



Gorilla Journal

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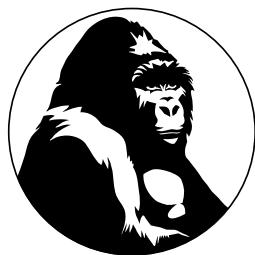


**Law Enforcement
in the Itombwe
Nature Reserve**

**The Impact of
Neighbours on
Bwindi Gorillas'
Spacing Patterns**

**Clubs des Amis
des Gorilles in
the Ebo Forest,
Cameroon**

**Give Me Your
Dung And I Will
Tell You Who
You Are**



BERGGORILLA & REGENWALD DIREKTHILFE

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Cover: CAG monitoring team using GPS and compasses to navigate in the forest

Photo: ZSSD/Daniel Mfossa

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Tshiaberimu sector of the Virunga National Park and in 2017 the Director of the Itombwe Reserve.

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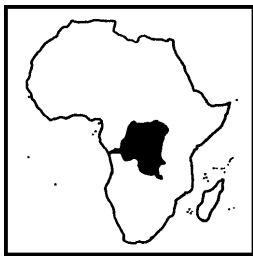
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Law Enforcement in Itombwe Nature Reserve

Conservation approaches in the Democratic Republic of the Congo have evolved from fine and fences, top-down approaches to adaptive co-management approaches (Inogwabini 2014; Pelissier et al. 2015; Kujirakwinja et al. 2017, 2018). Communities were excluded in conservation interventions such as law enforcement interventions. They were merely targeted and identified as poachers and associated with degradation of forests and species depletion (Oates 2002; Moreto & Lemieux 2015). With incoming changes on the ground and globally, innovative models have been implemented to preserve protected areas, especially in countries where protected area agencies are weak and lacking financial and technical capacities (Borrini-Feyerabend et al. 2004; Berdej et al. 2015). Although changes have been implemented, law enforcement interventions have been and are still conducted by armed rangers supported by armed forces (Marijnen 2017).

With changes in the governance of protected area conservation practitioners have questioned the exclusive patrolling approach for protected areas that have been created through participatory approach such as Itombwe (Kujirakwinja et al. 2018). Since its gazette-ment, the management of Itombwe has established community governance committees as a way of involving community representatives in the management of the reserve. Moreover, to respond to management challenges and ineffective management of the reserve, community members and their leaders have been involved in various conservation activities either to support ongoing interventions or to lead some of the interventions.

Management approaches in Itombwe are being adjusted to fit collaborative processes. Although armed rangers are still involved in patrolling some areas of the reserve, communities have been tasked to patrol areas located in management zones surrounding their villages. The process is based on established community governance structures, local agreement for community monitoring, training and patrols in key zones. As a result, patrol coverage of the reserve has increased compared to the previous year.

for patrolling and are empowered to make arrests and defend themselves in case of any gun exchange with poachers and other armed forces that threaten their work and lives. In various places, there have been attempts to include communities in either scaring animals from villages to force them going back in the forest (e.g., Virunga Massif with Human and Gorilla – HUGO).

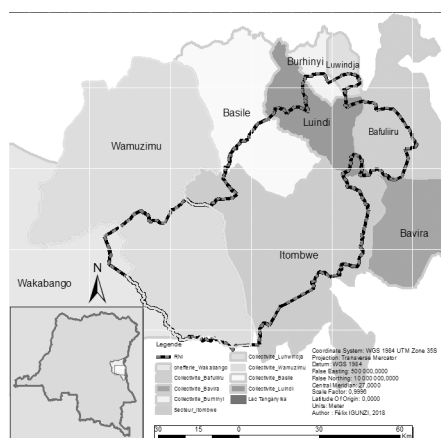
Towards Involving Local Communities in Law Enforcement Interventions in Itombwe

Itombwe Nature Reserve (NR – Réserve Naturelle d'Itombwe, RNI) was legally established in 2006 and its boundaries validated by the governor of South Kivu in 2016 as a result of a wider involvement of stakeholders. It covers about 6,000 km with less than 50 rangers and inadequate funding (see Baruka 2015). Baruka found that the Itombwe Nature Reserve has been underfunded by about 80% of its need in 2015. It is one of the strongholds of remaining Grauer's gorilla (*Gorilla beringei graueri*) in the world. Unfortunately, this species along with others (chimpanzee, elephant, etc.) are threatened by traditional and armed poaching, mining and habitat fragmentation by agriculture and cattle husbandry (Plumptre et al. 2016; Spira et al. 2017).

To face the challenge of patrolling that area with inadequate financial support, in agreement with local established community governance structures, community members have been trained to conduct patrols and support other interventions such as boundaries demarcation.

The process of establishing patrolling groups included:

- a. *Operational agreement between ICCN and community committees for patrolling.* Itombwe NR has 6 community governance committees established. They are the founda-



The Itombwe Nature Reserve boundaries in different local administrative entities (Chefferie and secteurs)

Map: ICCN RNI

Law Enforcement Approaches in DRC

Protected areas in DRC are a legacy of colonization (Harroy 1993; Van Schuylenbergh 2009; Pouillard 2016). Most protected areas were created during that time based on restrictions for local communities. The fine and fences approach has been implemented since then and restrictions to resources are still being implemented in one or another way despite the existence of some collaborative approaches and processes.

Based on the DRC Conservation Law 014 (Journal Officiel 2014), ecoguards are authorized to carry guns



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tion of the community approach as interface to ICCN in respective communities, this is based on the current community conservation strategy (ICCN 2015).

Committees are selected based on the prioritized sectors based on the presence of conservation targets, especially gorillas (*Gorilla beringei graueri*). Once committees are selected, an agreement is signed between ICCN, communities and financial supporting NGOs – international and national NGOs. The agreement specifies key activities, results and timeframe

- b. *Selection of community.* The selection of scouts by local governance structures based on agreed criteria such as be able to read and write, be fit, be able to learn and use field equipment such as GPS, smartphone for data collection using cybertracker application,
- c. *Training of selected community scouts.* Selected community scouts are trained by senior rangers and wardens for data collection based

on the ICCN data collection protocol.

They don't undergo military training. Their main role is ecological monitoring (species and human activities) as well as to report illegal activities. In circumstances where they move with rangers, offenders are arrested by the rangers based on existing laws.

- d. *Patrols and reporting.* Community scouts are equipped with necessary equipment for data collection. They collect data on wildlife species they see and human activities as well as any ecological feature that could inform management on changes or strategies.

Data collected by rangers are sent to the park headquarters and entered into the computer using the SMART (Spatial Monitoring And Reporting Tools) that archives and analyzes patrol data for DRC protected areas.

- e. *Information sharing.* Once data are analyzed, results are shared with communities during their meetings

for further actions on the ground. Moreover, they are used to plan for future patrols with communities.

Lessons learned

- a. *Trust building and collaboration.* The ongoing community patrolling has revived trust and confidence between communities and conservation bodies as they are involved directly in conservation activities.

- b. *Increase patrol coverage and protection of conservation targets.* The involvement of communities in patrols has leveraged low number of rangers to cover the reserve. Therefore, communities have covered areas that could not have been covered by rangers because of insecurity. Local communities know the area and all the trails better than the rangers.

For example, in April 2008 community scouts arrested a poacher with a hunting gun. The poacher was reported to local authorities and ICCN.

- c. *Resource sharing.* By signing agreements with communities and financing patrols, they gain some stipends that support their households. It has been seen as a way of sharing conservation money with communities.

- d. *Practical awareness.* The involvement of community scouts in patrolling the reserve has echoed the openness of ICCN to co-management and support to communities. In a workshop, one representative from communities said that the approach should be expanded to other areas.

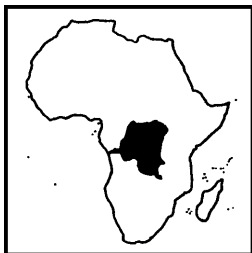


Area covered by community scouts in of the Elila sectors with key observations – snares, sightings of chimpanzee, duiker, etc.

Map: ICCN RNI

Conclusion

Conservation management practices have evolved to include various stakeholders at different levels to curb anthropogenic threats to key species. In Itombwe, the community patrolling practices have been tested and prove that it is possible to work with communities for long-term



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conservation. However, there are some challenges to be considered as the approach is still at experimental stage:

- the sustainability of the approach given that it is donor supported,
- jealousy and conflicts within the communities,
- conflicts of interest between eco-guards and community scouts,
- complicity between poachers and community scouts for poaching

To respond to these challenges, it is proposed that a detailed practical and operational agreement/manual be developed and implemented by involved parties. But also, the management should ensure that local traditional and political authorities are involved in the enforcement side of the process.

Deo Kujirakwinja, Léonard Mubalama, Jean-Claude Kyungu, Victory Paluku,

Gentil Kambale, Félix Igunzi and Jean de Dieu Wasso

Activities for community patrols were funded by WWF, USAID-CARPE, Africapacity, Rainforest UK, Berggorilla & Regenwald Direkthilfe, La Vallée des Singes, RACOD and ICCN.

Selected Literature

- Baruka, G. (2015): Analyse des financements des aires protégées en République Démocratique du Congo (RDC). Université Senghor
- Berdej, S. et al. (2015): Governance and community conservation. 2. Nova Scotia
- Borrini-Feyerabend, G. et al. (2004): Sharing power: learning by doing in co-management of natural resources throughout the world. Tehran (IIED and IUCN/CEESP/CMWG)
- Harroy, J.-P. (1993): Contribution à l'histoire jusque 1934 de la création de l'institut des parcs nationaux du Congo belge. *Civilisations* 41, 427–442
- ICCN (2015): Strategie nationale de conservation communautaire dans les aires protégées de la RDC (2015–2020). Page 56. ICCN, Kinshasa, DRC
- Inogwabini, B. (2014): Conserving biodiversity in the Democratic Republic of Congo: a brief history, current trends and insights for the future. *Parks* 20, 101–110

Journal Officiel (2014): Loi sur la conservation de la nature. Page Journal Officiel de la République Démocratique du Congo

Kujirakwinja, D. et al. (2018): Establishing the Itombwe Natural Reserve: science, participatory consultations and zoning. *Oryx* online, 49–57

Kujirakwinja, D. et al. (2017): Participatory mapping in the Itombwe Nature Reserve. *Gorilla* 53, 1–6

Marijnen, E. (2017): The 'green militarisation' of development aid, the European Commission and the Virunga National Park, DR Congo. *Third World Quarterly* 38, 1566–1582

Moreto, W. D. & Lemieux, A. M. (2015): Poaching in Uganda: Perspectives of Law Enforcement Rangers. *Deviant Behavior* 36, 853–873

Oates, J. F. (2002): Politicians and poachers: the political economy of wildlife policy in Africa. Page *Human Ecology*

Pelissier, C. et al. (2015): Aires protégées d'Afrique Centrale. Etat 2015. P. 256 in: Doumenge, C. et al. (eds.): Aires protégées d'Afrique Centrale. Etat 2015. Kinshasa, Yaoundé (OFAC)

Plumptre, A. J. et al. (2016): Catastrophic decline of world's largest primate: 80% loss of Grauer's gorilla (*Gorilla beringei graueri*) population justifies critically endangered status. *PLoS ONE* 11

We Need Help for the Gorilla Projects in Eastern Congo!

Claude Sikubwabo Kiyengo has come up with many suggestions for active support of the projects in the eastern Democratic Republic of the Congo. We would like to implement as many of these suggestions as possible, but to do this we need additional funds. For example, the following are urgently needed:

- Sarambwe: construction of a storage for supplies and toilets for the patrol post, solar panels, various equipment for patrols to spend the night in the forest, restoration of the road to the patrol post, renewal of the border demarcation of the reserve and two members of staff for kitchen duty; water

supply for the community, pig and goat breeding project.

- Mt. Tshiaberimu: equipment for the trackers such as sleeping bags; bamboo planting project, bee keeping project.
- Itombwe: There are still numerous funding gaps. Long-term funding for the salaries and equipment of the patrols still needs to be secured; Berggorilla & Regenwald Direkthilfe contributed to this in 2018 and agreed to continue in 2019.

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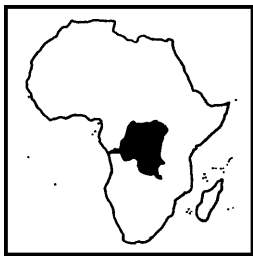
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Please help us to support long-term conservation of the protected areas and gorillas of the eastern Congo. As more and more organisations retreat from this troubled region, reliable support from us becomes ever more important.

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

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Banro's Activities in the Itombwe Nature Reserve

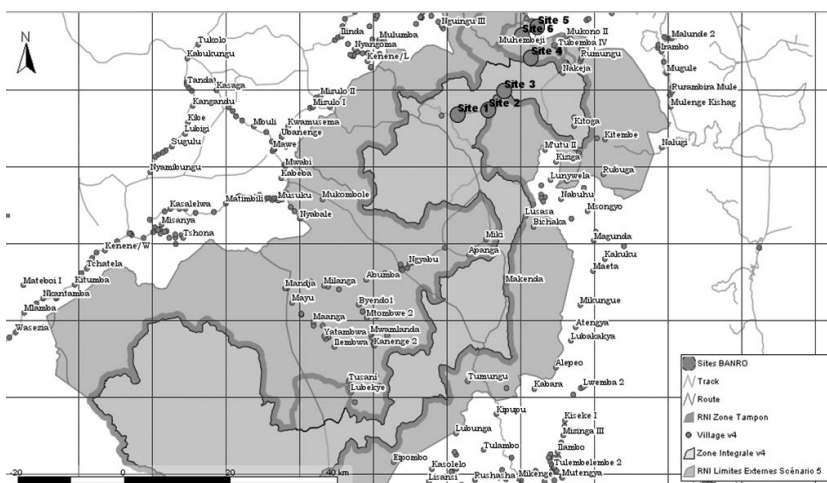
After investigation and verification on site, the management team of Itombwe Nature Reserve confirms with regret that the company Banro has not only carried out exploratory work and collected samples, but has put up installations within the reserve in the area of the Luindi chieftainship (indicated on the map).

This is in spite of Banro's participating in meetings with WWF in Kinshasa and recommendations made during meetings between Banro and the South Kivu civil society in previous years.

Itombwe Nature Reserve was established by Ministerial Decree no. 038/CAB/MIN/ECN-EF/2006 dated 11 October 2006. This protected area is located within the Itombwe Massif. It is of national interest and is classified as IUCN category VI. It aims to protect the landscapes and natural habitats that are most representative and important from the point of view of biodiversity. The Itombwe Massif is one of the sites prioritized for their biological importance both within the Albertine Rift and at a global level. Pre-dating the above, Ministerial Decree no. 01/008/CAB/GP – SK of the Governor of South Kivu Province, dated 25 February 1998, had already expressed major interest of the political authority – at a time of war in the east of the Democratic Republic of the Congo – and outlined conservation measures for the fauna and flora of the Itombwe Mountains.

Provincial Decree no. 16/026/GP/SK, dated 20 June 2016, officially recognized the physical borders of the Itombwe Nature Reserve with an area of 5,732 km² and a perimeter of 568 km of external boundaries. The boundaries were identified through a participatory process with the local stakeholders.

Jean Claude Kyungu



Violation of articles 25 and 74 of Law 014/003 dated 11 February 2014, relating to the prohibition of any activity that is incompatible with conservation and outlining infractions and penalties in case of mining in a protected area.

Pouillard, V. (2016): Conservation et captures animales au Congo belge (1908–1960). Vers une histoire de la matérialité des politiques de gestion de la faune. *Revue histoire* 679, 577–604

Spira, C. et al. (2017): The socio-economics of artisanal mining and bushmeat hunting around protected areas: Kahuzi-Biega National Park and Itombwe Nature Reserve, eastern Democratic Republic of Congo. *Oryx online*, 136–144

Van Schuylenbergh, P. (2009): Entre délinquance et résistance au Congo belge: l'interprétation coloniale du braconnage. *Afrique et histoire* 7, 25–47

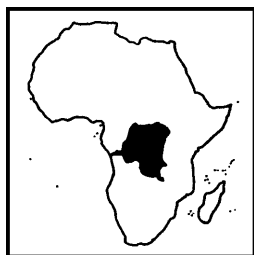
An Initiative by Local Women for the Families of the Itombwe Reserve's Rangers

Femmes Leaders pour l'Environnement, Unies pour sa Restauration (FLEUR – Women Leaders for the Environment: United for the Purpose of its Restoration) is a non-political association that was established in 2009 by the wife of a reserve ranger. She decided to form an association to develop activities that directly touched upon the socio-economic life of the rangers of the Itombwe Nature Reserve (INR) in South Kivu Province. The poor living standards faced by the majority of households of reserve rangers triggered this initiative by local women, which has supported the families of the reserve's rangers. Activities developed



FLEUR non-profit organisation members engaged in socio-economic activities

Photo: Félix Igunzi



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Income-generating activities of FLEUR members

Photo: Félix Igunzi

by FLEUR have helped to empower the wives of the rangers across social, educational, economic and ecological aspects of their lives. This is summarized as follows:

Economic aspects

The private canteen supported by Berggorilla & Regenwald Direkthilfe in the name of the association has provided jobs for ±30 rangers' wives. These women have been without a means of earning an income for a long time, but are now contributing to the social needs of their households, to the great satisfaction of their husbands and benefit of the local communities where they live.

Health and education

The income generated by the canteen is efficiently managed by a committee that is entirely made up of women. It is distributed according to the priority



Celebration of the 2018 JIF by FLEUR non-profit organisation members and their husbands

Photo: Félix Igunzi

needs of their households. During 2018, 30% of the income generated by the FLEUR has been spent on the medical care of 36 children of the INR, while another 35% was spent on school fees for 27 children.

Agriculture and animal husbandry

Subsistence farming, setting up kitchen gardens and breeding rabbits are some of the daily activities that each member of FLEUR is obliged to undertake.

Ecology and management of natural resources

The FLEUR non-profit organisation has reforested an area of 42.5 ha on the west side of Mwenga General Hospital, an important facility for the local community. The members have started to develop tree nurseries to produce ornamentals, fruit trees and other species.

Social aspects

The union and social cohesion displayed by the association have created mutual trust and a sense of responsibility in the rangers' wives in the face of the daily challenges of life.

Jean-Claude Kyungu and Félix Igunzi

Long-term Biomonitoring Program on the Great Apes Using Camera Trap Techniques at Kahuzi-Biega National Park

Kahuzi-Biega National Park (KBNP) is home to exceptionally diverse flora and fauna and represents an important site in the Albertine Rift, one of the most biodiverse regions in Africa. The upland sector of KBNP is dominated by montane forest where Grauer's gorillas (*Gorilla beringei graueri*) and eastern chimpanzees (*Pan troglodytes schweinfurthii*) range sympatrically. Kahuzi biodiversity faces severe threats due to illegal human activities, following

the political instability that occurred in the region in the last two decades and subsequently numbers of large mammals have declined drastically. Apes and elephants suffered greatly from the instability with almost the entire elephant population and half of the gorilla population slaughtered in the montane sector of the park (Yamagiwa 2003). Despite some isolated pockets of insecurity mainly in the lowland sector of Kahuzi-Biega National Park, the situation has much improved on the ground allowing the park management to restart the monitoring, mainly in the upland sector of the park.

Systematic wildlife monitoring combined with regular ranger patrols are fundamental components of protected area management, providing insight into the efficiency of park management with regard to the observed population changes. Unfortunately, few protected areas have accurate monitoring information available over extended time periods.

In 2017, Primate Expertise (PEX), a Congolese non-governmental organization dedicated to primate research and conservation, started a monitoring program in Kahuzi-Biega National Park using a camera trap technique. Primate Expertise has an operating agreement with the park authority to undertake a systematic biomonitoring program using camera traps. The program is being implemented in collaboration with KBNP. This is the first ever long-term monitoring program using the camera traps to systematically survey elusive animal species sharing the same habitat as the great apes in Kahuzi-Biega National Park.

The program also help to document key behavioural features of unhabituated Kahuzi apes and determine how observed behavioural features in combination with ecological data may help to understand variation existing among the apes' social systems across Africa. Moreover, the camera traps may inform



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A silverback Grauer's gorilla leading a group of three adult females, each carrying a dependent infant

on how snare-induced injuries impact ape behaviour especially on non-habituated individuals difficult to observe in the forest. Even though great apes may not necessarily be the target of bushmeat hunters, many apes are trapped by snares and incur grave injuries that can lead to loss of limb or death.

The project includes a significant capacity-building component. Capacity building and training of ICCN protected area staff is key to the long-term success of Grauer's gorilla conservation. Primate Expertise facilitate training workshops of national park staff where local assistants are gaining experience and knowledge in specialized data collection, improving their ability to monitor trends of different conservation targets, including ape population dynamics.

Methodology

Camera traps were systematically installed within a 20 km² grid of 1 x 1 km cell laid over the core area of the apes' home range. Within this grid 10 linear line transects of 4 km each were made along which we record information on apes and other wildlife using camera traps.

To assess the animal species sharing the same habitat as the great apes, 24 camera traps were installed (16 camera traps installed along 8 established line transects and 8 camera traps installed at the park's edge to survey animals involved in crop raiding). Camera traps are visited once a month to download recorded data.

Mid-term Results of the Program

Data for 10 consecutive months (De-

cember 2017 to September 2018) are available. Several hundred hours of photos and video clips of wildlife have been recorded, yet to be analyzed to assess the density and abundance of different animal species sharing the same habitat as the great apes in Kahuzi-Biega National Park. A preliminary analysis revealed about 40 vertebrate animal species that have been identified within the Grauer's gorilla habitat by 24 camera traps in the park.

The ape survey using camera traps is very successful as it informs on some socio-ecology behavioural features of unhabituated apes. The photos show pictures of a wild (not habituated to humans) gorilla family and adult female chimpanzees' party. Three adult female gorillas with unweaned infants led by the silverback and adult female chimpanzees are ranging together with their unweaned and young infants far from adult males, a social feature often observed in other long-term studied chimpanzee populations. Female chimpanzees were observed forming strong and long-lasting social bonds with other females, even in the

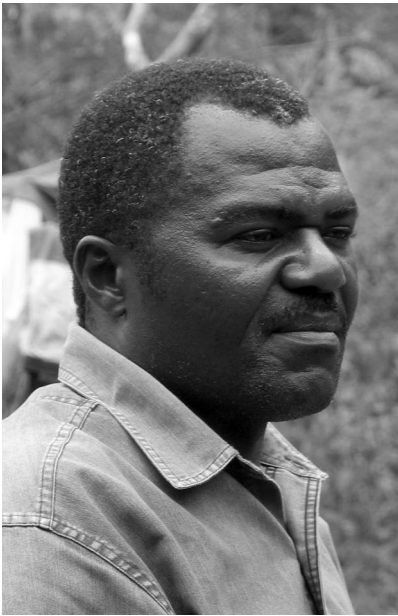
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Adult female gorilla carrying a dependent infant



D. R. CONGO



Omari Ilambu 1959–2018

Omari Ilambu was a much loved and highly respected conservationist who left us suddenly and unexpectedly in November. Omari worked for the Congolese Institute for Nature Conservation (ICCN), the Wildlife Conservation Society (WCS) and World Wide Fund For Nature (WWF) for almost 30 years. He is remembered here by his former colleagues from WWF.

Omari was our colleague at WWF-DRC from 2005 to 2013. He joined WWF in 2005 as the advisor for Salonga National Park, where he undertook the Herculean task of working with ICCN and other partners to revitalize law enforcement and management of one of the world's largest national parks – a critical contribution to protecting the global values of an endangered World Heritage Site. In parallel, he never lost sight of the importance of people – working tirelessly to build relations with the communities living in and around the park and local and provincial officials. In 2008, Omari became the landscape lead for the broader Salonga landscape, where he continued to coordinate across numerous partners and lay the foundation for the ICCN-WWF co-management model of today. From 2012 to 2013, Omari was the Senior Protected Areas Advisor for WWF's national programme, working to strengthen protected area planning and actions in the contemporary context of

the DRC. As part of on-the-ground assessments in remote areas of the country, Omari's experience and leadership were a source of inspiration for the young professionals on the team. His profound understanding and knowledge of the challenges facing the biodiversity of the DRC, in which he so delighted, provided important direction to the programme's reflections on the future of the national protected area system.

Omari was unique. He never became jaded in the challenging conservation environment of DRC and instead maintained his innate integrity, positive outlook, and enthusiasm and delight with the natural world. We have many fond memories of Omari – one in particular captures the essence of Omari. In 2006, Omari hosted a delegation visiting Monkoto. He was excited to introduce the group to the park and its people, and the itinerary included something special – a “surprise” in the forest. It was some place beyond Lokofa and to get there we had a slog through mud up to our thighs. When we arrived, the big surprise was ... a *Gilbertiodendron* forest. Omari was so happy, so proud. That is the Omari we will forever remember.

*Paya de Marcken, Cyril Pélissier
and Lisa Steel*



Omari Ilambu (in the boat at the left)

Photos: above Richard Carroll/WWF-US, below Lisa Steel/WWF-DRC



D. R. CONGO



Three adult female chimpanzees carrying their dependent infants and ranging alone with immature individuals far from adult males

absence of closely related partners (Lehmann & Boesch 2009). Sex differences in chimpanzee association patterns vary substantially across different sites in Africa (Pepper et al. 1999) and it is interesting to know which model may be ascertained to Kahuzi chimpanzee by observing clips from camera traps.

There is a lack of sufficient information regarding fauna species involved in crop raiding leading to conflicts between the park management and neighbouring farmers. PEx initiated a program to provide documentation on animals crossing the park's edge outside of the forest using camera trap surveys. PEx needs supplementary funds to proceed with this survey. Baboons are so far the animals most often observed in crop raiding events.

Conclusion

Thanks to the brave KBNP rangers and trackers, the activity is ongoing despite the shortage of funds to support monthly field activities. We need food rations for the park's staff working under hard conditions to protect the highly endangered Grauer's gorilla and other wildlife. We desperately need

more camera traps to meet the need of the park as this important program has covered only a small area of the highland


sector of Kahuzi-Biega National Park. More camera traps are indeed needed to be installed in various areas of the park to assess differences between sites in wildlife richness. We are very thankful to the Japan Monkey Center and Wild Earth Allies for providing a few camera traps, with which we have started this important activity.

Augustin Kanyunyi Basabose

References

Lehmann, J. & Boesch, C. (2009): Sociality of the dispersing sex: the nature of social bonds in West African female chimpanzees, *Pan troglodytes*. *Animal Behaviour* 77 (2), 377–387
 Pepper, J. W. et al. (1999): General gregariousness and specific social preferences among wild chimpanzees. *International Journal of Primatology* 20, 613–632
 Yamagiwa, J. (2003): Bush-meat poaching of larger mammals and the crisis of conservation in the Kahuzi-Biega National Park, Democratic Republic of Congo. *Journal of Sustainable Forestry* 16, 115–135

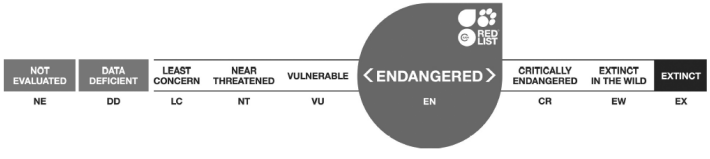
In the new IUCN Red List the mountain gorilla is no more classified as “critically endangered” as it was the years before; its status was changed to “endangered”. We are planning to include an article explaining the reasons for this change in the next Gorilla Journal issue.

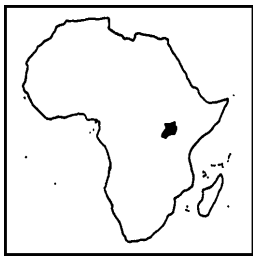


The IUCN Red List of Threatened Species™
 ISSN 2307-8235 (online)
 IUCN 2008: T39999A17989719
 Scope: Global
 Language: English

***Gorilla beringei ssp. beringei*, Mountain Gorilla**

Assessment by: Hickey, J.R., Basabose, A., Gilardi, K.V., Greer, D., Nampindo, S., Robbins, M.M. & Stoinski, T.S





UGANDA

The Impact of Neighbours on Bwindi Mountain Gorillas' Spacing Patterns

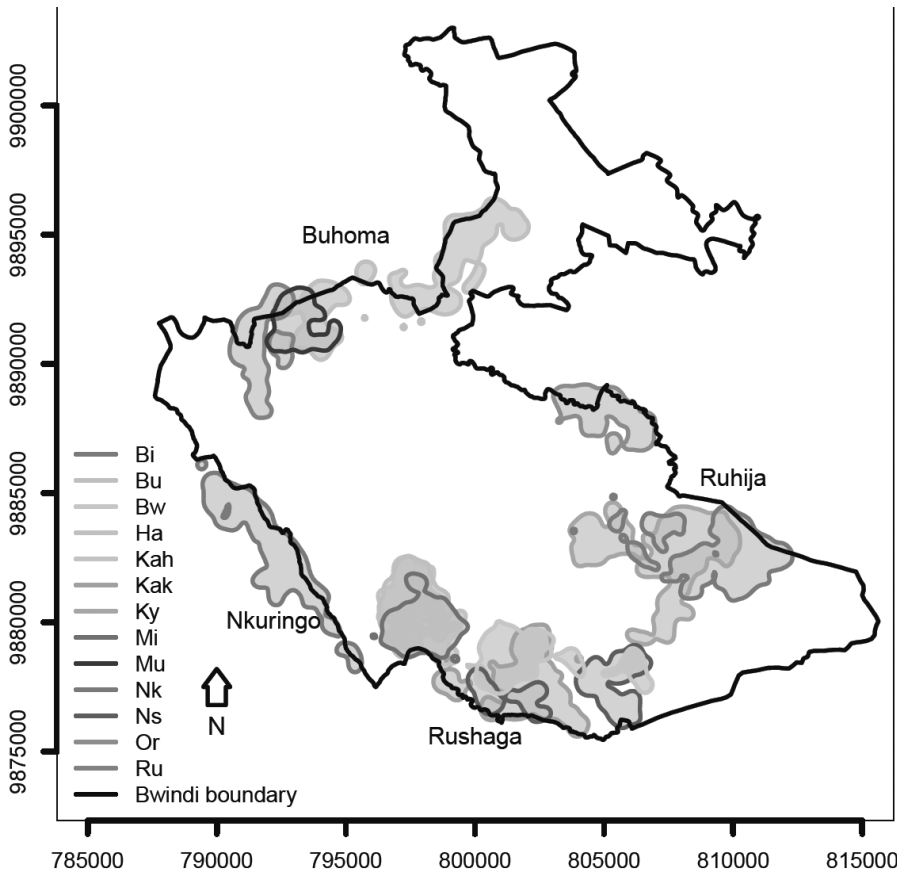
Finding food and mates is vital for all animals, so that they can grow, maintain metabolic functions, and reproduce. The way animals use their environment to find food and mates can be reflected in their spacing patterns or how they use their habitat. Spacing patterns describe how far animals travel on a daily basis or how far they range on a monthly or annual basis or how often they return to certain areas. For group-living species, all these patterns are assumed to be influenced by food availability but also by social factors,

such as the size of groups and by neighbouring groups. Understanding how these factors affect animals' spacing patterns is fundamental for understanding the abundance and distribution of animals, carrying capacity, habitat selection as well as for management and conservation.

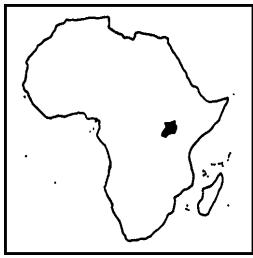
Animals usually do not wander around aimlessly in the environment but restrict their activities to certain areas. Such areas are referred to as an animal's home range. Home ranges of different groups can be non-overlapping and fixed in their location, which usually allows exclusive access to part or all the home range. Animals with such spacing patterns are called territorial. To maintain exclusivity, territo-

rial animals actively exclude conspecifics from a fixed area. They do so by using active defense, for example wolves will be aggressive towards neighbours, chimpanzees patrol the boundary of their territories, and lions use scent marking as keep-out signals. These behaviours then elicit an avoidance response by conspecifics. In contrast, home ranges of other animals can be overlapping and variable in their location. This usually does not allow exclusive access of areas to particular groups. Animals with such home ranges are referred to as being non-territorial. Non-territorial species, such as elephants or olive baboons, do not actively exclude neighbours from their home ranges but have extensive home range overlaps among neighbours (Brown & Orians 1970; Burt 1946). In territorial animals, spacing patterns are largely determined by competition between groups. However, for non-territorial animals the role of competition with neighbours is expected to play a weak role but remains poorly understood (Adams 2001).

Gorillas are an interesting model to investigate the role of competition between groups. They have been known to show a high degree of home range overlap among neighbouring groups at all sites where they have been studied (Caillaud et al. 2014; Ganas & Robbins 2005). Gorillas mainly feed on herbaceous vegetation, which is highly abundant and it is assumed that they do not defend their food. Therefore, mountain gorillas are characterized as being non-territorial. However, they face high competition between groups for mates. Mating competition is strongly linked to encounters between neighbouring groups, which is the only time that females can transfer between groups. During such encounters, males engage in aggression with extragroup males to prevent their females from transferring to other groups as well as to prevent infanticide of their offspring.



Home ranges of the 13 study groups of mountain gorillas in Bwindi Impenetrable National Park, Uganda (modified from Seiler et al. 2017)



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Although most encounters between groups are characterized by aggression between males involving displays and chest beating, only a very small proportion involves physical aggression. Additionally, despite extensive home range overlap among groups, encounters between groups are rare; they occur roughly once a month in mountain gorillas (Sicotte 1993; Robbins & Sawyer 2007).

To investigate the role of competition between groups in mountain gorillas in Bwindi Impenetrable National Park, Uganda, we examined the effect of neighbouring groups (density of groups and frequency of encounters between groups) on the groups' spacing patterns by quantifying the daily travel distance, the size of the monthly home range, and revisit frequencies to certain parts of the home range. Additionally, we examined how and when neighbouring gorilla groups use shared areas of overlapping home ranges. To do so, we collected location data on the ranging patterns of 13 groups of habituated mountain gorillas for approximately 1 ½ years. To get simultaneous ranging data on all habituated groups, 11 trained local research and field assistants helped us collect these data. We were able to work with groups ranging in all four general areas of Bwindi: Buhoma, Ruhija, Rushaga and Nkuringo.

Our analysis revealed that neighbouring gorilla groups experienced competition between groups. The higher the density of gorillas near a group, the smaller the area used per month by a group and the less a group returned to certain areas. Furthermore, groups increased the distance travelled on days that two groups had an encounter. Despite high home range overlap among neighbouring groups, core areas, i.e. areas of intense utilization within their home range, were largely mutually exclusive. Lastly, we showed that groups reduced using areas

as previously used by their neighbours. All of these results suggest that groups aim to avoid one another.

In conclusion, our results provide some of the first evidence of competition between groups in mountain gorillas. We clearly demonstrated that even in non-territorial species, such as mountain gorillas, neighbours are fundamental in influencing spacing patterns and groups appear to be constrained in their movements by neighbours. Our study is the first to show that despite having overlapping home ranges, gorilla groups have largely mutually exclusive high-quality core areas. This suggests that neighbouring groups actively avoid each other, although gorillas do not defend their home range. This leads to the question of how do gorillas avoid neighbours and maintain these largely mutually exclusive core areas without defending their home range.

There are three likely possibilities of how their behaviour could lead to such a pattern. First, we suggest that gorillas remember the locations of encounters between groups and subsequently avoid these areas. Second, gorillas may use chest beats to locate and then avoid neighbours. Third, they may use signs of foraging, such as trampled vegetation, feces, and food remains, to avoid areas previously used by neighbouring groups. Such a spacing pattern to avoid competition with neighbours may have consequences important for the conservation of this critically endangered species. Having exclusive core areas reduces the amount of available space for each group and thus lowers the carrying capacity of Bwindi despite abundant food resources. Our results highlight that there might be no clear distinction between animals being territorial or non-territorial because animals, such as Bwindi mountain gorillas, can combine some aspects of territorial with non-territorial behaviour.

Nicole Seiler and Martha M. Robbins

We gratefully acknowledge the Uganda Wildlife Authority, the Ugandan National Council of Science and Technology, the Institute of Tropical Forest Conservation, the Berggorilla und Regenwald Direkthilfe e. V., Deutscher Akademischer Austauschdienst, the Max Planck Society, and a special thanks to all the hard working and dedicated research assistants and Bwindi park staff. We also thank Roger Mundry and Christophe Boesch for their assistance with this research.

Original articles

Seiler, N., Boesch, C., Mundry, R., Stephens, C. & Robbins, M. M. (2017): Space Partitioning in Wild, Non-Territorial Mountain Gorillas: The Impact of Food and Neighbours. Royal Society Open Science 4 (11), 170720

Seiler, N., Boesch, C., Stephens, C. et al. (2018): Social and Ecological Correlates of Space Use Patterns in Bwindi Mountain Gorillas. American Journal of Primatology 80 (4), e22754

References

- Adams, E. S. (2001): Approaches to the Study of Territory Size and Shape. *Annual Review of Ecology and Systematics* 32, 277–303
- Brown, J. L. & Orians, G. H. (1970): Spacing Patterns in Mobile Animals. *Annual Review of Ecology and Systematics* 1, 239–262
- Burt, W. H. (1946): Territoriality and Home Range Concepts as Applied to Mammals. *Journal of Mammalogy* 24, 346–352
- Caillaud, D. et al. (2014): Mountain Gorilla Ranging Patterns: Influence of Group Size and Group Dynamics. *American Journal of Primatology* 76, 730–746
- Ganas, J. & Robbins, M. M. (2005): Ranging Behavior of the Mountain Gorillas (*Gorilla beringei beringei*) in Bwindi Impenetrable National Park, Uganda: A Test of the Ecological Constraints Model. *Behavioral Ecology and Sociobiology* 58 (3), 277–288
- Robbins, M. M. & Sawyer, S. C. (2007): Intergroup Encounters in Mountain Gorillas of Bwindi Impenetrable National Park, Uganda. *Behaviour* 144 (12), 1497–1520
- Sicotte, P. (1993): Inter-Group Encounters and Female Transfer in Mountain Gorillas: Influence of Group Composition on Male Behavior. *American Journal of Primatology* 30, 21–36
- Wang, M. & Grimm, V. (2007): Home Range Dynamics and Population Regulation: An Individual-Based Model of the Common Shrew *Sorex araneus*. *Ecological Modelling* 205 (3–4), 397–409



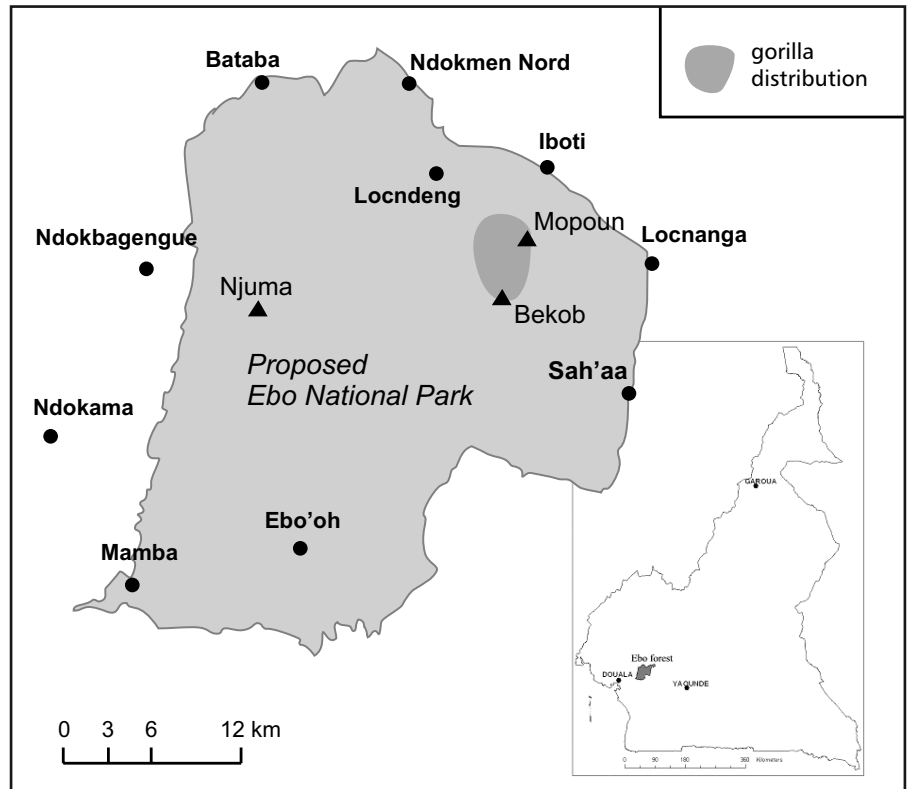
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Clubs des Amis des Gorilles in the Ebo Forest, Cameroon

The Ebo forest is one of the largest remaining intact forest tracts in the Gulf of Guinea Biodiversity Hotspot (Morgan et al. 2011) and it is in the process of being upgraded into a national park by the government of Cameroon. The forest is home to a unique primate assemblage including a small population of gorillas, one of the largest populations of Nigeria-Cameroon chimpanzees and drills, as well as one of only two remaining populations of Preuss's red colobus (Morgan 2010).

After the first observation of gorillas by a group of scientists in 2002 in the Ebo forest (Morgan et al. 2003), San Diego Zoo Global initiated a biodiversity research and conservation outreach program in the area called the Ebo Forest Research Project (EFRP). Among other objectives, the EFRP assesses the biodiversity of the forest through annual large mammal surveys and promotes community engagement in biodiversity conservation through partnerships and collaboration with a range of stakeholders in the Ebo forest area (Mfossa et al. 2017). One of the most important of these stakeholders is the 'Clubs des Amis des Gorilles' (CAG), a network of voluntary 'gorilla guardians' in the three communities closest to gorilla range.

The CAGs were launched in 2012 and 2013 by the Divisional Officer (Ministry of Territorial Administration) of Yingu Sub Division. The main collaborators of the clubs are local communities and traditional authorities, but they also get support from government services including MINAT and the Ministry of Forestry and Wildlife (MINFOF) as well as elites (Abwe & Morgan 2012). The goal of the CAG is to secure the small gorilla population of the Ebo forest and



The Ebo forest, location of the three CAG villages (Locndeng, Iboti and Locnanga) and the approximate range of the gorilla population

their habitat for posterity. We aim to achieve this through a number of ways, including monthly monitoring of gorilla signs and threats to gorilla habitat by a joint team of CAG and EFRP monitors. The clubs also engage in conservation outreach activities including sensitisation and sustainable alternative livelihood projects within their communities. After 5 years of existence, we have succeeded in ascertaining the gorilla range in the north eastern part of the Ebo forest. Here we report the results of monitoring activities undertaken from 1 January 2013 to 31 July 2018.

Monthly CAG monitoring in the gorilla habitat was conducted by a team of at least three persons composed of one EFRP staff (technical adviser and lead data collector) and two CAG members from two of the three CAG villages who

acted as assistants and/or local guides. The team used reconnaissance transects or recces (Kühl et al. 2008), from one end of the gorilla habitat to another, and spent nights at different temporary camps. At the start of every year, the CAGs in collaboration with EFRP developed an annual monitoring calendar. A copy of this annual schedule was kept by the CAG monitoring coordinator and president of each of the three groups for easy coordination. The number of CAG monitoring days has evolved from 5 days every 3 weeks in 2013 to 10 days per month since 2016. Monthly monitoring was not carried out in December, a month set aside for data collation and reporting.

While in the forest, the team recorded all large mammal signs including direct sightings, vocalisation, feeding



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CAG monitor removing a wire snare in the gorilla habitat

Photo: ZSSD/Daniel Mfossa

signs, nests, faeces, etc. To determine the range and distribution of gorillas across the area, the monitoring teams systematically georeferenced all gorilla signs using a GPS. Given that habituating gorillas and other species may pose a threat to these already endangered species, team members avoided direct contact with animals. Whenever the team encountered great apes, observation time was kept to the barest minimum to avoid habituation. Whenever a great ape nest was encountered, the monitoring team searched the area within 50 m of each observed nest thoroughly for more nests of the same age to determine the size of the sleeping party. For each nest observed, the team leader recorded the tree or herb species used in its construction, the height of the nest from the ground, the diameter of the tree in which the nest was made, the age of the nest, and whether faeces were present. To avoid repetitive counting, each nest spotted was marked with a

labelled flagging tape. Whenever present at nesting and feeding sites, great ape faeces were collected in plastic bags and later washed, dried and safely stored for eventual feeding ecology analysis.

To assess the monthly monitoring efforts, the itinerary of the team was tracklogged using the GPS tracklog function. At the end of each monitoring day, the team leader saved the GPS tracklog, logged all the data from the notebook to pre-prepared datasheets. The monitoring team also systematically collected threat indices including spent cartridge shells, wire snares, hunting camps, machete cuts etc. The team deactivated all wire snares and confiscated the wires encountered in the gorilla habitat to reduce the risk of animals trapped in them.

Systematically collecting these data over the years has enabled CAG and EFRP to understand the range of the Ebo gorillas and the threats posed by human activities. Following monthly

surveys, monitoring teams briefed the CAG executive bureau of their findings. Quarterly CAG assembly meetings were also held to brainstorm on conservation actions to save the Ebo gorillas. The mapping of gorilla signs and threats posed by human activities have helped the CAG and wider local communities to understand the degree of threat to the gorillas and other species of conservation significance in Ebo forest. This knowledge has been useful in designing focused conservation measures including a participatory and active gorilla conservation strategy geared at prohibiting access to the gorilla habitat. This 'No-Go Zone' (NGZ) idea was a consensus between the CAGs, traditional authorities, elites, MINAT, MINFOF and EFRP, and is one of our active projects at the time of writing.

Gorilla Habitat Monitoring Results

From 1 January 2013 to 31 July 2018 (excluding December months annually), the CAGs organized 469 days of gorilla habitat monitoring, within 73 separate trips.

The monitoring teams recorded 1647 sightings of 20 animal species including duikers (blue, red and yellow-backed), forest elephants, red river hogs, monkeys, and great apes. Monkey species were encountered



CAG coordinator Sey Felix recording information from a gorilla ground nest

Photo: ZSSD/Daniel Mfossa



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either alone or in multispecies associations including drills, red-capped mangabeys, Preuss's red colobus and guenons (*Cercopithecus mona*, *C. nictitans*, *C. pogonias*, *C. erythrotis* and *Allochrocebus preussi*).

A total of 325 gorilla signs were recorded during the 469 days of monitoring, with 213 of these signs being nest groups, composed of 858 individual nests. The average nest group size was 4.03 nests/group (range: 1–13 nests/group). Faeces were encountered on 50 occasions, and feeding signs on 32 occasions. Gorilla themselves were only encountered once, in 2016, throughout this five-year period since we deliberately avoided encounters to limit the risk of habituating gorillas to humans since hunting is prevalent across the site and disease risk must be minimized – the gorilla population is small and extremely vulnerable.

Based on the recordings of gorilla signs across the site, we have devel-

oped a potential range/distribution for Ebo gorillas mapped from GPS waypoints. This map is being used to develop the 'no-go zone' by the CAGs and local communities. The distribution of gorilla signs across the area seem to confirm our initial estimate of about 25 gorillas in one or two groups in Ebo, ranging over an area of about 25 km².

The teams also recorded and mapped threats to gorillas related to anthropogenic activities. In all, 1381 human signs were recorded, with the most recurrent being spent cartridges (565) and wire snares (334).

There was no seasonal difference in the encounters of used shotgun cartridge shells across the site. More wire snares were encountered during the wet (74 %) than the dry season (26 %). This could be related to the fact that animal signs including trails are more conspicuous in the wet season.

Though snaring and other hunting techniques endanger great apes, we

have not encountered or heard of cases of gorilla and chimpanzee killings across the gorilla habitat since the inception of CAGs in these communities in 2012. But potential threats to great apes remain high since human hunting presence in the gorilla habitat continues to be evident. In addition to hunting threats, there is also the threat of the spread of diseases between humans and great apes and vice versa. Gunshots and other human activities in the area may also result in high level stress in the apes that could affect reproductive success in the population.

Community Engagement in Gorilla Conservation

The monthly monitoring data and gorilla range/distribution and human encroachment maps have been used by CAGs, traditional authorities of the villages and EFRP to develop an active and integrated community conservation approach. This approach is a consensus derived from monthly CAG executive meetings after each monitoring trip as well as quarterly CAG general assembly meetings. These stakeholders are frustrated by the continued existence of hunting activities in the gorilla habitat and by the delay of the upgrade of the Ebo forest into a national park by the government of Cameroon.

Cognizant of the fact that part of the Ebo gorilla range falls outside the proposed Ebo National Park boundary, the CAGs and traditional authorities have proposed limiting human access to the gorilla habitat to protect the gorillas and other species for posterity.

It is believed that such a zone would limit the number of gunshots, snares and other human activities in the gorilla habitat, as well as reduce the potential for disease transmission between humans and gorillas, and general disturbance to the gorillas. The NGZ encompasses the current distribution of the gorilla range based on gorilla



AG president of one community (M. Titil) addressing the issue of the 'no-go zone' to CAG general assembly

Photo: ZSSD/Daniel Mfossa



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signs from monthly surveys over the years. The CAG general assemblies of the three communities have drafted a Memorandum of Understanding (MoU) outlining the goal and objectives of the NGZ as well as measures to be put in place to monitor and punish any illegal and unsustainable activities in the area. The MoU also outlines a range of stakeholders the CAG hope to work with for the successful implementation of this initiative. Among others, the groups have identified traditional authorities, elites, the administration (MINAT and MINFOF), the mayor and councillors, the EFRP, etc. The groups are planning meetings with these stakeholders and would eventually elaborate the roles of each of the stakeholders for the success of protecting the Ebo gorillas for posterity and seeking the welfare of local communities around the gorilla habitat.

Once these preparatory and sensitisation phases are complete, the Divisional Officer of Yingui Sub Division accompanied by the Littoral MINFOF Chief of Wildlife and Protected Areas will officially launch the NGZ in the villages. The monthly monitoring in the gorilla habitat and NGZ would continue following the launch. It is expected that the encounter rate and density of wildlife would increase in the area, and threats linked to human disturbance would decrease rapidly. All human encroachment and trespassing will be reported to the CAG executive assembly, traditional chiefs and local administrative authorities for appropriate sanctions as indicated in the MoU.

Conclusions and Ongoing Work

The main goal of the Club des Amis des Gorilles (CAG) is to ensure the full protection of the Ebo gorillas and their habitat as well as the rich biodiversity of the forest. The biodiversity of the Ebo forest is increasingly under threat from bushmeat hunting and trade as well as habitat loss linked to subsistence

shifting agriculture and industrial oil palm plantations. To reverse the trend, there is a need to mobilize a wide range of stakeholders within and outside the Ebo forest to actively engage in conserving the rich biodiversity of the area. CAG is now yielding positive results based on their commitment for gorilla protection through monitoring and the promotion of small-scale livelihood activities for local population in their villages. The decision of CAG to demarcate and restrict access to the gorilla habitat represents a major stride to protect this unique gorilla population for posterity. This decision has found wide support among other stakeholders including traditional and administrative authorities, elites as

well as EFRP. Increasingly, these local communities are recognizing the local, national and international significance of Ebo gorillas.

Daniel Mfossa, Ekwoke Abwe and Bethan Morgan

We are very grateful to the Government of Cameroon for supporting our work, as well as our supporters who continue to provide us their invaluable funding to carry out the monitoring and community outreach work around the Ebo gorilla habitat as well as the Ebo landscape in general. We would like to thank the traditional authorities and the local administration in Ebo region as well as other local NGO partners that all work in synergy for the protection of the biodiversity of the Ebo forest. Particular thanks to San Diego Zoo Global, US Fish and Wildlife Service Great Apes Conservation Fund, the Arcus Foundation, the Margot Marsh Biodiversity Foundation and La Palmyre Zoo.



Traditional authorities and elders deliberating the 'no-go zone' boundaries during the CAG general assembly meeting

Photo: ZSSD/Daniel Mfossa



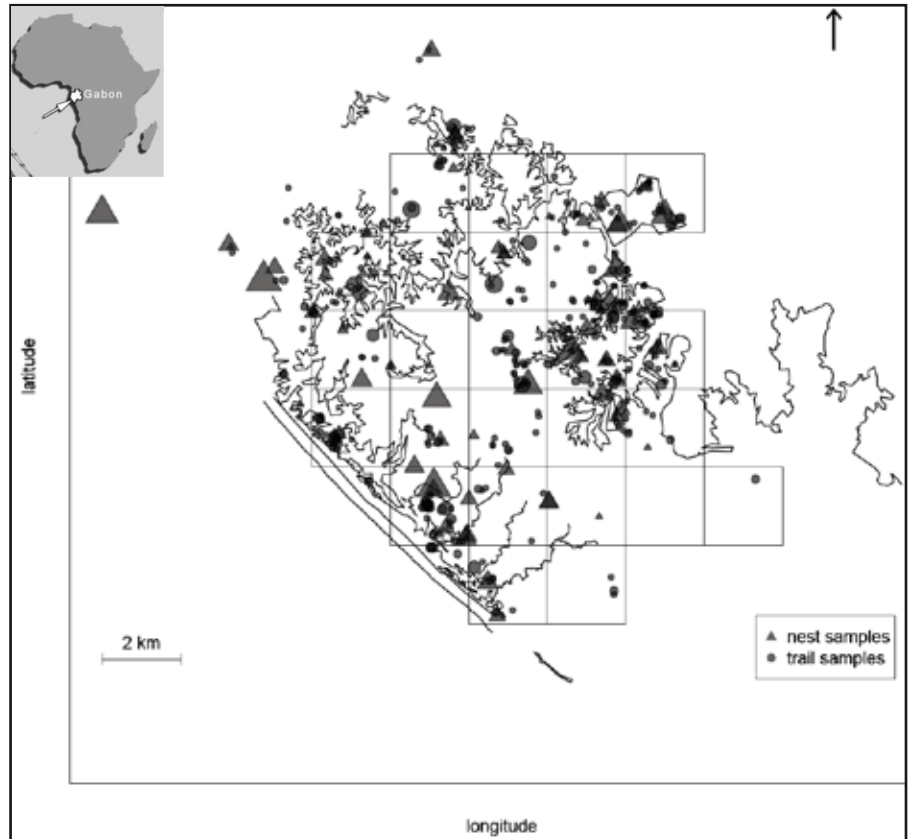
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References

- Abwe, E. E. & Morgan, B. J. (2012): The gorillas of the Ebo forest – developing community-led conservation initiatives. *Gorilla Journal* 44, 14–16
- Kühl, H. et al. (2008): Best practice guidelines for surveys and monitoring of great ape populations. Gland, Switzerland: IUCN SSC Primate Specialist Group (PSG). Occasional Paper of the IUCN Species Survival Commission No. 36
- Morgan, B. J. (2010): The gorillas of the Ebo forest, Cameroon. *Gorilla Journal* 40, 16–18
- Morgan, B. J. et al. (2011): Plan d'action régional pour la conservation du chimpanzé du Nigeria-Cameroun (*Pan troglodytes ellioti*). Groupe de spécialistes des primates de la CSE/UICN et Zoological Society of San Diego: CA, USA
- Morgan, B. J. et al. (2003): Newly discovered gorilla population in the Ebo forest, Littoral Province, Cameroon. *International Journal of Primatology* 24, 1129–1137
- Mfossa, D. et al. (2017): Conserving the Ebo gorillas through community collaboration. *Gorilla Journal* 55, 16–20

Give Me Your Dung And I Will Tell You Who You Are

In many primate species individuals coordinate their activities, share space and form groups. But how do groups form, how long can they exist and how often do individuals change groups? These are crucial questions to answer in order to understand a species' social system as well as its genetic structure. Groups should not be seen as isolated units but as parts of a coherent dynamic system. This system is characterized by formations of new groups, dissolutions of existing groups and individual movements between groups. Stable and dynamic elements complement each other and make up the social organization of a species. In order to gain insights into this complex system, several groups have to be observed over long periods of time. Especially in long-lived and elusive species this venture is very time intensive and costly and this is why only a small number of studies have been carried out for primates. Understanding social organization will however help to



The study area within Loango National Park, where the lines represent the border of the lagoon, swamps, savanna or rivers. Circles indicate locations of samples found at nest sites and all others. The area is proportional to the number of samples (modified from Hagemann et al. 2018).

answer a number of questions ranging from disease transmission patterns to the social evolution of species, including humans.

Here I will describe how we succeeded in reconstructing group dynamic processes in a western lowland gorilla population taking place over more than a decade. And like the best stories, this one starts with a pile of dung. In brief: we used fecal samples collected during two time periods (2005–2007/9 and 2014–2017) as sources of DNA for genetic 'fingerprinting' and combined this with information on time and date of sampling to reconstruct groups and track individuals through time. With this method we could infer the fate and

history of 144 gorillas, 17 mixed sex groups and 2 probable all male groups. The scope of the study was facilitated by combining published data (Arandjelovic et al. 2010, 2014) spanning the earlier time period with newly generated data spanning the later time period.

Western lowland gorillas are fascinating animals; they live in groups with one adult male and several adult females (one-male groups), are characterized by male and female dispersal, represent one of our closest living relatives and are recognized as critically endangered after the population was hit by severe Ebola outbreaks. Unimale social organization is rare within primates, as is dispersal by both sex-



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es and routine repeated dispersal by females.

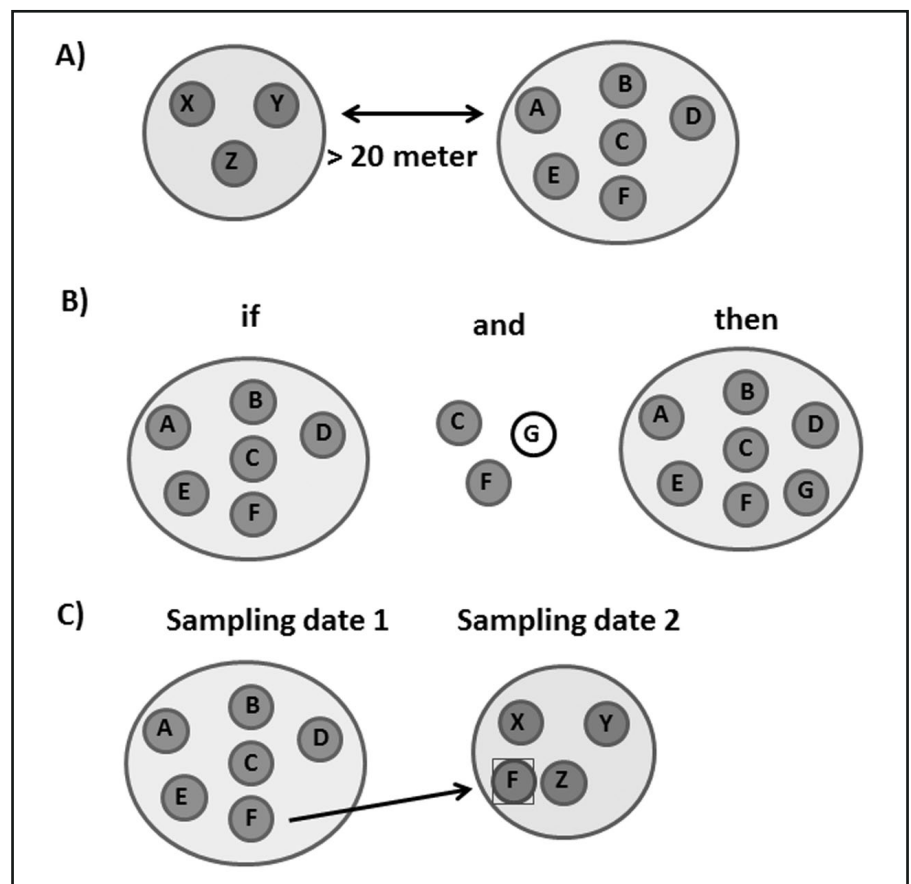
Most information on western lowland gorilla social organization originates from detailed observation of single groups that were followed and accustomed to human presence and observations from platforms overlooking swampy forest clearings. From these efforts we know that groups can dissolve quickly following the death of the silverback but also slowly due to female emigration. Females usually transfer directly from one group to another during an intergroup encounter or after the sudden dissolution of their group of residence. Males, however, typically do not transfer directly but undergo a solitary period before they may form a group. Group formations are believed to take place when an adult male acquires at least one adult female. Non-reproductive groups (consisting of several adult males or adults males and sub-adult individuals) have also been observed. The rareness of groups containing multiple adult males is one striking difference in social organization between western lowland gorillas and mountain gorillas. We have limited information on how frequent dissolutions and formations of groups and dispersal events take place and how stable groups can be over time and in terms of their membership.

To acquire in-depth information on the group dynamics and stability of multiple western lowland gorilla groups over a 12-year period of time, we collected fecal samples within a roughly 100 km² area in Loango National Park, Gabon. Our study area is bordered by a large lagoon on one side and the Atlantic Ocean on the other. This unique ecosystem contains a mosaic of habitats ranging from savanna and open coastal forest to dense secondary forest and large swampy areas and makes up the habitat for a variety of species including western lowland gorillas, chimpanzees and elephants. The sampling

teams were based at the permanent camps of the Loango gorilla and the Loango chimpanzee projects which are located on either side of our study area.

The detection of fresh dung across large, sometimes difficult to access areas is a challenging undertaking. We therefore relied heavily on the skills of indigenous BaBongo people from Waka National Park whose outstanding abilities in reading the signs of the forest allowed us to track ape groups in Loango. For three years, teams of

at least two people searched the area for signs of gorillas, like knuckle prints on the ground or feeding remains, and tried to follow them towards dispersed samples on the forest floor or aggregations of samples at gorilla sleeping sites. Every evening gorillas build nests in the tress or on the ground to sleep in and often leave behind dung. These samples are of special value for us since all gorillas sleeping together at a nest site can be assumed to belong to the same group.



Schematic illustration showing how group composition was reconstructed. A) All samples that were found on the same day within 20 m of each other were assumed to be from individuals of the same group. B) If individuals A–F belong to one group and individuals C, F and G were found together at a different occasion, individual G was also assumed to belong to the same group. C) A transfer was assumed if an individual was found with one group and at a different occasion with another.

Illustration: Laura Hagemann



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Gorilla night nest

Photo: Graden Froese

The gorilla DNA within the dung samples originates from intestinal cells that ‘get stuck’ when feces pass through the gastro-intestinal tract. In these samples, there is very little DNA as compared to the amount one can get from a blood sample, and the DNA is degraded, making the genetic analysis (‘genotyping’) very similar to the work done when using forensic samples from a crime scene.

As expected, we found that some individuals were sampled multiple times, and so the 681 successfully typed samples came from just 98 gorillas. We compared the genotypes of these 98 gorillas to those of the 85 gorillas found between 2005 and 2009. We found matches across time periods, showing that 39 gorillas were present during both sampling periods. Another 46 were found in 2005–2009 only, meaning that they either died, left the study area or were missed during the 2014–2017 collection period. Another 59 were only found from 2014–2017 so these might have entered the study area or been born after the earlier period, or were simply not sampled earlier.

Our next challenge was to use the information on where and when the gorillas had been sampled to reconstruct the group compositions. Similar numbers of groups were found in both time periods: 10 mixed sex and two uni-

male groups in 2005–2009 versus 11 mixed sex groups in 2014–2017. But were these the same groups? Which fraction of members needs to be present to postulate that a group still exists? Since western lowland gorillas live in uni-male groups, we assumed groups to be the same if the only adult male, the silverback and at least one other individual were found. By comparing genotypes we could do parentage tests to see if individuals had relatives within or across groups, and were thereby able to find 35 parent-offspring trios.

A good example of what we found using our data is seen with female LOG77. We reconstructed at least 17 years of her life: she was born before 2000 in group LayonA, transferred to GroupH where she was detected in 2005, 2006 and 2007 and gave birth to a son; before 2016 she transferred again to group Pink. Another example is male LOG8, who was found as a solitary silverback in 2005 and 2006, joined the all-male Group J in 2006 and was found to be the silverback of Group Green in 2014 where he sired a minimum of two daughters. The phrase



Gorilla knuckle print

Photo: Stefano Lucchesi

“tell me your name and I’ll tell you who you are” should actually be “give me your dung and I’ll tell you who you are” – we found out quite a bit about the lives of the gorillas without ever seeing them.

Gorillas in Loango National Park live in a very dynamic social environment whereby a high degree of stability is possible at the same time. At the group level, we detected six group formations, five group dissolutions and 40 dispersal events of individuals within 12 years. Four of 17 mixed sex groups were detected for 8–12 years, and we inferred a minimum existence of 17 years for one of the groups. We even saw differences between time periods, with about four times as many female transfers in the earlier as compared to the later period. Questions for the future are the factors driving the dynamics of gorilla groups: could these be due to ecological factors or just chance? What is clear is that we can infer many of the secrets of multiple gorilla groups using crime scene technologies applied to DNA from dung, and that it is imperative to continue long-term studies to obtain the most powerful insights into the lives of these elusive animals.

Laura Hagemann

Original article

Hagemann, L., Boesch, C., Robbins, M. M., Arandjelovic, M., Deschner, T., Lewis, M., Froese, G. & Vigilant, L. (2018): Long-term group membership and dynamics in a wild western lowland gorilla population (*Gorilla gorilla gorilla*) inferred using non-invasive genetics. *American Journal of Primatology* 80 (8), 1–12

References

Arandjelovic, M. et al. (2010): Effective non-invasive genetic monitoring of multiple wild western gorilla groups. *Biological Conservation* 143 (7), 1780–1791
Arandjelovic, M. et al. (2014): Genetic inference of group dynamics and female kin structure in a western lowland gorilla population (*Gorilla gorilla gorilla*). *Primate Biology* 1, 29–38



GORILLAS

A Poaching Categorization Scheme

Great ape conservation experts from the Great Apes Survival Partnership (GRASP) and the International Union for Conservation of Nature (IUCN) recently produced a report on the status of great apes and threats to their survival for CITES – the Convention on International Trade in Endangered Species of Wild Fauna and Flora (GRASP & IUCN 2018). During preparation of this report, we were asked to review usage of the word “poaching” and clarify its different meanings.

All great apes are protected by national and international legislation, so it is illegal to kill or capture them and to trade live animals or their body parts in all great ape range states (IUCN 2018). Such killing and trade are, therefore, termed poaching. Different types of poaching can be distinguished by the motivation for or the context in which killing takes place, and I developed the framework below to provide more specific terms and facilitate a better understanding of the context in which great apes are killed.

This framework is based on what is essentially common knowledge among people working in the field, but is not usually explicit when poaching is reported. It would be useful for researchers to adopt the classification presented here and use it when recording incidents of great ape killing and illegal trade in body parts and in live individuals.

Categories of poaching (illegal killing) of great apes

Type 1 poaching: Great apes are targeted and killing is intentional

1a. Bushmeat: Poaching for bushmeat is one of the greatest threats to most great apes (IUCN 2018). Most killing in this context is opportunistic: hunters tracking other species, such



Snare set by poachers in the Sarambwe Reserve

Photo: Aimé Bararua

as antelopes or monkeys, may come across and kill great apes. However, in some range states, great apes are occasionally targeted to serve their meat as a delicacy or high-status food at traditional or political functions. If infants captured alive when their mothers are killed for bushmeat are trafficked illegally, this trade in orphans is a by-product of poaching for bushmeat, so it is classed as bushmeat poaching.

1b. Conflict: Great apes are killed over competition with humans for natural resources (see Hockings & Humle 2009). Illegal killing and capture may occur on a large-scale when natural habitat is cleared or converted to other land uses. Also in this category are retribution killings motivated by crop-foraging or people being injured.

1c. Superstition: Great apes are sometimes killed for traditional ceremonies and “medicine” – superstitious beliefs, including black magic. However, “secondary use” of ape body parts for superstitious purposes when the primary motivation for

killing was to obtain meat is classed as bushmeat poaching (e.g. bones or digits used to confer “strength” upon hunters or human infants).

1d. Live: Live capture of infant great apes, which is in itself illegal, includes associated killing of conspecifics, as obtaining an infant necessitates killing the mother and usually other group or community members. In this category, taking a live infant is the primary motivation (however, the majority of orphaned infants thought to be destined for the illegal wildlife trade are trafficked as a “by-product” when obtaining bushmeat was the primary objective).

1e. Politically-motivated: Killing of great apes can result from conflict with governing bodies, usually the protected area authorities, or with law enforcement agents.

Type 2 poaching: Great apes are not targeted or killing is not intentional

2a. Indiscriminate: Great apes are accidentally caught in snares intended for other species. Often the apes



GORILLAS

are maimed and may lose a hand or foot. Such incidents are fatal when the animals are unable to free themselves, or when gangrene or septicaemia ensues.

2b. Collateral: Great apes have been killed in crossfire – shot in civil conflicts. Even when such killing is accidental, the ape is usually eaten.

For details on the types of poaching that threaten each species and subspecies of great ape, please see the GRASP & IUCN report, and for information about all threats to great apes, refer to the IUCN Red List of Threatened Species (IUCN 2018). With thanks to the GRASP & IUCN report contributors for reviewing this framework and to Tatyana Humle, Fiona Maisels and Julie Sherman for their input.

Liz Williamson

References

Hockings, K. & Humle, T. (2009): Best Practice Guidelines for the Prevention and Mitigation of Conflict Between Humans and Great Apes. Gland, Switzerland (IUCN SSC Primate Specialist Group). <https://portals.iucn.org/library/node/9324>

GRASP & IUCN (2018): Report to the CITES Standing Committee on the Status of Great Apes. United Nations Environment Programme Great Apes Survival Partnership, Nairobi, and International Union for Conservation of Nature, Gland.

IUCN (2018): The IUCN Red List of Threatened Species. Version 2018-2. <https://www.iucnredlist.org>

New Exhibition by Chisato Abe

During 5 to 11 December 2018, Japanese artist Chisato Abe organized her solo exhibition at the exhibition hall of KOBE DAIMARU, a department store in Kobe city, Japan. Chisato is a well-known artist, who has been painting only gorillas for more than 35 years. She has travelled around the world just to see gorillas and painted gorillas' beautiful portraits as well as the gorillas' world. Not only gorilla lovers, but also

non-gorilla lovers have been attracted by her amazing, heartwarming works. I am one of those people. When I was young, I read her picture books many times and dreamed to jump into the gorillas' world someday.

About 40 works including gorillas in several zoos as well as gorillas in Bwindi Impenetrable National Park (BINP) were exhibited. One of the main works in this exhibition was 63.8x63.8 inch sized portrait of the late great silverback Kanyonyi. In June 2017, Chisato travelled in Uganda and tracked Mubare group in BINP. She had already visited mountain gorillas (*Gorilla beringei beringei*) in DRC and Rwanda, but it was her first time to see mountain gorillas in BINP. After two and a half hours of massage on a stretcher (called African helicopter locally), she met Kanyonyi. She was really impressed by the warm and gentle atmosphere in the group. Gorillas in Mubare group including infants were really relaxed being with Kanyonyi. He was a dominant silverback loved by his family members, many tourists, UWA park staffs, researchers and even community people living around BINP. Unfortunately, he got injured in early September after falling down from a tree and eventually

passed away at the age of 21 on 9 December 2017.

On 9 October 2018, a talk event was held at the exhibition hall. Chisato Abe told her exciting experiences including some funny stories in BINP. Especially the story of the great moment Chisato spent with gorillas of Mubare group captured the hearts of the audience. Ryoma Otsuka (the author) added how Kanyonyi lived and died after Chisato left Bwindi. Chisato also highlighted that how she was lucky and how much Kanyonyi had been loved by many people. She said:

"I was really lucky and happy that I could see Kanyonyi only about 6 months before he passed away. During our visit, he posed like a model in front of me. What made me surprise was that trackers and community people were loving Kanyonyi so much."

After the talk event, participants enjoyed talking with Chisato in person and they seemed really interested in visiting the gorillas' world in BINP. During 7 days, many people of all ages, from children to the elderly, visited the exhibition and enjoyed her amazing works.

Ryoma Otsuka



Chisato Abe talking about her artwork

Photo: Makiko Otsuka



READING

David Modrý, Barbara Pafčo, Klára J. Petrželková and Hideo Hasegawa (eds.)

Parasites of Apes – An Atlas of Coproscopic Diagnostics. Frankfurt (Edition Chimaira) 2018. 197 pages, more than 300 colour photos and 15 drawings. Hardcover, € 98.00, US-\$ 128.04. ISBN 978-3-89973116-3

Neil Carr and Donald M. Broom
Tourism and Animal Welfare. Wallingford (CABI Publishing) 2018. 188 pages. Hardcover £ 95.00, € 125.00, US-\$ 160.00, ISBN 9781786391858. Paperback £ 35.00, € 45.00, UD-\$ 60.00, ISBN 9781786391865

Yu-Fai Leung, Anna Spenceley, Glen Hvenegaard and Ralf Buckley (eds.)
Tourism and visitor management in protected areas: guidelines for sustainability. Best Practice Protected Area Guidelines Series 27. Gland, Switzerland (IUCN) 2018. XII, 120 pages. ISBN 978-2-8317-1898-9 (PDF).
Download PDF (6.46 MB): <https://portals.iucn.org/library/sites/library/files/documents/PAG-027-En.pdf>

E. Meijaard, J. Garcia-Ulloa, D. Sheil, S. A. Wich, K. M. Carlson, D. Juffe-Bignoli and T. M. Brooks (eds.)
Oil palm and biodiversity. A situation analysis by the IUCN Oil Palm Task Force. Gland, Switzerland (IUCN) 2018. XIII, 116 pages. ISBN: 978-2-8317-1910-8 (PDF), 978-2-8317-1911-5 (print version).
Download PDF (12.4 MB): <https://portals.iucn.org/library/sites/library/files/documents/2018-027-En.pdf>

Ian Redmond (ed.)
Remembering Great Apes. Wildlife Photographers United 2018. Volume 3 of the charity book series Remembering Wildlife, published by

Margot Raggett in conjunction with the Born Free Foundation. £ 45.00. Available from <https://www.buyrememberingbooks.com/> or <https://www.buyrememberingbooks.com/product-page/remembering-great-apes>

New on the Internet

CCFU – The Cross-Cultural Foundation of Uganda
Culture and the Conservation of the Great Apes in Uganda. CCFU 2018.

28 pages. Download PDF (3.8 MB): <http://crossculturalfoundation.or.ug/wp-content/uploads/2018/07/Culture-and-Conservation-of-the-great-apes-in-Uganda-CCFU2018.pdf>

World Resources Institute
Congo Basin Forest Atlases. The Forest Atlases are online platforms that show long-term development of forests and help countries better manage their forest resources by combining government data with the latest forest monitoring technology. <https://www.wri.org/forest-atlases>

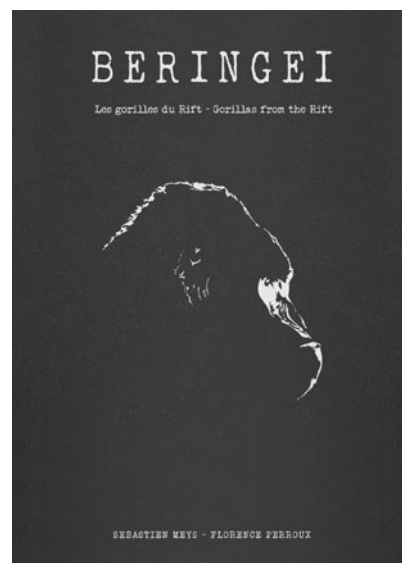
Sébastien Meys and Florence Perroux
Beringei, Gorillas from the Rift. Silverback Edition 2018. 128 pages, texts in French/English, € 25.00.
On sale on www.beringei.art

A deep fracture is tearing East Africa apart. A terrestrial divorce between two tectonic plates that never ceases to shape the landscape and the life in this part of the world. Lakes and volcanoes were born from this split, thus contributing to slow but inexorable changes in ecosystems.

Coinciding with this geological phenomenon, evolution gave birth to eastern gorillas, rejecting each of the two subspecies on both sides of the rift. Mountain and Grauer's gorillas are the world's largest primates, all are severely threatened with extinction and each moment shared with these gentle giants is such a singular and precious experience.

In keeping with their work on gorillas started in 2008 and after their first book *Gorilles portraits intimes* published by Editions Le Pommier in 2012 featuring black-and-white portraits of gorillas of rare intensity, wildlife photographer Sébastien Meys and Florence Perroux, scientific mediator and in situ conservation officer at La Palmyre Zoo, are releasing an original photographic travelogue with captivating portraits of eastern gorillas.

From Rwanda to the Democratic Republic of the Congo, from the lush forests of Kahuzi-Biega National Park to the slopes of the Volcanoes National Park and the rugged summits of the Virungas, discover strong individualities, remarkable stories as well as the "enfant terrible" of the region, the Nyiragongo volcano, symbol of a tormented geological past which brings together the two sides of the Albertine Rift.





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wri.org/our-work/project/congo-basin-forest-atlases

**Global Financial Integrity
Illicit Financial Flows and the Illegal
Trade in Great Apes.** Global Financial
Integrity October 2018. 76 pages.
Download PDF (1.9 MB): [https://www.
gfintegrity.org/report/illicit-financial-
flows-and-the-illegal-trade-in-great-
apes/](https://www.gfintegrity.org/report/illicit-financial-flows-and-the-illegal-trade-in-great-apes/)

IUCN

Species Strategic Plan 2017–2020
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Our Donors

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Many thanks to everybody, including all the donors that could not be listed by name here. We are grateful for any support, and we hope that you will continue to support our work in 2019!



The central area of the UN compound in Nairobi

International Primatological Society Meeting in Nairobi

From 19–25 August 2018, the biannual conference of the International Primatological Society, organised by

Johannes Refisch (GRASP), took place in the UN compound in Nairobi. The meeting was very successful: it included many interesting talks and discussions, and was an opportunity to exchange news with colleagues and gorilla conservationists. This



Johannes Refisch (left), GRASP



BERGGORILLA & REGENWALD DIREKTHILFE



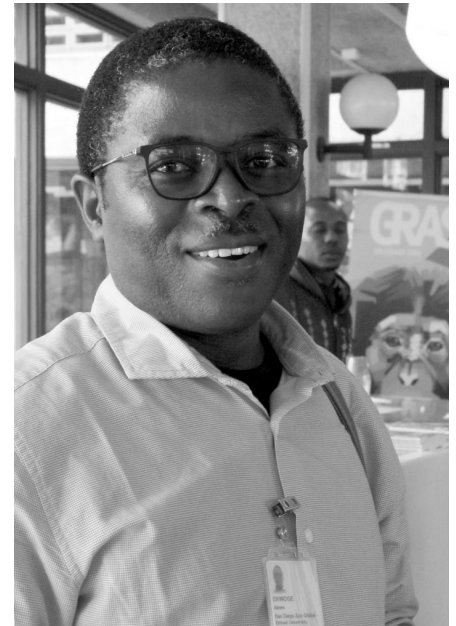
A crisis meeting on Itombwe: Claude Sikubwabo, Benoît Kisuki (ICCN), Deo Kujirakwinja and Ian Redmond

year, an especially large number of gorilla scientists and conservationists from Africa were able to participate – which gave me the opportunity to meet people in person with some that I had previously ‘met’ only by email.

I arrived early in Nairobi to discuss BRD projects and current issues with our assistant Claude Sikubwabo Kiyengo, who also participated in the conference. He reported that the situation in Sarambwe has improved: thanks to regular patrolling, the forest is slowly reclaiming hitherto cultivated areas and the gorillas sometimes visit and utilize these areas. In the Mt. Tshiaberimu area there had been problems with Mai-Mai rebels this year, but they had now retreated. The relationship with the local population is good: the people who live in the vicinity of the park frequently inform the rangers when they notice illegal activities. In both project areas, rangers, trackers and the communities adjacent to the protected areas have asked for additional support.

During the conference, we were also able to discuss the Itombwe Reserve. I learnt that the Canadian company

Banro has commenced gold mining in the core zone of the reserve. We discussed what can be done against this – and what can be done for the reserve, which urgently requires additional long-term support. We will certainly continue



Ekwoke Abwe, Ebo Forest Research Project in Cameroon

to do anything we can for this important area.

Angela Meder



Anna Behm Masozera (IGCP) and Annette Lanjouw (Arcus Foundation)

All Photos: Angela Meder