civil war started, which led to the creation of several armed gangs and uncontrolled circulation of war weapons.

In 1999: large-scale hunting of gorillas. Starvation and the spread of small arms among the local people, combined with the breakdown of park protection, were the main factors that led to the massive wave of poaching. The main purpose of the gorilla poachers was to stave off their own hunger and to generate some income by selling portions of meat locally. 17,000 individual Grauer's gorillas were estimated to live in eastern Congo's forests in 1997 with the largest population in KBNP and adjacent forests (more than 85% of the entire population); following the large-scale hunting of gorillas in 1999, all the silverback leaders of the gorilla tourist groups in the mountain sector of the park were killed with a great number of their family members massacred, and half of the population was killed as was confirmed by the census conducted in 2000.

Number of habituated gorillas left after the 1999 large scale gorilla slaughter

group	number of individuals before 1998	after 1999
Maheshe	14	0
Mubalala	22	0
Mushamuka	8	6
Ninja	25	5
total	9	11

Gorilla population sizes from complete censuses in the highland sector

year	1978	1990	1996	2000
total no. of gorillas	223	258	247	130
mean group size	15.6	10.8	9.8	9.6

Uniqueness of Kahuzi-Biega

Kahuzi-Biega is the only site where common eastern chimpanzees coexist sympatrically with eastern lowland gorillas in the montane forest. It therefore offers unparalleled opportunities for comparative studies with other sites where the apes live in different ecological and environmental conditions.

47% of the population counted in 1996 was slaughtered in 1998–1999. A drastic drop was found in the number of individuals per gorilla group, from nearly 16 individuals in 1978 to only 8 individuals in 2000. The insecurity may have caused a group dislocation within the Kahuzi gorilla population resulting in groups with fewer members.

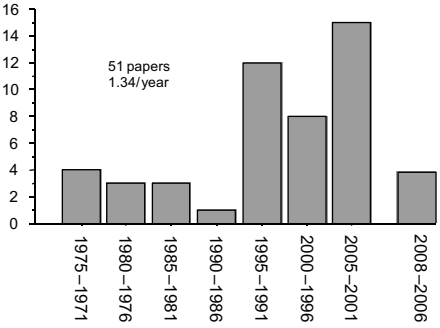
Methodology for Long-Term Research

Six different methods have been used in Kahuzi-Biega for the long-term research on the rich biodiversity including:

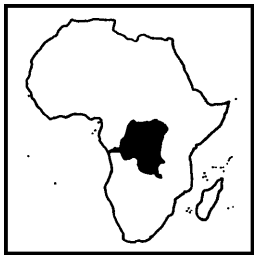
1. habituation and monitoring of gorilla groups for tourism (from 1970),
2. recording the demography of habituated gorillas (from 1982),
3. daily meteorological observation (from 1982),
4. habituation and monitoring of gorilla and chimpanzee groups for research purposes (from 1991),
5. collection of fresh fecal samples and feeding remains on a daily basis (from 1994),
6. monthly observations on phenology of fruits eaten by apes using transect census (1994~96) and fruit trail census (from 1998).

Compared to other sites such as Budongo, very few scientific studies on primates have been conducted and published in KBNP during the last two decades. Some of the reasons are:

– Looting in Kinshasa in 1991 caused the evacuation of several expatriate researchers with cessation of funding research activities.
– The two destructive wars in 1996 and 1998 caused a general destabilization in the region of the Great Lakes. Half of the Kahuzi gorilla population was massacred and almost the entire elephant population destroyed. This situation shocked most of the researchers, who hesitate to come back into the region.



Peer review papers published on great apes in Kahuzi-Biega



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– Lack of resources and weak support by the Government for research activities since the crisis in which the country has been plunged since the end of the 1980s.

Only one Ph.D. thesis has been published on KBNP, while more than 10 were published on primates in Budongo Forest during the same period.

Level of Knowledge on the Great Apes in KBNP

Phenology of fruit species consumed by primates. To estimate the abundance of fruits preferred by gorillas and chimpanzees, we monitored 28 species of trees and shrubs (24 species of which the fruit is preferred by apes, and 4 species whose fruit is not eaten by apes) twice each month. The 15 years of monitoring of fruit consumed by the great apes have given the following results:

1. Abundance of fruits eaten by chimpanzees only shows a slight fluctuation in quantity and diversity compared to that consumed by the gorillas.
2. Fruits eaten by only chimpanzees show a high synchrony in fruiting. This leads chimpanzees to frequently reuse the same areas rich in trees bearing ripe fruits.
3. Fruits available throughout the year are eaten by chimpanzees and contribute to the ecological niche separation between the two apes.
4. Abundance of fruits preferred by gorillas is inversely related to the amount of precipitation in the primary forest, implying seasonal frugivory in gorillas.
5. Both species contribute to fruit dissemination in KBNP.

Habitat Use

We observed that:

– Kahuzi gorillas use their home range evenly over a large territory to avoid reusing the terrestrial herbaceous vegetation, as a folivorous strategy.
– Kahuzi chimpanzees revisit a comparatively small home range several times, preferentially in primary forest, to maximize the use of fruit – interpreted as a frugivory strategy.

Inter-Specific Relations

Chimpanzees in secondary forest, where gorillas are frequent, rarely nest in those trees bearing ripe fruit whose fruit is also eaten by gorillas. This may be interpreted as a strategy to avoid competition over food with the gorillas.

It is suggested that all these strategies have been developed by both sympatric apes to avoid conflict encounters.

Recommendation on Primate Research Perspectives

Strategies to strengthen research activities in Kahuzi:

– establish a multidisciplinary team of research supervisors for KBNP,
– as much as possible use students' data to harvest the maximum amount of scientific information,
– as regularly as possible conduct rapid biodiversity assessments involving experts from other protected areas and research institutions or universities,
– collaborate with NGOs (local and international) and as much as possible involve local commercial enterprises, universities and research institutions in the sponsorship of research in the region, and promote publication of research results,
– promote educational activities on the conservation of primates to stimulate general public awareness.

A Few Topics of Research to Consider:

– influences of environmental factors on the organisation of ape societies,
– problems of exotic plants and invasive species control,
– monitoring and predicting impacts of climate change on Kahuzi biodiversity and, more specifically, on ape (gorilla and chimpanzee) conservation (establish baselines on selected few parameters and conduct long term monitoring).

Augustin K. Basabose and Juichi Yamagiwa

Selected references (published papers on primates during the last decade in KBNP)

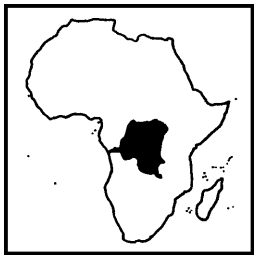
Basabose, A. K. (2002) Diet composition of chimpanzees inhabiting the montane forest of Kahuzi, Democratic Republic of Congo. Ameri-

Home ranges of gorilla and chimpanzees in KBNP

	months	days	total range km²	core area km²
gorilla	92	1440	42.3	6.3 (15%)
chimpanzee	82	1080	15.7	2.6 (16%)

Comparison of key parameters between gorillas and chimpanzees

key parameters	gorilla	chimpanzee
feeding on fruits in general	according to the abundance	selective and persistent eaters
feeding on preferred fruits by both apes	rarely	irrespective of its abundance
home range size	large	small
inter-specific encounters	avoid long stay on fruit trees	avoid encounters with gorilla on fruit trees



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can Journal of Primatology 58, 1–21
Basabose, A. K. (2004) Fruit availability and chimpanzee party size at Kahuzi montane forest, Democratic Republic of Congo. Primates 45, 211–219
Basabose, A. K. (2005) Ranging patterns of chimpanzees in a montane forest of Kahuzi, democratic Republic of Congo. International Journal of Primatology 26, 31–52
Basabose, A. K. & Yamagiwa, J. (2002) Factors affecting nesting site choice in chimpanzees at Tshibati, Kahuzi-Biega National Park: influence of sympatric gorillas. International Journal of Primatology 23 (2), 262–282
Inogwabini, B.-I. et al. (2000) Status of larger mammals in the mountain sector of Kahuzi-Biega National Park, Democratic Republic of Congo, in 1996. African Journal of Ecology 38, 269–276
Kasereka, B. et al. (2006) Vulnerability of habituated Grauer's gorilla to poaching in the Kahuzi-Biega National Park, DRC. African Study Mongraphs 27, 15–26
Matsubara, M. et al. (2005) Species and sex identification of western lowland gorillas *(Gorilla gorilla gorilla)*, eastern lowland gorillas *(Gorilla beringei graueri)* and humans. Primates 46, 199–202
Yamagiwa, J. (2001) Factors influencing the formation of ground nests by eastern lowland gorillas in Kahuzi-Biega National Park: some evolutionary implication of nesting behavior. Journal of Human Evolution 40, 99–109
Yamagiwa, J. (2003) Bushmeat poaching and the conservation crisis in Kahuzi-Biega National Park, Democratic Republic of the Congo. Journal of Sustainable Forestry 16 (3/4), 115–135
Yamagiwa, J. (2004) Diet and foraging of the great apes: ecological constraints on their social organizations and implications for their divergence. Pp. 210–233 in: Russon, A. E. & Begun, D. R. (eds.) The Evolution of Thought: Evolutionary Origins of Great Ape Intelligence. Cambridge (Cambridge University Press)
Yamagiwa, J. et al. (2003) Within-group feeding competition and socioecological factors influencing social organization of gorillas in the Kahuzi-Biega National Park, Democratic Republic of Congo. Pp. 328–357 in: Taylor, A. B. & Goldsmith, M. L. (eds.) Gorilla Biology: A multidisciplinary perspective. Cambridge (Cambridge University Press)
Yamagiwa, J. et al. (2003) Intra-specific variation in social organization of gorillas: implications for their social evolution. Primates 44, 359–369
Yamagiwa, J. et al. (2005) Diet of Grauer's gorillas in the montane forest of Kahuzi, Democratic Republic of Congo. International Journal of Primatology 26, 1345–1373
Yamagiwa, J. & Basabose, A. K. (2006a) Diet and seasonal changes in sympatric gorillas and chimpanzees at Kahuzi-Biega National Park. Primates 47, 74–90
Yamagiwa, J. & Basabose, A. K. (2006b) Effects of fruit scarcity on foraging strategies of sympatric gorillas and chimpanzees. In: Hohmann, G. et al. (eds.) Feeding ecology in apes and other primates.
Yamagiwa, J. & Kahekwa, J. (2001) Dispersal patterns, group structure and reproductive parameters of eastern lowland gorillas at Kahuzi in the absence of infanticide. Pp. 89–122 in: Robbins, M. et al. (eds.) Mountain gorillas. Cambridge (Cambridge University Press)
Yamagiwa, J. & Kahekwa, J. (2004) First observations of infanticides by a silverback in Kahuzi-Biega. Gorilla Journal 29, 6–9
Yamagiwa, J. et al. (2008) Phenology of fruits consumed by a sympatric population of gorillas and chimpanzees in Kahuzi-Biega National Park, Democratic Republic of Congo. African Study Monographs, Suppl. 39, 3–22

The Mount Tshiaberimu Conservation Project in the Year 2008

2008 has been a very difficult year for *The Gorilla Organization* on Mt Tshiaberimu. In February 2008 the adult female Mughole of the Kipura group died from a bacterial infection. In May another adult female, Molo, of the same group was also found dead, probably of the same cause.

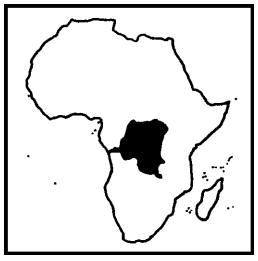
In August 2008, Musanganya, a juvenile of the Lusenge group fractured its skull falling from a tree. Specialists have taken samples and we are hoping that the ensuing investigation will quickly shed light on the causes of these deaths.

Meanwhile, the growing insecurity in the east of the Democratic Republic of the Congo has had its repercussions on the work at Mt Tshiaberimu. There have been cases of resurgence of armed groups in the region. The insurgent militia are often used by certain politicians against the establishment of the park and therefore seek out park rangers as their targets. During one clash between park rangers and the militia in January 2009 the head of monitoring Kakule Safari was killed. Recently another ranger, Katambireki of the Karumrume sector not far from Mt Tshiaberimu, lost his life in another incident.

Regrettably this was not the last of the unfortunate events. Early in 2009, a case of cannibalism was reported from Mt Tshiaberimu, where the female Mwengesyali was found devouring her new-born infant. Finally, in March, the eldest gorilla of the Lusenge group of Mt Tshiaberimu, the silverback Nzanzu, died of old age.

This is the first time that so many deaths have occurred in such a short

The silverback Nzanzu *Photo: The Gorilla Organization*



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period of time since the beginning of the project in 1996. Consequently, they have caused great anxiety and frustration within the monitoring team. In spite of these difficulties caused by the insecurity, the deaths of the gorillas and even the global financial crisis, *The Gorilla Organization* was still able to carry out park protection activities.

Monitoring of the Gorillas

During monitoring, special attention was given to the diet of the gorillas and the way they exploit their territory. In addition to the known 84 plant species eaten by the gorillas, 3 new species were identified, bringing the total number of known food sources for the gorillas of Mt Tshiaberimu to 87. 95% of the bamboo forest area was exploited by the gorillas in the course of 2008 up to December, and 10 interactions between the different groups were observed.

Observations and Inventory of the Fauna

Thanks to the efforts of *The Gorilla Organization*, the biodiversity of Mt Tshiaberimu is also being surveyed. During 2008 we observed a noticeable increase in the number of *Cercopithecus mitis* (about 361 compared to 100–160 individuals observed previously): this might cause competition between the gorillas and the *Cercopithecus,* especially for young bamboo sprouts.

An inventory of the birds of Mt Tshiaberimu has been carried out, identifying 145 species, with 7 species endemic to the Albertine Rift, including the well-known *Cryptospiza shelleyi* (Shelley's crimsonwing).

Monitoring Patrols

In an anti-poaching effort, 168 patrols were conducted and two semi-permanent tented camps have been set-up. The patrols have been able to destroy 51 traps, put a stop to timber felling and pit-sawing (75 boards have been found and confiscated), end the encroachment on the park in the Kabeka sector, and prevent bush fires that have recently destroyed 2 ha south of the patrol post of Mulango wa Nyama.

Education Campaigns and Awareness-raising

During 2008, campaigns to educate and raise awareness of the conservation of the environment in general, and the habitat of the gorillas in particular, have included the showing of films (in cooperation with the *Great Apes Film Initiative*), conferences, seminars, meetings with the chiefs from villages bordering the gorillas' habitat, distribution of the newsletter *Digit News*, calendars and posters about the health of humans and animals and on birds.

Meetings and debates held in 53 schools and universities have allowed us to raise awareness amongst 16,467 pupils, students and teaching staff concerning the threats to the great apes and their habitats. Contacts have been made with village chiefs bordering the gorillas' territories. The NGO SAGoT *(Solidarité des Amis des Gorilles de Tshiaberimu)* comprising 10 CBOs (community-based organisations with more than 1,600 members) benefitted from training courses in business to reduce poverty in the regions around the gorilla habitat.

53 radio programmes were broadcast in collaboration with local chiefs, leaders of the CBOs and religious and university authorities, covering topics related to current environmental problems and the threats that endanger the survival of the great apes.

Community Development

The Gorilla Organization has given support to a local school and a health centre through the programme for community development around the gorilla habitat. In fact, the precarious situation of community health and the low educational level of the population living around the park also pose a danger to the survival of the gorillas.

In addition, SAGoT member associations have received substantial support in agricultural materials (vegetable seeds and agricultural tools) through generous aid from FAO to *The Gorilla Organization*. Food security and improved income generation around the protected areas are another way of ensuring the long-term protection of endangered species.

The Gorilla Organization has also sponsored the maintenance of a total of 38 km of agricultural access roads around Mt Tshiaberimu by paying monthly subsidies for 28 road workers and their equipment.

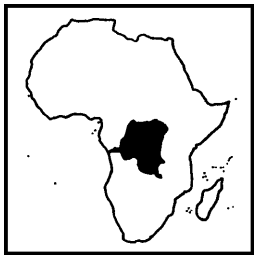
Direct support from *Berggorilla & Regenwald Direkthilfe* has allowed SAGoT to benefit from a tree nursery project with a capacity for producing 40,000 seedlings to reforest the area around Mt Tshiaberimu.

Finally, *The Gorilla Organization* has been able to pay subsidies and salaries for 91 staff (of ICCN and *The Gorilla Organization*), which has enabled the employees to feed their families (500 people altogether) during the whole of 2008 and to pay for schooling and medical expenses – all thanks to the gorillas.

In view of all the visible advantages of conservation, the recent gorilla deaths and the political attacks on park staff are causing concern among the human population bordering Mt Tshiaberimu, and they fear for the future of this small gorilla population.

Jean-Claude Kyungu, Henry Cirhuza and Jean De Dieu Vhosi

The Mount Tshiaberimu Conservation Project would like to thank the authorities of the ICCN both at the national and the provincial level, especially the ADG, ADT, and the Commissioner for Cooperation, for their efforts to stabi-



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lise ICCN in Congo. The team of the Virunga National Park, in particular the Director M. de Merode and his deputy Mushenzi, are recognized for their unfailing support of the Tshiaberimu staff during these difficult times.

We would also like to express our gratitude to the EU through the GRASP/ UNEP project for their continued financial support over the past 3 years.

Conservation in Sarambwe: Interventions and Perspectives

From its establishment in 1952 the Rutshuru Hunting Reserve included the Sarambwe hills until its recognition as the Sarambwe Special Reserve in 1998. From 1952 to 1978 the management of the hunting reserve was entrusted to the Ministry of Agriculture. During this period the reserve encountered grave difficulties which left it in a state of total neglect (Sikubwabo 2009; Mugangu 2001). In 1978 the management was transferred to the ICCN (*Institut Congolais pour la Conservation de la Nature* – Congolese Institute of Nature Conservation, the national park authority of Congo).

The lack of control of the hunting reserve caused a loss of 60% of its area between 1954 and 1988 (letter PDG, ICCN). The lost area included Sarambwe. From 1970 to 1996, licenses for pit-sawing were granted in and around Sarambwe by the Provincial Division for the Environment.

The discovery of gorillas at the site in 1994 led to rethinking and to increased awareness of the area's need for protection. AJAKAR *(Association des Jeunes Amis de Kacheche et Rutshuru)*, a local association in Kisharu, was the first to disseminate information about the gorillas and raise awareness in the local population.

With funds from *Berggorilla & Regenwald Direkthilfe* (B&RD) the NGO VONA *(Voix de la Nature)* organized a workshop on Sarambwe in 1998, with the aim of establishing a road map for the area's conservation. All the local notables, plus representatives of the ICCN and their partners, participated in this workshop. In 1998, Sarambwe was declared a Special Reserve for Gorillas by the Ministry of Environment of the RCD (Congolese Union for Democracy, the main opposition to the former government). Unfortunately, all activities subsequently halted and tree cutting resumed due to the persistent conflicts in the region.

In 2002, B&RD, the *Peace Parks Project* of the IUCN *(International Union for the Conservation of Nature)* and the ICCN, initiated a combined action to resume activities. B&RD financed the delimitation of the reserve using *Erythrina abyssinica* trees, and purchased uniforms for the rangers and rations for the park patrol teams, who also received two bicycles, T-shirts, medical supplies and raingear. The *Peace Parks Project* will continue to supervise activities and the ICCN will be in charge of protection and management actions.

During this time, certain ambitious persons were trying to persuade the local authorities to transform Sarambwe into a community reserve called RECOGOSA (Sarambwe Gorilla Community Reserve); they had in mind to use funds granted by the *Dian Fossey Gorilla Fund International* (DFGFI) to promote the creation of community reserves. Due to the failure of the funds to be delivered, and consequent lack of activity, this initiative floundered.

Since the beginning of armed conflict in the region, Sarambwe and the surrounding area have been under the control of Interahamwe (the former Rwandan militia) and the FDLR (Democratic Force for the Liberation of Rwanda). The presence of these military elements again stopped all activity in the reserve, which was without protection for 3 years. Charcoal burning and timber felling occured again.

Uniforms for the Sarambwe rangers provided by B&RD

Photo: Claude Sikubwabo Kiyengo

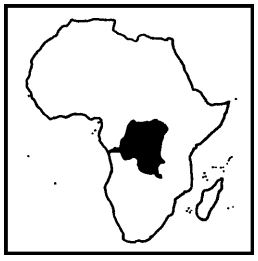
Recent Developments

In January 2008, B&RD established a focal point for the region. The first project initiated by B&RD allowed the resumption of activities in the Sarambwe Special Reserve, which had been abandoned for 3 years. The project provided for the purchase of necessary equipment for protection activities and sufficient monthly rations for the patrols. These included 30 pairs of rubber boots, 15 mattresses, 30 plates, 30 cups, a set of 15 pots, tailored uniforms for the guards, and ink cartridges for printers.

The uniforms would identify the rangers, who until then had been dressed in old and disparate clothing and who had hardly had set foot in the reserve for more than 3 years. Furthermore, clothing bought by B&RD was distributed to the rangers of Sarambwe. Patches for uniforms ordered by B&RD arrived at Kisoro and were collected by the B&RD representative.

Effects of the Aid Provided to Sarambwe

The support from B&RD effectively re-established the ranger force at Sarambwe, by contributing to the establishment of routine patrols, integrated and back-up patrols.



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During their patrol rangers found a place in the reserve where charcoal was produced.

Photo: Claude Sikubwabo Kiyengo

The effective protection of the reserve started in April 2008 with an integrated patrol consisting of 11 rangers accompanied by the military forces of the FARDC (army of the Democratic Republic of the Congo) and the local chief of Sarambwe. The main aim of this patrol was to ascertain the state of the reserve and to raise the awareness of the population, the local authorities and the military, about the conservation of the site – and subsequently to ask for their collaboration and help. Before the project started, the reserve's trackers had been persecuted and one had been killed. An individual who claimed to belong to the Mwami family had declared the reserve as his private property and organized timber felling, charcoal burning and hunting. Although it was known that the area was part of the reserve, the abandoned ranger post was used as a base for establishing plantations, and the cutting of timber for construction and fire wood was occurring at a place called Mwiganywa.

On 18 May 2008, following the improvement of security in the area, the rangers set up a tented camp in Sarambwe. This in itself contributed to the dispersal of people posing a threat to the reserve.

During the patrols of May 2008, the rangers discovered fresh footprints of approximately 8 gorillas. They also recorded other mammals: 48 baboons, 25 red river hogs, 17 chimpanzees, red-tailed and blue monkeys. In June 2008, the rangers set up regular surveillance patrols to discourage illegal activities. During these patrols they noted

– plantations in the Kalimande area of the reserve,
– confusion about the reserve boundaries in certain areas,
– displacement of the gorillas of the Congolese area towards Uganda by the Ugandan population at Kabumba and Mwiganywa,
– the presence of 16 adult gorillas and a newborn (born in the reserve),
– attempts by Ugandans to discourage the Congolese patrols through abuse and ambushes.

With the aim of improving the level of conservation and collaboration between different partners, the Sarambwe Reserve sent two teams to Uganda to hold discussions with the authorities of the Bwindi Impenetrable National Park, to inform them of the presence of gorillas and to organize coordinated patrols. This visit had good results for both parties concerned.

On 11 August 2008, the Minister for the Environment, Nature Conservation and Tourism signed a decree (Ministerial Decree number 029/CAB/MIN/ECN-T/JEB/08) reclassifying the Sarambwe Special Reserve and 17 other reserves as faunal sanctuaries. He also transferred their management from ICCN to the Institut de Jardins Zoologiques et Botaniques du Congo (IJZBC). It was planned that the DFGFI and the MGVP would support the functioning of these reserves; no measures have yet been taken, however, for the application of the provisions of the decree.

The ICCN rangers continued to work until October 2008, when the CNDP, a political-military movement launched by Laurent Nkunda, initiated mass military operations. All activities in the reserve were subsequently halted again and the rangers retreated to Rutshuru.

On 11 February 2009, the Minister signed a second decree (094/CAB/MIN/ECN-T/JEB/09), which annulled the first and restored its management function to the ICCN. At present the project is progressing well: the gorillas of the Rushegura family that were habituated in Uganda are currently in Sarambwe and have recently had a newborn.

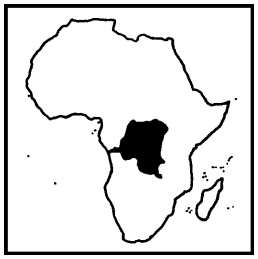
Conclusion

The support from B&RD has greatly benefitted the Sarambwe Reserve, and has permitted the following:

– the restoration of activities in the reserve,
– reinforcement of cooperation between rangers, traditional and local authorities,
– active collaboration between rangers and the military,
– establishment of contact with the Ugandan authorities,
– reduction of illegal activities in the reserve,
– recovery of a part of the reserve which had been used for agriculture,
– restoration of coordinated patrols,
– action against infractions involving flora and fauna.

Perspective

The Sarambwe Reserve has witnessed numerous problems related not only to the presence of militia but also to its conservation status. Initially a part of the Rutshuru Hunting Reserve and, as such, under the management of the Minister for Agriculture, the area was not fully protected and part of the forest exploitation areas were managed by the Provincial Directorate for the Environment. Only after the



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The motorcycle that was just donated to Sarambwe with funds of the Apenheul Primate Conservation Trust

Photo: Claude Sikubwabo Kiyengo

discovery of gorillas were conservation initiatives developed in the area, and its status evolved from hunting reserve to the Sarambwe Special Reserve. In view of Sarambwe's importance due to the presence of gorillas and their fragile habitats, the Minister for the Environment initially considered classifying Sarambwe as a sanctuary – but rapidly changed his mind.

Any disturbance of the Sarambwe habitats may have an impact on conservation in the Bwindi Impenetrable National Park in Uganda, as these two areas share a common boundary. To be effective, cross-border activities are required, and funds need to be made available for the protection of Sarambwe. The ICCN Provincial Directorate encourages the efforts made by B&RD through its focal point, as well as other partners active at the site such as the IGCP, and hopes that support will continue. B&RD has provided a motorcycle to support the patrols and food rations for patrols, and collaborates in the construction of a ranger post.

Claude Sikubwabo Kiyengo

References

Mugangu, S. (2001) Etudes des conflits au parc national des Virunga. IUCN, Peace Parks Project

Sikubwabo, C. (2009) Etude environnementale et socio-économique dans le Domaine de Chasse de Rutshuru. Consultancy report, February 2009

Emergency Funding in Virunga and Support to Mountain Gorillas

From early 2007, security in mountain gorilla habitats has been highly volatile due to the long-lasting war in the eastern Democratic Republic of the Congo, which has disrupted peace in the entire region. As a result of the ongoing conflict, the Mikeno Sector, home to the mountain gorilla in the Virunga National Park, has been insecure since January 2007. Within a period of only 7 months, from January to July 2007, 10 mountain gorillas were killed as a result of the conflict. An additional 2 gorillas are missing, one infant was orphaned but is still with its family, and 2 orphaned infants are under the care of the ICCN and the *Mountain Gorilla Veterinary Project* (MGVP) in Goma.

In July 2007, *Berggorilla & Regenwald Direkthilfe* (B&RD) stepped forward to address this wildlife conservation crisis by providing an initial emergency grant of US$ 25,300 to support the work of the *International Gorilla Conservation Programme* (IGCP) as it attempts to deal with these clear and immediate threats to the preservation of the mountain gorilla. Additional support from B&RD was then received to continue to provide assistance to ICCN (through IGCP) during the emergency period and for funding to ICCN to resume activities once the emergency situation was over, and also to help to mitigate human-gorilla conflicts in the region. We are extremely grateful to B&RD for their timely and generous support. In this report, we summarize the status of the work the IGCP has done to date with the assistance of B&RD.

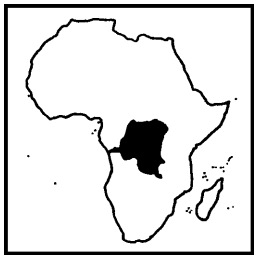
Patrol Post Construction: Sarambwe Patrol Post

A priority need identified by ICCN was the construction/rehabilitation of patrol posts in the Mikeno Sector following improvement of the security situation and once the ICCN rangers were redeployed back to the park. However, as the conflict there continued, making it impossible to redeploy rangers to the patrol posts, a request was made to B&RD to instead construct a patrol post in the Sarambwe Reserve, Congo (adjacent to the Bwindi Impenetrable National Park).

This activity has been identified as a priority in order to better coordinate conservation activities in the reserve and ensure the protection of the Rushegura group of habituated gorillas (from Bwindi) who are spending increasing amounts of time there. Construction of a ranger outpost is one of the most effective conservation strategies to allow for monitoring of the gorillas and activities in the reserve as it helps ensure that there is a permanent ranger presence in the area.

This activity was delayed slightly as there has recently been some confusion about the legal status of Sarambwe (see page 10). In the end, Sarambwe now has the status of Forest Reserve, and IGCP and ICCN can move ahead with the patrol post construction. We are now working with the infrastructure unit of ICCN to identify a contractor, and it is hoped that the contract will be signed by mid-May 2009 and then construction will begin.

A meeting is also planned for Monday 27th April 2009 at Sarambwe involving local stakeholders, ICCN Virunga National Park, and also Bwindi Mgahinga Conservation Area managers to begin discussions on the conservation status of Sarambwe, and the possibility of putting in place a management plan for Sarambwe. As Rushegura group from Bwindi is now spending considerable amounts of time in Sarambwe it



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is timely to begin discussions on Sarambwe's conservation status and management.

Ranger Uniforms
With respect to the uniforms for the ICCN rangers, IGCP DRC delayed purchasing anything until they could be certain of the need on the ground and to coordinate with the other NGOs who are providing equipment to prevent duplication (e.g. the uniforms that *Wildlife Direct* provide go to staff for the entire Virunga National Park and are not necessarily being distributed to the rangers in Mikeno Sector).

Once the need was established for uniforms in Mikeno Sector, IGCP DRC went ahead and arranged to purchase the fabric and have uniforms made up. Unfortunately on completion the uniforms were seized by Internal Security, and to date IGCP and ICCN are involved in discussions to have them released to ICCN. This dispute has now been referred to Kinshasa where it is hoped it will be resolved.

Patrols
Now that the security situation has improved, and with support from B&RD, coordinated patrols have recommenced between ICCN and ORTPN (in the areas between Mt Karisimbi and Mt Mikeno and Mt Sabyinyo and Mt Visoke); these are the first coordinated patrols that have been undertaken since September 2006, indicating that the security situation is indeed better and that normal park activities are resuming. The ICCN rangers have now also resumed their normal patrols in the Mikeno sector and Sarambwe, where local hunters had taken advantage of the absence of rangers to lay large numbers of wire snares. In one such patrol in the month of January more than 500 snares were removed from around Mikeno.

One 5-day coordinated patrol was also conducted between Virunga National Park and Mgahinga Gorilla National Park, which resulted in the uprooting of 16 snares on the Uganda side and 10 on the Congolese side. At the end of March 2009 another 5-day coordinated patrol was conducted between the Mgahinga and the Volcano National Park (Rwanda).

Support is also being given to regular ranger-based monitoring patrols in Bwindi. The coordinated monitoring of Rushegura group aims at ensuring the good health of the gorillas. Results from this monitoring indicate that the gorillas are in good health; as the ICCN rangers in Sarambwe do not know the individual gorillas, plans are underway to have Bwindi rangers join them to train them in the identification of the individuals and carry out joint monitoring.

HuGo – Equipment and Training
Support from B&RD for HuGo activities in Rwanda and Uganda is targeting the equipment and training needs of the HuGo members. Although currently this funding has not been utilized, activities are planned that will fully expend these funds before June 30th 2009. In Rwanda this includes purchasing field equipment (GPS units, gumboots and rain jackets) for the ANICO *(Animateur de Conservation)* who are monitoring

The Sarambwe Patrols Must Be Continued!

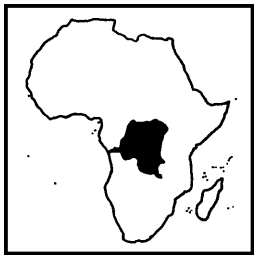
For several years we have supported the Sarambwe Reserve in many different ways. We funded the construction of a ranger post, provided uniforms, gumboots, field equipment – and food for patrols.

We already provided funds for the first half of 2009, and we want to continue this support until the end of the year. So we want to make sure that the regular patrols are done by the rangers. They need US$ 500 per month. We are confident that donations will allow us to reach this aim.

To do regular patrols, the rangers need our help. Please support us to fund their rations and thereby to enable them to effectively protect the reserve!

Bank Account:
Account number 353 344 315
Stadtsparkasse Muelheim/Ruhr
Germany
Bank code number 362 500 00
IBAN DE06 3625 0000 0353 3443 15
SWIFT-BIC SPMHDE3E

Address for cheques:
Berggorilla & Regenwald Direkthilfe
c/o Rolf Brunner
Lerchenstr. 5
45473 Muelheim, Germany



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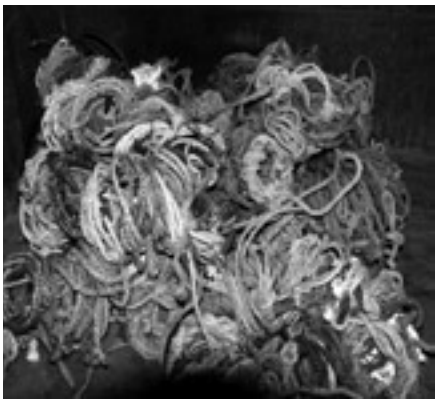


Snares collected by the rangers
Photo: IGCP

the gorillas when they come outside the park. ANICO will also undergo training; topics include gorilla behavior, chasing methods, mechanisms of disease transmission, gorilla awareness, and buffer zone management.

In Uganda, a training needs assessment for the HuGo members was undertaken to develop a training plan. An equipment needs assessment was also undertaken to procure equipment before June 30th 2009. Both these assessments will guide IGCP Uganda in its use of B&RD funds for HuGo support with training and equipment. Another activity (although not funded through B&RD) was to provide incentives to the volunteer spirit among the HuGo; credit associations were established to assist members to access savings and credit services. An evaluation of the health of these associations was conducted to link them to bigger credit institutions.

Conclusion
Currently the security situation in eastern Congo continues to improve, and as a result planned efforts to provide stability to the mountain gorilla conservation scenario in Mikeno sector of Virunga National Park are ongoing. Law enforcement patrols are now operating regularly as are the monitoring patrols for the habituated groups of gorillas. Additionally the HuGo programme continues to operate in communities bordering the parks with the aim of mitigating potential human-gorilla conflicts. IGCP continues to look forward to longer lasting peace while we remain vigilant in our gorilla conservation efforts and supportive of our partners and local communities.

The *International Gorilla Conservation Programme* would like to extend thanks to *Berggorilla & Regenwald Direkthilfe* for giving us this much-needed financial support for the protection of the mountain gorilla and its critical afromontane forest habitat.

International Gorilla Conservation Programme

Gorilla Baby Confiscated from Poacher

In April 2009, a baby Grauer's gorilla was rescued after being found stuffed into a bag after a 3-month undercover investigation against wildlife smuggling in the Democratic Republic of the Congo. It was a 2-year-old female who had been captured near Walikale. She was suffering from overheating and dehydration after spending more than 6 hours inside the bag. The suspected trafficker who was carrying the gorilla was arrested; he had planned to leave Congo by plane from Goma.

When confiscated, the infant had a wound on her leg, with the bone damaged by a bullet, and injuries on other parts of her body. She was later named Amani.

Summary of blog entries on the Virunga National Park website www.gorilla.cd

Three Elephants Killed by Soldiers

The local NGO IDPE (*Innovation pour le Developpement et la protection de l'Environnement)* is a group that monitors wildlife crimes in North Kivu. During a 2-week operation in May, they observed the poaching of wildlife in Virunga National Park. During this period, they uncovered 11 separate poaching incidents, in which FARDC soldiers killed 3 elephants, 3 warthogs, 3 hippos, 2 baboons, and several antelopes. The animals were killed for the meat, and in the case of the elephants the ivory is clearly also an incentive. It is imperative that all armed groups, FARDC included, must leave the park as soon as possible.

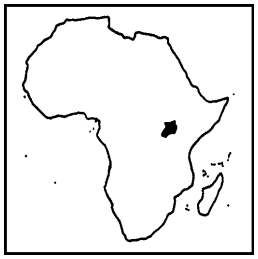
Summary of a report by IDPE, also published on the Virunga National Park website

Death of Silverback Shinda

In November 2008, the silverback Shinda died. Ever since 2007, he had been observed on several occasions to be very weak, and remained behind his group, but at 31 years old, he was still the dominant silverback of his group. Dian Fossey had observed him from his birth in 1977. He grew up in Group 5. When Ziz, the leading male of the group, died in 1993, some of the females followed Shinda while the others remained with Cantsbee and Pablo in Pablo's Group. For many years, Shinda's group proved the most stable of the three large research groups.

Shinda's body was recovered for necropsy, which is being conducted by veterinarians from the *Mountain Gorilla Veterinary Project*.

Summary of a report by Veronica Vecellio, published by DFGFI



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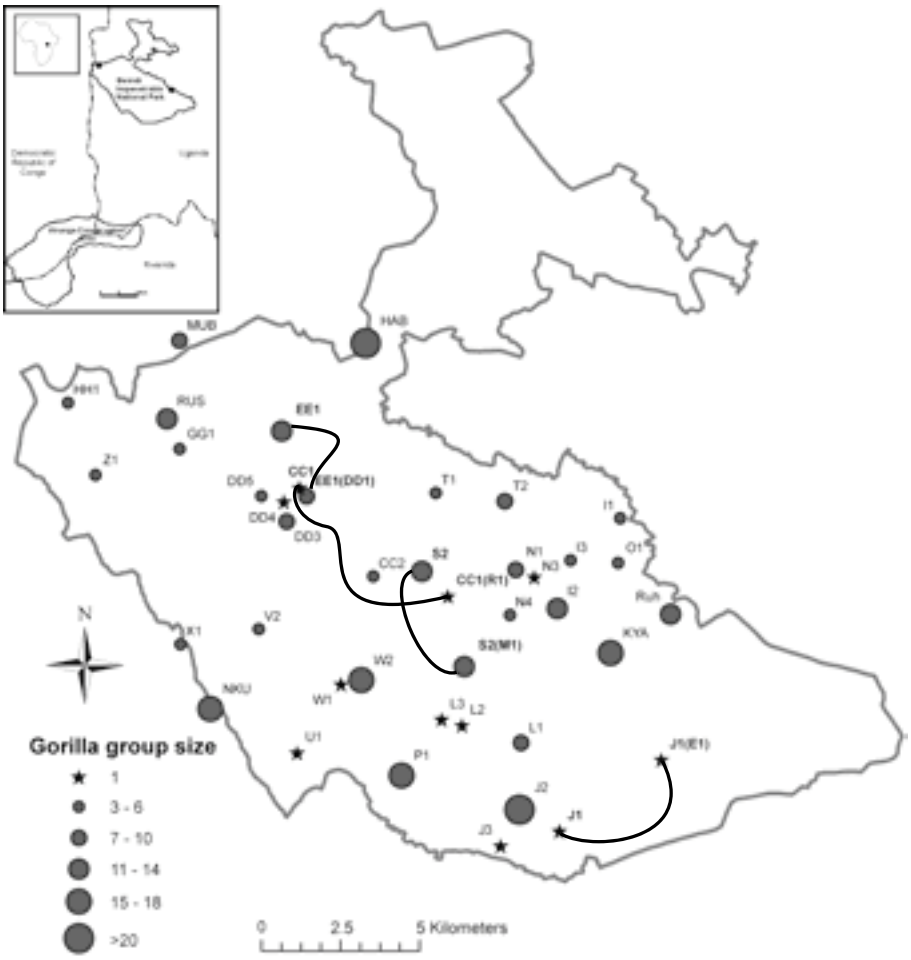
Genetic Analysis and Population Size Estimate for Bwindi Gorillas

Accurate population size estimates are an essential part of every effective management plan for conserving endangered species. Censusing rare and elusive wild animals that live in habitats where it is difficult to make direct observations, as is the case for mountain gorillas, is challenging and often relies on counting indirect signs, such as nests or feces. While in the Virunga Volcanoes approximately 71% of the gorillas live in habituated groups and can be directly counted, a much smaller proportion (approximately 25%) of the Bwindi gorillas is habituated and can be directly observed and counted.

For mountain gorillas, the relatively small size of the protected areas (Virungas: 450 km^2; Bwindi: 331 km^2) and the ability to easily find nest sites and trails left by individuals moving through the forest led researchers to devise a "complete sweep" census method. In this approach, several closely-spaced teams systematically search the entire forest for gorilla trails and nesting sites (Aveling & Harcourt 1984; McNeilage et al. 2001; 2006; Sholley 1991; Weber & Vedder 1983).

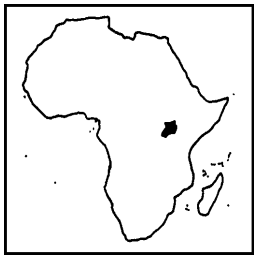
Most gorillas live in social groups and all weaned individuals construct a nest each night. These nests are cohesively distributed at the group's nesting site and each individual typically defecates in or next to the nest before leaving the site in the morning.

During a census, teams consisting of trackers, rangers, and researchers record the location and number of nests at each nest site and the size of the associated dung, which corresponds to the size of the gorilla, for up to three consecutive nest sites per gorilla group. This information is used to infer the direction in which the group is moving, the number of gorillas and the sex/age composition of social groups at the site, as well as the number of groups and gorillas in total. A key aspect of the complete sweep method is that it assumes that signs of essentially all population members can be detected and that each individual is counted only once. However, the accuracy of the assumptions of the indirect complete sweep census method for gorillas has never been systematically evaluated.



Map of the Bwindi Impenetrable National Park with the locations of gorilla groups found during the census. Stars denote lone silverbacks, circles represent groups. The size of the circle corresponds to group size. Each group and lone silverback is labeled with a unique identifier tag. Groups and silverbacks that were double-counted during the census are shown in bold and connected by a line. Reprinted with permission from Elsevier.

Using the complete sweep census method, two censuses of the Bwindi gorillas were carried out in 1997 and 2002 and suggested a 1% annual growth rate from 300 gorillas in 1997 to 320 gorillas in 2002 (McNeilage et al. 2001; 2006). The intensity of the effort expended to encounter gorilla signs across the small park suggests that it is unlikely that the complete sweep census produces a substantial undercount; of greater concern is the possi-



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bility of double counting gorillas. This can happen if individuals build more than one nest per night or social groups are double-counted. Both situations will violate the underlying assumption of the sweep census and inflate the population size estimate.

To assess the conservation status of the Bwindi gorilla population, in 2006 we carried out a genetic census in parallel with the traditional, nest-count based census of this population. In addition to counting nests at the nest site, we also collected fecal samples for genetic analysis. More than 700 fecal samples were collected, of which more than 400 were genotyped with the aim to derive an individual genetic profile for each individual in Bwindi. Population size estimates derived solely from nest counts were then compared to those derived from a combination of nest counts and genetic information.

Population Size Estimates

The nest-count based census inferred a total of 30 groups and 11 lone silverbacks, for a total count of 336 individuals after correcting for missed infants. Infant dung is often hard to find in the nest and therefore it is assumed that only 2/3 of the infants are found during the census. This population size estimate represents a 5% increase from the 2002 census estimate of 320 gorillas (McNeilage et al. 2006). By using the same field data and incorporating genetic information, however, we inferred the presence of only 28 groups and 10 lone silverbacks, comprising a total of 302 individuals, after correcting for missed infants and adults. The comparison between the nest-count based (336) and the genetic census results (302) reveals that the counts of Bwindi mountain gorillas differed by 34 individuals, or 10.1%.

Sources of Error

The main discrepancy in the number of gorillas between the nest-count based and the genetic population size estimate was the double-counting of groups, inflating the nest-count based estimate. Although the complete sweep census minimizes the chance of group double-counting by progressing in a fast and systematic way across the forest and by comparing the size, composition and temporal and spatial distribution of gorilla groups, double-counting groups is still possible and the likelihood of this happening cannot be adequately addressed by this method. Only by providing individual identifiers, such as genotypes, is it possible to assess whether groups have been double-counted or, alternatively, groups that are different were considered to be the same. The second greatest source of error in the number of gorillas was double-nesting of individuals, and this again inflated the nest-count based population size estimate. The nest-count based census assumes that each individual constructs a single nest; but on several occasions we found that individuals constructed and defecated in multiple nests, or dung from the same infant was present in more than one nest. Like the case of group double-counting, the nest-count based census method has no means to account for this bias and individual identifiers in form of genotypes are needed to tackle the problem. The complete sweep method produces a count of individuals and it is not possible to infer confidence intervals around the total population size estimate. Since the genetic analysis uses fecal samples collected during the complete sweep, no confidence intervals can be calculated for this method either.

Bwindi Population Dynamics

Given the lower population size estimate obtained from the genetic census, the previously inferred positive population growth of the Bwindi gorilla population has to be re-evaluated. Currently no conclusions about the dynamics of the Bwindi population can be drawn, although it is unlikely that the population has undergone a reduction in size in the past decade. This first genetic census provides a benchmark to which future population size estimates can be compared. Future censuses should continue to utilize the molecular method to derive population size estimates to accurately evaluate how the population of Bwindi gorillas changes over time. For long-term monitoring of the population dynamics of mountain gorilla populations in both Bwindi and the Virunga Volcanoes, we strongly recommend that future censuses utilize genetic analysis in combination with alternative census methods such as repeated partial sweeps that would allow statistical evaluation and an estimation of missed individuals.

Katerina Guschanski, Linda Vigilant, Alastair McNeilage, Maryke Gray, Edwin Kagoda and Martha M. Robbins

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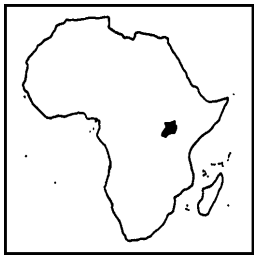

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uine commitment under harsh conditions. KG thanks Gervase Tumwebase for his support and advice throughout the field work. The Max Planck Society provided funding for the laboratory part of this project. We thank D. Lucas, O. Thalmann, M. Arandjelovic, G. Schubert, A. Abraham, H. Siedel, S. Hinrich, H. Kühl, S. Geidel, J. Ganas, and T. Breuer for assistance in the lab, with the analyses and for helpful discussions.

References

Aveling, C. & Harcourt, A. H. (1984) A census of the Virunga gorillas. Oryx 18, 8–13
Guschanski, K. et al. (2009) Counting elusive animals: comparing field and genetic census of the entire mountain gorilla population of Bwindi Impenetrable National Park, Uganda. Biological Conservation 142, 290–300
McNeilage, A. et al. (2001) Bwindi Impenetrable National Park, Uganda: Gorilla census 1997. Oryx 35, 39–47
McNeilage, A. et al. (2006) Census of the mountain gorilla *Gorilla beringei beringei* population in Bwindi Impenetrable National Park, Uganda. Oryx 40, 419–427
Sholley, C. R. (1991) Conserving gorillas in the midst of guerrillas. American Association of Zoological Parks and Aquariums, Annual Conference Proceedings 1991, 30–37
Weber, A. W. & Vedder, A. (1983) Population dynamics of the Virunga gorillas: 1959–1978. Biological Conservation 26, 341–366

Bacterial Exchange between Gorillas, Humans and Livestock in Bwindi

The nature and frequency of human contact with wild primates is changing as a result of hunting, human encroachment on wildlife habitats, research, ecotourism, and other activities that bring people and primates into direct contact or close proximity (Adams et al. 2001). Such interactions may increase the risks of anthroponotic and zoonotic pathogen transmission, which can reduce human health as well as the health and viability of wild primate populations (Wallis & Lee 1999). Apes may be particularly susceptible to exchanging pathogens with people because they range widely into human habitats, are hunted and typically surrounded by high human-population densities. Additionally, many groups of free-ranging mountain gorillas *(Gorilla beringei beringei)* and chimpanzees have been habituated to humans for purposes of research and ecotourism, which brings them into close proximity to people on a regular basis.

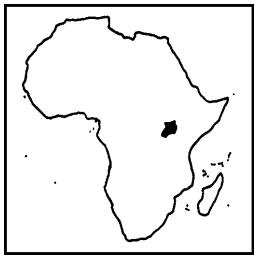
The study was carried out in Bwindi Impenetrable National Park to investigate whether habitat overlap influences rates and patterns of transmission of environmentally persistent and indirectly transmitted microbes between humans and wild apes. Mountain gorillas, an endangered taxon experienc-

Gorilla Killing in Bwindi

On the evening of March 6th, the adult female Kashongo from the Mubare group (habituated for tourism) was found dead near the Bwindi Impenetrable National Park headquarters in Buhoma. A post-mortem examination showed that she had a cracked skull. Kashongo died when a farmer threw stones at her when she was feeding on bananas. The farmer said that in the rush to chase the gorilla away and protect her children, she threw some stones but did not mean to directly hit Kashongo. A few days after this tragic death, Kashongo's 21-month-old infant also died, even though the silverback and a blackback were taking care of it.

IGCP press release

The silverback of the Mubare group *Photo: Uwe Kribus*



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ing frequent contact with people and their livestock (goats, sheep, and cattle), were the main focus of the study. Three groups of mountain gorillas were targeted: Nkuringo, a group of 19 individuals that has been the focus of a tourism venture since 2004 and spends more than 67% of its time outside the park boundary; Kyagurilo, a group of 16 individuals that has been studied continuously for approximately 15 years by researchers but that is not visited by tourists; and a wild, un-habituated gorilla group that has no regular contact with humans and is not the subject of research. The population size of the wild gorilla group is unknown, but it is estimated at approximately 6 individuals on the basis of nest counts that were made at the time of sampling. The study also focused on people who interact with the mountain gorillas at high frequency as research workers or tour guides or because gorillas raid crops on their land.

Using a common gastrointestinal bacterium *(Escherichia coli)* as a model system, the nature of bacterial transmission across ape populations as a function of habitat overlap with people and livestock was investigated. Fecal samples from human volunteers, their livestock, and mountain gorillas were collected from May to August 2005 and bacteria were isolated and confirmed using standard microbiological methods. Genetic work was further done using previously described protocols. The susceptibility of the isolated bacteria to 11 antibiotics readily available to people in and around Bwindi Impenetrable National Park was measured.

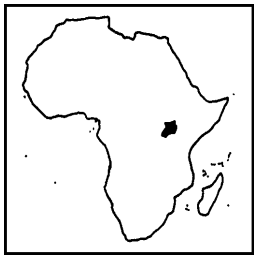
Humans and livestock harboured bacteria that were very closely related to each other. Bacteria from all the three groups of gorillas were more closely related to bacteria from people employed in gorilla research and tourism than to bacteria from people in local villages. Across gorilla groups, genetic similarity between bacteria isolated from gorillas and those isolated from human populations was highest for the tourism group (group with highest human contact), lower for the research group (intermediate human contact), and lowest for the wild group (lowest or no human contact). Gorillas from the same group tended to share genetically similar bacteria. However, people working with the same gorilla group did not necessarily share genetically similar bacteria more than would be expected by chance alone.

Thirty-five percent of bacterial isolates from humans, 27% of isolates from livestock, and 17% of isolates from gorillas were clinically resistant to at least one of the antibiotics tested. Multiple resistances to Chloramphenicol, Streptomycin, Trimethoprim-sulfaxazole, and Tetracycline was observed in 4.2% of genetically distinct isolates, and multiple resistance to Ampicillin, Trimethoprim-sulfathaxazole, and Tetracycline was also observed in 7.2% of all genetically distinct isolates. This same pattern was observed in 20.3% of isolates from humans involved in gorilla work and 11.2% of genetically distinct isolates from humans from the village.

This means that habitat overlap among humans, livestock, and mountain gorillas can influence patterns of gastrointestinal bacterial exchange among species. Overall, gorilla populations that overlap in their use of habitat with people and livestock tend to harbor *E. coli* bacteria that are genetically similar to *E. coli* from those people or livestock. *E. coli* from the Nkuringo (tourism) gorilla group in particular were consistently most genetically similar to *E. coli* from local people and livestock. Mountain gorillas in the Nkuringo group spend a large percentage of their time outside the park boundary venturing into areas used by humans (Rwego 2004) and thus come into direct or indirect contact with villagers and their livestock. Conversely, gorillas in Kyagurilo group interact with the field assistants working with the group but not with local villagers, and gorillas from the wild group would rarely contact people or their habitats. These significant effects underscore that frequent contact and shared habitats, even on very fine scales, can influence bacterial transmission rates within and among populations of humans, apes, and livestock.

Antibiotic resistance was high in humans in this study. In rural Uganda, antibiotics are easily obtained over the counter and may be used indiscriminately. Antibiotics are rarely used for livestock in the Bwindi area, and administration of antibiotics to gorillas has been exceptionally rare. The presence of clinically resistant bacteria in gorillas (especially isolates resistant to multiple antibiotics) highly suggests that antibiotic-resistant bacteria are spreading from humans into the gorilla population. Such transmission appears to occur even between humans and gorilla groups that do not overlap with humans, although at a low rate, as evidenced by the presence of an isolate resistant to multiple antibiotics in the wild gorilla group. Local antibiotic use by humans seems to be responsible for the trends observed. Nearly the same patterns of antibiotic resistance were found in *E. coli* from humans and chimpanzees in a study carried out by Goldberg et al. (2007) in Kibale National Park, Uganda (approximately 200 km north of Bwindi and separated by a densely populated agricultural landscape).

These results should however be interpreted cautiously with respect to transmission. Genetic similarity between bacterial populations does not necessarily imply transmission in the conventional sense (i.e., direct exchange of microbes through direct or immediate contact). Transmission in the Bwindi system may occur indirectly and over extended time periods, perhaps through contaminated environ-



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A member of the Rushegura group crosses a road in Buhoma – in front of human onlookers *Photo: Uwe Kribus*

mental sources such as soil and water. Goldberg et al. (2007) showed that bacterial gene flow was higher between chimpanzees and humans employed in chimpanzee research and tourism than between chimpanzees and people from local villages who rarely, if ever, share habitats with chimpanzees. This previous study also documented surprisingly high levels of antibiotic resistance in local people and the diffusion of antibiotic resistance to apes. Like chimpanzees, gorillas that are the subjects of research and tourism appear to be at increased risk of exchanging gastrointestinal microbes with people.

Overall, the patterns of genetic similarity and antibiotic resistance seen in the current study reflect the degrees to which apes, humans, and livestock interact. Habituation of mountain gorillas to humans for the purposes of research and tourism also appears to be associated with increased risks of gastrointestinal bacterial transmission between the species. Concerns about pathogen transmission already underlie many of the regulations in place governing interactions between people and apes (e.g. minimum observational distances, maximum observation times). These results suggest, however, that apes even in well-managed situations may be at increased risk of pathogen exchange with humans and livestock. If common sources of environmental contamination underlie the trends that have been documented, then preventing direct or even close contact between people and mountain gorillas may not be sufficient for preventing microbial exchange. This conclusion may apply to gastrointestinal pathogens and to pathogens transmitted by other modes, such as through the respiratory system, that represent serious and potentially epidemic disease threats to wild apes. Strategies such as discouraging people from defecating in the forest, encouraging hand washing before and after entering the forest, mandating the wearing of aerosol-limiting face masks for people entering ape habitats, and encouraging employee health programs would be reasonable strategies to limit bacterial exchange between people and apes, which would safeguard ape health and aid conservation efforts.

Innocent B. Rwego, Thomas R. Gillespie, Gilbert Isabirye-Basuta and Tony L. Goldberg

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The full scientific report (from which this article is taken) is available from Conservation Biology 22 (6), 1600–1607.

References

Adams, H. R. et al. (2001) Self-reported medical history survey of humans as a measure of health risks to chimpanzees *(Pan troglodytes schweinfurthii)* of Kibale National Park. Oryx 35, 308–312

Goldberg, T. L. et al. (2007) Patterns of gastrointestinal bacterial exchange between chimpanzees and humans involved in research and tourism in western Uganda. Biological conservation 135, 511–517

Rwego, I. B. (2004) Prevalence of Clinical Signs in Mountain gorillas, Bwindi Impenetrable National Park. M.Sc dissertation, Department of Wildlife and Animal Resources Management, Makerere University, Kampala

Wallis, J. & Lee, D. R. (1999) Primate Conservation: the prevention of disease transmission. International Journal of Primatology 20, 803–826

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Genetic Diversity: the Cross River Gorilla in a Comparative Context

Conservation research on gorillas has, to date, mainly focused on demographic factors, human impacts, and the influence of disease. Genetic data have been primarily used to examine questions related to social structure, relatedness, mating strategies and phylogenetics. Yet when populations are small, genetic diversity and its distribution within a population may be as important as other factors for assessing the overall conservation status of a group of organisms. Reduced genetic diversity as a consequence of small population size or inbreeding may threaten the long-term survival of wildlife populations. However, in the absence of historical genetic data, defining "reduced diversity" is difficult; there is no absolute value below which a population should be considered genetically depauperate.

The Cross River gorilla *(Gorilla gorilla diehli)* occupies approximately 11 primarily highland sites dispersed across a larger forest landscape in Cross River State, Nigeria and Southwest Province, Cameroon. This gorilla subspecies in particular may be under threat from genetic factors as its population is small, fragmented and may have undergone a considerable reduction in size (Oates et al. 2003; Bergl 2006), numbering only an estimated 250–300 individuals today. We examined patterns of genetic diversity in the Cross River gorilla at both the intra- and inter-population level using data from autosomal microsatellite loci (see explanations of technical terms at the end of this article) derived from non-invasively collected fecal samples. We compared the genetically defined subpopulations of Cross River gorillas (Bergl & Vigilant 2007) to each other, and we compared the Cross River population as a whole to three other gorilla populations (Bwindi, the Virungas and Mondika, Central African Republic). The genetic data from the four gorilla populations were also examined for evidence of demographic bottlenecks (when a population is reduced in size).

Diversity within the Cross River Gorilla Population

Genetic diversity is not evenly distributed within the Cross River gorilla population. The largest central subpopulation exhibits higher levels of genetic variability than either of the peripheral subpopulations in terms of both the measures we examined. This may be due to the small size of the eastern and western subpopulations (these smaller subpopulations may consist primarily of single social groups).

In these smaller subpopulations the loss of diversity due to drift and inbreeding will be considerably greater. In contrast, the central subpopulation will have been less affected by drift given its relatively greater size, and less susceptible to inbreeding due to the presence of gene flow between localities. Interestingly, though the smaller subpopulations had lower levels of genetic diversity, they still contributed to the overall diversity of the Cross River population because they contain genes not found in the central subpopulation.

Protection of all subpopulations is, therefore, important, but the central subpopulation is integral to the long-term survival of these gorillas.

Comparative Diversity of the Cross River Gorilla

Contrary to what might have been expected, the Cross River gorilla population does not exhibit uniformly lower genetic diversity than either a large, undisturbed gorilla population (western lowland gorillas at Mondika) or small, unfragmented populations (mountain gorillas in the Virungas and Bwindi). Our comparisons between the Cross River and mountain gorilla populations revealed no evidence that, compared to these similarly sized populations, the Cross River gorillas are genetically depauperate. In fact, the Cross River population shows slightly greater diversity for some parameters.

However, while the Cross River population compares favorably to the mountain gorilla and other primate populations, it does show reduced diversity for some measures when compared to the larger Mondika population.

Genetic Evidence for Population Bottlenecks

Using genetic data, we were able to detect a significant signal of a reduction in population size in the Cross River, Virunga and Bwindi gorilla populations. The bottleneck signal was much stronger in the Cross River gorillas. This is perhaps surprising given that each of the populations is similar in size. Our data suggest that the Cross River population reduction was quite recent and/or severe (perhaps within the last 100–200 years), while reductions in the mountain gorilla populations were either older or more gradual.

Overall, it appears that though the Cross River, Virunga, and Bwindi populations are equally small, the ways in which they reached their current sizes are different. Two contrasting elements of the Cross River and mountain gorillas' habitat may have influenced the differing bottleneck signals we observed. First, the Cross River gorillas inhabit a large forested area (over 2,000 km^2). Much of this area, while currently unoccupied by gorillas, may represent habitat from which they have been recently extirpated (Bergl 2006). In contrast, the two mountain gorilla populations are limited to two relatively small forest areas, each of which is approximately 350 km^2. The land surrounding the mountain gorilla habitat is the most densely populated area of Africa, and

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has been cultivated and used for cattle grazing for at least the last 400 years. Second, the Cross River region has a long history of bushmeat hunting (Oates et al. 2004), which likely intensified in the 19th century with the introduction of firearms. Conversely, the hunting of primates for meat in the range of the mountain gorillas is rare, though hunting for trophies and conflict-related mortality have occurred sporadically.

An explanation consistent with these observations and our genetic data is that the Cross River population was recently larger, and the current population size is the result of hunting during the last 100–200 years. This decline may have accelerated as guns became more common and hunting of larger, potentially dangerous mammals more common. A similar situation has been observed recently in Central Africa where the introduction of large bore shotgun shells greatly increased hunting off-take of large mammals. In contrast, the current sizes of the Virunga and Bwindi gorilla populations appear to be the result of a more gradual decline, mediated by the increasing habitat loss due to farming.

Implications for Conservation

Our analysis of genetic diversity in the Cross River gorillas has important implications for the conservation and management of this population. At the within-population level, diversity is unequally distributed between subpopulations. While the peripheral subpopulations contribute to the diversity of the population as a whole, their lower levels of diversity may reduce their prospects of long-term survival. All the Cross River subpopulations can be considered small by mammal standards, and very small populations such as these can be highly susceptible to inbreeding in the short term and suffer from a limited future evolutionary potential. Increasing the variability of these smaller subpopulations must be part of any effort to preserve them.

Two complementary strategies could be applied. First, population expansion, beyond its obvious benefits of increasing census size, will also promote greater diversity. Second, gene flow into small, genetically depauperate subpopulations can drastically increase variability. A single additional migrant per generation could significantly improve levels of diversity, particularly if from a divergent and more variable subpopulation (i.e. the central subpopulation). Such outcrossing of divergent populations has been demonstrated to stimulate recovery of genetic diversity in a wide range of species. Since migration from the peripheral subpopulations to the larger central subpopulation has been documented (Bergl & Vigilant 2007), natural migration in the opposite direction may be possible. Management efforts should foster movement of individuals between subpopulations by maintaining habitat corridors and controlling hunting in lowland areas. Alternatively, the possibility of translocating animals between subpopulations could be explored.

Similar heterozygosity levels for both the small Cross River and large Mondika populations are encouraging. Studies have shown that heterozygosity is important for short-term evolutionary potential (England et al. 2003) and is more representative of the relationship between genetic diversity and fitness than other measures (Keller & Waller 2002). Similarly, the lack of difference in diversity indices between Cross River, the Virungas and Bwindi is promising, since the mountain gorillas (though endangered) are generally considered to be demographically stable (Werikhe et al. 1998). Together these results suggest that the Cross River population is not in immediate danger of extinction due to genetic factors. However, levels of diversity in the Cross River population must be viewed with caution. If the relatively robust heterozygosity in the Cross River gorillas is an artifact of a historically larger population, this diversity would be transient and may be lost quickly if the population is maintained at its current size.

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References

Amos, W. & Balmford, A. (2001) When does conservation genetics matter? Heredity 87, 257–265

Bergl, R. A. (2006) Conservation Biology of the Cross River gorilla (*Gorilla gorilla diehli*). Ph.D. thesis. New York (City University of New York)

Bergl, R. A. & Vigilant, L. (2007) Genetic analysis reveals population structure and recent migration within the highly fragmented range of the Cross River gorilla (*Gorilla gorilla diehli*). Molecular Ecology 16, 501–516

Dudash, M. & Fenster, C. (2000) Inbreeding and outbreeding depression in fragmented populations. In: Young, A. J. & Clarke, G. (eds.) Genetics, Demography and Viability of Fragmented Populations. New York (Cambridge University Press)

England, P. R. et al. (2003) Effects of intense versus diffuse population bottlenecks on microsatellite genetic diversity and evolutionary potential. Conservation Genetics 4, 595–604

Frankham, R. (2005) Genetics and extinction. Biological Conservation 126, 131–140

Keller, L. F. & Waller, D. M. (2002) Inbreeding effects in wild populations. Trends in Ecology & Evolution 17, 230–241

Lacy R. C. (1997) The importance of genetic variation to the viability of mammalian populations. Journal of Mammalogy 78, 320–335

Oates, J. et al. (2003) The Cross River gorilla: Natural history and status of a neglected and critically endangered subspecies. In: Taylor, A. & Goldsmith, M. L. (eds.) Gorilla Biology. Cambridge (Cambridge University Press)

Oates, J. F. et al. (2004) Africa's Gulf of Guinea Forests: Biodiversity Patterns and Conservation Priorities. Washington D.C. (Conservation International Center for Applied Biodiversity Science)

Reed, D. H. & Frankham, R. (2003) Correlation between fitness and genetic diversity. Conservation Biology 17, 230–237

CROSS RIVER

Srikwan, S. & Woodruff, D. S. (2000) Genetic erosion in isolated small mammal populations. In: Young, A. J. & Clarke, G. (eds.) Genetics, Demography and Viability of Fragmented Populations. New York (Cambridge University Press)
Werikhe, S. et al. (1998) Can the Mountain Gorilla Survive? Population and Habitat Viability Assessment for *Gorilla gorilla beringei*. Apple Valley, MN (IUCN SSC Conservation Breeding Specialist Group)

Explanations of some of the technical terms in this article:

Autosomes are the non-sex chromosomes. Humans have 22 pairs of autosomes, gorillas have 23 pairs.

Microsatellites consist of repeating units of DNA, 1–6 base pairs in length.

An **allele** is one member of a pair (or series) of different forms of a gene.

A **heterozygous** organism has two different alleles of a gene.

Genetic drift is a change that occurs purely by chance in the relative frequency with which an allele occurs in a population.

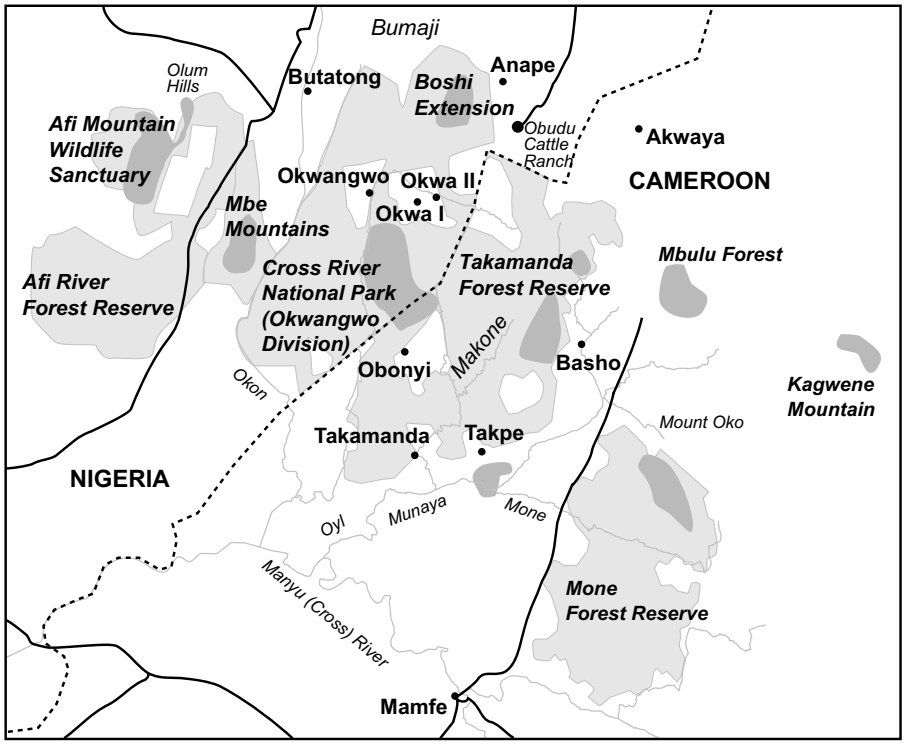
Cross River Gorillas: Nigeria

Improving Gorilla Protection in the Mbe Mountains

Covering an area of about 80 km^2 the Mbe Mountains is one of three sites in Nigeria where gorillas are known to occur. Mbe is located midway between the Afi Mountain Wildlife Sanctuary to the west and Cross River National Park (Okwangwo Division) to the east. Since 2006 the area has been managed as a community wildlife sanctuary by the *Conservation Association of the Mbe Mountains* (CAMM) with support from the *Wildlife Conservation Society* (WCS) and the local NGO *Development in Nigeria* (DIN). Funds to support Mbe have been provided by a variety of organizations including the Great Ape Conservation Fund of the *United States Fish and Wildlife Service*, the *Great Ape Trust of Iowa*, the *Kolmården Fundraising Foundation*, the *Margot Marsh Biodiversity Foundation*, North Carolina Zoo, *Berggorilla & Regenwald Direkthilfe* and the Ecosystem Grants Programme of IUCN-Netherlands.

Although protection efforts in the Mbe Mountains have been fairly successful to date, the lack of a clear boundary on the ground posed a major challenge to law enforcement. In 2006 CAMM and its partner organizations agreed to demarcate a boundary for the conservation area. Working with the nine surrounding communities and the Cross River State Forestry Commission (the government institution in charge of all forests and wildlife within Cross River State), WCS helped to demarcate a provisional boundary – a map of this provisional boundary was subsequently signed by the traditional rulers of all nine communities in 2007. The boundary included two critical corridor areas linking Mbe to Cross River National Park and to the Afi River Forest Reserve. Unfortunately permanent demarcation of this boundary was delayed owing to the lack of funds.

In 2008, WCS received grants from the *Kolmården Fundraising Foundation* and from IUCN-NL (through DIN) to complete the permanent demarcation of the boundary. The process is now almost complete and soon the sanctuary will have a clearly demarcated boundary (all vegetation cleared in a 3-m-wide strip and planted with seedlings of bush mango and teak together with concrete boundary beacons). It is expected that this boundary will be endorsed by Cross River State Forestry Commission and will have full legal status. This will eliminate the difficulty faced by eco-guards when dealing with offenders who feign ignorance of the boundary between the community use area and the sanctuary as an excuse to carry out illegal activities in the area.



Constructing a Second Research Camp in the Mbe Mountains

With funds provided by *Berggorilla & Regenwald Direkthilfe* in 2008 WCS

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The new camp in Mbe is constructed *Photo: Andrew Dunn*

are currently constructing a second research camp in the Mbe Mountains. Located in the very heart of the sanctuary the first camp was completed in 2006 – also with funds from B&RD. The first camp has greatly facilitated research and gorilla monitoring in the area and also acted as a base for anti-poaching patrols by Mbe's 9 eco-guards. The second research camp is located in the southern sector of the mountains – an area that is difficult to reach from the first camp. As with the first camp, construction of the second camp has taken longer than expected because of the difficult terrain – and all building materials had to be conveyed to the site by porters. Construction of the camp is however almost complete. Built entirely with local labour construction of the camp is providing valuable, even though temporary, employment opportunities besides giving the people a sense of ownership of the facility that should encourage care for and protection of the camp.

Gorilla Monitoring with Cybertracker Technology

As part of our ongoing efforts to improve gorilla monitoring we have recently introduced the use of a hand-held computer-based data capture system in the Mbe Mountains and Cross River National Park. Based on the Cybertracker software these units allow the collection of standardized, georeferenced data by monitoring teams in the field. Ten units were provided for use in Nigeria by the North Carolina Zoo with a grant from the Great Ape Conservation Fund of the *US Fish and Wildlife Service*. Training was conducted by Richard Bergl of North Carolina Zoo and took place in August 2008 (in the Mbe Mountains, Nigeria) and January 2009 (at the Kagwene Gorilla Sanctuary, Cameroon). The training included practical demonstrations of how the hand-held units work, data collection practice as well as practical computer-based training on use of the Cybertracker software. Researchers in both Cameroon and Nigeria are already using the equipment to collect and analyse data. By using this technology we hope to be able to improve the quality of the data that our eco-guards collect in the field, improve our database management and the effectiveness of our conservation efforts.

Gorilla Census of the Afi Mountain Wildlife Sanctuary

Working with the Cross River State Forestry Commission and *Pandrillus*, WCS participated in a joint survey of the Afi Mountain Wildlife Sanctuary in March 2009. The survey was conducted to evaluate the status of three primate species of conservation importance – the Cross River gorilla *Gorilla gorilla diehli*, the Nigeria-Cameroon chimpanzee *Pan troglodytes ellioti* and the drill *Mandrillus leucophaeus*. The sanctuary was divided into 9 sectors and each sector simultaneously searched by a team of 3 observers.

The 7-day sweep survey found evidence of the presence of all three species though evidence of gorillas was observed only in the south-central, southern and north-eastern areas of the sanctuary. Fresh evidence of gorillas was also observed outside of the sanctuary in the adjacent Olum Hills

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(see map on page 21). Gorillas previously abandoned the Olum Hills in 1997 when the area was destroyed by fire but subsequently returned to the area in 2005.

In February 2008 Afi Mountain Wildlife Sanctuary suffered from another series of major wild fires. Originally started in nearby farms the fires quickly spread to the north-central and south-eastern sectors of the sanctuary where extensive damage was caused. No gorilla sign was observed in the affected areas during the March 2009 survey. A full report on this survey will be provided in the next *Gorilla Journal*.

Inaoyom Imong and Andrew Dunn

Additional Support when the Going Gets Tough

When viewed on a clear day from a rocky mountain top high above the montane forest cloaked slopes of the Kagwene Gorilla Sanctuary, the landscape in which the Cross River gorilla has sought refuge from persecution is truly stunning with steep ridges and grass topped peaks stretching into the distance towards the Obudu Plateau area of Nigeria. On such days it is easy to quickly forget the physical and logistical trials associated with undertaking gorilla survey, monitoring and protection activities in the forests below.

Wildlife Conservation Society staff based in South West Cameroon spend a great deal of time in this rugged landscape. In the last 12 months, our Cross River gorilla survey and monitoring teams have completed an estimated 563 field days in Cameroon alone related to ongoing daily monitoring in the Kagwene Gorilla Sanctuary, distribution surveys to discover unknown Cross River gorilla sites, general reconnaissance surveys in the Mbulu and Obonyi-Okwangwo areas (the latter in collaboration with rangers from Cross River National Park) and finally associated with surveys of potential habitat corridor areas between core gorilla areas. As I write, a further survey of the promising Mount Oko area is taking place to further improve our understanding of a new gorilla site that has recently been discovered there (more on this in the next journal!).

Survey team getting ready to depart *Photo: Aaron Nicholas, WCS TMLP*

Local porters supporting survey
Photo: Pius Nkumba, WCS TMLP

As every good field biologist knows, having good, well maintained field kit is essential to success, especially under Cross River gorilla conditions! Despite our careful selection of the most reliable backpacks, clothing, boots, tents, roll mats etc., the turn-over in field equipment is high and with so much recent field work having taken place and with shortages of field-ready equipment, we turned to *Berggorilla & Regenwald Direkthilfe* for help. Thanks to their generous support, we were able to purchase new waterproof backpacks, roll mats, tents, pelican cases and field books which have allowed our teams to remain field based.

While the intention of this brief article is to thank *Berggorilla & Regenwald Direkthilfe* for this timely support, perhaps we should all take a minute to also reflect on the huge contributions that our field staff make towards our conservation goals, if anyone knows what it takes to save a species, they do!

Aaron Nicholas

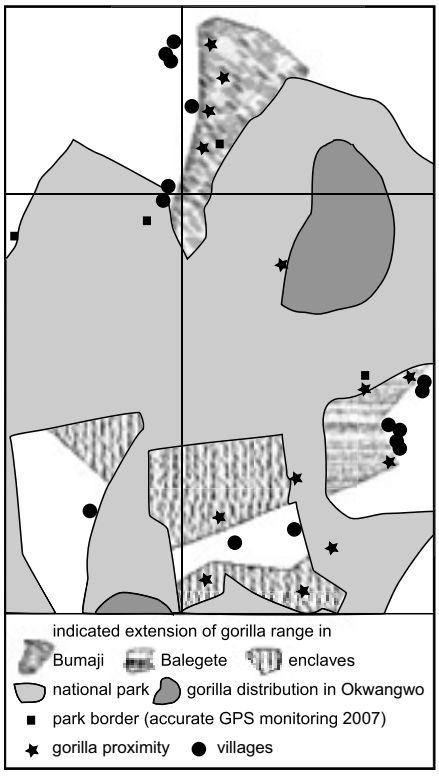
CROSS RIVER

Cross River Crop-Raiding Survey in Okwangwo

As has been reported in previous editions of the *Gorilla Journal*, fieldwork in the Okwangwo Division of the Cross River National Park was carried out during September and October 2007. The study was conducted as: 1. a qualitative study based on participant observations, in situ interviews of conservation workers and local farmers, and 2. a quantitative study using GPS to map farmland in respect to alleged gorilla incidents, with subsequent processing of acquired data. Gorillas visit community farmland almost exclusively during the dry season, which generally occurs from November to March.

Upon arrival in the villages concerned, we established a positive understanding, and set up possible future collaboration and participation; to avoid false expectations, it was stressed that it was a minor study with extremely limited resources and funding (total cost approximately 25,000 Swedish crowns + assistance from WCS). There did not seem to be any major clandestine agendas interfering with the purpose of the survey, though villagers may on occasion have acted from self interest in some of their allegations.

Initially, we made inquiries about general farming issues, and we then asked questions to explore how much damage different wild mammals inflict on annual farm productivity, establishing a general picture of what animals do what kind of damage and their share of accumulated crop damage. During interviews we deliberately did not focus specifically on gorilla incidents, and questions about primate/gorilla incidents were left until the conclusion of interviews. In the villages of Okwangwo and Anape, we established that gorillas never visit community farm land, so we made no further surveys. In villages where gorilla visits were acknowledged, arrangements were made for one or two farmers chosen by the community to guide us to the borders of present farming areas and to the areas visited by gorillas.



An important aspect to consider is whether farmers are able to distinguish between chimpanzees and gorillas, which have been known to be mistaken for each other locally (Liza Gadsby, pers. comm. 2007). Our assessment from this survey is that people living in Okwangwo, and engaged in interviews/guiding, have become more enlightened about these matters during recent decades and had no real misconceptions any more concerning different species of great apes.

The map indicates 12 points of reference near the villages concerned, where gorillas allegedly visit just outside the park border, or in some places in encroaching on fields (lack of correct GIS foundation makes exact locations of the national park border uncertain). The results indicate that a fifth of active farming land between village centres and ultimate edges of cultivated land have occasional visits by gorillas, although no direct evidence could be collected.

The general results of our collected data are in accordance with our expectations of where gorilla presence can be expected, taking into account core habitats, human presence, topology and previous data. Due to the limited extent of the study, we could often not collect actual evidence of gorilla presence; still, the information from the villagers may be worth considering as an indicator of present gorilla range in and around Okwangwo Division, and an urgent issue is to collect hard evidence about the Cross River gorilla range in the region, which is being done now. The study furthermore confirmed that it is almost exclusively banana *(Musa sapientum)* and plantain *(Musa paradisiaca)* that are exposed to gorilla crop-raiding, and that the amount of crops damaged by gorilla activity is marginal in comparison to damage done by smaller mammals.

Jan Erik Patrik Norberg

On the Obudu Plateau
Photo: Patrik Norberg

GORILLAS

History of Mountain Gorilla Research

Fifty years ago, in 1959, George Schaller left New York for Africa to begin a study of mountain gorillas that would have lasting impact. His year of fieldwork in the Virunga Volcanoes culminated in his book, *The Mountain Gorilla*, published in 1963; a classic of quantified natural history, behaviour and ecology, it is still frequently cited and referred to. Research on mountain gorillas has come a long way since then. This is a brief review of that journey.

The Early Years

After George Schaller came Dian Fossey. In 1967 Fossey arrived at Kabara meadow, Schaller's base in Congo's Parc National des Virunga. After only six and a half months, political troubles forced her to move across the border to the Rwandan sector of the Virunga Volcanoes, where she set up camp. Making a combination of the names Karisimbi and Visoke, the two nearest volcanoes, she christened the site Karisoke. It was to become one of the longest running field studies in primatology.

Fossey's first task was to habituate gorillas to the presence of observers. This process has always been easier with mountain gorillas than western populations, both because the thick ground vegetation makes mountain gorillas easier to track and therefore locate regularly, and because they have not been hunted.

Following Schaller's technique for identifying individuals, Fossey drew "nose prints" – the pattern of wrinkles and creases above gorillas' nostrils. When she was near a group of gorillas, she dropped to her hands and knees and crawled after them, giving "belch" vocalisations and mimicking their feeding sounds. These were the methods and demeanour that all researchers employed in those early years. By 1972, Fossey, with the help of newly arrived students such as Sandy Harcourt, had habituated three study groups, including the well-known Groups 4 and 5. The doors had been opened into the lives of individual gorillas whose fortunes would be tracked for decades to come. Today, researchers still observe the descendants of gorillas that Fossey first contacted. For example, the males Titus and Pablo, Ziz, Shinda, and Cantsbee, silverbacks whose names have often appeared on the pages of this journal, were all born in the 1970s.

During this first decade, research expanded and elaborated Schaller's basic picture of gorilla social organisation and ecology, documenting the animals' day-to-day lives as well as relatively rare events such as female transfer and infanticide, and producing what came to be viewed as the gorilla blueprint. Mountain gorillas were almost entirely folivorous, living in groups with overlapping home ranges. Most individuals left the group in which they were born, with females immediately joining a lone male or another group. Dispersing males did not enter breeding groups but wandered alone until they attracted females away from other silverbacks. The resulting social structure consisted of cohesive groups held together by long-lasting bonds between males and females. In comparison, social ties between females were weak and their dominance relationships unclear. While most groups had one silverback, in those with more than one, the dominant male did most of the mating and therefore sired most offspring. It was considered, essentially, a one-male mating system.

As for conservation, the park's guard force was ill equipped and untrained, and the involvement of conservation NGOs in the region was minimal. Karisoke Research Center was a focus of conservation effort in the Virungas

The famous Virunga gorilla Titus above: in 1974, 2 days old, in the arms of his mother Flossie below: as a subadult in the 1980s

Photos: Kelly Stewart

and became the coordinator and implementer of regular, whole-population

censuses, probably the most basic and vital conservation research there is.

Censuses during the 1970s showed that the gorilla population had declined since Schaller's estimate. Habitat loss was the major threat, but gorillas were also being hunted for the pet and trophy trades. Then in 1978, something happened that would change everything. Poachers attacked Karisoke's longest-studied group, Group 4. The resulting deaths of two silverbacks, a female and an infant led to the disintegration of the breeding group.

The massive publicity campaigns in Europe and the USA that followed these killings led to the now famous *Mountain Gorilla Project*, a program that became a model for gorilla conservation across Africa.

1980s

During the 1980s, our knowledge of the processes of group formation, and the dispersal and life histories of individuals, increased significantly, starting with the demise of Group 4 and its aftermath. Following the death of the leading silverback, all females transferred to other groups, and two infants were killed by males who were not their fathers. These tragic events underlined the crucial importance of adult males in protecting their offspring from infanticide. It would be eventually documented in other gorilla populations and would inspire theoretical developments in the study of social evolution. The remaining males of Group 4 ended up in a new study group – a band of bachelors, studied by Juichi Yamagiwa, who has since become well known for his work in Kahuzi-Biega. This all-male group would be relatively stable for years and provide another dimension to the story of gorilla society.

It was a time for documenting and understanding variation on the basic gorilla theme. Gorillas first seen as small infants, and now reaching sexual maturity, did not always follow the same path into adulthood. For example, while some females dispersed, others remained in their natal groups with their close relatives. Some males too stayed behind, which meant that researchers could observe a breeding group with more than one silverback. Amy Vedder and David Watts studied ecological variation, showing that the gorillas' habitat varied in both food abundance and quality. One leaf was not the same as another, and gorillas ranged accordingly, favouring high quality areas.

Across Africa, studies of other populations were starting to produce data for comparison with mountain gorillas. In Kahuzi-Biega, Zaïre (now Democratic Republic of the Congo), observations of habituated Grauer's gorillas became more systematic and consistent. Caroline Tutin established her long-term study of western gorillas at Lopé in 1980, and studies in the Central African Republic and Congo Brazzaville were getting underway. Meanwhile in Uganda, Tom Butynski was directing attention to the only other population of mountain gorillas, those in Bwindi Forest.

In the Virungas, censuses indicated that the decline in the population had been halted after 1981 with the initiation of the *Mountain Gorilla Project* in Rwanda, and similar conservation efforts were now underway in Uganda and Zaïre. For the first time, research focused on the human population around the park with, for example, Bill Weber's sociological questionnaires assessing attitudes towards the park and its wildlife. And in 1986, a new avenue of conservation-based research opened up with the establishment of the *Mountain Gorilla Veterinary Project* to manage medical interventions, such as snare removals, and to conduct routine monitoring and analyses related to gorilla health.

When Dian Fossey was murdered in her cabin at the end of 1984, many wondered if the long term research would die with her. But by then, her legacy had a momentum and reached far beyond any one individual. The *Digit Fund*, which would eventually become the *Dian Fossey Gorilla Fund International* (DFGFI), was established to ensure Karisoke's continuation.

1990s

Mountain gorilla research made impressive strides during the 1990s. Some of the most significant were developments in Uganda. By 1991, both Bwindi Impenetrable Forest and Mgahinga had been made national parks. The *Institute of Tropical Forest Conservation*, spearheaded by Tom Butynski, built research sub-stations in Bwindi's Ruhija and Buhoma, conducted a census, and implemented the training of Ugandan students and counterparts such as Samson Werikhe. Conservation efforts and research were intimately linked. By the mid nineties, four gorilla groups had been habituated for tourism and one for research. Studies concentrated on feeding ecology and comparisons with the Virunga population.

The 1990s saw a general shift towards an understanding of differences between gorilla populations. As studies of western gorillas progressed in Gabon, Congo Brazzaville, and the Central African Republic, and on Grauer's gorilla in Zaire/Democratic Republic of the Congo, more data were available to ask the question: just how representative were mountain gorillas of the genus as a whole? How were they different? What became clear in the course of the decade was that mountain gorillas, especially the Virunga population, are at one ecological extreme for the genus. No other population has such limited access to fruit. Across Africa, from Bwindi westward, research showed that gorillas eat fruit when they can get it, and that this influenced ranging behaviour. The impact of frugivory

on other aspects of behaviour, such as competition between females or between groups, is an ongoing topic of investigation.

With the advent of new techniques for genetic analyses, gorilla taxonomy became a hot topic. How many species and subspecies were there? While some suggested, on the basis of morphology and ecology, that Bwindi gorillas be considered a separate subspecies from the Virunga population, DNA analyses showed the two populations to be almost identical.

The genetic studies across populations during the 1990s helped to support the growing consensus of an east-west split into two species, eastern gorillas, *Gorilla beringei* (including Grauer's and mountain subspecies), and western gorillas, *Gorilla gorilla*. Of course, there is continuing disagreement over these taxonomic questions and probably always will be.

While gorilla research and conservation programs were fast progressing in Uganda during the 1990s, they were suffering devastating setbacks in Rwanda. War broke out in 1990 and carried on with surges and lulls until the genocide of 1994 and its aftermath. War in D. R. Congo since 1996 has chronically destabilized the Virunga region, and had effects in Uganda as well. Karisoke Research Center was completely destroyed after 1994. Despite these circumstances, foreign researchers as well as several Rwandan university students conducted projects based in the Virungas, often with the sounds of gunfire and explosions in the background. Diane Doran was director of Karisoke when these troubles began.

The main gorilla study groups had continued to grow and now contained multiple silverbacks, and large numbers of females. It was the perfect opportunity to investigate behaviour in relation to these demographic changes, especially male mating competition, female mate choice, and the first documented group fission.

New technologies came to Karisoke during the 1990s. For example, Martha Robbins and Pascale Sicotte developed techniques for collecting fresh urine for hormonal analyses of males and females. Dieter Steklis helped implement GPS technology, which was also used in Bwindi, and has transformed the mapping of gorilla ranges, vegetation and human use. It has now become a crucial tool for park rangers as well as research teams.

Collaboration between conservation personnel and researchers, both within and between countries, increased during this decade, with the sharing of technologies (such as GPS), activities, and data. Cooperative efforts were, and still are, facilitated by the *International Gorilla Conservation Program* (IGCP), established in 1991, and based on the earlier *Mountain Gorilla Project*. The veterinary programs in both Rwanda and Uganda developed procedures for effective interventions and for studying intestinal parasites and other pathogens of gorillas. Many of these studies are aimed at questions about the risks to gorillas of proximity to humans, be they researchers, tourists or the local population. The health of wild gorilla populations and the risk of catastrophic diseases would become a growing concern.

The 21st century

While the research center that Dian Fossey set up no longer physically exists in the forest, its activities have never ceased. Karisoke field assistants and personnel of Rwanda's Parc National des Volcans, working with research directors, Liz Williamson and, later, Katie Fawcett, have followed research and tourist groups in Rwanda throughout periods of violence.

In this new century, researchers are harvesting the fruits of long-term data, with the help of a powerful new tool: DNA analyses. Martha Robbins and colleagues, analyzing data from as far back as the 1970s on habituated groups in the Virungas, have examined lifetime reproductive success of males and females and related it to various factors such as dispersal decisions (should I go or should I stay?) and female dominance relationships. Paternity analyses have shown that while dominant males do indeed get most of the mating, subordinate males manage to sire about 15% of the offspring. In fact, the famous Titus sired an infant while he was still turning silver, the youngest wild male known to be a father.

In Bwindi, where Robbins has been leading field studies, recent genetic work combined with population modelling has yielded valuable information about population structure, including how far males and females disperse.

But sophisticated new tools still rely on the same basic raw materials: data on where the gorillas are going and what they are doing. Methods of following groups and recording their behaviour continue much as they always have. In the Virungas, regular monitoring has documented the extraordinary growth of some groups such as Pablo's group, holding the record at over 60 members. Observations of "super groups" have provided insights into group processes such as dispersal and group fission.

In Uganda, continuing socio-ecological studies facilitate comparisons between mountain gorillas and other species/subspecies. While fruit-eating clearly influences gorilla society, it is now clear that group structure is quite similar across Africa, with one consistent exception: the number of silverbacks per group. In mountain gorillas of both the Virungas and Bwindi, multi-male groups are relatively common (30–50% of groups), whereas in Grauer's and western gorillas, they are rare. Why? The answer is still unclear and

may lie with environmental differences, life history variation, genetic factors or, most likely, a combination of forces.

And finally, new research techniques are shaping gorilla conservation efforts. A good example is the recent extraordinary genetic census conducted in Bwindi. Individual gorillas were identified by fecal DNA analysis. The results were compared with those of a traditional census conducted concurrently, showing that traditional methods overestimated gorilla numbers. The power of a genetic census to estimate population size in areas where gorillas are unhabituated is obvious.

Given the progress of research on mountain gorillas in the last 50 years, even through the most difficult of times, there is hope that it may carry on for decades to come, as long as the gorillas and their habitat continue to be valued and safeguarded by the governments of Rwanda, Uganda and D. R. Congo. It has not been possible in this brief review to mention all of the people who have played a role in the story. Especially significant, and far too numerous to single out, are the field assistants and park personnel of all three countries, who have observed and monitored the gorillas, often risking and sometimes losing their lives in the process. Without their skill and dedication we would not have the decades of long-term data on known individuals, which is the defining hallmark of mountain gorilla research.

Kelly Stewart

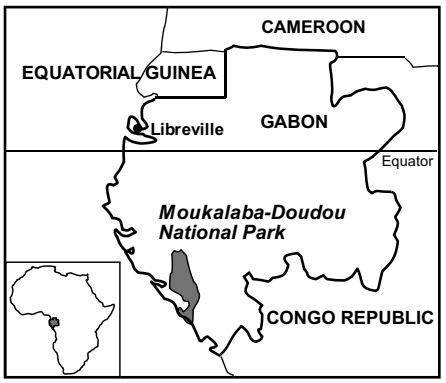
Habituation and Conservation of Gorillas in Moukalaba-Doudou

Since 1999, a long-term survey of gorillas and chimpanzees has been conducted by Kyoto University in Moukalaba-Doudou National Park, Gabon. The Moukalaba area was gazetted as a forest reserve in 1962 and as a national park in 2002. Selective logging was carried out from 1962 until 1988 by a logging company. Although local people living near the park say that gorillas had been hunted in this period, we find no evidence of hunting of gorillas and chimpanzees at present.

The Moukalaba-Doudou National Park is located about 700 km south of Gabon's capital, Libreville, and covers 5,028 km^2, and our study site is located on the southwest side of the park, covering an area of about 30 km^2. The study site is roughly divided into four vegetation types: old secondary forest, riverine forest, young secondary forest (ancient plantation of *Musanga cecropioides,* and *Aframomum* sp. are dominant), and savanna. There are two seasons: a rainy season from October to April and dry season from May to September. Annual rainfall in the study area fluctuated from 1,582 to 1,886 mm for three years (2004–2006), and mean monthly minimum and maximum temperature ranged from 21.3 to 24.1 °C, and 29.3 to 33.7 °C, respectively.

We form a research team consisting of researchers and field assistants to follow the daily fresh trails of gorillas and chimpanzees, recording their travel routes and collecting fecal samples, in order to analyze their diet and ranging patterns. In 2003 we focused on habituating gorillas to understand their

Members of Group Gentil (January 2004) *Photo: Chieko Ando*



social ecology. In other study sites, hunter-gatherers are usually employed as trackers, because of their skill at tracking wild animals in the tropical forests (Tutin & Fernandez 1991; Cipolletta 2003; Doran-Sheehy et al. 2007); in our case, we employed local farmers as field assistants, because there are no hunter-gatherers living in the areas around the park, and it is very important for local people who live around the park to get a chance to work and to understand and carry out wildlife conservation. In the first year we employed about 16 local people from three villages, Doussala, Konzi and Mboungou, who wanted to work with us. The following year we selected seven people who had high tracking skills and who were motivated.

In January 2004, we identified one group of gorillas named Group Gentil (GG) for habituation, but it was still difficult to follow them constantly. In November 2005 we concentrated on following only GG, and since then we have contacted them on a daily basis. By July 2007, we had succeeded in following the group continuously between consecutive nest sites, and we have gradually increased contact time with them. It took 21 months for us to achieve all-day follows.

The group consisted of a silverback male, a blackback male, 9 females, 6 suckling infants, and 5 juveniles/subadults in January 2008. Two females

left the group between February and May 2008, and another female left in July 2008, hence the group's size was 19 individuals as of August 2008. By June 2008 we had indentified all group members and named them.

The responses of the gorillas in GG to human observers changed over time as habituation progressed, and their responses varied with sex and age. At first, almost all gorillas ran away when they encountered the observers. In September 2006, when the number of contact days increased rapidly, the silverback started to threaten us and sometimes made mock-charges. Almost all adult females avoided the observers, and it was difficult to see them during this period. Once all-day follows were achieved, the silverback started tolerating our approaches, and the infants showed great interest in our presence, but several females showed aggressive behavior such as slapping tree trunks, chest-beating and screaming persistently, frequently making mock-charges toward observers, and they occasionally bit us. The silverback, therefore, was more quickly habituated than the females.

Such female aggression never has been reported in the process of habituation of mountain gorillas and eastern gorillas. Doran-Sheehy et al. (2007) reported similar female aggression in encounters with observers during the process of habituation at Mondika, although the responses of silverback males to female aggression are different between Mondika and Moukalaba. At Mondika the silverback rarely joined in the females' attacks on human observers and mostly ignored them, even if the females attempted to enlist his support; at Moukalaba, by contrast, the silverback rushed at females who attacked us with aggressive vocalisations and probably stopped them by grasping or pulling them down on the ground. These observations suggest variations in social relations among group members between gorillas in different habitats, although we need more observational data on their social interactions in agonistic contexts before interpreting such variations.

The silverback "Papa Gentil" in Group Gentil (September 2007)
Photo: Chieko Ando

We can make the following conclusion regarding the habituation of western lowland gorillas: the first important task is to train good trackers. Our experience shows that even inexperienced trackers increased their skill to attain reliable follows of wild gorillas under the difficult conditions of the tropical forests of Central Africa. Secondly, successful habituation needs constant contact with the same single group, tracking their movements, and increasing the frequency of contact and the duration of contact time with the gorilla group.

To enhance our efforts as far as the conservation of wildlife, including gorillas, is concerned, we named all individuals in GG in consultation with our field assistants, and tried to familiarize these names with local villagers; and we employed men and women from villages near the park, as many as possible, not only as trackers but also for other simple work, as we wanted to give local people the opportunity to earn money – in this way, the people can better understand our activities and the importance of wildlife conservation. In addition, the research team and local staff coordinated the first cinema show for all villagers in Doussala in December 2007 and January 2008; in this show we introduced our research work and showed a gorilla video, and we found that some villagers were seeing wild gorillas for the first time in their lives, even though they live near the habitat of gorillas. Because of these shows, gorillas became popular in all villages, and conservation awareness and activities increased among local people.

Chieko Ando

References

Cipolletta, C. (2003) Ranging patterns of a western lowland gorilla group during habituation to humans in the Dzanga-Ndoki National Park, Central African Republic. International Journal of Primatology 24, 1207–1226

Doran-Sheehy, D. M. et al. (2007) Habituation of western gorillas: The process and factors that influence it. American Journal of Primatology 69, 1354–1369

Tutin, C. E. G. & Fernandez, M. (1991) Responses of wild chimpanzees and gorillas to arrival of primatologists: Behaviour observed during habituation. Pp. 187–196 in: Box, H. O. (ed.) Primate responses to environmental change. London (Chapman & Hall)

Western Lowland Gorilla Tourism: Impact on Gorilla Behaviour

Following the widely perceived success of mountain gorilla tourism, there has been increasing interest in developing tourism based on the observation of western lowland gorillas. The difficulty in habituating western lowland gorillas to human presence has limited the number of sites, restricting tourist and film crew visits to a handful of gorilla groups. This preliminary study is the first to evaluate the impact of such visits on western lowland gorilla behaviour. We focus on the impact of visitor number, distance and type (tourist/film crew/researcher/tracker) on the short-term behavioural responses of a western

GORILLAS

lowland gorilla group at Bai Hokou, Central African Republic.

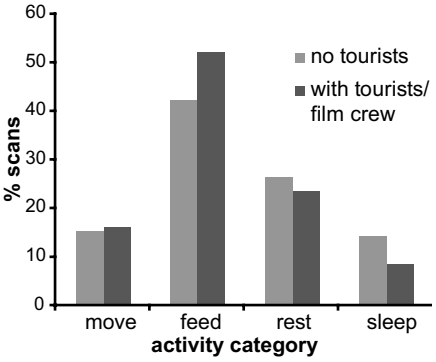
The Bai Hokou gorilla tourism program was established in 1998 as part of the Dzanga-Sangha Project: an integrated conservation and development project, run in partnership between the Central African Republic government, the *World Wide Fund for Nature* (WWF) and the German Technical Cooperation (GTZ). Following 4 years of intensive habituation efforts, the program was opened to tourists in 2002. In contrast to mountain gorilla tourism, this program is still run on a relatively small scale. There is currently one habituated gorilla group visited by a maximum of 3 tourists at a time (although two tourist groups may visit the gorillas per day). A further two groups are in the process of being habituated for the same purpose. As home to one of the few habituated western lowland gorilla groups, Bai Hokou also frequently plays host to film crews and independent researchers.

This study was designed to assess the effect of human group type (research/tourist/film crew) and size on gorilla behaviour. We collected behavioural data during visits to group Makumba, which, during the course of the study, was composed of 1 silverback, 3–4 females, 4 juveniles and 4–5 infants. Data were collected over a 12-month period beginning November 2005 in the presence of tourist groups, film crew groups and researchers and trackers only. Analysis focused on the effect of human type, number and distance on gorilla behaviour, here measured in terms of activity budget, frequency of aggressive behaviour and vocalization, and silverback close calls and long calls.

Since program inception in January 2002, visitor numbers have steadily increased to around 300 tourists per year, with tourists experiencing an average of 69 minutes' unobstructed visibility of the gorillas (although tourists may spend more time in the area with visibility obstructed by thick vegetation). Over the 12 months of this study, we recorded data on 98 separate days. This included 25 days' observation accompanying tourists or film crews. During the study period an average of 2.6 trackers and 1.7 researchers visited the gorillas each day. Tourist/filming groups ranged in size from 1 to the project maximum of 3 tourists/film crew members. Tourist group size average over the study period was 2.0 people.

The amount of time the silverback was in view was found to be strongly related to the type of visitor group, with those including film crew significantly more likely to see the silverback than those just containing researchers. We also found that the visibility of the silverback was positively related to the number of tourists and negatively linked to the number of researchers. The number of film crew members had no effect.

Serious concerns have been raised regarding the possibility of close contact between humans and wild gorillas and the related health risks (e.g. Wallis & Lee, 1999; Woodford et al. 2002). Whilst our data suggest that tourist groups do tend to get closer to the gorillas when compared to visits by just trackers and researchers, all averages well exceed the project-set minimum distance of 7 m.



Silverback activity budget by human group type

We also found that more tourists resulted in a smaller distance between the tourist group and both the silverback and other group members.

Gorilla activity budget when in the presence of tourists or film crew was not found to be significantly different so data were combined for ease of analysis. The presence of tourists/film crew was found to have an effect on silverback activity, causing him to spend less time resting or sleeping and more time feeding. Increasing the total number of humans present resulted in a similar effect.

Incidences of aggressive vocalizations and behaviour were generally low. 6% of the 10-minute long observation periods featured an aggressive vocalization or behaviour from the silverback, the most common of which was a bark or soft bark; 4% featured an aggressive vocalisation or behaviour from another group member – usually a bark or soft bark by a female. The presence of film crews resulted in an increased rate of aggressive vocalizations by the silverback compared to when in the presence of just trackers and researchers, and increased group aggressive behaviour when compared to both tourist groups and non tourist groups. The silverback was also found

Average distance between humans and gorilla for different human group type. Distances in meters

	researchers only	with tourists	with film crew
silverback	19.6	17.4	19.7
other	19.5	18.9	17.4

to emit significantly more belch vocalizations in the presence of film crews than he did with either tourist groups or research groups.

The economic success of the mountain gorilla tourism programs has led to an increasing interest in habituating western lowland gorillas for that purpose. This study is the first to evaluate how the type and number of humans affects the short-term behaviour of western lowland gorillas. These results show that, far from being accepted as a neutral element in the environment, the presence of film crews, tourist groups, and even an increased number of researchers, can alter gorilla behaviour.

The presence of film crews appears linked to increased rates of feeding at the cost of resting or sleeping, higher rates of silverback close calls and silverback aggressive vocalizations, and increased rates of group aggressive behaviour. Film crews were also found to spend significantly more time in visual contact with the silverback. This evidence of both increased time spent in close proximity to the silverback, and the impact on his behaviour, is unsurprising when considering the pressure film crews are often under to gain quality footage under difficult conditions and often strict time constraints. Closer following of the gorillas, along with constant shifting of position to obtain higher levels of visibility, have the potential to create greater disturbance amongst the gorillas. Furthermore, the considerable amount of equipment that film crews require greatly increases the amount of noise generated while tracking and viewing the gorillas. Whilst the level of disturbance witnessed nevertheless appears generally low, these results should be considered a warning as to the potential for film crews, often engaged in actively promoting gorilla conservation efforts through film, to actually negatively impact the gorillas in question, highlighting the need for careful management.

The presence of tourist groups was found to be linked to increased incidences of aggressive group behaviour and increased rates of feeding at the cost of sleeping and resting in the silverback. Tourist group size also affected both silverback visibility and distance, with larger tourist groups achieving greater visibility at closer distances. Researchers should also consider the effect of their presence on gorilla behaviour, with an increasing number of researchers shown to be linked to alterations in activity budget.

Despite the changes in gorilla behaviour in the presence of different visitor types, levels of aggression and activity budget changes remained relatively low. Lowland gorilla tourism, when compared to mountain gorilla tourism, continues to operate on a much smaller scale. The level of habituation of Makumba group means much greater distances are maintained than with mountain gorillas (Sandbrook & Semple 2006). Given the density of vegetation in the area, visibility at these distances is often limited and, as a result, tourist groups are deliberately kept smaller – a maximum of 3 people as compared to 8 – to try and ensure each tourist gets a rewarding view of the gorillas. Nevertheless, from the ecological viewpoint what we are ultimately interested in is how these short-term behavioural changes relate to long-term effects, in particular group demographics. Such impacts will take longer to be revealed, although it is interesting to note that the group's females have been successfully reproducing during the 7 years since habituation began, and most have given birth to two or three infants during this time. The disease risk posed by the tourists, to both the visited gorillas and other, unhabituated groups, also remains unquantified (to be assessed).

The levels of visibility and tourist satisfaction with tracking group Makumba at Dzanga Sangha (Hodgkinson et al. in prep.) shows that, sensitively managed, western lowland gorilla tourism programs are feasible. They may remain limited, however, by continuing issues such as the political instability of the host countries and the difficulties and high costs associated with accessing the site.

The difficulties involved in "habituating" lowland gorilla groups to the level at which it is possible to take visits should not be underestimated – it is a process which takes years of hard work, and the support of experienced BaAka trackers has been crucial to habituation attempts. Gorilla habituation can also be extremely costly, with a considerable financial investment required to both develop and manage the program, often in very remote locations.

Furthermore, by training wild gorillas to lose their fear of humans, we are potentially putting them at increased risk of hunting. It is therefore crucial that long-term funding be secured to ensure the continued protection of habituated groups. Finally, managers should be wary of basing a tourism program on just one group. The disbanding of another habituated gorilla group in 2004 caused the temporary closure of the tourism program in Dzanga-Sangha.

Chloe Hodgkinson and
Chloé Cipolletta

We are greatly indebted to the Dzanga-Sangha project and staff for their assistance throughout this study, made possible through the support of the Central African Government and the World Wide Fund for Nature. Particular thanks must go to the guides, trackers and volunteers at Bai Hokou camp. Grateful acknowledgment of funding is due to both Natural Environment Research council and the Economic and Social Research Council.

References
Sandbrook, C. & Semple, S. (2006) The rules and the reality of mountain gorilla *Gorilla beringei beringei* tracking: How close do tourists get? Oryx 40 (4), 428–433
Wallis, J. & Lee, D. R. (1999) Primate Conservation: The Prevention of Disease Transmission. International Journal of Primatology 20, 803–826
Woodford, M. H. et al. (2002) Habituating the Great Apes: The Disease Risks. Oryx 36, 153–160

PALF: Project for the Application of the Law on Wildlife Protection

The aim of PALF *(Projet d'Appui à l'Application de la Loi sur la Faune Sauvage)* is the legal protection of endangered species of the Congo Republic by reinforcing the application of the law on wildlife protection and by discouraging potential hunters and wildlife traffickers. The main species targeted are gorillas, chimpanzees, elephants, leopards, parrots, mandrills and others.

The most immediate threat to protected species in the Congo Republic is illegal hunting for bushmeat and animal parts and the capture of young great apes. These activities are illegal, but the lax enforcement of the law has allowed the establishment of commercial trafficking and the massacre of these species.

PALF was established as collaboration between the *Aspinall Foundation* and WCS *(Wildlife Conservation Society)*, with the contribution of expertise from LAGA *(Last Great Ape Organization)*. LAGA is an NGO that has been working in Cameroon for more than 6 years with very promising results which merit replication through all of Central Africa. These NGOs work in close collaboration with the Ministry of Forestry (MEF) and other government bodies (police, judiciary etc.) with the aim of enforcing the law on wildlife protection in the Congo Republic.

The objectives of PALF are as follows:

- exposing all traffickers of ape meat, live apes, ivory and other illicit animal products, and collecting solid evidence for action against them,
- arresting the people involved in this illegal activity,
- guaranteeing that legal action will be taken, and assuring that all verdicts will be enforced,
- raising awareness in the population through media coverage concerning the application of the law on wildlife protection and the risks and penalties applied.

To attain these objectives, PALF has received financial support from USFWS *(US Fish and Wildlife Service)*, which has made possible the recruitment of investigators, two lawyers and a journalist – a team which will need to be built up gradually.

The results obtained in Brazzaville after little more than 6 months have been very positive. Nine traffickers of animal products have been arrested (three cases involving ivory, four involving leopard pelts, one involving a mandrill pelt, one involving a gorilla and one involving a chimpanzee). Despite corruption and blackmailing attempts, one trafficker of chimpanzee products has been brought to trial in the Congo. The defendant was sentenced to one year in prison and fined 1,100,000 CFA (1,679 Euro). Between September 2008 and March 2009, more than 80 articles were published or broadcast in the Congolese media (press, television and radio), with the result that the Congolese population (particularly in Brazzaville) is now well informed about the dangers and consequences of trafficking animal products.

Law enforcement is a priority both in situ within the protected areas and in regard to the trafficking of animal products between the wild animals' habitats and the urban areas. We hope that different sponsors, NGOs and government organisations, will all get involved in similar projects to apply the experience from PALF. In this way, the PALF slogan "zero tolerance for crimes against wildlife" will become a reality in Central Africa.

In the words of Leonardo Da Vinci: "The day will come when the killing of an animal will be punished in the same manner as the killing of a human."

Luc Mathot

The confiscated gorilla
Photo: Luc Mathot

READING

Gene Eckhart and Annette Lanjouw
Mountain Gorillas: Biology, Conservation, and Coexistence. Baltimore (The Johns Hopkins University Press) 2008. 320 pages, 199 colour photos, 5 line drawings. Hardcover, US$ 34.95. ISBN 978-0-8018-9011-6

This looks like a handsome coffee-table book, but it is very much more. The photos by Gene Eckhart are excellent, and the book is worth buying for them alone, but the extremely high standard of Annette Lanjouw's text, and other features, lift it well above the level of just a picture-book.

The book is especially interesting for gorilla tourists and other mountain gorilla enthusiasts who want to know more than tourist guidebooks provide. Annette Lanjouw states that she also wrote it for policy makers – let's hope that they gain some insight from reading it, although from the start the reader has the impression that tourists are the main target.

The first part explains the life of the mountain gorillas. The second part concerns their ecology, the conservation of their habitat, and the factors influencing gorilla conservation, as well as details about the human population living in the mountain gorilla area and their economic situation; and the role of tourism for the countries' economy is discussed. The third part provides interesting information for tourists and others, with suggestions for further reading.

One notices something special right away: that the book is dedicated to "the men and women of the Protected Area Authority (National Parks) organisations in Rwanda, Uganda and the Democratic Republic of Congo, and the field staff from the Karisoke Research Centre who lost their lives while protecting the areas' gorillas and attempting to preserve the integrity of the forests in which the gorillas live". And they are named: there are 12 for Rwanda, one for Uganda, and 190 for the Democratic Republic of the Congo. This is something that the world still does not realise, and for that, by itself, we need to publicise this book.

The theme continues in the book. Every so often, there is a box giving a short biography of a hero of gorilla conservation, with a photo. Some of the well-known fieldworkers are here, but half or more are rangers, guides and conservators, who would otherwise be unknown outside a narrow range of mountain gorilla specialists. But they are not the only characters: an especially nice idea is to also portray the individual gorillas who are shown on the photos.

It seems a shame to make criticisms of a book of this quality, but the chapter "Evolution and Classification" is not up to the standard of the rest of it. It starts with the mythical Oscar von Beringe; for the story of this person, and what his name really was, see the article by Andreas von Beringe in *Gorilla Journal* 24 (2002). There is then a brief and inaccurate history of gorilla taxonomy, conflating it with nomenclature; for the real story, see the article by Meder and Groves in *Gorilla Journal* no.30 (2005). Although the book aims to provide in-depth information, in some cases the facts should have been checked more carefully.

The information is generally brief, but solid; some tables, however (e.g. the plants that gorillas eat and their composition), are not that interesting for most general readers, while other subjects could perhaps have been explained in more detail.

In the appendix, tour operators and conservation organisations are listed, but it is the authors' choice and the reader is not told why these are selected and the many others are not.

Never mind; these are relatively minor criticisms in what is overall a work to be much recommended.

Colin Groves and Angela Meder

Martin Harvey and Letitia Farris-Toussaint
Gorillas, the Gentle Giants. Rickmansworth (Evans Mitchell Books) 2008. 127 pages. Hardcover, £ 14.99, US$ 19.95. ISBN 978-1-901268-35-5

Annette Henderson
Wild Spirit. How a year in the African rainforest changed an Australian woman's life. William Heineman 2009. 296 pages, 32 colour photos. Paperback. ISBN 978-1-74166-671-7

Rick LoBello
Guide to Rwanda's Volcanoes National Park, home to critically endangered mountain gorillas. CreateSpace 2009. 248 pages. Paperback, US$ 34.99. ISBN 978-1440405198

Serge A. Wich, S. Suci Utami Atmoko, Tatang Mitra Setia and Carel P. van Schaik
Orangutans. Ecology, evolution, behaviour, and conservation. Oxford (Oxford University Press) 2008. 464 pages. Hardcover, £ 59.95, US$ 125. ISBN 978-0-19-921327-6

Sarah Blaffer Hrdy
Mothers and others: the evolutionary origins of mutual understanding. Belknap Press of Harvard University Press 2009. 432 pages. Hardcover, US$ 29.95. ISBN 978-0-674-03299-6

Richard J. Delahay, Graham C. Smith and Michael R. Hutchings (eds.)
Management of disease in wild mammals. 284 pages. Springer 2008. Hardcover, US$ 139, Euro 106.95. ISBN 978-4-431-77133-3

Michael A. Huffman and Colin A. Chapman (eds.)
Primate parasite ecology: the dynamics and study of host-parasite relationships. Cambridge University Press 2009. 548 pages. Hardcover, US$ 126. ISBN 9780521872461

READING

Robert H. Bates
When Things Fell apart: state failure in late century Africa. Cambridge (Cambridge Universitx Press) 2008. XIV, 191 pages. Hardcover £ 40, US$ 60, ISBN 978-0521887359. Paperback £ 14.95, US$ 19.99, ISBN 978-0521715256

Bob W. White
Rumba Rules: the politics of dance music in Mobutu's Zaire. Durham, NC (Duke University Press) 2008. XXIII, 300 pages. Paperback, £ 12.99, US$ 23.95. ISBN 978-0822341123

John F. Clark
The Failure of Democracy in the Republic of Congo. Boulder, CO, London (Lynne Rienner) 2008. XI, 307 pages. Hardcover, £ 42.99, US$ 59.95. ISBN 978-1588265555

New on the Internet

Kimberley Hockings and Tatyana Humle
Best Practice Guidelines for the Prevention and Mitigation of Conflict Between Humans and Great Apes. SGA 2009. A pdf of the English version is available at: www.primate-sg.org/BP.conflict.htm

French version of the Survey and Monitoring Guidelines (Modules 1 and 2): the pdf is online at: www.primate-sg.org/BP.surveys.htm

A new website features the Cross River gorillas: www.crossrivergorilla.org

Nicholas Garrett and Harrison Mitchell
Trading Conflict for Development. Utilising the trade in minerals from eastern DR Congo for development. Resource Consulting Services 2009. 52 pages. www.resourceglobal.co.uk

Endangered Species International
Saving the Great Apes and Their Forest, Southern Congo. Annual Report 2008

Cleve Hicks published an ebook on the Bili chimpanzee massacre in the Democratic Republic of the Congo: *Trading Chimpanzees for Baubles: A Bushmeat Crisis in the Northern DR Congo*. It is available at:
http://www.wasmoethwildlife.org/folder2007-2008/part1/
http://www.wasmoethwildlife.org/folder2007-2008/part2/
http://www.wasmoethwildlife.org/folder2007-2008/part3/

On the "Year of the Gorilla" website **www.yog2009.org** you will find all kinds of interesting documents in English and French at "Downloads".

Year of the Gorilla 2009: Photos from the Gorilla Symposium in Frankfurt

Gorilla Pathology Study Group formed

Skeletons, skins and other material from gorillas (*Gorilla* spp) offer an opportunity for retrospective research on the pathology and diseases of these important, threatened primates. Many of the specimens that are available for investigation are from animals that died, or were killed, decades ago and they therefore provide valuable reference ("baseline") data and possibilities for DNA and other molecular studies.

The skeletal remains of gorillas have been studied by a number of researchers in recent years using material in museums and collections in Belgium, France, Germany, the Netherlands, Kenya, Rwanda, South Africa, Uganda, the UK and the USA.

The recently formed Gorilla Pathology Study Group (GPSG) comprises people who have an interest in the pathology of gorillas and in the factors that affect the health and welfare of these species. The main focus of the group's work is in East and Central Africa and there it relates primarily to the mountain gorilla. Membership is at present restricted to those living in or having close and regular contact with Africa, but the group is keen to be in touch with others who would like to contribute to the studies and, in turn, to receive literature and correspondence from the GPSG. To this end a "Links List" is being established.

Anyone interested in the work of the GPSG, or interested in joining its Links List, should contact the group's official email address: ngagi2@gmail.com

BERGGORILLA & REGENWALD DIREKTHILFE

Finances

Income in 2008	
Subscriptions	16,123.65 Euro
Donations	24,867.65 Euro
Refund	–1,658.50 Euro
Sales	1,019.40 Euro
Total	***40,354.20 Euro***
Expenses in 2008	
Administration	789.82 Euro
Gorilla Journal	4,266.33 Euro
Flyer	673.66 Euro
Items for sale	301.02 Euro
Postage	792.17 Euro
Pay/top-ups	4,131.00 Euro
Office Congo	580.00 Euro
Uganda	
HuGo	9,000.00 Euro
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HuGo	7,870.00 Euro
Virunga National Park	
Sweaters	682.00 Euro
Mt. Tshiaberimu	
Tree nursery	3,000.00 Euro
Sarambwe	
Food for patrols	504.04 Euro
Sweaters	150.00 Euro
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Patrol post	23,620.00 Euro
2 binoculars	402.35 Euro
Mbe Mountains	
Ranger post	5,000.00 Euro
Kagwene	
Monitoring equipment	3,147.73 Euro
Emergency aid	7,135.00 Euro
Total	***74,309.01 Euro***

Our Donors

From November 2008 to April 2009 we received major donations by Elisabeth Engel, Marianne Famula, Christian George, Susanne Gregarek, Susan Götsch, Peter Günther, Hannelore Herker, Gabriele Holzinger, Marianne Holtkötter, Helga Innenhofer, Jutta Jenkner-Becke, Götz Kauschka, Rosl Kirchshofer, Hartmann Knorr, Reinhold Künstle, Hans Kummer, Hanna Leuer, Angela Meder, Hannelore Merker, Kurt Niedermeier, Holger Nithack, Ottonia Media GmbH, W. Past, Manfred Paul, Richard Raskin, Birgit Reime, Gaby Rindlisbacher, Dieter Peter Schmitz, Elke Schmitz, SOS Internet, Anja Stelter, Hans-Christian Ströbele, Juliana Ströbele-Gregor, Nina Sündermann, Christof Wiedemair, Ingo Wolfeneck and Heinz Zaruba.

Many thanks – to all the other donors as well! We are grateful for your support, and we hope that you will continue to support us during the rest of the Year of the Gorilla 2009.

Berggorilla & Regenwald Direkthilfe on Facebook

Facebook is a popular, free-access social networking website. Ravid Aloni created a fan page for our organisation (in German and English). Any facebook member who joins the group can post interesting links, information, upload photos as well as videos related to gorillas and their conservation. The benefit is not only spreading of the word but also getting to know other gorilla fans and keeping in touch. Visit *Berggorilla & Regenwald Direkthilfe* on facebook under the following web address: http://www.facebook.com/group.php?gid=57391021042

If you are not yet a facebook member, you will have to register first.

Help us Design our New Website!

Would you like to support us with your expertise? Ravid Aloni is presently engaged in completely re-developing our large website. This means a lot of work, and she needs support urgently. The supporter has to be familiar with typo3 administration and/or has to be a typo3 extension developer. If you are interested, please contact Ravid Aloni directly at: webmaster@flashexpert.de

Berggorilla & Regenwald Direkthilfe e. V. Celebrates its 25th Anniversary!

Ravid Aloni designed this anniversary logo for us.

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If you become a member, you will receive the journal regularly. If you want to receive the printed journal without becoming a member, we would be grateful if you could make a donation to cover our costs. The costs to send the journal overseas are about US$ 20 per year.
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