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**RESULTS OF WESTERN LOWLAND GORILLA (*Gorilla gorilla gorilla*)  
PILOT STUDY AT MBELI BAI,  
NOUABALE-NDOKI RESERVE, NORTHERN CONGO**

**Report to:  
WCS Nouabale-Ndoki Project Staff**

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## EXECUTIVE SUMMARY

Over the past ten years, considerable progress has been made in western lowland gorilla field research. However, habituation and direct observation of this sub-species still prove to be a challenge. As a result, most published studies of free-ranging *Gorilla g. gorilla* have reported on population distributions, density estimates, basic ecology and diet. All are topics for which indirect methods of data collection (e.g. nest counts, following feeding trails, fecal analysis) suffice. These records have been supplemented with direct observations when possible.

In June through August 1993, I monitored Mbeli Bai in the Nouabalé-Ndoki Reserve, northern Congo. This is a large (approx. 30-40 ha), marshy, grassland clearing in the eastern sector of the reserve. Gorillas and other mammals had been frequently sighted here and were thought to visit the bai on a regular basis.

The purpose of this study was to:

- 1.) Document western lowland gorilla and other mammalian activity in the bai.
- 2.) Begin to compile a record with which to identify gorilla groups and individuals plus describe their behaviors while in the clearing.
- 3.) Assess the feasibility of Mbeli Bai as a site for a long-term study of *Gorilla g. gorilla* social organization, behavior and ecology.

I report here on the results of the first, continuous monitoring of this area.

Systematic observations were made at both ground level and from a tree platform constructed 10 m above the forest floor. From this platform on the bai's periphery, I obtained an unobstructed view of three quarters of the clearing. I was able to directly observe natural behaviors of western lowland gorillas on 31 of the 45 days of the study. This translates to 92+ hours of gorilla observations. Gorilla groups visited the bai on 30 occasions, lone silverbacks on 32. The duration of their visits ranged from 4 minutes to over 4 hours. The apes' primary activity at the bai was feeding on herbaceous monocotyledons. While the gorillas traveled and foraged in all areas of the bai, they

appeared to prefer the water's edge and islets of vegetation located in the stream which runs through the center of this clearing. The gorillas did not hesitate to enter the stream and were sometimes observed to feed while standing chest-deep in water.

I positively identified six gorilla groups and 2 lone silverbacks. Average group size was 7.5 (5.5 if lone silverbacks are included). The maximum number of gorillas present at one time in the bai was approximately 31 (4 groups and 1 lone silverback). This occurred on a rain day. At times rainfall was quite heavy, however, the gorillas continued their activities despite the downpour. On average, the most gorillas and some of the longest observation times were logged on rain days, 4+ hours.

Inter-group encounters and interactions between lone silverbacks were observed. The majority of these encounters were calm (i.e. no overt signs of aggression were detected, in contrast to what is often reported for *Gorilla g. beringei*). The apes' reactions to the observer(s), if sighted, ranged from neutral to aggressive.

The only other primate species seen to feed within the bai was *Colobus guereza*. Three species of *Cercopithecus* monkeys and *Cercocebus albigena* were observed foraging in fruit trees along the bai's periphery. Other mammals seen at Mbeli during this study, in order of decreasing frequency were: *Tragelaphus spekei*, *Potamochoerus porcus*, *Syncerus caffer nanus*, *Lutra* spp., *Loxodonta africana cyclotis* and *Cephalophus nigrifrons*.

This study confirms reports of frequent western lowland gorilla activity in Mbeli Bai. Given the amount of time I was able to observe animals and the data I was able to accumulate in this relatively short study, it is concluded that Mbeli Bai offers an unparalleled opportunity for *Gorilla g. gorilla* research. Investigations here, will be able to extend beyond gorilla feeding behavior and ecology. Observations of group composition over time, and intergroup interactions, will provide a continuous record of gorilla population dynamics in this sector of the reserve. It will also contribute to a better understanding of the social organization and behavior of this sub-species. By collaborating with Kyoto University researchers, we will be able to compile a substantial record on the *Gorilla g. gorilla* population in the Nouabalé-Ndoki Reserve.

## INTRODUCTION

Over the past ten years, considerable progress has been made in western lowland gorilla (*Gorilla gorilla gorilla*) field research. Recent studies have further determined this sub-species' distribution and estimated population densities (Carroll, 1986, 1988; Fay, 1989; Fay & Harris, 1987; Fay et al., 1989; Fay & Agnagna, 1992; Kuroda, 1992; Mitani, 1992; Mitani et al., *in press*; Tutin & Fernandez, 1984; Yamagiwa, 1992); confirmed that unlike the mountain gorilla (*Gorilla g. beringei*), a significant portion of the *Gorilla g. gorilla* diet is comprised of fruit (Calvert, 1985; Fay, 1989; Kuroda, 1992; Mitani et al., 1992; Nishihara, 1992; Tutin & Fernandez, 1985; Tutin et al., 1991; Williamson et al., 1990; Yamagiwa, 1992); and discovered western lowland gorillas utilize primary forest more often than previously reported (Carroll, 1988; Mitani et al., *in press*; Tutin & Fernandez, 1984), as well as range in swamps - a forest type never considered suitable gorilla habitat (Fay et al., 1989; Fay & Agnagna, 1992; Mitani et al., 1992; Blake, pers. comm.).

Research continues with efforts to determine western lowland gorilla day and home range sizes, group composition, social organization and behavior. Compilation of these data have primarily relied upon indirect methods of collection - nest counts, examination of feeding trails and nest sites, along with analyses of fecal samples and food remains. When possible, direct observations have served to confirm and supplement data gathered by indirect methods.

The direct observation and habituation of western lowland gorillas have proven a challenge primarily due to the nature of their habitat. Forest dwelling *Pan troglodytes* and *Pan paniscus* are reported to be equally wary of humans (Badrian & Badrian, 1984; Boesch, 1978; Ghiglieri, 1984; Tutin & Fernandez, 1985; Tutin et al., 1991). Dense forest vegetation obscures viewing (both the observer's and the ape's), making reliable, constant observations difficult. That the apes should be able to clearly view an observer has been cited as one of the most important factors in the habituation process. The animals' previous experiences with humans will also affect the ease of habituation (Fossey, 1983; Schaller, 1963; Tutin & Fernandez, 1991; Williamson, 1989). It is well known that successful habituation of mountain gorilla groups in the Virunga Volcanoes, facilitated the compilation of detailed, long-term records on this sub-species' behavior, demography and ecology. The relative ease of the habituation process at this site has been attributed to the fact that low vegetation and uneven topography in certain

areas, provided better conditions for prolonged observations (Schaller, 1963; Williamson, 1989).

Watches at fruiting trees or other areas of target animal activity have proven to be an effective method for data collection, as well (Boesch, 1978; Ghiglieri, 1984; Rogers & Parnell, 1991; Uehara, 1988, 1990). Williamson (1989) reported direct observation success rates at Lopé, were highest when monitoring particular trees revisited by gorillas on a regular basis. Also, when the apes traveled in a savannah area between gallery forests. At a major clearing in the Dzanga-Sangha Reserve, Central African Republic, over 950 individual forest elephants (*Loxodonta africana cyclotis*) have been identified. Continuing research at this site has accumulated a substantial record on the social organization and behavior of this little known species (Fay et al., 1991).

Marshy, grassland clearings are scattered throughout the forests of northern Congo. These clearings (which the local people call bais) contain relatively low, monocotyledonous vegetation which reportedly attract gorillas and other wildlife. In June through August 1993, I monitored Mbeli Bai located in the Nouabalé-Ndoki Reserve, northern Congo (Fig. 1). I report here on the results of the first continuous monitoring of this area.

### GOALS OF THIS STUDY

It has been estimated that the Republic of Congo may contain the second largest population of western lowland gorillas after Gabon (Fay et al., 1989, 1991). Indeed, a few researchers state that gorilla numbers in Congo may surpass those in Gabon. Mitani et al. (1992, pers. comm.) hypothesize that it is the presence of these bais that support the relatively high densities of *Gorilla g. gorilla* found in sections of the Nouabalé-Ndoki Reserve. These clearings are usually covered by a thick growth of Cyperaceae spp. and depending on animal densities, open ground. It is thought that these clearings were created and maintained by elephants and buffalo, originating as natural salt licks (Ruggiero & Fay, *in press*).

Covering approximately 30-40 ha, Mbeli Bai is the largest and most open of these clearings known to date in the reserve. Western lowland gorillas and other mammals had previously been sighted at Mbeli and were believed to visit this clearing often.

However, the area had not been monitored on a continuous basis for any significant length of time.

The purpose of this study was to:

- 1.) Document western lowland gorilla and other mammalian activity in the bai.
- 2.) Begin to compile a record with which to identify gorilla groups and individuals plus describe their behaviors while in the clearing.
- 3.) Assess the feasibility of Mbeli Bai as a site for a long-term study of *Gorilla g. gorilla* social organization, behavior and ecology.

## METHODS

### Study Site

Mbeli Bai is located in the Nouabalé-Ndoki Reserve, Sangha province, northern Congo. It is approximately 32 km east (2°16'N, 16°25'E) of the village of Bomassa (Fig. 1). While not presently a site of human activity, poaching in this area was a problem until 1987. However, it is believed gorillas were not a target (Fay, pers. comm.). Current human population density in the surrounding area is low - ca 0.5 inhabitants/km<sup>2</sup> (Fay, 1993). Vegetation within the reserve can be classified into four general types: swamp forest, riverine *Gilbertiodendron* forest, mixed species forest and inland *Gilbertiodendron* forest with herbaceous undergrowth (for detailed descriptions, refer to Fay, 1993; Mitani, 1992; Nishihara, 1992). Four seasons have been identified during the year: the major dry season (Dec.-Feb.); a minor rainy season (March-May); a minor dry season (June-Aug.); and the major rainy season (Sept.-Nov.). The average annual rainfall recorded at Ouessou (70 km south of Bomassa), is ca 1,600 mm; average annual temperature, 25.4°C (Letouzey, 1968; Mitani, 1992).

This study began during the minor dry season and continued through the start of the major wet season. Temperatures were recorded daily at the observation point. These ranged from a high of 39°C to a low of 19°C, with a mean daily temperature of 25.8°C. Temperatures in the clearing were probably 5° - 15°C higher, especially on clear days.

As stated earlier, Mbeli is the largest and most open clearing known to date in this 386,592 ha reserve. Smaller, more enclosed bays are located to the north, near the Central African Republic border. Kyoto University researchers have been working in this area since 1987. They too, have found that vegetation in these clearings attract gorillas and other mammals (Mitani et al., *in press*; Mitani & Nishihara, pers. comm.). Bays also occur in the southern section of the reserve, but are less well known at present (Fay, pers. comm.; pers. obs.).

Covering approximately 30-40 ha (1+ km in length; avg. width between 250-300 m), Mbeli has been described as a relatively dry bay, dominated by species of Cyperaceae (Fay, 1993). Plants identified during this study were: *Rhynchospora* sp., *Kylinga* sp., *Cyperus* sp. and *Hydrochoris* sp.; *Aframomum* sp. grows along the fringes of the bay. All are eaten by gorillas. As illustrated in Figure 2, a stream runs across the eastern portion of the clearing and cuts through its center. In sections, this stream can reach more than 1 meter depths. The clearing is bordered on the west and south by flooded forest, with *Gilbertiodendron dewevrei* forests to the north and east.

### Data Collection and Definitions

From June 20-August 10, 1993 a total of 45 days (380+ hours) were devoted to monitoring Mbeli Bay. All observations were conducted from a fixed point along the clearing's south-central periphery (Fig. 2). During the first 11 days of the study, while observations were made at ground level, an effort was made to remain out of view. From July 5 on, all observations were conducted from a simple platform constructed in an *Alstonia* sp. tree, 10 m above the forest floor. Some vegetation was placed around the platform to make it less conspicuous, however, it and myself were visible to any animal that happened to look up in that direction. From this vantage point, three-quarters of the bay were in view. I divided this area into six quadrants on a sketch of the bay. Obvious paths and landmarks were included (Fig. 2). Locations and travel routes of animals were then referenced to this sketch in my notes.

On a typical day, data was collected from 07:00 until 16:00. The observation point was approached cautiously to avoid startling any animals already present in the bay. Upon arrival, I scanned as much of the clearing as possible using 8 x 56 binoculars. I recorded the species, group size, location and activity of any mammals sighted. Later in the

study, the sex and identifications of individuals were included when possible. Scan samples every 30 minutes, recorded general mammalian activity in the bai when gorillas were not present. *Ad. libitum* notes were taken to describe individuals and any significant incidents (Altmann, 1974). The entry and exit routes, as well as direction of travel by animals were noted, if observed.

When gorilla groups were present, scan samples every 5 minutes (later reduced to every 10 mins.) were employed to record the predominant activity of the group(s). Observations began when the first gorilla entered the clearing. The individual's sex and identity, when possible, were noted, along with the location of their entry. The order and direction from which the rest of the group arrived and their progression through the bai were logged. If gorillas were present upon my arrival, I simply noted their location and activity when first sighted.

During observations, I recorded group composition and made detailed notes describing as many individuals as possible. *Ad. libitum*, I recorded feeding and general behavior; plant species and parts eaten; interactions between group members; and intergroup encounters as they occurred. When the group(s) departed, I noted who appeared to initiate/lead the departure and if apparent, the behaviors associated with the communication of this intent; the order of group members as they left the bai; the path(s) taken and their direction of travel. The same types of data (with obvious exceptions) were logged for lone silverbacks. Any changes in the weather during the observation period were recorded as well.

In defining group composition, I used the following sex/age classifications: silverback males, age 15+ years; blackback males, age 8-14 years; adult females, age 8+ years; subadult/juveniles, age 3-7 years; and infants, age 3 years and under. These are consistent with definitions used in other studies (Harcourt et al., 1981; Mitani et al., *in press*; Yamagiwa, 1992). In most instances, silverbacks, blackback males and adult females with infants were easy to distinguish. I was also able to sex some of the younger animals based on their behavior. I was not always able to assign individuals to an age category. Thus, I collapsed subadults and juveniles into one class. Small-sized females and those without offspring were also more difficult to determine. Consequently, these animals may have been classified as subadults/juveniles. I classified a silverback as a lone male if he was not joined by other group members within five minutes after his arrival or, if he was never consistently seen in association with a group while at the bai.



On most days, two observers were present - myself and either a Congolese assistant or another member of the Nouabalé-Ndoki project staff. This was extremely helpful for tracking animal activity/behavior, especially during times when more than one gorilla group was present in the bai. The second observer also aided in confirming animal counts and the identification of individuals.

## **RESULTS**

### **Gorillas**

I was able to directly observe natural behaviors of western lowland gorillas on 31 of the 45 days of the study (68.9%). This translates to 92 hours, 22 minutes (24.3%) of the total time I spent monitoring the bai (380 hours, 43 mins.)(Table I). In comparison to direct observation times reported in other published studies of *Gorilla g. gorilla*, this is the most time logged to date (Table II; see Table III for examples of direct observation times reported for *Gorilla g. beringei*). Use of the platform greatly improved my view of the bai and enhanced the amount and quality of the data I was able to record.

During this study, a total of at least eight different gorilla groups and four lone silverbacks were observed in the clearing. Groups were seen on 30 occasions, lone silverbacks on 32. I was able to identify 6 of the groups and 2 of the lone silverbacks with certainty. Group sizes ranged from 5 to 10-14 members. The average group size was 7.5 individuals, 5.5 if lone silverbacks are added to the computation (Averages include 5 additional groups, for which accurate counts were made and two lone silverbacks. All were encountered in the forest on walks between the bai and my campsite.)(Table IV). Each group observed in the bai, contained only one silverback. A group of eight (MGRP 3), had a silverback and a relatively large (almost fully mature) blackback male. Another group of 8, seen in the forest, included 2 silverbacks.

The length of time spent in Mbeli by gorillas ranged from four minutes to over 4 hours (Table IV). Most arrivals were in the morning (57.1%), with the gorillas remaining at the bai into the afternoon (Table V, Fig. 3). Groups were never observed returning to the clearing on the same day. However, on at least three occasions, identified lone silverbacks sighted in the morning, returned in the afternoon.

The gorillas' primary activity while at the bai was feeding on four species of herbaceous monocotyledons. These were identified as: *Rynchospora* sp., *Cyperus* sp., *Kylinga* sp. and *Hydrochoris* sp.. While the apes traveled and foraged in all areas of the bai, they appeared to prefer the water's edge and islets of vegetation in the stream.

Groups and/or lone silverbacks were simultaneously present in the bai on 11 occasions (Table VI). Eight of these times, intergroup interactions or encounters between lone silverbacks were observed. Several interactions are described in the following section. The maximum number of gorillas present at any one time was 31 - 4 groups and one lone silverback. This occurred on a rain day. At times the rainfall was quite heavy, however, the gorillas continued their activities despite the downpour. On average, the most gorillas (Fig. 4) and some of the longest observation times were logged on rain days, 4 hours, 23 minutes.

No patterns of association between specific gorilla groups were apparent during this study period (i.e., it was not always the same combination of groups present simultaneously). At first glance, it appears there may be some difference in entry/exit routes and sections of the bai used by groups versus lone silverbacks (Table VII, Figs. 5-7). Further study and data analysis may help to substantiate any patterns noted during this observation period.

### **Other Diurnal Primates and Mammals**

A summary of the other primates and mammals seen in and on the periphery of the bai is provided in Table VIII. Observations regarding individual species are covered in the following section.

## DISCUSSION

### Gorillas

Group size and composition - The sizes (5-12 individuals) and c groups observed at Mbeli (Table IV) are comparable to those report g. gorilla study sites. At two locations in Equatorial Guinea, Jones and Sabater Pi (1971) observed gorilla groups varying in size from 2-12 members. Sightings of lone males were not common. However, they did report observations of groups temporarily mingling without incident. Based on direct observations at Lopé in Gabon, Tutin et al. (1992:247) have reported gorilla group sizes of between 4-16 individuals (median 10; n=8). Only the two largest groups (15 & 16 indiv.) included 2 silverbacks. One group for which Tutin has the most continuous records, has had three different silverback leaders. The change-overs however, were not observed. Sightings of lone silverbacks at Lopé have been relatively rare. From the northern sector of the Nouabalé-Ndoki forest, Kuroda (1992) estimates gorilla group sizes to range between 1-30. This estimate is based on a combination of nest counts and direct observations. In the same vicinity, Mitani (1992) reported group sizes of 1-22 individuals. A majority of the nests he found (64.19%) reflected the presence of lone silverbacks (or "single walkers"). From a more recent survey, Mitani et al. (*in press*) report group sizes in the range of 5-12. One group of 6 members, included two silverbacks. The majority of gorilla groups in these reports contain more than one adult female. As stated earlier, in the two groups of 8 sighted at Mbeli, it is possible that I may have classified small adult females as subadults/juveniles. All other identifications are believed accurate. Lone silverbacks were sighted during this study slightly more often (32 times) than groups (30 times).

A high proportion of immature individuals among groups in an area has been considered indicative of a growing and healthy population in some mountain gorilla studies (Aveling & Aveling, 1987; Yamagiwa et al., 1993). Approximately 57.4% of the individuals seen at Mbeli were immatures. In fact, all females in a group of 12 (MGRP 6), were either carrying a dependent infant, or had an independent infant or juvenile in tow.

During this study, the composition of all positively identified groups remained constant. I found two observations however, a bit puzzling. On only one occasion, what I assumed were two individual groups arrived simultaneously from approximately the same direction. A group of six gorillas from the northeast, the other

I know this section gets clumsy in parts (Lone silverbacks) but, I didn't really want to change anything at all for this - but article I know I'll have to

with 8 members (identified as MGRP 3), from the far northeast. The groups joined in the northeast quadrant with no apparent tension and commenced feeding. Some of the younger animals played. The silverbacks, in contrast, were never seen in proximity to each other. Both groups traveled through the bai together, though the group of 6 sometimes lagged behind MGRP 3 at distances of 100-200 m. This group was the first to depart. Most members of MGRP 3 were still present when observations ended for the day. However, I did see a female with an infant from MGRP 3 traveling toward the same exit the other group had taken. This happened about 10 minutes after their departure.

On another occasion, a female with an infant and two juveniles (believed to be from MGRP 6), were seen sitting at the forest edge, watching the other groups present in the bai (MGRP's 5 and 3 plus an unidentified group of nine). Neither this female nor her young interacted with the others. It is possible that the rest of her group may have been out of sight in the forest; or she may have been part of the unidentified group of nine.

Feeding behavior - The primary activity of gorillas while at Mbeli was feeding. They were most often observed eating the white bases of *Rhynchospora* sp., followed by *Cyperus*, *Hydrochoris* and *Kylinga*. Groups and individuals varied in their behaviors. Some gorillas, upon entering the bai commenced feeding near the forest edge, then leisurely made their way to the stream bank. They paused often along the way to feed. Others, headed immediately for the water's edge.

The apes moved with relative ease over the marshy substrate. They did not hesitate to enter the water to reach islets of Cyperaceae on which they fed. In fact, it was not unusual to see silverbacks standing in chest-deep water, pulling vegetation from these islets or the stream bank. When in the stream or crossing it, the gorillas would enter quadrupedally, knuckle-walking until they reached deeper water. They then continued on, walking bipedally, always holding their arms and hands above the water's surface, sometimes even above their heads. Females carrying infants, made no effort to keep them out of the water. This observation is in contrast to early reports stating that gorillas were never seen entering water or crossing even shallow streams (Merfield & Miller, 1956; Schaller, 1963; Yerkes & Yerkes, 1929). However, more recent studies have provided evidence that both western lowland and mountain gorillas do forage in

marshes, swamps and streams (Casimir, 1975; Fay et al., 1989; Williamson et al., 1988). My findings at Mbeli support these later observations.

Most of the gorillas alternated between sitting and standing postures while feeding. When moving through the bai or stationary, each ape would visually search an area for food items. They then uprooted single plants or several at once. Whether the *Rynchospora* bases were peeled or not varied, but all gorillas first swished the bases in water before eating. They were seen doing this with the other plants as well. At times, the fairly deep root systems of this vegetation, made it difficult for the gorillas to uproot plants. On several occasions, silverbacks were seen struggling to pull up a plant. They stood bipedally, braced their legs and used both hands to obtain the food item. This behavior was usually observed when the gorillas were feeding on *Rynchospora*. Others, would simply sit, digging the more stubborn plants out of the ground.

There were visible differences in the length and thickness of *Rynchospora* bases and the gorillas appeared to be selective in their choice between individual plants. When picking several items at once, a gorilla sometimes ate only one or two, tossing the others aside. Both *Gorilla g. beringei* and *Gorilla g. gorilla* are known to feed selectively on specific plants and plant parts (Watts, 1984, 1988; Calvert, 1985; Rogers et al., 1990). Bonobos, are similar to gorillas in their consumption of terrestrial herbaceous vegetation (THV). They too, appear to be selective in their choice of THV patches and individual food plants within a patch (Malenky & Stiles, 1991).

If gorillas foraging in Mbeli Bai are selectively choosing food items, one might expect to see evidence of competition during feeding periods. This would be reflected in either wide dispersal of group members within the area and/or the frequency of an individual's displacement from a feeding site by another group member (Watts, 1985). During this study, I observed behavior indicative of within group feeding competition, but it was variable. When only one group was present, the gorillas would sometimes spread out into adjacent quadrants. In fact, the subadult/juvenile male in MGRP 2 (5 members), often foraged far from the group. At other times, groups would feed as relatively compact units, even if they were the only group in the clearing.

The silverback of MGRP 2 was observed to repeatedly displace the subadult/juvenile male on three days. Each time, the silverback approached the younger ape and directed either a threat "cough" or "bark" at him. This resulted in the younger animal moving

off. Twice, the silverback also physically chased him from a site. However, on only one occasion did the silverback actually assume the young male's place to feed.

A much longer and more focused study is necessary to substantiate these observations of selectivity and intragroup feeding competition.

In mid-July, *Landolphia* fruits ripened on a tree directly across from the observation platform. Gorillas, including a silverback, were seen feeding approximately 12-15 m up in this tree on two occasions. All apes gathered fruits from the outer limbs by pulling the branches to themselves. The silverback as well, was observed on outer branches, but he spent the most time near the tree's trunk.

*Intergroup interactions* - The majority of intergroup interactions and encounters between lone silverbacks I observed were calm or neutral. While several meetings could be classified as aggressive or tense, no direct physical conflicts were seen. In fact, most interactions resembled early descriptions given by Schaller (1963) and Fossey (1983) for mountain gorillas.

When more than one gorilla group was present in the bai, the animals either ignored each other; mingled without incident, especially the juveniles who often played; or seemed to subtly monitor one another, the silverbacks in particular. This is in contrast to the reports of frequent violent interactions between mountain gorilla silverbacks. The aggressive behavior of *Gorilla g. beringei* adult males is most often attributed to their competition for mates. Lone silverbacks are considered the most serious threats to a group male since the lone male's reproductive success depends on his ability to attract females. In order to form a group, the lone silverback may be more willing to engage in contact aggression (Fossey, 1983; Harcourt, 1978; Stewart & Harcourt, 1987). More current *Gorilla g. beringei* research however, has demonstrated that while aggressive physical conflicts do occur, they are not as frequent as originally reported (Sicotte, 1993). Sicotte also found that the number of potential migrants in a group seemed to influence the probability of contact aggression. Potential migrants were defined as females (cycling or pregnant) without dependent offspring (i.e., infants age 0-3 years).

The majority of identified females at Mbeli had dependent offspring. This may account for the relative ease with which some of the groups mingled. I also noted that many of

the gorillas seen here had similar patterns of hair coloration. In fact, two of the identified group silverbacks looked very much alike. Thus, it is possible individuals feeding at the bai are related. This offers another reason for the lack of observed aggression. A final, alternative explanation is that these groups form a "community" (Goodall & Groves, 1977), whose ranges overlap near the bai (an important food resource). Members of these groups may be familiar to each other and thus, tolerated. The lone adult silverbacks sighted at Mbeli, usually remained a substantial distance apart from groups when feeding in the bai.

The following summarizes several of the more interesting encounters I observed.

The only direct encounter between two lone silverbacks was seen early in the study, before the platform was in use. A lone silverback arrived from the east around noon and proceeded to feed, traveling west in and along the stream. After about two hours (2:15 - by now he was in the middle of the clearing), he stopped abruptly, stood bipedally, looked west and gave a series of chest-beats. He then continued to feed, traveling back towards the east. A half-hour later (2:45), he again stopped, gave several low grunts and strut-displayed through the water, casting sidelong glances to the southwest. He again stood bipedally and splashed down hard in the water, then resumed traveling east, not pausing to feed. At 3:15, another silverback came into view from the west. He directed a "splash-display" toward the first silverback who was now moving at a quick pace towards the bai's periphery. By 3:45, this gorilla had departed, using the same path on which he had entered. The second silverback had settled to feed in the southwest quadrant.

Interaction between the young lone male, 1L and the subadult/juvenile male of MGRP 2 was observed once. 1L arrived first and was feeding in the southeast quadrant. MGRP 2 entered the bai from the southwest several minutes later. The subadult/juvenile male from this group traveled east, approaching 1L. Upon seeing this young male, 1L gave several chest beats, then assumed a stiff-armed stance, glancing sideways at him. The young group male assumed a similar posture. After a few minutes, they both started to feed, backs to each other, ca 5 m apart. The younger MGRP 2 male, tried to maintain proximity to 1L. They would feed close together for a time, then 1L would rise, perform a short chest-beat display and move a few meters away. At one point during this interaction, the MGRP 2 silverback, who was in the southwest quadrant with the rest of his group, stood up and looked over in the direction of the two young

males, then settled back down to feed. An hour later, when 1L departed, the subadult/juvenile male followed. The rest of MGRP 2 left shortly afterwards, heading in the same direction as the other two.

This was the only time 1L was seen to associate with a group. Considering 1L's young age (he was relatively small, just beginning to develop the silver saddle hair and did not yet have a crest), it is possible that MGRP 2 was his natal group. Emigrating mountain gorilla males typically establish ranges adjacent to, or overlapping with their former groups (Caro, 1976; Fossey, 1974).

Two group interactions deserve description. The first occurred shortly after the tree platform was constructed and before groups were positively identified. It was also the first observation of more than one group at the bai simultaneously. A group of eight gorillas arrived first. The silverback seemed alert, standing up often, looking to the west. An hour later, a group of 9 gorillas came into view from the southwest. The juveniles of these two groups mingled and played, frequently crossing back and forth through the stream. About 45 minutes after the first group departed, the silverback returned alone. He appeared tense (tight-lipped expression) and kept standing bipedally, to watch the group of 9 still present in the southwest quadrant. He remained at the bai even after the other group departed and was still present when observations ended for the day.

It is possible some of the subadults/juveniles from his group left with the second group or, perhaps a young female transferred. An alternative explanation might be that he was looking for females to join his group. Since this incident occurred before groups were well known, these explanations are only speculative. This type of behavior was not seen again during the study although this group, identified as MGRP 1 did return to the bai on several occasions.

Finally, on the day when four groups were present together, a number of interactions were observed. Two groups, seen at the bai fairly often (MGRP's 1 & 2), mingled without incident. The group of 12 individuals (MGRP 6) made their first and only appearance at the bai on this day. The response of the other two groups can best be described as curious. The subadults/juveniles in particular, kept standing up to look across the stream at this group. At one point, the adult female from MGRP 2 crossed the stream, entering the same quadrant as MGRP 6. All gorillas remained calm.



Another group of 5 (MGRP 5) which had only been seen at the bai one other time, early in the study was also present. This group stayed primarily in the northeast quadrant. About an hour into observations, the two subadults/juveniles of MGRP 5, were seen playing with the younger animals of MGRP's 1 and 2 in the northwest quadrant. When screaming and chasing broke out among this play group, it was obvious the juveniles from MGRP 5 were the targets. The only ape to take notice was the adult female of MGRP 5. She ran to the site (with an infant on her back), where the chasing had by that time stopped. MGRP 5's silverback then joined the rest of his group and all began to feed. This silverback walked directly in front of MGRP 1's silverback. Both males seemed to ignore each other. One lone silverback was also present during this observation, however, he remained apart from the groups at the opposite end of the clearing.

*Other behaviors* - The silverback male has often been described as the coordinator of gorilla group activities and the focal point of the females and their young (Fossey, 1983; Harcourt, 1978, 1979; Stewart & Harcourt, 1987; Yamagiwa, 1983). During this study, some evidence of these observations were recorded.

In most cases, the silverback was the first group member to enter the bai and to initiate departure. However, on occasion, an adult female or another group member appeared to lead travel. There were also instances when an individual from the group stayed behind to continue feeding (in one case a subadult/juvenile male, in another, an adult female w/infant; both members of MGRP 2). Other times, leadership by any one individual was not obvious.

To communicate his intent to leave, several different behaviors by the silverback were observed. Most often, he would simply approach the periphery of the bai and sit there, glancing over at the rest of his group. On some occasions, a "hoot series" or chest-beats were added to attract the group's attention. Once, after MGRP 2 had been present for over four hours, the silverback, strutted past the female who was still feeding. He paused, glanced over at her, then traveled on for about 15 meters. She continued to feed, glancing often to where the silverback sat. Five minutes later, she walked past him, out of the bai. The silverback and the other two juveniles of this group then followed her.

Individuals' proximity to the silverback while in the bai, varied. This could have been to avoid feeding competition. I did observe females with infants staying close to the silverback, especially when other groups were present or chest-beats were heard from beyond the clearing. There were also cases when the silverback appeared to be responsible for maintaining proximity to the female. Independent infants and juveniles were observed to spend some time near the silverback, but just as often, they could be seen feeding alone or playing with other members of the group.

One example of paternal behavior by the MGRP 5 silverback was observed. This occurred as the group was leaving the bai. The youngest juvenile was on the opposite side of the stream and appeared to be having difficulty finding a suitable place to cross. As the rest of the group left, the silverback responded to this juvenile's whines by returning to the stream bank. He then crossed back over to join the juvenile, who at first ran away from him. After ten minutes, the silverback crossed the stream at another point which appeared to be more shallow, and waited for the juvenile to follow. Both then departed.

Gorilla groups were active in the clearing throughout the day, even mid-morning and mid-afternoon. Most published accounts regarding gorilla activity periods, state the opposite (Fossey, 1983; Jones & Sabater Pi, 1971; Schaller, 1963). Each found both mountain and western lowland gorillas to be in the habit of resting during mid-day for 1 to 3 hours. Schaller (1963) also observed, that at the beginning of a heavy rain, all mountain gorilla feeding activity stopped. The animals did not resume feeding until the rain subsided, unless the downpour continued for a prolonged period of time. The gorillas at Mbeli did not end feeding bouts or activity during rainy periods. In fact, groups continued arriving at the bai to feed even during heavy rainfall. My observations here, are similar to those of Schäfer (1960) who found gorillas became especially active during rainy periods; and Jones & Sabater Pi (1971) who reported gorillas to be more active in wet weather than in dry.

**Predation** - One possible predation threat to gorillas foraging in the bai are crocodiles. While a crocodile may not be able to kill a large silverback, one could take down a young gorilla, especially if the ape is caught unaware. Evidence of leopards (*Panthera*

*pardus*) fatally wounding adult chimpanzees, demonstrates that even large-bodied primates are not immune to attacks by predators (Boesch, 1991).

A crocodile was spotted several times in the stream and sunning itself on an islet of *Cyperus*. In one case, a crocodile seemed to be stalking the MGRP 2 silverback who was feeding in the stream, not more than two meters from it. When the silverback sighted the crocodile, he calmly, but quickly left the stream and joined the rest of his group. Another time, a lone silverback was foraging near the stream. Abruptly, he jumped up and fled from the spot. He even turned a somersault in his haste to leave that area. This silverback settled down again at some distance from the stream, but kept a watch in the direction from which he had fled. A half-hour later, he was back in another part of the stream, when again something in the water or on the bank startled him. This time he ran through the water and left the bai.

Reactions to observer(s) - As with other behaviors, the gorillas' reactions upon sighting the observer(s) varied.

One lone silverback was present at the east end of the bai on the day we constructed the platform. He stayed for two hours despite the noise and activity.

Four MGRP 1 subadults/juveniles spotted us while they were feeding in the *Landolphia* tree directly across from the platform. They continued looking over at us intermittently, but then followed the rest of their group into the bai. None of these gorillas looked up to the observation point while in the clearing. Another time, we descended from the platform while MGRP 2 was still present. The female and subadult/juvenile male were on the south side of the stream, almost directly in front of the observation tree. They watched us climb down, apparently undisturbed by our presence.

Not all gorillas were this calm upon seeing observers. When the young lone male, 1L spotted me from across the bai, he first kept glancing back up, then slowly started backing out of the clearing. He gave one rather tentative "hoot" and a few chest-beats, then continued to back out. He did settle to feed again, close to the forest edge, but all the while kept looking up at the platform. Twenty minutes after first spotting me, 1L departed. This occurred on July 17. 1L returned July 23, this time staying near the periphery of the bai. He kept glancing up to the platform. After this day, he was not

seen until August 2nd. Again he stayed near the forest edge, where he fed on *Aframomum* bases. All the while, he sat facing the observation tree and from time to time he would glance up in my direction. This gorilla returned on two other days before the end of the study, each time, looking up at the platform.

The only aggressive reaction to an observer, came from the silverback of MGRP 5, a group not often seen at the bai. This incident took place late in the study. The adult female was feeding just below the platform. Her infant spotted me, she looked up, screamed and ran into the forest below. The silverback immediately ran over to the base of the tree. He stood there in a stiff-armed stance, staring up at me for approximately 3 minutes. Every time I made a slight move he "barked". He then moved off into the forest to join the rest of the group. They were heard moving below for 10-15 minutes after this incident.

The reactions of groups and lone silverbacks encountered in the forest, as expected, were also variable. They either fled rapidly, or calmly left the area upon seeing us. In one instance, a group of 6 that had been feeding on *Gilbertiodendron deweveri* seeds, watched us. We broke contact after an hour.

### Other Diurnal Primates

The only other primate species active within the bai was *Colobus guereza*. On six occasions, *Colobus* groups ranging in sizes from 5-9 members (adults and young), descended from the trees to enter the clearing. Here they fed on the vegetation and possibly insects. The *Colobus'* consumption of insects or some other small, mobile prey was inferred from their behavior. Individuals would often stand bipedally, look around as if searching for something, then pounce. When they stood up again, they placed an item in their mouth. All group members exhibited this behavior while in the clearing.

*Colobus* were also observed feeding in mixed species groups. Once, a group of 9 *Colobus* were accompanied by an adult *Cercopithecus nictitans*, an adult *C. neglectus* and another small, unidentified monkey. The second time, three *Colobus* fed in a *Landolphia* sp. tree, above a group of 4-8 *C. nictitans*.

*Cercopithecus nictitans* were often seen and heard in the forest around the bai and our campsite. They were spotted seven times feeding in *Gilbertiodendron* and fruit trees (*Xylophia* sp. and *Landolphia* sp.) just beyond the bai. In addition to the observations mentioned above, these monkeys were seen on three other occasions in the company of an adult male *C. neglectus*. I observed *C. neglectus* only one other time in the lower bushes on the bai's periphery. This again, was one adult male and he appeared to be alone. Grey-cheeked mangabys (*Cercocebus albigena*) were observed three times. On one occasion, a group of 5 mangabys fed on *Xylophia* sp. fruits with at least two adult *Cercopithecus pogonias*.

While at the bai, chimpanzees (*Pan troglodytes*) were sometimes heard hooting in the distance. More often, they were heard near our campsite, especially in the early morning and evening. However, I never directly observed chimps in this part of the reserve during the study.

### Other Mammals

The most frequently sighted mammals at Mbeli were sitatunga (*Tragelaphus spekei*). Three females could be seen feeding and resting in all areas of the bai almost daily. Two of these females often stayed in close proximity. Male sitatunga (3 adults) did not seem to spend as much time in the bai as the females. Interactions between individuals were rare, but for a period of two days in mid-July, encounters between the males and one of the females were observed. The female would approach the youngest male or one of the older males and sniff their rump. The male either walked away or the two would feed in close proximity. No breeding attempts were seen. Aggression towards the youngest adult male by the two older males was witnessed on one occasion. The animals were feeding peacefully, then for no obvious reason, one of the adult males barked and started to chase the younger male for a distance. When this stopped, the animals resumed feeding. The young male never left the area as a result of the chase.

Many signs of forest elephant (*Loxodonta africana cyclotis*) activity were seen around the bai. However, the elephants themselves were sighted at Mbeli on only nine days of the study. I was able to identify four different individuals, 2 males and 2 females. Each arrived at the bai alone, entering most often from the southeast. The elephants always remained in the stream at the eastern end of the bai, where they drank and sprayed

themselves with water. The duration of each animal's visit ranged from six minutes to over an hour. Twice, an elephant was still present when observations ended. On one occasion, an adult male was present when we arrived in the morning and returned two more times during that day.

A solitary male forest buffalo (*Syncerus caffer nanus*) was seen often at Mbeli early in the study. After July 20, the same individual was always observed in the company of a female. A group of five buffalo - an adult male and female, a young male and 2 other young - was seen on only one occasion. I am not certain if these adults were the same individuals previously sighted. I think not.

Groups of up to 34 bush pigs (*Potamochoerus porcus*) were observed at the bai about one-third of the time. The pigs primarily foraged in muddy areas near the forest edge. Only twice were individuals seen in the mud/saline hole located in the clearing's southeast quadrant.

Up to three spot-necked otter (*Lutra* sp.) were sighted swimming in the stream at intervals throughout the day. These animals were not observed until the platform was in use.

Only three very brief sightings of black-fronted duiker (*Cephalophus nigrifrons*) were recorded. These were always lone individuals that remained close to the forest edge.

## CONCLUSIONS

This study confirms reports of frequent western lowland gorilla activity in Mbeli Bai. The availability of relatively large amounts of terrestrial herbaceous vegetation appears to be what draws gorillas to this site. A much longer and more focused study is needed to document the importance of this habitat type - a large patch of THV - to *Gorilla g. gorilla* and the other animals sighted here. Also, to determine if there is any seasonality to the gorillas' use of the clearing. Further studies could encompass not only feeding competition within and between gorilla groups, but interspecific competition as well.

I have also demonstrated that it is possible to collect a substantial amount of behavioral data on *Gorilla g. gorilla* using the methods employed here. This methodology needs refinement, however the important point is that direct observations of natural gorilla behaviors can be achieved. This means Mbeli offers an unparalleled opportunity to extend investigations beyond western lowland gorilla feeding behavior. The establishment of a long-term study at this site will provide a continuous record of gorilla population dynamics in this sector of the reserve. Observations of group composition over time, and intergroup interactions, may further our understanding of the social organization and behavior of western lowland gorillas. Collaboration with the Kyoto University research team, based in the northern area of the reserve, will provide a substantial data base on the *Gorilla g. gorilla* population in the Nouabalé-Ndoki forest. This data can then be used in a comparative analysis of all three gorilla sub-species.

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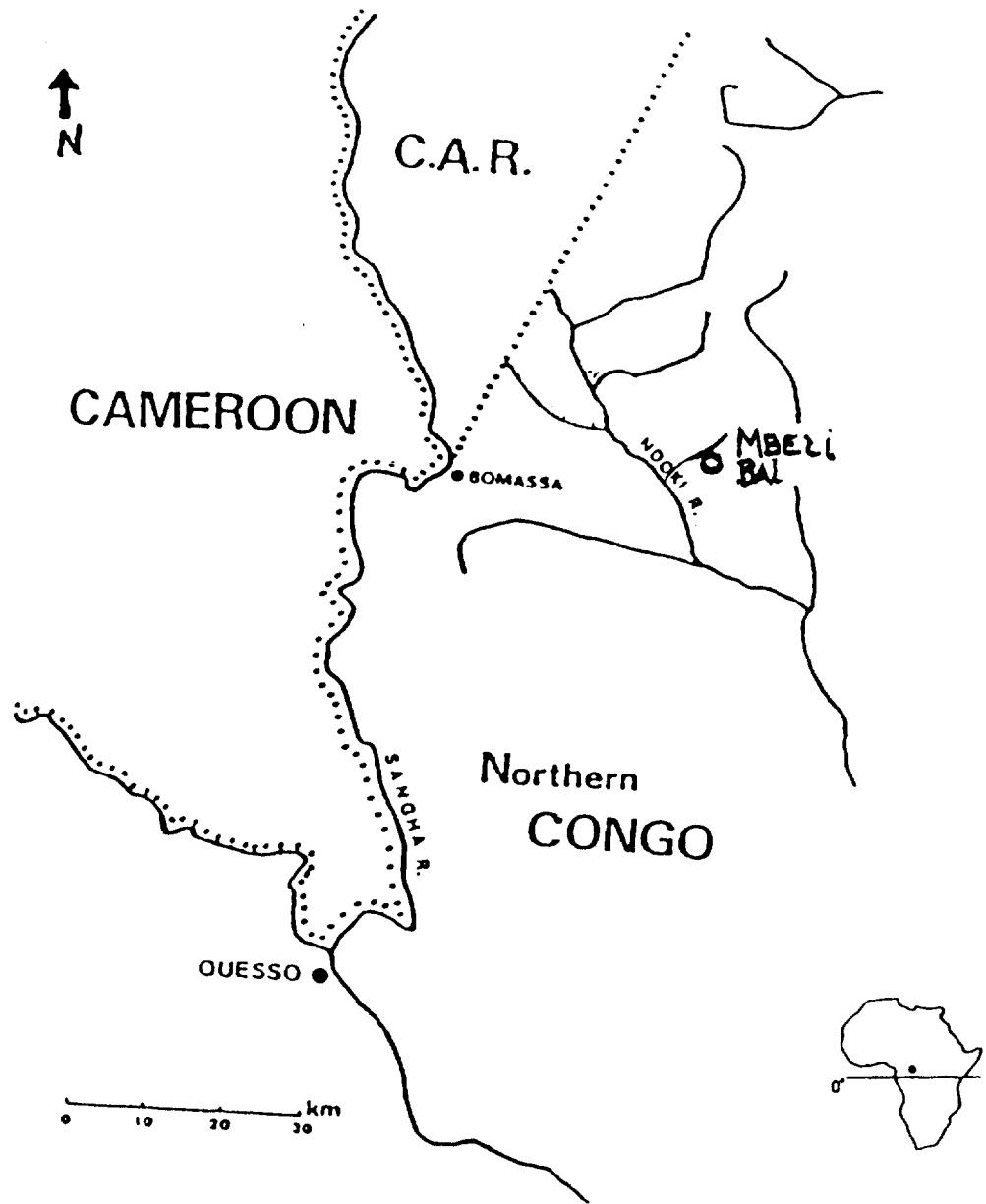


Fig. 1. Location of the study area in northern Congo.

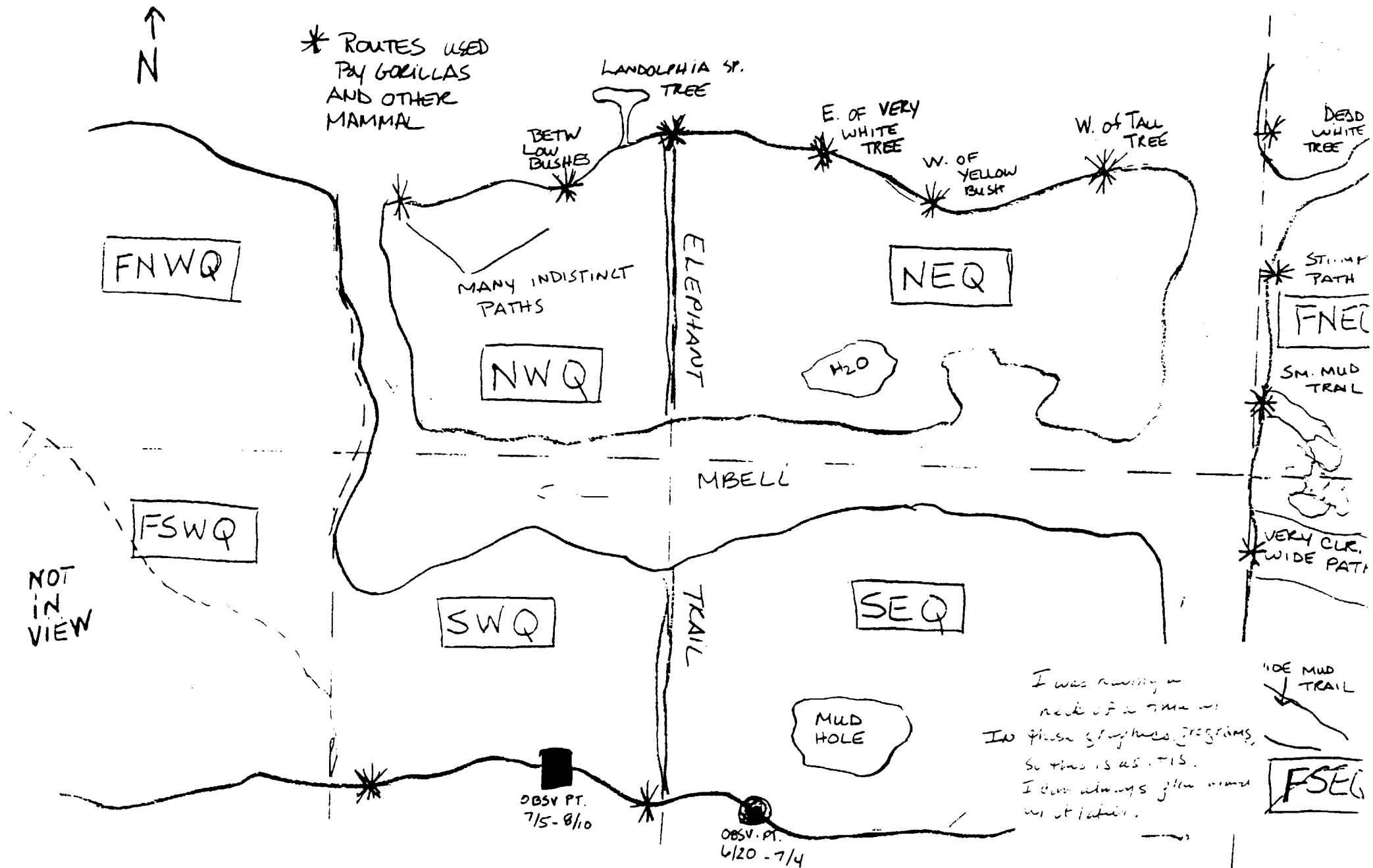
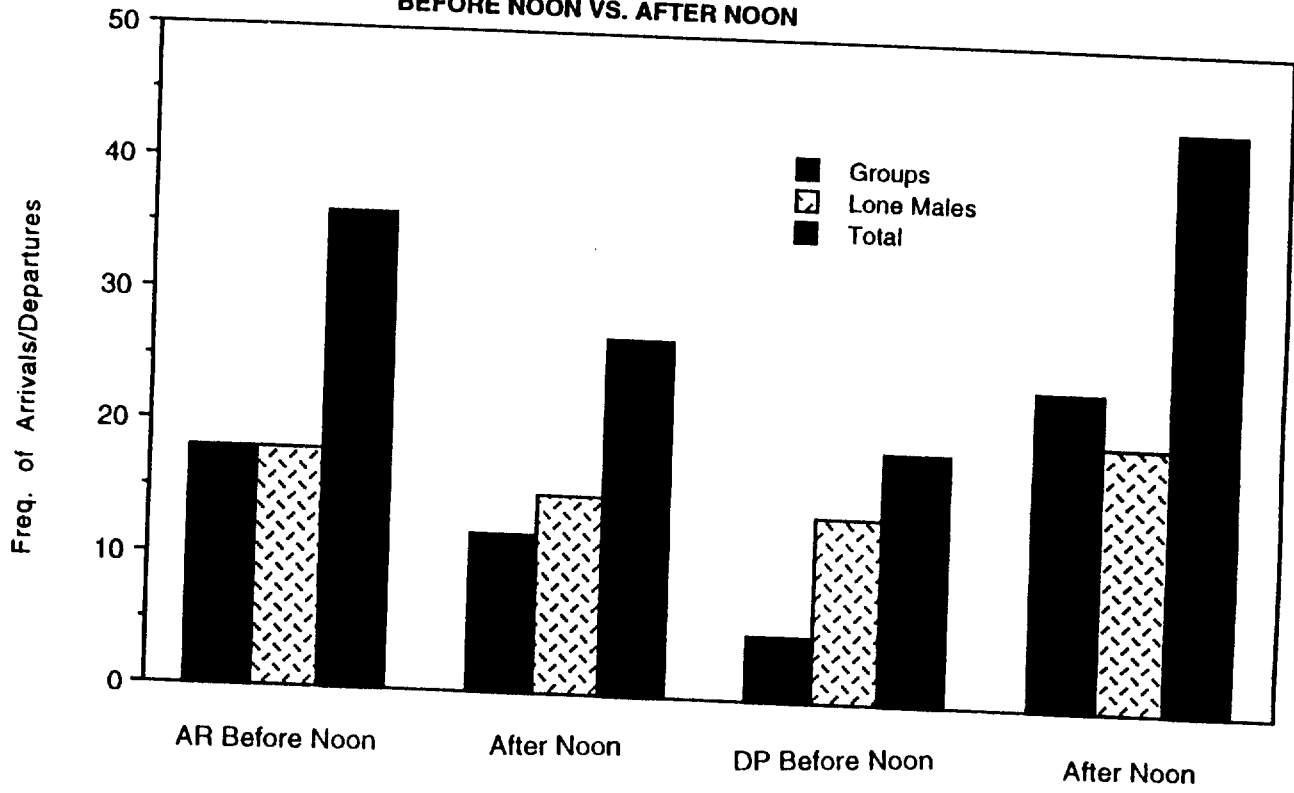


Fig. 2: Schematic map of Mbeli Bai, where gorillas observed; total area of clearing estimated to be approx. 30 - 40 hectares.

Key to quadrant locations: FNEQ=far Northeast, NEQ=Northeast, NWQ=Northwest, FNWQ=far Northwest, FSWQ=far Southwest, SWQ=Southwest, SEQ= Southeast, FSEQ=far Southeast.

**Fig. 3**  
**FREQUENCY OF OBSERVED**  
**GORILLA ARRIVALS/DEPARTURES**  
**BEFORE NOON VS. AFTER NOON**



**Fig. 4**  
**AVERAGE NUMBER OF GORILLAS OBSERVED ON**  
**RAIN DAYS VS. NO RAIN DAYS, MBELI BAI**

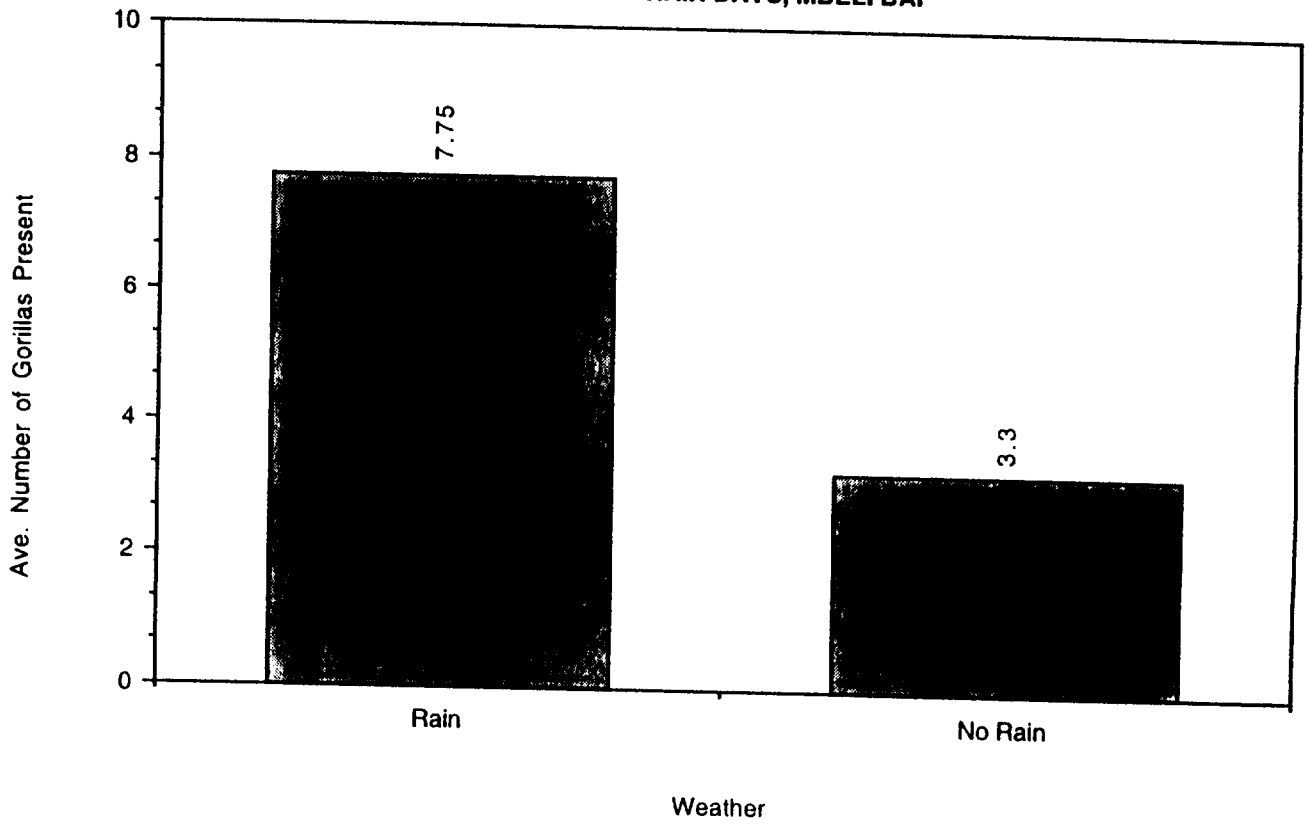




Fig. 5  
LOCATION OF GORILLA ENTRY ROUTES, MBELI  
BAI: FREQUENCY OF USE

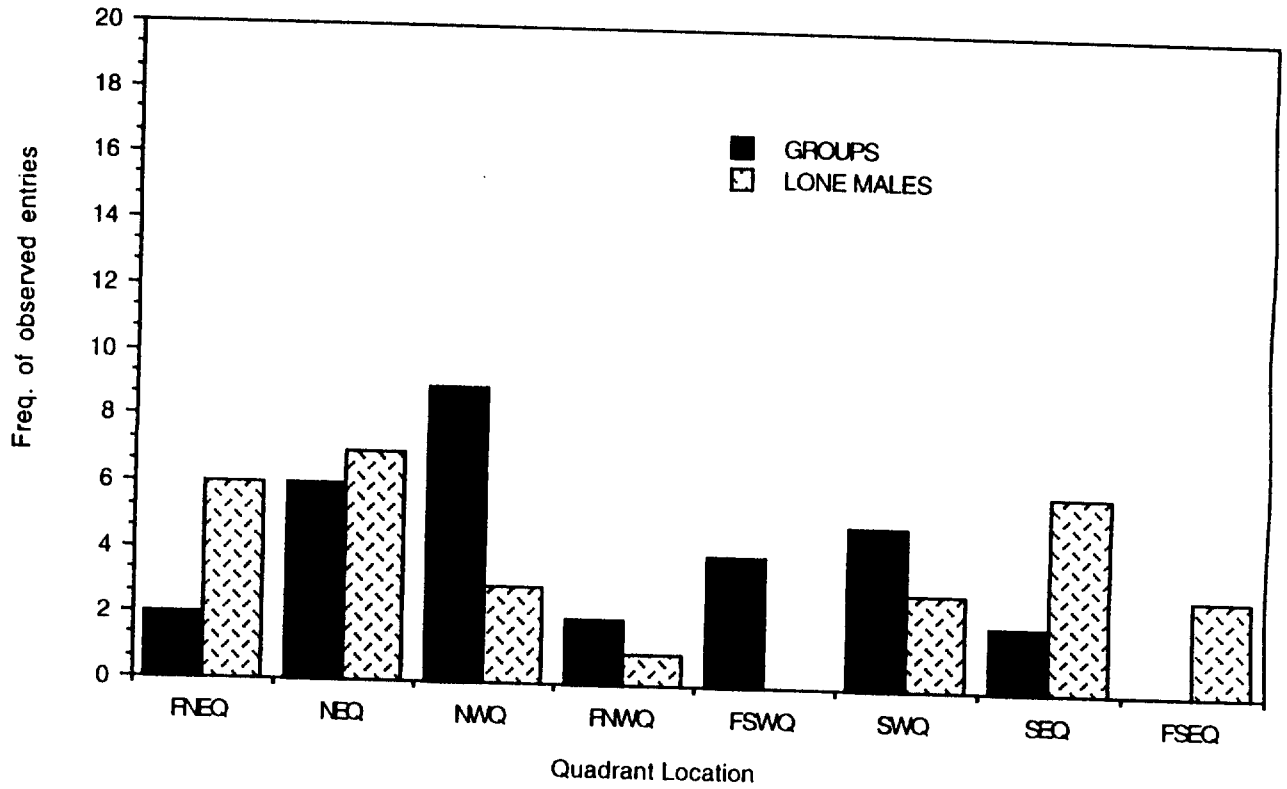


Fig. 6  
LOCATION OF GORILLA EXIT ROUTES, MBELI BAI  
FREQUENCY OF USE

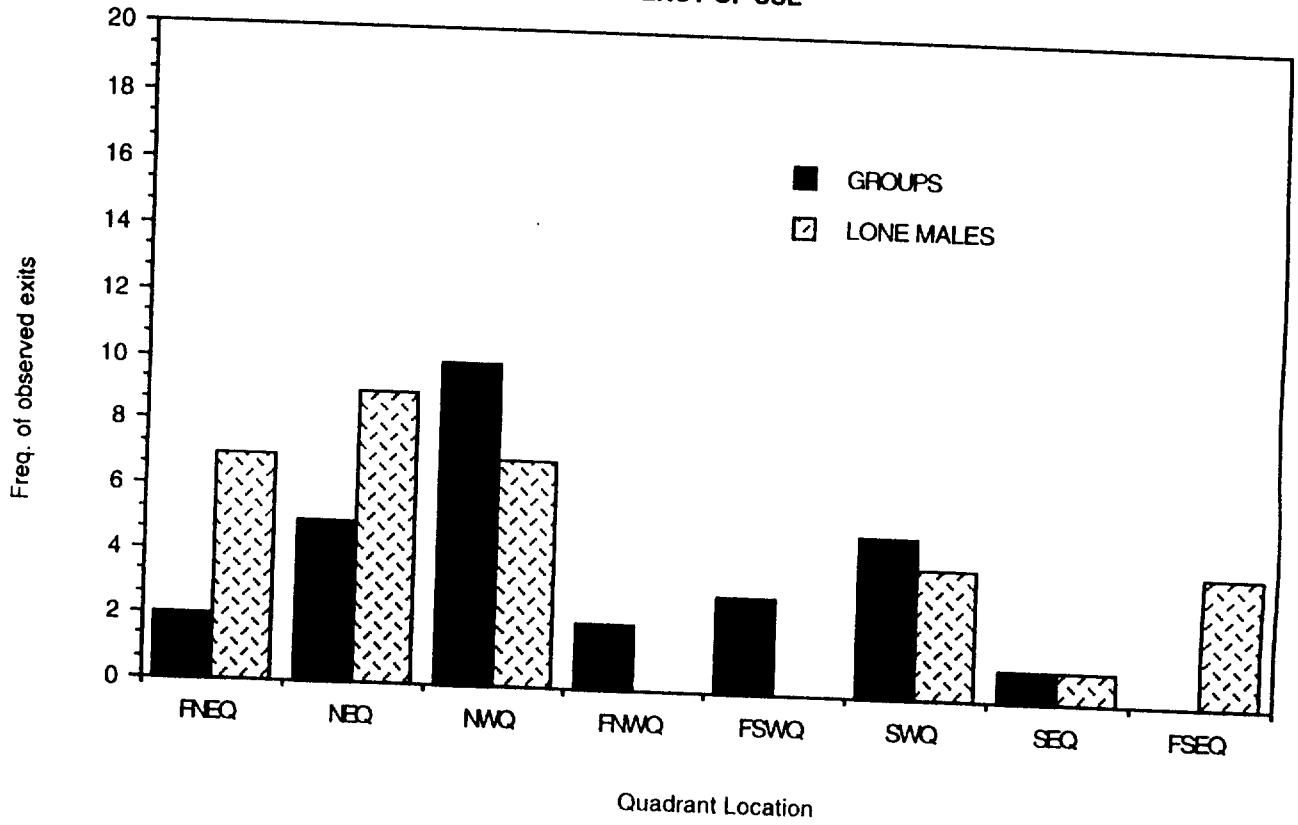


Fig. 7  
AREAS GORILLAS OBSERVED IN WHILE AT BAI  
FREQUENCY OF USE

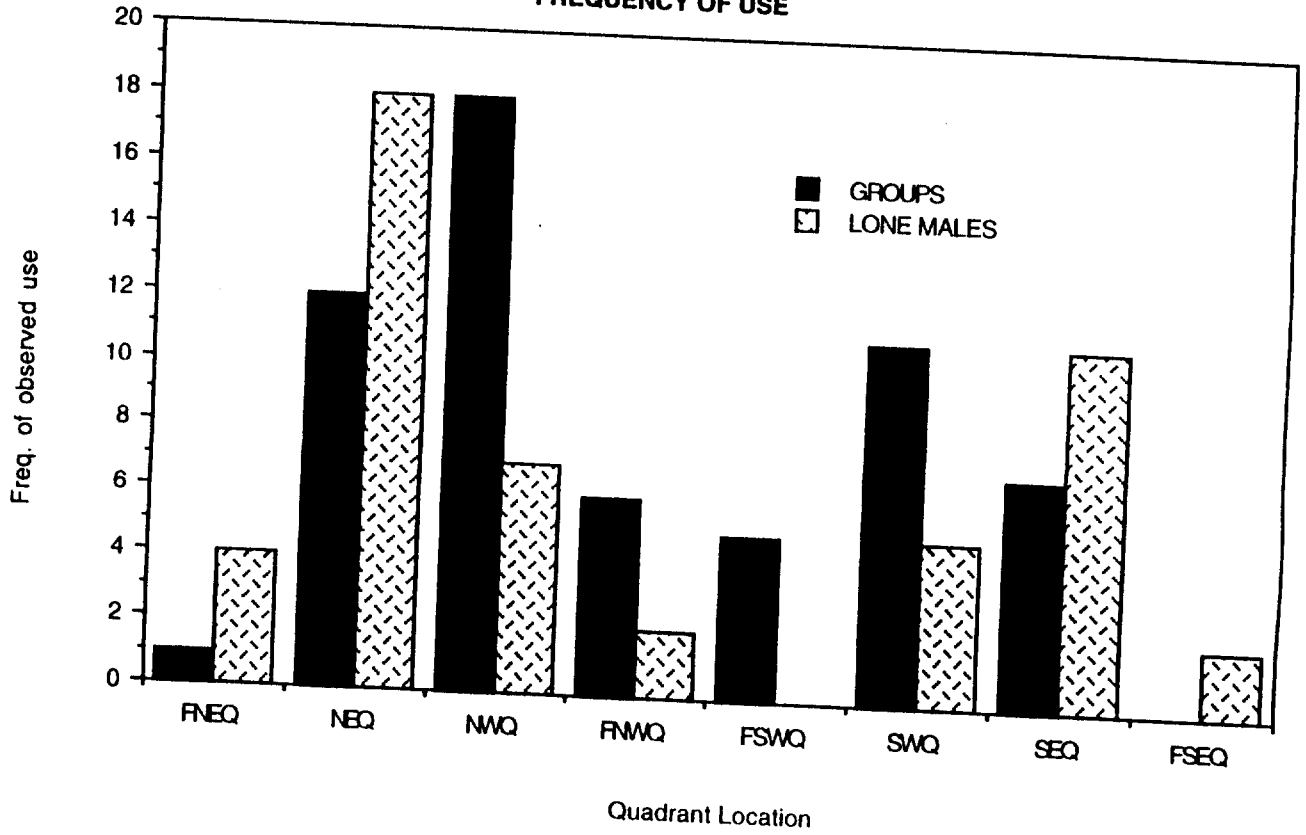


Table I

Observations of Western Lowland Gorillas (*G. g. gorilla*) at Mbeli Bai  
20 June - 10 August, 1993

	<u>Number of Study Days</u>	<u>Gorillas Present</u>		<u>Hours: Mins. of Observations</u>	<u>Gorillas Present</u>	
		<u>Days</u>	<u>%</u>		<u>Hrs.: Mins.</u>	<u>%</u>
<u>Before "Blind"</u> <u>(Ground Level)</u> <u>6/20 - 7/4</u>	11	4	36.4	90: 51 ( 5,451 mins )	9: 53 ( 593 mins)	10.9
<u>After "Blind"</u> <u>10M Height</u> <u>7/5 - 8/10</u>	34	27	79.4	289: 52 ( 17,392 mins )	82: 29 ( 4,949 mins)	28.5
<u>Total</u>	45	31	68.9	380: 43 ( 22,843 mins)	92: 22 ( 5,542 mins)	24.3

**Table II**

**Published Reports Including Direct Observation Time of  
Western Lowland Gorillas (*G. g. gorilla*) \***

<u>Study Site &amp; Primary Researchers</u>	<u>Study Dates/ Total Field Hrs.</u>	<u>Direct Observ. Time</u>	
		<u>Hrs. : Mins.</u>	<u>%</u>
<u>Lopé Reserve, Gabon</u>			
Tutin, et al. (1992)	On - going - reported for 1984 - mid-1990/approx. 10,500 hrs.	130:00	1.2
Rogers & Parnell (1991)	Mar. - Dec., 1990/ not given	30:25	--
Williamson (1989)	Jan. 1984 - May 1985/ 3,346 hrs.	28:00	.84
<u>Rio Muni, Equatorial Guinea</u>			
Jones & Sabater Pi (1971)	Feb. 1967 - July 1968/not given	45:53	--
Sabater Pi (1977) - 8 different locations	intermittent, 1956 - 1969/ 672 hrs.	54:30	--

\* Published data on (*G. g. gorilla*) research in Northern Congo report number of direct observations: Kuroda, 1992 - 8 Dir. Obs.; Mitani, 1992 - 17 Dir. Obs., Nov. 1989 - Jan. 1990; Suzuki & Nishihara, 1992 - observed gorillas feeding in fig trees w/chimpanzees, 4 consecutive days in a 10 mo. period; Yamagiwa, 1992 - 7 Dir. Obs., Nov. 3-20, 1991. Articles by Calvert (Cameroon, 1985), Carroll (Central Afr. Rep., 1986,1988), Fay (Central Afr. Rep., 1989), Fay et al. (Congo, 1989, 1992) do not include counts or details of direct observations.

**Table III**

**Examples of Published Reports Including Direct Observation  
Time of Mountain Gorilla (*G. g. beringei*)**

<u>Study Site &amp; Primary Researchers</u>	<u>Study Dates/ Total Field Hrs.</u>	<u>Direct Observ. Time</u>	
		<u>Hrs. : Mins.</u>	<u>%</u>
<u>Virunga Volcanoes Region. Rwanda &amp; Zaire</u>	On - going studies, Karisoke Research Ctr., Rwanda		
Watts (1984, 1988)	2 - 17 mo. studies, 1978-79 & 1984-85/not given	2,400 :00	--
Fossey (1979)	Jan. - July 1967; Sept. 1967 - ? (7 yrs. total)/not given	3,568 :00	--
Harcourt (1979)	Sept. 1972 - Sept. 1974	900 :00	--
Schaller (1963)	Feb. 1959 - Oct. 1960	466 :00	--
<u>Mt. Kahuzi Region, Zaire</u>			
Goodall (1977)	Apr. - Oct. 1972	273 :00	--

Table IV

Group Composition and Time Spent at Mbeli Bai for Identified Gorilla Groups and Lone Males

<u>Group ID</u>	<u>Group Composition *</u>						<u># of Days Observed</u>	<u>Total Time Present</u>	<u>Ave. Length of Stay</u>	
	<u>SB</u>	<u>BB</u>	<u>AF</u>	<u>SA/JU</u>	<u>INF</u>	<u>Total</u>			<u>Hrs : Mins</u>	<u>Hrs : Mins</u>
MGRP 1	1	-	1	5, 1F 1M 3Unk	1	8	5	12:44	2:33	1:50 - 3:31
MGRP 2	1	-	1	2, 1M 1Unk	1	5	8	25:10	3:09	2:00 - 4:23
MGRP 3	1	1	1	4	1	8	5	12:21	2:28	0:41 - 4:23
MGRP 4	1	-	3	3	2	9	1	1:45	-	---
MGRP 5	1	-	1	2	1	5	3	6:04	-	0:15 - 4:23**
MGRP 6	1	-	3-5	3	3-5	10-14	1	2:00	-	---
<hr/>										
<u>Lone Males</u>										
Mature	2-3					2-3	18	39:52	2:21	0:04 - 3:57
1L young, just turning silver							8 (2x's, 1 day)	13:23	1:47	0:21 - 3:03
<hr/>										
<u>TOTAL</u>	<u>9-10</u>	<u>1</u>	<u>10-12</u>	<u>19</u>	<u>9-11</u>	<u>48-53</u>		<u>Mean # of Individuals/Grp. (incl. Lone Males): 5.1 (5.5)<sup>+</sup></u>		
								<u>Mean # of Individuals/Grp. (excl. Lone Males): 7.8 (7.5)<sup>+</sup></u>		

\* Key: SB=Silverback Male, Age 15+ yrs; BB=Blackback Male, Age 8-14 yrs; AF=Adult Female, Age 8+ yrs; SA/JU=Subadult/Juvenile, Age 4-7 yrs; INF=Infant, Age 0-3 yrs (age classifications determined following guidelines established by Harcourt et al., 1981; Mitani, et al., 1993; Yamagiwa, 1992; Watts, 1990; my own experience w/ captive populations).

\*\* Not truly representative, the day this group stayed only 15 mins., they saw observer and fled; thus, ave. length of stay not calculated.

+ This average includes 2 UnID'd groups observed at the bai- 6 members & 9 members; plus groups encountered in forest if an accurate count was made.

**Table V**

**Raw Data for Arrival and Departure Times of Gorilla Groups and Lone Males**

<b>Time</b>	<b>Frequency of Arrivals*</b>			<b>Frequency of Departures*</b>			
	<b>Total</b>	<b>Lone Males</b>	<b>Groups</b>	<b>Total</b>	<b>Lone Males</b>	<b>Groups</b>	
Pres. on arr.	4	4	-0-	--	--	--	
7:00 - 7:59 AM	4	1	3	2	3	1	
8:00 - 8:59	6	5	1	3	1	-0-	
9:00 - 9:59	6	3	3	6	5	1	
10:00 - 10:59	7	3	4	4	2	2	
11:00 - 11:59	9	2	7	4	3	1	
Noon - 12:59	6	3	3	6	2	4	
1:00 - 1:59 PM	6	5	1	8	5	3	
2:00 - 2:59	13	5	8	5	1	4	
3:00 - 3:59	2	2	-0-	10	6	4	
4:00 - Pres. on dept.	--	--	--	15	6	9	
<b>Total Arr. Before Noon</b>	36	18	18	<b>Total Dept. Before Noon</b>	19	14	5
<b>Total Arr. After Noon</b>	27	15	12	<b>Total Dept. After Noon</b>	44	20	24

\* Does not include as separate, instances of individuals returning/departing w/in 30 mins. after group departed the first time.



**Table VI**  
**Observations of Gorilla Groups/Lone Males**  
**Simultaneously Present at Mbeli Bai**

<u>Date</u>	<u>No. of Groups</u>	<u>Group ID*</u>	<u>No. of Lone Males</u>
6/21 pm	--	--	3 - UnID'd
7/2 pm	--	--	2 - UnID'd
7/9 am	2	MGRP 1; UnID'd grp of 9	1 - UnID'd
7/12 am	--	--	Young male - 1L; 1 - UnID'd
pm	2	MGRP 3; UnID'd grp of 6	--
7/13 am	2	MGRP 1; MGRP 2	--
7/16 am	1	MGRP 2	Young male - 1L
7/18 am	1	MGRP 2	1 - UnID'd
7/26 late am/pm	4	MGRP 5; MGRP 2; MGRP 6; MGRP 1	1 - UnID'd
7/29 late am/pm	4	MGRP 3; UnID'd grp of 9; UnID'd F w/Inf +2 SA/JU; MGRP 2	2 - UnID'd
8/1 late am/pm	1	MGRP 4	1 - UnID'd

**Summary: Gorilla Groups/Lone Males Present Simultaneously**

<b><u>Total No. of Times Lone Males Only</u></b>	3
<b><u>Total No. of Times Groups Only</u></b>	2
<b><u>Total No. of Times Groups and Lone Males</u></b>	7
<b><u>Grand Total</u></b>	11 (10 days - 32.2% of the 31 days gorillas observed at Mbeli)

\* Groups listed in order of arrival. Exception is 7/12 when the two groups arrived at the same time via adjacent quadrants in Northeast area of bai.

Table VII

Location of Gorilla Entrance/Exit Routes and Areas Utilized in Mbeli Bai  
Raw Data on Frequency of Use

Group ID		FNEQ	NEQ	NWQ	FNWQ	FSWQ	SWQ	SEQ	FSEQ								
MGRP 1	Enter	--	1	4	--	1	--	--	--								
	Exit	--	1	4	--	--	--	--	--								
	Use	--	1	5	2	1	1	--	--								
MGRP 2	Enter	--	--	4	1	1	2	--	--								
	Exit	--	1	2	--	1	2	1	--								
	Use	--	3	6	2	--	4	2	--								
MGRP 3	Enter	--	4	--	--	--	1	--	--								
	Exit	2	--	2	1	1	--	--	--								
	Use	1	3	2	1	1	1	1	--								
MGRP 4	Enter	--	--	1 (used 2 rtes.)	1	--	--	--	--								
	Exit	--	--	--	1	--	--	--	--								
	Use	--	--	1	1	1	--	--	--								
MGRP 5	Enter	--	--	--	--	--	1	2	--								
	Exit	--	--	1	--	1	1	--	--								
	Use	--	2	2	--	--	2	3	--								
MGRP 6	Enter	--	--	--	--	--	1	--	--								
	Exit	--	--	--	--	--	1	--	--								
	Use	--	--	--	--	--	1	--	--								
UnID'd Groups	Enter	2	1	--	--	2	--	--	--								
	Exit	--	3	1	--	--	1	--	--								
	Use	--	3	2	--	2	2	1	--								
UnID'd Lone Males	Enter	6	7	1	--	--	2	3	2								
	Exit	7	6	4	--	--	2	--	4								
	Use	4	14	4	1	--	3	7	2								
Lone Male (1L)	Enter	--	--	2	1	--	1	3	1								
	Exit	--	3	3	--	--	2	1	--								
	Use	--	4	3	1	--	2	4	--								
<hr/>																	
		<u>Gp</u>	<u>Ln</u>	<u>Gp</u>	<u>Ln</u>	<u>Gp</u>	<u>Ln</u>	<u>Gp</u>	<u>Ln</u>	<u>Gp</u>	<u>Ln</u>	<u>Gp</u>	<u>Ln</u>				
Totals	Enter	2	6	6	7	9	3	2	1	4	0	5	3	2	6	0	3
	Exit	2	7	5	9	10	7	2	0	3	0	5	4	1	1	0	4
	Use	1	4	12	18	18	7	6	2	5	0	11	5	7	11	0	2
<hr/>																	

Refer to schematic map of Mbeli Bai, Fig. 1 for locations of quadrants. FNEQ=far Northeast, NEQ=Northeast, NWQ=Northwest, FNW=far Northwest, FSWQ=far Southwest, SWQ=Southwest, SEQ=Southeast, FSEQ=far Southeast.