

Gorilla beringei beringei

(Gorilla gorilla beringei)

Status report

**Document based essentially on
the gorilla report prepared by IRSNB for CMS in 2005,
the World Atlas of Great Apes and their Conservation (published in 2005),
and numerous additional primary publications**

**IRSNB
July 2007**

1. TAXONOMY AND NOMENCLATURE

1.1. Taxonomical remark

The taxonomy currently followed by CMS (Wilson & Reeder, 1993) recognises a single species of gorilla, *Gorilla gorilla*, with three subspecies. This comprised one western subspecies, *Gorilla gorilla gorilla* and two eastern subspecies, *Gorilla gorilla graueri* (eastern lowland gorilla) and *Gorilla gorilla beringei* (mountain gorilla).

Recently however, western and eastern populations have been widely recognised as separate full species, *Gorilla gorilla* and *Gorilla beringei* respectively. The eastern and western populations are separated by approximately 1,000 km (Garner & Ryder, 1996). Western and eastern populations can be distinguished based on external features (Groves, 2002) and clear geographic and morphological distinctions can also be seen (Garner & Ryder, 1996). In the western group, the isolated Nigeria-Cameroon gorillas are now recognised as a subspecies, Cross River Gorilla *G. g. diehli*, and the Western Lowland Gorilla, *G. g. gorilla*, though there is much divergence even within this subgroup. The eastern group includes both the Eastern lowland *G.beringei graueri* and the two mountain populations of *G.b.beringei*. Following the newer taxonomic classification, among the mountain gorillas, the Bwindi mountain gorilla may form a third subspecies, *Gorilla beringei bwindi* (Sarmiento *et al.*, 1996) although the taxonomic status of the populations is as yet unclear (McNeilage *et al.*, 2001). Sarmiento *et al.* (1996) list a number of morphological and ecological differences between the gorillas of Bwindi-Impenetrable Forest and the Virunga volcanoes, and insist that Bwindi gorillas do not belong to *G. g. beringei* and so should not be called mountain gorillas. Stanford (2001) contests this and suggests that the evidence showing the Bwindi and Virunga gorillas to be taxonomically distinct is not well supported. Garner & Ryder (1996) found that the populations of mountain gorilla in the Virungas Volcanoes region and the Bwindi forest were indistinguishable using a particular mitochondrial DNA region.

The following document is a summarized conservation status report for the Mountain Gorilla, *Gorilla beringei beringei* (Matschie, 1903), the nominal subspecies of eastern gorilla. The Mountain gorilla is living in two small isolated populations. One is found among the volcanoes of the Virunga Massif at the border of DRC, Rwanda and Uganda, the other is found mainly in Bwindi Impenetrable Forest in southwest Uganda on the border with DRC.

1.2 Nomenclature

The American physician and missionary Thomas Staughton Savage first described the Western Gorilla (he called it *Troglodytes gorilla*) in 1847 from specimens obtained in Liberia. The name was derived from the Greek word Gorillai (a "tribe of hairy women") described by Hanno the Navigator, a Carthaginian navigator and possible visitor (circa 480 BC) to the area that later became Sierra Leone.

1.2.1 Scientific name

Gorilla beringei beringei (Matschie, 1903)

The name *beringei* was first given by Paul Matschie in 1903, a mammalian taxonomist working at the Humboldt University Zoological Museum in Berlin. He described a new species of gorilla inhabiting the Kirunga (= Virunga) Volcano. Matschie named the species *Gorilla beringei* in honour of Captain von Beringe the finder of the specimen.

1.2.2 Synonyms

Gorilla gorilla beringei, *Gorilla beringei*, *Gorilla beringeri*, *Gorilla beringei mikenensis*

1.2.3 Common names

English – Mountain Gorilla

French – Gorille de montagne

German – Berggorilla

Spanish - Gorila Montañés

1.2.4 Description

Very large, the largest living primates. Barrel-chested ape with relatively even hair, a bare black face and chest and small ears. The bare shaped brows are joined and the nostril margins are raised. Females are much smaller than males. Adult males range in height from 165-175 cm (5 ft 5 in-5 ft 9 in), and in weight from 140-200 kg (310-440 lb). Adult females are often half the size of a silverback, averaging about 140 cm (4 ft 7 in) tall and 100 kg (220 lb). Occasionally, a silverback of over 183 cm (6 feet) and 225 kg (500 lb) have been recorded in the wild. The belly of wild gorillas is very much more massive than in captive specimens. Gorillas move around by knuckle-walking.

Mountain Gorilla is a very black and densely furred Gorilla, with a broad face and massive jaws. He has a long blue-black coat and the small of the back, or 'saddle' of mature males becomes grey or white with ages, hence the name of 'silverback' for old males.

2. BIOLOGY OF THE SPECIES

2.1 General Biology

Gorillas are mainly terrestrial. The gorilla's large size and folivorous habits mean that the animals must spend long hours feeding everyday to maintain their body weight. Of all the great apes, the gorilla shows the most stable grouping patterns. The same adult individuals ravel together for months and usually years at a time. It is because gorillas are mainly foliage eating that they can afford to live in these relatively permanent groups. Foliage, unlike fruit generally and especially the ripe fruits that the ape gut require, comes in large patches than can in turn support large groups of animals.

In west Africa, where fruit form a far higher proportion of the gorilla's diet than in the East, gorilla groups tend much more often to split into temporary subgroups that they do in east Africa, as animals range far apart searching for the relatively scarce ripe fruit. Gorilla groups can include up to 30-40 animals, but more usually number 5-10.

2.1.1 Habitat

The Gorilla is a forest species. They inhabit tropical rain forests, forest edges and clearings, riverine forests, swamps, and abandoned, cultivated fields. The characteristic habitat of the mountain gorillas (*Gorilla beringei beringei*) is high-altitude montane forests with a dense herb layer and abundance of fruit (reviewed in Doran & McNeillage, 1998, 2001). The habitat of subtropical-tropical Moist Forest (IUCN, 2002). Forest edges and regenerating or secondary forest are favoured (IUCN, 1982).

A number of vegetation zones have been identified in the mountain gorilla habitat of the central Virungas Volcano region, which mostly consist of *Hagenia-Hypericum* woodland with a relatively open canopy and extremely dense herbaceous understorey (Watts, 1997). Mountain gorillas range up to 3400 m in altitude with occasional forays even higher (IUCN, 1982). Bwindi gorillas tend to live in lower elevations, warmer temperatures and are more arboreal than Virunga gorillas (Sarmiento *et al.*, 1996). The area of habitat occupied by the mountain gorilla in the Virungas is approximately 375 km² and the Bwindi gorillas occupy an area of approximately 215 km² (Butynski, 2001).

2.1.2 Adaptation

Gorillas are herbivorous (plant-eating). Plant material contains cellulose which is indigestible to many non-herbivorous animals. With regard to digestion, herbivorous animals that do not ruminate (re-chew their food as part of the digestive process) rely solely on the microbes (microscopic bacteria) living in their colon. The bacteria function to breakdown the indigestible plant cellulose and turn it into valuable digestible carbohydrates through the fermentation process.

2.1.3 Social behaviour

As far as group structure is concerned, gorillas do form harem. It was once thought that gorilla groups contained only one adult male, but around one third of groups in both East and West Africa have been found to host two full-grown males. Adult female in anyone silverbacks (dominant adult male) harem are mostly unrelated, and the social ties that exist between them are weak. In contrast to many other primates, it is the bond between each individual female and the silverback, rather than bonds between the females that hold the group together. Upon reaching maturity, both the males and females leave the natal group. The females usually join another group or a lone young adult male, whereas the males remain solitary until they can attract females and establish their own groups (Masicot, 2003). After emigration, some males may spend a large proportion of their time in their natal group's home range (Harcourt *et al.*, 1981). At least with Mountain gorilla, it is unusual for adult males to migrate into other groups (Yamagiwa, 1987). Of the 15 changes in the size and composition of the two main study groups between 1972 and 1974 listed by Harcourt *et al.* (1981), 11 were due to migrations.

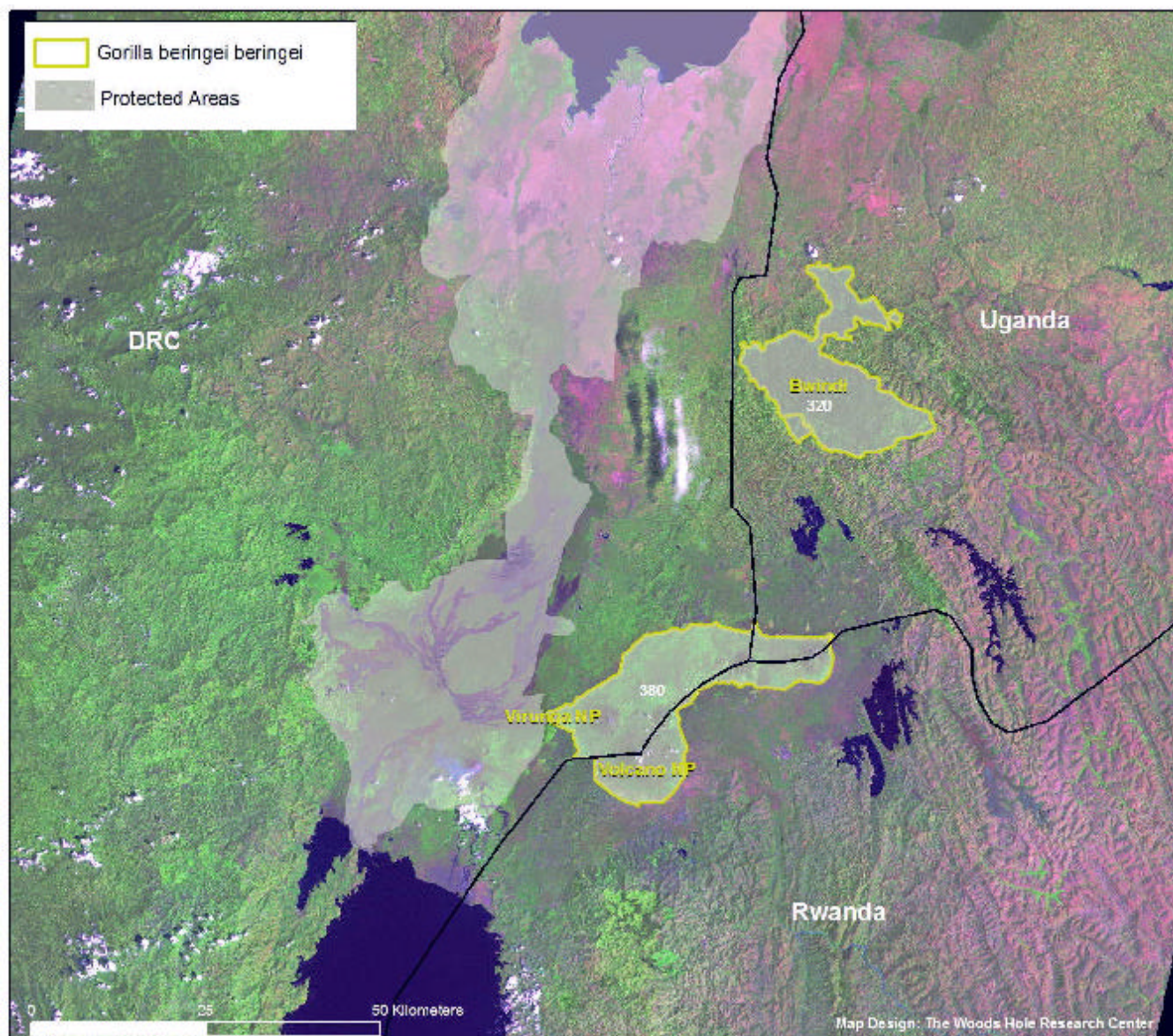
2.2 Distribution (current and historical)

There are two known populations of mountain gorilla, all of which occur in national parks. One population occurs on the extinct volcanoes of the Virunga Massif along the borders of the Democratic Republic of the Congo (DRC), Rwanda (RW), and Uganda (UG) within the Virunga National Park of DRC, the Volcanoes National Park in Rwanda and to a lesser extent the Mgahinga National Park, Uganda. A separate population of mountain gorillas is found in the Bwindi-Impenetrable National Park in southwest Uganda, on the border of DRC (UNEP-WCMC & WWF, 2001). In this report these populations will be referred to as either the Virungas or Bwindi population of mountain gorillas.

The distribution of mountain gorillas is probably confined since a very long period of time.

Generally gorillas are found in two widely separated areas of Africa. The western and eastern populations were probably originally separated first by the massive inland Congo basin lake of the Miocene, and then, from about 5 millions years ago, by the gradual drying of the region and the retreat of forest to higher areas. Subsequently, gorillas have not spread back into the central Congo basin, either because they have not had time, or because the heavily shaded primary forest there does not allow the growth of sufficient ground vegetation to support such a large, predominantly terrestrial animal (MacDonald ed., 2001).

Figure 1. The distribution of the gorilla, *Gorilla gorilla*
(from http://www.whrc.org/africa/prioritypops/images/gorilla_beringei_beringei_ls.gif)



2.3. Evaluation and evolution of populations

Based on recent estimates (Kalpers *et al.*, 2003 and McNeilage *et al.*, 2001), the total number of mountain gorillas may be between 651 and 687, or according to Plumptre *et al.* (2003) there are a total of approximately 650-700 mountain gorillas. If the most recent census are added 700 mountain gorillas live in two disjunct populations.

The census of the Virunga Volcanoes mountain gorilla population carried out during September and October 2003 has shown a 17% increase in population size since 1989. Their number is now estimated as a total of 380 gorillas. Six teams had traversed the entire gorilla habitat range, searching for fresh signs of gorilla groups. Their night nests are used to establish the number of gorillas in each group. A total of 100 team members participated in the census, drawn from the staff of the protected area authorities and their partners. 269 gorillas were counted in 16 habituated groups, 80 gorillas in 12 unhabituated groups and 11 solitary silverback males. Among the unhabituated animals, several infants potentially were missed as they slept together with their mothers in the same nest; or even whole groups might have been missed. Therefore, this

number was corrected and the total number was calculated - 380 gorillas. 71% of these animals is habituated (1989 this was the case only in 57%).

A team of scientists has found that nearly 300 gorillas are still living in the Bwindi Impenetrable National Park. A similar number (290-310) had also been found during the period of 1987 to 1993 when all groups were identified and monitored by Thomas Butynski and his team.

A census conducted in October and November 1997 by WCS (Wildlife Conservation Society), IGCP (International Gorilla Conservation Programme), ITFC (Institute of Tropical Forest Conservation) and UWA (Uganda Wildlife Authority), resulted in 292 gorillas from 28 groups, along with 7 lone silverback males. The researchers followed trails and counted nests. To reduce the possibility of missing groups or counting them twice, more survey teams were used than in the past, and the counting took place over a shorter period of time. They also collected hairs from every nest for DNA fingerprinting, to confirm that no groups were counted twice, and to understand the genetic differences between the populations in Bwindi and the Virungas. Teams consisted of national park staff from Uganda, Rwanda, and D. R. Congo as well as visiting scientists from conservation organisations.

During a more recent census conducted in January to March 2002, a team of researchers counted about 320 gorillas in the Bwindi Impenetrable National Park.

In Rwanda and Uganda, the entire populations are now located within protected areas. The number of mountain gorillas declined throughout the 1970s and early 1980s, and some declines were seen into the 1990s (e.g. Binyeri *et al.*, 2002). IUCN (1982) described a decline in the mountain gorilla numbers in the Virungas, from 400-500 in the late 1950s, to 275 in 1973 to 250 by 1981, with most of the decline occurring in the Democratic Republic of Congo section. However, since the mid 1980s, the mountain gorilla appears to be gradually increasing in numbers. According to WWF (2002) the Virunga population of mountain gorilla has increased by 17% in the 14 years between 1989 and 2003. The Bwindi population is stable and may also be increasing (Uganda Wildlife Division, 2002a; WWF, 2002; McNeilage *et al.*, 2001).

The Mountain gorilla (*G.g.beringei*) (IUCN 2002, CR C2a(ii)): The Mountain Gorilla continues to be considered critically endangered on the IUCN Red List of Endangered Species. It faces an extremely high risk of extinction in the wild due to its very small population level, habitat loss, poaching, human disease, and war.

With the exception of the Mountain gorilla, accurate population estimates for gorillas are difficult to establish, because their hugely vast range has not yet been thoroughly surveyed. Population counts and estimates of gorillas are commonly carried out on the basis of nest or sleeping site counts (e.g. Inogwabini *et al.*, 2000). Adults and immature weaned animals build new nests to sleep in each night. The nests are counted and any dung adjacent to each nest examined gives a reliable indication of group size as well as age of animal, particularly when the counts are repeated over several nights.

2.4. Migrations

The mountain gorillas of the Virunga volcanoes inhabit an area that is shared between three countries, the Democratic Republic of the Congo, Rwanda and Uganda. Gorillas have a home range of between 5 and 30 km² (UNEP-WCMC & WWF, 2001), which may include land in more than one country and hence daily foraging movement may involve crossing international borders. The area of habitat occupied by the Virungas mountain gorilla is approximately 375 km² and that occupied by the gorillas of Bwindi-Impenetrable National Park is approximately 215 km² (Butynski, 2001).

A study by Vedder (1984) in Volcanoes National Park of Rwanda indicated that, within each of the dietary seasons (October-November and December to September), gorillas responded to decreases in food abundance by expanding their range and travelling further by day, as well as by altering their diet. This group of gorillas travelled through an area of 8.56 km² during a 12 month period. Solitary male mountain gorillas travel further and expand their home range as long as they are unmated, and mountain gorilla home ranges typically overlap extensively (Watts, 1994). Watts (1998) found that they used areas less than or

equal to 25 km² and that annual home range size and core area size varied considerably both with groups and across years. Food and male mating competition can influence the home range and core area selection and size.

3. CONSERVATION STATUS, BY PARTY

Republic of the Congo (Endangered): The mountain gorilla, *Gorilla beringei beringei* occurs in the Virunga National Park of DRC. The Virunga National Park is 790,000 hectares in size and is contiguous to Ruwenzori Mountains National Park, Uganda and Volcanoes National Park, Rwanda.

Rwanda (Endangered): The mountain gorilla, *G.b. beringei* occurs in the Volcanoes National Park, which is 12,500-13,000 hectares in size and is contiguous to Virunga National Park in DRC and Gorilla National Park in Uganda. It ranges in altitude from 2,400 m to 4,507 m (UNEP-WCMC, 2003c).

Uganda (Endangered): The mountain gorilla, *G. b. beringei* occurs in the Mgahinga National Park, Uganda and Bwindi-Impenetrable National Park, Uganda. The Mgahinga National Park is 2,899 hectares in size and is found in the extreme south-west of Uganda on the borders with DRC and Rwanda. It ranges in altitude from 2,700 m to 4,127 m. The Bwindi-Impenetrable National Park is 32,092 hectares and ranges in altitude from 1,190 m to 2,607 m.

4. ACTUAL AND POTENTIAL THREAT

The major threats affecting or having affected Mountain Gorilla populations are (1) habitat loss or modification (e.g. through deforestation, wood extraction, infrastructure development, human settlement and agricultural crops (IUCN, 2002)) and forest encroachment (Muruthi *et al.*, 2000), (2) disease and disease transmission from humans and (3) war or political unrest (Plumptre *et al.*, 2003; Muruthi *et al.*, 2000; IUCN, 2002).

4.1. Degradation and decline of habitats

Throughout the gorilla's range, the forests on which it depends for survival are being cut down for timber and to make way for agriculture. Habitat loss is a major threat to gorillas as forests are rapidly being lost to commercial logging interests and subsistence agriculture. In particular, the mountain gorilla lives in an area where there is a high human population. In eastern RDC, Rwanda and Uganda, including Bwindi Impenetrable Forest Reserve, fragments of forest form part of a landscape that supports one of the highest densities of rural human populations in Africa (Taylor *et al.*, 1999). The main threat to gorillas in DRC is forest clearance and, although no land has been appropriated from the habitat of the Virunga gorillas there, declines may be due to the presence of livestock in the Virungas (IUCN, 1982). Deforestation to supply refugees' demand for fuelwood has affected 105 km² of the park, of which 35 km² has been completely stripped (UNEP-WCMC, 2003b). Plumptre *et al.* (2003) comment that when the civil war in DRC ends, it is likely that logging companies will quickly move into DRC. However, they also note that gorillas often favour areas of secondary vegetation and so could coexist with logging, if adequate protection was insured (Plumptre *et al.*, 2003). Forest clearance also threatens the population of mountain gorillas in the Volcanoes National Park of **Rwanda** (IUCN, 1982). In Mgahinga National Park, **Uganda**, agricultural and pastoral activities are major threats. Deforestation by residents of the lower slopes is destroying more gorilla habitat and this was further exacerbated by allowing restricted bamboo cutting annually in the reserve before 1982. The area seems to be less well protected than neighbouring protected areas in DRC and Rwanda. There are about 380 gorillas in this whole region, but only one group is found in the Ugandan sector (UNEP-WCMC, 2003d). The Bwindi-Impenetrable Forest National Park population is relatively well protected. Only manual extraction of timber is permitted, and hence logging is very selective although it is allowed throughout the whole forest reserve (now National Park) (IUCN, 1982) and only about 10% of the forest remains free from human disturbance (UNEP-WCMC, 2003a). However, relatively intensive logging and the extraction of gold and charcoal does occur in certain areas, although most illegal activity has been reduced to sustainable levels. Agricultural encroachment is the major threat to forest integrity (UNEP-WCMC, 2003a).

In the long run, only preventing continued international exploitation of Africa's forests will ensure the well-being of the gorilla.

4.2. Direct exploitation

- **the bushmeat trade**

If habitat loss or degradation have been regarded as the major threats to gorilla populations, much recent concern has been focused on the bushmeat trade. Forest is being converted to crop production and livestock grazing in many parts of Africa. Where new routes are opened up for timber or mineral extraction, exploitation of forest animals for food use (bushmeat) rises in order both to support the incoming labour force and to export bushmeat to urban markets. Although bushmeat has been, and still is culturally and nutritionally important in many regions, the impact of bushmeat hunting is now more widespread and serious on many species because it is increasing rapidly with increasing access into remote areas, and new markets are being developed to serve rising demand among urban populations, where it is considered a delicacy. Gorilla meat forms only a small proportion of the commercial bushmeat trade, but the impact on ape populations is disproportionately great because of their slow reproductive rate and the social consequences of silverback's being killed (infanticide may ensue when nursing mothers join a new male).

Mountain Gorillas are not usually hunted for bushmeat, but they were frequently maimed or killed by traps and snares intended for other animals (see 4.5 Other threats). Very recent information suggest that Mountain Gorilla's kills for their meat is still occurring (<http://enn.com/today.html?id=12056>)

- **Other forms of direct exploitation**

In the past they have been killed for their heads, hands, and feet, which were sold to collectors. Infants were sold to zoos, researchers, and people who want them as pets. The abduction of infants generally involves the loss of at least one adult, as members of a group will fight to the death to protect their young. In the Virunga and Volcanoes National Parks of DRC and Rwanda, infant gorillas may be captured for sale, and adult males killed so that their skulls can be sold as souvenirs to tourists. Adults may also be killed in order to gain access to the infants. An infant can reportedly fetch as much as £86,000 on the black market (Vesperini, 2002). At least three infants were stolen in the Virunga Volcano Region in 2002 (Anon., 2002). Binyeri *et al.* (2002) reported a number of incidents in the Virunga National Park of DRC in which infant gorillas were abducted for sale, and adults killed to gain access to the infants.

4.3. Diseases

Another potential threat to gorillas is exposure to human diseases (e.g Graczyk *et al.*, 2001a; Graczyk *et al.*, 2001b) particularly for habituated gorillas that come into contact with humans, in areas of gorilla tourism (UNEP-WCMC & WWF, 2001). Gorilla tourism exposes gorillas to humans and hence to any diseases that humans may be carrying, some of which the gorillas may never have been exposed to before. Williamson (1999) reported that in Volcanoes National Park the most serious threat to the gorillas may be the acquisition of human parasites and disease and recently a number of gorillas in this Park have died of an unknown illness (UNEP-WCMC, 2003c). An outbreak of a respiratory disease, with the possibility of measles as the primary infection, in the Volcanoes NP (Parc National des Volcans) in Rwanda claimed six gorilla lives, and 27 other gorillas were successfully treated (Wallis & Lee, 1999). However, there are few data on the impacts of disease, particularly outside the Virungas (Plumptre *et al.*, 2003). In Rwanda, strict rules are in place to regulate tourist visiting times and the number of tourists per group (Plumptre *et al.*, 2003). Other measures are in place and include limiting the approach of humans to 5 m, burying human excrement deeper than 30 cm and chasing gorillas from private lands surrounding the parks (Kalema-Zikusoka *et al.*, 2002).

Beside severe impacts on human populations, several outbreaks of the Ebola virus since 2000 might have claimed thousands of great apes in Africa. The first, in 2000 and 2001, was centred in Uganda, the second outbreak occurred in 2001 and 2002 in Uganda and the Republic of Congo. Ebola hemorrhagic fever is a severe, often-fatal disease that affects humans and non-human primates, such as monkeys, gorillas and

chimpanzees. Many scientists believe the disease is spread through the butchering and handling of primate bushmeat. The disease has been confirmed in six African nations: the Democratic Republic of Congo, the Republic of Congo, Gabon, Sudan, Ivory Coast, and Uganda. Up till now Mountain Gorillas had not suffered from outbreaks of the Ebola virus but this can change in the future...

4.4. Impact of Conflicts

The impact of wars and political conflicts is particularly well documented for the Mountain gorilla. The early 1990s saw the outbreak of fighting in Rwanda, which by April 1994 had expanded into DRC and resulted in a stream of refugees pouring into gorilla habitat. Indeed, approximately 50% of Rwanda's civilian populations were displaced during this conflict, of which 860,000 refugees were concentrated in the vicinity of Virunga National Park (Dudley *et al.*, 2002). Shortly after the influx of Rwandan refugees in 1994/1995 into DRC, came the 1996 war between the armed forces of DRC and the rebel movement of Kabila, backed by Angola, Rwanda and Uganda. Subsequently fighting again broke out in 1998 between Rwandan and Ugandan troops and the DRC army. The streams of refugees that were displaced during these conflicts led to uncontrolled firewood harvesting, and increased poaching in the Virungas National Park and the death of more than four silverback mountain gorillas (UNEP-WCMC & WWF, 2001) and disruption of natural animal migration patterns (UNEP-WCMC, 2003b). Three of the four refugee camps in North Kivu were located in or near to the park buffer zone, and it is estimated that at least 500,000 ha of the park have been affected by wood harvesting or poaching (UNEP-WCMC, 2003b). After the refugees left in 1996, conflict in the DRC led to looting and destruction of infrastructure in the Park, as well as the possible death of 15 Virunga mountain gorillas (UNEP-WCMC & WWF, 2001). Kalpers *et al.* (2003) report that between 12 and 17 gorillas are known to have died between 1992 and 2000 in the Virungas volcanoes region as a direct result of military activity. Concern for the protection and management of the site, especially with regards to recurring encroachments, deforestation, poaching, population growth, and the refugee related problems that have arisen due to civil unrest in Rwanda, led to the site being placed on the World Heritage in Danger List in 1994 (UNESCO, 1994). The situation around Virunga is unstable, militia groups may still be active in the region, aerial census of the area has not been possible since 1995 and there are frequent reports of poaching, deforestation and illegal gold mining in the park (UNEP-WCMC, 2003b). Much of the Virungas has clearly been severely affected by conflict.

4.5. Other threats

Accidental entrapment in wire snares used to trap other wild animals is also a threat to the mountains gorillas. Plumptre *et al.* (1997) stated that the setting of snares for ungulates in the Volcans National Park, Rwanda is one of the greatest threats to *Gorilla beringei beringei*. However, Williamson (1999) reported that at least 99% of the three research groups in the Volcanoes National Park, Rwanda were in good physical shape.

The isolation and low numbers of mountain gorilla populations have given rise to concerns about inbreeding (Garner & Ryder, 1996). The mitochondrial DNA of the Virunga and the Bwindi mountain gorillas exhibited low variability further strengthening this concern, although more extensive sampling is required (Garner & Ryder, 1996).

The two populations of Mountain Gorilla are too small to meet survival theoretical criteria, and are vulnerable to stochastic catastrophic events such as outbreaks of disease, sudden wide loss of habitats, and would quickly be reduced by poaching if the vigilance of the conservationists were to be relaxed.

International trade in live gorillas and gorilla parts, which used to be a threat, has declined since the gorilla was listed in Appendix I of CITES.

5. Regulatory provisions

5.1 International

CMS : Gorilla gorilla sl is registered on the Appendix I of the CMS since 2005.

CITES: The Gorilla is in the Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1975.

ACCNNR : Gorilla is also enumerated in A class in The African Convention on the Conservation of Nature and Natural Resources in 1969.

5.2 National

In **DRC** the Nature Conservation Act of 1969 (Ordinance-Law 69.041) defines national parks. The 1982 hunting act (Law 82.002) defines faunal reserves and game reserves and lists animals for which hunting and trapping are prohibited. Since 1985, regional governments have had the right to set their own regulations on species protection and to specify hunting seasons, bypassing this law. Management of National Parks, faunal reserves, and game reserves is delegated to the Institut Congolais pour la Conservation de la Nature (ICCN), which also manages scientific research. Effective control of many protected areas in the east of the country has been in the hands of rebel authorities in recent years.

Mountain gorilla is totally protected in DRC by the decree relating to hunting and fishing of 1937, owning, transport and/or national trade is forbidden or regulated. It is also mentioned in the hunting law of 1982 and in departmental order of 1973 setting the establishment of special conditions for elephants hunting and listing the protected animals (ECOLEX, 2003). Besides, in accordance with the Order Law relating to the preservation of the nature, each person who captures or kills gorillas in a strict nature preserve is exposed to imprisonment penalty from 1 to 10 years.

In **Rwanda** Ordinance 18/6/73 modified by Law-Decree 26/4/1973 and Law 34/2000, established the Office of Tourism and National Park, and governs the creation and functioning of protected areas and hunting arrangements. The Office of Tourism and National Parks, based within the Ministry of Commerce, Industry, Investment Promotion, Tourism and Cooperatives has direct responsibility for management of national parks and matters relating to ecotourism. The Volcanoes NP is therefore under its responsibility. Department of Environment has overall responsibility for biodiversity conservation.

Mountain gorilla is totally protected in Rwanda by the Ordinance Law (18/6/1973) of the "office Rwandais du tourisme et des parcs nationaux). owning, transport and/or national trade is forbidden or regulated (ECOLEX, 2003). Volcanoes national park in Rwanda is a biosphere reserve.

In **Uganda** there are two main statutes that concern protection of gorillas (and great apes): the Forests Act (1964) and the Uganda Wildlife Statute (1996), respectively executed through the National Forestry Authority (INFA) and the Ugandan Wildlife Authority (UWA), in the Ministry of Tourism, Trade and Industry. The Uganda Wildlife Statute provides tools for the establishment of wildlife conservation areas, which fall under two categories: wildlife protected areas (national parks or wildlife reserves) and wildlife management areas (wildlife sanctuaries and community wildlife areas).

It is forbidden by the national legislation to catch mountain gorillas (Uganda Wildlife Division, 2002a). Among the appropriated legislations we have to retain the Uganda Wildlife Statute, n° 14 of 1996, and the National Environment Statute, n°3 of 1995. Uganda Wildlife Statute, No 14 of 1996 says that species that migrate or go by Uganda and that are protected by terms of any international convention or treaty to whom Uganda is part and to which section 91 is applied, will be protected species by this text of law (ECOLEX, 2003), the mountain Gorilla is included in that text.

As all mountain gorilla populations occur within national parks, they and their habitat have some degree of protection. However, political and institutional instability as well as illegal hunting and poaching may undermine such protection. National laws in all range states exist for the control of hunting and catching of the gorillas, although wide enforcement of the legislation is difficult due to lack of funds and inaccessibility (Nellemann&Newton, 2002).

In the Bwindi Impenetrable Forest national park, the protection is full, though the extractive use may be authorised by the executive committee (UNEP-WCMC, 2003a). When the Bwindi Impenetrable national

park and the national park of Mgahinga have been created, the access to the park was forbidden for everyone except authorised researchers, which results in an important fall in the timber-cutting and in gorilla poaching (Nowak, 1995). Parks have been opened later to a regulated tourism.

6. Conservation measures

6.1 Takings prohibition

The taxon is legally protected in three of its ranging states. Illegal takings are nevertheless an important problem in some of those at least.

6.2 Habitat conservation

Table 1. Priority Populations for Mountain Gorillas (*G. b. beringei*)

Country/Countries	Population Name	Pop. Size	Area (km ²)	Habitat Type(s)	Land Use Status	Scientific Importance	Other Important Conservation Features	Major Threats	Rationale for Prioritization
Uganda	Bwindi Impenetrable NP	320 ***	355	Montane to lowland forest	National Park	Long-term gorilla research	Major site of local Endemism; <i>P. t. Marungensis</i> Present	Hunting, sawing	One of two major mountain gorilla populations; protected area; long-term research; sympatric with chimpanzees
DRC, Rwanda, Uganda	Virunga NP	380 ***	430	Montane forest	National Park	Long-term gorilla research	Park also contains pops of <i>G. b. graueri</i> and <i>P. t. marungensis</i>	Trafficking of infant gorillas, hunting, encroachment by agricultural and development projects	One of two major mountain gorilla populations; protected area; long-term research; sympatric with other great apes

Accuracy of population estimate is scored as follows: ***indicates the estimate from good transect surveys spread over areas or habitats of population; **indicates estimate based on adequate set of transects from one location, and estimate extrapolated to the rest of the areas/habitats of population; *no scientific estimate of ape density from any location

6.3 Reduction of the obstacles for the migrants

The level of legal protection given to mountain Gorilla's population and habitat is probably appropriate. All mountain gorillas survive in small populations apparently stable in several Virunga national parks and in Bwindi. These parks are managed and supported by the DRC, Rwanda and Uganda government, by research and preservation groups, and financed by tourism programmes based on the gorillas vision which carry important funds. These gorillas are potentially vulnerable to diseases and poaching but, in comparison with most of other gorillas populations, they are for the moment relatively in security.

6.4 Regulation concerning other harmful factors

Implementation of recommendations from International Primatology Society, concerning Ebola epidemics.

7. Additional Remarks

8. References

- Anon. (2002) International Gorilla Conservation Programme. Programme Profile, November 2002. <http://www.awf.org/documents/IGCPPProgramProfile1102.pdf> Downloaded 27 may, 2003.
- AWF (2003) Mountain gorilla poachers jailed in Rwanda. African Wildlife Foundation <http://www.awf.org/wildlives/149> Downloaded 27/10/2003.
- Barnes, R.F.W. (1990). Deforestation trends in tropical Africa. *Afr. J. Ecol.*, 28, 161-173.
- Bermejo, M. (2004) Home-range use and intergroup encounters in western gorillas (*Gorilla g. gorilla*) at Lossi Forest, North Congo. *American Journal of Primatology* 64, 223-232.
- Binyeri, D. K., Hibukabake, D. M and Kiyengo, C. S. (2002) The Mikeno gorillas. *Gorilla Journal*, 25: 5-7.
- Blake S., M. Rogers, J. Fay, M. Ngangoue & G. Ebeke. 1995. Swamp gorillas in the northern Congo. *Afr J Ecol* 33:285-290.
- Butynski, T. M. (2001) Africa's Great Apes. In: *Great Apes and Humans: The ethics of Coexistence*. Beck, B., Stoinski, T. S., Hutchins, M., Maple, T.L., Norton, B., Rowan, A., Stevens, E. F. and Arluke, A. (eds). Smithsonian Institution Press, Washington D.C. Pp.3-56.
- Byrne, R. W. and Byrne, J. M. E. (1993). Complex leaf gathering skills of mountain gorillas (*Gorilla g. beringei*): Variability and standardization. *American Journal of Primatology*, 31: 241-261.
- Doran, DM & A. McNeilage. 1998. Gorilla ecology and behavior. *Evol Anthropol* 6:120-131.
- Doran, DM & A. McNeilage. 2001. Subspecific variation in gorilla behavior: the influence of ecological and social factors. In: Robbins MM, Sicotte P, Stewart KJ, editors. Mountain gorillas: three decades of research at Karisoke.
- Doran, D. M., D. Greer, P. Mongo & D. Schwind. (2004) Impact of ecological and social factors on ranging in western gorillas. *American Journal of Primatology* 64, 207-222.
- Dudley, J. P., Ginsberg, J. R., Plumptre, A. J., Hart, J. A. & Campos, L. C. (2002). Effects of war and civil strife on wildlife and wildlife habitats. *Conservation Biology*, 16 (2); 319-329.
- ECOLEX (2003) ECOLEX – A gateway to environmental law. http://www.ecolex.org/SPECIES/search/FA_search.htm Downloaded 28/07/2003.
- Fay, JM, M. Agnagna, J. Moore & R. Oko. 1989. Gorillas (*Gorilla gorilla gorilla*) in the Likouala swamp forests of north central Congo: preliminary data on population and ecology. *Int J Primatol* 10:477-486.
- Garner, K. J. & Ryder, O. A. (1996). Mitochondrial DNA diversity in gorillas. *Molecular and Phylogenetic and Evolution*, 6 (1): 39-48.
- GRASP (2004) http://www.unep.org/grasp/Fact_gorilla.asp
- Graczyk, T. K. & Cranfield, M. R. (2003) Coprophagy and intestinal parasites: Implications to human-habituated mountain gorillas (*Gorilla beringei beringei*) of the Virunga mountains Bwindi Impenetrable Forest. *Primate Conservation*, 19: 58-64.
- Graczyk, T. K., Cranfield, M. R., & Eilenberger, U. (2001a) Hyperkeratotic mange caused by *Sarcoptes scabiei* (Acariformes: Sarcoptidae) in juvenile human-habituated mountain gorillas (*Gorilla gorilla beringei*). *Parasitol. Res.*, 87: 1024-1028.
- Graczyk, T. K., DaSilva, A. J., Cranfield, M. R., Nizeyi, J. B., Kalema, G. R. N. N. & Pieniazek, N. J. (2001b) *Cryptosporidium parvum* Genotype 2 infections in free-ranging mountain gorillas (*Gorilla gorilla beringei*) of the Bwindi Impenetrable National Park, Uganda. *Parasitol. Res.*, 87: 368-370.
- GROMS (2002) Species Fact Sheet – Gorilla gorilla. http://www.biologie.uni-freiburg.de/data/zoology/riede/groms/Species_HTMLs/Ggorilla.html Downloaded on 30 April 2003.
- Groves, C. (2002) *Primate Taxonomy*. Smithsonian Institute Press, Washington and London.
- Hamilton, A., Cunningham, A., Byarugaba, D. & Kayanja, F. (2000) Conservation in a region of political instability: Bwindi Impenetrable forest, Uganda. *Conservation Biology*, 14(6): 1722-1725.
- Harcourt, A.H., 1996. Is the Gorilla a threatened species? How should we judge? *Biological Conservation* 75. 165-186.
- Harcourt, A. H., Fossey, D. & Sabater-Pi, J. (1981) Demography of *Gorilla gorilla*. *Journal of Zoology, London*, 195: 215-233.
- Inogwabini, B., Hall, J. S., Vedder, A., Curran, B., Yamagiwa, J. & Basabose, K. (2000) Status of large mammals in the mountain sector of Kahuzi-Biega National Park, Democratic Republic of Congo, in 1996. *African Journal of Ecology*, 38: 269-276.
- IPS, International Primatology Society. 2004. <http://www.ips2004.unito.it/about.html>.
- IUCN (1982) *The conservation status of the great apes*. The World Conservation Union.
- IUCN (1996) *African Primates. Status survey and conservation action plan*. Revised edition. IUCN, Gland, Switzerland, 88 pp.
- IUCN (2002) 2002 IUCN Red List of Threatened Species. <http://www.redlist.org> Downloaded on 30 April 2003.
- Kaiza, D. (2001) Bushmeat: Trade in endangered species threatens apes in Uganda. *The East African Business*, September 3-9, 2001.

- Kalema-Zikusoka, G., Kock, R.A. & Macfie, E. J. (2002) Scabies in free ranging gorilla (*Gorilla beringei beringei*) in Bwindi Impenetrable National Park, Uganda. *The Veterinary Record*, 150: 12-15.
- Kalpers, J., Williamson, E. A., Robbins, M. M., McNeilage, A., Nzamurambaho, A., Lola N. & Mugiri, G. (2003) Gorillas in the crossfire: population dynamics of the Virunga mountain gorillas over the past three decades. *Oryx*, 37 (3): 326-337.
- Kemf, E. & Wilson, A. (1997) *Great apes in the wild – 1997 WWF Species Status Report*. WWF – World Wide Fund for Nature.
- Magliocca F. , S. Querouil, A. Gautier-Hion. 1999. Population structure and group composition of western lowland gorillas in north-western Republic of Congo. *Am J. Primatol* 48:1-14.
- Mahaney, W. C., Watts, D. P. & Hancock, R. G. V. (1990) Geophagia by mountain gorillas (*Gorilla gorilla beringei*) in the Virunga Mountains, Rwanda. *Primates*, 31 (1): 113-120.
- Masicot, P. (2003) Animal Info <http://www.animalinfo.org/species/primate/gorigori.htm>
- McNeilage, A., Plumtre, A. J., Brock-Doyle, A. & Vedder, A. (2001) Bwindi Impenetrable National Park, Uganda: gorilla census 1997. *Oryx*, 35 (1): 39-47.
- Mudakikwa, A. (2001) An outbreak of mange hits the Bwindi gorillas. *Gorilla Journal*, 22. <http://www.berggorilla.de/english/gjournal/texte/22scabies.html> Downloaded 06/11/2002.
- Muruthi, P., Proce, M. S., Soorae, P., Moss, C. & Lanjouw, A. (2000) Conservation of Large Mammals in Africa. What lessons and challenges for the future? In: *Priorities for the Conservation of Mammalian Diversity: Has the Panda had its Day?* Eds A. Entwistle & N. Dunstone. Conservation Biology 3.
- Nellemann & Newton (eds) (2002) The Great Apes – the road ahead. A Globio perspective on the impacts of infrastructural developments on the Great Apes. United Nations Environment Programme. http://www.globio.info/download.cfm?File=region/africa/GRASP_5.pdf
- Nishihara T. 1995. Feeding ecology of western lowland gorillas in the Nouabale-Ndoki National Park, Congo. *Primates* 36:151-168.
- Nowak, R. (1995) Uganda enlists locals in the Battle to save the Gorillas. *Science*, 267: 1761- 1762.
- Nowak, R.M. (1999) *Walker's Mammals of the World*. 6th Ed. The Johns Hopkins Univ. Press, Baltimore.
- Parnell RJ. 2002. Group size and structure in western lowland gorillas (*Gorilla gorilla gorilla*) at Mbeli Bai, Republic of Congo. *Am J Primatol* 56:193-206.
- Plumtre, A. J.(1995) The Chemical-Composition of Montane Plants and Its Influence on the Diet of the Large Mammalian Herbivores in the Parc- National-Des-Volcans, Rwanda. *Journal of Zoology* 235:323-337.
- Plumtre, A. J. & Harris, S. (1995) Estimating the biomass of large mammalian herbivores in a tropical montane forest: a method of faecal counting that avoids assuming a 'steady state' system. *Journal of Applied Ecology*, 32: 111-120.
- Plumtre, A. J., Bizumuremyi, J. B., Uwimana, F. & Ndaruhebeye, J. D., (1997) The effects of the Rwandan civil war on poaching of ungulates in the Parc National des Volcans. *Oryx*, 31(4): 265-273.
- Plumtre, A. J., McNeilage, A., Hall, J. S. & Williamson, E. A. (2003) The current status of gorillas and threats to their existence at the beginning of the new millennium. In: *Gorilla Biology, A Multidisciplinary Perspective* (Taylor & Goldsmith, ed.s). Cambridge University Press.
- Robbins, M. M. (1995) A demographic analysis of male life history and social structure of mountain gorillas. *Behaviour*, 132 (1-2): 21-47.
- Robbins, M. M. (1996) Male-male interactions in heterosexual and all-male wild mountain gorilla groups. *Ethology*, 102: 942-965.
- Robbins, M. M. (1999) Male mating patterns in wild multimale mountain gorilla groups. *Animal Behaviour*, 57: 1013-1020.
- Sarmiento, E. E., Butynski, T.M. & Kalina, J. (1996) Gorillas of Bwindi-Impenetrable Forest and the Virunga volcanoes: Taxonomic implications of morphological and ecological differences. *American Journal of Primatology*, 40: 1-21.
- Sicotte, P. (1995) Interpositions in conflicts between males in bimale groups of mountain gorillas. *Folia Primatol.*, 65: 14-24.
- Stanford, C. B. (1999) Bwindi-Impenetrable Great Ape Project: Progress Report for 1999. <http://www.anthro.ucdavis.edu/gcn/g13bwindi.htm> Downloaded 14/05/03.
- Stanford, C. R. (2001) The subspecies concept in primatology: The case of mountain gorillas. *Primates*, 42 (4): 309-318.
- Tamale, E. S. (1996) Incentive measures for the conservation and sustainable use of biological diversity in Uganda; A case study of the 'Development Through Conservation' Project in communities around Bwindi National park. Presented at a Workshop on Incentives for Biodiversity: Sharing Experiences, Montreal, Canada, 20 August –1 September 1996.
- Taylor, D., Marchant, R.A. & Robertshaw, P. (1999) A sediment-based history of medium altitude forest in central Africa: a record from Kabata Swamp, Ndale volcanic field, Uganda. *Journal of Ecology*, 87: 303-315.
- Uganda Wildlife Division (2002a) Uganda National Report to CMS (2002) Prepared by Wildlife Division, (in the Ministry of Tourism, Trade and Industry, - P.O. Box 4241, Kampala, Uganda. http://www.unep-wcmc.org/cms/cop7/proceedings/pdf/national_reports/national_report_uganda.pdf Downloaded 30/10/2003.
- Uganda Wildlife Authority (2002b) <http://www.uwa.or.ug/research.html> Downloaded 26 May, 2003.

- UNEP (2002) The Great Apes Survival Project partnership (GRASP): Strategy. United Nations Environment Programme.
- UNEP-WCMC (2001) Gorilla – Species sheet. http://www.wcmc.org.uk/species/data/species_sheets/gorilla.htm Downloaded 16 May, 2003.
- UNEP-WCMC (2003a) World Conservation Monitoring Centre Protected Areas Database. http://www.wcmc.org.uk/protected_areas/data/wh/bwindi.html Downloaded 16 May, 2003.
- UNEP-WCMC (2003b) World Conservation Monitoring Centre Protected Areas Database. http://www.wcmc.org.uk/protected_areas/data/wh/virunga.html Downloaded 16 May, 2003.
- UNEP-WCMC (2003c) World Conservation Monitoring Centre Protected Areas Database. http://www.unep-wcmc.org/protected_areas/data/sample/0360p.htm Downloaded 16 May, 2003.
- UNEP-WCMC (2003d) World Conservation Monitoring Centre Protected Areas Database. http://www.unep-wcmc.org/protected_areas/data/sample/0238p.htm Downloaded 16 May, 2003.
- UNEP-WCMC & WWF International (2001) Gorillas. Threatened Species Account. World Conservation Monitoring Centre and World Wildlife Fund for Nature, International. <http://www.panda.org/resources/publications/species/threatened/downloads/GORILLs1.doc> Downloaded 15 May, 2003.
- UNESCO (1994) United Nations Educational, Scientific and Cultural Organization, Convention concerning the Protection of the World Cultural and Natural Heritage, World Heritage Committee, Eighteenth session, Phuket, Thailand, 12-17 December 1994. <http://whc.unesco.org/toc/mainf4.htm> Downloaded 16 May, 2003.
- Vedder, A. L. (1984) Movement patterns of a group of free-ranging mountain gorillas (*Gorilla gorilla beringei*) and their relation to food availability. *American Journal of Primatology*, 7: 73-88.
- Vesperini, H. (2002) Poachers kill two mountain gorillas in bungled raid. *Times*, 15 May 2002. <http://abcnews.go.com/sections/science/DailyNews/gorillas990305.html>
- Wallis, J. & Lee, D. R. (1999) Primate conservation: the prevention of disease transmission. *International Journal of Primatology*, 20 (6): 803-826.
- Watts, D. P. (1984) Composition and variability of mountain gorilla diets in Central Virungas. *American Journal of Primatology*, 7: 323-356.
- Watts, D. P. (1994) The Influence of male mating tactics on habitat use by mountain gorillas (*Gorilla gorilla beringei*) *Primates*, 35 (1): 35-47.
- Watts, D. P. (1997) Agonistic interventions in wild mountain gorilla groups. *Behaviour*, 134: 23-57.
- Watts, D. P. (1998) Long term habitat use by mountain gorillas (*Gorilla gorilla beringei*). I. Consistency, variation, and home range size and stability. *International Journal of Primatology*, 19 (4): 651-680.
- Whitfield, J. (2002) Gorillas go into virtual reserve: computer model of mountain forest to keep track of threatened apes. *Nature, Science Update*, <http://www.nature.com/nsu/021104/021104-18.html>
- Williamson, L. (1999) Report from the Karisoke Research Centre, Rwanda. *Gorilla Conservation News*, 13, May 1999.
- WWF (2002) Gorillas Under Threat. World Wildlife Fund for Nature. http://www.panda.org/downloads/species/Gorillas_Final.pdf Downloaded 26 May, 2003.
- WWF (2003) Flagship Species: Eastern Gorillas. World Wildlife Fund for Nature. http://www.panda.org/about_wwf/what_we_do/species/what_we_do/flagship_species/great_apes/eastern_gorilla/index.cfm . Downloaded 26 May, 2003.
- Yamagiwa, J. (1987) Intra- and inter-group interactions of an all-male group of Virunga mountain gorillas. *Primate*, 28 (1): 1-30.
- Yamagiwa, J. (1999) Socioecological factors influencing population structure of gorillas and chimpanzees. *Primates*, 40 (1): 87-104.