



Rukina's Remarkable Family

*Steep mountains, impenetrable forest and muddy ground are all part of a day's work for **MARTHA ROBBINS**. Far from her home base at the **MAX PLANCK INSTITUTE FOR EVOLUTIONARY ANTHROPOLOGY** in Leipzig, she roams the Bwindi Impenetrable National Park in Uganda in her study of mountain gorillas. She shares the large and small dramas that mark the lives of these rare primates – and she is also not a stranger to a certain amount of adventure.*

“It's better if we're on higher ground than them,” says Martha Robbins, pointing to a tangle of black bodies about 10 meters away. Could we be in danger? It all seems so innocent. The gorillas are dozing under the narrow rays of the morning sun that pierce the dense vegetation here in Bwindi Impenetrable National Park in southwestern Uganda. Then suddenly, as if they had understood the words of the Max Planck scientist, a few of the apes awake. ▶

PHOTO: MPI FOR EVOLUTIONARY ANTHROPOLOGY – MARTHA ROBBINS



PHOTO: ROUF SCHULTEN

Mutual grooming session: Happy grooms another group member.

A two-year-old youngster named “Happy” amuses himself by beating his fists on the chest of the alpha male Rukina, who stoically endures the treatment. Now he is staring at the human intruders. Happy has known Martha and her assistant Gaad Twinomujuni since he was born. But the two unknown visitors catch his attention – strangers he’s never seen before. Even as he romps upside down among the branches, he never takes his eyes off them.

Suddenly, either goaded by the little one’s high spirits or in order to protect him, Rukina leaps up and comes toward us, standing almost upright, 200 kilos with powerful shoulders and a huge head. His body emits a sharp and pungent smell. We gulp. Martha Robbins remains calm. “Don’t move,” she whispers. We can almost feel the breath of the silverback as he walks several meters away from us without so much as a sideways glance. That’s how sure he is of himself. Then, for a few seconds, he stands still, draws himself up once again and leaves us in no doubt of what he means: “Friends, watch your step! This is my territory.” Message received. In the days that follow, Rukina won’t even deign to notice us. “If he was serious, things would

be different,” Martha casually explains, “but gorillas are not usually aggressive creatures.”

Still wide-eyed, we turn around to see a blackback, a male who has not quite reached maturity, silhouetted against the morning sun beneath a lone tree further up the slope. Marembo appears engrossed by his world, quiet, even solemn. Scenes like this still affect Martha Robbins. An American by birth, she has been observing this gorilla group since 1998 on behalf of the Max Planck Institute for Evolutionary Anthropology. There are 28 to 30 such groups in Bwindi – the exact number is not known for sure. It’s a little like watching a daily soap opera: friends, enemies, fights, sex, births and deaths. Dramas played out by 16 principal actors: the large alpha Rukina, four blackbacks like Marembo, six females and five youths and infants. “It’s a relatively large group,” Martha notes. “They let me into their lives, and I turn their lives into science.”

STUDYING GORILLAS IS A TOUGH JOB

Gorillas can live under a variety of ecological conditions. The animals’ diet affects their social behavior and their reproduction, and scientists

want to understand the extent of those effects. For example, the ecological conditions for Bwindi’s mountain gorillas differ from those of their counterparts in Rwanda and from those of the lowland gorillas in Africa’s Congo Basin. Ecological variations can also affect the composition of the groups. “The number of females in a group can determine the number of males,” says the Max Planck biologist. She has a collaboration with scientists from the Kari- soke Research Center, Rwanda to analyze the data collected during 40 years of gorilla research there. She also supervises students studying lowland gorillas in Gabon, the Republic of the Congo and the Central African Republic. “Together, these studies allow us to make some unique comparisons between gorillas in differing ecosystems.”

She is still whispering; the scientists want to disturb the creatures as little as possible in order to be able to observe their natural behavior. For research purposes, the group has become habituated, meaning that the gorillas don’t run away at the approach of humans. “But they are not pets or like animals in a zoo,” as Martha will repeat time and again as we search for the gorillas each morning in the national park.

The local inhabitants call this the impenetrable forest. It takes up to two hours for us to struggle up the steep slopes, getting tangled in lianas and stumbling over fallen trees as we fight our way through the undergrowth. Gorilla research in Bwindi is hard work, even for Martha. Every piece of data is paid for in sweat. She occasionally clambers up the sometimes extremely steep inclines with her left hand on her hip and her head bent low so she can see no more than a few meters in front of her, rather than look at what lies ahead. “Tricks like that make it mentally easier,” she explains. The ground underfoot also saps one’s strength: the slopes are covered up to a meter deep in leaves and scrub. We stagger and stumble. Without a

stick to act as a third leg, we would have long since fallen down.

Martha and other researchers and their staff recently combed meter for meter through the green hills of the park which, at 330 square kilometers, is somewhat larger than Munich. Their goal was to count every single mountain gorilla in Bwindi in the space of two and a half months. “Absolute madness,” the 40-year-old recalls. “But fantastic too, because there were people from Uganda, Rwanda and the Democratic Republic of the Congo all working together.” She talks passionately about the census, the third in 10 years. Over the course of 2.5 months, teams each spent 10 days searching the park for gorillas and their signs – excrement or sleeping nests – with such thoroughness that scarcely a single ape escaped them. Some teams, despite their GPS, were lost for hours in the darkness before turning up again. After 9 hours of gorilla trekking in the pouring rain, with feet and socks that seemed permanently wet, the exhaustion plainly

showed on the faces of researchers around the evening campfire.

GRAY HAIRS POINT TO A SILVERBACK

Katarina Gushanski and Linda Vigilant, head of the Genetics Laboratory in Leipzig, analyzed each of the 650 dung samples collected to establish its genetic fingerprint. This process, used for the first time in a census in Bwindi, makes it possible to determine each gorilla’s identity. The size of the excreta varies depending on the animal’s age and gender and reveals information on group structure. Gray hairs in a nest point to a silverback. The results indicate that, in contrast to the approximately 335 gorillas estimated by field methods alone, there are actually about 300 gorillas in Bwindi. The discrepancy was due to some gorillas or groups being counted twice due to the difficulty of distinguishing them based on nest sites alone. This casts uncertainty on the previous sense of a positive trend in the population size,

but this “genetic censusing” method is a refinement that adds precision to the field methods and will likely be used again in the future. The researchers will be able to monitor changes in group composition and dispersal patterns with such genetic tracking methods.

The national park is only a small island surrounded by a region of extremely high human population density. The inhabitants live in poverty and many of them, out of sheer deprivation, would turn to poaching if rangers did not guard the park. Poaching is also discouraged by the profits that local communities gain from tourism at the other end of the park, in Buhoma, where four more groups of gorillas have been habituated. So far this arrangement has been successful, but who knows if it can last? Less than a hundred kilometers away, on the Congo side of the Virunga Mountains, rebels in recent months have suddenly started shooting gorillas. It’s been a bitter loss, especially because the Virungas

Just a little larger than Munich: Bwindi National Park in Uganda is one of the few places in the world where gorillas still live.



PHOTO: ROUF SCHULTEN



PHOTOS: ROLF SCHULTEN (2)

Martha Robbins and her assistant Gaad Twinomujuni sometimes spend days on end following the gorilla group they have been observing since 1998.



Every detail is carefully recorded – this is how researchers document the behavior and lifestyle of the gorillas.

and Bwindi contain a total of only around 720 mountain gorillas – the last of their species.

“No gorilla researcher can ignore their responsibility to protect the animals,” says Martha as she stares down into a ravine. “Just beyond the next hill are the first of the farmers’ tea and coffee plantations. There isn’t even a buffer zone beyond the park boundary.” So there is no chance of enlarging the national

park. The apes, of course, have no idea. When we arrived today, we found them resting again. At such times, the group bunches together and nothing happens for hours. “It takes patience to be a gorilla researcher,” Martha murmurs, “lots of patience.” We wait, and wait, and wait, as the gorillas rest and digest. Gorillas generally exude an infectious feeling of calm. But suddenly, as if in response to an inaudible command, the dozing stops and, before you know it, the gorillas get up to start feeding and can suddenly be on all sides of you. That can be a magnificent moment, but also a difficult one. Every effort is made to follow the rule of maintaining at least seven meters’ distance between humans and gorillas, which is meant to prevent us from passing on our diseases to the apes.

NOT JUST LEAVES ON THE MENU

Without warning, we find ourselves confronted by Byiza, a blackback

and notorious troublemaker, as Martha says. Byiza gives us a glance, and then withdraws into the greenery, reaches out for a tall branch full of leaves, just manages to grasp it and jerks forcefully downward until it snaps. Carefully, and with a practiced hand, he peels the outer skin from a stalk, appraises it like a connoisseur, and pops it into his mouth. Staring at the sky, he sits and chews, lost in contemplation.

Nutritional ecology is one of Martha Robbins’ specialties. “No one knew exactly what the gorillas eat here,” she says, emphasizing in the same breath a fundamental problem: even though gorillas can be found in quite different environments, “80 percent of what we know is the product of 40 years of research in Kari-oke, and that still dictates many people’s perceptions.” Indeed, anyone who hears the word “gorilla” tends to think of the murdered Dian Fossey and the still extant Karisoke research station in the Virunga Mountains on the borders of Rwan-



A successful silverback: Rukina defeated Zeus, the leader under whom he grew up.

PHOTO: MPI FOR EVOLUTIONARY ANTHROPOLOGY - MARTHA ROBBINS

da, the Congo and Uganda. Accordingly, for a long time, both Bwindi mountain gorillas and lowland gorillas in central Africa were thought to be exclusively leaf-eaters, like the mountain gorillas of Rwanda.

But the Virunga Mountains that reach heights of up to 4,500 meters are an extreme environment in which, for example, no fruits grow. Not so in Bwindi, where the mountains are no more than 2,600 meters high: it’s warmer here, there are more plant species, and there are fruits available. Hence, the gorillas behave differently from those in the Virungas: “The animals in our group frequently eat fruit,” Martha explains, “almost one day in three.” The gorillas spend between 10 and 15 percent of their time searching for their favorite fruits. Lowland gorillas spend 40 percent of their time doing so.

Their choice of fruits varies, because even in the relatively small habitat of Bwindi, the ecological conditions vary according to altitude. Therefore, the gorilla groups visited by the tourists in lower-lying Buhoma not only eat more fruit than Rukina’s group, but in some cases, totally different kinds. Even the two groups studied in Buhoma – living in the same environment – have developed their own tastes, as Martha’s

colleague Jessica Ganas discovered. “Maybe the two groups traditionally have different nutritional patterns,” says Martha, “but it may also be that they choose different plants with a similar nutritional content.”

FRICTION WHILE SEARCHING FOR FOOD

The choice of food depends on the availability and nutritional value of different plants. The gorillas optimize their sugar and protein requirements. Even in different regions, gorilla groups ultimately achieve the same nutritional value despite eating different plants. In months when fruit is unavailable, they compensate for the lack of sugar and fiber with herbaceous vegetation. In any case, Bwindi Impenetrable National Park offers enough high-quality food to enable the gorillas to survive and continue to reproduce, the biologist emphasizes. She and colleagues intend, over the coming years, to systematically record all information deriving from censuses and the ecology and demography of the Bwindi gorillas to then model what the potential is for the gorilla population to continue increasing in size. In the event of a disturbance caused by, for example, global warming, this fundamental data is the only basis by which researchers can tell whether

anything genuinely unusual happens, or whether the resulting changes are within normal limits.

It is clear from the Max Planck scientists’ latest findings that the Bwindi mountain gorillas have far larger territories – covering 7 to 20 square kilometers – than their counterparts in Rwanda who, for lack of availability, have to do without fruit, but have highly abundant herbaceous vegetation in their habitat. The larger the group, the more frequent and extensive are its wanderings, as Jessica Ganas and Martha Robbins have recently confirmed. The average gorilla group has 10 members; the maximum can be more than 20 to 30 (one group in Rwanda exceeded 60). By widening the area they cover, the animals in larger groups reduce the risk of conflicts over food. Nevertheless, friction surfaces frequently, especially when feeding on fruit, which occurs in clumped, discrete patches. Lowland gorillas in western Africa supplement their diet mainly with fruits that can be found scattered over wide areas. They therefore tend to wander more when the fruits are in season, which corresponds with less time spent resting. Consequently, their groups do not reach the same size as mountain gorilla

GENETIC CLUES TO A WANDERING LIFE

Just as the technique is used in forensic science to identify humans, gorillas, too, have a genetic fingerprint that, once analyzed, can be used to unambiguously identify a specific animal. “Genetics has dramatically changed and simplified field research,” explains Martha Robbins. A sample of hair or excreta is sufficient to enable Linda Vigilant and her colleagues at the Max Planck Institute in Leipzig to extract enough genetic material for analysis. Of course, it must be possible to attribute each sample to a specific individual. This technology has enabled Martha Robbins to, for instance, track the movements of a silverback that left her habituated group. When counting gorillas in Bwindi, they determined that this silverback was initially a solitary male before becoming the alpha male of a group.

In a few years’ time, when the next census is carried out, genetic analysis will show whether and how the distribution of gorilla groups in Bwindi National Park has changed and whether this is due to human influence. It is possible to identify changes in group size, as well as whether individual animals have transferred to other groups. Genetics is also enabling researchers to discover the parentage of offspring – data that is essential to ascertain the reproductive success of the males.



An infectious calmness: Gorillas can spend hours doing nothing – leaving the researchers to do likewise.

clans. “Each additional group member,” Martha explains, “would reduce the fruit ration per head and increase the potential for feeding competition.”

As she is speaking, she is interrupted by loud screams. The biologist has a suspicion that something serious has happened, and hastens through the undergrowth. About 50 meters away, we come upon a small patch of dried-out swamp. The group is in a state of extreme agitation. The screams are coming from the thicket in front of us where Byiza and Sikio,

the second oldest blackback, are partially concealed. Each is challenging the other, louder and louder, with progressively more overt aggression. A fight is erupting. Moments later, Rukina storms past to the right of us into the thicket, from which a shrill squeal now emanates. “Rukina is likely attacking Sikio,” Martha suspects. “In clashes like this, the silverback tends to support the weaker individual, although this is very interesting because Byiza, not Sikio, initiated the fight and caused it to escalate. She has a feeling that Byiza

may have picked the fight, knowing that if Rukina gave support, it would be against Sikio.

How gorillas use their territory is a key issue for Martha, because it is their environment that affects their social behavior. According to one current theory, it is the availability and distribution of food that limits the number of females that can live together in one group. And the number of females determines whether the dominant silverback tolerates a second silverback, a beta animal. The presence of such males increases the potential risk of aggressive behavior.

FEMALES LEAD TO VARIABILITY

Among the fruit-loving lowland gorillas, it is extremely rare to find more than one adult male in a group, whereas this is quite common in groups of mountain gorillas. “This is one of the most important differences between species,” she points out. Maturing blackbacks and young silverbacks must decide whether to remain in their current group, or roam the forest alone or in bachelor groups. Sooner or later, they may challenge a silverback and lure females away from other groups. “If the food situation allows for only a few females,” Martha Robbins emphasizes, “then it is more likely that males will leave their group.”

From a female perspective, it is advantageous to be in a group with several males. We have seen the blackback Marembo hanging around Tindamanyere, a young female, conspicuously often. He seems to be pestering her. She is pregnant and has mated predominantly with Rukina, but not exclusively. Marembo also mated with her, as did the other blackbacks. By creating uncertainty about who sired her offspring, the female ensures that more males will protect them.

From a male perspective, there are tradeoffs for being in a group with other males. By tolerating or at least failing to prevent the presence of



If you want to get ahead: The sagittal crest determines whether a gorilla becomes a successful alpha. A highly developed crest means plenty of offspring.

PHOTO: ROUF SCHULTEN / PHOTO RIGHT: MPI FOR EVOLUTIONARY ANTHROPOLOGY – MARTHA ROBBINS



Martha Robbins has an office in the jungle. Shortly before she is due to arrive, her staff breathes life into the open fire.

in Bwindi were not fathered by the dominant silverbacks. Among lowland gorillas, however, the offspring are always sired by the alpha male.

The Max Planck scientist has entered the data from Karisoke in a computer simulation, which indicates that a second-rank male in Karisoke generally does better, not by leaving its group and living alone, but by biding its time until it can one day exploit an opportunity to challenge the group leader. Until then, it can at least occasionally pass on its genes. The females are safe in any case: the strongest male will win and guard them well.

In real life, however, the laws of nature take their course. As a young silverback in November 2000, Rukina left the group, only to return a few months later. From then on, he continually taunted the then alpha male, Zeus, who wished to avoid open confrontation and therefore took his females off more frequently than before into new territories.

SELF-PROMOTION – APE-STYLE

For three years, the two silverbacks skirmished with one another until it came to a showdown. “Three females in the group were having estrous cycles,” Martha recalls, and that gave Rukina the final impetus: “He had nothing to lose and everything to gain.” It was the younger ape’s strength that triumphed in the final violent clash. Zeus suffered serious injuries. The females still could have followed him, but they did not do so. The allure of a young, attractive and powerful protector was too great. And thus the leadership of the group was decided.

However, not every male gorilla achieves alpha status. Martha’s colleague Thomas Breuer has discovered a criterion that must be met in order to become a successful silverback. For some years now, he has been observing several groups of lowland gorillas that visit a clearing in the Ndoki rainforest in northern Congo.

A striking feature of all silverbacks is the distinctive, frightening bulge on their head, known as the sagittal crest. Using a special camera, Breuer has measured the size of the crests of various silverbacks. And he has found that the greater the crest, the more offspring a silverback has, and the more successful he will be. Martha will have to wait 15 to 20 years to find out how successful Rukina becomes.

At the moment, he is lying in the undergrowth with females Siato, Mugwere and Tindamanyere in a tight embrace. It makes an intimate, even tender scene as he grooms them. But soon the females leave this cozy setting. Rukina is displeased and chases after them. Pow! All three receive a blow for no apparent reason. Acts of violence such as these against females, as well as such threats as the well-known gorilla behavior of chest-beating, are frequent, especially when the females are in estrus. “This behavior could be purely aggressive, designed to make it clear to the females that they shouldn’t get involved with others, but it rarely causes any serious damage,” says Martha. However, it could also be a kind of self-promotion – gorilla-style.

In any case, the females seem unimpressed and fan out to start feeding again. A fully-grown gorilla consumes 20 to 30 kilos of food in a day. The Buhoma groups even treat themselves from time to time to a portion of animal protein in the form of ants. This is unusual behavior for such large animals, but it is unclear whether the nutritional value is sufficient in itself to justify the effort involved in the insect hunt. It takes a lot of time and more than a little skill to collect several hundred tiny insects with hands the size of a gorilla’s. The lowland gorillas in the Central African Republic have specialized in termites, which live in large mounds.

Martha’s colleague Chloé Cipoletta was the first to record the two ways they get at the insects. Using brute force, the apes break off pieces of the



PHOTO: ROUF SCHULTEN

Dietary experts: Gorillas vary their diet depending on their nutritional needs.

termite mounds and bang them on their hands so the insects fall out. Or they simply lick the termites out of these lumps with their tongues. “There could be cultural differences behind these various techniques,” says Martha Robbins, “but that is pure speculation.” In contrast to chimpanzees and orangutans, no one has yet demonstrated culturally induced behavior among gorillas. Cultural behavior is not innate or determined by different environments, but is learned socially and passed on in the same way within a population. Imitation – copying a sequence of actions – is regarded as the primary mechanism.

BIZIBU USES A NEW TECHNIQUE

Martha Robbins may have been well on the way to becoming the first to document cultural behavior by gorillas – a case that dramatically illustrates the ups and downs of field research. Gorillas eat thistles, “and that must be extremely painful,” our biol-

ogist remarks. Normally, they just grasp a leaf in their hands and fold it to reduce the risk of mouth injuries caused by the thorns. But Bizibu, a young female, came up with a new technique: she rolled the leaves into a ball. “It was dramatically different from the usual method,” emphasizes Martha, who was very struck by the observation. This would mean that perhaps the female would have offspring that could acquire the technique through social learning – an indicator of cultural behavior.

The chances were good that Bizibu would stay with the group, since her father was the old silverback Zeus, not Rukina. But in September 2006, Martha’s habituated group interacted

with another gorilla group. These encounters provide the only opportunity for females to have a look at other alpha males – and possibly change allegiances. The silverbacks, of course, make aggressive efforts to prevent a female from changing groups, but the females do sometimes succeed in dispersing. Astonishingly, Bizibu disappeared with the other group that is not habituated. So Martha Robbins will probably never know whether Bizibu’s offspring culturally acquire the new thistle-eating technique. “And while that is really frustrating,” she says, “one of the joys of field work is that you never know what you will see next.”

KLAUS WILHELM

PARTNERS

- ▶ The Institute of Tropical Conservation, which is part of Mbarara University in Uganda and is supported by the Wildlife Conservation Society;
- ▶ The Dian Fossey Gorilla Fund International, which manages the Karisoke Research Center;
- ▶ The Genetics Laboratory of the Max Planck Institute for Evolutionary Anthropology in Leipzig, headed by Linda Vigilant.