WWF Project ZR0009.02

GARAMBA NATIONAL PARK MONITORING AND RESEARCH

Interim report , January - June 1994

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1. INTRODUCTION

1.1. General

The increase in poaching in the north of the park has continued, with larger gangs. use of a hand grenade and shooting at the aircraft. It is still largely for meat. probably to supply the profitable demand from the refugee camps. but elephants (*Loxodonta africana*) are taken for ivory as well. We have no evidence yet of it affecting the rhino population. although some incidences of poaching have been found at the same distance north of the Garamba river as rhinos have been observed recently. Aerial surveillance of the rhinos was increased. and the Rhino Guards were focused frequently on the vulnerable zone north of th Garamba River.

1.2.Objectives

The overall objectives for the project remain the same. Specific objectives for this year were influenced by the increasing poaching pressure on the ecosystem and the need to detect any encroachment into the rhino area, an accumulation of data needing analysis and the requirements for information at a more policy making and general level. They did not, therefore involve much ground based field work.

Specific objectives were:

1. Continue rhino monitoring, mainly from the air for broad coverage, with more focus on searching dispersal areas to try to find individuals not seen recently.
2. Continue general ecosystem monitoring. including burn plots and vegetation, laregly measured by IZCN researchers, and assisting with the health survey of buffalo *(Syncerus caffer brachyceros)* and kob (*Kobus kob)* by Dr W.B.Karesh.
3. Develop the anti-poaching patrol monitoring system with training.
4. Analyse data and put together material for:
   - WWF/WCS cost-benefit study of rhino conservation
   - Meetings on the management of northern white rhinos
   - African Rhino and African Elephant Specialist Group Meetings
   - Publications and management plan
5. Through the work of Research Assistants with IZCN counterparts to:

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- Develop the application of the GIS system and the habitat map of park and reserves
- Survey the elephant use of the reserves and elephant-vegetation interactions.

2. ACTIVITIES

2.1 Rhino Monitoring

Aerial recce series were carried out in January, March, April, May and June, with single recce flights at other times. In May the recce series was of high intensity over the whole southern section of the park, using two aircraft simultaneously in different blocks, with a total of 9 observers. This intensive rhino count was carried out instead of a general ecosystem aerial count this year.

26 of the known individuals were seen on the intensive survey. Two others not seen had been observed two weeks previously and were therefore almost certain to be present. Subsequently, in June, another sub-adult female was found, believed to be a missing one. The current population is therefore 29 confirmed individuals and 3 more of which there have been no confirmed observations for two years. The population structure with dates of last sightings is given in Fig. 1. It includes guesstimates of ages of adults for use in population modelling.

A calf was born to F4. Boletina in January, her sixth since 1983, with an inter-calf interval of less than 2 years. Unfortunately it was missing in March and on all subsequent sightings. Predation is the most likely cause. Hyenas are common and lions relatively so. She is a very experienced mother, but a few years ago she lost the end of her tail, probably also in defense of a young calf. Since losing the calf she has always been found in the cover of long grass, exhibiting more nervousness than normal for her. Figure 2 summarises rhino births and deaths since the start of the monitoring.

Three weeks was spent at the Bac Garamba camp, alternating with Dr Mbayma on rhino observations and the buffalo and kob health survey. There was at least 50 % long grass in the rhino area this year however, and without radio telemetry the rhinos proved very difficult to find on the ground. There was generally a greater concentration towards the east in association with the early burned areas in the first trimester, followed by a movement of several of those animals far to the west in the second trimester, possibly in avoidance of labour gang that was making river crossings in the east then. The male M4, Bac was ousted from his territory in May by a young male who has been in the vicinity for two years and who is identified as either 1a Moke or 4a Bolete moke. M4 crossed the Garamba river towards Mt Bagunda.

2.2. Northern White Rhino Management

There are 29, possibly 32 northern white rhinos in the wild in Garamba N.P., Zaïre, with a possible, but unconfirmed few more in Southern Sudan. There are 9 in captivity in two groups. While those in Garamba have had a proven successful rate of increase from breeding over the last 10 years, the captive group has decreased from 12 to 9 over the same period. In 1992 a suggestion was made by Dr Tom Foose that some of the captive animals be moved to a sanctuary situation to establish a second semi-wild breeding group in conjunction with one or two individuals from Garamba. The

captive community could not agree to release any rhinos at that stage. but in view of the potential for instability in Zaïre and a recent increase in poaching at Garamba, the idea of a second wild or semi-wild population persisted as a means of avoiding the "all-the-eggs-in-one-basket" syndrome of Garamba.

A meeting was therefore held at IUCN headquarters in March under the kind auspices of IUCN/SSC and WWF. Representing Zaïre. Garamba, SSC, WWF. IRF and expertise in relevant fields, the following were present:

Mankoto ma Mbaelele (the President Délegué Général of IZCN) and three delegates from IZCN and the Ministry : Sivi (Director Admin.). Mbanga (Director, Protocol) and Nzina Mbenga, (Director. Finance), Muhindo Mesi (Conservateur Principal.Garamba N.P.), Kes Hillman Smith (Garamba). Martin Brooks (Chairman ARSG), Simon Stuart (SSC), John Newby (WWF), Tom McShane(WWF), Tom Foose(IRF and Captive) and Pete Morkel(Capture vet.).

Various options for the rhinos of Garamba and the management of northern white rhinos as a whole were considered and some rejected. The following were agreed upon as feasible options to be explored further:

1. Garamba, conservation in situ - no relocation of any rhinos
2. Garamba, conservation in situ - some relocation
   a) in Africa
   b) elsewhere
3. Integrated-coordinated programme with
   a) Garamba, conservation in situ
   plus b) Population inside Africa (maybe a few captive rhinos)
   plus c) Population outside Africa (consisting mostly of existing captive animals supplemented by a few from Garamba)
4. Contingency plans for Garamba

I was requested to solicit further information from various sources to put together as a briefing document. outlining the practical possibilities and logistical constraints, the advantages and disadvantages of the various options, to guide decision making by the IZCN and other interested parties.

In a follow up working group session at the IUCN African Rhino Group meeting in June it was suggested that the options be considered in the context of metapopulation management of the entire remaining northern white rhino population, world wide. and that the strategy be developed with all interested parties present at a workshop meeting. ideally in Garamba. The document enclosed in annex was produced.

2.3. Cost benefit study

Three weeks were spent gathering and writing up data to contribute to a cost benefit analysis study of rhino conservation that is being funded jointly by WWF and WCS (Wildlife Conservation Society). Although this was an exercise separate from direct project work, the document produced is proving very useful as a reference work on the project.

The information from this and many other sources is being analysed by Dr Nigel Leader-Williams.

2.4. Health survey

Dr Mbayma and I alternated taking part in the health survey of buffalo and kob carried out in March by Dr Billy Karesh of WCS. We took the opportunity of the immobilisation of 10 animals of each species to take body measurements and tooth wear stages. These results are summarised in Fig. 3. The full results of the health survey will be presented after analysis.

2.5. Patrol monitoring

The system of standardised reporting by patrols of the poaching and anti-poaching activities continued successfully, but a new simplified system of data collection on animal sightings has been instigated for the whole park. Patrol secretaries are being trained or training revised in small groups between patrols.

Emmanuel de Merode has been working on developing his computer based system in Fox-Pro for data entry and analysis.

2.6. GMS

Despite the painstaking re-introduction of all the experimental vegetation data from the burn blocks into GMS (Garamba Monitoring System programme) at the end of 1993, by Barbara Buls and Monungu Likango, corruptions in the data files have again been discovered. It seems that this is due to sudden cuts in the power system to the computer. The computers run on 12v battery power charged by solar panels and converted to 110 or 240 v. through inverters and transformers. When the power gets low these cut out. The batteries have been replaced, but although in theory two solar panels and two batteries should be adequate, they are not proving to be. Data cannot be re-entered in this sensitive programme until the problem has been resolved.

2.7. Vegetation Map

Emmanuel de Merode, with Monungu Likango has been working on the geo-corrections and classifications necessary to interpret vegetation zones from the satellite imagery. Amube Ndey has been working on the quantified description of species composition of the zones to accompany it. The map will be printed out at GRID, UNEP.

2.8. Elephant study

Aaron Nicholas and Amube Ndey, with two guard technicians have carried out a series of 42 x 5km line transects in the three Domaines de Chasse which surround the park. The aims of these were principally to assess the distribution and intensity of elephant use of the Domaines and their effect on the vegetation in wet and dry seasons, and to establish baseline monitoring that could be continued in the future. They have had the secondary advantage of data collection on the distribution and relative densities of all other species using the reserves and of local poaching. The overall goal is to provide information to guide the planning of zoned management of the domaines de chasse for the management plan for the park and surrounding protected areas. This is reported

more fully in annex.

2.9. African Rhino and African Elephant Specialist Group Meetings

Dr Mbayma attended the rhino meeting and I attended both these meetings in Kenya in May. The text of the country status report for rhinos is included in annex, as is the report of the working group on the management of northern white rhinos.

One of the main themes of the Elephant Group meeting was human-elephant conflict and as that is one of our current increasing problems a draft discussion document on the situation at Garamba was put together, and made available for working groups. It comprised the data on elephant use of the reserves collected by Nicholas, together with long term monitoring data from the project, which demonstrates the causal effects on this movement and with the case study on crop damage by Buls. Much of this was presented and analysed in GIS format by de Merode, who then went on to develop a model to predict potential areas of human-elephant conflict based on the distribution of elephant damage to natural vegetation and the distribution of human settlement. A summary and selected figures are included in annex. The data are being written up as two papers.

2.10. Personnel

Amube Ndey has been employed by the project as a researcher, at the same salary level as the IZCN researcher, with bonuses, for the last two years. It has now been agreed by IZCN that he would be employed by them on an initial 6 month trial period. A report of his work is enclosed.

For the first half of 1994 the project has been providing a basic stipend to two research assistants: Emmanuel de Merode and Aaron Nicholas. Their briefs were to carry out specific tasks and to train IZCN personnel in techniques, and to work with them on data collection and analysis. Summary reports are enclosed in annex.

2.11. Equipment

For several months the old laptop computer sold to the project by José Kalpers has been under repair in Nairobi. It now functions but the floppy drive does not. The desk top computer used for data analysis has had a hard disk crash, and we are having to use one borrowed from de Merode. In view of this and of the power problem refered to earlier we urgently need to obtain a robust lap-top computer with rechargeable batteries.

Field work has also been considerably slowed up by problems with the two land-rovers available for researchers. The more reliable one used on the transects in the domaines had a puncture on average every 9 km. We hope this problem will be largely resolved when the new vehicles arrive and when one researcher is able to bring his own private vehicle.

DRAFT

AN EXAMINATION OF HUMAN-ELEPHANT CONFLICT AT GARAMBA NATIONAL PARK AND SURROUNDING RESERVES

SUMMARY

The effect of the human-elephant conflict of poaching on the distribution of elephants is examined. The primary effect is a concentration of elephants into the park at least in day-time and secondarily a compression into the south of the park at a current density of 3.6 elephants/km^2, as the focus of poaching is in the north. The high elephant density combined with hot fires has led to a low density of woody vegetation in the park contrasted with a high density in the surrounding reserves. This contrast in resource availability is a main causal factor in elephant movements into the reserves at night. The distribution of these movement is plotted by GIS interpolation and found to be significantly correlated with proximity to the elephant core area and distance from human settlement. The elephant distribution in the reserves as mapped from their effect on natural vegetation is overlaid on the human distribution in a model to predict areas of potential human elephant conflict from crop damage. The type and extent of this damage is examined in a case study. The information is put together to provide guidelines for planning integrated management of the park and reserves.

GARAMBA NATIONAL PARK PROJECT, CONSERVATION OF THE NORTHERN WHITE RHINOCEROS, DEMOCRATIC REPUBLIC OF THE CONGO
World Wide Fund for Nature (WWF) Project No: ZR 0009
with support from Frankfurt Zoological Society (FZS), International Rhino Foundation (IRF), US Fish & Wildlife Service (USFWS), Wildlife Conservation Society (WCS) and Wildlife Conservation Fund (WCF)

Project start date: March 1984 **Project end date:**

Reporting period: July 1997 to June 1998

Grantee: Garamba National Park Project, D.R.Congo

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Report by: Fraser Smith & Dr Kes Hillman Smith

Executive Summary

The current goal of the project is the ***Conservation of the northern white rhinos in Garamba National Park.*** Achieving this goal means addressing and supporting the full range of activities needed to implement and logistically support the law enforcement and management of the National Park and surrounding Reserves. within a prioritised framework. Under normal circumstances, the work is classified into seven outputs:

1. ▸ Strengthening of political and institutional support.
2. ▸ Developing the personnel capacity
3. ▸ Implementation of strategic law enforcement
4. ▸ Logistical support to park operations
5. ▸ Continuation and development of rhino monitoring and research
6. ▸ Maintenance and development of law enforcement monitoring
7. ▸ Initiation of a community outreach programme

The reporting period, July 1997 to June 1998, has largely been focused on dealing with the post war transition period in the Democratic Republic of the Congo. This involved raising the support and carrying out the ground work to begin the process of rehabilitation and re-development in order to address the urgent and serious poaching problem that existed at the start of the period.

To this end, action and progress was as follows:

1. ▸ Strengthening of political and institutional support.

This was extremely successful. starting with the Round Table meeting on conservation in the DRC hosted by the Ministry . A guard training programme in Garamba and placement of a Technical Advisor in Kinshasa was agreed. The Embassies of USA, South Africa. UK, Holland and Switzerland were particularly supportive of the conservation effort The President of the Republic pledged his support to Garamba and WWF in a very successful audience in February, and Garamba representatives participated in an ICCN strategic planning workshop in March. A strategic planning workshop for Garamba was planned.

2. ▸ Developing the personnel capacity

Support to the personnel was maintained by the project as far as possible during the difficult time of the reporting period. ICCN evaluated and carried out disciplinary action on personnel who had been involved in looting and other disloyal activities. The bonus system was revised and developed and all staff back paid and paid until the end of June on a results based system.

3. ▸ Implementation of strategic law enforcement

The patrolling system was re-developed to the full strength possible within the limitations, during the period, and recommendations for improvement have been made. The poaching was severe. largely for meat and mainly on elephants, buffalos and hippos. but at least two. probably more rhinos have been poached and the poachers were in the Rhino Sector at the start of the period. The training and support programme proposed to help develop and reinforce the capacity of the guards to counteract the poaching was agreed upon, but could not be supported by WWF or other NGO funds. if it involved in-field para-military training by non ICCN or government personnel. However, for external reasons, the poaching eased. with indices dropping by a half on average after January 1998.

The guards have been awarded the Fred Packer Award from the IUCN Commission of National Parks and Protected Areas for their long standing bravery and action. but there has not yet been an opportunity for its presentation.

4. ▸ Logistical support to park operations

The back ground work and obtaining of import documents and agreements took until March 1998, but in March 3.5 tonnes of guard equipment was flown in by Antanov and issued to the guards. In April a year's fuel supply was flown in by the same Antanov. The radio relay is still to be installed and preliminary work has gone into the development of an all season means of crossing the Garamba river for maintenance of law enforcement and protection of the relay north of the river at all times, even in the absence of the aircraft.

5. ▸ Continuation and development of rhino monitoring and research

Rhino monitoring by ground patrols and occasional aerial observation continued to provide information. In April a comprehensive and intensive aerial rhino survey was carried out and a minimum of 24 rhinos confirmed, with four calves having been born since the Liberation. Another survey in May saw 22 individuals. but added another to the 24 previously seen in April, bringing the confirmed minimum to 25, with the rhinos missing in May having been seen again in June. This result is far better than was feared possible and reflects well on the motivation of the guards.

6. ▸ Maintenance and development of law enforcement monitoring

Law enforcement monitoring through guards reports continued throughout and has enabled a thorough objective measure and demonstration of the level of illegal activity and law enforcement. This has been valuable not only for feed-back in the direction of the law enforcement effort, but in

demonstrating the situation and raising support and in calculating the results based bonuses. Some minor modifications have been made and intens.ve training programmes are planned for both data collection and analysis levels.

A systematic sample count of the whole park indicated drops in numbers of elephants of the order of a half, buffalos to a third and hippos to a quarter of the 1995 count results. No significant reductions of other species are indicated, but the northern two thirds of the park are almost devoid of large mammals.

7. ▸ Initiation of a community outreach programme

A pilot project for the proposed community outreach programme was planned, so that information could be available for development of a full proposal at the workshop. Unfortunately, insufficient funds were available within the time frame, but this activity is a priority for implementation, not only to support the conservation efforts of the park and ecosystem, but in the context of National priorities..

WWF Project ZR0009.02

GARAMBA NATIONAL PARK, MONITORING AND RESEARCH

Annual Report 1993

Dr Kes Smith
Technical Advisor, Ecology

1.INTRODUCTION

1.1 Objectives

The overall objectives of the monitoring and research project are to contribute to maintaining and improving the conservation of the ecosystem. Means of achieving these objectives are : the collection of information on priority issues, the provision of feed-back for planning, implementation, monitoring and development of conservation and management activities, and through generating an active field presence.

Activities are principally:

1. Continued monitoring and reporting on the rhino population.
2. Basic monitoring of the whole ecosystem and of poaching and anti-poaching activities.
3. Carrying out and promoting research on priority aspects of the ecosystem
4. Training and the establishment of standardised systems for the long term continuation of the monitoring.
5. Contribution to planning and feed-back on the results of activities.

Specific objectives for 1993 were:

1. To continue monitoring the rhinos.
2. To facilitate the monitoring and research by radio-telemetry involving the immobilisation and data collection on six rhinos.
3. To carry out biopsy darting of the rhinos to obtain material for genetic analysis to assess the potential for in-breeding problems, and at the same time to up-date the identifications.
4. To carry out specific studies on the rhinos of:
   a) feeding ecology
   b) communication
   c) inter-individual and age group relations relative to the known individuals and the sub-adult identifications verified through genetic analysis.
5. To carry out a general aerial census of the whole ecosystem.
6. To continue burns and vegetation monitoring in the fire experimental blocks and exclosure plots.
7. To carry out vegetation measurements related to rhino and elephant studies and habitat mapping.
8. To prepare a Rhino Conservation Action Plan for Zaïre and to develop project proposals for

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the Rhinoceros Range States Meeting at UNEP in June.
9. To carry out data analysis and writing.
10. To contribute to establishing a management plan for the park.
11. To establish and train researchers in the use of a Geographic Information System (GIS) for the compilation, mapping and analysis of monitoring data, and through this to develop a vegetation map of the whole ecosystem.
12. To contribute to the long term conservation of the ecosystem, through proposals to seek support and through efforts to support and motivate the IZCN staff through the difficult times in Zaïre.

1.2. Personnel

The research group currently comprises:

1 Technical Advisor (WWF)
1 Conservateur Researcher (IZCN)
2 Researchers (IZCN and GNP Project)
5 Guard Technicians (IZCN/GNP Project)

During 1993 there were also the following Consultants and Assistants involved in the work:

Dr Pete Morkel (International Wildlife Veterinary Services IWVS) -
Rhino immobilisations
Dr Billy Karesh (International Field Veterinary Unit of New York Zoological Society NYZS) - Biopsy darting and immobilisations
Dr Martin Nicoll (Conservation Advisor WWF) - Project development
Emmanuel de Merode - Establishment of Global Information System (GIS) and computer training in DOS and IDRISI, Aerial census
John Watkin - Data analysis, computer training in Word perfect and Quattro. Aerial census. Conservation education workshops.
Barbara Buls - Volunteer research assistant, data collection and analysis for vegetation monitoring, investigation of crop damage by wildlife at Nagero.

2. PROJECT ACTIVITIES

2.1. Rhino Monitoring

The rhino monitoring continued with a reconnaissance series in February, the recce flights related to the immobilisations, biopsy darting and follow up, and further general recce series in August and October. In total 102.7 hours were flown for rhinos during 1993. Data are being analyzed using Dbase III and Ranges.

There have been three rhino births, in February, June and July, and two deaths. Both deaths were from natural causes. The first was the male infant born in February, who became mired in mud shortly after

birth. The second was a three and a half year old male 5cM "Molende", whose remains were found about two months after death. Both horns were present and there was no sign of poaching, but cause of death has not been ascertained. During the first half of 1993 three young elephants were also found dead from unknown causes.

The second birth was to the female F1 *Mama Moke* in June. The third was to the female F3 *Kunalina*. F1's calf is male. The sex of the other calf has not yet been ascertained.

At the time of the birth *Kunalina* moved over 30 km from the Nanganzi region to the Nauloko. At the same time her sub-adult daughter 3b *Juillet*, in association with her age mate 4b *Mai* also moved to this region. The related rhinos were never seen in the same group during this period, but remained in the same region. In November they all moved back to the Nanganzi region, where they were found again in distant association, also with F3's two sons, *Solo* and *Mamu*. It is examples like this that motivate the investigation of communication.

As far as we know, therefore, at the end of 1993 there were 32 rhinos. A list is included of the rhino population up-dated to February 1994, following the birth of another calf in January. However the young female 3aF *Kuni* was not seen during 1993. Rhinos have been reported far west and we have not yet been able to identify them. She could have moved there. But another female, F6 *Pacque* appears to have gained a male calf aged about two years old, yet was seen a year ago several times with no young calf. It is possible that something may have happened to Kuni, with the subsequent adoption of *Kuni's* calf 3aaM *Bonne Annee* by *Pacque*.

Tables and graphs show the increase of the population since the start of the project and the changing age and sex ratios. Two sub-adult males are now over 10 years old and join the adult male cohort, though they are probably not breeding yet. This brings the total of adult males to 9. The two sub-adult females Mai and Juillet should be pregnant, and it is to be hoped that they will soon raise the ranks of breeding females.

2.2. Radio telemetry

Between the 12th and the 26th March six rhinos were immobilised for the attachment of radio collars. At the same time blood and skin samples were taken for genetic and pathological analysis, the animals were measured, ear notched for identification and tooth impressions made using dental alginate. The details of the procedures are reported in the interim report 1993. The samples taken and their placements for analyses were outlined in Table 1 of the interim report.

The radio transmitters are MOD-505 made by Telonics on collars and kindly purchased by International Wildlife Veterinary Services (IWVS) in 1992. The same method of modification was used as in 1992. The wide, stiff top of the collar was removed and replaced by elastic encased in a protective sleeve. This year we used two layers of upholstery elastic for greater strength and the sleeve was backpack material kindly donated by Backpacker Ltd of South Africa, who have a supportive link with WWF.

As a result the collars have stayed on the rhinos on average 5.6 months as opposed to 2 months achieved in 1992, but problems have arisen in two instances. On the dominant adult male Notch and the sub-adult female Minzoto, the collars slipped half off over one ear but failed to come completely

off. This meant that one ear was being bent forwards and the collars were rubbing. In the case of the male it was the result of a fight with another bull, almost certainly M3 Kondo Akatani, since he was found outside his normal range with horn wounds on his head. We cannot be sure how the female's collar moved, but it was associated with leaving her family group and previous range. The male's collar has since come completely off and he has re-established his territorial claim and been seen in good health courting females. The young female was monitored as closely as possible while she still carried the collar, with a group of guards continually in the region, since she was north of the Garamba river. Before she lost her collar she moved back to her original range south of the river. She lost the collar probably in December, by breaking the elastic against a fallen tree.

The following Table summarises the length of time that the collars lasted:

Chan	Indiv.	Class	On	Off	Mths on	Notes
1	M9	Dom.ad.male	14/3	<16/5	2	Half.split.pulled off
2	6bM	S2 male	15/3	<9/9	5.5	Broke,nr tree & wallow
3	4dF	S1 fem.	26/3	/12	9	Half,then broke.nr.tree
4	3bF	S2 fem.	12/3	16/10	7	Slipped off in wallow
5	3cM	S1 male	22/3	<13/7	3.5	Broke,nr tree & wallow
55	M2	Per.ad male	16/3	<9/10	6.5	Pulled off

2.3 Health analyses

Blood samples from the six rhinos immobilised were analyzed by Professor J. van Heerden, Medical University of South Africa, with the following results:

Blood chemistry (average of 6 rhinos):

Na	133.3 mmol/l
K	4,3 mmol/l
Cl	96 mmol/l
TP	76 g/l
Alb	31 g/l
Ca	2,5 mmol/l
Cholesterol	1,65 mmol/l
ALP	60,8 u/l
GGT	11.8 U/l
LDH	702 U/l
AST	53 U/l
ALT	10 U/l
Ck	148 U/l

Hormonal assay:

INDIVIDUAL	PROGESTERONE nmol/l	17B OESTRADIOL pmol/l	
4dF	<0.3	167.7	Not pregnant
M2	<0,3	<70	Not pregnant
3cM	<0,3	<70	Not pregnant
6bM	<0.3	<70	Not pregnant
M9	<0,3	<70	Not pregnant
3bF	4,3	501.1	Not pregnant

The female 4dF, at 3 years old is not sexually mature, but the female 3bF at 7y9m is sexually mature though not yet pregnant. She and her compatriot 4b have spent a large part of 1993 in consort with an adult male, mainly M5, but also M3 and M9. We hope that by now both are pregnant.

Sixteen samples of faecal matter were analyzed by Dr W.B.Karesh, using the methods of flotation in Na Nitrate, direct microscopic examination and sedimentation. Only one, from a sub-adult contained no significant organisms. Of the rest, 10 samples (63% of the total) contained Strongyles, and 5 (31%), either as well or instead, contained Strongloides spp. Nematode larvae were found in 5 (31%) of the samples, coccidia in 3 (19%), and Ascarids and Ciliates in one each.

2.4. Biopsy Darting and genetic analysis

Samples for genetic analysis were taken from all the immobilised rhinos. These included ear nicks and blood. In addition three more rhinos were biopsy darted, bringing the total to 30 samples. Of these at least five were double samples of the same animals by different techniques, so there are 25 different samples. In addition samples were taken from the two rhinos that died, though one was only of traces of dried tissue.

The Department of Molecular Genetics at the National Museums of Kenya has a sample from each individual, and has succeeded in isolating DNA from some samples. They are continuing to develop suitable primers for micro-satellite techniques on rhinos using other rhino material and will be carrying out the full analysis of the Garamba material when the methods are satisfactory. Professor Eric Harley, Head of the Dept. of Chemical Pathology, Capetown University, reports (pers comm.) that they have found a considerably greater difference between the material from northern and southern white rhinos than has been found from different sub-species of black rhinos.

2.5. Specific studies

Rhino feeding ecology Data was collected on the rhino feeding ecology by Dr Mbayma and guards. The current focus is on the differential use of termitaria and non-termitaria grassland. This is being backed up by sampling of availability of species and condition and different times of year in the two habitats. The sampling is carried out four times a year by Ir Amube Ndey.

Communication More indirect information on communication was collected but effective recording of communication by sound still appears to require the development of equipment to attach to the rhinos. This is under development by Steven Gulick.

Inter-individual relations The radio-telemetry has contributed considerably to our insights into inter-individual relations and home ranges and into guiding anti-poaching patrols.

Elephant food selection Amube Ndey and John Watkin began a series of observations of elephant food selection in different habitats, using the domestic elephants. One surprising result was the selection for the creeping dicotyledons and annual grasses typical of termitaria. The base-line sampling of plant availability in the two habitats carried out primarily for the rhinos is therefore also contributing to analysis and interpretation of these data.

Crop damage Following the Workshop for Management Planning, at which problems of wildlife/human conflict were raised and following reports of elephant problems in the Domaine de Chasse that were continually made to investigators in the Domaine, Barbara Buis made a short study of the extent and type of crop damage around Nagero, the Park head-quarters. Since this involved the problems of the guards themselves, it was directly relevant to the need to motivate and improve the standard of living of the guards. The results will contribute to management planning.

This study involved 48 interviews, concerning almost twice that number of fields. 84% of the interviewees reported wildlife damage, and in some cases they had lost 100% of their crops. Over the past two or three years 28 (47%) of the guards interviewed had moved their fields or created extra fields further from the river Dungu to reduce the risk from animals crossing the river from the park. In some cases they had moved their entire household away from the IZCN accommodation to facilitate crop protection. In all cases it was reported that they had to spend every night at their fields, during the pre-harvest few months, protecting them from animal invasions, by fires, drumming and chasing. This is conducive neither to efficient work during the day, nor to motivation in wildlife protection, when salaries are so low that agriculture is vital to subsistence.

Over the past two years the main crop had changed from manioc to rice and millet, not from food preference, but because the manioc is favoured by elephants, and with a long growing season, requires a longer investment in protection. Elephants (*Loxodonta africana*) and hippos

(*Hippopotamus amphibius*) were the main species causing damage, followed by Waterbuck (*Kobus ellipsiprymnus*) and six other smaller mammal species, as well as birds. Hippo damage is positively correlated with proximity to the river.

The extent of the damage and the investment required for crop protection makes it important that this question is considered seriously in the formulation of the management plan, and that the project for investigation and integration of the domaine de chasse becomes operational as soon as possible. In the current economic and political instability of Zaïre, the support and motivation of people, particularly those charged with wildlife protection is vital to avoid deteriorating conservation standards, particularly in times of crisis.

2.6. Systematic aerial sample count

A systematic aerial sample count of all large mammal species and habitat assessment over the entire park and domaines de chasse was carried out in May.

The count is reported in full in annexe (Smith et al 1993), but a summary of results is tabled here. A simple, but comprehensive method of analysing and presenting this type of count data was developed with Watkin and de Merode, and Garamba will now standardise on this system. A guide on how to analyze the counts is being prepared to facilitate long term continuation of the method.

2.6. GIS System

From April through October, Emmanuel de Merode was at Garamba establishing a GIS system for organising and correlating monitoring data from aerial counts, all species ground observations, rhino observations, human land-use patterns and vegetation. He has been training the research group in use of the system and writing a very basic manual in French. The programme IDRISI has been adopted for basic use and training, but the whole ecosystem has been mapped using ArcInfo. This project and its continuation and development, involving vegetation mapping from satellite imagery and an analysis of historic trends in vegetation and the causal factors, is being carried out in collaboration with the Geographic Resource Information Database (GRID) at UNEP. We are very grateful for this co-operation.

Ground truthing De Merode and Monungu Likango carried out a series of walked transects in sample sub-units in the Domaine de Chasse, to collect precise data on human distribution and hut occupancy to correlate with the aerial census data.

2.8 Patrol monitoring

The figure and table of dead elephants and ivory recovered are based on the ivory in the Grand Magasin store at Nagero. This ivory is largely recovered by anti-poaching or research patrols from elephants found dead and from poachers, both in the park and in the domaines. The results indicate the trend since 1991, when arms and ammunition began coming across the border in large

numbers from Sudan. Part of the increase is due to increased surveillance. as indicated by the fact that old ivory has also risen, though less steeply. Mainly. however it indicates the increase in poaching of elephants for ivory. Equipment and personnel are badly needed to help combat this problem. The amount of weapons recovered from the domaines, the reports of elephant/human conflicts. the national economic situation and general attitudes also point to the urgent need to begin implementing projects designed to integrate the people in the domaines into a more positive link to conservation.

During October de Merode began developing a programme for summarising and reporting the basic monitoring of patrols from guards reports. This programme, called Guards Data, is similar to the Garamba Monitoring System developed for the vegetation by Paul Krystall.

2.9 Vegetation Monitoring

Monitoring of the fire blocks continued. largely carried out by Monungu Likango and AtofoBako Vukoyo. Barbara Buls participated in the data collection and entry this time with a view to taking data through to the next stage. However it was found that many of the files in the Garamba Monitoring System (GMS) programme were corrupted and much of the data had been lost. Working in conjunction with the relevant technicians. she and Monungu re-entered all the old data. The dates of measurements and fires within each block are summarised.

2.10 Meteorology

The climatic measurements for 1993 are presented in tabular and graphic form. The rainfall total was 1178.5mm, lower than the 10 year mean from 1980-1991 of 1342mm. There was a marked drop in rainfall during July, August and September, normally the midst of the wet season.

2.11.Birdlist

The birdlist was revised and up-dated thanks to help from Alec Forbes-Watson. who visited the park in June with Alan Root. A copy is available in Annex if required.

2.12. Rhino Conservation Action Plan

A Rhino Conservation Action Plan for Zaïre. which centres on Garamba as the only park with rhinos was developed by the Project Management Unit and others. This included
the project proposals for supplementary support to anti-poaching and to monitoring and research. and for integration of the domaines de chasse in the conservation and development of the ecosystem. These proposals had been rated *priority* and *important* by the IUCN African Rhino Specialist Group. The proposals were developed by the P.M.U., with the help of Dr Martin Nicoll.

This document was presented by the Zaïre delegation to the UNEP Rhino Range States Meeting in June. The project has subsequently received grants from the International Rhino Foundation for

supplementary support to guards and for purchase of a vehicle, from Save the Rhino International for purchase of a vehicle, an emergency supplement from WWF and negotiation by WWF, a grant from the Japanese Government through the World Bank. Thanks in particular are extended to Dr Holly Dublin for promotion of the latter. Other organisations to express interest were the US Fish and Wildlife Dept. and Safari Club International.

2.13. Management Planning Workshop

In September a facilitated workshop was held to elicit the views of all levels of the park staff and civilian population on the conservation issues, problems and future of Garamba and its surrounding Reserves, and to involve them in the basis of the Management Plan. This was contributed to by all concerned including the research group.

2.14 Meetings

In August, a meeting of the PMU and the President Délégué Général (PDG) of the Institut Zaïrois pour la Conservation de la Nature (IZCN) was held at Rwindi in Virunga National Park. We were able to raise many pressing questions and clarify a number of issues. The minutes were written up by Dr Mbayma and are available if required.

Later in August we contributed to a WWF fund-raising film being made for Dutch television.

2.15 Support for IZCN staff

The economic situation in the country remains bad, with salaries being low and late. The research technicians are now all receiving a regular bonus based on a dollar rate. The project continues to purchase and issue medicines to the dispensary, forming a very important support and motivation for the guards. Medicines are also issued for patrols.

2.16 Leave

We took leave from the 14th to 21st August and from 10th December to 1st January.

AfRSG RANGE STATE REPORT
Democratic Republic of Congo
May 2000

Dr Kes Hillman Smith & C.P. Mbayma Atalia

Report to African Rhino Specialist Group

CONTEXT

There is only one rhino population in the Democratic Republic of Congo (DRC) This is the last known wild population of Northern White Rhinos *(Ceratotherium simum cottoni)*, which is in Garamba National Park in the north east. The Rhino Conservation plan is therefore integrally part of the conservation and management plan for the park

In recent years, the side effects of wars have been the major threat to the rhinos and the ecosystem of the park Since 1991, the on-going civil war in Sudan, with associated availability of arms, military "deserters" and refugees led to an increase in poaching. During 1997 the country experienced the Liberation War, which changed the leadership and name of the country. At this time the guards were disarmed. patrols virtually stopped and poaching increased significantly. By late 1997 and early 1998, collaborative action with the new government led to a stronger national conservation context, re-equipping began and protection became effective Since August 1998 there has been a second, but less clear cut war Garamba falls into the zone controlled by Ugandan rebel-linked occupation. The park headquarters was occupied from September to December 1998, and technical advisors and Wardens and aircraft were forced to leave. This time guards were not disarmed and anti-poaching and monitoring continued led by senior guards. Conservation control of the park has now again been improved, but the general break down of political and military authorities makes for an unstable regional situation.

1. CONSERVATION PLAN

1.1 Status of plan

A national Rhino Conservation Action Plan was drawn up in 1993 and accepted at the UNEP Rhino Range States meeting. The goals of this plan remain essentially the same, but a series of planning exercises and reviews in relation to changing circumstances lead to annual workplans which reflect current situations in their approach towards achieving these goals

The plan for 2000 (Annex 1) was drawn up by ICCN and partners in the context of the new broader support for World Heritage Sites in the DRC, that will have core funding from the UN Foundation, through UNESCO-World Heritage Centre and that relies on the on-going partnerships between ICCN and supporting organisations for each site and joint development activities

1.2 Goals and Objectives

Rhino-related broad objectives are:

a) Secure long term support for Garamba and ICCN
b)Reinforce surveillance
c) Maintain rhino. law enforcement and ecological monitoring as far as possible
d) Improve political and diplomatic support
e) Improve local community relations

Table 1 gives specific objectives and achievements

2. Coordinating Committees

A coordinating and planning group for park activities comprising project and ICCN personnel in relevant positions is the basic planning mechanism. In the past this was the Garamba Management Unit. Under the UNF/WHC/DRC programme it is called Committee de Coordination Sites (CoCoSi) This structure is concerned with Garamba management activities including rhino conservation. Its role includes: a) Elaborate

Table 1 Rhino Related Conservation Objectives

Goal of Action Plan	Rhino Objectives 2000	Status
Secure donor support for ICCN and Garamba long term.	- Maintain and raise funds through the Garamba donor consortium - Raise financial and political support in a broader, long term context	-IRF with USFWS, FZS, EIG, WCS,WCF is committed to continue support - WWF continues limited support until July 2001 - UNF/WHC/DRC programme provides support, training and development to ICCN through partners, provides political support in a complex emergency situation and aims to establish sustainable funding ($4million over 4 years)
Maintain and expand surveillance anti-poaching operations	- Eradicate poaching from Rhino Sector. - Reduce poaching to acceptable limits in central buffer zone - Rhino numbers stable	poaching indicators and contacts only north of Rhino Sector in 2000 - Contacts 100 patrol days/month/quarter from 10 1998 to 2000 - Rhino numbers stable 98-2000
Maintain & develop applied monitoring & research	- Evaluate rhino status - Maintain and update with training, law enforcement and rhino monitoring - Genetic profiling of NWR for back up development	- Aerial rhino survey April 2000 - Updating LE and Rhino protocols, retraining to come - Genetic analysis slow.Low key
Address conservation/ community/civil authority problems & threats through integrated programmes	-Improve political and diplomatic support locally and internationally, including approaches to SPLA - Improve park and local community relations	- Collaborative operations with SPLA to recover weapons in areas surrounding the park and refugee camps and trans-border poaching information exchange - Actions with all sides in the conflict, through UNF/WHC project & diplomatic mission to facilitate on-going conservation of Garamba and other World Heritage Sites - Development of appropriate community projects in context of above project

the Garamba operational plan, b) Ensure the execution and follow up of activities, c)Coordinate and manage financial and logistical support, d) Report on activities

3. Rhino Population Estimates

The known limits of the rhino range over the past 15 years is given on the attached map. (Fig 1).

The rhino population estimate for June 1998 was 26 rhinos.

This was based on two intensive aerial surveys. In April, using a block count with stratified search intensities correlated with rhino distribution, one aircraft, three observers and ground verification, 23 different individuals were found. In May, with independent observers (Adcock and Mackie) using long transects over larger areas, two aircraft and 7 observers, 22 different individuals were found. Two of these were different from the 23 seen in April, bringing the combined minimum to 25. A further well known ear notched adult male, who had not been seen on either count was reported from two long ground observations, bringing the minimum to 26. His continued presence was confirmed this year. Since June 1998 it has not been possible, due to the war, to do aerial survey until April 2000.

The rhino population estimate for April 2000 was 24 to 30 rhinos

This is based on a single intensive aerial survey using the stratified block count approach, where high density areas are re-surveyed after the first basic coverage. The re-surveying was cut short by an aircraft engine problem, but 24 different individuals were found, including seven new calves, one of which was probably less than a week old. One of the original adult females and her calf were not found although were potentially present in the area where surveying was curtailed. All other five individuals that could have been present are young sub-adult males, three of which would recently have left their mothers on the birth of her new calf. At this stage they are their most nervous and cryptic, hiding in long grass and very difficult to see. The estimate of 24 is therefore certainly a minimum and we strongly believe that more are present, up to a maximum of 31, if 26 was the maximum in 1998. Distribution was mapped and was again associated with the central protected areas and the long/short grass mosaics

Table 2 Summary of population dynamics between surveys

	Survey date * 1996	War	Survey date 1998 *	War	Survey date 2000 ** April, June + August/Sept 2000
Min.-Max. Pop.est	29		26 (-31)		24 (-36) 30
Births		+4		+7	
Not seen			7		± 3
Known poached		-2		-2	
Present and not yet seen / or died naturally / or poached			5		?

* Combined total of individuals seen over a combined series of surveys during the preceding 6 months

To assess a trend the figure 24, resulting from a single survey, cannot be compared with the combined total minimum of 26, but needs to be compared with the 23 and 22 generated by the same method in 1998. The population is therefore approximately stable.

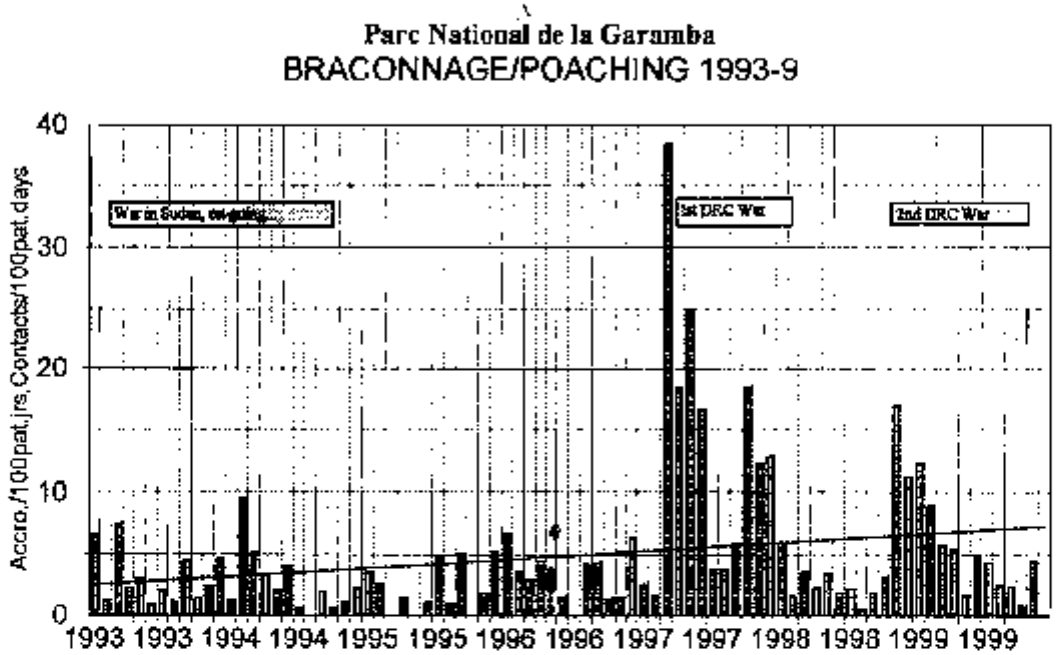
No recent signs of poaching were found in the Rhino Sector during the survey. All armed contacts with poachers by patrols are now north of the river, indicating that for the present the poaching has been pushed out of the Rhino Sector.

(Annex Table 2 gives the up to date known population situation)

4. Rhino translocations None

5, Rhinos poached

The graph Fig.2 shows the changing levels of general, (largely meat), poaching since 1992, as indicated by armed contacts per 100 patrol days, averaged per quarter. The highest peak is correlated with the first Liberation war in 1997, when half the elephants, two thirds of the buffalos and three quarters of the hippos were lost to poaching. A second smaller peak occurs in early



stages of the second, on-going war. The graph (Fig. 2) and table 3 also shows the reduction in poaching.

Fig.2 Poaching levels measured as armed contacts per 100 patrol days from 1993 to 1999

The maps Fig 3 to 6 indicate the increasing threat to rhinos as the distribution of poaching changes.

Table 3 : *Poaching contacts per 100 days from 1998 to end 1999*

Period	Contacts /100 patrol days
Last quarter 1998	**10**
First quarter 1999	**8.8**
Second quarter 1999	**3.5**
Third quarter 1999	**3.4**
Fourth quarter 1999	**2.1**

Table 4 Known poaching of rhinos:

Year	Month	Rhino ID	Age	Sex	Notes
1995?	?	3cM or 3dM	SA	M	Old skull recently found, of age class
1996	2	M5 Bawesi	Ad	M	Killed by poachers, meat & horn taken
1996	3	3bF Juillet	YAd	F	Shot by poachers,horn taken
1997	3	1a/4aM Ch.2	YAd	M	Killed by guards in war
1997	11	F4 Boletina	Ad	F	ID from post horn recovered from poachers
1999	1	4bF Mai ?	YAd	F	Tentative ID from age by dentition. Carcass found fresh
1999	1	4ba Edi ??	J	M?	With 4bf, probably died

6. Rhino Conservation activities

1998

- Promotion of high level support - ICCN DG, Ministry, President Kabila *Jan,Feb*
- Reinforcement of surveillance by leadership, back pay, increase of bonuses, re-equiping (uniforms, tents equipment and fuel flown in by Antanov) and installation of radio relay. *Mar, April*
- 2 Intensive rhino surveys to evaluate post war status of rhinos. *April & May*
- Further increase in bonuses *August*
- Guards continued anti-poaching and monitoring throughout war

1999

- Support to surveillance by continued provision of bonuses, rations and medecines and visits by Conservateurs and Tech.Advisors when possible.
- Raising new sources of support
- Major development of UNF/WHC programme to financially and politically support the World Heritage Sites of DRC with key species being rhinos and gorillas.

2000

- Collaboration with SPLA to recover weapons in refugee camps, leading to major reduction in poaching
- Aerial survey to evaluate status of rhino population and current threats following the first phase of the war.
- Diplomatic mission and negotiations to facilitate re-equipping the park and carrying out ecosystem survey
- Implementation of UNF/WHC programme for DRC World Heritage Sites

INTERIM REPORT ON THE STATUS OF THE RHINOS AND ESTABLISHMENT OF ECOLOGICAL MONITORING AT GARAMBA NATIONAL PARK, ZAIRE

INTRODUCTION

Garamba National Park in northern Zaire is the only known place at present where there is a chance to conserve the last of the northern white rhinos (Ceratotherium simum cottoni) in Africa. The Park, which was established in 1938 for the rhinos and the congo giraffe (Giraffa camelopardalis congoensis) consists of 4,900km² of sparsely treed long grass savanna in the south grading to more densely bushed savanna and woodland towards the north. It is very well watered by numerous rivers and has an average annual rainfall of 1,500mm. The north-eastern boundary is the Sudan border, where it partly abuts the Kentoto Game reserve. In Zaire it is completely bordered by Hunting Reserves, with theoretically limited settlement. The Park also contains nearly 6,000 elephants of a mixed savanna/forest type (Loxodonta africana africana & cyclotis) and about 53,000 buffalo, also showing characteristics of both the cape and forest types (Syncerus caffer caffer and nanus). The Park is far more sparsely wooded than the surrounding area and there is evidence that there has been reduction of some woodland in the recent past. Fire appears to be the main controlling factor at present, but elephants must also have had an influence. Woodland reduction would tend to be disadvantageous to the giraffe. There has been considerable work on the invertebrates in the past, limited work on mammals, and none on the ecology. It is clearly a system which needs investigation, monitoring and all action possible to save the rhinos, especially in the context of an aid project to rehabilitate the Park management.

This work is being carried out at the request of the Institut Zairois pour le Conservation de la Nature, for the conservation of the rhinos and wildlife in general and the guidance of a counterpart biologist and at the request of the IUCN African Elephant and Rhino Group to assess exactly what the rhino population now is and evaluate the possible approaches to improving their conservation. It is being supported by the Kenya Rhino Action Group, the Fauna and Flora Preservation Society and with a vehicle from IUCN/WWF, with particular thanks to the backing and promotion by Major Ian Grimwood, and Dr David Western.

All work is done in close collaboration with the Park biologist, in charge of Projet Rhino. Between January 1981 and September 1984 this was Nenkoto ma Oyisenzoo. I have worked closely with him on the survey we did in March 1983 and since this project began in March 1984. He is to be replaced by a veterinarian, Dr Ndieme.

The Park has a unimodal rainfall regime, with a wet season from April through November. During this time the Hyparrhenia, Loudetia, Panicum dominated grasslands grow to over 2 metres and ground work for rhinos and other wildlife becomes ineffective.

1984

OBJECTIVES

The primary aim is conservation of the northern white rhinos and the ecosystem.
The immediate objective is to establish as far as possible the exact numbers and age and sex ratio of the rhinos and evaluate possible alternatives for improving their conservation.
The long term objective is to establish a monitoring programme for the ecosystem with primary emphasis on the rhinos and secondary on the elephants, giraffe, buffalo and the effects of fire.
The third objective, throughout is encadrement and guidance of the IZCN Park biologist.

METHODS

Timing

The dry season is from December through March

January - March, Personnel: Nenkoto ma Oyisenzoo & guards

313 days were spent on patrol by 37 guards in 8 groups, in the southern section of the Park, specifically on rhino surveillance. 35 sightings of rhinos were reported. Some tracks of rhino were recorded and measured.

April - June, Personnel: Hillman, Nenkoto, 3 guards and in co-operation with members of the Rehabilitati project.

The following work was planned for this period:
- The regular Park ground count carried out by the staff.
- A systematic aerial search for rhinos and general reconnaissance
- Ground/air co-ordinated searching. This was to be the main method of locating, identifying, sexing and estimating approximate age of the rhinos individually, since it had been amply proved before how difficult it is to find them from the ground, and not easy from the air.
- Ground work seeking and following up rhinos for individual recognition and habitat use.
- An aerial census of the Park in conjunction with the Rehabilitati Project.

It was not possible to carry all of these out. Suitable aircraft for the biological work were unavailable or prohibitively expensive, and some flying time for the cost of only fuel, in the Frankfurt Zoological Society C185 was kindly offered, however it took 3 months for the Projet Rhino fuel to arrive at the Park, for a month the aircraft was unserviceable, and it had many administrative calls on its time elsewhere. The following were carried out:
- The Park's ground count in the sector south of the Garamba river. It involves 150 guards and labourers, walking in pairs on transects spaced at 2 km intervals. In the main rhino area, this division was altered to single guards at 1km intervals.
- An aerial search aimed at locating rhinos and at obtaining an idea at least of minimum numbers was carried out at the beginning of June. 1100km² was searched, south of the Garamba river and to 3 km north of it. The area was searched in blocks, the total taking 8hrs 48 min search time, a rate of 8.4km²/km².

- Only one attempt at air/ground co-ordinated searching was possible.
- 215km on foot and about 500km by vehicle were spent specifically searching for rhinos

August,September Personnel: Hillman, Mankoto, with help from Rehabilitation Project

During this period the grass is too long to be able to find rhinos on the ground.
Paperwork and vegetation monitoring and collection are being carried out.
The project is paying for frequent flights over the main rhino areas with 2 aims: Anti-poaching
Systematic searching for rhinos, particularly in areas not previously covered, north of the river.

General monitoring

Monitoring of other species and the habitat includes aerial censuses in late wet and late dry seasons (Methods as in Hillman et al 1983), Standard periodic recording of age and sex structures, habitat use and group size. Vegetation is measured using fixed transects and pin-frame sampling.

RESULTS

Ground count

Sightings of 8 rhinos were reported by 3 transects (6 from that of Hillman and Smith). It appeared that 2 were double sightings of the same animals, and that this represented 7 individuals.

The 3 groups seen were as follows:	Known individuals
1 adult male, 2 adult females, 1 juvenile	(M3,F1,f2,F1a)
1 adult female, 1 male juvenile	(F3,f3a)
1 adult male	(M1 or M2)

The ground count is not a total count. It is probably between 25% and 50% sample on average. However much variation depends on inexperienced or unmotivated observers and uncontrolled transects. Very few of the guards have binoculars.

Aerial search

The aerial search was not attempting to be a total count, since these are well known to be inaccurate for rhinos. Search intensity differed in different blocks. It aimed to give a minimum idea of numbers and to locate rhino areas for subsequent ground searching.
10 or 12 different individuals were seen. One well-known male, recognisable from the air and who had been seen twice by tourists in that season was not seen. One male was seen north of the Garamba river, where it had for some time been thought that none remained.

Ground searching

From the ground we have seen 7 different individuals.
Individual record cards are made for each rhino and all locations plotted on individual maps with standard data collected for each sighting, as well as general information.
Standard forms for reports by rhino guards have also been drawn up and are being tested.
For a number of reasons it is not easy to find the rhinos on the ground. For example a week spent in the main concentration area, after the aerial search, walking daily in 2 groups resulted in no sightings. Returns per unit effort this way are therefore low.

Known individuals

From a combination of all the ground and aerial work, we can so far account for at least 13 individuals. We have not covered all the areas thoroughly, especially north of the river, and certain individual identification is difficult from the air except in some cases. So there are almost certainly likely to be a few more.
Those known so far comprise:
4 adult males
4 adult females
2 unsexed adults (but thought to be a male and a female)
1 unsexed sub-adult
1 juvenile male ≤ 1 year
1 unsexed juvenile ≤ 1 year

Poaching

There is far less evidence of poaching than last year, especially south of the river, where a number of fresh carcasses had been seen on the aerial survey. In the north the incidence of poaching noted from the air appears similar to that seen last year. No freshly dead elephant or rhino have been seen, but there have been 2 sightings of freshly dead buffalo with the meat being cut and dried, plus 3 or 4 sightings of camp sites. All these were in the north. No gunshots have been heard, which apparently were a common occurence in the past. The reduction of poaching in the south may have been due to the increased patrolling that was possible with the funds for ration provided by IUCN/WWF and FAC.

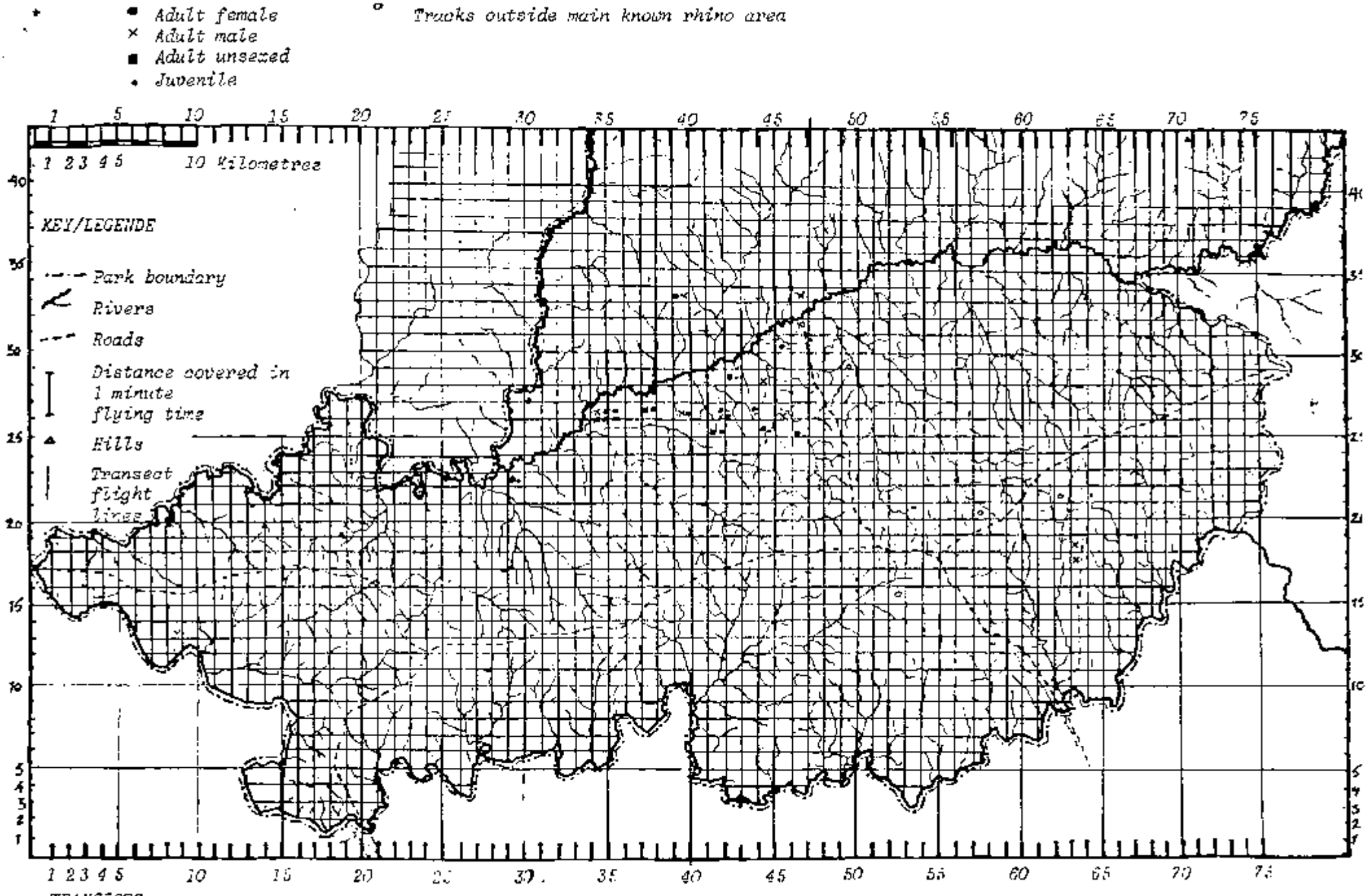
However it is believed that 4 or 5 rhinos have been poached since March 1983. One was reported poach e south of the Garamba river in June 1983. A poacher has claimed to have killed 2 last year at unspecified times or places, and 2 in June this year from north of the river. These 2 would not have been included in the total of known individuals, since the 3 seen north of the river were observed in August and September. Nor were they included in those we saw on the census last year, unless they have since crossed the river when it was low, since none were then seen north of the Garamba.

It would seem that although there is better control of the poaching south of the river, there has been little or none north of it. It had for some years been thought that almost no rhinos existed north of the river. We did not see any last year, but neither did we search thoroughly there. This view was perpetuated largely because no-one went north of the river. The pantheon has been broken or non-existent for 20 years. The loss of 5 or so rhinos in 2 years represents about 1/4 of the then population. Clearly the anti-poaching must be further improved, urgently.

Anti-poaching

Until August , recent improvements in anti-poaching has been largely promoted through Projet Rhino. Since August 1983, with the arrival of vehicles for the rehabilitation project and funds for rations, improvements in the overall anti-poaching are able to begin.

The basis of the anti-poaching in Garamba is foot patrols. About 60 of the guards are based at the 2 stations, Nagero and



PARC NATIONAL DE LA GARAMBA (Southern sector)

Rhino sightings April – August 1984

Garamba National Park. The rest are at Patrol posts around the periphery. With the improved communications of the project, leadership and rations, some of these are now becoming far more effective. All successful anti-poaching activity by patrol posts will benefit the rhinos, but certain specific activities might particularly benefit the rhinos and have been discussed with the conservateur and project officer. These are as follows:

-Semi-permenant camps at the Garamba and Willibadi 1 rivers, well controlled and frequently serviced.
- Patrols from these around the periphery of the rhino areas with only trusted guards of Equipe Rhino or others patrolling in the area, using a standard form of reporting.
- Placement of a canoe at the Garamba, so that guards could cross before the new pontoon is built, and patrols to the north of the river.
-Frequent flights over the area and air/ground communications with the radios
- Monitoring in conjunction with the anti-poaching.

Future for the rhinos

The situation for the rhinos is very grave and has been for some time. Biologically, there are enough that it would be very possible for them to build up a reasonable population again, given enough time and adequate protection. There are ample examples of populations building up from very low numbers, such as the southern white rhinos, the 6 black rhinos introduced into Akagera National Park, that increased to 20-40, Himalayan Thar that increased from 8 to become a national pest, Pere David's Deer, where the present world population of some hundreds developed from 3 individuals, etc. If one assumed a starting population of 15 animals, and allowed for only a very pessimistic rate of increase with 10% annual natural mortality, they could have more than doubled in 10 years. If one assumed the same rate of increase as that recorded for a population of southern whites, by Owen-Smith (10%) they would be over 40 in that time.

But the big IF is whether or not they could be adequately protected. If the rate of loss per year was to much exceed 10% per annum when the aid project was putting maximum resources into controlling poaching, then clearly there could be little hope, but that situation needs to be tested. At a meeting of all those at the Park directly concerned with the future of the ecosystem it was agreed that the only thing that could be done immediately is to build up the effectiveness of the anti-poaching, and that is now starting; however this by itself was not the long term solution. The latter depends upon the decisions of the Zairois. Clearly if the rhinos are to be saved in the wild there needs to be long term input, both national and international. This is however no different from most other Parks in Africa, and the need was accepted by us when we came here, and everything possible will be done to promote its fulfillment. Contingency plans can exist, should the situation deteriorate badly and the Zairois decide that they must be carried out, but we also feel that more action should be taken to improve the survival chances of the rhinos as soon as possible. Various possibilities are considered in a separate chart.

At least they are backed up by a captive breeding group and all efforts should be made to increase this rapidly.

General monitoring

Although lower on the priorities than the immediate need to enumerate the rhinos, a monitoring programme, basically as follows has been begun:

	Months J F M A M J J A S O N D
Monitoring of the rhinos for individual recognition, population dynamics, ecology, behaviour and poaching	----------
Aerial census	- -
Ground sampling for age and sex ratios of main mammal species	- ---
Opportunistic sampling for habitat use by main mammals	----------
Vegetation monitoring for determination of effects of fire and elephants	-------
Writing reports and papers	----------
Controlled burning	-
Opportunistic vegetation collection	----------
Monthly bird records (also by tourists)	----------

Grass and tree samples collected previously and identified by the Kenya Herbarium will be housed in the Museum.
The African Wildlife Foundation has kindly agreed to fund a small interpretive display to be put in the Museum. This, we hope will help in explaining the function of the Park and the value of the wildlife in promoting public relations with local chiefs and dignitaries and enlisting their support, and as an educational aid.

REFERENCE

Hillman K., Barner M, Menkoto me Oyisenzoo, Rogers P, Smith F, (1983) An Aerial census of Garamba National Park, Zaire, with special emphasis on the northern white rhinos and elephants Report to IUCN/WWF/UNEP/FZS

6.2.2. TOWARDS THE INTERPRETATION OF AERIAL SAMPLE CENSUS DATA FOR RHINOS

KES HILLMAN

Census of rhinos, both from the air and the ground is notoriously difficult, because they occur at relatively low density, for the most part singly, and are of somewhat cryptic coloration and habits. Behaviour patterns and type of habitat cause variations in countability.

Degrees of census accuracy and method employed depend to a large extent on purpose and resources. The most accurate way is an in-depth study to recognise individuals and home ranges. Failing this, a more rapid indication of population size can be gained by ground or aerial counts, total or sample, using sightings or indirect signs, depending on size and type of area and resources. Examination of aerial methods in small areas in Hluhluwe G.R. (Hitchins, P), Laikipia (Brown, M., Elliot,R. pers comm.) and Meru N.P. (Kenya Rangeland Ecological Monitoring Unit KREMU) indicated that a helicopter total count gives most accurate results, followed by fixed wing aircraft total counts, followed by sample counts. However, the more accurate the method, the more expensive. If the objective is to gain a broad picture from a vast area, counts designed to be accurate for rhinos are logistically and economically impossible and the best use has to be made of existing or multi-purpose data.

Systematic aerial sample counts are a method which has been widely employed over large parts of wildlife areas of Africa. The objective of this paper is therefore a preliminary examination, as a basis for discussion, of a variety of tests of the standard sample method to aid interpretation of such data for rhinos.

It considers a comparison of a long-term series of 68% samples over a relatively known, low density population in Amboseli by Western, who found that there was large variation between individual counts, but overall a correction factor of 1.8 gave a reasonable population estimate.

Aerial census figures for rhinos from the rangelands of Kenya at 22% and 45% sampling intensity by KREMU were interpreted by correcting x 2, which gave a figure that tied closely to a country estimate made using other methods. However, detailed tests of the Meru area at sampling intensities between 9.5 and 31% gave very varied figures for rhinos.

The method was tested by Hillman and Douglas-Hamilton over a roughly known population in Nsefu Game Reserve in Luangwa Valley at 8 and 16% sampling intensity. The higher intensity was reasonally accurate, but the lower gave variation above and below.

The sample method was also tested by Hillman, together with a total count over an accurately known population of both black and white rhinos on a Kenyan ranch. Sampling was done at 42% and analyzed at a variety of intensities. The estimates for black rhino at high intensity were either similar or of the order of 75%, while the estimates for white rhino varied above and below the true figure, and the attempted total count was well below.

At very high sampling intensities aerial census data for rhino can be reasonably accurate without correction factors. At lower intensities the variation from single counts is so great that only under certain conditions can correction factors be interpreted at this stage. The variations, limitations and usefulness of this type of data are discussed and preliminary conclusions made on interpretation and factors to be considered.

Zaire

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GARAMBA NATIONAL PARK

ECOSYSTEM RESOURCE INVENTORY

by

Kes Hillman Smith

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NOTES ON THE MAIN LARGE MAMMALS

RHINOS
(Ceratotherium simum cottoni)

The rhinos were the main reason for the creation of the park and this population is the last relict of the northern sub-species in the wild for which any conservation effort is currently possible. Elsewhere, only a few individuals remain in Southern National Park in Sudan, which is in the grip of civil war. A summary of the history of the sub-species is given in Hillman-Smith et al (1986).

The population in the Park has had a varied history, as summarised in Hillman et al (1983). There were estimated to be about 100 at the creation of the Park in 1938, though that is likely to be an under-estimate. They increased to 1000-1300 in 1960 and the population was literally decimated during the Simba rebellion. Numbers rose again, and in 1976 an aerial census estimated 490+-270(Savidge et al 1976). In 1988 the known population is 22, as deduced from individual recognition and regular monitoring. Population details are summarised in the section of this report entitled RHINOCEROS.

Since our survey in 1983 10 calves have been recruited to the population, 45% of the present number, with an increase of approximately 10% per annum. The only evidence of poaching since the Rehabilitation Project started is 2 rhinos claimed by a poacher to have been killed before the vehicles first arrived and the man-power became mobile. The potential for increase would therefore appear to be good if adequate protection can be maintained in the long term .

Rhinos have been observed within a total range of 900km2, mainly in the north central area south of the Garamba river, with some occupation of a band up to 10 km north of the river (see Map in RHINOS). There is however a core area central to this. Male home ranges are over 100 times and female ranges over 20 times larger than those observed for southern white rhinos (C.s.simum) (Owen-Smith 1973). Factors which contribute to this situation include the low density of the population, the effect of fires and the availability of palatable grasses both after fires and during the latter wet season when most of the Loudetia and Hypparrhenia is long and coarse.

The rhinos are most often found in the savanna grassland, with only occasional use of the riverine grassland, which is a very small habitat anyway. The short grasses and herbs growing around the termitaria clearings are favoured, especially during the long grass season and the termitaria or beneath trees are favoured resting sites. It has been observed that the presence of patches of long grass is important for cover.

THE NORTHERN WHITE RHINOCEROS
(Ceratotherium simum cottoni)

INTRODUCTION

In March 1983 we carried out an intensive survey of the numbers of the rhinos and other species of large mammals at the Park (Hillman et al 1983). Since March 1984 the rhino population has been studied and monitored on a long term basis.

The aims of this work were:
1. To find out how many rhinos remain at the Park and the population structure.
2. To monitor the population dynamics and basic ecology and behaviour to provide information for assessing and improving their conservation.

Regular reports of the current status are provided, and a full analysis and report is being prepared. The report in this inventory merely summarises methods and results.

METHODS

The main tool for counting and monitoring the rhinos has been the use of recognition of individuals by natural characteristics. They are at such a low density that it is never possible to find and count them all at any one point in time. By recognition of individuals one can gradually work out the number over time, without double counting. It also allows for observations of social behaviour and population dynamics. Horn shapes, ears, tails and nose wrinkles are the main characteristics used. A card exists for each individual with sketches, photographs, footprint measurements and personal records.

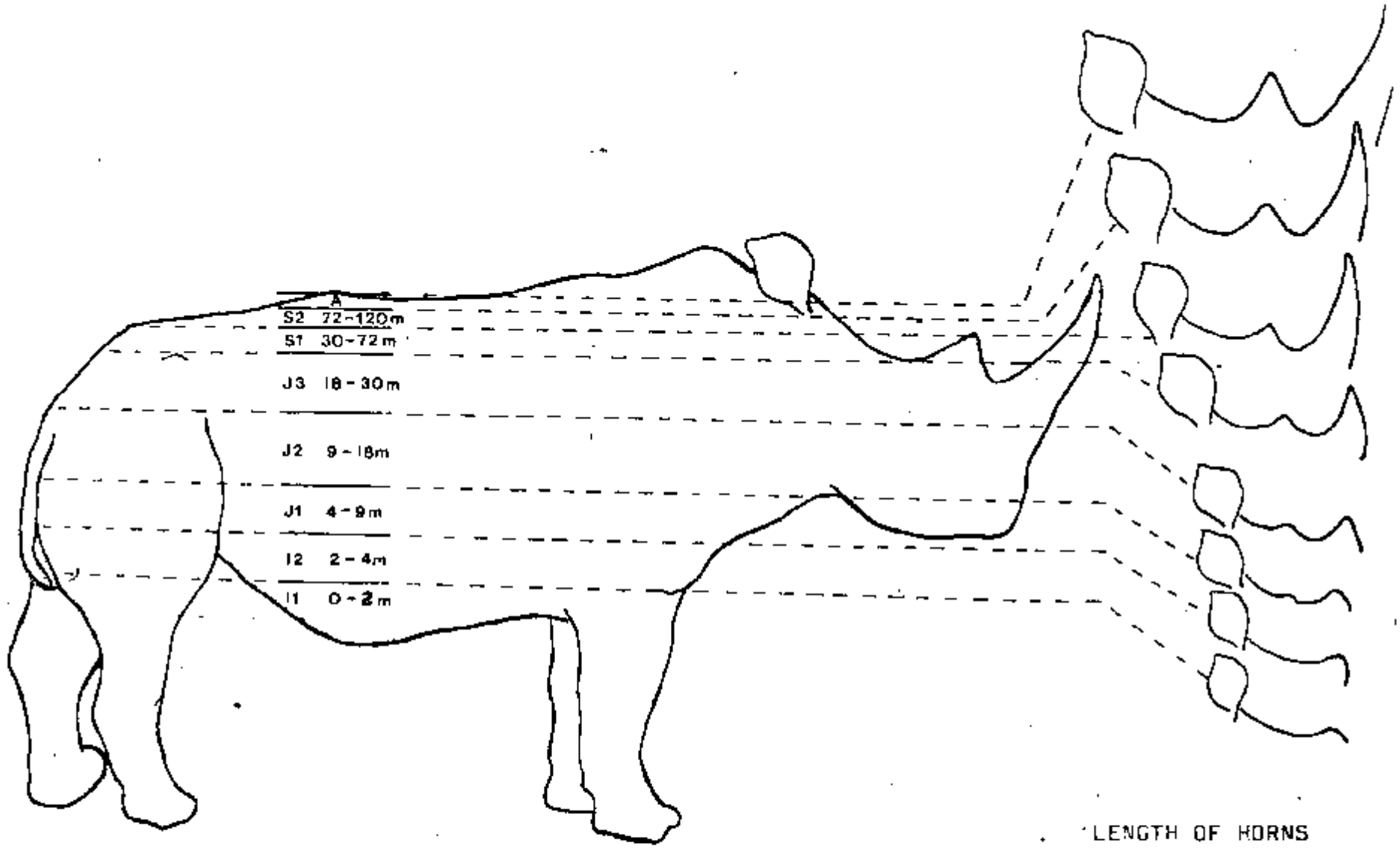
Each observation is recorded on standard form as to date, time, location nominally and on a 1x1km grid system, age and sex structure of the group, habitat, activity, inter or intra specific relations, identification, measurements and notes on method of observation. Standard forms are also used for observations of activity and behaviour, and of feeding.

Most of the monitoring is carried out from the air in regular series of flights to intensively search in blocks the areas used by the rhinos. This is backed up by ground work as much as possible. Dr Mbayma Atalia is now carrying out a more detailed study of the ecology and behaviour of the rhinos.

The accompanying figure, 'Field Age Determination of White Rhinos' is used both as a basis for age determination and is now being tested for its accuracy with the northern sub-species on known age animals.

RESULTS

The following tables summarise the population structure and dynamics. Ranges of each individual are outlined on the accompanying maps.



HEIGHT OF JUVENILE WHITE RHINO RELATIVE TO MOTHER

LENGTH OF HORNS RELATIVE TO EARS

FIELD AGE DETERMINATION OF WHITE RHINOS

(Based on Hillman-Smith A.K.K., N.Owen-Smith, J.L.Anderson, A.J.Hall-Martin & J.P.Selaladi, Age estimation of the White Rhinoceros (Ceratotherium simum),J.Zool.Lond.(A)(1986)210,355-379)

Parc National de la Garamba

NORTHERN WHITE RHINOS (Ceratotherium simum cottoni)

Summary of Results

Oct.1986
Updated Mar.1987
May.1988
Jul.1988
Dec.1988
Apr.1989

INDIVIDUALS

ADULT MALES		STATUS
M2	'Eleti'	Previously dominant.Range changed for social reasons Aug/Sept.88
M3	'Kondo akatani'	Previously sub-ordinate old sub-ad. sharing range with M2. Now taken over range & mating there.
M4	'Bac'	Previously dominant. Range changed 1986,probably ecological reasons.
M5	'Bawesi'	Previously dominant.Range changed, probably ecological reasons. Now in part of M2's old range
M6	'Blancorne'	A
M7	'Moitier'	Young male
M9	'Notch'('Limp')	A
M8 ?	'PS'	? Uncertain if separate individual.
ADULT FEMALES		
F1	'Mama moke'	With c. 5+yr old.Potential for calving.
F3	'Kunalina'	With c. 4yr old S1.
F4	'Boletina'	With J2
F5	'Mama Giningamba'	With J2
F6	'Pacque'	With J1
SUB-ADULTS		
1a	'Moke'	Old S1,male, born c.mid 1983
3a	'Kuni'	Old S1,female, born c.late 1983
4a	'Bolete moke'	Old S1,male, born c.Aug-Oct 1983
5a	'Giningamba'	S1,male, born Feb.1985
4b	'Juillet'	S1,female, born c.July 1985
3b	'Mai'	S1,female, born c.May 1985, with dam.
JUVENILES		
4c	'Noel'	Female, born late Oct. or Nov.1987
5b	'Grizmek'	Female, born c.Oct. 1987
6a	'Oeuf de Pacque'	Female,born March 1986.
6b	'Elikya'	Male, born late June 1988

TOTAL KNOWN AT PRESENT	
Adult males (MA)	7 or possibly 8
Adult females (FA)	5
Sub-adult males (SM)	2 young S2
	1 S1
Sub-adult females (SF)	1 young S2
	2 S1
Juveniles	3 female, J2 & J3
Infant	1 male J1
TOTAL	22 or possibly 23

AGE AND SEX RATIOS

Sex ratio of confirmed known animals 11 M : 11 F

Age ratio of confirmed known animals

MA	7	32%
FA	5	23%
S	6	27%
J	3	18%

OBSERVED HOME RANGES

INDIVIDUAL	SIZE(km2)	DATES OF OBSERVATION
M2	205	Mar.84-Sept.88
	68 out of	previous range, Sept.88-Apr.89
M3	130	May 84-Apr.89
M4	329	Aug.84-Apr.89
M5	194	Apr.85-Apr.89
M6	418	Mar.86-Apr.89
M7	174	Feb.86-Aug.89
(M8	86	Apr.86-Aug.87)
M9	170	Mar.86-Apr.89
F1&1a	237	Apr.84-Apr.89
F3,3a&3b	512	Apr.84-Apr.89
F4,4a&4b&4c	280	Jan.85-Apr.89
F4&4a	82	Jan.85-Apr.85
F4&4b	65	Aug.85-Oct.86
F5&5a&5b	93	Apr.84-Apr.89
F6&6a&6b	175	Mar.86-Apr.89
3a/4a '83SA	417	July85-Apr.89
3b/4b/5a'85SA	72	Feb.88-Apr.89

Mean range for adult males	289 km2 (well known only)
Mean range for adult females	220 km2
Mean range for Sub-adults	245 km2
Total range of direct observations	900 km2

GROUP SIZES, April 1984-August 1987

GROUP SIZE	NO.OBSERVATIONS	% OF TOTAL
1	149	37
2	189	46
3	53	13
4	11	3
5	4	1
6	1	0.2

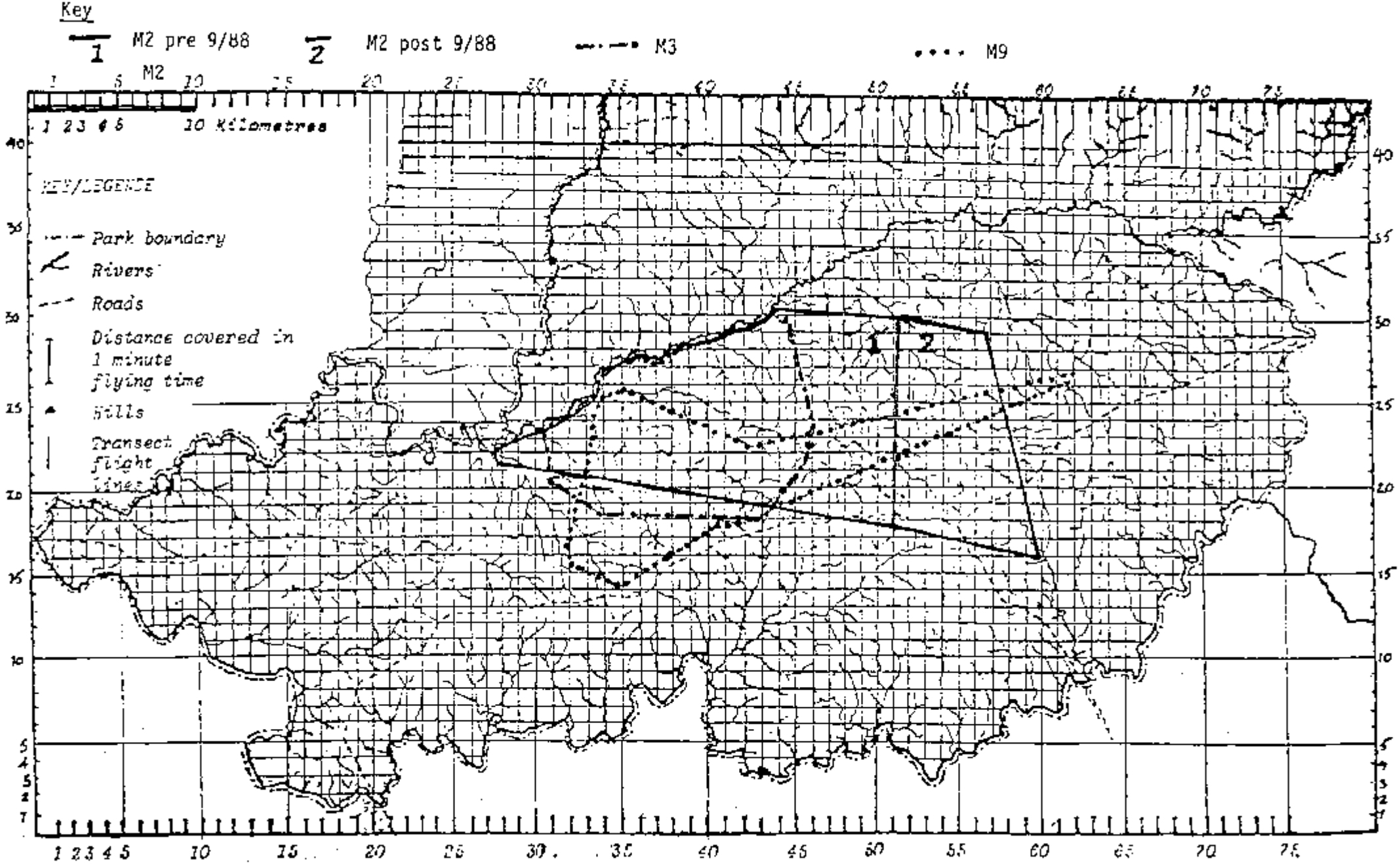
FREQUENCY OF OBSERVED SOCIAL GROUPS

GROUP COMPOSITION	NO.OBSERVATIONS	% OF TOTAL
MA	103	32
FA	6	2
MA+FA	14	4
AU	9	3
MA+FA+S	11	3
MA+FA/s+J/s	27	8
MA+FA+S+J	3	0.9
MA+S/s	3	0.9
FA+S	8	2
FA+J	115	35
FAs+Js	1	0.3
FA+S+J	9	3
FAs+Ss+Js	1	0.3
S	5	2
Ss	18	6

LIST OF KNOWN FOOD PLANTS

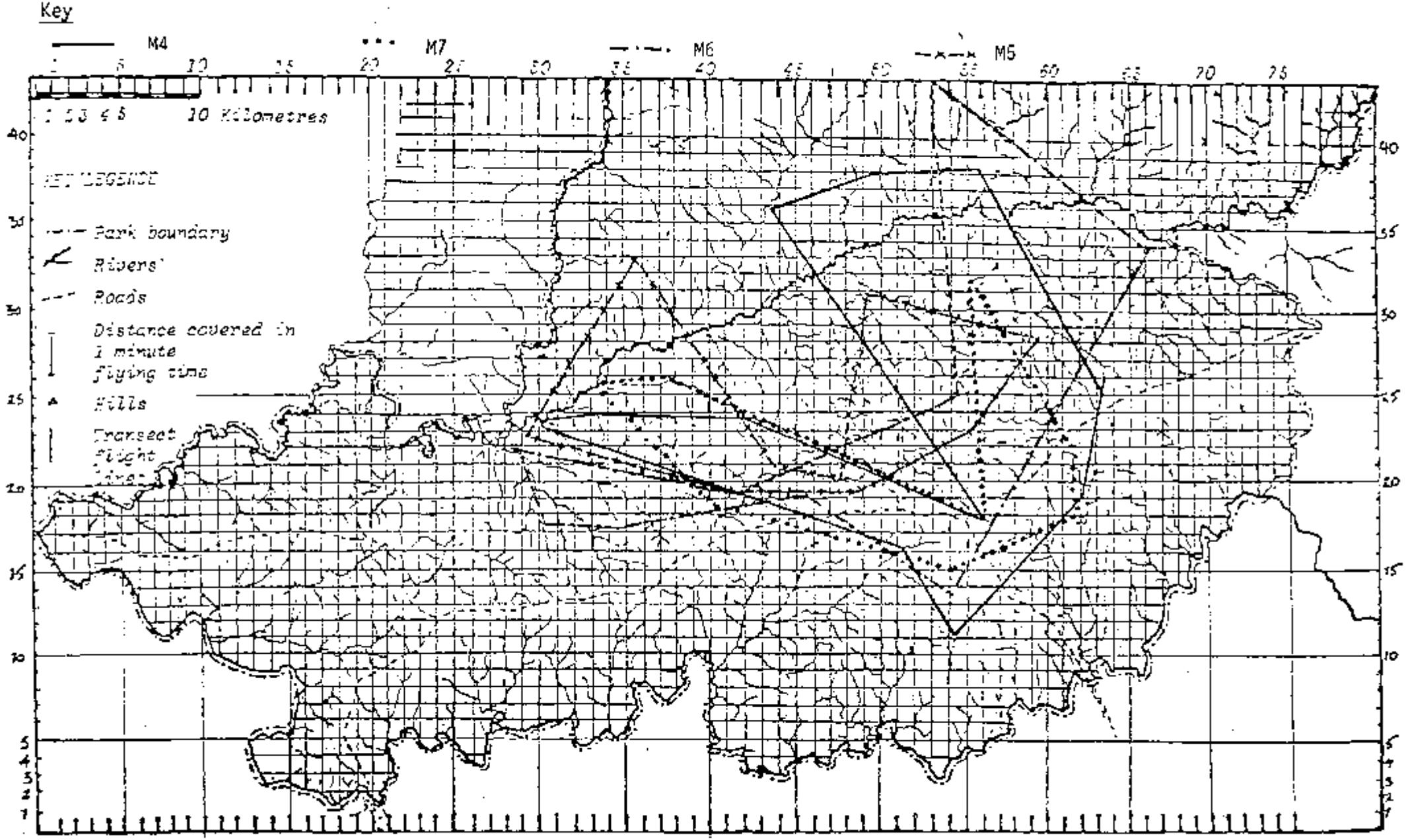
Loudetia arudinacea (young form)
Panicum maximum
Brachiaria decumbens
Brachiaria jubata
Dichondra repens
Desmodium hirtum
Cynodon dactylon
Imperata cylindrica
Pennisetum purpureum
Eleusine indica
Hyparrhenia spp.
Cenetella asiatica
Symedrella indica
Indigofera spicata

(Some identifications are awaited from the Herbarium, Nairobi)

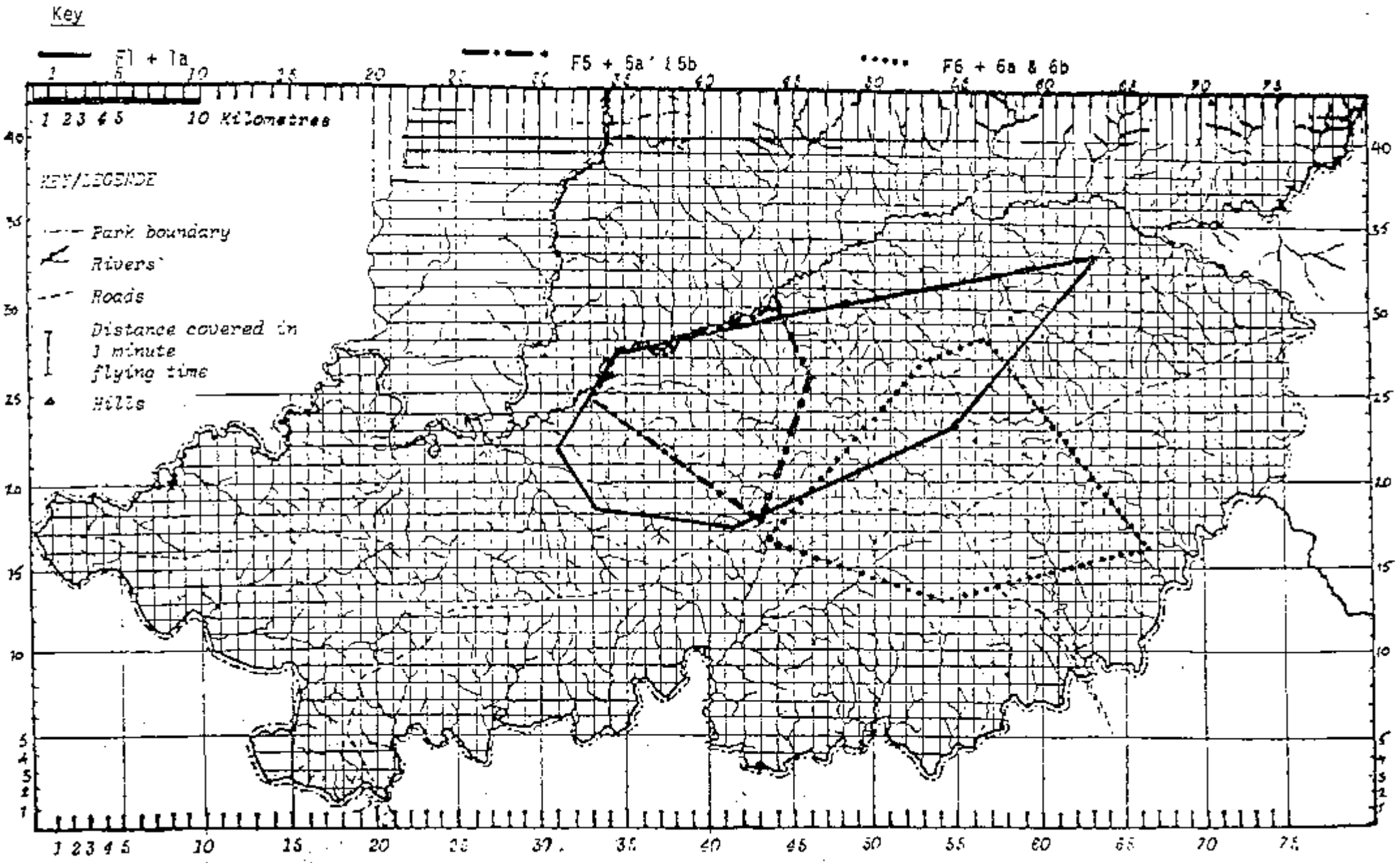


HOME RANGES - Males

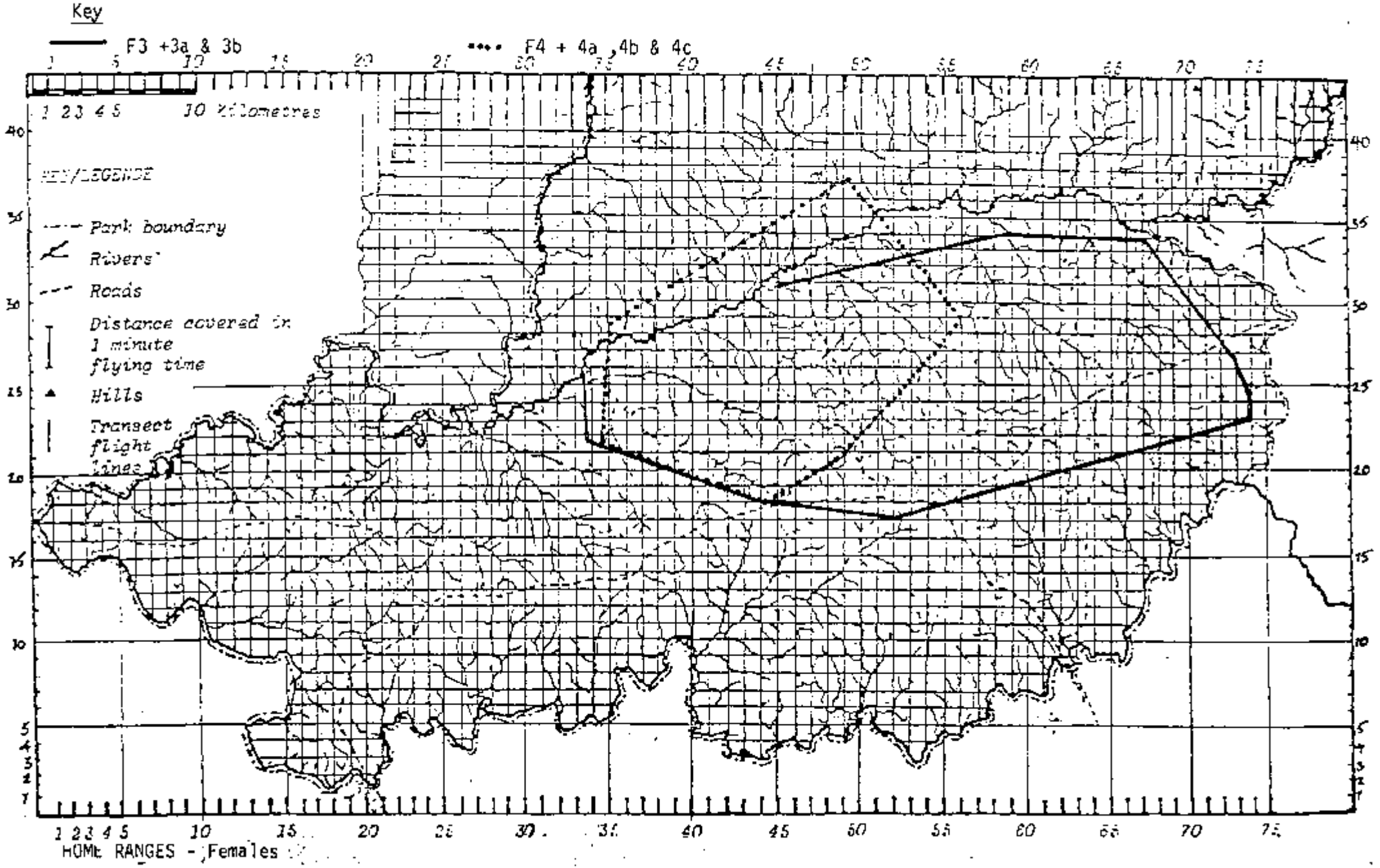
PARC NATIONAL DE LA GARAMBA (Southern sector)



HOME-RANGES - Males
PARC NATIONAL DE LA GARAMBA (Southern sector)



HOME RANGES - Females
PARC NATIONAL DE LA GARAMBA (Southern sector)


Key
F3 +3a & 3b
F4 + 4a ,4b & 4c
1 2 3 4 5 10 Kilometres
KEY/LEGENDE
Park boundary
Rivers
Roads
Distance covered in 1 minute flying time
Hills
Transect flight lines
1 2 3 4 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
HOME RANGES - Females
PARC NATIONAL DE LA GARAMBA (Southern sector)

DISCUSSION

In March 1983 we estimated that there were 13-20 rhinos remaining at the Park. This meant that 97% of the population of 490 +- 270 estimated by Savidge et al in 1976 had been lost due to poaching. There was still some poaching of rhinos until the Garamba Rehabilitation Project became effective in 1984, when there were probably 15 rhinos remaining. 3 calves were recruited to the population between March 1983 and March 1984 and another 7 have been recruited since then, a rate of increase of over 10% per annum. At the end of 1988 there were 22 known individuals at the Park. There is a slight possibility that another male, M8, with different characteristics exists, but it may be simply misidentifications of another male from the air, since it has never been possible to confirm more than 7 males on any one survey.

The sex ratio is 11M:11F. Recommendations from captive breeding suggest that a sex ratio of equality among the 'effective population' or Ne (that contributing to breeding) is the best for maximising genetic heterozygosity. All 5 females have bred during the period of observation. Until the end of 1988 there were considered to be 5 adult males and 2 males, who, from horn development and behaviour, were considered to be sub-adult subordinate males. As the 5 adult males had more or less separate home ranges and most have at times been observed with females, it is likely that all contributed to breeding. Now at least one of the previous subordinates is contributing to breeding as well. The male M2 'Eleti', who previously occupied the core area almost certainly made the largest contribution in recent years. But since September 1988 he has only been observed outside his previous range. He appears to have been superceded by M3 'Kondo akatani', who as an old sub-adult or sub-ordinate male had shared most of his range, but who is now seen to be contributing to breeding there. In February 1989 he was observed courting F5, 'Mama Giningamba'. The population as it exists, therefore, has reasonable potential for maintaining genetic diversity.

Further evidence from captive breeding indicates that the more rapid the increase from a low level, the less of the gene pool is lost. Numbers have only been very low for between one and two rhino generation times. Dinerstein and McCracken examining the genetic variation of the Greater Indian One-horned Rhinoceros found that a high heterozygosity had persisted even after that population had been reduced to Ne of 30, because it had been large until relatively recently and the rate of recovery from the bottleneck had been rapid. Previous rates of increase of the northern white rhinos at Garamba, from about 100 to 1000-1300 from 1938 to 1961, and from about 100 in 1963 to 490 in 1976 have been very rapid. It would seem therefore that the potential for increase and mainatainance of genetic variation in this population is good, if it can continue to be adequately protected. If the present rate of increase was maintained the population could double in 7-8 years and top 100 in 17 years. The long term future of the population, however, would probably be improved by some genetic exchange with rhinos from the captive population at some stage.

Rhinos have been observed within a total range of 900km2, mainly in the north central area south of the Garamba river, with some occupation of a band up to 10 km north of the river. There is however a core area central to this. Male home ranges are over 100 times and female ranges over 20 times larger than those observed for southern white rhinos (C.s.simum) (Owen-Smith 1973). Factors which contribute to this situation include the low density of the population, the effect of fires and the availability of palatable grasses both after fires and during the latter wet season when most of the Loudetia and Hyparrhenia is long and coarse.

The rhinos are almost entirely found in the savanna grassland, with some use of short riverine grassland. They do not use the swamps. Trees are favoured as shade in the middle of the day and termitaria in the grassland are frequently used both as resting and feeding sites. Observations of rhinos when disturbed and of their habitat use particularly in relation to the experimental burning indicate that though they like to graze the more palatable shorter grasses, they need areas of long grass as cover.

A more detailed analysis of habitat use and behaviour will be presented elsewhere.

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