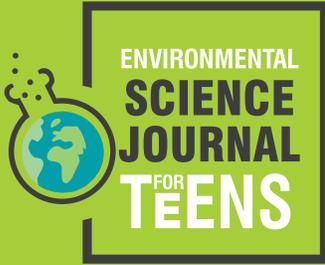


How does war affect gorillas?



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Abstract

The Grauer's gorilla is one of two *subspecies* of the Eastern gorilla. The whole population of Grauer's gorilla lives in the forests of eastern Democratic Republic of the Congo (DRC) in Central Africa.

In 1996 a civil war started in the DRC, which killed 5 million people. We wanted to find out what effect the civil war had on the population of Grauer's gorillas. We carried out field surveys and used data from local communities and

park rangers and found that the global population had decreased by 77% since 1994. There are now only 3,800 individuals left.

This makes this ape *Critically Endangered* on the *IUCN Red List of Threatened Species* and now makes both gorilla species (Eastern and Western) and all four subspecies *Critically Endangered*. This is the highest category of threat before extinction.

Introduction

The Grauer's, or "Eastern lowland" gorilla (Fig. 1), is a cousin of the Mountain gorilla. Because they live in two separate areas and there are some differences in size and limb length between the populations, we call them two subspecies of the Eastern gorilla.

Scientists have carried out regular studies on the Mountain gorilla, helping them to keep an accurate record of its population size. This helped scientists prove many years ago that the Mountain gorillas were *Critically Endangered* (the very last stage before extinction). Since then, their numbers have slowly started to grow again.

The only study to calculate the numbers of Grauer's gorillas, however, was in 1994-95. At the time, researchers estimated that there were 16,900 individuals (and declining in number) so as a result classified them as *Endangered* (less at risk than the Mountain gorillas).

Figure 1:

The Grauer's gorilla (*Gorilla beringei graueri*) is the largest primate on earth. A male 'silverback' can weigh up to 400 pounds (200 kg) and eat 40 pounds (20 kg) of fruit and veggies every day (bottom photo)! A female gorilla will give birth to a single infant after a gestation period of 8 and a half months. The baby will normally stay with the mother for 3-4 years (top photo).



But between 1996 and 2003, there was a civil war in the DRC (when armed groups within the same country fight each other). The war resulted in millions of people being killed, villagers cutting down large sections of the forest, and armed groups taking control of mines (Fig. 2) in isolated parts of the forests, where the gorillas live.

Because these mines are so deep into the forests, the people working there have to hunt wild animals for food because there is no food grown near by. They favor gorillas because they are large and easy to kill with guns.

We wanted to find out what effect the civil war and the continuing problems in the region had on the numbers of the Grauer's gorilla. We carried out field surveys (where possible) and we also used data collected by local communities and park rangers to find out:

1. What environmental and human factors affected where gorillas lived
2. The density of gorillas (how many gorillas there were per km²)
3. The total area (range) that the gorillas lived in

From these data, we could calculate the total population size.

Figure 2:

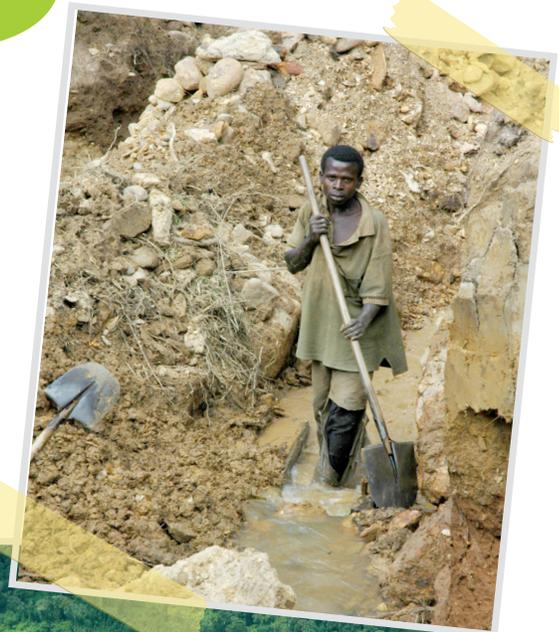
There are many coltan mines in the Kahuzi Biega National Park, which we identified as being a critical site for the Grauer's gorilla conservation. Coltan is a metallic material that contains minerals which go into mobile phones. (Top: local man who works as a miner. Bottom: a mining site photographed from the air.)

Methods

Every gorilla over three years old builds their own nest to sleep in every night. Sometimes they make them in trees, weaving branches and leaves together to make their own hammocks. Otherwise they make them on the ground. Just like our own beds, gorillas make theirs so that they can sleep safely and comfortably at night. (Watch [this BBC video](#))

We used *line transect surveys* of the encounter rate of gorilla nests (the number of nests seen per km walked) across ten

Do you know what is being mined in the gorilla's home range? One of the minerals is Columbo-tantalite (Coltan for short). Coltan is a key component of computer chips used in smartphones - our phones! It is possible to certify minerals from eastern DRC as conflict free and environmentally friendly! This would put pressure on the mining companies to make sure they are sourcing their minerals in a responsible way.



sites in the Grauer's range to calculate their densities at these sites. The Wildlife Conservation Society (WCS), Fauna and Flora International (FFI) and local rangers and communities carried out these surveys between 2011 and 2015.

We also collected data on encounters of gorilla signs across their whole range by putting together additional patrol data from park rangers and local community scouts. These locals have been collecting information on signs of gorillas as they patrol areas of forest to try and protect them, at a great personal risk.

We looked at 13 different environmental and human factors to see which of these might affect where gorillas lived using the range-wide data. We ran statistical analyses on these to create a map of the probability of presence for the gorillas. Our analysis showed us which factors had a significant effect on gorilla occupancy (whether gorillas were present).

To calculate the total range of the gorillas, we used our

map of the probabilities of presence from the occupancy analysis. We defined the current gorilla range as all areas with a probability threshold greater than 35% (See figure 3).

We multiplied the density of gorillas obtained from the nest counts at the ten sites by the total range size to calculate the total number of individuals.

Results

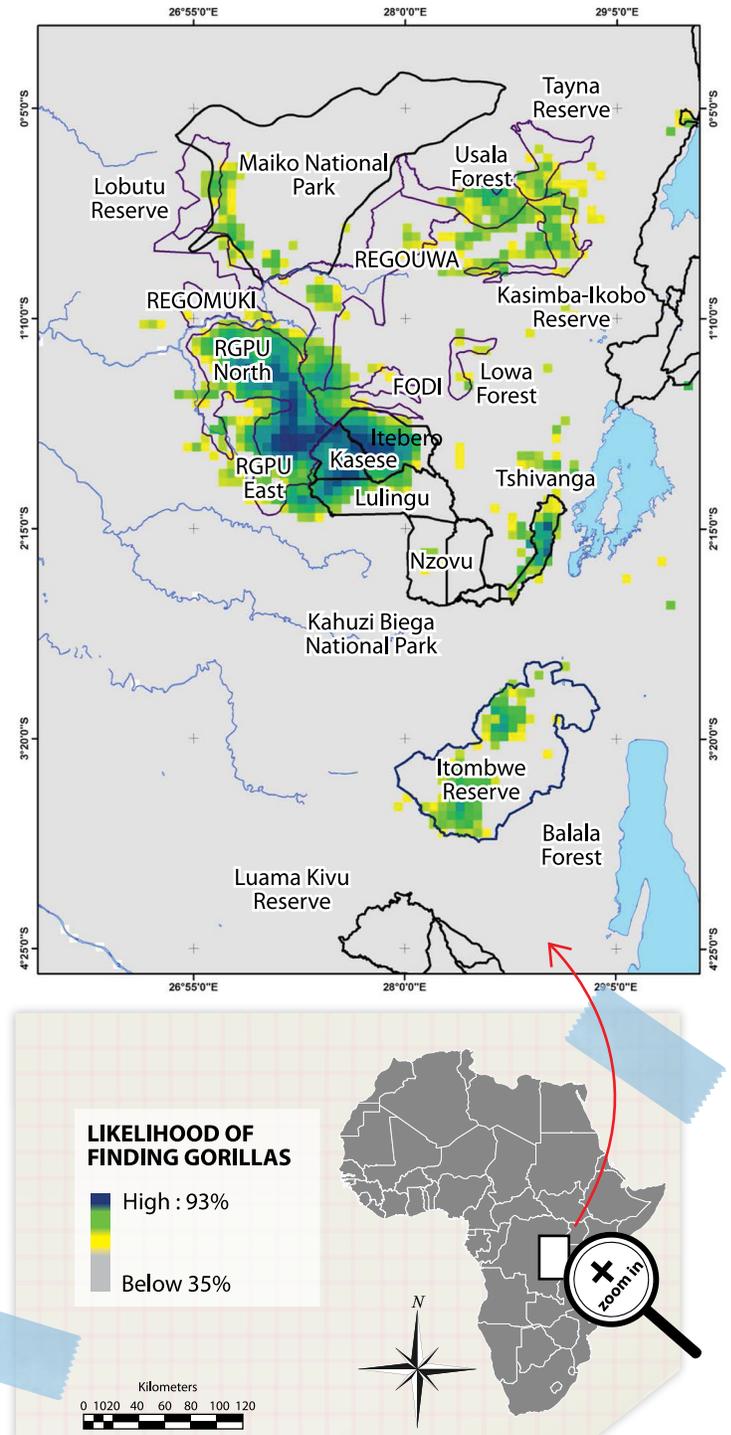
- ①. By comparing the area which was surveyed in 1994-95 in the Kahuzi Biega National Park, we found that gorilla densities had dramatically declined. We used this to calculate an 86.6% reduction in gorilla numbers in this area.
- ②. When we compared the nest encounter rates, we saw an average decline of 94.2% in six out of ten sites between 1994 and 2015.
- ③. At one site, there was an increase in encounter rates. In the 1990s, the population here halved but since the early 2000s, targeted protection efforts and the recovery of gorilla tourism have helped to re-grow it.
- ④. We found that Grauer's gorillas are most likely to be in high altitude areas, far away from where people are clearing forest, and with a high tree cover. This helped us to identify three areas that are critical for conservation of the Grauer's gorilla. The size of this area has reduced by 29.5% since 1994. We also found that mining sites were more likely to be found where remaining gorillas live.
- ⑤. We calculated the total area of habitat for the Grauer's gorilla to be 19,700km² (Fig. 3).

By calculating the average density of gorillas, we were able to estimate the total population of the Grauer's gorilla to be only 3,800 individuals. This is a 77% decline in numbers in just 20 years.

Figure 3:

Gorilla distribution range (habitat size). The grey areas are where the likelihood of finding gorillas was less than 35% and we assume there are unlikely to be many gorillas (if any) in this region.

Africa with Countries: <https://freevectormaps.com/>



Discussion

The *average generation time* of Grauer's gorillas is 20 years - almost as long as for humans. This means that in just one generation, there has been a 77% decline in the population size.

This decline makes the Grauer's gorilla Critically Endangered on the IUCN Red List of Threatened Species and now makes both gorilla species (Eastern and Western) and all four subspecies Critically Endangered. This is the highest category of threat before extinction.

We recommend the creation of two new protected areas

for Grauer's gorilla. The Congolese parks authority, local communities, WCS and WWF have already created one of these, the Itombwe Natural Reserve. We are also working with communities to establish the Oku Primate Reserve.

We also recommend preventing mining in protected areas, and the disarmament (removal of weapons) of the groups that control the mines. It will require a big effort from the government to take back control of this part of the country.

If nothing is done, we believe that we are likely to lose Grauer's gorilla from many parts of its range within five years.

Conclusion

The Eastern and Western gorilla species are among 188 species of mammals that are currently classified as Critically Endangered.

All of these species have received this status because of the work of scientists making population studies like ours. Population studies are important to increase awareness of the threat that species are facing. Would you like to work as a population ecologist one day?

By increasing awareness, we can hope to encourage governments to take action. Personal donations to conservation groups such as the Wildlife Conservation Society, Fauna and Flora International and Chester Zoo, go a long way in helping to protect these animals. Hopefully, these efforts might help to start rebuilding the Grauer's gorilla numbers again, as it happened with the Mountain gorillas.

Check your understanding

- 1 Field teams walked along straight lines in the forest (as straight as they could!), looking for gorilla nests. What other signs do you think the teams could have been looking for?
- 2 Gorillas are a semi-nomadic species, moving around within an annual home range, although they do not guard fixed territories. Their diet consists mostly of herbs, fruit, bark and other plant parts. Why do you think this diet would cause them to be nomadic?
- 3 In one site that we studied, the nest encounter rate was higher than in 1994-95. Part of the reason for the growth of this population was a gorilla tourism programme. Why do you think that this might have helped the gorilla population to grow?
- 4 Why do you think it's important for the mining to be stopped in protected areas?

Glossary of Key Terms

Bushmeat – meat from wild animals. In the DRC, people hunt gorillas for their meat because they are large, and easier to find and kill than monkeys

Civil war – a war between different groups of people in the same country. The civil war in the DRC lasted from 1996 until 2003

Critically endangered – this is the highest category of risk on the “Red List” before extinction

Deforestation – when humans cut down forests for their needs. They might sell the wood, or use the land to grow crops or raise animals

Encounter rate – the number of gorilla nests (or signs) that researchers counted per km walked

Endangered – the term given to a species, or subspecies that is at risk of extinction

Endemic – when a population of organisms are restricted to an area. The Grauer’s gorilla is *endemic* to eastern DRC.

Generation time – as defined in the IUCN Red List, is the average age of parents of the current offspring in the population. As a comparison, in human populations a typical generation time is 22 to 32 years.

Habitat – the place, or type of place, where an animal lives

IUCN – the International Union for the Conservation of Nature. This is the organisation that manages the “Red List of Threatened Species”

Line transect survey – a data collection method used by scientists to estimate population density of living organisms. A tape measure is laid down and scientists count the number of times the living organism, or signs of the organism (e.g. nests), are sighted. Learn more at <http://pbsg.npolar.no/en/methods/linetrans.html>

Militia – a military force that is not controlled by the government

Primate – the order of animals that includes apes (like the gorilla), monkeys and hominins (humans – us!)

Species – a group of similar organisms that are able to breed with each other. The Eastern and Western gorillas are two different species because they cannot breed with each other

Significant – a result that is likely not due to chance, but rather due to a real process

Subspecies – a race of a species that is geographically separated and genetically different from another population, but is still able to breed with the other. The Grauer’s gorilla and the Mountain gorilla are two subspecies of the Eastern gorilla

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Why do gorillas build new nests every night?

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- 4 Why do you think it's important for the mining to be stopped in protected areas?

1 The teams could have looked for footprints, feces (poo!), discarded food, paths and trails created by the animals.

2 In the forest, different plants and trees are often distributed patchily and will have fruit that ripen at different times of the year. The gorillas have to move through the forest to find the fruit when it is ripe enough to eat. Remember that a big male can eat 40 pounds of fruit and vegetables every day. That's a lot of food that they have to find!

3 Gorilla tourism allows tourists to go on guided treks into the forest to try to see wild gorillas. Regularly visiting the gorilla groups provides protection for them as well as income for local employment which is what has protected the gorillas. The treks are run by experienced guides so that the gorillas (and the tourists!) are not put at any risk. This form of tourism is known as "sustainable tourism" because the money that it generates can form a reliable income for the country, create jobs for local people and increase awareness about the importance of the gorillas both locally and internationally. After a war, building up the economy and creating jobs for local people are two of the most important things to make a country and its inhabitants (including the gorillas) safe again.

4 The protected areas are the places that are most important for the survival of the Grauer's gorilla population. Because the mines are often very far away from other villages or towns, the miners hunt wild meat (known as bushmeat) to survive. Miners will hunt gorillas around their camps because they provide them with a lot of meat per gun cartridge (compared to monkeys), and they are quite easy to kill: they tend to move on the ground and can be tracked easily. Even though the gorillas are protected by law, the forests are so large and the mines are so isolated that it makes it very hard to stop people hunting them. The easiest way to protect the gorillas is therefore to shut the mine down entirely.