the Jane Goodall Institute

Gombe Stream Research Centre
2004 Annual Report

Photo by ML Wilson, 09 June 2004

Fifi, matriarch of Gombe, 1958-2004

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1 Introduction

2004 marked the 45th year of the research program begun by Jane Goodall at Gombe. What began with the efforts a single woman in what was then Gombe Stream Game Reserve has now grown into a research station with nearly 40 full-time employees.

This year marked the end of an era at Gombe. Goblin, the oldest male chimpanzee in the Kasekela community, died in August (Figure 1). Soon thereafter, Fifi, Gombe's oldest chimpanzee and the only individual known to have been alive since before Jane Goodall's first arrival in Gombe, disappeared in September, together with her infant daughter (Figure 2). Vincent, the alpha male of the Mitumba community, injured himself falling from a tree in September. Vincent's injury made him vulnerable to attack, and in December members of his own community killed him.

Major changes also occurred with the personnel at GSRC. Five of the long-term employees retired (Hilali Matama, Eslom Mpongo, Hamisi Mkono, Yahaya Almasi, and Yahaya Matama). These employees, some of whom started working at Gombe as long as 35 years ago, provided deep connections to the past, and their wisdom and experience will be missed. This year also marked the baboon project's first year without Appolinaire Sindwimo, who retired at the end of 2003. Simba Hassani Abedi, who had been planning to retire, passed away in October.

Despite these many changes, scientific productivity continued at a high rate. At least 13 publications based on Gombe research appeared in 2004, including one book chapter, 2 PhD Theses, and 10 journal articles, 2 of which appeared in the prestigious journal *Nature* (Appendix I). Gombe researchers also maintained a strong presence at international conferences, with at least 12 presentations given at conferences in the United States and Europe. These recent studies relied both on traditional research tools—pen, paper, wristwatch, raincoat and a good pair of hiking shoes—as well as exciting new technologies, from molecular analysis of genetics, viruses, and hormones to satellite images. New software such as GIS (Geographical Information Systems) helps us to understand and interpret data in exciting new ways. Digital photos and video provide essential documentation of events and individuals. Frame by frame analysis of videotaped behavior is an important new tool in behavioral analysis. Much of our recent scientific productivity depends on the computer database developed at the University of Minnesota by Anne Pusey and her colleagues and students, who have now digitized and organized over 30 years of data from Gombe.

This report covers six major topics. First, we provide an overview of ongoing research on chimpanzees, baboons, and other topics at Gombe. Second, we present findings from the long-term monitoring of the chimpanzees, including the demography, male dominance relations, mating, hunting, intergroup aggression and disease. Third, we present findings from the baboon study, including group composition, female and male reproductive strategies, disease, and interactions with other species. Fourth, we discuss issues relating to park-wide ecology: fire, poaching, and weather data. In the final two sections, we discuss administrative issues, including personnel changes and support for TANAPA's development of a General Management Plan for Gombe.

1.1 Research projects – Overview

Gombe is best known for chimpanzee research, and indeed, most of the ongoing projects focus on chimpanzees. Gombe is also the site of a well-known baboon project, and studies continue on other primates and other topics, including botany, habitat change and conservation. Ongoing projects in these topics are summarized below.

1.2 Chimpanzee projects

Gombe contains three chimpanzee communities: Mitumba, Kasekela, and Kalande. Most research focuses on the centrally located Kasekela community, which has been studied since 1960. A smaller research effort focuses on the Mitumba community, which has been studied systematically since the mid 1990s. The Kalande community is not habituated but has been monitored since 1998.

Current investigations include the following:

1.2.1 Health monitoring

Disease is the main cause of death of Gombe chimpanzees, and we suspect that at least some of the diseases chimpanzees suffer come from human sources. Improving the health of Gombe chimpanzees is thus critical for conserving them. Moreover, since humans and chimpanzees are so closely related, study of chimpanzee health can yield important findings for human health.

We have implemented a project for monitoring the health of Gombe chimpanzees in regard to the following: general health and parasites; virology and genetics; and hormones related to reproduction and stress. Monitoring efforts focus on non-invasive collection of urine and fecal samples. This project involves collaboration with leading scientists at universities in Tanzania and abroad (Universities of Dar es Salaam, Alabama, Minnesota, and Harvard), and experts in wildlife health at TANAPA and Lincoln Park Zoo (USA). Drs. Elizabeth Lonsdorf and Dominic Travis of Lincoln Park Zoo raised funds to implement the project and visited Gombe twice (Jan. and Jul.) to provide key guidance and support.

The virology component of the health-monitoring project is part of a multi-site project led by Beatrice Hahn at the University of Alabama. This project focuses on SIVcpz, a close relative of HIV, the virus that causes AIDS in people. At least 13% of chimpanzees at Gombe carry this virus (Santiago et al. 2003), but those affected with the virus do not show any obvious AIDS-like symptoms. Chimpanzees carry this virus naturally, and are now thought to be the source of HIV – which people probably got from hunting and butchering chimpanzees for meat (Worobey et al. 2004). What we learn about this virus at Gombe will provide important information for improving human health.

Jared Bakuza (University of Dar es Salaam) is studying chimpanzee parasitology for his MSc. Jared has overseen the transformation of an old storage shed into a well-equipped field laboratory, complete with microscope and materials for collecting and storing samples.

As part of the health monitoring project, we collected over 500 samples, including approximately 110 fecal samples preserved in formalin for parasitological analysis, 338 fecal samples in RNAlater for virology and genetics, 83 fecal samples dried for hormonal analysis, 130 urine samples frozen for virology and hormone analysis, and about 15 tissue samples to diagnose the cause of death of Goblin.

1.2.2 Female range use and social relations

Carson Murray (University of Minnesota) spent 10 months in Gombe (Jan-Oct) studying range use and social relations in female chimpanzees. In addition to recording behavioral data, Carson sampled over 120 vegetation plots randomly distributed throughout the Kasekela community's home range to quantify habitat quality in different regions of the range.

1.2.3 History and demography of the Mitumba community

The Mitumba community of chimpanzees was habituated in the early 1990s but has received relatively little research attention. Deus Cyprian Mjungu (University of Minnesota) spent 2004 pulling together data on the history and demography of this neglected community for his master's thesis. Deus visited Gombe for several months (Jun-Aug), mainly to interview people in and around the park about the history of the Mitumba chimpanzees. Deus will finish his master's thesis in May 2005 and has been accepted into the PhD program at Minnesota, where he will focus on intercommunity relations.

1.2.4 Intercommunity relations

In addition to serving as Director of Field Research, Dr. Michael Wilson (GSRC) has continued his studies of intercommunity relations at Gombe. Chimpanzees are well known for their hostile intercommunity relations. Studies at Gombe and other sites have greatly influenced the debate on the origins and evolution of human warfare. The ongoing study of chimpanzees at Gombe provides an unparalleled opportunity to gain valuable insights into the causes of intergroup aggression. The project consists of two components: analysis of long-term data from Gombe, housed at the University of Minnesota; and direction of ongoing field studies at Gombe, to ensure that intergroup interactions are adequately documented when they do occur.

1.2.5 Videography

Bill Wallauer (GSRC) continued to document on videotape the life histories and significant events of the chimpanzees within the Kasekela community. Over the course of 2004 Wallauer recorded approximately 130 hours of footage. Highlights during the year included the changes in male politics within the Kasekela community,

Frodo's illness and subsequent return to the community, and further development in the lives on Gremlin's twins Golden and Glitter.

Changes in hierarchal status among the high-ranking males of the community are always of particular interest. With the temporary disappearance of Sheldon (the highest ranking male during much of 2003-2004), a void existed at the top position. During this period, Wallauer documented the rise of Kris as the alpha male of the Kasekela community. Male politics are discussed in more detail below (Section 2.2.1).

Over the past six years, Wallauer has documented the life experiences and development of the longest surviving pair of twins known from studies of wild chimpanzees. In April 2004, the twins reached a new pinnacle of independence when they spent three days together away from their mother. Wallauer followed the twins (Golden and Glitter) through their separation from Gremlin. The two stayed within close proximity of one another through this time. When either individual lost visual contact with the other their behavior was similar to that of an infant separated from their mother. Wallauer recorded events including an encounter with a bush pig, the twins successfully capturing and consuming dozens of flying termites, and the events leading to their eventual reunion with Gremlin (Figure 3).

The Gombe Video Program and GSRC continue to maintain a close relationship with the Jane Goodall Institute's Center for Primate studies at The University of Minnesota. Wallauer visited Minnesota in October to discuss ongoing efforts to develop a readily accessible digital library of video images.

1.2.6 Completed projects

In addition to these ongoing projects, several previous projects have reached or neared completion. Stephanie Pandolfi (Duke University) completed her PhD thesis on chimpanzee feeding behavior (Pandolfi 2004). In November, Ian Gilby (University of Minnesota) successfully defended his PhD thesis on hunting and meat sharing in wild chimpanzees (Gilby 2004). For his post-doctoral studies, Ian will work with Richard Wrangham (Harvard University) and Anne Pusey to develop a database to facilitate comparative study of chimpanzees at both Gombe and the Kanyawara community in Kibale National Park, Uganda. Melissa Emery Thompson (Harvard University) successfully defended her PhD thesis on the reproductive ecology of female chimpanzees (Emery Thompson 2005). Elizabeth Greengrass (Bristol University) completed major portions of her PhD thesis on play and dominance interactions in chimpanzees, to be defended in early 2005.

1.3 Baboon projects

The Gombe baboon study has continued since 1967, encompassing many aspects of ecology, life history and disease. Currently three projects are underway:

1.3.1 Female hormones and reproduction

Annie Bosacker (University of Minnesota) continued to work on her PhD thesis, which focuses on the relationship between reproduction and hormone levels, as

measured through fecal samples previously collected at Gombe. This study focuses on two main topics: the relation between dominance rank and reproduction, and the decline in reproductive competence with increasing age.

1.3.2 Genetic structure of the population

Amanda Vinson (University of Minnesota) continued work on her PhD thesis, analyzing genetic material obtained from baboon fecal samples collected in previous years at Gombe. Amanda identified paternity for baboons in one well-studied troop, and compared the population genetics of Gombe baboons with baboons from Mikumi National Park, Tanzania

1.3.3 Bones and teeth indicating life events

When baboons die, there are numerous signs in their bones and teeth of the events that happened to them during their life, from breakages and injuries down to diseases and periods of stress. Currently Charles Msuya (State Univ. of New York; Muhimbili University College of Health Sciences) and Jacqueline Bowman (University of Philadelphia) have been investigating the skeletons of 40 baboons whose full life histories are known, together with 29 others partially known, and some others for comparison.

1.3.4 Visitors

In addition to these ongoing projects, the baboon project enjoyed a visit from Jackson Kinyua, a field assistant for the Amboseli Baboon Project in Kenya.

1.4 Other primate projects

1.4.1 Natural hybridization of red-tailed and blue monkeys

Red-tailed and blue monkeys occur together at many sites across Africa, but at Gombe these two species interbreed to an extent not documented elsewhere. Kate Detwiler (New York University) and her husband James Gray arrived in August to begin a 12-month study of the genetics and natural history of this unusual hybrid zone.

1.5 Conservation and botanical research

1.5.1 Vegetation change

Changes in vegetation in and around Gombe have had a profound effect on the conservation status of chimpanzees living in Gombe. Lilian Pintea (University of Minnesota) neared completion of his study of habitat change in and around Gombe, using aerial photographs, extremely high-resolution satellite images and Geographical Information Systems (GIS) software to analyze how habitat has changed inside and

outside the park since the 1940s. Grace Gobbo (GSRC) added to our understanding of vegetation change by resampling vegetation plots first sampled over 30 years ago (Clutton-Brock 1972).

1.5.2 Bwavi monitoring

Dr. Shadrack Kamenya (GSRC) directed the ongoing efforts to monitor the Kalande chimpanzee population and associated conservation issues near the Bwavi ranger station in the south of Gombe. This project began in 1998 with an effort to estimate the number of chimpanzees in the southern Kalande community (Greengrass 2000). As the project continued, the focus expanded to include other issues relating to ecology and conservation (Grossman 2004). In mid-2004, GSRC research assistant Sood Ndimuligo shifted from Kakombe to Bwavi to directly oversee the monitoring efforts and establish transects for recording tree cutting and other poaching and encroachment events.

1.5.3 Medicinal plants

Dr. Kamenya and Grace Gobbo (GSRC) worked together to compile information on medicinal plants used by traditional healers in the villages around Gombe. Many of the plants identified as having medicinal value are important chimpanzee foods. By focusing attention on these plants, this project hopes not only to add to our understanding of potentially useful plants, but also to increase awareness in the villages regarding the value of conserving forests.

2 Chimpanzee Research

Chimpanzees have remained the focus of research at Gombe since 1960, when Jane Goodall began the first long-term study of wild chimpanzees. This study now ranks as one of the longest and most detailed studies of any wild animal.

2.1 Demography

The Gombe chimpanzee study provides a uniquely long-term and detailed dataset for chimpanzee demography (Jones et al. in prep). Analysis of demographic trends – births, deaths, and migrations – provides critical information on the health of the population. Such information is essential for guiding management decisions. Here we discuss the size and trends of the total population plus details for the park's three chimpanzee communities.

Gombe National Park contains three chimpanzee communities: Mitumba in the north, Kasekela in the center, and Kalande in the south. Detailed demographic data exist for Mitumba since 1996 and for Kasekela since 1966. The Kalande community, which remains unhabituated, has been monitored systematically since 1998, but the exact number of chimpanzees there remains uncertain. As of 1 January 2005, these three communities contained approximately 22, 57, and 7 chimpanzees respectively, for a total of 86 chimpanzees in the park. Occasional sightings indicate that a small number of additional chimpanzees may live in the park but have not yet been identified reliably.

The total number of chimpanzees in the park has remained relatively stable over the past 10 years (Figure 4). On 1 January 1996, an estimated 88 chimpanzees lived in the park. Since that time, the population has fluctuated between 84 (in 2004) and 90 (in 2002) chimpanzees.

This overall stability, however, masks a dramatic decline in the Kalande community, which has dropped from at least 22 (and more likely 25-30) chimpanzees in 1996 to perhaps 7 at the start of 2005. The total population remained relatively stable because of a concomitant increase in the size of the Kasekela community. However, much of the increase in Kasekela resulted from females emigrating from Kalande. In addition to the precipitous decline already observed in the Kalande community, the Mitumba community has grown increasingly vulnerable to intercommunity attack with the death of the former alpha male, Vincent. Only two adult males now survive to defend the Mitumba community against the 10 adult males of the Kasekela community.

The extent of the decline in Mitumba may also be underestimated here due to uncertainties of the size of the community in the early 1990s. For example, we estimate the 1996 population of Mitumba as 26 individuals (Figure 4). However, the actual population may have been closer to 30, with the inclusion of some rarely seen or poorly known individuals, including one male (Brutus) and several unnamed females.

In any case, the current population of 86 chimpanzees represents a substantial decline from the 120-150 estimated to live in the park in 1960 (Figure 5) (Pusey et al. 2006). Moreover, computer models indicate that the stability apparent over the past 10 years is unlikely to continue over the long term (Earnhardt et al. 2004). Over the next 100 years, the population is expected to decline further, to less than half the current population. Given the existing age structure and levels of mortality, the population may be expected to remain stable for the next 10 to 20 years before resuming a decline, with a mean predicted number of 40.2 chimpanzees remaining after 100 years. Unless this trend can be reversed, the population will eventually become extinct. Interventions that could reverse this trend include reducing mortality from disease and poaching, increasing habitat, and supplementing the population with a small number of females (Earnhardt et al. 2004).

2.1.1 Kasekela Community: Many births and deaths

The Kasekela community numbered approximately 57 individuals at the start of 2005 (Table 1). This represents a net increase of 1 from the previous year, the sum of 6 births (Table 5) and (perhaps) 1 immigration minus 6 deaths (Table 6).

Established females Candy, Fanni and Gremlin gave birth to Cocoa, Familia and Gimli, respectively. Sherehe, a young female who had only recently started cycling, unexpectedly gave birth to Shangaa in August. Immigrant females Malaika and Kipara gave birth to Mambo and Kobe – the first immigrants in recent years to bear offspring. Kobe lived only a few months, however, before dying, possibly from intraspecific aggression.

The six births were offset by an equal number of deaths, including the deaths of the

community's oldest male (Goblin, who would have been 40 in September) and the disappearance and presumed death of the oldest female (Fifi, 46), along with her youngest offspring, 2-year old daughter Furaha.

When last seen, Fifi appeared to be in good health. B-record researchers did not follow Fifi in August, due to the fire and other disturbances, but mother-infant researchers saw her in late August while following another mother. Initially, Fifi's absence seemed unremarkable. For most of the year she had been seen infrequently, having shifted her range to the remote northern valleys of Linda and Rutanga. Worries mounted in mid-September, however, when Carson Murray found a large group of northern mothers traveling without Fifi. Then, on 17 September, researchers found Fifi's six-year old daughter Flirt traveling without her mother – surprising behavior for such a young female. Researchers and park rangers from Kasekela and Mitumba searched intensively for Fifi throughout October but could find no sign of her and she and Furuaha are now presumed dead.

Born about 1958, Fifi was Gombe's most fertile female, giving birth to nine infants. Two of her sons, Freud and Frodo, grew up to be alpha males. Grown daughters Fanni and Flossi and son Frodo have provided Fifi with at least ten grandchildren. Fifi and her descendants together constitute over 28% of the main study community. Her most recent offspring, Furaha, was born 9 October 2002.

In addition to Furaha, three other infants died in 2004: Kobe, Tofiki, and Dylan. Kobe, as mentioned above, disappeared shortly after his birth. Dylan was seen dead on 13 November, being carried by his mother Dilly. Researchers were unable to recover Dylan's body or to see clearly whether he showed any signs of injury. Tofiki died following an unexpected attack by Freud. Freud was grooming Tofiki's mother Tita when he suddenly grabbed the 3-year old Tofiki, ran off with him, and bit him in the head (Carson Murray, unpublished data). In addition to these six deaths from 2004, Skosha, a sterile female who cycled for many years without giving birth, disappeared in late 2003 and presumably died at that time.

In recent years, many new females have joined the Kasekela community, most of them presumed immigrants from the declining Kalande community. In late 2003, four new females were identified: adult female Echo, her 3-4 year old daughter Eowyn, an adolescent female Eliza (possibly an older daughter of Echo), and adult female Haiki. At least one additional female seems to have immigrated in 2004.

The large influx of females has created confusion in the identification of females. Researchers disagreed in particular over the identification of one female, who was called either California or Conoco (both daughters of Candy). Based on photographic evidence, however, Bill Wallauer determined that this female is most likely Bahati, an immigrant from the Mitumba community. Mitumba field assistant Lamba Hilali confirmed this identification. The fate of California and Conoco is unknown.

One Kasekela female, Schweini, attempted to join the Mitumba community but returned to Kasekela after suffering repeated attacks from Mitumba females. Mitumba researcher Gabo Paulo reported that Schweini, who turned 13 in April, visited Mitumba several times in early 2004. On two occasions, 24 January and 19 February, Mitumba females attacked Schweini fiercely, despite attempts by Mitumba males to

protect her. Flossi and Darbee led the February attack. Schweini then returned to Kasekela, where Carson Murray saw her suffering from a severe open wound to the head as well as wounds to her fingers.

2.1.2 Mitumba Community: Increased risk of extinction

As of 01 January 2005, the Mitumba community numbered approximately 22 individuals (Table 2). This represents a net increase of 2 (or perhaps 4) over the past year: 2 births, plus one immigration, minus one death. Reports of an unfamiliar mother and infant seen in 2004 suggest the actual total may have been 24. These individuals likely represent residents of Mitumba who have not previously been identified.

Two births occurred in Mitumba in 2004 (Table 5). Eva gave birth to daughter Eden in June, and in November Aphro gave birth to an infant whose sex has not yet been determined. The young female Aqua has not been seen since 2003 and has either emigrated or died. The only death known to occur in Mitumba was Vincent, the former alpha male (Table 6). Vincent fell approximately 30 m from a tree in September, when he attempted to take meat from another chimpanzee after a hunt. After the fall, Vincent favored his left leg but, amazingly, did not seem to have suffered severe injuries. However, Vincent appeared weakened and avoided the other males, especially Rudi, who attacked and displayed at Vincent whenever they met. On December 22, shortly after Rudi and Edgar had hunted red colobus monkeys, Vincent joined the males, who then attacked him brutally and killed him. The death of Vincent leaves Mitumba with only 2 adult males, and thus extremely vulnerable to intercommunity attack from the much larger Kasekela community.

The death of either of the surviving two adult males in Mitumba may lead to a rapid decline of this community, much like that already documented for Kalande and, in the 1970s, for K-group in Mahale (Nishida et al. 1985). Females without infants would be expected to transfer to the Kasekela community. Males of any age, and infants of either sex, would face a high risk of lethal aggression from the Kasekela males.

2.1.3 Kalande Community: Rapid decline

The least studied community in Gombe is the Kalande community. These chimpanzees are not habituated to observers and remain fearful of people. Habituation is not recommended for this community because it occupies the part of the park most at risk from human poachers. Since 1998, GSRC has maintained staff in the Bwavi camp to monitor the Kalande community and poaching threats.

In recent years, the Kalande community has declined in numbers rapidly, representing an acceleration of a trend already evident when Elizabeth Greengrass began systematic monitoring of this population in 1998.

The Kalande community was once a large community that occupied much of the southern half of the park (Goodall 1986). In the 1980s, researchers attempting to habituate the Kalande chimpanzees estimated the community to have a total of 60 to 80 chimpanzees (Greengrass 2000). By 1998-1999, however, Greengrass (2000) estimated that no more than 20-30 chimpanzees remained in Kalande. In a subsequent

study carried out between 2000 and 2003, Grossman (2004) conducted line transects that yielded a similar estimate of 17 weaned chimpanzees (95% confidence interval:12 to 24 individuals).

These earlier estimates are now supported by both observational and genetic data. A list of all individuals known or suspected to have lived in Kalande from 1997 to the present, based on clearly identified individuals currently or formerly living in Kalande, plus known deaths and recent immigrations, yields 31 individuals (Table 3). By the end of 2004, of these 31 individuals, 10 had emigrated to Kasekela, 6 were known or suspected to have been killed by people, 4 were killed by disease, 2 were killed by Kasekela chimpanzees, and only 9 were known to remain in Kalande. From this much reduced population, a further 2 females appear to have emigrated to Kasekela in early 2005.

This list of 31 individuals includes a few whose existence is known only from verbal reports of chimpanzees found dead or for sale in Mtanga village (Table 3). However, these estimates of population size are supported by genetic tests of fecal samples collected in Kalande (Keele et al. 2005). As part of the SIVcpz study, the Beatrice Hahn lab has used genetic methods (microsatellites) to distinguish different individuals from fecal samples collected from unknown individuals. These methods revealed a total of 18 distinct individuals, including Tumaine and three other males, in samples collected 2002-2004. This number agrees well with the estimated population size of 20 in 2002 (Table 3).

By the end of 2004, the Kalande community consisted of perhaps 9 or 10 individuals (Table 3). For two consecutive years, maximum observed party size has been 7 (Table 4). The party observed in 2004 with 7 individuals consisted of 3 adult females, 3 infants/juveniles and 1 male. Most sightings occurred in Bwavi, Nyamagoma and Gombe valleys. On a few occasions observers reported finding chimpanzees in Kalande Valley, which was once solid Kalande territory but is now a border zone used by both Kalande and Kasekela chimpanzees. The Bwavi field assistants do not know the Kasekela chimpanzees, but can generally distinguish them from Kalande chimpanzees based on their habituation level. In contrast to the well-habituated Kasekela chimpanzees, most Kalande chimpanzees are unhabituated and flee on seeing humans. The only exceptions, Patina and Porosa, are well known to the observers.

With perhaps only one surviving adult male, the Kalande community has approached the brink of effective extinction. In late 2003, the emigration of Echo and her young infant Eowyn from Kalande to Kasekela raised the question of whether any males survived in Kalande. Mothers of young infants rarely transfer unless their community has become effectively extinct, with no surviving adult males (Nishida et al. 1985). In recent years, most chimpanzee sightings in Kalande have consisted of only mother and infants, mainly the well-known mothers Patina and Porosa. Only one sighting of a male (“Leonard”) occurred in 2003. Subsequent sightings of a shy adult male did continue through 2004, indicating that Leonard survives in Kalande. Carson Murray has suggested, however, that the male seen in Kalande is in fact the Kasekela male Sheldon, who often ranges in the south and who disappeared from Kasekela for months at a time in 2004.

Observers did not report any births or deaths for this community in 2004.

2.2 Social behavior

This section focuses on behavioral events recorded by the "B-record" field assistants and other observers of the Kasekela community.

2.2.1 Male dominance relations

This year was an eventful time for male dominance interactions. At the start of the year, Sheldon (Figure 6) was widely considered the highest ranking male. However, he never appeared to be a very strong alpha male, and by the middle of the year he began spending long stretches of time away from the main group. By the time Sheldon returned in November, Kris (Figure 7) appeared to have taken over as the clear alpha male. In addition to Kris's rise, Frodo showed signs of recovery from his illness of two years ago and might well regain his old position in the coming months.

B-record observers recorded approximately 854 dominance interactions (pant-grunts, directed displays, beating, biting, chasing, hitting, and threatening) over the course of the year. Of these, a total of 175 involved dyadic interactions among adult or adolescent males. Considering these dyadic interactions over the course of the entire year, Sheldon emerges as the highest ranking (Table 7). However, Sheldon's status clearly changed over the course of the year. Of the 57 dyadic wins recorded for Sheldon during the course of the year, only 7 occurred after June (and only 1 after September). In contrast, of the 31 dyadic wins recorded for Kris, 17 occurred after June.

For purposes of comparison with estimates based on quantitative data, we also report subjective rank estimates by Bill Wallauer (Table 8). Although quantitative data are generally considered to provide the most reliable estimates of rank, subjective estimates are also extremely valuable, especially when based on many hours of detailed observation. Wallauer observed the Kasekela males extensively throughout 2004, but based the estimates reported here mainly on observations from the final months of 2004. The correlation between these two rank estimates is fairly poor (r^2=0.22). Many of the differences between the estimates result from the different time frames of the estimates: the quantitative estimates consider a full year, in which many rank changes occurred, including the fall of Sheldon. Excluding Sheldon from the comparison yields a better correlation (r^2=0.56)

Additional sources of differences between the quantitative and subjective rank estimates include differences in individual's behavioral traits and tactics, and perhaps incomplete recording of behavior by B-record observers. For example, in Table 7, Freud is ranked higher than Tubi because of a single interaction: a display by Freud towards Tubi. However, according to Wallauer's observations, Tubi clearly outranked Freud. Wallauer noted that Freud rarely asserted himself, but when he did he sometimes displayed at higher-ranking males. Although B-record did not record any dyadic dominance actions by Tubi towards Freud, Wallauer observed that Tubi demonstrated his dominance over Freud throughout the year with direct displays. In each case, Freud either climbed or ran from Tubi.

One of the key events in Kris' acquisition of the alpha position involved competition between the males over the popular female, Trezia. Wallauer recorded video of Kris and Wilkie shadowing Trezia as other community males followed. Kris and Wilkie displayed frequently and the competition was fierce at times.

In addition to Kris' rise to alpha, Trezia's cycling marked the full return of the former alpha male Frodo from exile. After suffering a severe illness in early 2003, Frodo spent most of his time alone, but began traveling with others more frequently starting in January 2004. By November, Frodo appeared to have ended his exile and spent much of his time in the main group. By this time, Frodo's health had measurably improved, and he had resumed hunting and engaging in dominance interactions. In the first few months of the year, Frodo's dominance interactions were limited to pant-grunting and screaming to other chimpanzees. By June, however, he had begun displaying, and by the end of the year was vigorously beating and chasing low-ranking males such as Apollo and Titan. In the second half of the year, Frodo was only recorded pant-grunting once (in December, to Kris and Tubi).

Frodo's return to dominance competition during Trezia's cycling marked a sharp contrast to former alpha males who have behaved in a more subtle fashion upon re-entering the community. Frodo persistently attempted to mate with Trezia, disrupting Wilkie and Kris' hold over her. Strikingly, Kris initially stood by and watched Frodo's pursuit of Trezia, rather than directly interfering, as a more experienced or confident alpha male might have done. Wallauer recorded two such occasions on video in which Kris stood by and watched as Frodo attempted to mate with Trezia. Kris was clearly agitated but did not have the confidence to display directly at Frodo. In contrast, Wilkie, who was alpha male in the early 1990s, actively prevented Frodo's advances toward Trezia. On several occasions, Wilkie attacked Frodo and chased him screaming away from Trezia. Despite his inexperience, Kris' frequent impressive displays were sufficient to get him to the top of the male ranks. While Wilkie was able to intimidate Frodo to protect Trezia, Kris was clearly dominant over Wilkie. The next year will be a fascinating time for male politics, with several strong contenders who may take advantage of Kris' inexperience.

On 30 November, Wallauer recorded another critical event in male politics: the attempted re-entry into the community by Sheldon. After initial displays by the other community males, followed by some intense grooming, Sheldon seemed to be integrating back into the group. However, on one occasion in early December, Sheldon was attacked and for a short time pinned to the ground by at least three other community males (including Wilkie). Following the attack, there was a very tense hour in which Wilkie, Kris and Freud followed Sheldon up a tree and sat near him. It was not clear at the time if things were settling down or if the other males were putting subtle pressure on Sheldon. Finally, Sheldon's nerve broke and he fled whimpering and screaming as he climbed to the ground. A short time later, Sheldon disappeared again and has not rejoined group activity.

2.2.2 Mating

Observers recorded a total of 240 matings in 2004 (Table 9). Twelve different females were recorded mating this year, including six nulliparous females and six parous

females (Table 10).

Most of the observed matings involved the nulliparous females: Bahati (53 matings), Sifa (37), Nuru (24), Schweini (18), Gaia (11), Nasa (4). This was the first year in which Gaia and Schweini were observed mating with adult males. The remaining four females (Bahati, Sifa, Nasa, and Nuru) have cycled for years without producing offspring.

Considering only matings with parous, swollen females, 82 matings were recorded (Table 10). Two females (Echo and Trezia) have resumed cycling after the weaning of their previous infant. Two other females (Kipara and Dilly) resumed cycling after losing their infants. The remaining two have cycled for many years without giving birth. Jiffy hasn't given birth since 1989, and Hope hasn't given birth since 1998. Neither has surviving offspring.

Apart from the clearly high-ranking Kris, male mating success correlated poorly with dominance rank. Kris obtained the highest mating success with parous females (17 matings) and the second highest with all females (30 matings). Sheldon – the apparent alpha male for much of the year – was recorded mating a modest 18 times, and only 5 of these were with parous females. In contrast, Wilkie, who (based on recorded dominance interactions) is only mid-ranking, achieved the second highest mating success with parous females (13 matings) and the highest with all females (32).

For a variety of reasons, including observation conditions and choice of focal targets, B-record observers did not record every mating that occurred. For example, Wallauer – who focused on male politics, which in November and December mainly involved competition to mate with Trezia – observed multiple matings between Trezia and Kris, in contrast to the single mating recorded by B-record. An additional female, Yolanda, was observed mating in December but this was not recorded in B-record.

2.2.3 Hunting

Kasekela chimpanzees hunted frequently, killing at least 53 animals, most of them red colobus monkeys, except for 4 young baboons and 7 young bushpigs.

2.2.4 Intergroup aggression

The Kasekela community made many forays into the far north and south of their range. Despite repeated incursions from Kasekela, the Mitumba community also expanded their range, traveling into areas that they had not been observed visiting for many years. In August they crossed the Rutanga Stream into RK 6, where they fed on 'mvumvu' fruits and 'minoso.' They visited RK 6 on 28 August and visited RK 15 on 30 August. The return of Mitumba chimpanzees to Rutanga may have resulted from increased strength in numbers, with the maturation of the young males Edgar and Rudi.

The timing of Fifi's disappearance – in September, months after she had shifted her range to the north, and soon after Mitumba chimpanzees had begun making forays into Rutanga – suggests that she and Furaha may have fallen victim to attack by Mitumba chimpanzees.

During the year, Kasekela and Mitumba chimpanzees exchanged calls on many occasions. Kasekela chimpanzees even crossed north of Mitumba stream, which had rarely been recorded before. In addition to such incursions and exchanges of calls, Mitumba researchers observed an intergroup attack on 18 December. At 1340, the Mitumba party included Loretta, Londo, Rudi, Edgar, Bima, Lucy, Lamba, Rumumba, Flossi, Fansi, Forest, Eva, and Eden. The party was in MT1, with young ones playing around and mothers doing their regular things, when the Kasekela chimpanzees appeared abruptly. The Kasekela chimpanzees numbered about 27 including females and males, including Frodo. The mothers gathered their infants and juveniles and fled. Three Kasekela females caught Konyagi, who had delayed her escape to collect her son Kocha. The Kasekela females hit her but she managed to escape and run away. Konyagi suffered small injuries to her mouth (upper and lower lips). The Kasekela chimpanzees followed the Mitumba chimpanzees for a distance and then exchanged calls, with Mitumba chimpanzees calling from MT9 and Kasekela chimpanzees calling in the upper part of MT3.

Though worries continued that males from the large Kasekela community would attack and kill members of other communities, the most violent attacks actually observed took place within communities: Freud's killing of infant Tofiki and the brutal killing of Vincent by Rudi and Edgar.

2.3 Disease

Disease is the main cause of death for Gombe chimpanzees. Chimpanzee health is thus a critical conservation concern for this population.

Considering all 7 chimpanzee deaths in 2004, only one (Goblin) was clearly associated with disease. Up to three deaths resulted from violence – two known (Tofiki and Vincent) and one suspected (Kobe) case of intracommunity killing. In one case (Dylan), the body was found but cause of death could not be determined. In the remaining cases (Fifi, and Furaha), the individuals simply disappeared, with no body found later.

The main health issue affecting Gombe chimpanzees in recent years has been the "skinny male" syndrome. At various times over the past two years, male chimpanzees have exhibited a rapid deterioration of condition, losing weight and becoming weak. Males affected so far include Beethoven, Frodo, Kris, Apollo, and Goblin. Before Beethoven disappeared in late 2002, he appeared unusually thin. Goblin rapidly grew thin and died in August 2004. Frodo, Kris, and Apollo have all recovered. Some females, such as Nasa, have also shown temporary deterioration of condition, though none so striking or severe as the males.

Chimpanzees at Gombe regularly lose weight during the dry season, presumably because of limited availability of food at this time (Pusey et al. 2005), but the extreme and rapid weight loss shown by Frodo, Goblin and others seems more likely the result of disease.

Goblin was first reported in ill health on 05 August 2004, when he was seen moving slowly and not eating. Fecal samples revealed the presence of hookworm and *Ascaris*

ova and *Strongyloides* larvae. Fecal culture proved negative for *Shigella* and *Salmonella*. Goblin was treated with 500mg Cipro twice daily and fed bananas dosed with rehydration solution. Goblin's health seemed to improve after he was provided with food and antibiotics. Nonetheless, he continued to move little, and eventually his condition deteriorated further. He slept repeatedly in the same night nest and eventually stopped eating altogether. Autopsy revealed numerous lesions in his body cavity. Preliminary analysis of one lesion revealed the presence of a nematode worm, possibly *Stronglyoides* (Karen A. Terio, pers. communication). Samples of additional tissues are being sent for further analysis.

A previous death at Gombe, Michaelmas, who died in 1986 at the age of 13, was also associated with numerous *Strongyloides* abscesses (Jane Goodall, pers. comm. to Anne Pusey). Necropsies of Mitumba chimpanzees Vincent and Ebony also revealed the presence of *Stronglyoides* granuloma, numerous in Vincent's case and few in Ebony's.

3 Baboon Research: Long-term monitoring

The field staff has continued under the leadership of Marini P. Bwenda, following the retirement of Appolinaire in 2003. We are studying nine groups. Five of these groups are monitored every day; the other four are sampled twice a week.

3.1 Group composition

The largest group comprises 42 baboons, the smallest has only 13, but most groups have between 30 and 40. A typical group has 33 members, composed of 5 adult males, 12 adult females, and sixteen immature offspring. Group-compositions at the end of the year are shown in Table 11.

Over 2004, the number of baboons in the study population remained the same: there were 279 in January and 278 in December. Although none of the groups changed by more than three, this constant figure does conceal a considerable amount of change within each group. For example, BA Group increased only slightly from 29 to 32 over the year. During this time, 9 infants were born, but of these 3 died, and a further two juveniles (born the previous year) also died. One natal male (Allium) left to breed elsewhere, and three adult males (Kiloboto, Beetle and Pendo) also left, but these losses were balanced by three other adult males (Applejack, Arusha and Maha) who came in. In all groups, there is considerable turnover of this sort, while outwardly the general structure of the population remains the same.

3.2 Female reproduction

The core of the group is the adult females, of which there are between 6 and 14 per group, and they are generally related, The more adult females there are, the more offspring there will be, and the population-average is 1.26 immatures per female. However there are three groups (C, BA, and BB) that have less than one extant offspring per female. C Group, with 0.86, has always had a lower breeding rate. BA group, with 0.79, suffered high infant mortality in 2003 as a side effect of male competition and infanticide, so the number of offspring is still low. The low number

of immatures in BB Group, 0.67, is harder to explain, unless it is because the group has been forced to occupy a small range-area uphill. However in June, BB Group extended their range down into Kakombe valley, and although clearly avoiding the Waterfall Group, they do gain access to many productive fruit-trees along the stream, and perhaps their breeding rate will benefit.

Four females deserve mention:

Female ranks are much more constant and family-based than male ranks, but the female ranked seventh in BA Group, Akarura, was so badly wounded in January that she fell to the lowest rank (13), and on recovery only made it back up to rank 10.

During May one female, Aroma, lost a pregnancy of 11 weeks. As early as 17 days later she resumed swelling, and had a very extended swelling cycle during which she was consorted by males over a span of 19 days (normal is about seven), excepting one gap of 4 days in the middle. This exceptionally long cycle was also fertile, as she became pregnant.

Salina, a 14 mo female infant of DC Group, was wounded on 19 June 2003, with a very bad transverse cut across the buttock. She managed to survive for many months with this cut alternately improving and worsening (especially in the increasing rains of March and April) but finally died of its infection in August, as long as 14 months after the wound was inflicted.

Semolina, born on 20 April 1976, finally died on 28 August 2004, aged 28 years 4 months, one of the oldest females we have seen at Gombe.

3.3 Male reproductive strategies

The number of adult (immigrant) males in each group ranges from one to 8, with an average of 0.44 males per adult female. It might be expected that, the more adult females there are in the group, the more adult males will join, but in fact the number of males does not track very closely the number of females. This is mainly because males are attracted more to those groups in which there are many females at the fertile stage of their reproductive cycle.

Some groups of females are small enough that they can be monopolised by a single male, reminiscent of the one-male groups more typical of hamadryas and gelada baboons. For example Group AC, with only six females, started the year with only one male, Akimbo, who had been able to monopolise the group since October 2003. During March a second male, Amber, tried to join the group but he was harassed so much and eventually wounded by Akimbo that he left after only two days. The following month another male, Moto, arrived, and though Akimbo pressured him and chased him to the edge of the group, he also presented to Akimbo a lot and managed to defuse the conflicts enough that he was able to stay. However in his fourth month, he left three days after another male, Pingo, came in from C Group, followed shortly by Pedro also from C, and in August came Shirati from DC. In September another male, Mink, arrived, and there were many conflicts between these males, out of which Pedro, even though a young adult on his first transfer, attained alpha rank, while Akimbo fell in status to number 2. Thus having started the year with a breeding

monopoly, by September Akimbo was only one of five rivals for mating in his group.

There were two surprising cases where alpha-males left their groups. In AB Group, in May, alpha male Sandarusi left to join the adjacent DC group. It is not clear why except that he left on the day a new male, Harambee, arrived, though he did not take over alpha rank. In a similar way the alpha male of BB Group, A Popowia left the same day as an immigrant Uria joined, though again it was another male who took alpha rank.

3.4 Disease

In March, the genital infection (probably *Treponema*) had spread to all adult females of AA Group, so all sexually active members of that group were treated with Amoxycillin, a daily dose of 250 mg for seven days to all 6 adult males, all 13 adult females, 6 subadult/adolescent males, and 4 juvenile males (who received half-dose). There were rapid improvements through April and May in all the affected baboons, except for one juvenile male whose infection was so bad he could not urinate, and he died in June, and one female Doda who although her lesions had healed yet she continued to lose weight and finally died in July, most likely from systemic infection. Those remaining appeared free of infection until December, when one female (Yuma) developed fresh lesions, indicating that the pathogen is still at large.

3.5 Interactions between baboons and other species

Baboons often meet chimpanzees during their daily range, and they often pass by without interaction. However there was some sign of feeding competition, when chimpanzees chased baboons from food sources (*Harungana* and *Uapaca*). Two infant baboons were also caught and eaten by chimpanzees, Sierra of DC Gp on 10 August, and Segou of DA Gp on the 13th. Both these infants were less than a month old. It is also interesting that the killings were only three days apart: this echoes the fact that chimpanzees tend to hunt in phases, but it is also true that there may be long periods when baboons are ignored, then when one is killed there may be one or two more killed within a short space of time.

Baboons were commonly seen close to red colobus monkeys ('vyondi'). Sometimes there was no interaction, or they met at a food source (*Periscopsis* shoots, *Pseudospondias* leaves and gum, leaves of Pterocarpus angolensis), while once Colobus tried to chase baboons out of a fruiting *Vitex* ('mpapa'). One juvenile male baboon was seen grooming a red colobus.

Baboons also commonly encountered Cercopithecines, both redtailed monkeys (*Cercopithecus ascanius*, 'nkungwe') and blue monkeys (*C. mitis*, 'kima'). Sometimes they fed together at a common source (*Ficus vallis-choudae*, *Pseudospondias*, and catching winged termites (*Pseudacanthotermes*) as they swarmed from the ground), but baboons were twice seen chasing blue monkeys out of their group. Most remarkably, during May baboons of BA Group were found eating a baby blue monkey: although the catch was not seen, this is the first case of Gombe baboons preying on another primate species.

Baboons also encounter bushbuck (*Tragelaphus scriptus*) and feed close to them. However baboons tried to hunt a bushbuck in November, and were seen eating bushbuck twice in January. They have also been seen feeding peacefully alongside bushpig (*Potamochoerus porcus*), usually on palm nuts, but in February pigs chased baboons from their piglets.

Baboons were also seen eating birds on occasion ('nsalama' and 'mwewe') and in February DC Group members chased a bird of prey ('nkongoli') from tree to tree for fifty minutes, before eventually driving it away from the group. There was also one peaceful encounter with a python in January.

3.6 Baboons in camp

One female Salad of DC Group learned to open the sliding bolts that secure doors to the cages round peoples' houses at Kakombe, and could steal food easily. Three adult males who had not learned to open them, learned instead to follow her around and take food from her, or gain entry to the houses in her wake. This illustrates the level of difficulty in minimising human animal-conflict at Gombe when baboons are involved.

4 Ecology

4.1 Fire

A long and harsh dry season resulted in low food availability for much of the year, which was compounded by fires that swept through roughly half the park. Much of the burning occurred during a single fire in August, when fire swept through the park (Figure 8). Fire burned approximately 50% of the park in 2004 (Figure 9).

By November, the rains had come and the park began regenerating. The grasslands grew lush and green again (Figure 10) and many of the charred trees that survived put forth new vegetation (Figure 11).

4.2 Poaching

Cutting of trees declined in the southern portion of the park, following increased patrolling by park rangers. No snares were found in the entire year. Snares used to be found fairly often in the park but for the past two years snares have not been seen. The only recorded cases of trespassing were by goats (2 cases) and dogs.

In October, researchers observed two adult hippos grazing in the southern valleys of the park, including Gombe valley. Soldiers in Mtanga village shot and killed both hippos when they ventured out of the park. Dr. Shadrack Kamenya saw the skins being sold while he was passing by on a boat to town. One hippo was sold in Kazinga and the other was sold in Mtanga village.

On 24 August, Roots & Shoots member Laurent Elias Kagete reported that he had found the body of a chimpanzee in Kwitanga Forest, a forest reserve surrounding a

prison located some 20 km east of Gombe. GSRC staff helped local wildlife department authorities to collect and examine the chimpanzee, which appeared to have been speared to death, perhaps to obtain body parts for traditional medicine or witchcraft. As the largest – and only confirmed – population of chimpanzees in this region outside Gombe, Kwitanga Forest has immense importance for conservation of the Greater Gombe Ecosystem.

4.3 Weather data

Bwavi researchers collected daily temperature and rainfall data (Table 12, Figure 12). TANAPA rangers recorded daily rainfall at the park gate in Kakombe (not shown here). Compared to 2003, 2004 was a relatively cool year (Figure 12a). Though the total rainfall in 2004 (1047.6 mm) was slightly higher than in 2003 (980.2 mm; Figure 12b), both years were low compared to the reported average of approximately 1500 mm.

The low rainfall of 2004 followed a succession of dry years, resulting in an unusually extensive drying out of streams and vegetation. For example, by October, water flowed only in the lower half of Rutanga stream, and leaves on usually evergreen plants near the stream were drying and dropping. When the wildfire swept through Gombe in August, some areas in the evergreen forest were dry and burnt easily.

5 Personnel changes

Five men retired in 2004: Hilali Matama (Headman, Field Assistant), Eslom Mpongo (Elder, Field Assistant), Hamisi Mkono (2nd Head of Field Assistant), Yahaya Almasi (Chimpanzee Researcher), and Yahaya Matama (Head Maintenance). These men contributed enormously to the research project and gained an unparalleled degree of expertise in chimpanzee behavior, having accumulated a total of over 130 man-years of chimpanzee observation time.

In recognition for the long service of these men, Dr. Shadrack Kamenya took them on a 4,800 km safari to see the global wonders of Tanzania: diamonds, craters, mountains, cities and wildlife (Figure 13). The safari covered Serengeti, Manyara National Park, Tarangire National Park, Arusha National Park, Kilimanjaro National Park, Saadani National Parks and Ngorongoro Conservation Area. The staff of Tanzania National Parks provided a warm welcome and invaluable assistance in each of the parks visited. We are thankful to Gombe alumni and Dr. Jane Goodall herself for donations that made this trip possible.

In addition to the retirements, GSRC experienced several other changes in personnel. Dr. Anthony Collins was promoted to a new position, Senior Representative, with many administrative responsibilities in town. Dr. Michael Wilson, who had been involved with Gombe research since 2001 as a post-doctoral fellow at the University of Minnesota, joined the project full-time as Director of Field Research. Dr. Kamenya requested a change in title, from Director of Chimpanzee Research to Director of Conservation, to reflect his growing focus on conservation issues.

6 General management plan

In addition to working on research, throughout the year, GSRC staff assisted TANAPA with preparation of the General Management Plan for Gombe National Park. JGI obtained funds for preparation of the plan from USAID.

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Table 1. Extant members of Kasekela community, 31 Dec 2004

Name	ID	Birth year	Name	ID	Birth year
Mothers			Infants		
CANDY	**CD**	1969	**COCOA**	**COC**	2004
ECHO	**ECO**	1984	**EOWYN**	**EOW**	2001
FIFI	**FF**	1958	**FLIRT**	**FLI**	1998
			FURAHA	**FUR**	2002
FANNI	**FN**	1981	*FUDGE*	*FU*	1996
			FUNDI	*FND*	2000
			FAMILIA	**FAM**	2004
GREMLIN	**GM**	1970	**GOLDEN**	**GLD**	1998
			GLITTA	**GLI**	1998
			GIMLI	*GIM*	2004
MALAIKA	**MAK**	1990	**MAMBO**	**MAM**	2004
PATTI	**PI**	1961	*TARZAN*	*TZN*	1999
SANDI	**SA**	1973	*SAMPSON*	*SN*	1996
			SAMWISE	**SAM**	2001
SHEREHE	**SR**	1991	*SHANGAA*	*SHA*	2004
SPARROW	**SW**	1960	*SINDBAD*	*SDB*	2001
TANGA	**TG**	1989	*TOM*	*TOM*	2001
TREZIA	**TZ**	1978	**ZELLA**	**ZEL**	1999
YOLANDA	**YD**	1986	**YAMAHA**	**YAM**	1998
Females without infants			Adolescents		
BAHATI	**BAH**	1988	**ELIZA**	**EZA**	1994
DILLY	**DL**	1986	**GAIA**	**GA**	1993
HAIKI	**HAI**		**SCHWEINI**	**SI**	1991
HOPE	**HO**	1970			
JIFFY	**JF**	1975			
KIPARA	**KP**	1986			
NASA	**NAS**				
NURU	**NUR**				
SIFA	**SIF**				
TITA	**TT**	1984			
Males			Adolescents		
APOLLO	*AO*	*1979*	*FERDINAND*	*FE*	1992
FAUSTINO	*FO*	*1989*	*TITAN*	*TN*	1994
FREUD	*FD*	*1971*	*ZEUS*	*ZS*	1993
FRODO	*FR*	*1976*			
GIMBLE	*GL*	*1977*			
KRIS	*KS*	*1982*			
PAX	*PX*	*1977*			
SHELDON	*SL*	*1983*			
TUBI	TB	1977			
WILKIE	WL	1972			

Table 2. Extant members of Mitumba community, 31 Dec 2004

Name	ID	Year of birth	Name	ID	Year of birth
Mothers			Infants		
APHRO	**AP**		*APPLE*	*APL*	1998
			A**	**A****	2004
EVA	**EVA**		**EDEN**	**EDE**	2004
FLOSSI	**FS**		*FOREST*	*FOR*	1997
			FANSI	*FAN*	2001
KONYAGI	**KON**		*KOCHA*	*KOC*	2001
LUCY	**LUC**		*LAMBA*	*LAM*	2001
LORETTA	**LOR**		*LONDO*	*LON*	2000
UNNAMED NEW MOTHER			Unnamed infant		
Females without infants			Adolescents		
DARBEE	**DB**	1984	**BIMA**	**BIM**	1992
VANILLA	**VAN**	1986	**RUMUMBA**	**RUM**	1998
MGANI	**MGA**				
Males			Adolescents		
EDGAR	*EDG*	1989	*EBONY*	*EBO*	1996
RUDI	*RUD*	1986			

Table 3. Current and recent members of Kalande

Name/ID	Last in Kalande	Comments
KIPARA	1997	Emigrated to Kasekela
YOLANDA	1997	Emigrated to Kasekela
KLAM1	1998	Dead male found on Nyamagoma beach with genitals and hands cut off, July/August1998 (Greengrass 2000)
KLI1	1998	Infant, attacked and killed by Kasekela males Oct 1998
KLSM1	1998	Attacked by Kasekela chimpanzees 14 Aug 1998
KLAF1	1998/99	"2 dead females outside the Park (Ngerwe), reported from villagers" (Greengrass 2000)
KLAF2	1998/99	"2 dead females outside the Park (Ngerwe), reported from villagers" (Greengrass 2000)
KLAF3	1999	Decomposing female found on Bwavi beach Feb 99. At the same time an infant was offered for sale in Mtanga market. (Greengrass, 2000; Kamenya pers. comm.)
KLI2	1999	Infant seen for sale in Mtanga market Feb 1999; possible infant of **KLAF3**
NASA	2000	Emigrated to Kasekela
SIFA	2000	Emigrated to Kasekela
KLAF4	2002	Adult female died during resp. outbreak; body found
KLJ1	2002	Juvenile (3-5 yrs) daughter of KLAF4; presumed dead following respiratory outbreak; survived for some time after mother died, but injured in fall from a high tree
KLSM2	2002	Male (~14 yrs) died during resp. outbreak; body found
MALAIKA	2002	Emigrated to Kasekela
NURU	2002	Emigrated to Kasekela
TUMAINE	2002	d. 2002 (apparently killed by villagers)
KLAM3	2002?	One of 2 males consistently seen together in 2002, both of which appeared sick; presumed dead
ECHO	2003	Emigrated to Kasekela; possibly same as Olivia
ELIZA	2003	Emigrated to Kasekela; possible daughter of Echo/Oliva
EOWYN	2003	Emigrated to Kasekela; daughter of Echo/Olivia
HAIKI	2003	Emigrated to Kasekela
IMANI	2005	Emigrated to Kasekela (possibly **KLJ1**?)
UCHAO	2005	Emigrated to Kasekela
KLAF5	Present	Mother with infant male
KLI3	Present	ISon of KLAF5
PATb	Present	Offspring of Patina
PATINA	Present	Possible mother of Porosa
PORb	Present	Offspring of Porosa
POROSA	Present	Seen by Michael Mushi with offspring
LEONARD	Present	Adult male seen occasionally, including by Kasekela observers (Sep 2003)

Count 2002: 20
Count 2004: 9

Table 4. Sightings of Kalande chimpanzees in 2004

Month	Number of sightings	Maximum party size
Jan	3	2
Feb	1	1
Mar	0	0
Apr	3	4
May	1	2
Jun	1	2
Jul	7	5
Aug	8	5
Sep	5	5
Oct	4	5
Nov	3	2
Dec	6	7

Table 5. Chimpanzee births in 2004

Name	Sex	Mother	Community	Birth Date	Birth date note
GIMLI	*M*	**GREMLIN**	Kasekela	Jan 04	
MAMBO	**F**	**MALAIKA**	Kasekela	5-Feb-04	First seen on 12 Feb 04, estimated to be < 1 week old
KOBE	*M*	**KIPARA**	Kasekela	25-Feb-04	First seen 14 Mar 04. Estimated to be 2-3 weeks old at that time.
FAMILIA	**F**	**FANNI**	Kasekela	18-Apr-04	Fanni appeared with infant on 23 Apr 04. At the time, Familia appeared < 1 week old
EDEN	**F**	**EVA**	Mitumba	13-Jun-04	
COCOA	**F**	**CANDY**	Kasekela	10-Jul-04	Coco first seen on 27 July 04, at which time she appeared to be 2-3 weeks old.
SHANGAA	*M*	**SHEREHE**	Kasekela	25-Aug-04	First seen on 04 Sep, at which time appeared to be 2-3 weeks old. Sherehe seen without infant 11 Aug 04.
Not yet named	UNK	**APHRO**	Mitumba	18-Nov-04	Aphro seen without infant on 17 Nov and with infant on 19 Nov.

Table 6. Chimapnzee deaths in 2004

Name	**Sex**	**Community**	**Death Date**	**Age at death (years)**	**Notes**
KOBE	*M*	Kasekela	2-May-04	0.2	Infanticide? Kipara seen without Kobe on 09 May, with fresh scars. Death date estimated at 02 May.
TOFIKI	*M*	Kasekela	13-Jun-04	3.6	Infanticide – killed by Freud. Attack observed by Carson and Matendo on 13 Jun 04. When Tita (mother) was seen next on 04 July Tofiki was absent.
GOBLIN	*M*	Kasekela	24-Aug-04	40	Body cavity contained numerous abscesses containing a nematode worm.
FIFI	**F**	Kasekela	early Sep 2004	46	Disappeared
FURAHA	**F**	Kasekela	early Sep 2004	2	Disappeared
DYLAN	*M*	Kasekela	13-Nov-04	1.5	Dilly seen carrying body on 13 Nov 04. Observers were unable to retrieve body or examine it closely.
VINCENT	*M*	Mitumba	22-Dec-04	28	Killed by Rudi and Edgar.

Table 7. Male dyadic dominance interactions in 2004

	SL	KS	FD	TB	FO	WL	GL	AO	FR	GB	PX	FE	ZS	TN	Sum
SL	X	2	6	6	10	1	5	1	11	5	1	5	2	2	57
KS		X	1	3	3	5		3	5	4	1	3		3	31
FD	1		X	1		2		2			1	2		1	10
TB				X	7	1		2	2		1	5	1	2	21
FO		2			X	2	1	2		1		1	2	1	12
WL					2	X		1	3	1		3		1	11
GL							X		3		1	5	1	2	12
AO				1		1		X	2			3	1		8
FR								2	X					1	3
GB		1								X	1	1	3	1	7
PX											X				0
FE												X		1	1
ZS													X	1	1
TN									1					X	1
Sum	1	5	7	11	22	12	6	13	27	11	6	28	10	16	175

Table 8. Wallauer's estimation of male ranks

Rank	Name	Birthdate	Comments
1	Kris	2/15/82	Inexperienced but clearly highest ranking by year's end.
2	Tubi	8/01/77	With the exception of Kris, all other males avoided Tubi's direct displays.
3	Wilkie	10/21/72	When Kris gained the highest rank in Nov-Dec during competition over Trezia, Wilkie formed a short-term alliance with Kris. These two were able to prevent other males (with the occasional exception of Frodo) from mating with Trezia. After that time, Wilkie continued to command respect. However, if Wilkie is not able continue his alliance with Kris, it seems unlikely he will remain as third ranking male.
4	Freud	5/24/71	Freud continued to rank among the top males, though he seldom asserted himself during fierce competition.
4	Frodo	6/30/76	With an amazing comeback at year's end. Frodo was the only male besides Kris and Wilkie who was able to gain access to Trezia during the height of competition over her. It is tempting to place him alone in the number four position
4	Apollo	2/06/79	With the exception of a short period of illness in 2003, Apollo has been perpetually in the thick of male political competition. Depending on the circumstances, Apollo is able to intimidate most of the other community males.
7	Gimble	10/24/77	Like Apollo, Gimble is difficult to rank at the moment. After attaining a high rank in the late 1990's, Gimble spent several years at the bottom of the hierarchy. Only in the last month of the year did Gimble show clear signs of an interest in re-entering the competitive ranks.
8	Faustino	4/30/89	In the vast majority of observations through the year Faustino avoided or fled during dominance events.
9	Sheldon	5/29/83	Because Sheldon was not present at year's end he must be ranked at the bottom of the potentially competitive males.
10	Ferdinand	8/19/92	At thirteen years of age, Ferdinand has not yet begun to challenge the nine adult males in the community.
11	Pax	12/16/77	Pax does not participate in male politics.

Table 9. Mating matrix: All matings

	BAH	**DL**	**ECO**	**FN**	**GA**	**HO**	**JF**	**KP**	**MAK**	**NAS**	**NUR**	**SI**	**SIF**	**TZ**	Sum
WL	9	1	2			1	1	6	3				7	2	32
KS	8	1	8				3	4			3	1	1	1	30
FO	8		1		4	1	1				5	5	2	1	28
GL	3	1	2			1	6	1		1	6		4	1	26
TB	7				1		1	2	1	2		3	2	1	20
SL	2		1			1	2	1	2	1			8		18
FE	2		3		2						2	5	2	1	17
AO	8		1					1	1		1	1	1	1	15
FD	4	1						2	1		4		2		14
GB	1			1			5				1		4		12
TN	1	1	1		1			1	2		2	1	1	1	12
FR			2		1							1	1	4	9
SN					1									2	3
FU					1								1		2
ZS												1	1		2
Sum	53	5	21	1	11	4	19	18	10	4	24	18	37	15	240

Table 10. Mating matrix: parous, swollen females only

	DL	**ECO**	**HO**	**JF**	**KP**	**TZ**	Sum
KS	1	8		3	4	1	17
WL	1	2	1	1	6	2	13
GL	1	2	1	6	1	1	12
FR		2				4	6
GB				5			5
SL		1	1	2	1		5
FE		3				1	4
FO		1	1	1		1	4
TB				1	2	1	4
TN	1	1			1	1	4
AO		1			1	1	3
FD	1				2		3
SN						2	2
FU							0
ZS							0
Sum	5	21	4	19	18	15	82

Table 11. Baboon study troops, Dec 2004

Troop	Males	Females	Immatures (<7 years)	Total per troop
AA	3	13	18	34
AB	5	11	18	34
AC	5	6	10	21
BA	8	14	11	33
BB	3	6	4	13
C	4	14	12	30
DA	7	14	17	38
DB	3	12	18	33
DC	7	13	22	42
			Total	278

Table 12. Temperature and rainfall data for Bwavi ranger post, 2003-2004.

MONTH	MIN. TEMP. 2003	MIN. TEMP. 2004	MAX. TEMP 2003	MAX. TEMP. 2004	RAIN 2003 (mm)	RAIN 2004 (mm)
JAN	21.42	23.23	35.61	29.41	141	111.7
FEB	20.93	23.34	35.45	29.72	115	186.52
MAR	21.61	23.94	32.61	31.03	70	159.7
APR	21.37	22.1	30.93	29.32	227	144.26
MAY	22.1	21.77	33.77	29.39	3.5	14.02
JUN	20.5	20.86	32.3	30.96	10	0
JUL	20.06	20.41	32.55	30.79	0	0
AUG	20.58	22.87	34.81	31.3	0	0
SEP	22.77	21.89	34.17	31.39	15	57.05
OCT	24.45	23	31.55	30.74	48	49
NOV	23.28	21.44	30.38	27.36	138.4	128.16
DEC	22.77	21.71	29.29	27.71	212.3	197.19
Total rainfall					980.2	1047.6

Figure 1. Goblin, shortly before his death

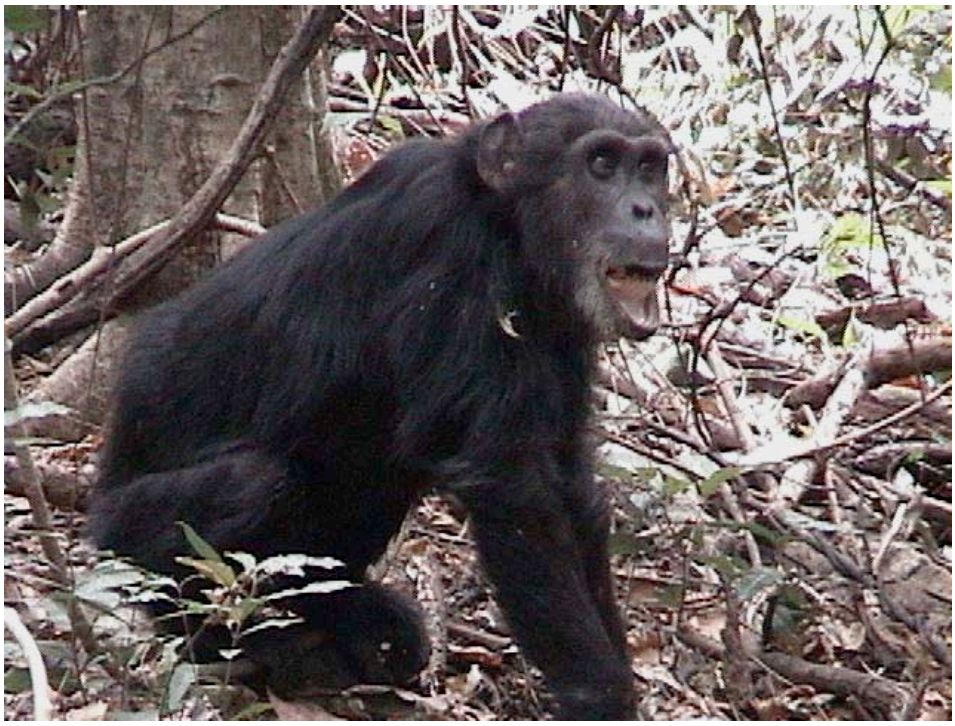


Photo by ML Wilson; 10 Aug 2004

Figure 2. Fifi and Furaha

Photo by ML Wilson, 09 Jun 2004

Figure 3. Glitter standing atop a tree gathering flying termites.

Photo by Kristin J. Mosher

Figure 5. Population of Gombe chimpanzee communities 1996 - 2005.

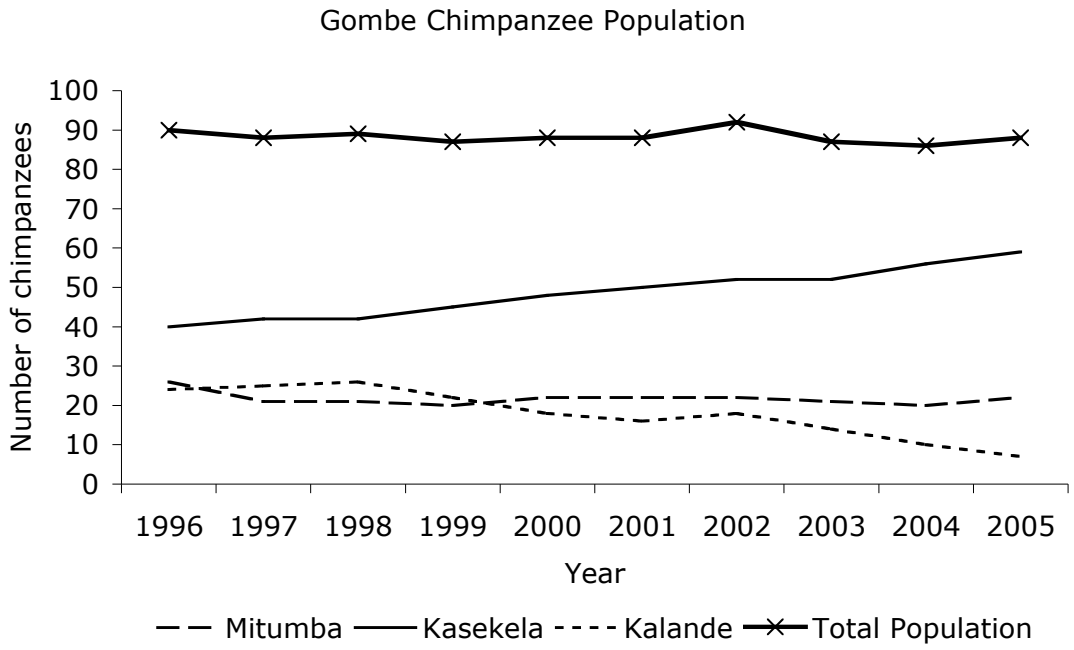
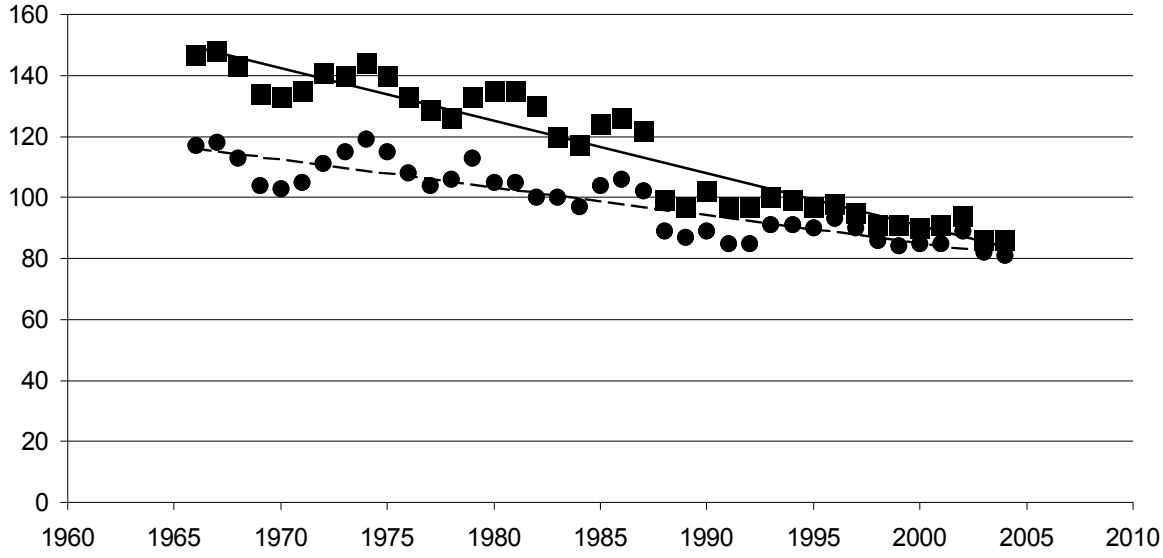


Figure 4. Population of Gombe chimpanzees 1966-2004



Symbols indicate maximum (squares) and minimum (circles) population estimates for each year. (Pusey et al. 2006)

Figure 6. Sheldon, the insecure alpha male

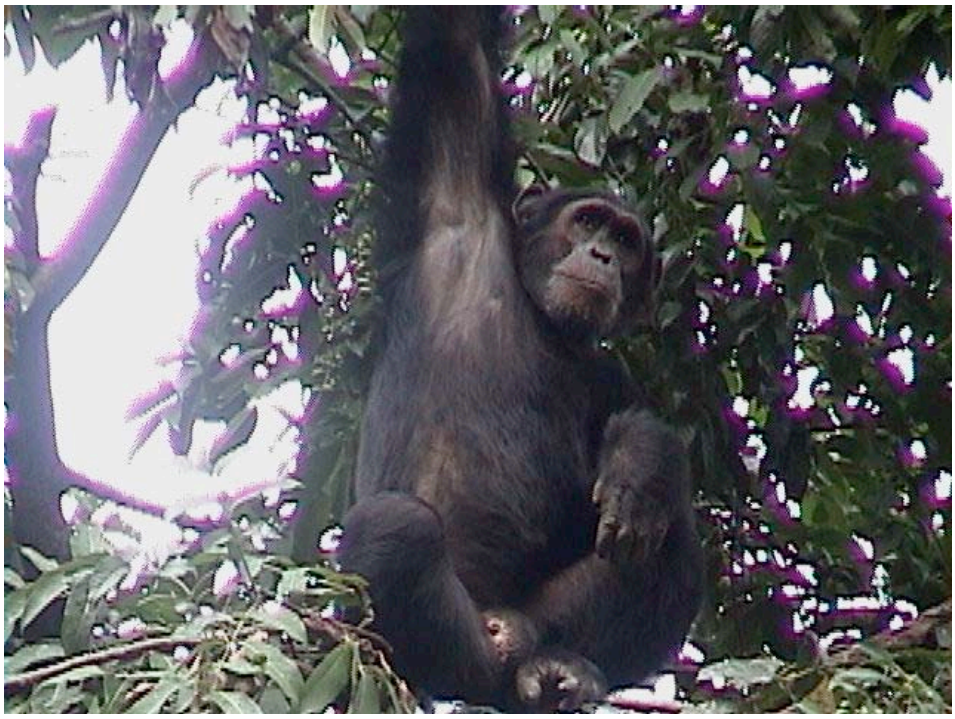


Photo by ML Wilson, 23 Jun 2004

Figure 9. Kris, the new alpha male: (a) Kris (left) and Wilkie monopolized Trezia during her estrous cycle; (b) Kris (left) with high-ranking male Tubi.

a.

Photo by RW Wallauer

b.

Photo by RW Wallauer

Figure 8. Fighting the August fire

Photo by ML Wilson, 18 Aug 04

Figure 9. Areas burned by fire in 2004

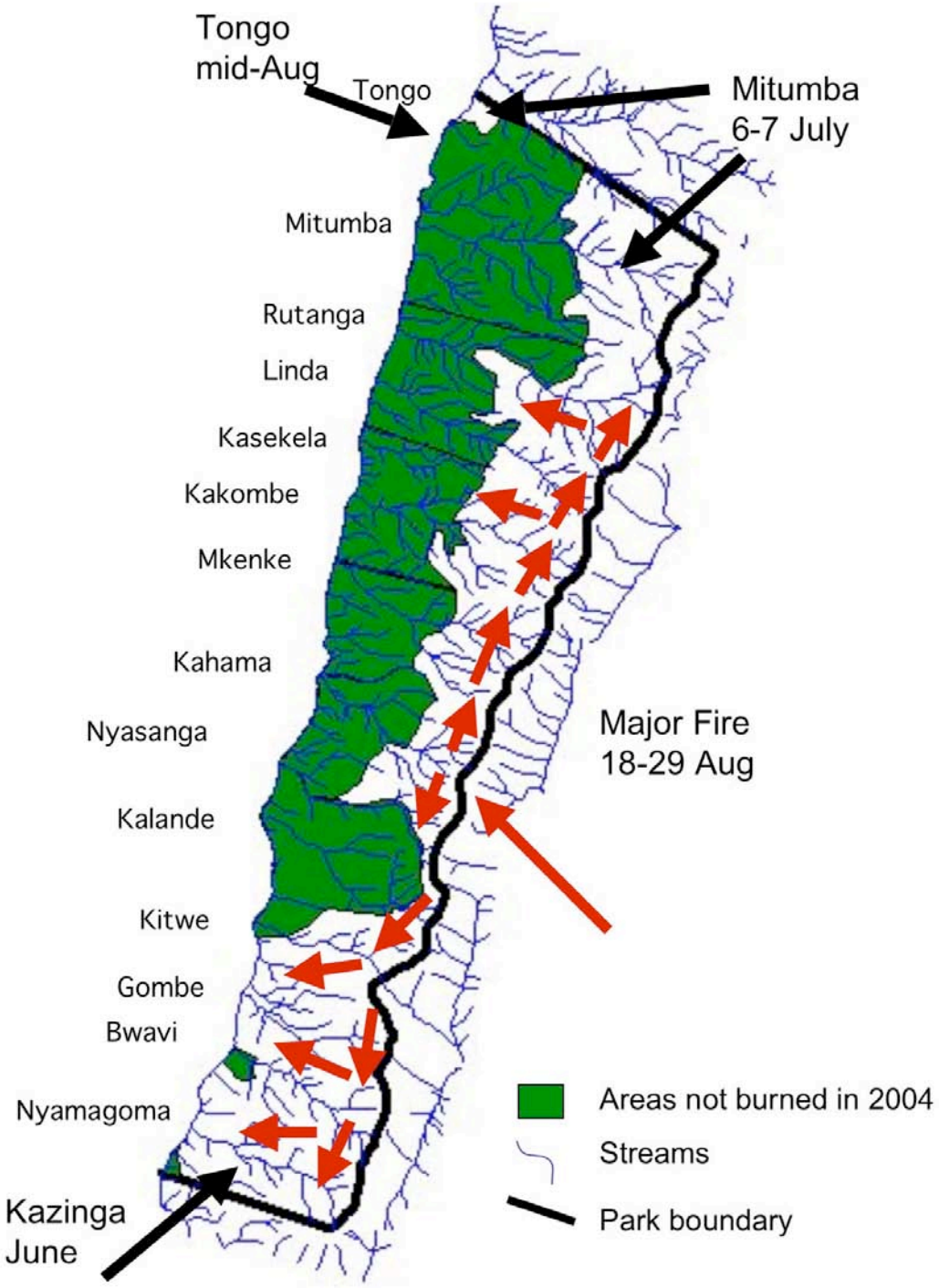


Figure 10. Rift moorlands regenerating after the fire

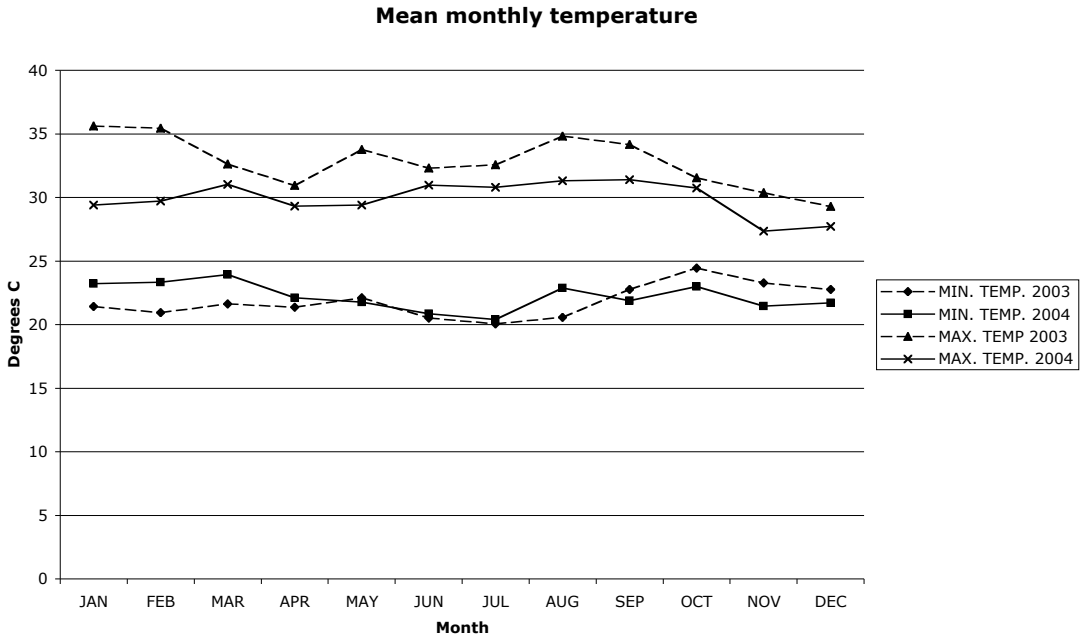
Photo by ML Wilson, 18 Nov 2004

Figure 11. Charred tree regenerating

Photo by ML Wilson, 18 November 2004

Figure 12. Weather data for Bwavi ranger post, 2003-2004: (a) mean monthly temperature and (b) monthly rainfall.

a.



b.

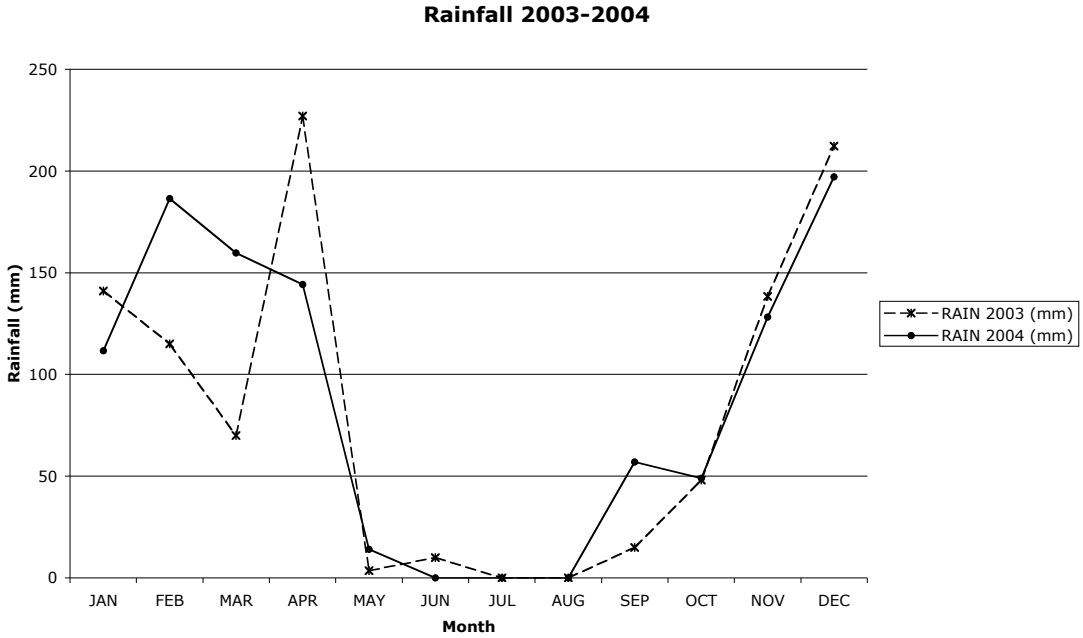
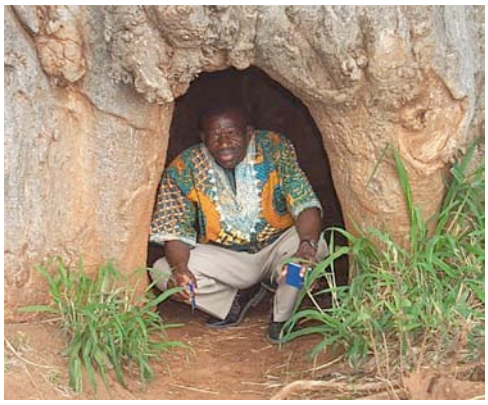


Figure 13. Wazee on safari: (a) Mzee Hilali and Mzee Hamisi enjoying the sofa at TANAPA headquarters, Arusha; (b) Mzee Eslom in a poacher's hide in a baobab tree in Tarangire National Park; (c) Shadrack and wazee on Mount Kilimanjaro.



Appendix I. Publications based on Gombe research 2004

Journal papers, book chapters and theses:

1. Detwiler, K. M., A. Burrell and C. J. Jolly (2004). "Conservation implications of hybridization in African monkeys." International Journal of Primatology **in press**.
2. Gilby, I. C. (2004). Hunting and meat sharing among chimpanzees of Gombe National Park, Tanzania. Ph.D. Thesis, Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, MN.
3. Goodall, J. (2004). Do chimpanzees have souls? Possible precursors of religious behavior in animals. Spiritual Information. C. L. J. Harper, Templeton Foundation Press.
4. Lodwick, J. L., C. Borries, A. E. Pusey, J. Goodall and W. C. McGrew (2004). "From nest to nest -- influence of ecology and reproduction on the active period of adult Gombe chimpanzees." American Journal of Primatology **64**: 249-260.
5. Lonsdorf, E. V., L. E. Eberly and A. E. Pusey (2004). "Sex differences in learning in chimpanzees." Nature **428**: 715-716.
6. Pandolfi, S. S. (2004). Ecological sex differences in chimpanzees and the evolution of the sexual division of labor. Ph.D. Thesis, Department of Anthropology. Duke University, Durham, NC.
7. Pusey, A. E. (2004). Inbreeding avoidance in primates. Incest, Inbreeding and the Incest Taboo. A. P. Wolf and W. H. Durham. Palo Alto, CA, Stanford University Press**:** 61-75.
8. Stevens, J. R. and I. C. Gilby (2004). "A conceptual framework for nonkin food sharing: timing and currency of benefits." Animal Behaviour **67**: 603-614.
9. Williams, J. M., G. Oehlert and A. E. Pusey (2004). "Why do male chimpanzees defend a group range? Reassessing male territoriality." Animal Behaviour **68**(3): 523-532.
10. Wilson, M. L., W. Wallauer and A. E. Pusey (2004). "New cases of intergroup violence among chimpanzees in Gombe National Park, Tanzania." International Journal of Primatology **25**(3): 523-549.
11. Worobey, M., M. L. Santiago, B. F. Keele, J.-B. N. Ndjango, J. B. Joy, B. L. Labama, B. D. Dhed'a, A. Rambaut, P. M. Sharp, G. M. Shaw and B. H. Hahn (2004). "Contaminated polio vaccine theory refuted." Nature **428**: 820.
12. Wrangham, R. W. and M. L. Wilson (2004). "Collective violence: Comparisons between youths and chimpanzees." Ann. N. Y. Acad. Sci. **1036**: 1-25.
13. Zihlman, A. L., D. Bolter and C. Boesch (2004). "Wild chimpanzee dentition and its implications for assessing life history in immature hominin fossils." Proc. Nat. Acad. Sci. **101**(29): 10541-10543.

Abstracts

1. Earnhardt, J., M. L. Wilson, A. E. Pusey, S. Thompson and E. V. Lonsdorf (2004). Population habitat viability analysis (PHVA) for the Gombe National Park chimpanzee population. 18th Annual Meeting of the Society for Conservation Biology, New York, New York, Lincoln Park Zoo.

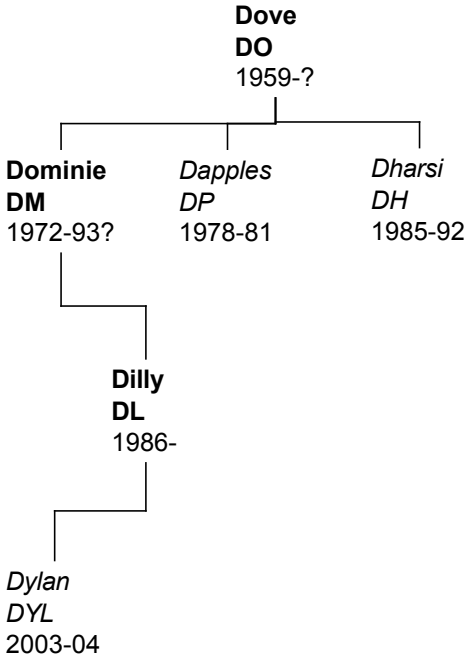
2. Emery Thompson, M., R. W. Wrangham, V. Reynolds and A. E. Pusey (2004). "Natural variation in ovarian function in East African chimpanzees (*Pan troglodytes schweinfurthii*): non-invasive hormonal assessment in females from three study populations." American Journal of Primatology **62 Suppl**: 122.
3. Gilby, I. C. (2004). "Meat or sex? A fresh look at hunting and meat sharing among the Gombe chimpanzees (*Pan troglodytes*), using 25 years of long-term data and new field observations." American Journal of Primatology Supplement **62 (S1)**: 71.
4. Lonsdorf, E. V., D. Travis and A. E. Pusey (2004). Using retrospective health data from the Gombe chimpanzee study to inform future surveillance efforts. 20th Congress of the International Primatological Society, Torino, Italy.
5. Lonsdorf, E. V., D. Travis and A. E. Pusey (2004). Gombe chimpanzee health-monitoring: past, present and future. Inaugural meeting of the Great Ape Health Monitoring Unit (GAHMU), Leipzig, Germany.
6. Lonsdorf, E. V., D. Travis and A. E. Pusey (2004). Gombe chimpanzee health-monitoring: past, present and future. 18th Annual Meeting of the Society for Conservation Biology, New York, NY.
7. Pintea, L. P., M. L. Wilson and A. E. Pusey (2004). Using GIS to integrate chimpanzee research and conservation in Gombe National Park, Tanzania. ESRI International User Conference, San Diego, CA.
8. Pintea, L., M. Wilson., and A. Pusey (2004). Integrating Chimpanzee Research and Conservation in Gombe Using GIS. Society for Conservation GIS (SCGIS) Annual Conference. September 27 - 29, Shepherdstown, West Virginia.
9. Pintea, L (2004). The role of hyperspatial satellite images for conservation planning at the village level: the case of chimpanzees in Gombe National Park, Tanzania. 18th Annual Meeting Society for Conservation Biology July 30-August 2, 2004, New York, USA.
10. Wallis, J. and D. A. Collins (2004). Sexual transmission of diseases in Gombe baboons. Diseases - the third major threat for wild Great Apes?, Inaugural meeting of the Great Ape Health Monitoring Unit (GAHMU), Leipzig, Germany.
11. Wilson, M. L., R. W. Wrangham and A. E. Pusey (2004). Is chimpanzee intergroup violence the result of human disturbance? XVI World Meeting of the International Society for Research on Aggression, Petros M. Momikos Conference Centre, Fira, Santorni, Greece.
12. Wrangham, R. W. and M. L. Wilson (2004). Accounting for similarties in collective violence between youths and chimpanzees. Conference on Scientific Approaches to Youth Violence Prevention, New York Academy of Sciences, New York, NY.

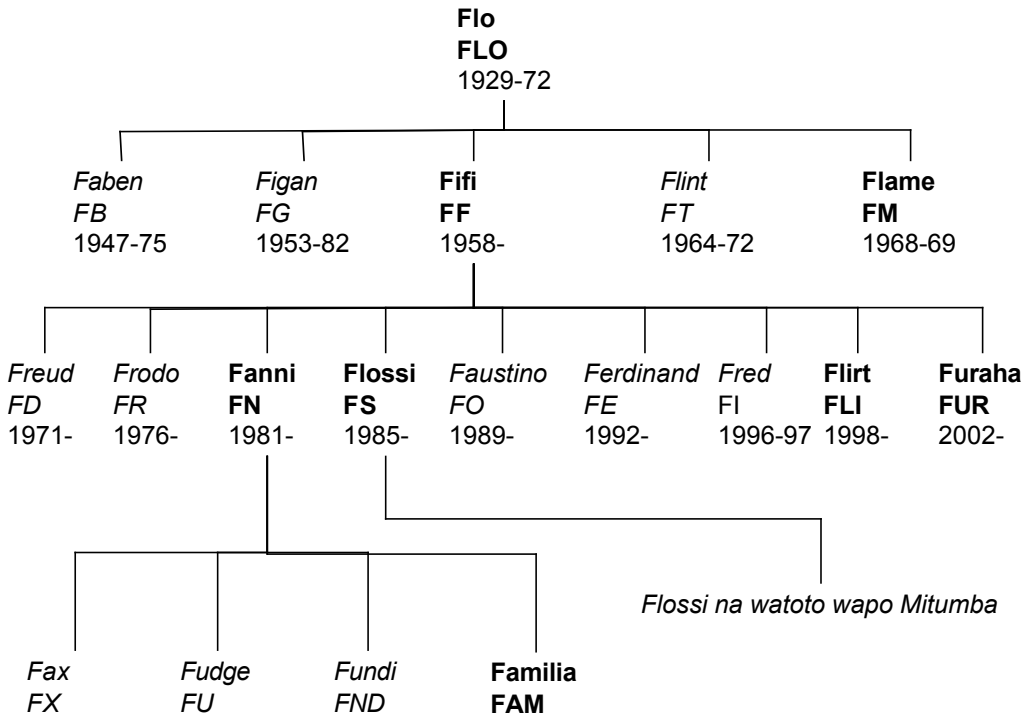
Reports:

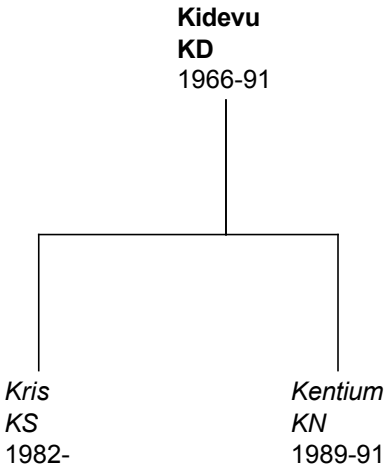
1. Anderson, G. W., L. Gaffikin, L. Pintea, G. C. Kajembe, K. Yeboah, and B. J. Humplick. 2004. Assessment of the Lake Tanganyika Catchment, Reforestation and Education (TACARE) Project. USAID & JGI, Washington DC.
2. Grossmann, F. (2004). Bwavi Ecological Survey: Presentation and Analysis of Data. Kigoma, Tanzania, Gombe Stream Research Centre.

Appendix II Kasekela Family Trees

This appendix provides family trees for all surviving lineages in the Kasekela community. Male names are given in italics and female names in bold. These family trees are for illustrative purposes only. Infants that died before being named are not, in general, included for Kasekela. Birth years for individuals born before 1960 are estimates, as are birth years of most immigrant females.



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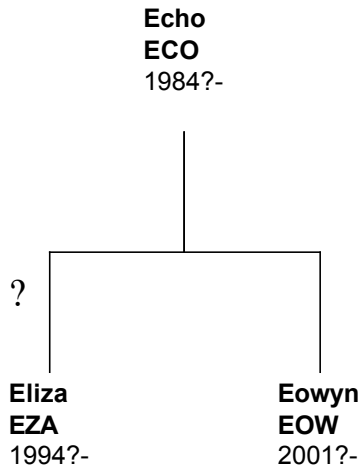
KD
1966-91
Kris
KS
1982-
Kentium
KN
1989-91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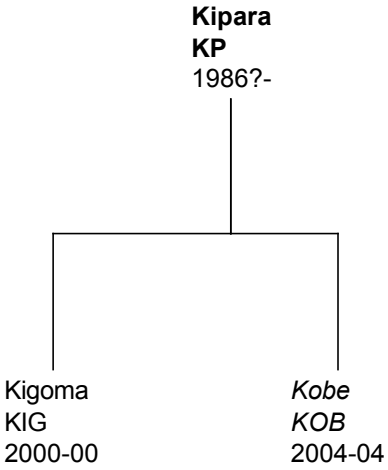
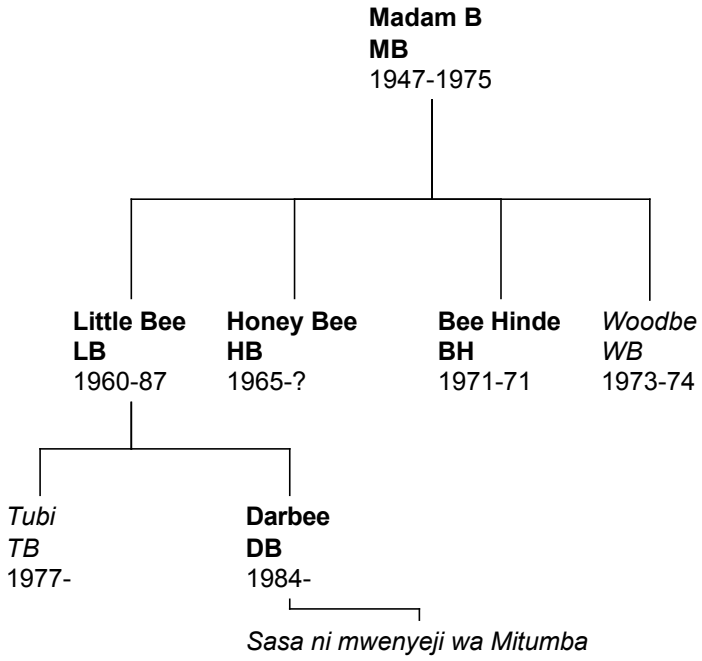
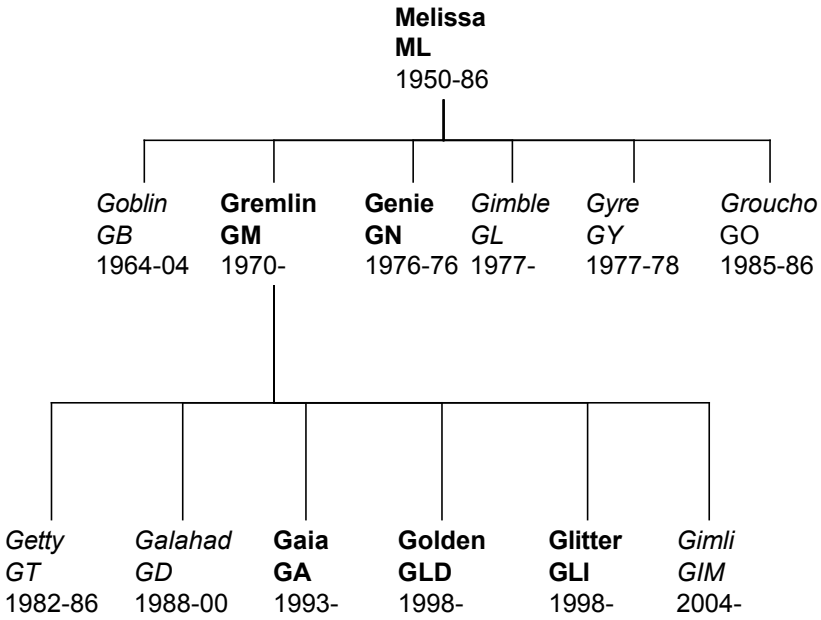
ECO
1984?-
?
Eliza
EZA
1994?-
Eowyn
EOW
2001?-


Kipara
KP
1986?-
Kigoma
KIG
2000-00
Kobe
KOB
2004-04


Madam B
MB
1947-1975
Little Bee
LB
1960-87
Honey Bee
HB
1965-?
Bee Hinde
BH
1971-71
Woodbe
WB
1973-74
Tubi
TB
1977-
Darbee
DB
1984-
Sasa ni mwenyeji wa Mitumba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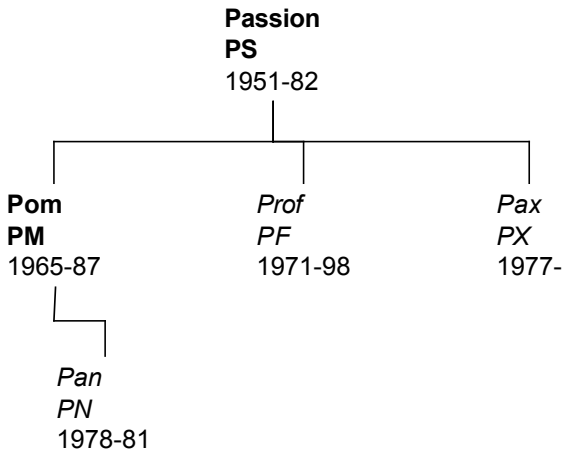
1950-86
Goblin
GB
1964-04
Gremlin
GM
1970-
Genie
GN
1976-76
Gimble
GL
1977-
Gyre
GY
1977-78
Groucho
GO
1985-86
Getty
GT
1982-86
Galahad
GD
1988-00
Gaia
GA
1993-
Golden
GLD
1998-
Glitter
GLI
1998-
Gimli
GIM
2004-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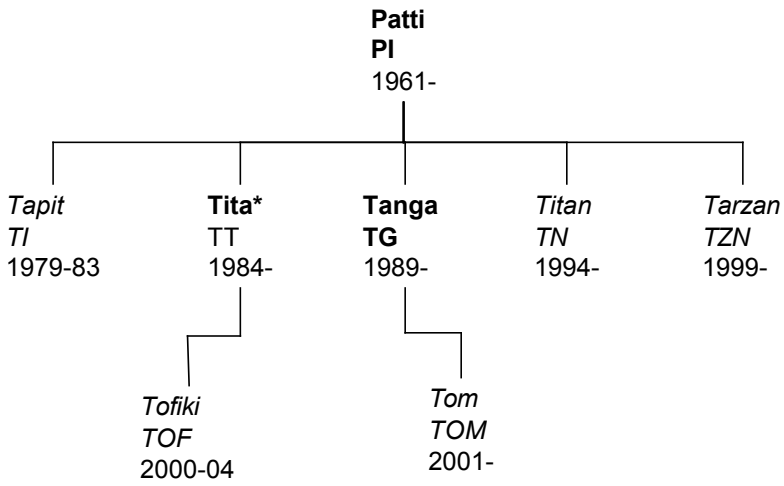
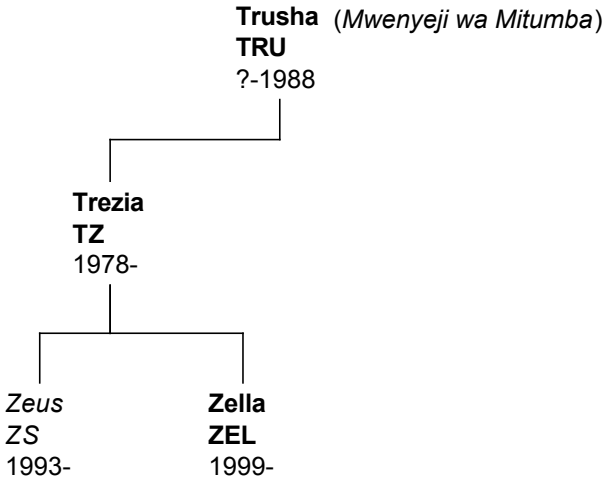
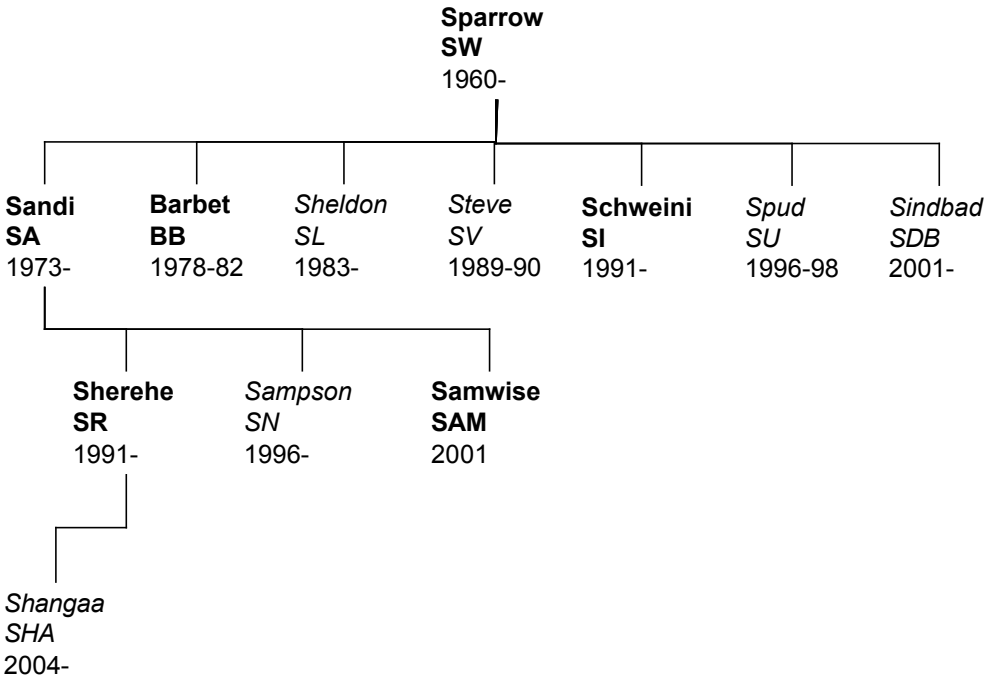
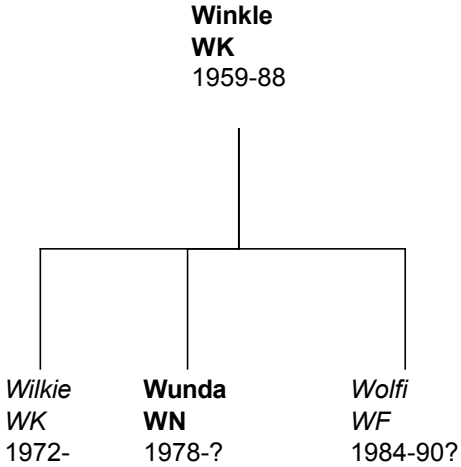
1951-82
Pom
PM
1965-87
Prof
PF
1971-98
Pax
PX
1977-
Pan
PN
1978-81

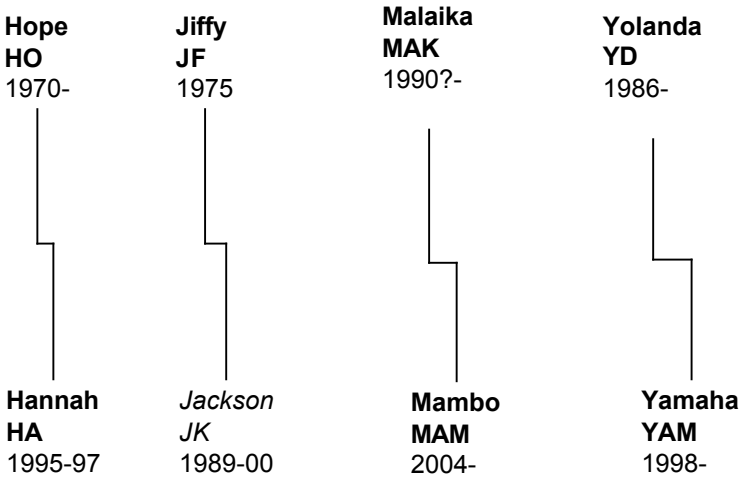


** Utafiti wa DNA unaonyesha "Tita" sasa si mtoto wa Patti*




Sparrow
SW
1960-
Sandi
SA
1973-
Barbet
BB
1978-82
Sheldon
SL
1983-
Steve
SV
1989-90
Schweini
SI
1991-
Spud
SU
1996-98
Sindbad
SDB
2001-
Sherehe
SR
1991-
Sampson
SN
1996-
Samwise
SAM
2001
Shangaa
SHA
2004-


Winkle
WK
1959-88
Wilkie
WK
1972-
Wunda
WN
1978-?
Wolfi
WF
1984-90?

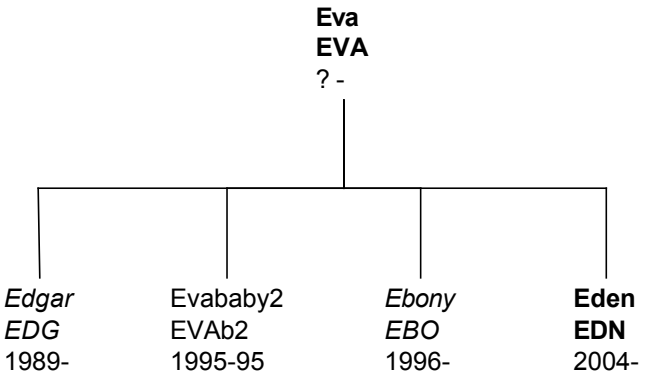


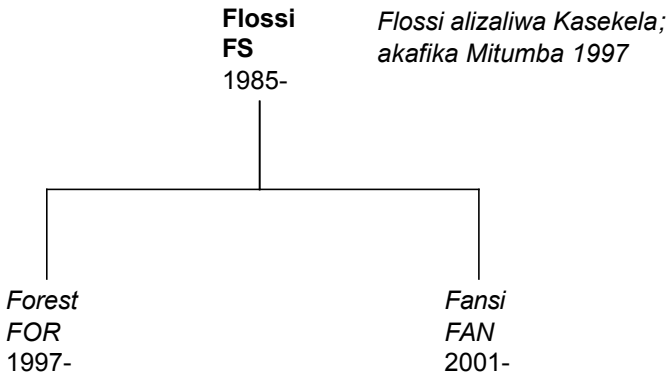
Wahamiaji bila mtoto ye yote

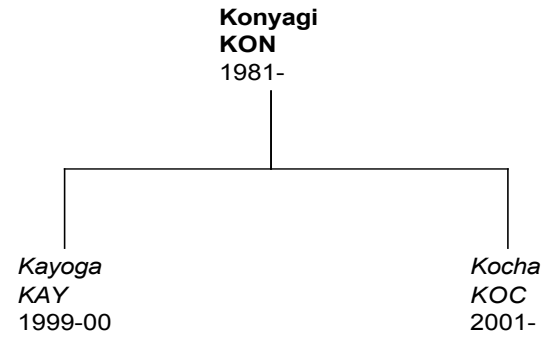
Bahati	**Haiki**	**Nasa**	**Nuru**	**Sifa**
BAH	**HAI**	**NAS**	**NUR**	**SIF**
1988-				

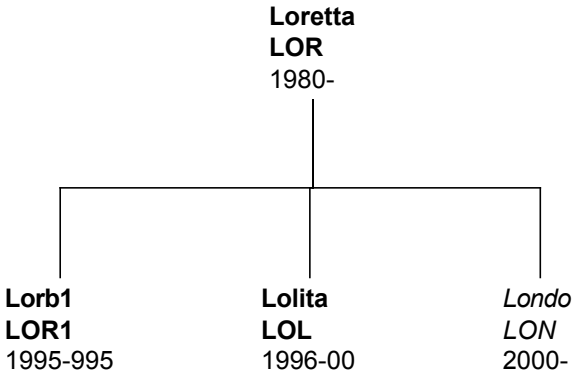
Appendix III Mitumba Family Trees

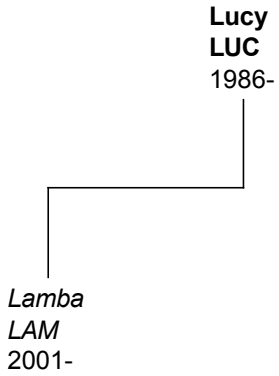
This appendix provides family trees for all surviving lineages in the Mitumba community. Male names are given in italics and female names in bold. These family trees are for illustrative purposes only. Infants that died before being named are included here, named for birth order (e.g., "Evababy2). Birth years for individuals born before about 1996 are estimates, as are birth years for most immigrant females.

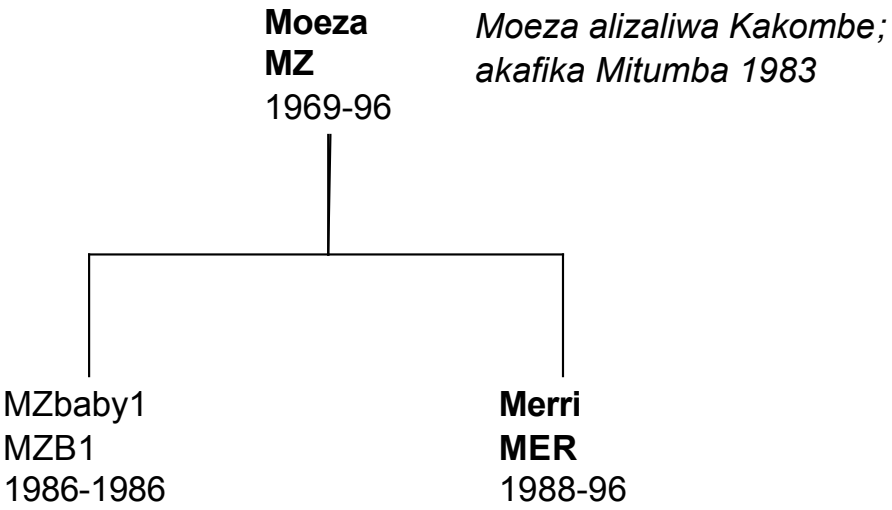


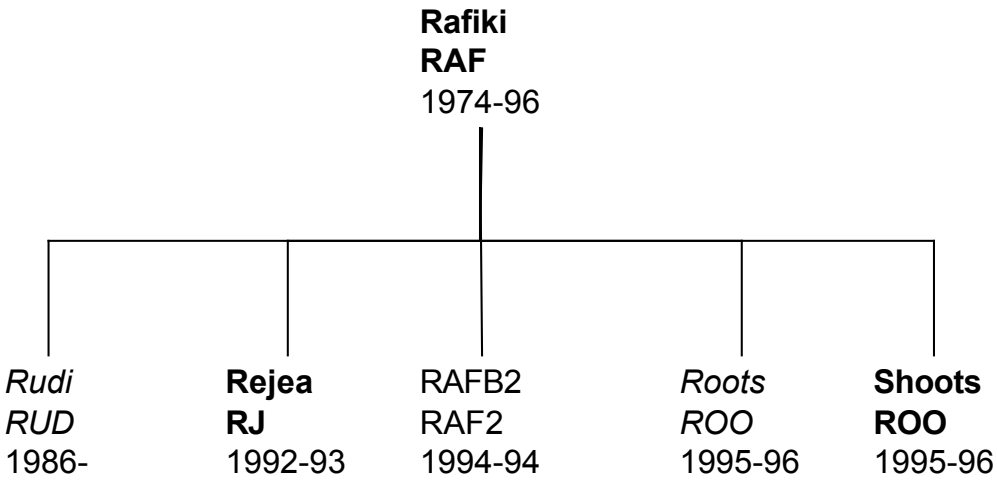


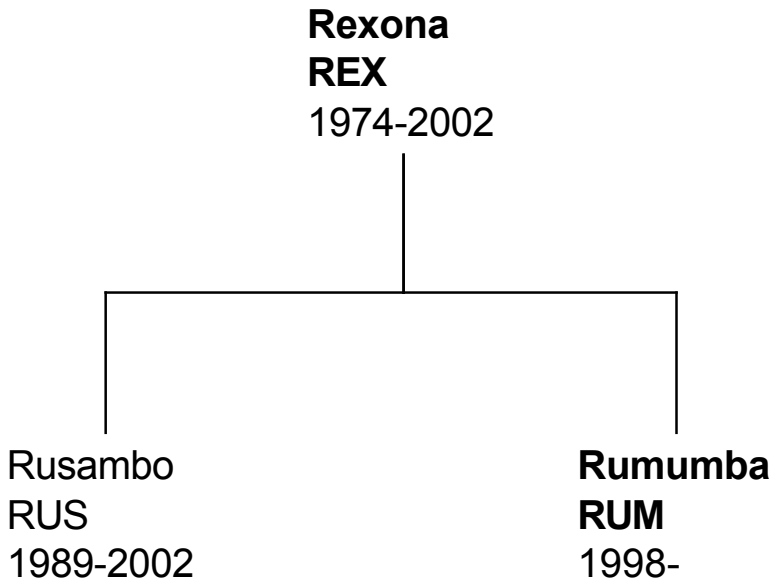

Konyagi
KON
1981-
Kayoga
KAY
1999-00
Kocha
KOC
2001-

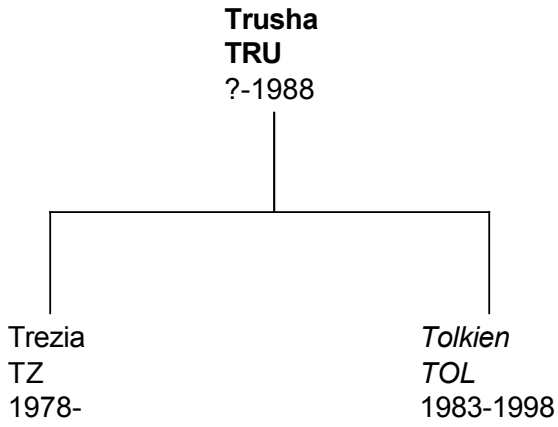

Loretta
LOR
1980-
Lorb1
LOR1
1995-995
Lolita
LOL
1996-00
Londo
LON
2000-


Lucy
LUC
1986-
Lamba
LAM
2001-


Moeza
MZ
1969-96
Moeza alizaliwa Kakombe; akafika Mitumba 1983
MZbaby1
MZB1
1986-1986
Merri
MER
1988-96


Rafiki
RAF
1974-96
Rudi
RUD
1986-
Rejea
RJ
1992-93
RAFB2
RAF2
1994-94
Roots
ROO
1995-96
Shoots
ROO
1995-96


Rexona
REX
1974-2002
Rusambo
RUS
1989-2002
Rumumba
RUM
1998-



Alienda Kasekela 1991

Majike bila watoto		Madume	
Darbee **DB** 1984-	*Darbee alizaliwa Kakombe; akafika Mitumba 1999.*	*Cusano* *CUS* 1956-1996	*Gorbachev* *GOR* 1968-1996
Pom **POM** 1965-1987	*Pom alizaliwa Kakombe; akafika Mitumba 1983.*	*Rugongo* *RUG* 1945-87	*Sefa* *SEF* 1954-98
Vanilla **VAN** 1986-		*Vidole Vitatu* *VID* 1971-2001	*Vincent* *VIN* 1976-2004
Mgani **MGA**			