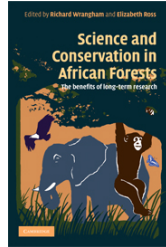


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The Benefits of Longterm Research

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Chapter

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Long-term research and conservation of the Virunga mountain gorillas

BACKGROUND

The Virunga Volcanoes encompass three National Parks in three countries of eastern Central Africa: Mgahinga Gorilla National Park in Uganda, Virunga National Park in the Democratic Republic of the Congo and Volcanoes National Park in Rwanda (Fig. 18.1). This region harbors one of only two remaining populations of mountain gorillas, 380 “Virunga” gorillas (*Gorilla beringei beringei*). The Virungas cover an area of about 425 km² and contain a variety of afromontane habitats, stratified by altitude ranging from 1850 m to 4507 m above sea level. Much of this high altitude vegetation is not suitable for the gorillas (Weber and Vedder, 1983), thus the gorilla population is concentrated below 3400 m in the mid-altitude *Hagenia*–*Hypericum* zone and the lower altitude bamboo zone.

The first National Park in Africa was created in 1925, specifically to protect the mountain gorillas. These magnificent beasts received little attention until 1959, by which time they were thought to number only 400–500 individuals (Schaller, 1963). Following a pioneering study by George Schaller, long-term research and conservation efforts began in 1967 when Dian Fossey established the Karisoke Research Center in Rwanda. Fossey’s study was initiated along the same lines as Jane Goodall’s research on chimpanzees at Gombe in Tanzania, after a meeting with the famous paleoanthropologist, Dr. Louis Leakey.

By the 1970s, the Volcanoes National Park had been reduced to 46% of its original size, so that only 160 km² of forest remained in Rwanda. The bulk of this habitat conversion was for a pyrethrum project, which excised 100 km² of forest in 1968. All forest between 1600 and 2600 m ASL was removed, and an estimated 40%–50% decline in the number of

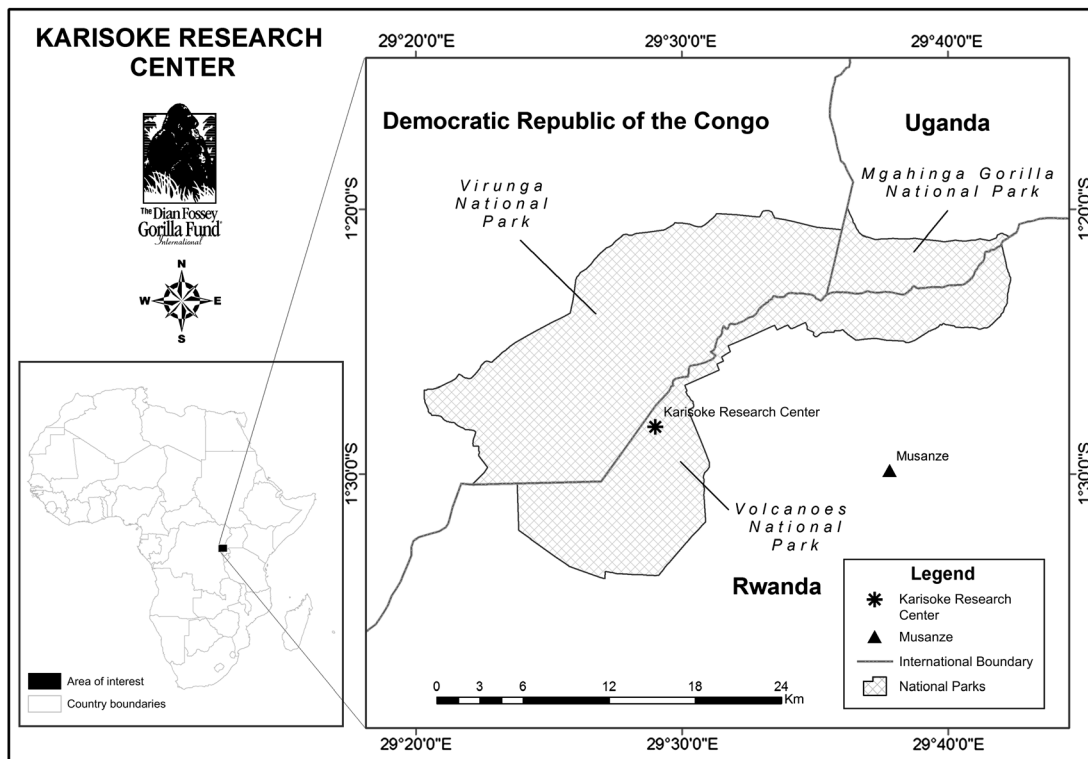


Fig. 18.1. Map of Virunga Volcanoes region.

gorillas ensued (Weber and Vedder, 1983). The population stabilized with the implementation of measures against poachers and their snares in the 1980s and, with increased protection, more gorillas survived in the groups that were monitored daily, and the population increased for the first time in three decades. Today, despite a significant recovery, only a few hundred of these great apes exist and they are classified as Critically Endangered on the IUCN Red List of Threatened Species.

Security has been an overriding factor impacting conservation and research, as the Great Lakes region has been severely affected by fighting between rebel groups and regular armies. More than a decade of civil war and political instability have impacted the Virungas, at times threatening the lives of both gorillas and field staff, and preventing all field operations. Refugees and militia invaded the forest periodically between 1991 and 2001, causing severe habitat degradation by cultivating food in the Park, as well as increasing the likelihood of disease outbreaks, with many people living in unhygienic and unhealthy conditions (Plumptre and Williamson, 2001).

Since 1959, research has made important contributions to mountain gorilla conservation, and we present examples in the following sections.

ECOLOGY AND BEHAVIOR OF MOUNTAIN GORILLAS

As with chimpanzees, mountain gorillas must be “habituated” before details of their social behavior can be studied. Habituation is a process by which wild animals become accustomed to the presence of humans in their vicinity to the point where humans are considered a neutral element in their environment. This requires considerable investment of time and effort, months or more often years, and the key to success is persistent, regular, and frequent neutral contact with the same individuals (Williamson and Feistner, 2003). Anyone considering habituation for research or tourism purposes should bear in mind that habituated individuals are more vulnerable in dangerous situations, since habituation is basically the loss of fear of humans. Habituation makes animals easier to approach, not only by Park staff but also by militias and poachers. The future of any study or tourism population must be contemplated carefully before making the decision to habituate, as their lifelong protection must then be assured.

Habituation allows observers to approach within a few meters, because subjects no longer flee, so behavior can be sampled consistently and fine level behaviors such as subtle social interactions or food

processing can be observed. Observers can also learn to identify individuals, which is essential for research purposes. In the habituated mountain gorilla groups, each animal is named, photographed, its “noseprint” drawn, other physically distinctive characteristics noted, and demographic information recorded systematically. An individual’s mother, date of birth, sex, and other pertinent information are noted as a matter of course. Daily observations of gorillas allow field staff to check on the physical condition of each individual, to remove snares from their habitat, and to intervene rapidly in emergency situations. Precise numbers of habituated gorillas in the Virungas are known through this close monitoring of identified individuals.

A small population of slow-reproducing and long-lived great apes must be studied for many years before we can begin to establish “norms” for their development and behavior. Like the study of chimpanzees in Kibale National Park, Uganda, the long-term research at Karisoke is one of a handful of continuous studies of an animal population that has spanned decades. Conservation practitioners are able to use the results of this research to interpret dramatic instances of natural behavior, such as infanticide, while knowledge of the natural processes of male emigration and female immigration explains transfers and “disappearances” of individuals (e.g., Sicotte, 1993). Data on interbirth intervals and other reproductive parameters are critical to assessing rates of change (Harcourt *et al.*, 1981). Demographic and life history data are especially important for Protected Area managers to evaluate the effectiveness of their activities. A steady increase in mountain gorilla numbers in the 1980s indicated that conservation actions were having positive results.

Similarly, an understanding of gorilla feeding ecology, nutrition, and ranging behavior is important in determining whether the Virunga population could increase in size by occupying more of the habitat, and for improving management practices in areas which are not used by gorillas. For example, ecological data will be crucial to evaluate any “underuse” of parts of the forest (Watts, 1998). If able to assess avoidance of certain areas, Protected Area managers may be able to alleviate detrimental conditions and improve the gorillas’ chances of survival.

Tourism is considered below, but we should mention here that the research center played a critical role in developing the techniques of gorilla habituation: researchers with experience gained at Karisoke designed and initiated gorilla tourism in Rwanda. This successful program incorporated knowledge of the research groups’ diet, daily travel distance and ranging, to anticipate group movements, and locate the gorillas with relative ease. Predictability of daily activity rhythms was

also important and, when possible, visits were timed to coincide with the gorillas' rest periods, facilitating observation conditions for the visitors (Plumptre and Williamson, 2001).

Another concern for the future is whether the size of the mountain gorillas gene pool has been reduced to a level where inbreeding may become a serious problem. A Population and Habitat Viability Assessment (PHVA) and similar analyses have shown that habitat loss is a greater danger to gorilla survival than inbreeding (Harcourt, 1995). Such studies can guide the use of resources and the development of Park management plans.

Many generalizations and assumptions about gorillas have been made, based on our knowledge of only one small population in Rwanda. Western gorillas are much more difficult to study; they rarely lose their fear of humans because:

- (a) the vegetation and the terrain of their flat dense forest habitat make observation difficult, and the gorillas cannot see the trackers from a safe distance;
- (b) their lowland habitat is quite different from montane forest, consequently their ecology is different. Their ranging behavior, in particular, makes them difficult to follow as they leave little trail where they have been feeding, and do not make trails in the vegetation;
- (c) they are often hunted as bushmeat;
- (d) they have sometimes been hunted for "sport".

Consequently, the mountain gorilla model has been utilized not only by other projects in the Great Lakes region, but in the absence of data on western gorillas, research carried out in Rwanda has also provided valuable input to gorilla research and tourism programs in Cameroon, Central African Republic, Gabon and the Republic of the Congo. Similarly, the chimpanzee populations of the Congo Basin have barely been studied and so conservation programs are designed using knowledge of the ecological and behavioral needs of chimpanzees in Tanzania and Uganda.

TOURISM

International awareness of the research center opened the door to tourism. Dian Fossey and now her legacy have been a major draw; even the remains of Karisoke form part of the tourism circuit. Although strictly speaking neither research nor conservation, links between tourism and research are significant, and will be discussed here.

In 1979 plans were announced to convert a large swathe of Virunga Parkland to cattle pasture. At that time, habitat destruction was the greatest threat to gorilla survival and so a means of maintaining the forest and making the gorillas “pay for themselves” was needed urgently. A highly regulated tourism program was initiated, founded on experience gained at Karisoke. Visits by tourists are potentially stressful to the gorillas, so it was important to minimize risks to both gorillas and people. Consequently, important rules were established regarding the number of visitors permissible, the distance to which gorillas can be approached, and a 1-hour time limit imposed. Gorilla tourism gradually became a great success in terms of much-needed revenue, which provided for increased protection of the habitat, and close surveillance of additional gorilla groups. In 1989, tourism was the third highest foreign currency earner for Rwanda after tea and coffee (Weber, 1993), and the revenue earned directly from gorilla tourism is now estimated at US\$3 million per annum. However, financial benefits extend beyond the price of a permit, and tourists brought US\$35 million to Rwanda in 2006 (*New York Times*, 2007).

Tourism with great apes has well-known pros and cons (see also Mugisha, Chapter 11). The greatest risk to gorillas is the potential for introduction of lethal diseases from humans – guides and trackers as well as tourists. With such a small number of gorillas remaining, an infectious disease could devastate the population. While this was recognized at the start of the tourism program, loss of their habitat was a far greater threat to the gorillas at that time. Strict rules were put in place for gorilla tourism, and adherence to these rules is vital to minimizing the associated risks.

Until recently, we relied on speculation, extrapolation, and common sense to evaluate the risks of cross-infection between gorillas and humans. Now the tourism regulations have been reviewed in the light of epidemiological data: studies of captive gorillas show that they are susceptible to human diseases, but do not have the same defences as humans (Homsy, 1999). While most international tourists visiting Rwanda are fairly healthy, and have been inoculated against certain diseases, many pick up respiratory infections on long-haul flights. Illnesses to which the gorillas have never been exposed are potentially the most dangerous.

Soon after tourism began, the Volcanoes Veterinary Center was established in direct response to need – Dian Fossey had determined that declining gorilla numbers in the 1980s were due to human-caused disease and injuries. The veterinary project developed a health-monitoring program for gorillas, and in recent years has expanded this to include park

staff and researchers, providing medical counseling and treatment of common infections, such as intestinal parasites.

Twenty years after tourism was initiated, scientific studies of the impacts of tourism on the gorillas have begun. Targeted research is needed to evaluate impacts, both positive and negative, and to provide information to ensure that tourism is implemented sustainably. Continued study of gorillas in the research groups also provides a baseline from which to judge the impacts of tourism. These data allow conservation practitioners to assess whether new or altered behaviors observed might result from stress caused by tourism (Plumptre and Williamson, 2001).

An important means of coping with tourism demands and assuring adequate revenue for the Protected Area authorities is to revise the price of permits regularly. The mountain gorilla population is too small and too fragile to withstand increasing pressure from tourism. Even with high permit fees, currently US\$500 per person, numbers of visitors do not diminish, but some of the pressures subside, while the revenue accrued by the governing authorities is maintained or increased.

Some of the major lessons learned in relation to tourism have been the following:

- (a) Tourism with such a vulnerable species requires strict enforcement of rules. All sites which promote tourism with great apes should have peer-reviewed guidelines with limits to the duration of visits, the number of visitors permitted, and distance to be maintained between people and gorillas. Projects should include the following components: staff training, health monitoring (apes and people), and guidance in appropriate visitor control and behavior.
- (b) Despite the dangers inherent in tourism, it provides a mechanism for ensuring that great apes and their habitats are valued for many reasons. Tourism has probably saved the gorillas in Rwanda from further habitat loss or degradation.
- (c) The high cost of permits is a necessary means to try to limit the pressures put upon both the apes and the Park authorities.
- (d) Research and tourism activities should be separate. One important aspect of tourism with mountain gorillas is that tourists do not visit the research groups and do not therefore disrupt research, but this is not always the case elsewhere (e.g., Gombe).
- (e) We do not advocate habituation of western gorillas for tourism. It is often assumed that the success seen with mountain gorillas could be exported to the Congo Basin, but this is not the case, in part for the reasons listed above.

- (f) Finally, it should never be forgotten that tourism with gorillas was started, first and foremost, as a means of conserving the gorillas, and not simply for financial gain.

LONG-TERM MONITORING OF THE VIRUNGA GORILLAS

Routine censuses to monitor changes in a population are essential to the understanding of population dynamics, and for conservation practitioners to assess the effectiveness of management strategies. Census results and population statistics not only show changes in the actual numbers of gorillas, but also reproductive health and potential growth are indicated by the age–sex composition of the population (Weber and Vedder, 1983).

In 1959, George Schaller conducted the first extensive study of mountain gorillas and he developed a census technique using nest counts and measurements of dung diameter to estimate population size (Schaller, 1963). Censuses have been carried out at more-or-less 5-year intervals since research on mountain gorillas first began. Surveys in the 1970s showed a drastic decrease from 400–500 to only 250 animals. Immediate protective measures were imposed to prevent further decline. These measures, described below, have led to a slow recovery and growth of the population (Fig. 18.2).

One aspect of long-term monitoring, lacking until relatively recently, was any detailed monitoring of groups outside of the area covered by the research center. Ranger-based monitoring has been developed and implemented as a data collection tool for Park managers (Gray and Kalpers, 2005). It is simple and systematic, and has been applied to all gorilla groups habituated for tourism, greatly expanding our overall knowledge of gorilla demography and habitat use throughout the Virungas.

Population monitoring has also enabled us to assess the effects of war and instability from 1991 and 2001. It is notable that increases in the Virunga population can be accounted for by one subsection of the population: the Karisoke research groups plus the Susa tourist group. If other groups have not fared so well, this is likely to result from differing levels of protection, human disturbance, and demographic factors (Kalpers *et al.*, 2003).

Population modeling has shown that the Virunga population is viable for at least the next 100 years in the absence of severe disturbance, but that the population could easily suffer a heavy decline in the event of environmental perturbations such as habitat loss or degradation. A malicious new threat has emerged in the DRC: at least eight gorillas were shot

dead in three incidents in 2007. News reports indicated that these deliberate killings were intended to deter conservation activities, thus facilitating the lucrative but illegal production of charcoal inside the Virunga National Park (BBC, 2007).

SURVEILLANCE OF ILLEGAL ACTIVITIES

Anti-poaching patrols, which stemmed from the research program, are an essential aspect of Park management and biodiversity protection. To combat the illegal killing of antelope and buffalo for their meat, Dian Fossey initially tried to thwart poacher activities by cutting their trap-lines. She also herded gorillas away from areas where snares had been set, as they could become unintended victims. But, after the slaying of several gorillas in attempts to capture their infants, Fossey employed anti-poaching teams and established regular patrols in 1978. The formation of the Mountain Gorilla Project a year later increased and improved patrols and law enforcement, and thus discouraged interest in gorilla infants. The subsequent creation of the regional International Gorilla Conservation Program led to greater collaboration, coordination of ranger patrols and sharing of information among the three range states. In recent years, the gorilla groups that have been monitored most closely for either research or tourism have experienced the highest growth rates (Kalpers *et al.*, 2003).

Research into poaching has included an assessment of the frequency and location of snares in the park to determine patrol effectiveness. In the 1990s, an analysis of patrol effort showed that, as the number of patrols increased, more snares were found, but that the number of snares per patrol dropped after patrols reached 20 days per month. There were peaks in poaching around Christmas and Easter, when households need extra disposable income, which necessitated extra protection efforts at these times (Plumptre and Williamson, 2001).

During the last decade, ranger-based monitoring (RBM) has become a key management tool throughout the Virungas. Information is collected not only on the gorillas, but also on illegal use of resources in the forest. Knowledge of the distribution of illegal activities allows patrol coverage to be targeted. The level of illegal activities is now high at all times of year, reflecting human demands for natural resources. RBM data have shown that, in recent years, increased patrol effort has not necessarily resulted in a reduction in illegal activities, and that it is also necessary to investigate the links between resource utilization and the economic situation of local people. The gorillas' habitat is surrounded

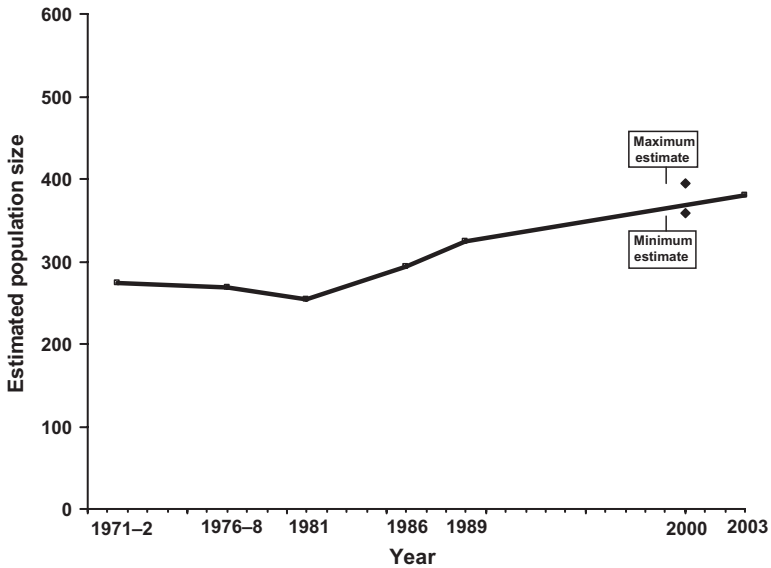


Fig. 18.2. Changes in the Virunga gorilla population from 1971 to 2003.

by one of the highest human population densities in Africa, at 400–600 people per km². The fertile volcanic soil supports this high-density human population of subsistence farmers, and there is constant pressure along the Park edges for additional agricultural land. Activities are now being developed to assist local communities to meet their needs, with the intention of reducing pressure on the forest (Gray and Kalpers, 2005).

As a result of renewed direct poaching of gorillas since 2002, there are currently 11 confiscated infants (four mountain and 7 Grauer’s gorillas) in the care of the Mountain Gorilla Veterinary Project, Dian Fossey Gorilla Fund International, and the Rwandan and Congolese National Park authorities. This partnership of veterinary and behavioral specialists provides the care necessary for these orphans to recover from the devastating trauma of poaching. To date, no mountain gorillas have been successfully reintroduced to the wild (Whittier and Fawcett, 2006). It is proposed that, by caring for and rehabilitating a young female mountain gorilla, Maisha, until she is age-appropriate for a transfer between gorilla groups in the wild (i.e., adolescent), it may be possible to reintroduce her to a wild mountain gorilla group or lone silverback. Behavioral data from Karisoke are guiding decisions about diet, socialization, and the future choice and timing of any reintroduction attempts. This plan, if successful, will serve as a model for mountain gorilla reintroductions.



Fig. 18.3. A silverback male mountain gorilla and family. © David Pluth.

ECOLOGICAL RESEARCH IN THE VIRUNGAS

The Virungas form part of the Albertine Rift biodiversity hotspot, harboring an exceptionally high number of endemic plants and animals, and the scope of research activities has broadened over time to include other aspects of the Park's biodiversity. Recently, research has expanded to cover key species and habitats, focusing on endemics such as the Golden Monkey (*Cercopithecus mitis kandti*) and Grauer's swamp warbler (*Bradypterus graueri*).

An ecosystem approach, in addition to a focus on gorillas, has provided valuable information to bolster the arguments for keeping the forest cover on the volcanoes. In the 1980s, it was demonstrated that converting the entire Park to agricultural land would only provide extremely marginal land for the equivalent of 1 year of Rwanda's human population growth. The slopes of the volcanoes are too steep for sustainable agricultural production and could only provide short-term benefits rather than the longer-term benefits of gorilla tourism. Regional land use could not increase in any significant way in the Ruhengeri prefecture (Weber, 1987).

A high level of rainfall is generated in the volcanoes, and this rain is captured by the forest in a way that minimizes erosion and provides a gradual release of water into surrounding areas, and thus a perennial supply of clean water. The Volcanoes National Park forms only 0.5% of

Rwanda's surface area but contributes a vital 10% of the water catchment (Weber, 1987).

GIS and remote sensing have become established technologies in conservation management. Satellite imagery has been used to produce vegetation maps of the Virungas to address questions about the habitat's carrying capacity, the impacts of illegal human activities, and changes in the type and extent of vegetation cover over time.

Monitoring is essential to effective management. Ecological functions of the forest must be demonstrated, tourism and other impacts on the ecosystem should be monitored, to enable us to develop and improve tools with which to protect the Park and the gorillas. The positive integration of research and management will ensure that management decisions are based on sound scientific data.

CAPACITY BUILDING

A crucial role of the Karisoke Research Center is to contribute to the scientific training of the next generation of conservation biologists. Rwanda has the political will to protect mountain gorillas and their habitats; however, much of the contemporary science has been conducted by expatriate researchers. It is important to build upon the ability of Rwandan scientists and conservation managers to conduct conservation-oriented research and implement their findings. Reports, theses, and publications have been written, but the human knowledge base developed during the research process is not always readily available in-country to assist with the implementation of conservation strategies. Efforts must be made to rectify this.

Courses at the National University were interrupted by the genocide in 1994, resulting in a lack of national scientists to lead conservation efforts, a situation common to technical capacities of all sectors in Rwanda. Post-genocide, the Government's strategic plan relies upon the development of human and institutional resources. Given its 40-year history, the Karisoke Research Center can play an important role in supporting the education of Rwandan scientists. Currently, around 150 students participate annually in field-based conservation courses at the research center, while others conduct research for their undergraduate dissertations. This provides opportunities to train young scientists for the future, and also to address important Park management needs: student projects address priority areas of research, identified in Park management plans, and are often of an applied nature (e.g., crop-raiding, tourism values, vegetation dynamics).

SOCIOECONOMIC RESEARCH

We indicated earlier that illegal activities within the Park are a concern for the protection of mountain gorillas. These activities are intended mainly to meet the subsistence needs of the poorest people around the Park. Like many National Parks in Africa, the Volcanoes National Park was managed initially following a strict exclusionary Protected Area model. However, a key focus of contemporary conservation strategies is on local communities living around the Park, with the intention of addressing local welfare needs and mitigating some of the conservation threats caused by human poverty.

The socioeconomic challenges facing conservation in the Virungas are land shortages, high human population growth, high human mortality, immigration of young men, low levels of literacy, and extreme poverty. The consequences have been high rates of soil erosion and loss of soil fertility, flooding, deforestation, and loss of biodiversity through habitat destruction and hunting, problems exacerbated during the 1997–1998 insurgency in the northwest of Rwanda.

The presence of subsistence farming households around the Park has serious implications for conservation. Many households close to the Park depend on resources in the forest, such as clean water, bamboo, grass for thatching, honey, medicinal plants, and bushmeat. In addition, these households face the difficulties of inadequate farmland, little prospect of employment, and no access to credit, and therefore possess few livelihood alternatives. Moreover, the negative aspects of living next to a Protected Area, such as crop-raiding by wild animals, hit the poorest families hardest and reinforce negative attitudes towards the Park (Plumptre *et al.*, 2004). Thus local people meeting subsistence needs may be considered as one of the greatest threats to survival of the mountain gorilla and the integrity of their habitat (Bush, 2004).

Addressing social threats to conservation through local community development initiatives is seen currently as a key method of mitigating such problems. Integrated Conservation and Development Projects (ICDPs) are now a common approach in developing countries. It is usually assumed that ICDPs result in the conservation of natural resources, while at the same time benefiting local communities who may forego less environmentally friendly activities. However, quantitative assessments of ICDP strategies are rare and have shown variable results in terms of meeting either environmental or welfare goals. A key challenge to the successful implementation of social and economic development programs intended to meet conservation objectives is a rigorous understanding of

the dynamics of use of the Park by local people in order to design successful interventions. However, conservationists whose core skills lie mainly in the biological sciences may not be best equipped to identify and implement development programs; conservation practitioners therefore must work closely with development organizations to ensure the survival of these forests.

Given that the principal sources of threat to the gorillas and their habitat are local people and their social and economic circumstances, socioeconomic data are needed to qualify and quantify these threats. Are community conservation approaches improving conservation prospects? To date, socioeconomic research has been largely qualitative, focusing on identifying the means by which people live, and on the importance of Protected Area resources in their lives; however, few quantitative data are available on this dynamic. Such data, coupled with relevant biological data from within the Park, could provide an important baseline from which to assess the impact of community conservation projects on human welfare and conservation. Importantly, they can guide the planning of project interventions (Bush, 2004). A study carried out in 2002 showed that people's attitudes towards conservation are improving; however, benefits from tourism are perceived to accrue primarily at a national rather than local level, thus equity issues must be addressed (Plumptre *et al.*, 2004). In addition, a broader valuation of ecosystem services will enable governments to make informed decisions about conservation and management strategies and contribute to the economic justification for financing conservation.

CONSERVATION EDUCATION

An important responsibility of the research community is the dissemination of research results, most commonly through scientific publications. However, in a conservation context it is also important that this information be translated into a form readily accessible to various stakeholders – local, national, and international. The results of research at Karisoke have formed the basis of several education initiatives, which have been successful in raising awareness of the conservation value of the forest and, in particular, of ecosystem services.

SUMMARY

Research on the “Karisoke” gorillas has attracted worldwide attention, fueled through a multitude of nature documentaries and magazine

articles about their lives, notably *National Geographic* magazine and the movie “Gorillas in the Mist”. Public commitment to try to save the mountain gorillas provides funds for conservation activities through donors and international NGOs. This high profile also attracts many visitors to Rwanda, bringing revenue to the country and reinforcing pride in the national heritage. A positive image enhanced by a well-managed tourism program has stimulated development and generated publicity.

These factors all contribute to strong government commitment to gorilla conservation, which is key to their survival. In a region where the demand for land is intense, the risk of forest conversion for human settlement, cattle pasture, or agriculture has not been eliminated completely. In the last decade, there have been several attempts by local political leaders to degazette areas of the National Park, but intervention by National Government prevented further loss of the forest. Government commitment is also seen in the security provided to researchers and tourists on a daily basis in the form of military escorts. The Congolese portion of the Virungas is already a UNESCO World Heritage Site, and procedures are under way to award this status to the Rwandan sector.

Dian Fossey predicted that mountain gorillas could become extinct within the same century that they were recognized scientifically. Without the attention generated by the research center, support developed though tourism, and consequent commitment from the governments, gorillas would perhaps no longer exist in the Virungas.

The Karisoke Research Center recently celebrated 40 years of almost continuous study of the gorillas. Field activities were suspended periodically during the 1994 genocide and subsequent insecurity, throughout which it was vital to support the staff and their families, and to ensure their safety. To this end, the gorilla trackers and anti-poaching patrols have undergone paramilitary training and have endured difficult and dangerous working conditions. Much of the success of the research and conservation programs, and the continued survival of the mountain gorillas, can be attributed to the long-term dedication and hard work of the field staff of Karisoke and of the Rwandan Office of Tourism and National Parks.

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