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FINAL REPORT

IUCN/WWF - Project 1731.

Pilot survey for conservation management of eastern gorillas in Zaire. (Conducted 24.9.79 - 3.3.80)

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Background - Only one previous survey of the distribution and status of eastern gorillas (Pan gorilla beringei and Pan gorilla graueri) has been conducted - by John Emlen and George Schaller in 1959. They estimated that there were between 5,000 and 15,000 gorillas,⁽¹⁾ scattered in some sixty more or less isolated pockets, throughout an area of some 91,000 km.² (from the equator south to 4°20' latitude and from longitude 26° 30' E to 29° 45' E). Within this overall range they recognised the following geographic regions⁽²⁾ :-

1. LUBERO - MT. TSHIABERIMU
2. KAYONZA - VIRUNGA VOLCANOES
3. LAKE KIVU - MT. KAHUZI
4. FIZI - MWENGA (ITOMBWE MOUNTAINS)
5. UTU - WALIKALI - SHABUNDA
6. ANGUMU - PINGA

IUCN/WWF Project 1731 set out to update as much of the information of the 1959 survey as possible and to lay the foundations for future gorilla conservation management projects in Zaire. For more details see project application and the overall eastern gorilla strategy plan. (Goodall 1979)

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- (1) Emlen and Schaller referred to all these populations as 'mountain gorillas' (Gorilla gorilla beringei). See map 1
 - (2) All these regions, except Kayonza, are in Zaire - but the Virunga region also includes areas of both Rwanda and Uganda.

Survey findings: Unfortunately, owing to the many problems encountered in obtaining road transportation for this project - and the present impassibility of some of the roads in the Kivu district of Zaire, the proposed road survey route could not be followed. Thus the objective of precisely delimiting the total range of eastern gorillas has not yet been achieved. However, the continued presence of gorillas in all the regions of Zaire listed above has been confirmed - but their status varies considerably from region to region as follows:-

1. LUBERO - MT. TSHIABERIMU REGION.

In 1959 Emlen and Schaller identified three, isolated gorilla populations in the following areas of this region:-

- (i) Bikara - Ndoluma
- (ii) Tshiaberimu - Lubango (A.B.C. on map²)
- (iii) Matembe - Katakalende

Each of these areas was visited during this project (Jan/Feb 1980) where it was found that the 'fears' expressed by Emlen and Schaller in 1959 are now a reality i.e. extensive deforestation which is still proceeding at a rapid rate. Consequently gorillas now exist in only one of the areas listed above - Mt. Tshiaberimu - and there they are probably greatly reduced in numbers and most definitely threatened with extinction in the next few years.

Some patches of (montane) forest still remain bordering the Goma-Lubero road (between Lubero, 29° 13' E, 0° 10' S, and Bikara, 29° 12' E, 0° 14' S). Vegetation surveys showed that they contain many gorilla food plants - especially the main food items eaten by the Kahuzi gorillas (inhabiting very similar montane biotopes), e.g. Urera hypselodendron, Basella alba, Myrianthus spp., Cyperus latifolius, Piper capense, Smilax kraussiana, Arundinaria alpina, Galium spp., Musa spp., Ensete spp., Cyathea spp., Afromomum spp., Rumex spp. However, these forest patches are now tiny and completely isolated from the main forest area in the west and are too small to support gorilla populations - particularly in the face of extensive hunting pressures. The many locals interviewed stated that all the gorillas in these forest patches had been killed and eaten 'a long time ago'.

A similar fate has befallen the gorilla population which Emlen and Schaller found near Ndoluma - where they used to come into the grounds of the mission there even later than 1959 (Ngezayo and Hurlebert pers. comm.). The forest edge is now several hours walk from the mission and many large patches have been cleared even further to the north and west towards the Lubero - Kasuo road. It is possible that some gorillas have been able to move into the main forest which lies to the west, for I found recent gorilla signs in the forests around the village of LUHUNGA ($29^{\circ} 3' E, 0^{\circ} 14' S$) which lies 19 kms, westward on the Lubero - Kasuo road. This is further north-west than any population recorded in the 1959 survey, (but they may have been there in 1959 and not been recorded).

The gorilla populations which were found in the Matembe - Mt. Katokalende area in 1959 have now completely disappeared, and so has virtually all of their forest habitat. Only a few patches of forest remain to the west-south-west of the main Goma - Lubero road and even the forest on Mt Katokalende has many large clearings. Throughout this whole area, and east of the road, there are vast areas of Pteridium ferns - presumably as a result of the continued ^{repeated} burning practices of the local peoples. Thus the present views from previous gorilla habitats such as Matembe, and further north-west at Kipese ($29^{\circ} 17' E, 0^{\circ} 14' S$) (which now has clear 360° panoramas) reveal only tiny, scattered patches of remnant forest - usually on mountain tops. But even some of these have been cleared, especially where bamboo (Arun-dinaria alpina) was growing, for this is regarded as prime land. On Mt. Itoya the gorillas have been replaced as the large herbivore by over 500 cattle on a newly created farm.

According to Mr. Leroux (pers. comm.), who manages the farms at Bikara, and Kitsambiro, excellent pastureland can be made in this region - if the forest is cleared with the minimum of burning possible, and then planted immediately with KIKUYU grass (This spreads rapidly, has excellent soil holding properties and gives good grazing (he has 500 cattle on 500 hectares). Unfortunately most of the non-grazing land in this region has been cleared with the use of extensive burning which, in some cases lasted three weeks. Thus the humus layer, initially shallow in tropical forests anyway, has been almost completely destroyed. Consequently as happens so frequently in this type of situation, it only managed to support crops for a

few years before it became unproductive and therefore more forest was cleared.

There are many new villages in this region and agriculture is now extensive - both for food crops such as potatoes, beans, leeks, sorghum, and cash crops such as coffee and more recently wheat. This is now grown over vast areas of this rolling landscape and is the subject of an agricultural research programme by INERA at Bikara.

The spread of agriculture, especially wheat, has been more extensive east of the Goma - Lubero road and this has further threatened the gorilla population still surviving in the forests of the Mt. Tshiaberimu section of the Virunga National Park. This population has long since been isolated (when its forest connection to the west and north was cut - probably by the growth of the town of Lubero). Traces of gorillas were found in Feb. 1980 but the population now appears to be even more sparse and could easily become extinct within the next few years unless positive action is taken.

Only a tiny area of forest is inside the park, and this consists mainly of bamboo forest. It is a widely held, but mistaken, belief that this is the best of all gorilla habitats. However, studies of the behavioural ecology of gorillas in similar mixed montane forests in the Kahuzi region have shown that its usage by gorillas is limited to the few months of the year when the new shoots are growing (late rainy season Sept.- Dec.) (Goodall 1979). Thus in Tshiaberimu the other essential components of the ideal 'mosaic' of forest biotopes for gorillas such as mixed primary and secondary forest, are rapidly being clear felled. Cyperus swamps, which as in Kahuzi are plentiful, and utilised extensively by gorillas, are being drained and cultivated. From the summit of Mt. Tshiaberimu (3117 metres) one can now clearly hear the forest being cut down on the surrounding foothills - which are perpetually covered with a smoke haze from the many fires.

Another, more recent, threat to the gorillas in this region comes from the many unofficial gold mines - and the 'villages' which have sprung up around them. These gold workings can be seen throughout the region - even in the park areas. It is very difficult to assess their real impact on gorillas - for obviously the miners do not welcome investigations - but it is most likely that they trap and eat any game available, including gorillas. The only protection the remaining gorillas

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have in the Tshiaberimu area is that of just two guards - who live in a small, very remote encampment about one and a half hours walk east of the village of KIVUGHA on the Masereka road ($29^{\circ} 25' E, 0^{\circ} 8' S$). I found the wives of the guards were cutting trees, for firewood, inside the park - and, presumably, so were many of the other local inhabitants.

This population of gorillas can only survive if:-

1. The guard force is increased to at least ten, with someone of responsible rank in charge, and having more regular supervision from the regional station at Mutsora.
2. The park area is immediately extended to the south and west in order to protect the remaining montane forest belt which surrounds the bamboo zone. The best possible boundary to the west would be a line following the Talia (North) and Talia (South) rivers, as far to the south as the present forest exists (see map⁴). All areas eastwards to the lake should be fully protected and any inhabitants (as yet not too many), except those on the western shore of Lake Edward, moved to other areas. If this is not done, not only will the rest of the gorilla population be killed soon, but total deforestation can only have drastic effects on the climate, hydrology and soil structure of this area - with consequent problems to downstream ecosystems served by the many rivers which have their origins in this watershed.

It is further recommended that this region needs an immediate survey in order to determine (a) the size of the Tshiaberimu gorilla population and (b) where the remaining gorilla populations in the Lubero area are most threatened with isolation from the main forest block in the west. In areas which have been scheduled for complete deforestation it is suggested that, rather than allow these rare animals to be killed and eaten a study is undertaken of the costs and logistics involved in translocation several family groups to other suitable areas which do not contain gorillas - such as the Ruwenzories. This region was surveyed in January 1980 and extensive areas of excellent gorilla habitat were found - in forest types ranging from lowland (1,000m.) to montane (up to and even over 3,000m.) Thus it contains examples of virtually every forest biotope that gorillas must have travelled through during their evolutionary migrations. Schaller (1963) suggested that

gorillas had been unable to colonise the Ruwenzories because the Semliki river was too wide a barrier for these non-swimming primates to cross. Having flown over the length of this river I think that, gorillas could have crossed via natural bridges of fallen trees to the many islands and sand banks - but were probably not present this far north anyway. The Ruwenzories region, however, is ideal gorilla habitat - some of the major gorilla foods are in super-abundance and, what is more important, the remoteness of the area will afford excellent protection. Thus no matter how bizarre, or expensive, such an operation may seem at first sight, it must be considered carefully. Only a few small groups need to be translocated.

Finally, the whole of the agricultural development of this area needs to be more carefully monitored and controlled in order to avoid long term disasters for the flora, fauna and humans alike. There seems a very evident need for education in basic agricultural practices, such as terracing, in order to protect the soil from further erosion in this hilly terrain.

2. Kayonza (Impenetrable forest) - Virunga Volcanoes.

The gorillas of the Kayonza forest (Uganda) and the Virunga volcanoes (Rwanda, Zaire and Uganda) have long since been isolated, from each other and from populations in other regions. Kayonza forest contains the only population of eastern gorillas which lies totally outside Zaire. It was not visited during this project - but was surveyed by Sandy Harcourt in 1979.

The situation in the Virunga volcanoes region is most complex - due to its remoteness and the many problems associated with shared borders e.g. cross border poaching and the difficulties this causes for effective protection by the park guards who must respect international boundaries. I visited the central volcanoes area in late Dec. 1979 and found many traps (for antelopes) on both sides of the border. One contained a freshly caught black-fronted duiker which I was able to release, but another contained only an amputated hoof - the gruesome remains of a most painful struggle for freedom. The cabin in the Rukumi meadow was obviously frequently used by poachers and their fresh signs were seen. They had also been active near Kabara, and were also

presumably responsible for the total destruction of the tomb of Carl Akeley. This is a tragedy - for it was Akeley who initiated the protection of this beautiful and unique area and so enabled Zaire to possess the first National Park in Africa as long ago as 1925. The following year he became seriously ill on an expedition there and climbed to Kabara so that he could be buried in what he regarded as 'the most beautiful place in the world'. His gravesite has been a place of pilgrimage for many people in the last 50 years. It is to be hoped that the Zaire authorities will catch those responsible and ensure the restoration of the tomb.

No sightings were made of gorillas or their trail signs in the areas between Visoke and Rukumi nor in the vicinity of Kabara - this is disturbing. The cabin at Kabara is in a very good state of repair, and that at Rukumi is still quite reasonable. It is recommended therefore that someone is sent as soon as possible to ^{conduct} detailed census work in this area. Their very presence will undoubtedly aid conservation - but the responsibility for anti-poaching must be taken by the park authorities. Because of the remoteness of this situation it is imperative that Kabara is equipped with good radio facilities (ideally Karisoke should be as well). This will enable guards to be called up for patrol from Rumangabo whenever necessary.

The killing of adults and the capture of young is still ongoing - a silverback was killed by a small calibre, high powered rifle in the Sabinio area (Rwandese side) in Dec. 1979. Several people reported that two baby gorillas were up for sale in the nearby border towns of Gisenyi (Rwanda) and Goma (Zaire). Unfortunately efforts by the Rwandese authorities were frustrated when the 'middleman' crossed the border into Goma. I reported this to the Zaire authorities in Goma in Jan. 1980 - but I do not think any positive action was taken. Again this is an example where cross border conservation measures are urgently needed.

The major problem of control in this area undoubtedly arises from the remoteness of the gorilla area - even from the guard camp at Rumangabo - which, like others is short of transport and fuel. The local population are alienated from the park and can therefore see only the immediate benefits of poaching or selling animals. It seems imperative therefore that the local community become more involved - and the best way is to open this area up for tourism. Gorilla safaris should be organised

using the camp at Kabara as a centre. Scientific work can still be done from there - especially using the ^{Cabin} ~~barin~~ at the Rukumi meadow. I feel that only with the dual pressures from scientific and tourist interests can something be salvaged here.

The most recent published report on the Rwandese conservation efforts is that by Bill Weber (1979). Reports of the joint WWF/FPS/AWLF project will be made by Jean Pierre von der Becke, Sandy Harcourt and Bill and Amy Weber and therefore will not be discussed here. However, after discussions with each of these people and others involved in the conservation of this area it is urgent that the WWF obtain agreements, at top ministerial level, between Zaire, Rwanda and Uganda about the joint conservation of this region - particularly regarding cross border patrols.

3. KAHUZI

The behavioural ecology of the gorillas in the eastern section of this region is now well known - Goodall (1974, 1977, 1979) and Casimir (1975). A recent census by Murnyak and Ekam Wina (1979) confirmed Goodall's predictions that more gorillas would be found in the areas of mixed secondary forest in the east of the park than in the primary forest areas to the west. However, their extremely high figure of 98% in secondary forest could well have been influenced by the timing of the surveys in each biotope and must not be interpreted to indicate total reliance of gorillas on secondary forest. It is the 'mosaic' of biotopes which makes the eastern Kahuzi region such excellent gorilla habitat (Goodall loc. cit.) Murnyak and Ekam Wina estimated a total gorilla population of some 250 for the 600 Km² of the original Kahuzi-Biega Park area. Since almost 50% of these 250 animals were juveniles and infants this population appears to be expanding.

Recently the Kahuzi-Biega National Park has been enlarged to cover an area of forest ten times its previous size (i.e. 6,000 Km²). This newly protected area consists mainly of lowland forest west of the rift escarpment, but some of the vital forest connection between the Kahuzi and Biega mountains and the lowland forest to the south west has been included (see map 3). Since most of this extension is primary forest it is unlikely, for reasons given above, that the ten times enlarged area contains ten times as many gorillas (i.e. 2,500) as the original park area.

The two habituated gorilla groups which were studied in 1971/72 (Goodall)

have since undergone considerable natural changes in their social composition - knowledge of which is important for our understanding of gorilla social behaviour and in our formulation of future conservation plans. The family group once led by the silverback male I called Kelele (also referred to as Casimir) consisted of twenty in 1972, and the other group (led by 'Mushamuka') of some fourteen. Since then Casimir has died (in 1974) apparently as a result of wounds received in a fight with another male - and his group was 'led' by a succession of males before the present one (called Maeshi by the pygmies) took over (Deschryver pers. comm.) It now contains only five other adults and three sub-adults and no young at all. The other group, however, still led by the silverback 'Mushamuka' now consists of some thirty-eight animals. Some known females from Casimir's old group can be recognised and others have probably joined from groups elsewhere. There have also been many births especially recently, for during this survey I saw eight infants of two years old or less. Many thousands of tourists have been to see these two habituated gorilla groups since 1972 and so this region appears to be the most successful of all in combining scientific research, conservation and tourism. Unfortunately however, the situation is not one for complacency.

The Kahuzi gorilla population is now being threatened in the following ways:-

(1) Pressures on the park borders and local incursions.

Compared with many areas of Zaire the eastern Kivu region has a very high human population which is increasing rapidly and, as a direct result, huge areas of rain forest are being completely cleared - rather than being subjected to traditional 'slash and burn' rotational practices. This is especially so on the western edge of the Albertine rift - where cultivation is now up over the summits of many of the rift mountains and threatening the northern and eastern borders of the Kahuzi-Biega National Park. On the western side of the park the expanding population in the Nyakalonge district is similarly threatening the park's western borders and the northern boundary of the narrow 'corridor' of forest connecting Kahuzi to the Utu region. It is threatened on the south by the growth of agriculture north of the Kingulube-Walungu road. Such a large human population inevitably means an increase in incursions into the

the remaining forest, whether it is a park or not, for firewood, to collect honey or to trap animals. In November 1979 seven gorillas were killed near Ninja in the new extension to the Kahuzi Biega Park and even the habituated gorillas near the park headquarters are not immune - for one female has had a foot amputated by a wire snare, another a hand and an adult male still has wire embedded in his arm. In some areas small sections of the forest just inside the park boundary have been cleared for local agriculture and only constant vigilance will prevent the spread of such practices.

(2) Natural changes in the forest via succession.

The 'mosaic' nature of the forest biotopes in the Kahuzi region is the result of interplay between natural factors, such as geology and climate, and anthropogenic influences - particularly traditional 'slash and burn' rotational agriculture. Goodall (1979). The latter has been particularly important in creating many large areas of secondary regenerating forest in the east of the Kahuzi-Biega National Park. It is now over twenty years since some of these areas were abandoned and consequently the forest is becoming more mature, thus it is becoming more closed with fewer and fewer sun-loving herbs and vines - which are the main gorilla foods. If left to natural succession the forest in these areas will become progressively worse gorilla habitat and therefore will probably only be able to support a much smaller gorilla population.

However, in contrast to this there has been a 'natural' opening up of the forest in some areas - by elephants. During the last five years they have returned to Kahuzi and are having an obvious, and increasing influence on vegetation changes in some areas. Adrian Kortland (1972) believes they are prime causes of what he calls 'parklandisation'. Thus, this may prove a serious management problem in such a park as Kahuzi - although the gorillas certainly seem to be benefitting from their activities at the present time - in fact they sometimes follow the elephants' trails (but this may be as much for convenience as for obtaining food plants from knocked over trees). It is therefore essential, and urgent, to get information on the ecology of elephants in the Kahuzi park.

Mismanagemnt of the park.

Good conservation management of any park includes a thriving tourist industry - which brings in both revenue and international prestige. Thanks

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largely to the work of M. Adrien Deschryver this was achieved most successfully in the Kahuzi-Biega National Park in the early 1970's - but now unfortunately the park has a bad reputation among tourists, both locally and internationally. In the early days small parties of less than five were rewarded, for a few hours hard travel through the forest, by spectacular views of free-living gorillas - and for many it was the best safari of their life. In recent years parties of up to fifty tourists have been taken to 'see' the gorillas - with drastic results for both people and animals. The tourists have only seen a little of the gorillas - but the gorillas have seen too much of the tourists and appear to have reacted with more violent display charges than usual. On several occasions tourists have panicked and ran away - and pygmy guides have been attacked and bitten.

Some years ago Monsieur Deschryver, Principal Conservator of the Kahuzi-Biega National Park divided the twin responsibilities of tourism and conservation (anti-poaching patrols) between himself and his Zairois assistant - he taking responsibility for tourism and his assistant for conservation. Unfortunately, M. Deschryver has since let tourism virtually run itself - ^eby leaving him free to fly his private aeroplane on a daily commercial basis. Thus the number of tourists who visit the gorillas is uncontrolled - despite the knowledge of the real dangers this entails for both animals and humans. Similarly, the guides and trackers are visited at the camp only once or twice a month by M. Deschryver and, since they are also uncontrolled they do not work properly. For example, there are twelve pygmy trackers - six for each of the two habituated gorilla groups - and their job is to locate the two groups every day. But, since they are not supervised, and it is a long walk into the park each day, they often only work when tourists arrive. Thus instead of following a trail only one day old many tourists have (unknowingly) had to follow trails several days old. Sometimes, in an effort to try to save time, the trackers have tried to guess where the gorillas are located and often they have been wrong - this has meant even longer walks for the tourists. Consequently many have given up exhausted and some have not got out of the forest until after dark! Those who have been lucky enough to eventually see gorillas tell of guides who allow only a short viewing time before they order the party to return, and they ⁿvirtually demand matabeeshis (tips)! The park's log book

contains records of these disappointments - but even more of them have been passed verbally to other potential tourists both locally and internationally. This has resulted in the spread of bad publicity for the park, with a consequent decline in the numbers of tourists - a situation which no park in Zaire can afford - for tourists in Africa have a choice between many parks in several countries.

It is therefore of the utmost urgency that this park regains its status as the best example of gorilla conservation in the world. It will need extra manpower and more equipment - for the original guard force of thirty has not been increased to match up to the greatly increased responsibility of the ten times enlargement of the park. New guard posts will have to be set up to protect the most threatened areas e.g. in the 'corridor'. Above all however, there will have to be a greater sense of responsibility and more effort on the part of the Principal Conservator to supervise the park full time and not run it like a part time hobby. This can quickly ensure that the trackers and guides do their jobs properly - but the problems of tourists will need a careful review. I suggest that the maximum party size should be limited to ten tourists - and preferably five. This will also make it safer regarding the problems now posed by elephants. Some form of priority booking will have to be arranged and widely publicised to avoid disappointment. In addition the recent increase of the tariff to 100 Z. (40 US \$) per day has deterred many local visitors from making several visits - this could be avoided by adopting a two tier tariff, common in other Zaire parks, with a reduced rate for Zaire residents. Booklets should be prepared to give the visitors more information - on both the park and the gorillas, and the whole education potential of the park be explored. In the long term the management plan of the park may have to be reviewed in the light of the natural habitat changes described above - in order to avoid the area becoming poorer habitat for gorillas. It is also recommended that a study of the ecological position of the elephants in the Kahuzi Park be initiated as soon as possible.

4. FIZI - MWENGA (Itombwe Mountains).

Apart from the brief visit of Emlen and Schaller in June 1959 this area has not been surveyed. They list seventeen locations of gorillas,

- (see map) one as far south as the area of the Luiko river east of Fizi ($28^{\circ}58' E, 4^{\circ}19' S$) - but reported that the gorillas apparently crossed short stretches of grassland from one forest island to another. They were puzzled by such 'pockets of animals' in this area (and in Utu) where 'isolated groups of animals existed in the vast expanse of the rain forest - where no major rivers hemmed them in, the forest was continuous and the altitude and topography were similar to other areas'. Schaller (1963).

In November/December 1979, I flew to the Kamituga area ($28^{\circ}12' E, 3^{\circ}4' S$) east of Mwenga. From the air I was able to see that the Itombwe region is in fact largely cut off from the main forest to the north-west by a large belt of agriculture stretching from east of Kamituga north-eastwards to Bukavu on the shore of Lake Kivu. However, some tenuous remnants of a forest connection may still exist to the south-west of Kamituga - but gorillas were not found there in 1959 nor are they there today, not even further south-west in the main forest near Kama ($27^{\circ}8' E, 3^{\circ}33' S$) - (but chimpanzees are.)

Unfortunately this area is even more isolated than it was in 1959. The Mwenga-Fizi road has now been closed for several years - since all the bridges are broken. I was advised, by many experienced people at Kamituga and at Mwenga, that I would be foolish to travel into this region, especially alone, for there were frequent reports of bandits, rebels or gold diggers - none of whom would welcome a visitor. According to the Commissaire de Zone de Mwenga - Citoyen Bitinapaga Etumba, gorillas are still present, but as elsewhere, they are killed and eaten by the local people who accuse them of raiding their bean crops.

Thus the status of the gorillas, and the forests, of this region is still unknown, yet it needs urgent attention - for there are plans to open up a new road from the mission at Nundu ($29^{\circ}7' E, 3^{\circ}49' S$) westwards into the mountains to exploit the timber potential of the forest. The implications of such a development must be discussed fully, and soon, with the mission people and the Zaire authorities.

5. The lowlands of eastern Zaire (UTU - WALIKALI AND ANGUMU - PINGA)

This is by far the largest region of forest containing gorillas accounting for over two thirds of their total range of some 90,000 Km.²

- but again as noted by Schaller (1963) there are no natural barriers to their range, especially to the north. In the west the Lualaba river would undoubtedly prove a geographic barrier but gorillas are not present even in the forests on its eastern banks. Their range appears to be limited to the area bounded by Pepe Aluta in the north-west ($26^{\circ} 37' E$, $0^{\circ} 27' S$), Lulingu in the south-west ($27^{\circ} 33' E$, $2^{\circ} 20' S$), in the south they can be found just north of Luntukulu ($28^{\circ} 27' E$, $2^{\circ} 44' S$) - while over on the east their populations are continuous with those in Kahuzi - near Ninja ($28^{\circ} 34' E$, $2^{\circ} 33' S$) and up in the north-east with the populations near Lubero at Luhunga ($29^{\circ} 3' E$, $0^{\circ} 14' S$) (see map). Virtually nothing is known about the northern border of the gorillas range in this region - which is hardly surprising considering the virtually total cover of primary rain forest extending almost three hundred kilometres north of the equator. In fact it is probably the nature of the forest (i.e. primary) which is the boundary. The 1959 survey records gorillas as far north as the mining centre at Angumu ($27^{\circ} 42' E$, $0^{\circ} 7' S$) - they are still reported as being present there, but are not present near the mining centre only one hundred kilometres north-east near Etaetu ($28^{\circ} 23' E$, $0^{\circ} 23' N$). They may well migrate there in future years.

In October 1979 I flew to the Sominki mining centre of Mashabuto ($27^{\circ} 44' E$, $1^{\circ} 22' S$) in the Obaya district. There I found traces of gorillas, and heard them, close to the mining village, however, visual sightings proved impossible in the dense vegetation. According to the locals there are no gorillas south-east of Mashabuto - for they are only present on the northern side - where the shambas (cultivated fields) are located! Nor are there any gorillas inhabiting the surrounding primary forest, but chimps and baboons are present and these were seen and heard in October. Visits were made south towards Utu ($27^{\circ} 52' E$, $1^{\circ} 39' S$) and east to Walikale ($28^{\circ} 3' E$, $1^{\circ} 25' S$) and the continued presence of gorillas was confirmed in all of the areas they were inhabiting in the 1959 survey. They still appear to be concentrated near the pockets of secondary regenerating forest surrounding the mining centres and other concentrations of human habitations, even though some are killed (and eaten) by local inhabitants. In some cases this is in reprisal for their destruction of banana trees in order to eat the tender pith (something which I was able to confirm), but many of the native peoples readily admit to a liking for gorilla meat, so the killings may be even

more common. ↗

Recently the Maiko Park was created, covering 10,000 Km² in the north of this region, but it proved impossible to visit this remote area during this survey. The distribution of gorillas in this region seems to correlate very well with the distribution of mining centres! In addition the Kahuzi-Biega National Park was extended to cover a further 5,400 Km² in the south-east. Unfortunately, while these parks now give formal protection to quite large areas of mature equatorial forest they do not protect the main concentrations of eastern gorillas which lie further to the west.

Very little information has been given to the inhabitants of this region as to the precise limits of the new extension to the Kahuzi-Biega National Park. This has caused them to accuse some of the park authorities of trying to make them vacate certain areas, which they believe are not in the park, so that they can mine the gold which is present there. A map of the park should immediately be publicised (e.g. in the Kivu newspaper 'Jua')

Conclusions. 1. Distribution.

The entire range of eastern gorillas still probably covers over 90,000 Km² of forest in central Africa, most of which is in Zaire. Their distribution is still most uneven, for they are more concentrated in some areas than in others. The highest concentrations being in areas of mixed forest mosaics, particularly where secondary regenerating forest is present, rather than in uniform forest stands. Ecological studies of the Kahuzi gorillas have shown that such mosaics ensure the availability of good forage during all seasons. Such mosaics are partly the result of the great fluctuations in the past climates of this region (see for example Livingstone 1975) and, more recently, the various agricultural practices of man. Since the changes in the forest have been dynamic the distribution of gorillas must have changed through time also - with localised population increases and range extensions as habitats 'improved', and range contractions with population decreases - and even localised extinctions - as habitats 'deteriorated'.

As a response to these changes gorillas have evolved as very adaptable apes, coping with wide variations in temperature, rainfall, altitude and even biotopes, but they have evolved certain habitat 'preferences'.

However, in recent times the speed and direction of the changes has led them into a paradoxical relationship with man. For, his traditional 'slash and burn' rotational agricultural practices created many pockets of the mixed forest mosaics in which gorillas find most forage - but modern deforestation and intensive agriculture now threatens gorilla populations with extinction on a wider scale than ever before. The changes in agricultural practices are partly the result of various economic pressures - but in the main stem from a rapid population increase in the Kivu province. Any conservation management plans for eastern gorillas must therefore take these wider factors into consideration.

The dynamic nature of the distribution of eastern gorillas, coupled with past changes in forest composition and distribution, has resulted in the isolation of gorilla populations in some areas. Some may be regarded as 'ecologically isolated' i.e. inhabiting islands of favourable habitat surrounded by areas of less favourable habitat. Others however, are completely isolated - in that all forest connections have been removed, either by natural changes in the past or, in the main, by the recent spread of agriculture. These 'island populations' are by no means unusual (see MacArthur and Wilson 1967) nor are they in any great danger of extinction - if the population is large enough to be self sustaining and is not threatened in any way either directly or indirectly. Unfortunately, where eastern gorillas are concerned this is not the case - for the following reasons:-

1. The rapidly increasing human population in the Kivu province of Zaire (especially in the east) regards any remaining forest as an immediately usable resource - to provide food plants and game, timber for housing and fuel, and when cleared, as agricultural land. This attitude also applies to forest reserves and National Parks. Closer liason with agricultural authorities is clearly urgently needed.
2. Gorillas are regarded as 'pests' in many areas. They do cause some destruction, and occasional injuries to humans, when they forage in overgrown 'shambas' (cultivated fields), usually for herbs and vines - but they also do eat some crops, notably the pith of banana trees. This is often used as justification for killing them by local people, however, they are highly regarded for their meat and are killed and eaten over most of their range - even though this is against Zairean law.

- 3. In many areas gorillas have acquired some sort of ritual or magical association - either as a worthy opponent for hunters e.g. the pygmy Banniaga Barabangi in the Masienna region, or via parts of their bodies being attributed with certain properties e.g. women in the Utu region grind up gorilla finger bones - in the belief that they make good aphrodisiacs for their husbands.
- 4. Zaire is a vast country. Communications are poor and, in most cases - especially the roads - are deteriorating. This leaves many areas even more remote from regional capitals, and therefore from authority. The recent rapid increase in vehicle and fuel costs has further exacerbated an almost impossible problem of contact. Thus many of the areas still containing gorillas are extremely difficult to control because of their remoteness. Add to this the huge, and in some cases poorly defined, borders of the forest park areas and one begins to appreciate the immensity of the problem facing the Zaire Conservation authorities - who are already understaffed, underpaid and under-equipped for their task. This has, I feel, led in some areas to a feeling of 'hopelessness' on the part of some guards and conservators - and thereby created opportunities for bribery and corruption by poachers and gold diggers. Unless this is prevented all other efforts will be a waste of time, money and effort.

2. Total Population Size. of eastern gorillas.

Emlen and Schaller's wide ranging estimate of the total numbers of eastern gorillas as being between 5,000 and 15,000, highlights the difficulties in trying to arrive at accurate figures for such a forest living ape. So far only 3 isolated populations have been censused with any degree of accuracy - those in the Virunga volcanoes, Kahuzi-Biega and Kayonza forest. All show population densities of less than one/Km² - the highest figure being Muryak's estimate of 0.88/Km² for the secondary forest areas of Kahuzi-Biega National Park. Emlen and Schaller estimated that only some 20,000 Km² of the entire range of eastern gorillas is actually occupied, this would give us an estimate of some 17,000 - but hides a multitude of problems! For example when Murnyak's population estimate includes the rest of the Kahuzi forests i.e. primary (which is utilised some seasons) then it drops to 0.37/Km² - giving an overall eastern gorilla population of only 7,400. The Virunga gorillas are living in probably the 'best' habitat of all - in terms of food density and low seasonal changes in availability, thus their population density of approximately 0.6/km² may be regarded as the upper limit - this gives a total population figure of

12,000. But it is obvious that any figure is also highly influenced by the total range size occupied - and this is only a rather crude guesstimate (of 20,000 Km²) by Emlen and Schaller. It may be possible to arrive at a more accurate figure for range occupation by references to aerial photographs showing the various vegetation types. Having made qualitative comparisons of gorilla habitats in several regions, especially between the lowland regions (where the bulk of eastern gorillas are to be found) and the Kahuzi and Virunga regions, I would suggest an overall population density figure of no more than 0.25/km², which if 20,000 km² of range is actually occupied, gives a total population size of only 5,000.

However, I have already stressed, many times that it is not the overall population size of eastern gorillas which is the immediate threat to their continued survival. Nor, do I now believe, is their 'islandisation' - for this is part of a continuing natural process - which has been further enhanced by man's creation of localised pockets of more favourable habitat. Thus the problem lies in finding the best conservation management for these
many ^{and varied} island populations.

Taxonomy: These island populations have been subjected to various taxonomic reviews - notably Coolidge (1929), Haddow and Ross (1959), Vogel (1961) and Groves (1967 and 1970). That of Groves is now widely accepted today i.e. Gorilla is in the same genus as chimpanzee i.e. Pan, and has three sub-species, namely Pan gorilla gorilla - western lowland gorilla, Pan gorilla graueri - eastern lowland gorilla, and Pan gorilla beringei, - eastern highland (mountain) gorilla. But even this is based on the rather limited specimens available for analysis. Taxonomic wrangles can only detract from the real problems of gorilla conservation management and therefore should be avoided. I suggest that the term 'eastern gorillas' be used - with specific populations being referred to by their locality e.g. Virunga gorillas, Utu gorillas etc. - since this is more meaningful in relation to the localised conservation management problems of these island populations.

Recommendations cont.

RECOMMENDATIONS

A. As an immediate follow up to project 1731.

1. Establishment of a Headquarters for gorilla conservation management in Zaire with responsibility for planning, research and management in both scientific and educational fields. In the latter, provision of material for tourists as well as schools should be a priority. The IRS station at Lwiro seems the best place - with close contact with nearby INERA at Mulungu and the IZCN station at Lulimbi being essential.
2. Population estimates are urgently needed for the gorillas of the Mt. Tshiaberimu and Kabara areas. Census workers should be established here as soon as possible - for these are the most endangered of all the eastern gorilla populations which were visited. The censuses could be relatively low cost, two-man surveys, equipped with a cross-country motorcycle for transport and lasting 3 - 6 months. The benefits of a continued presence in these areas will be large in conservation terms so it is recommended that plans be made to finance permanent workers. Kabara has a good metal cabin, and another at Rukumi meadow about one hours walk away. Mt. Tshiaberimu however, will have to be a tented camp. If at all possible the census team should include a Zairian worker from IZCN.
3. The precise delineation of the remaining populations of eastern gorillas also needs urgent attention - since I was unable to visit the areas to the west and north of their range. However, I have now built up important contacts and feel that this could be done in a few months.
4. Immediate initiation of a conservation education programme in both the schools of the Kivu province and in the villages - stressing the importance of good land use management in soil and rain conservation. The precise role of the gorilla in local ecology should be explained and its status as a crop 'pest' contrasted with the benefits to Zaire of the animals as a tourist attraction. This approach is likely to be more meaningful than one stressing the moral issues of conservation of rare animals. This must be coupled with some recognition of the problems faced by these agricultural

peoples with crop destruction by primates - especially baboons. Thus some sort of pest control programme should be investigated. The village conservation education work should be started immediately - by means of a vehicle suitably equipped for audio-visual presentations - such as the Renault van being tried out in Rwanda. However, a Land-Rover may well be more suited to the Zaire roads.

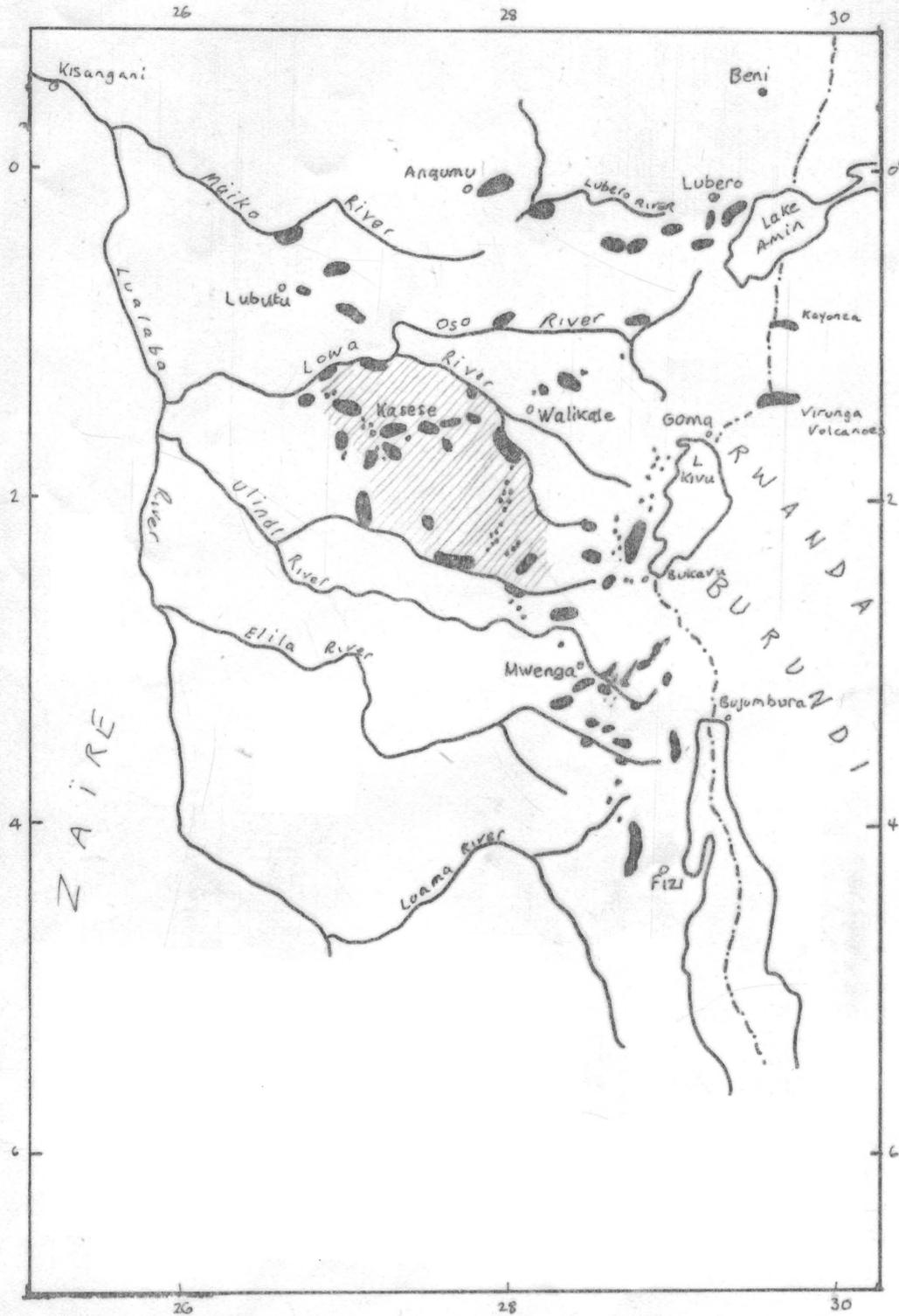
In the long term the conservation education programme for schools should be related to the Environmental Education recommendations of the IUCN Commission on Education.

B. Long term - Formulation of Zaire National Conservation Plan.

There is no future in continuing to apply traditional conservation measures i.e. more money, more guards, more guns - to the symptoms of increased rural development in the Kivu province of Zaire without proper consideration of the underlying causes. Thus it is urgently recommended that the Zaire Government be helped to develop a National Conservation Plan along the lines suggested by the IUCN, UNEP, WWF World Conservation Strategy. This will need liason with the various Zaire bodies responsible for Agriculture, Conservation, Tourism and Education in order to achieve the essential integrated approach. As a beginning the Zaire National Strategy could start with forest conservation management - and perhaps give special emphasis to the distribution of eastern gorillas - but it must become comprehensive for all Zaire as soon as possible.

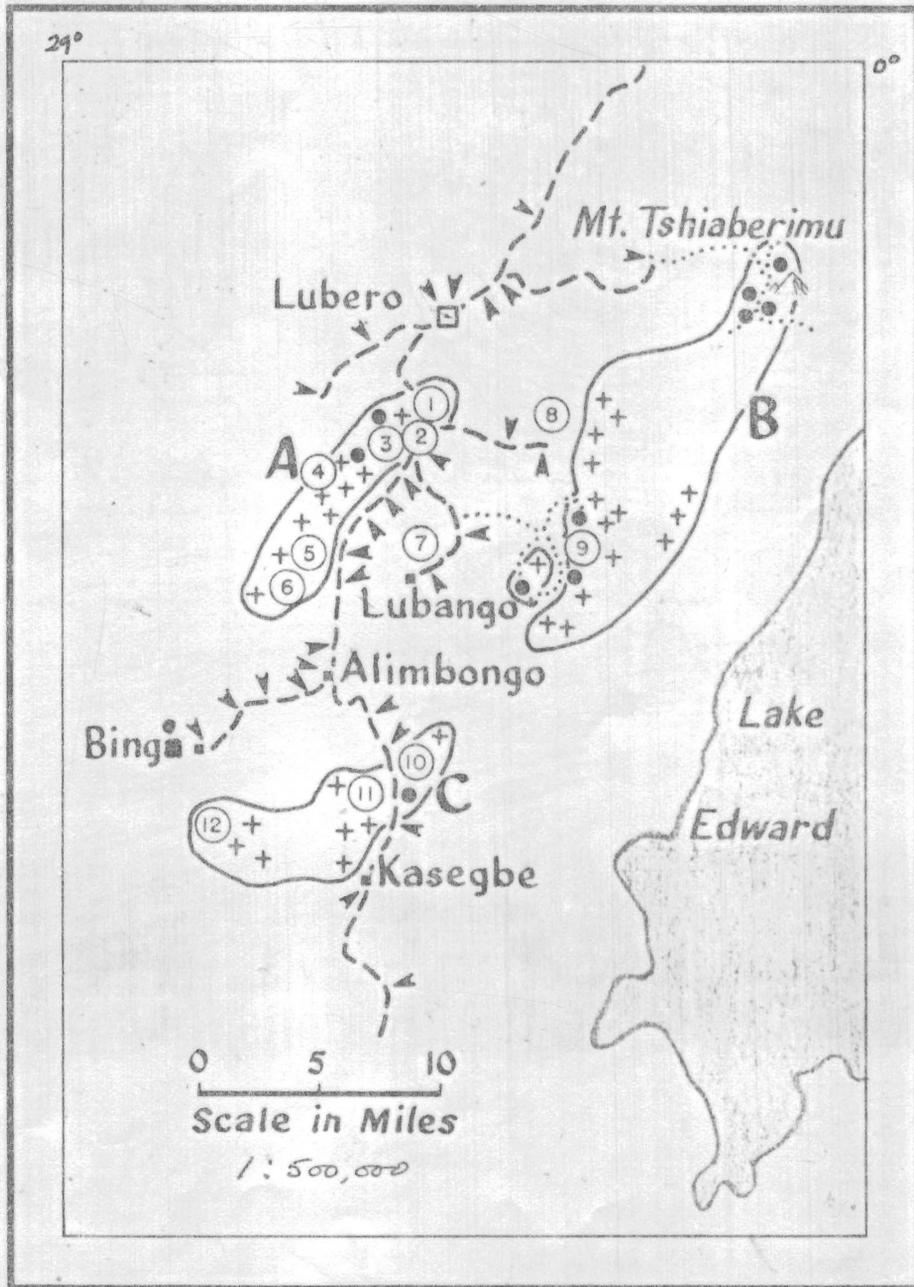
Where eastern gorillas in particular are concerned it is suggested that an overall strategy plan for their conservation be drawn up to save as much of the variety of the habitats in which gorillas live as possible - since these range from several unique mountain regions, such as the Virunga volcanoes and Itombwe mountains, to diverse lowland regions. Areas which are not already given formal protection will have to be chosen carefully therefore with a view to variety and to the future agricultural development in Kivu. In the main gorilla conservation management would best fit in with other development if the 'Cluster Biosphere' approach was followed (see IUCN Biosphere Reserve Report 1979). Thus one could identify certain 'core areas' e.g. in the Virunga volcanoes, Kahuzi, Itombwe, and, wherever possible include buffer zones e.g. of mixed mosaic forest, experimental biosphere reserves - perhaps allowing traditional 'slash and burn' agriculture or artificially creating secondary forest, or selective logging where areas of forest are sufficiently extensive and not earmarked for immediate agricultural

development. Biosphere reserve fringes could also be included. The long term possibility of forest, and animal rotation, should be investigated. This would enable conservationists to take advantage of the main feature of gorilla ecology i.e. its concentration into 'island populations'. Thus new 'islands' could be created in suitable areas and the founding population of gorillas would not have to be very large at all. This could be the best form of conservation management practise for all gorillas - since it mimics natural processes which have evolved over many thousand of years.



Map 1 Distribution of eastern gorillas as found in 1959 by Emlen and Schaller

● Gorilla population



Map 2. Gorilla Distribution 1959, (Emlen & Schaller)
I Lubero Region

KISANGANI

Bafwasende

Etsatu

Beni

Ruwangories

Lubutu



Lubero

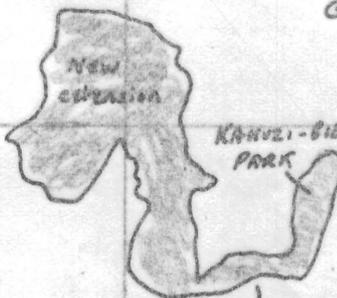


VIRUNGA NATIONAL PARK

Obapes

Walikale

GOMA



KIGALI

'corridor'

Bukavu

Kanitza Mwenga

BUJUMBURA

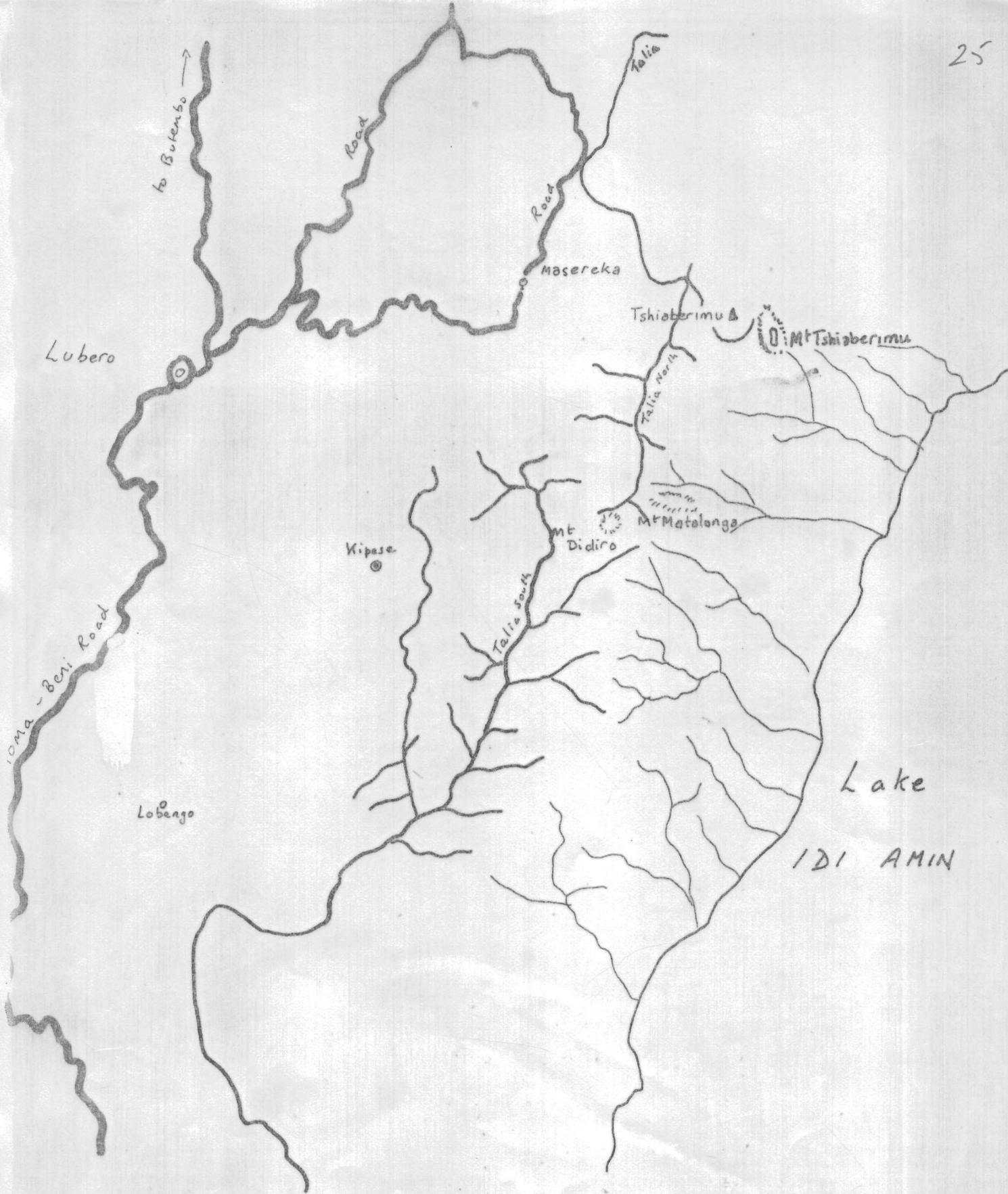
Kama

Fizi

Lake Tanganyika

LUALABA RIVER

SCALE 1: 3,000,000.



Map. 4.

Sketch map of Mt. Tshiaberimu watershed showing positions of Talia North and Talia South

(taken from Territoire Map 1:200,000).