

TANZANIA RHINO PROJECT
Survey report and recommendations: Selous Game Reserve
December 1991

Project Leader, W.A. Laurie

Summary

A five person survey team worked in the Selous Game Reserve (55,000 sq km) between 11 July and 11 November 1991. We covered 1,354 km on foot surveys in 60 days of walking, and 5,300 km by Landrover. Surveys covered approximately 3,000 sq km at a sampling intensity of 0.45 km of walking per 1 sq km of terrain. This area was divided into 18 sectors, each assigned a code letter for security purposes. Signs of rhino (187 dung piles and 100 sets of footprints) were found in eight of these 18 sectors, and there are reliable reports of footprints in 1991 from a further two sectors. Tracks of calves were found in five sectors and reported from one other sector. Rhinos (four individuals) were seen three times during the survey, all in the same sector, and there are six other reliable reports of sightings of rhinos (of at least 8 different individuals, in three sectors) in 1991. There are reports of rhinos from some of the areas still not surveyed. The rhinos discovered so far appear to be concentrated in three different places separated by extensive areas of unoccupied habitat. During the dry season they are split effectively into three populations, but there may be some interchange of animals during the rainy season. The dangers of renewed poaching make increased protection essential for the survival of the rhinoceros in the reserve. The establishment of three rhino sanctuaries within the Selous Game Reserve is proposed.

Personnel

The survey team consisted of three permanent members and a number of temporary members filling two other posts for varying periods.

Three permanent members:

Team Leader: W.A.Laurie
Manager: H.Y. Ndauka
Camp assistant: C. Pangisa

Two other posts:

Driver: K. Medda/ H.U. Laurie/ D. Mtwange
Game Scout: K. Chisumu/ S. Chande/ I. Sudi/ R. Ndembo/ R. Kiluke

Andrew Chisanyo was the Project administrator in Dar es Salaam.

Methods

1. Selection of survey sites

We were looking for signs of a rare animal in a very large area and had only a limited time in which to complete the work. Systematic or random sampling techniques were not appropriate for such a survey, so we narrowed down the area to be surveyed by concentrating on the most likely places for rhinos (those providing water, adequate cover and suitable food) and where they had been

reported within the last two years by local informants such as Game Reserve staff, professional hunters or other field biologists. We also surveyed areas where large rhino populations were reported within the last 15 years, even if there were no recent reports. The survey was restricted to the areas east of the Luwegu/Ulanga River and north of the Ruaha River, so the Western Sector of the Selous Game Reserve remains to be surveyed.

2. Survey

All survey work and planning of routes was done on the ground - either on foot or in one of the two project Landrovers (see Appendix 2). We later flew over the areas surveyed to assess the extent of our coverage of the likely places for rhinos. We set up a series of camps, spending two to six days in each place carrying out surveys on foot, either from the camp itself, or from places nearby that we drove to. A Transpack Global Positioning System Personal Navigator was used to fix positions on the 1:50,000 topographic maps of Tanzania (Series Y742) and the 1:1,000,000 Operational Navigation Charts (Sheets N5 and M5). We recorded all signs of rhinos (footprints, feeding sign, dung piles and scrapes) and actual sightings. We either made one survey sortie during the day, starting to walk at dawn and returning between 13.00 and 16.00, or we made two sorties, one in the morning until 11.00 and another in the evening from 15.00 until dusk. We travelled on sensibly distributed routes from each campsite, following fresh tracks of rhinos on the rare occasions on which we found them. Our routes frequently followed animal paths, but not always, and we returned each time by a different route. Foot surveys covered 1,354 km, on 60 days. Another 5,300 km were covered by vehicle in or along the borders of the Selous Game Reserve when moving camp or going to the starting points for some of the foot surveys. Sometimes we drove along slowly, either on or off the road, looking for rhino sign.

To give some idea of what proportion of the Selous Game Reserve and its environs (Figure 1) we surveyed, we drew straight lines on the maps to surround, with about 1 km margin, all the survey routes from each camp (or the places we started walking from), and calculated the area thus enclosed. For analysis of the results we identified 18 sectors with code letters, for security (see Key). Some of these sectors are divided physically into up to 7 sub-sectors, but other sectors adjoin each other directly. The overall picture is of 34 separate blocks of terrain surveyed (Figure 2): they vary in area from 4 to 459 sq km and the total area is 3,002 sq km. This area was thus covered by the 1,354 km of foot survey at a sampling intensity of 0.45 km of foot survey per 1 sq km of terrain. At two sites (in Sectors A and D) we constructed tree platforms above waterholes and spent three nights on them waiting for rhinos to come to drink.

During the dry season rhino footprints are difficult to find: the ground is hard away from water, and footprints left near water-holes and on sandy river beds are often obscured by the prints of more abundant species. Many footprints are in soft sand or mud, or obscured by leaves, and the measurements of the same individual's footprints vary so much with the gait of the rhino and the nature of

the ground surface that most are not worth measuring. We measured clear footprints that could be useful in trying to distinguish between different individuals in the same area. The few accurate measurements that we obtained on hard ground with a light covering of sand, dust or mud allowed us to estimate the absolute minimum number of rhinos in an area. We could not distinguish between individuals with the same size footprints unless they were adult females accompanied by calves with different sized footprints. Measurements were made of the widths of either fore-foot prints (when they were not obscured by the hind-foot prints) or hind-foot prints, the width of the front nail on each hoof, and, in the few cases that it was possible, the length of the whole footprints (fore and/or hind). Estimation of actual numbers have to be made by combining the data on footprint sizes, frequency of sign, actual sightings, distribution, and the area of habitat available, together with some idea of the likely ranging pattern of individual rhinos, and it is extremely difficult to do this with the data available.

Signs of feeding were always associated with recent footprints. Samples of food plants, and samples of dung were collected.

3. Reports of rhinos from other people

We talked with professional hunters, reserve staff and biologists working in the reserve, and record here recent reports of rhino footprints or sightings that we consider to be reliable. In particular, Dr Neil Stronach, leader of the World-Wide Fund for Nature/Tanzania Wildlife Department's Selous Game Reserve Elephant and Rhino Conservation Project, has been collecting information on rhino distribution and numbers and has been coordinating patrols by reserve game-scouts in areas where there are still rhinos.

4. Aerial survey

After we had completed most of the foot surveys Gerald Bigurube flew Neil Stronach, H.Y. Ndauka and me in a Cessna 182 aircraft for two hours around some of the places where we had found signs of rhino. This allowed us to look at the areas surrounding our surveyed sectors and to make a rough assessment of how much of the suitable habitat we had covered on foot.

5. Questionnaire

Andrew Chisanyo is still receiving replies from the questionnaires that he sent out (copies attached) and will report on the results in January 1992.

Results

1. Rhinoceros

Signs of rhino (187 dungpiles or scrapes and 100 sets of footprints, some with feeding sign) were found in eight of the 18 sectors: footprints of calves were found in five of them. Note that Sector F is outside the reserve. There are reliable reports of rhino footprints in 1991 from a further two sectors, with footprints of calves reported from one of them. Four rhinos were seen in one sector, and reliable reports of sightings of rhinos (at least 8 individuals) in 1991 were received from another three sectors.

Table 1 shows the abundance of sign recorded per kilometer of route walked, for each sector. Sign was clumped on particular stretches of the survey routes: rhino sign was found on 24 (29%) of the 83 foot sorties, but 152 (85%) of the 187 dung-piles were recorded on only 9 (11%) of the sorties. Eighty-nine (48%) of the 187 dungpiles recorded were less than one month old (classified as 'recent'), and the ratio of recent to old dung-piles changed significantly in Sector D from 9:1 in August to only 1:6 in October (Table 2).

We occasionally saw sign first from the vehicle, but on each occasion this was just before we were about to start walking.

TABLE 1

Sector (Code)	Dung-piles Number/km	Footprints Sets/km(*)		Foot No.	sorties No. with sign	Dist. walked: km	Rhinos seen (**)	Recent ('89-'91) reports (***)		
A	0.83	0.18	Y	6	4	114	Rep 2	'89-'91	T,S	PP
B	0.23	0.17	Y	8	4	145	4	'89-'90	T	P
C	0.23	0.11	Y	3	2	66	No	'91	T	
D	0.19	0.05	Y	8	4	120	Rep 4	'89-'91	T,S	PP
E	0.17	0.31	Y	7	7	121	Rep 3	'91	T,S	
F	-	0.06	N	2	1	17	No	'90-'91	T	
G	-	0.05	N	3	1	70	No	'90	T	
H	-	0.03	N	2	1	38	No	'91	T	P
J	-	-	-	6	0	133	No	'91	T	PP
K	-	-	-	5	0	120	No	'89	S	
L	-	-	-	7	0	55	No	'91	T	P
M	-	-	-	2	0	56	No	'90	T	
N	-	-	-	5	0	90	No	'89	T	
P	-	-	-	6	0	17	No	'89	T	
Q	-	-	-	4	0	9	No	'90	T	
R	-	-	-	4	0	122	No	None		
S	-	-	-	3	0	56	No	None		
T	-	-	-	2	0	5	No	Unconf	'91	

(*): Y or N indicates whether footprints of calves accompanying females were seen: Y = Yes, N = No

(**): Rep indicates reliable report by professional hunter or gamescout during 1991

(***): T = Tracks, S = Sighting(s), Unconf = Unconfirmed
P and PP indicate sign found in 1991 by patrol teams coordinated by Neil Stronach of the W.W.F./Wildlife Department Selous Elephant and Rhino Conservation Project:
PP indicates more sign than P.

Two routes through the same general area sometimes produced quite different results, so in most blocks we walked two or more routes in each general area. Parts of three of the areas were surveyed twice - two, 10 and 16 weeks apart. There were considerable differences between the results of these surveys, particularly for those separated by the longer intervals (Table 2). This shows the importance of repeating surveys in all areas at different seasons.

Table 2
Differences in frequency of rhino sign discovered
according to time of survey

<u>Sector + Date</u>	<u>Dung-piles Number/km</u>	<u>Footprints Sets/km</u>	<u>Calf tracks</u>	<u>Distance walked:km</u>	<u>Rhinos seen</u>	<u>% Dung-piles < 1 month old</u>
A: Oct	0.52	0.09	Y	46	No	33
A: Oct	1.26	0.42	Y	38	No	44
B: Jul	0.01	0.03	Y	113	No	{1001 (n=1)
B: Nov	1.00	0.66	Y	32	4	72
D: Aug	0.33	0.13	Y	30	No	90
D: Oct	0.43	0.07	Y	30	Rep 4	15

2. Poachers

During the entire survey we came across only one poachers' camp (in Sector C: southernmost block) and that had been used during the previous rainy season, probably in May or June. We thought we heard people on one other occasion, in Sector E. Apart from hunters with permits, and reserve staff, the only other signs of people we found were on the Ilonga-Liwale footpath, which is a right of way through the Reserve. A few years ago poachers camps, and indeed poachers themselves were abundant and widespread, and frequently encountered by professional hunters and reserve staff. Poaching for meat is still common along the reserve boundaries, but poaching for ivory and rhino horn has been greatly reduced. Nevertheless, there have been some arrests of suspected ivory or rhino horn poachers in the Reserve during 1991.

Conclusions

1. Distribution

Figure 3 shows the distribution of rhino sign or sightings recorded by this survey, by other reliable informants during 1991 and by other reliable informants during 1989 and 1990. The sites surveyed (Table 1) can be grouped geographically into five regions (Figure 4), including the surveyed sectors and their immediate surroundings:

<u>REGION</u>	<u>Includes sectors</u>	<u>Area as drawn: sq km</u>
1.	K,B,M,Q	1,300
2.	G,A,D,J,H,C	3,900
3.	L	1,500
4.	P,R,N,T	4,400
5.	S,E,F.	1,400

There are breeding populations of rhinos in Regions 1,2 and 5, there are recent records of rhinos in Region 3, but no proof of recent breeding, and there are probably no rhinos, apart from transients, in Region 4, although that region once supported one of the highest rhino populations of the Selous and the habitat is suitable. The rhinos are mainly restricted to places where thick cover is available, although the vegetation type of the cover varies according to location and altitude. The rhinos found in Region 3 were all at the end of the rainy season, and may be seasonal visitors from Region 2.

Our flight over Regions 2 and 3 showed us very clearly how little, in most places, our foot surveys had covered of the suitable habitat in the areas that we had seen signs of rhinos. There are vast areas still to be surveyed, particularly in Regions 2, 3 and 5.

2. Numbers

Forty five sets of hind-footprints were measured, varying in width from 16 cm to 23 cm. From the measurements of the footprints, and their geographical distribution we concluded that there were a minimum of four animals in Region 1, nine in Region 2, and five in Region 5. These are absolute minimum estimates and of limited use in estimating total population. In Region 1 we saw four rhinos but know that there must have been at least five because we found the footprints of an individual that we did not sight. It is extremely difficult to arrive at any estimate of the size of the Selous rhino population: we are really guessing still. For example, we found 5 rhinos in 100 sq km of suitable habitat in Region 1, but we do not know how many we missed, how far the rhinos range, or how their ranging behaviour changes during the rainy season. We can calculate a minimum population density of one rhino per 20 sq km for the period of the survey, but we cannot assume either that the population density around the surveyed areas is the same as inside the surveyed areas, or indeed that there is a uniform density of rhinos throughout the region. This is a basic problem when estimating the population size of a rare species, particularly when the population has been reduced by poaching and is not evenly distributed within habitat types. In Region 2 we know that there were at least seven rhinos in one part of the region with an area of 290 sq km, and by drawing a line on the map around our records of rhinos in the region, following as far as possible the boundaries of what appears to be suitable habitat with adequate cover, we can say that there could be rhinos distributed over an area of about 2,000 sq km in the region. In Region 5 we know of at least four rhinos in an area of about 190 sq km, we have surveyed a further 100 sq km of suitable habitat that may be used by rhinos at other times of the year, and we have yet to survey an area of at least 400 sq km north of Sector E that appears to contain suitable habitat and is likely to be still occupied by rhinos.

It should be noted that, in the past, whenever testing of the results of surveys for large mammals has been possible, it has generally been shown that the surveys have underestimated the actual population size.

In conclusion:

1. The absolute minimum population densities in parts of Regions 1, 2 and 5, at the time of the survey, were one rhino per 20, 41 and 48 sq km respectively. These figures are based on parts of the regions with areas of 100, 290, and 190 sq km respectively.

2. Although there is plenty of suitable habitat in Region 1, we only found signs of rhinos in one small part of the region, and, despite surveying an area of more than 460 sq km, we found no recent sign of rhinos outside 100 sq km in Sector B. However, we have reports of rhino sign from other parts of the region (Sectors K, M and Q) within the last two years.

3. The distribution of rhinos in Region 2 extends over an area of 2,000 sq km of suitable habitat with available cover. It is not known how the population density varies over this area, or even whether the distribution is continuous.

4. Looking at all reports of rhinos in Regions 2 and 3 together, there is about 4,000 sq km of suitable habitat connecting the outermost points of the rhino distribution, although some places in the middle of this block of land are devoid of thick cover and therefore not favoured by rhinos at present. It is likely that Region 3 is visited by rhinos mainly during the rainy season.

5. The extent of occupied habitat in Region 5 is unknown as we found rhinos in four adjoining valleys, found none in another three to the north-east and have yet to visit the areas to the north and north-west, where there are at least another 400 sq km of habitat similar to that in Sectors E and S.

6. The Western part of the Selous Game Reserve (west of the Luwegu River and south of the Ruaha River) remains to be surveyed, and there are recent reports of rhinos from two places there.

Discussion

1. Background

Widespread poaching for their valuable horns has pushed the black rhinoceros to the verge of extinction. In Tanzania the species was once extremely widespread and abundant and it is estimated that 95% of the country's rhinos were killed by poachers between 1975 and 1989. A brutal 21 month crack-down on poachers and dealers, organized jointly by the army, the police and the Wildlife Department, followed by improvement of the reserve management, under the Selous Conservation Programme, have been effective in reducing poaching in the Selous and elsewhere since 1988.

Initial reactions to the very intense wave of poaching that more than decimated Africa's largest rhino population in the Selous Game Reserve in the 1980's included the tough anti-poaching measures referred to above and proposals to move the rhinos out of danger.

2. Survey results and implications

We now have more information on the rhino population of the Selous, and are in a position to make further recommendations. The important facts to emerge from this year's survey and the work coordinated by Neil Stronach of the W.W.F. with Selous Game Reserve staff, is that there are rhinos breeding in the Selous in several different places, and although they are at risk from poachers, there has been little poaching recently. Estimating numbers is not yet possible, but it is clear that the population of the Selous has been reduced drastically over the last 15 years. As the population has been reduced very rapidly over a short period of time relative to the rhino's generation time it is likely that the small population remaining still retains sufficient genetic diversity to avoid the problems of inbreeding. The population of Rhinoceros unicornis in the Chitwan Valley of Nepal was once reduced to less than one hundred individuals. It has since recovered to its present size of about 400 individuals, but Eric Dinerstein and Gary McCracken estimate that the population still retains 90% of the genetic heterozygosity present when R. unicornis was still widespread and

common. This is because the time since the drastic decline of the population to less than 100 individuals is only three times the rhino's average generation time of 12 years. In the case of the black rhino the time since the drastic reduction of population is considerably less than three generation times. Further survey work will clarify how many rhinos there are in each part of the Selous and its environs and show how far and how often rhinos move from one part to another.

3. Immediate threats

The rewards for rhino poaching are still high. There has been a recent seizure of [REDACTED] rhino horns at Changi Airport in Singapore, and there are recent reports of a large consignment of black rhino horns coming onto the market elsewhere in Asia. There is now a possibility that a certain amount of controlled trade in rhino horn will be legalised in the near future, increasing the risk that poaching will become more common in places like Tanzania as it will become easier to get the horn onto the market without detection.

The few rhinos found in Region 1 are very vulnerable as they are close to a navigable river and the area is easy to reach by boat. Region 2 has the most rhinos and is also being patrolled more intensively by game scouts collaborating in a W.W.F. Department project that is providing incentives and training for reserve staff. However, many people know there are rhinos there, and poaching is still a severe risk. The presence of a population of rhinos in Region 5 was brought to our attention only in May 1991 by game scouts supervising the construction of a 180km road into the south of the Selous Game Reserve. A large number of labourers who worked on the road now know about the rhinos and this poses a serious security threat, particularly as the nearest guard post is outside the reserve and 50 km from the rhino area.

The present level of patrolling in all these areas is insufficient to protect the rhinos from poachers. Action needs to be taken now if the rhinos are not to disappear entirely within the next ten years.

4. Possible solutions

Three main options have been proposed: (a) capture of rhinos and translocation to secure areas outside the Selous for breeding and possible reintroduction to the Selous at a later date, (b) establishment of a secure area within the Selous, possibly using fences, and translocation of rhinos into it from other parts of the Selous and (c) improved protection of rhinos in situ, concentrating on areas that support the most rhinos.

A major problem with the translocation options is that we do not yet know of any location that would be a suitable release site in terms of both security and habitat. Second, there are particular difficulties involved in capture and translocation in the hilly areas where many of the rhinos live in the Selous. Third, there are doubts about the advisability of mixing the two Tanzanian subspecies of rhino (michaeli and minor), something that would have to be considered in specific proposals for translocations. Fourth, the enormous costs involved in these operations, and the risks of rhinos dying during capture or translocation, or after release, mean that much could be done, possibly to greater effect, with the same amount of money if it was spent in other ways. Most important of all, capture and translocation to a secure area is appropriate only when

survey results reveal isolated rhinos that are genuinely at risk from poachers or are irrevocably cut off from other rhinos. This is not the case for the rhinos of Selous, which are breeding, live in a large area uninhabited by man and are protectable with funds equivalent to the costs of a translocation operation. Indeed, if the rhino areas of Selous are given effective and lasting protection, the Selous might perhaps be seen in the role of a secure area for the receipt, rather than the export, of rhinos.

It is important to stress now that there are potential dangers as well as potential advantages to moving animals between isolated populations, particularly small ones. Inbreeding can lead to inbreeding depression, manifested as lower fertility, and to increased vulnerability to disease due to homogeneity of disease defence genes. So, translocation has advantages in:

1. Preventing demographic catastrophe such as the loss of small populations for reason of the loss of major breeders, or skewed sex ratios, or deaths due to poaching
2. Preventing genetic inbreeding in the recipient population.

However, moving animals between populations that have been isolated from each other for a long time carries the potential risk of spreading infectious disease outbreaks. Genetic analysis of the populations by blood sampling can provide data to resolve this paradox.

If security can be maintained and there are enough individuals present the best solution is to leave rhinos in the places they are familiar with and know how to live in. Establishment of some form of rhino sanctuary status for parts of Regions 1, 2, 3 and 5 would give most of the rhinos in the Selous extra protection. If protection is effective in the selected sanctuary zones the rhino population will in time increase and spread out from those zones to the large areas of suitable habitat in between, where there are at present few if any rhinos resident year round, but where they were common in the past. In some cases rhinos may be captured in the sanctuary areas for repopulation of areas that are by then considered to be secure and protectable.

Increased patrolling is essential, and should be concentrated in the areas identified during the survey. It needs to be started immediately. There are of course risks of drawing the attention of poachers to the remaining rhinos by implementation of better protective measures, but there are greater risks in doing nothing: the location of the main rhino areas are well known to many of the local people, and as soon as the rewards are thought to be worth the risks of detection and punishment the poachers will become more active. It is vital that all extra protective measures are well planned, adequately financed to ensure their continuity over several years, and under good leadership. The most important requirement is for a dedicated, well motivated and well paid guard force which will put up with being stationed inside the reserve during the rainy season. In the past there were guard posts distributed all over the Reserve and they were manned year round. Now, however, many of those in the interior have been abandoned and most of the guards live on the periphery of the Reserve or in villages up to 70 km outside the boundary. Protection with such a distribution of guards cannot be effective, so guard posts should be rebuilt and remanned in the rhino areas. All weather roads and/or airstrips will be essential to provide access to the guard posts and to assist in patrolling during the rainy season. There is no reason at present

to restrict trophy hunting for other species within the designated areas: indeed the presence of the hunting camps probably helps to deter poachers. The cooperation of the hunters should be sought in monitoring the rhino population.

Early burning in the sanctuaries, indeed in the whole reserve, should be enforced strictly: at present far too many areas are subject to destructive late burns.

The sanctuary scheme might act also as a pilot scheme to test the effectiveness of returning the guard force to the interior of the reserve throughout the whole reserve.

Immediate priorities

The outline proposals listed here will be discussed and amplified at a workshop to be held in Dar es Salaam in February 1992 (see 5 below).

1. Selous Rhino Sanctuary Programme

Funding should be sought immediately to establish three rhino sanctuaries within the Selous Game Reserve. Figure 5 shows the approximate location of the proposed sanctuaries, referred to here as North, Central and South. Proposed detailed boundaries have been sketched on 1:50,000 topographic maps and will be discussed in detail with Selous Game Reserve staff. The sanctuaries should be under the control of the Reserve authorities and be staffed by employees of the Wildlife Department, but there should be some kind of arrangement that allows joint leadership or supervision of the programme by a fieldworker from the funding agency. The programme should be implemented as soon as possible, certainly by the beginning of the dry season in July 1992. Waiting until the end of the countrywide survey could well prove too late for the rhinos of the Selous.

The first priority is to establish the Central sanctuary in Regions 2 and 3, because it has the largest rhino population. The proposed sanctuary has a total area of 4,000 sq km, with 2,000 sq km within Region 2 (west of the dotted line on Figure 5) and 2,000 sq km in Region 3 and between Regions 2 and 3. The second priority is the North sanctuary (ca 220 sq km) in Region 1 because it is easy to do: indeed a guard post was manned year round there until relatively recently. There is plenty of scope for enlarging this reserve when the rhinos start to increase in numbers and range. Region 5 needs more survey but it is nevertheless essential to do something now to protect the rhinos already located: an initial South sanctuary of 300 sq km may be added to after more survey work, to make 700 sq km or more in total.

The North and South sanctuaries are obviously not large enough to support big populations of rhinos: the aim of all three sanctuaries, is not to protect intensively the rhinos' whole range, but to safeguard the main concentrations of rhinos until they increase in numbers and gradually extend their range outside the sanctuaries and their environs.

2. Conservation education and awareness in the villages

There is a requirement for this quite apart from the rhino conservation aspect, but it must not be neglected, and it will be discussed at the workshop referred to below. Theatre groups

performing plays that have a clear conservation message, require little technological support, and are fun to watch, have been a success in southern Africa, and there may be a role for them in Tanzania.

3. Survey

The survey of Tanzania's rhino population should continue using the existing vehicles. Unless more funds are found, and an aircraft is provided the survey will be slower than originally envisaged and will probably not be completed in less than three years. Further work is required in the Selous Game Reserve: in particular, the western part of the reserve remains to be surveyed, the area north and north-west of Sector E needs to be covered to determine the extent of the rhino distribution in Region 5, and more surveys are needed in Regions 1, 2 and 3, preferably towards the end of the rains, in May 1992, to determine the extent of rhino movements during the rainy season. At that time estimation of numbers from footprint measurements may be easier: we were working in the dry season on ground that was often covered in fallen leaves and was not suitable for footprint measurements.

Other areas in the country that should be surveyed in due course include Ngorongoro, Moyowosi, Uwanda, Ugalla River, Kisigo, Rungwa, Burigi, Maswa, Katavi, Tarangire, Mikumi and Serengeti among the protected areas, as well as parts of the huge uninhabited areas outside game reserves or national parks. There have been recent reports of rhinos in Ruvu (in Masailand), Arusha National Park and near Tarangire, but they have not been confirmed. The results of the questionnaire will help in deciding priorities for the survey.

4. Tanzania Black Rhino Action Plan

An action plan should be prepared after the countrywide survey has been completed.

5. Tanzania Rhino Project Workshop

It is planned to hold a workshop to present the results of the Selous survey and to discuss how best to put into action the conservation measures that are essential to ensure the survival of the black rhinoceros in the Selous Game Reserve. The workshop is scheduled for 4 February in Dar es Salaam, and a list of those that have been invited to attend is included in Appendix 3.

A large number of people have been invited, from a variety of backgrounds, but it is unlikely that all will be able to attend. Others may be invited at a later stage. The general sessions of the workshop will deal with an overall review of the results of the Selous survey, without publicizing the actual location of the rhinos, followed by an outline of the proposals to establish rhino sanctuaries within the reserve, the reasons for making the proposals, and the funds that are required to put the proposals into action. No details of location will be given at this stage. Proposals for village education projects and the possible establishment of a theatre group to perform plays with a rhino conservation message will be discussed. The role of antipoaching units, and how they should be operating most effectively, in the

long term, in the villages will be discussed. The need for further survey and monitoring will be stressed. Details of the results of the survey and the locations of the proposed sanctuaries will be disclosed only to selected members of the Wildlife Department and potential donors who may provide funds for rhino conservation in the Selous.

Meetings with various workshop participants individually will be necessary to prepare fully for the meeting. The workshop agenda will be available only shortly before the meeting itself. The topics to be discussed will include the following.

1. Rhino survey in the Selous Game Reserve
 The difficulties in surveying rare species that have been hunted intensively, in particular the black rhino in Selous.
 The rhinos - decline in numbers
 The problems faced in conservation of small populations
 Inbreeding depression
 Demographic and genetic risks
 Implications for the black rhino
 Immediate and long term threats
 Comparison with black rhino populations and their decline elsewhere in Africa
 Prospects for the future if no action is taken
2. The options available to save the rhinos
 Translocation
 Protection in situ
4. Proposals for Selous Rhino Sanctuaries
 Number and location
 Boundaries
 Guard-posts, Roads, Airstrips, Vehicles
 Staff and leadership: pay and allowances
 Patrol schedules and training
 Funding: budget and potential donors
 Fire Management
 Sanctuaries as models for eventual return of manned guard posts throughout the Selous.
5. Conservation Education Projects in the villages around Selous
 Coordination with SCP/GTZ programme
 Theatre group for performances of plays with conservation message
 Role of antipoaching teams in villages
 Personnel and funding needed
6. Survey and monitoring of rhino populations
 Selous:
 Continued surveys - priorities
 Monitoring of rhinos in sanctuaries
 Elsewhere in Tanzania
 Personnel and funding
7. Rhino conservation action plan for Tanzania
 Timetable for production
 Personnel and funding

Appendix 1

Key to Sector Codes:

A: Lukuliro - Namakororo - Nunga - Nanteme
 B: Kidai - Kibambawe - Kugota
 C: Nambalapi - Luele - Likwera - Likungile
 D: Nahomba - Likwaju
 E: Naluale - Ligombe - Namahaha - Kilowero - Minyonyo
 F: Likuyu Sekamaganga - Mkucho - Kahunde - Msawate
 G: Mkongo - Kibundi - Kitope (Mswega)
 H: Narung'ombe - Nyanga - Mingwea
 J: Mpapule - Ngondolo - Luwimbi - Muhinje
 K: Beho Beho - Msini - Hatumbuluwa - Kipalala - Tagalala
 L: Barani - Nakilala - Kichuye - Mwende - Mkumbi - Nandachi -
 Kombanjiko - Mingyenye
 M: Mpanga - Mkindu
 N: Njenje - Mbarangandu - Kibaoni - Likale - Mihuro
 P: Madaba - Namkongo - Shuguli - Mbwera - Lijungu - Likuyu
 Q: Stiegler's Gorge - Sumbadsi - Ruaha
 R: Mkangira - Mliwasi - Mliwati - Mihangalaya - Ngindo - Mahoko
 S: Mkuyu - Humbalilo - Mengyenye
 T: Ngarage - Maji Mabovu - Luhanyando - Machungwa

Appendix 2Notes on project equipment in Dar es Salaam

The Suzuki (STH 2762) and the two Landrovers (STH 2760,STH 2761) are in storage at the Oyster Bay Hotel together with other project equipment. Six months storage fees have been paid in advance (up to 1 June 1992) but will be refunded at the rate of US\$100 per month if the vehicles and equipment are collected earlier. The two Bedford lorries (STH 2758, STH 2759) are parked at the Ivory Room and the keys are in the care of the site manager.

Landrover STH 2761 was involved in an accident in Dar es Salaam on 19 November and sustained damage to the front nearside wing, wheel and bumper and a broken windscreen. Landrover STH 2760 is due for a full service before going into the field again: it has had a front driver's side coil spring replaced, and needs a rear shock absorber replacing, but otherwise is in good condition. Four spare tyres and two spare wheels should be purchased before the next field season.

BP Tanzania provided us with 2400 litres of Gasoil, which has been charged to our credit account at STH73.65 per litre plus taxes. The Wildlife Department has not provided the tax exemption certificate that would enable BP to supply fuel at the duty free prices and thus make their donation go further in quantity of fuel. BP have issued an invoice for STH108,240.00 for the 12 drums that we took the fuel in, but we have since returned the drums, so the only charge so far against our credit account should be for the 2400 litres of Gasoil (STH211,526,85).

Appendix 3

Some potential workshop participants

<u>Tanzania Rhino Project:</u>	A. Laurie A. Chisanyo H.Y. Ndauka
<u>Wildlife Department:</u>	
Dar es Salaam:	Mr Mosha
Morogoro (R.N.R.O.):	Victor Lyamuya
Songea (R.N.R.O.):	Mr Ndunguru
Anti-poaching:	(To be determined)
<u>Selous Game Reserve:</u>	
Project Leader:	Gerald Bigurube
Deputy Project Leader:	Miriam
The Four Sector Managers:	Western (Msolwa): Eastern (Kingupira): Southern (Liwale): Northern (Matambwe):
Game scout (Sekamaganga):	I. Sudi
<u>National Parks:</u>	
Mikumi:	J. Balozi
<u>Serengeti Project:</u>	B. Mbano
<u>F.Z.S.:</u>	M. Borner
<u>G.T.Z./S.C.P.:</u>	R. Baldus
<u>Hunting safaris:</u>	L. Samaras
<u>Tourism:</u>	C. Bailey
<u>W.W.F.:</u>	J. Boshe Mr Melamari N. Stronach
<u>P.A.W.M.:</u>	N. Leader-Williams C. Kibasa R. Lamprey
<u>W.C.S.T.:</u>	P. Nnyiti E. Boswell
<u>Kenya Wildlife Service:</u>	R. Brett
<u>F.A.O.:</u>	W.A. Rodgers

Abbreviations:

R.N.R.O.	Regional Natural Resources Officer
F.Z.S.	Frankfurt Zoological Society
G.T.Z./S.C.P.	Deutsche Gesellschaft für Technische Zusammenarbeit The Selous Conservation Programme
W.W.F.	World Wide Fund for Nature
P.A.W.M.	Planning and Assessment for Wildlife Management - a project of the African Wildlife Foundation
W.C.S.T.	Wildlife Conservation Society of Tanzania
F.A.O.	Food and Agriculture Organization of the United Nations

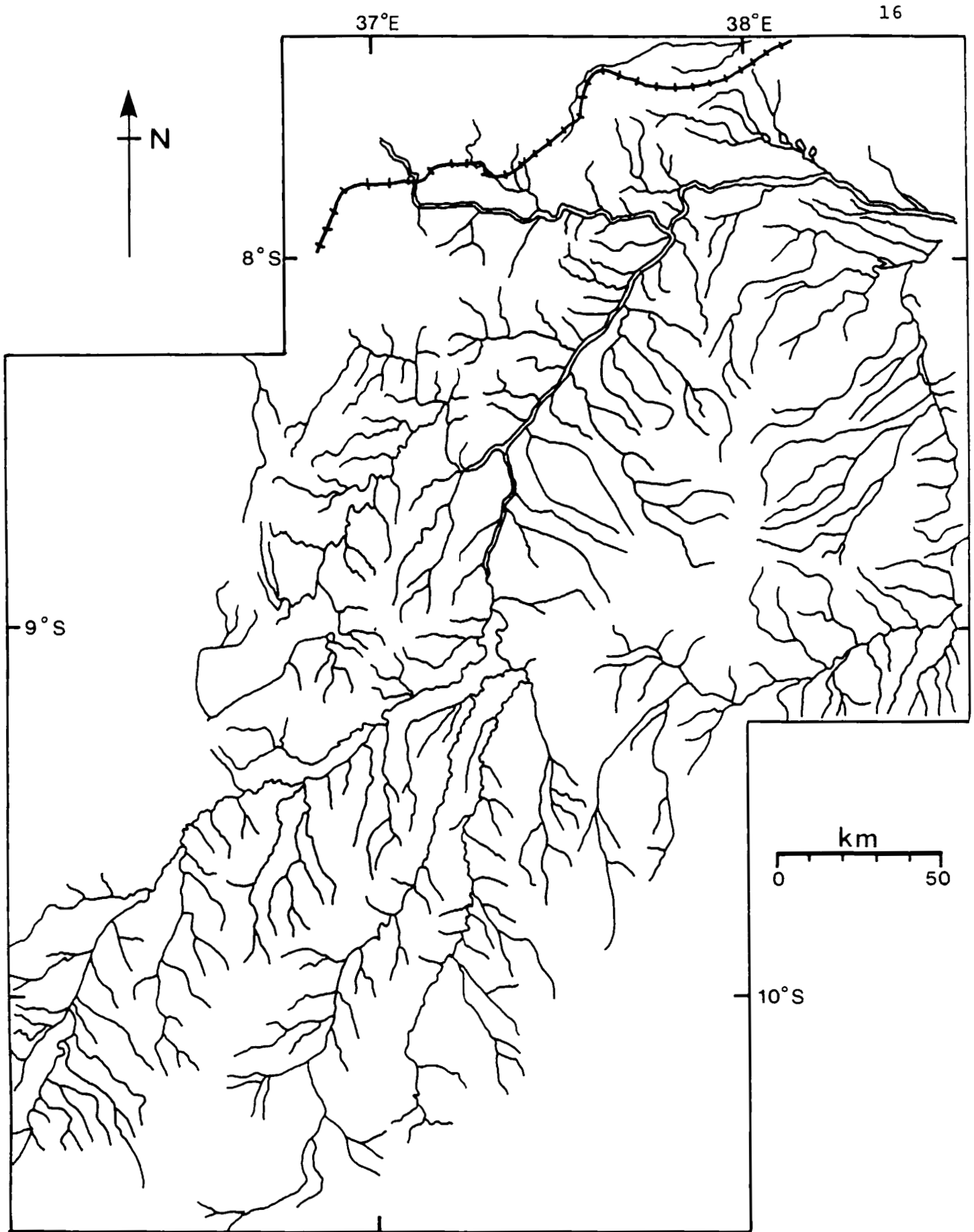


Figure 1. The Selous Game Reserve and its immediate surroundings

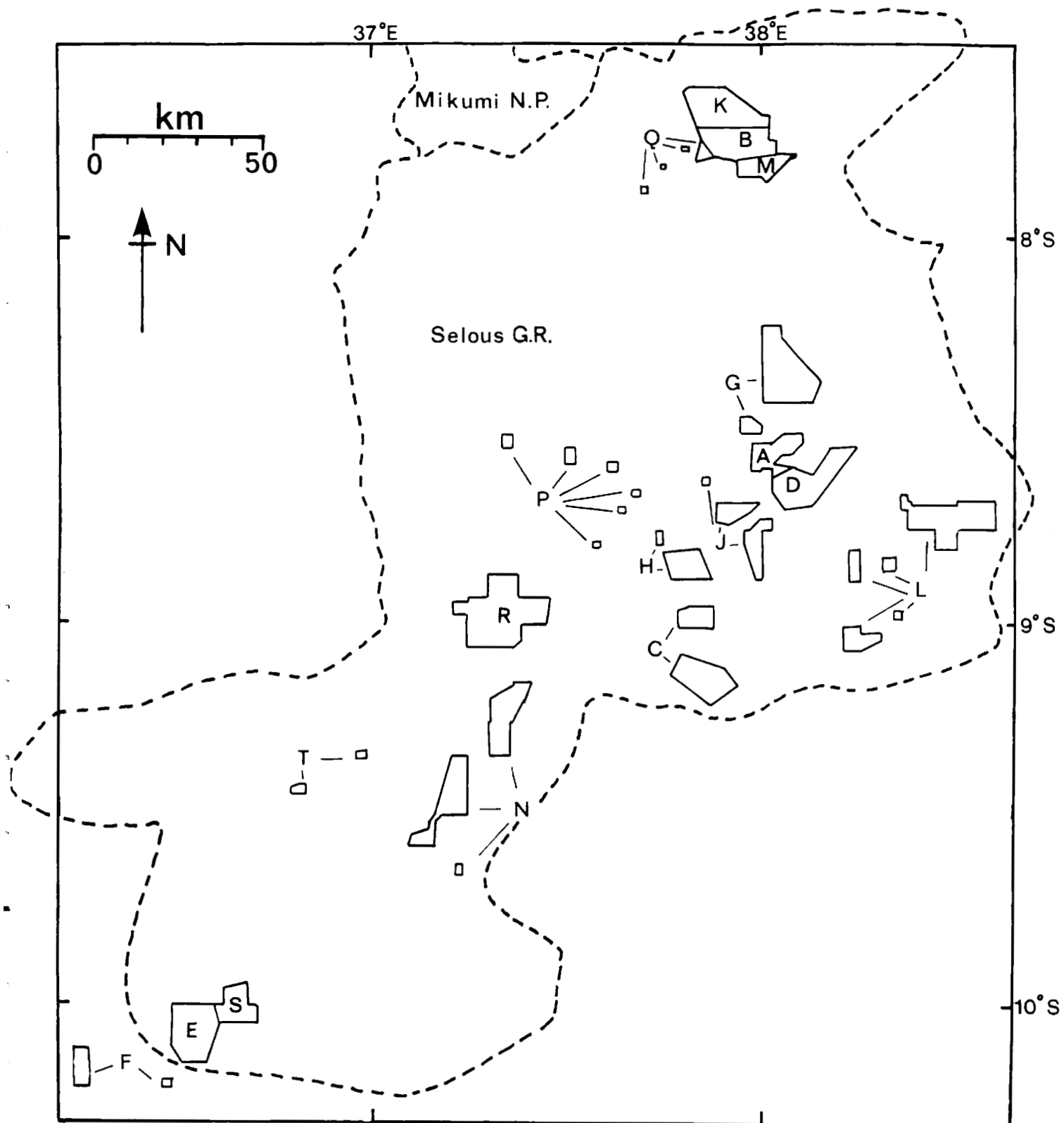


Figure 2. The sectors surveyed, identified by their code letters, and the approximate boundaries of the Selous Game Reserve.

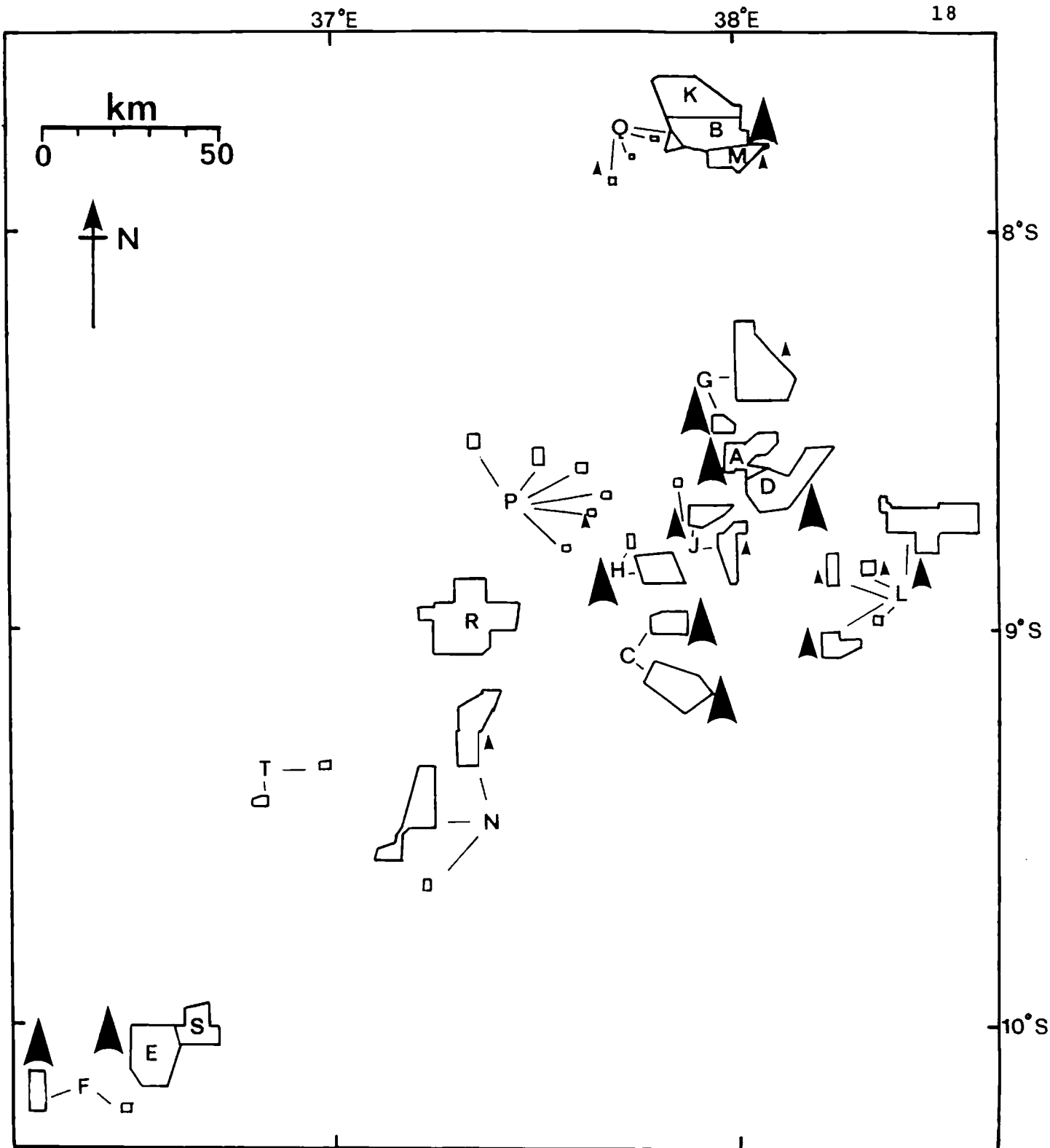


Figure 3. Distribution of records of rhino in Selous Game Reserve

Key:

Symbol



Indicates, for the relevant sector or part thereof:

Rhino(s) recorded during this survey



Rhino(s) recorded by other observers during 1991



Rhino(s) recorder by other observers in 1989 or 1990

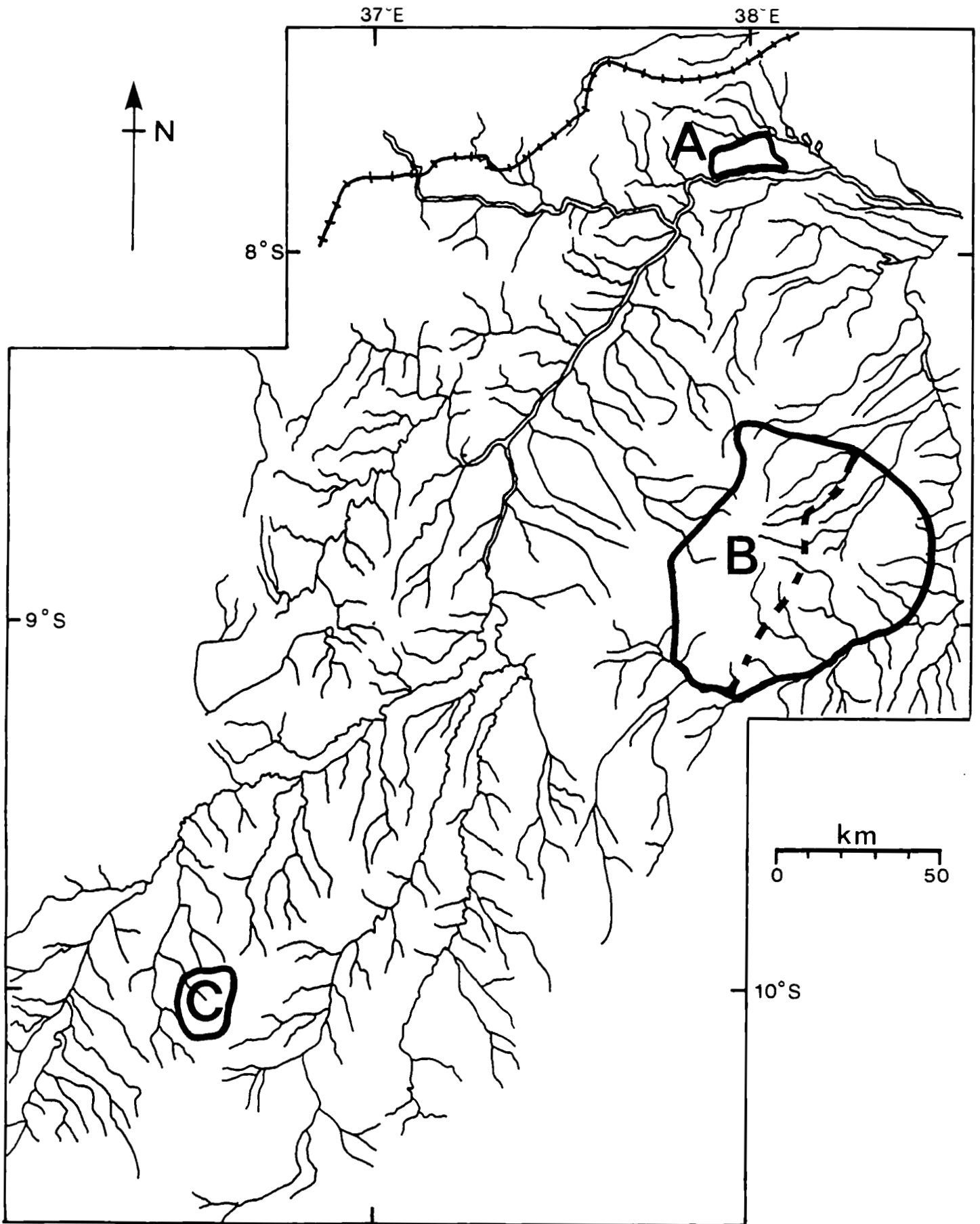


Figure 5. Approximate location of three proposed rhino sanctuaries
A = North Sanctuary, B = Central Sanctuary, C = South Sanctuary

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The Project is a joint operation by three organizations. The Faith Foundation and the Frankfurt Zoological Society financed the survey, and the Tanzanian Wildlife Department provided staff for the survey and general logistic support, including accommodation at guard posts, help with radio communication and flying time in a light aircraft. I am very grateful to the many companies who made donations of equipment, in particular to Landrover of Great Britain who donated the survey vehicles. I had considerable support and help from many people and organizations in Tanzania. Shell Petroleum Development Tanzania kindly provided accommodation and office and medical facilities in Dar es Salaam, often at short notice and at inconvenient times. They also helped with car repairs, storage of equipment and with immigration formalities: one of their visiting contractors (from Racal Survey) even repaired the GPS Personal Navigator! BP Tanzania donated diesel fuel for the survey and lent the drums in which to take it to the field. The Wildlife Conservation Society of Tanzania allowed Andrew Chisanyo and me to use their office communication and desk-top publishing facilities and helped in many other ways with advice and introductions. World Wide Fund for Nature (WWF) assisted with fuel for flights to and over the Selous and with communication through their Dar es Salaam office. In the Selous Tanganyika Wildlife Safaris, Luke Samaras Safaris, Richard Bonham Safaris and Beho Beho Safari Camp helped in various ways with accommodation, communication, vehicle repairs, and information about rhinos. Kubo, of the Japanese Volunteer Service, Richard Copsey of the African Wildlife Foundation and the mechanic from Kibaoni Hunting Camp put the vehicles back on the road on several occasions. Neil and Rosie Stronach, of the WWF, helped with advice, information, vehicle repairs, and a warm welcome at Kingupira whenever I passed through. British Airways allowed excess baggage free of charge. Many thanks to all those who helped, but who are not mentioned by name - there are too many to list here individually. Finally, the survey would have been impossible without the hard work of my team members, who always performed their tasks cheerfully and without complaint, and cared about the results so that it really felt like a team with a purpose.