

Redirected from France!
I have indicated some botanical errors (taken from Ridding 1975) — F. Dewett- Lemaire.

BLACK RHINOCEROS AND OTHER LARGE MAMMALS IN THE MWABVI GAME RESERVE

**A CONSULTANT REPORT TO THE MALAWI GOVERNMENT
SPONSORED BY THE SOUTH AFRICAN NATURE FOUNDATION**

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My time in Malawi was a pleasure thanks to the courtesy of Malawians in general and the hospitality I received from Mr and Mrs Anstey, Mr Bannister, Mr and Mrs Bleazard, Mr and Mrs Hunter, Mr and Mrs Kombe and Mr and Mrs M. Turner.

Finally I thank my wife for correcting and typing this report.

INTRODUCTION

This report presents the outcome of a consultancy undertaken for the Malawi Government between the 4th and 29th October 1976. The project was financed by the South African Nature Foundation. The Consultant's terms of reference were :

1. To count the black rhinoceros (*Diceros bicornis* L.) in the Mwabvi Game Reserve,
2. To make a general survey of the other large mammals in the Reserve, and
3. To make recommendations for the area's long term future as a Game Reserve.

National Parks and Game Reserves are political human concepts. Their survival depends more upon the attitudes of people and their needs than on any flora or fauna that they may contain. From the outset of this consultancy it was apparant that the issues most in need of attention in the Mwabvi Reserve were those concerning humans and it is to these that I have addressed myself in greatest detail. The philosophy that permeates the report is that once humans accept, or at the very least tolerate the Reserve, the management of animal or plant life in it becomes relatively simple.

THE MWABVI GAME RESERVE

In Malawi a game reserve is an area set aside for the protection of fauna, in which residence or trespass is banned and legal control of human activity is complete.

The Mwabvi Game Reserve takes its name from a stream which is a major tributary to the seasonal Thangadzi river in Malawi's lower Shire valley (fig. 1). In turn this stream probably derived its name from the Chewa term for a tree (*Erythrophleum sauveoleus* (Guill & Perr)) which favours water courses and from which concoctions were made for use in the poison ordeals of traditional Maravi justice.

In 1928 the British Protectorate Government established the Thangadzi River Reserve somewhere in the vicinity of the present Mwabvi Reserve. I was not able to find any description of its boundaries, but it was very small (G.D. Hayes pers. comm.) and probably declared to give some protection to black rhino and possibly nyala (*Tragelaphus angasi*). Absence of reference to this early reserve leads one to assume that its sanctity was neither enforced nor effective. In 1951 a Mwabvi Game Reserve was proclaimed (see Game Division file 3/5/1, letter 4/8(55) dated 19th May 1953). Its boundaries encompassed c.50 square miles (131 km²) as outlined in fig. 1. However, the area was not officially declared "public land" and the boundaries formally defined until 1966 (Malawi Government Gazette Notice 136 of 1966). The *raison d'être* for the formation of the 1951 Mwabvi Reserve was

"... to preserve some of the few remaining black rhino in Malawi ..." (Anon 1976a)

In 1975 the Reserve's boundaries were substantially increased (fig. 1). It now extended to the Malawi/Mozambique international frontier and encompassed a total of 134 square miles (351 km²). This development required the removal of a number of peasant cultivators from within the

new boundaries. Its purpose was primarily to protect water catchments by preventing cultivation on the steeper slopes of the head-waters of streams in the western Shire watershed. While the extension increased scope for flora and fauna conservation substantially, it is quite clear that the legal status of game reserve was invoked for administrative expediency.

Quoting from the Master Plan for Malawi National Parks and Game Reserves (Anon 1976a) :

"Since its inception, the (Mwabvi) Reserve has been managed on a care and maintenance basis ... There are several ... rough dry season tracks connecting four scout camps; however all but Migudu and Mwabvi are now used only as patrol camps. A total of eight scouts serve as the resident protection staff ..."

In essence this means that through shortage of funds and greater priorities elsewhere, the Mwabvi Game Reserve has seen little development. The Department of National Parks and Wildlife is conscious of the need to develop the Reserve and in 1973 asked the National Fauna Preservation Society (N.F.P.S.) for assistance. As a result Mwabvi was adopted by a sub-committee of the Society which set about trying to acquire a better knowledge of the area and to stimulate general interest in it. Largely because of this, it was visited in 1975 by a group of students from Aberdeen University. They stayed in the Reserve during July and August, mapped the vegetation and endeavoured to make faunal checklists. Regrettably they failed to publish their results or even have the courtesy to list their findings for the Malawi authorities. Fortunately the expedition was accompanied by a Miss Clare Ridding from the Lilongwe Land Development Programme (Ministry of Agriculture) who produced a detailed interim report. In this she summarised geological information about the area, produced a map of vegetation types and made comments on the Reserve's fauna. This report provides a working base for anyone wishing to study the area's flora and some detail from Ridding's

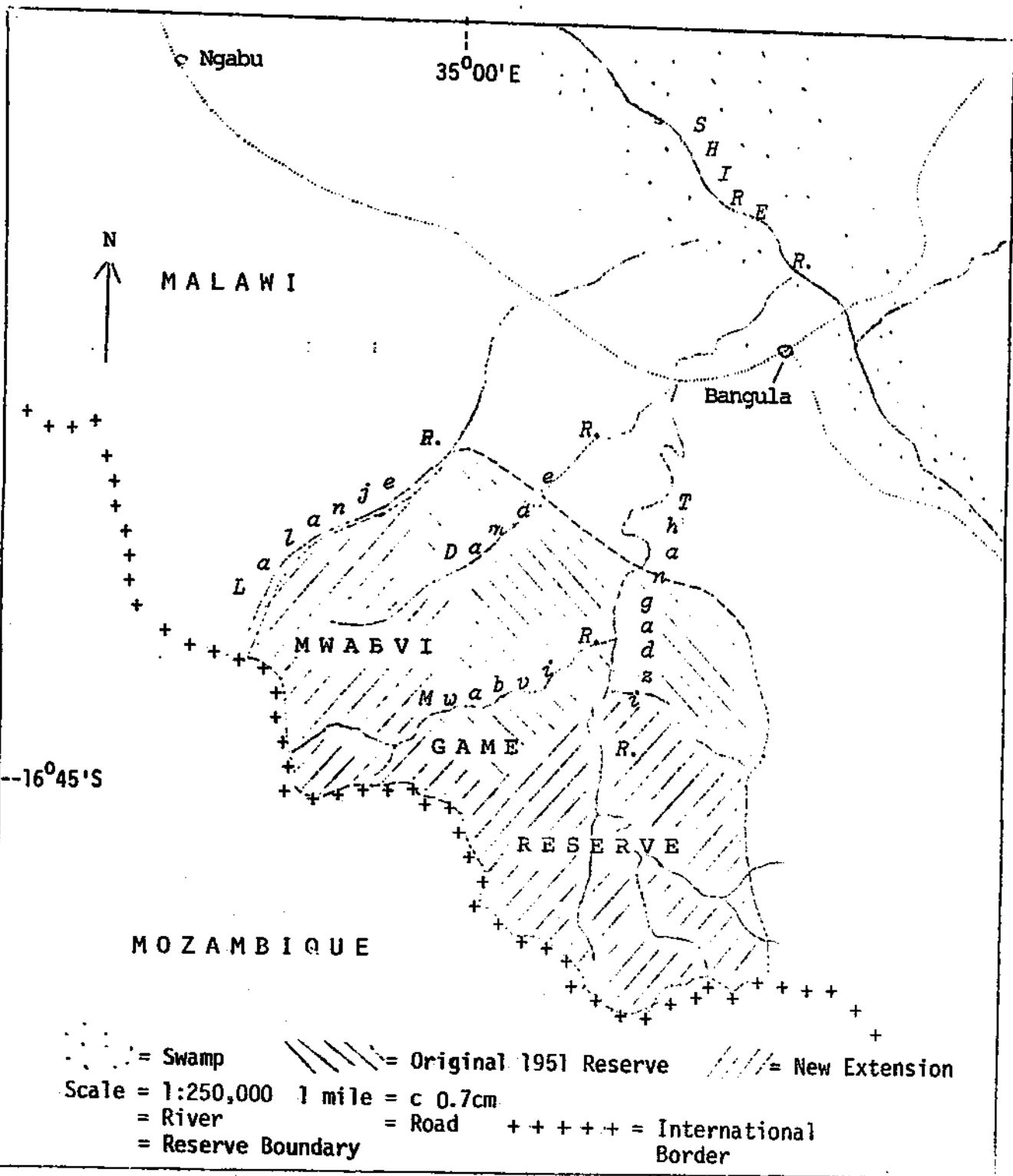
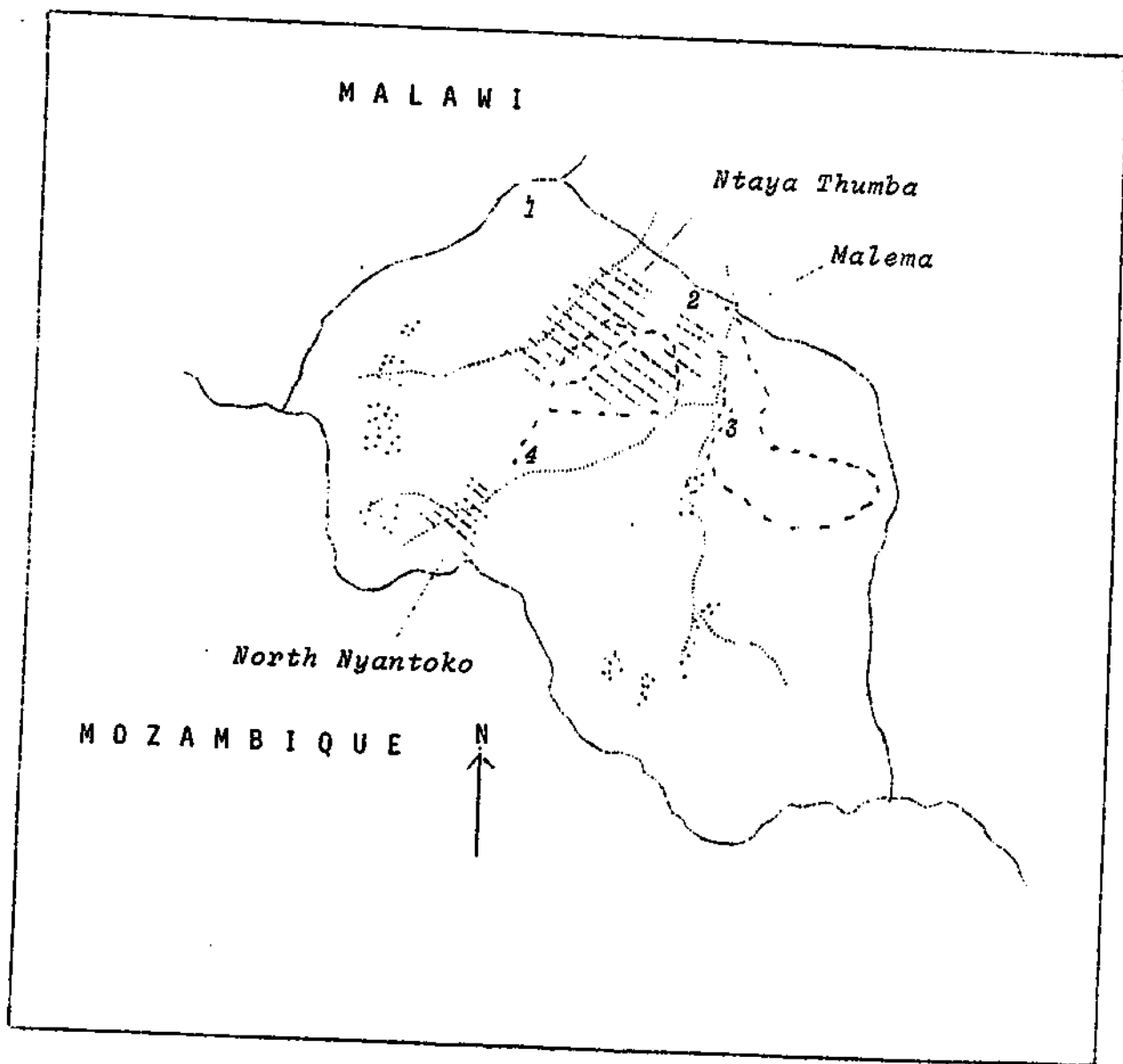


FIG. 1 The original Mwabvi Game Reserve boundaries and the 1975 extensions.

vegetation map is reproduced here in fig. 2.

The Mvabvi Game Reserve harbours tsetse flies (*Glossina morsitans*) and in this respect is an island in an area relatively free of them. This is a cause of certain concern with the Veterinary Department (e.g. see letter 91 in Dept. of Nat. Parks & Wildlife file 3/5/1).



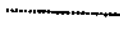



- | | | | |
|---|-----------------------|---|--------------------|
|  | = River courses |  | = Ground transects |
|  | = Thickets | 1 = | Madziabango Post |
|  | = Recently cultivated | 2 = | Migudu Post |
| | | 3 = | Matope Post |
| | | 4 = | Mwabvi Post |

Fig.2 The location of the main thickets, recently cultivated land and Guard Posts in the Mwabvi Game Reserve. Also shown are the ground transects made during this consultancy.

THE MWABVI RHINOCEROS (*Diceros bicornis*)

Background

Records in the Department of National Parks & Wildlife were searched for information on the past and present distribution and numbers of rhino in Mwabvi. The following sparse data were obtained :

1. From file 3/1/4 an extract from "Notes on Game Distribution in Nyasaland - 1st Battalion, The King's African Rifles" (a compendium made by the battalion's officers) read :
 "... There are probably not more than ten individuals. They move across the Thangadzi river. They are very shy and seldom seen."
 This was written in 1926.
2. In response to a questionnaire sent out by FAO in May 1967, the Senior Game Ranger Southern Region wrote that the Game Guard in the Reserve thought that there were 16 rhino in it. The Ranger held that this was too high and on the basis of spoor counts felt that there were probably between 8 and 10.
3. Ridding (1975) wrote :
 "Rhino were never seen during the two months of the (Aberdeen University) expedition and have not been seen during any of the N.F.P.S. meets. Fresh spoor was found on 21 occasions, particularly at waterholes. Dung and old spoor was found six times and two rhino rubbing posts were identified by Game Guards ... Unfortunately these records were rarely made simultaneously ..."
 On the basis of spoor measurements - width across the widest part of the foot (it is not clear whether she was able to distinguish between fore and hind feet, which are of different dimensions) Ridding concluded that there were a minimum of 4 adults and 1 sub-adult rhino in the Mwabvi.
4. In an anecdotal report to their financial sponsors, the Aberdeen students claimed that there may have been between

8 and 30 rhino in the Reserve. However, they presented no supporting evidence and it is difficult to reconcile this statement with Ridding's. On the basis of Ridding's fundamental caution, I have accepted her estimate and rejected the students'.

- 5. Game Guard patrol reports for the years 1970, '71, '72, '73 and '74 were examined. The information was erratic. The number of rhino sightings, including records of spoor seen were as follows :

1970 = 26, 1971 = 30, 1972 = 6, 1973 = 30, 1974 = 33.

On the face of it and with the exception of 1972, these are constant. They might be taken as evidence that a constant patrol effort produced a constant number of rhino sightings. However, the 1970 and '71 records were all of actual rhino sightings with NO spoor. Seventysix percent of the 1973 and '74 records were of spoor and not actual rhino sightings. Sightings and average group sizes in the patrol records were as follows :

1970	26 sightings	averaging	1.9 rhino
1971	30	"	" 2.8 "
1972	6	"	" 2.3 "
1973	12	"	" 3.4 "
1974	12	"	" 1.9 "

Rhino are not easy animals to sex, particularly when they are running away through scrub and bush. Running away was the most frequent activity recorded by the Game Guards, yet they claimed to have sexed all of the 196 adults seen in 86 sightings. They also recorded 5, 6, 7 and 9 rhinos consorting as herds. This is unusual, for while black rhino will aggregate around salt-licks and water-holes, they are not on record elsewhere as forming cohesive herds.

In 1970 and '71, the patrol sheets indicated that only 4% of rhino sighted were browsing. In 1972, '73 and '74 this had

risen to 33% of activity recorded.

The Guards were appraised of the unusual aspects of their reports and conceded without further ado that they had made them up. Thus, what should have been an extremely valuable set of records turned out to be worthless. Nonetheless they must have played an important part in creating past over-estimates of the number of Mwabvi rhino.

Once the inaccuracy of the written records had been established, the Guards were questioned verbally on their knowledge of rhino. The following emerged :

- 1) Rhino spoor was seen frequently around water at Fodya in the Mwabvi gorge, Nankhungu stream, Nyangalambe and Dande.
- 2) No rhino spoor has been seen recently from the Thangadzi river despite abundant watering places.
- 3) Rhino are not commonly seen because they confine themselves to the thickets (I use Ridding's term here, though in fact dry forests would be a more appropriate term) of Ntaya Thumba, Malena and on the north end of the Nyantoko ridge (fig. 2). They only emerge from these dense patches to drink.
- 4) In the 9 months - January/September 1976 - they conceded having seen only one rhino.
- 5) They were unaware of any rhino having been poached either recently or in the past.
- 6) Only one rhino skeleton had been seen to their recollection and that was sometime in the late 1950s.

Senior Game Warden Alfred Kombe, under whose control Mwabvi falls, said that in all the patrols he had personally carried out in the Reserve, he had only seen rhino on 2 occasions. He felt that it was likely that he had seen the same animal twice.

G.D. Hayes and N. Hunter of the N.F.P.S. who had both spent time in the Reserve, confirmed that rhino tracks were readily seen around the watering points listed by Ridding (1975) and the Game Guards. They also confirmed the general observation that the rhino were particularly associated with the thickets.

The evidence from the K.A.R. game notes, the estimate by the Senior Game Ranger in 1967, Ridding's (1975) records, the impressions of Hayes, Hunter and Kombe, together with the verbal material from the Game Guards, present a cohesive and consistent picture. It would seem that for the past 50 years there have been few rhino in the Mwabvi area. The only estimates to exceed 10 were the single Game Guard claim of 16 in 1967, the falsified Game Guard patrol sheets (in which the implication was that there must have been more than 10 although it was never stated) and the Aberdeen undergraduates' estimate of 30, for which there was no evidence and direct conflict with Ridding's treatment of the same data. Other than the K.A.R. reference to rhino crossing the Thangadzi in 1926, the combined evidence indicates that the Mwabvi rhino restrict themselves to a relatively small portion of the Game Reserve (fig. 3), comprising c.36 square miles (94 km²). The only immediately apparent feature of this range is that it seems to encompass most of the thicker vegetation in the Reserve. Rhino use of the 36 square miles is very uneven, with the bulk of their time being spent in the Ntaya Thumba, Malema and north Nyantoko thickets which amount to 10.6 square miles (27.7 km²).

Counting Methods

The most certain method for establishing the identity and number of a few rhino living in a small area of thick vegetation, would be to follow all tracks and identify each individual (rhino being readily recognisable from one another from sex, size and horn shape, Goddard 1966). However, as a method it is time consuming. In the broken ground of Mwabvi, with the erratic breezes that characterise such situations, as often as not the rhino would scent their follower before he could sight them.

If all tracks were followed when and as come across, there would be unavoidable re-sightings and consequent waste (through duplication of effort) of time. Further in the conditions prevailing in Mwabvi during the dry season, hard ground and a carpet of leaves would make tracking slow work. Thus tracking and individual identification did not seem an appropriate technique for counting rhino in the circumstances of this consultancy. An alternative giving higher returns for time and effort spent was needed. Such an alternative is observation from the air, providing that vegetation and terrain permit a reasonable chance of seeing the object searched for.

Ridding (1975) stated that the vegetation of Mwabvi was too dense to permit large mammals to be seen from the air. This was found to be incorrect. With the trees leafless as they were in October 1976, large mammals could be seen easily. Even in the "thickets", where conditions were far from optimal for aerial observation, far more could be seen from the air than laterally from the ground. It was therefore decided to search for Mwabvi's rhino from the air, and compensate for difficult conditions by repetitive counting and spending as much time over the rhino habitats as possible. This, it was felt, would yield the greatest volume of information per unit time spent.

Using the Department of National Parks & Wildlife's Supercub (PA18) aircraft flown by the consultant, a total of 19 hours was spent in the air over the Reserve. This flying was undertaken between the 12th and 20th October (both dates inclusive) and covered all hours of the day in a variety of conditions that ranged from very hot and sunny to wet and overcast. The pilot carried out most of the observations, but was assisted on several occasions by the Game Warden Mr. Alfred Kombe and Mr Peter Bannister of the Shire Valley Agricultural Development Project.

Of the 19 hours spent searching over the Reserve, 11 were devoted to repeated examinations of the Ntaya Thumba, Malema and north Nyantoko

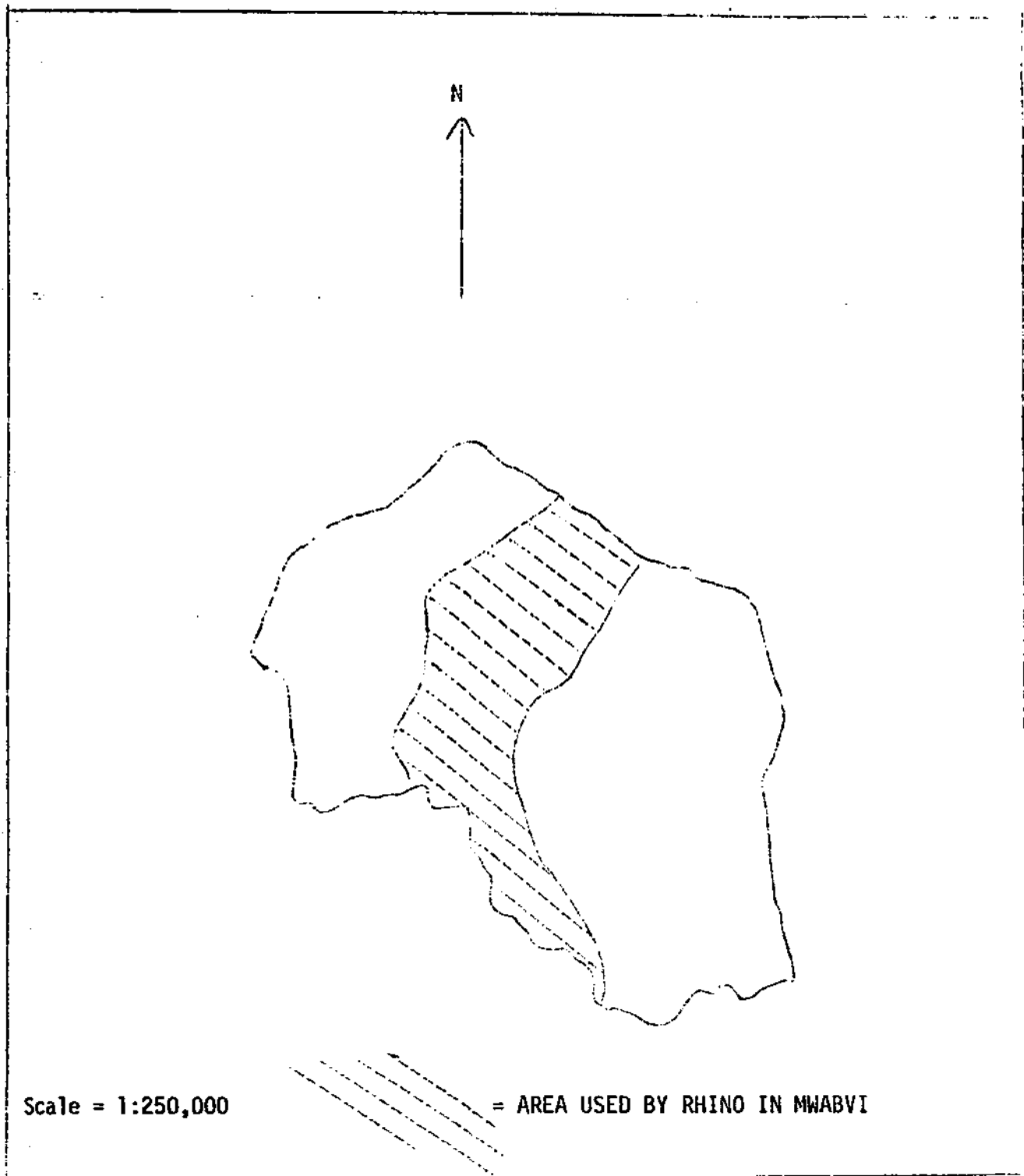


Fig. 3. Rhino distribution in the Mwabvi Game Reserve .

thickets, whose combined areas total 10.6 square miles (27.7 km²). The aircraft quartered and circled these patches of dense vegetation, flying at 65 mph (105.3 kph) at between 200 and 300 feet above the ground. From time to time low runs were made at tree-top height to create disturbance and induce animal movement, which enhances visibility. Immediately after each low run the aircraft was returned to observation level and circled around the disturbed area. Observations were made through the aircraft's starboard side with both door and window open and folded out of view. A strip of c.220 yards minimum width (202.5 m) was under observation continuously.

The actual area of ground searched while flying over the thickets was computed :

time flown x speed x strip width

$$11 \text{ hrs} \times 65 \text{ mph} \times 0.125 \text{ mile} = 89.4 \text{ sq miles (234.2 km}^2\text{)}$$

The aerial coverage was thus equivalent to examining their entire area 8.4 times.

The more open vegetation outside the thickets in the rhino range permitted greater visibility. In consequence the rest of the Reserve was searched from a series of parallel flight lines (fig. 4) flown at 80 mph (129.6 kph), at the same height of 2-300 feet, observing overlapping search strips of c.440 yards (405 m). The area searched may be computed in the same manner as the flying over the thickets :

$$8 \text{ hrs} \times 80 \text{ mph} \times 0.25 \text{ mile} = 160 \text{ sq miles (419.2 km}^2\text{)}$$

Thus aerial coverage outside the thickets was equivalent to examining at an intensity of x 1.3.

Results

The location of all rhino sightings are given in fig. 5. A single rhino was seen in the Mtaya Thumba thicket on 3 separate occasions. From size and horn shape it could have been the same animal on all 3, but this is not certain.



Fig. 4. Diagrammatic indication of flight paths to show aerial coverage of the Mwabvi Game Reserve outside the thickets.

A single rhino was seen in the Malema thicket on an occasion when none could be found in Ntaya Thumba. From size and horn shape it could have been the same rhino seen previously and subsequently at Ntaya Thumba, but again it was not possible to be absolutely certain of this.

A female with a large sub-adult were seen once in the Malema thicket. From both size and horn shape, neither could have been the singleton seen in Ntaya Thumba or Malema.

A large single rhino, thought to be a male, was seen outside the thickets in the south-west of the Reserve. From the shape of its horns it was very distinctive and certainly not one of those seen in the thickets.

If the single rhino seen in Ntaya Thumba and Malema was in fact the same animal on all 4 sightings, then the count indicates that there are only 4 black rhino in the Mwabvi Reserve. If, however, the four sightings represent different animals, then the total is 7.

Discussion

Goddard (1967a) and Caughley (1973) have emphasised the difficulty of counting black rhino from the air. The species tends to stand in thick cover and only move when the aircraft actually passes over them. Thus Goddard (*op. cit.*) showed that on conventional aerial transecting, the true density of black rhino is likely to be about 4 times the observed density. Later he was able (Goddard 1969) to reduce this bias by counting from low altitude on a very narrow strip, with the observer scanning *behind* the 'plane.

The difficulty of sighting rhino will have been greatly reduced during the Mwabvi count as the aircraft passed over a given spot several times, unlike the transecting described by both Goddard (1967a & 1969) and Caughley (1973) in which a single pass only was made. By continuously

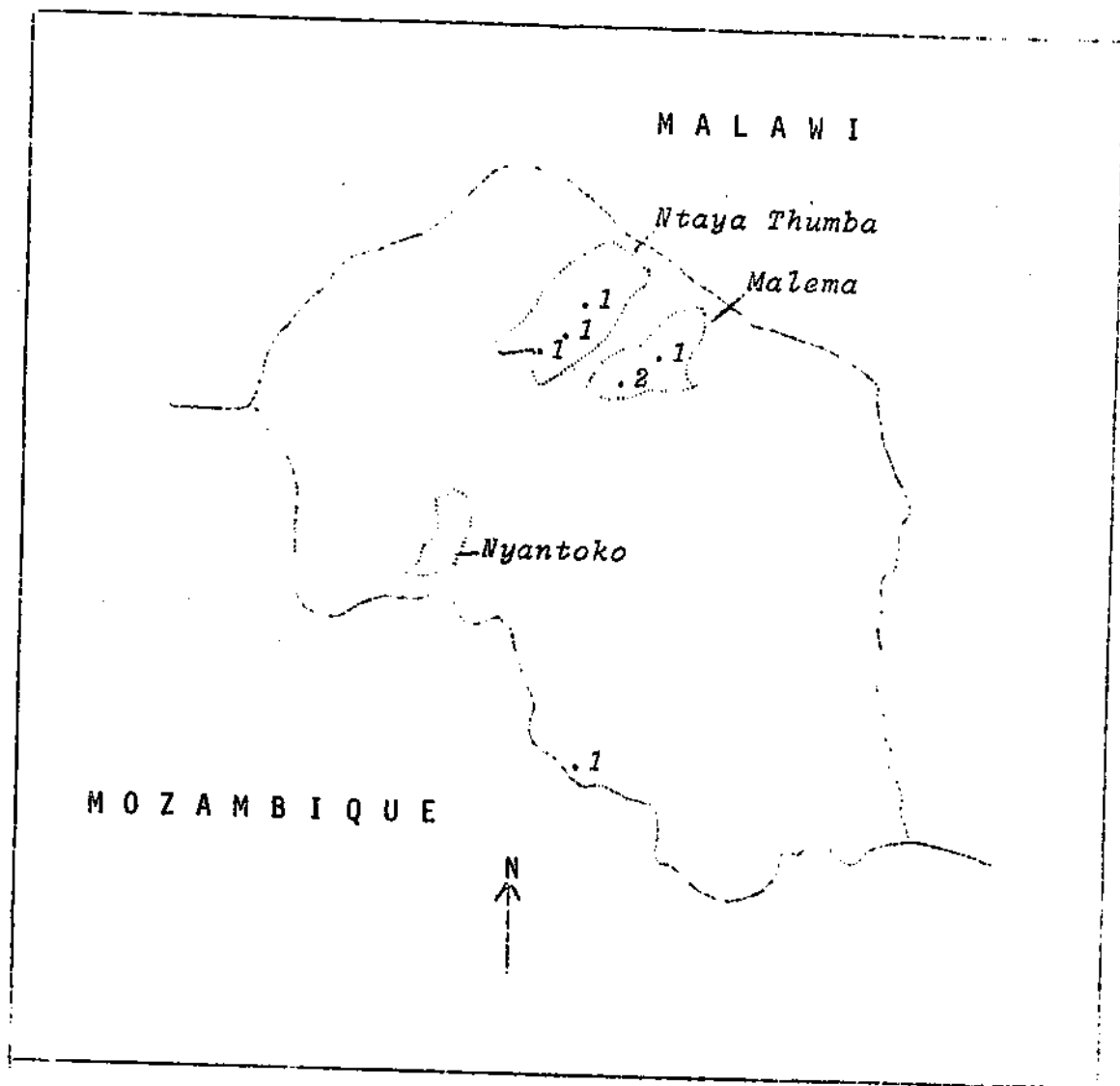


Fig.5. Rhino sightings in the Mwabvi Game Reserve during this consultancy.

circling overhead it provided far greater disturbance than it would have on a single pass, and a rhino missed on one circuit stood increasing chances of being seen on subsequent passes. In addition the circling permitted the same place to be examined from many different angles. Finally the sheer intensity of observation is likely to have reduced the chance of persistently missing individual rhino. Nowhere in the literature is there a record of so small an area as the thickets having been searched from the air so intensively.

The pilot and both observers who assisted him were confident that they could see animals easily. In support of this it is worth noting that in the thickets we saw porcupines (*Hystrix*), suni (*Nesotragus*), bushpig (*Potamochoerus*), hyrax (*Procavia* or *Heterohyrax*) and forest guinea fowl (*Guttera*). None of these are commonly seen from the air.

Yet despite this evidence of good visibility it is quite possible that some rhino were missed. For example, the thickets were flown over on several occasions when no rhino were seen at all, when it is unlikely that those seen at other times were absent. Those located were difficult to relocate, even when their approximate position was already known. However, in view of the intensity of the aerial searching it is held improbable that there would have been more rhino unseen than were seen. If the possibility that there were as many rhino unseen as there were seen is considered, then the population could be as high as 8 (or 14 in the event that the rhino seen did not involve any re-sightings).

It should be borne in mind that the count covers only a short space in time. The proximity to the international border of the one rhino seen outside the thickets, suggests strongly that its range was not confined to Malawi. It is thus possible that some Mwabvi rhino were in Mozambique at the time of the count.

That no rhino have been recorded drinking in the Thangadzi river in recent times, even though some of its permanent pools are closer to the Malema thicket than the water-holes that are used, implies conservative and restricted ranges. This is reinforced by the infrequency with which they have been sighted outside their thickets. Goddard (1967b) confirmed extreme conservatism and recorded small home ranges for rhino in Ngorongoro, Tanzania (adult males 6.1 sq miles, adult females 5.8 sq miles) and Olduvai, Tanzania (adult males 3.5 sq miles, adult females 13.7 sq miles). Caughley (1973) was able to relocate known individuals usually within 0.38 sq mile in the Luangwa valley. Thus the bulk of local evidence plus that recorded elsewhere makes extensive trans-border movement unlikely.

Little research has been done on rhino densities in the deciduous woodlands of central Africa and as a result any estimate of how many rhino Mwabvi could carry must be speculative. However, in its range in Africa, the black rhino occupies such a varied range of habitats, from arid semi-desert to the moist woodlands of central Uganda (e.g. Kabalega Falls National Park) and from montane moorlands to coastal scrub, that the species is obviously catholic and adaptable in diet. The nearest areas to Mwabvi where rhino have been studied, albeit cursorily, are probably the Luangwa Valley National Parks in Zambia. While the vegetations there are not identical to those in the Reserve, they contain many common components. It is thus worth noting what two workers - Caughley (1973) and Liberg (1973) say about rhino in them :

Caughley : "Rhino were found in all vegetation types, and in all land systems as defined by Astle *et al.* (1969) ... Known individuals could easily be relocated on the ground within an area of 1 km^2 . Figures 16 and 17 (of Caughley's paper) indicate minimal seasonal movement ... $0.4/\text{km}^2$... can safely be used as an estimate of density in the parks."

Liberg : "The association indices for rhino are very low ... indicating a non-specialised species. The density figures are rather

even over all 6 strata in the late dry season" (the 6 strata corresponded with different vegetations).

The vegetation types in which both Caughley and Liberg worked included *Brachystegia* and *Colophospermum mopane* woodlands. Both of these occur in the Mwabvi Reserve outside of the thickets (Ridding 1975). It thus seems curious that rhino are not recorded from them. If Caughley's density estimate for the Luangwa populations was applied to the Mwabvi one would expect the area to hold a population of c.140 rhino. The absence of any evidence of rhino poaching in Mwabvi and an apparently more or less constant population over a span of 50 years suggests that there may be some environmental/nutritional constraint upon their expansion. Only research over a complete annual cycle would reveal what such a limit might be. Suffice it that with so few subjects that are both shy and confined to a dense vegetation, any nutritional study would be time consuming.

One possible constraint upon rhino expansion into Mwabvi's more open woodlands may be the pattern of burning that takes place annually. In this context Hall-Martin's (1975) comments are worth considering :

"Where fire has for so long been a natural phenomenon accompanying the rains the vegetation could be expected to be adapted to it. However, the colonial administration of Nyasaland deemed it wise to advance the annual burn and decreed that all fires should be started as soon as the grass would burn. Penalties were laid down for villages which had not burned their areas by the end of August. Unfortunately these practices are now accepted as custom and it seems that early burning is slowly changing the vegetation over large tracts of Malawi."

The rationale for early burning was that it does less damage to trees and woody growth than hot late fires, and this is probably true. However, it may be as effective in scorching and removing edible leaves and twigs in the browsing zone of rhino (0-7 feet above ground) and many other large

browsing mammals. There would, though, be a major difference: a late fire will cause a temporary famine of far shorter duration than one early in the season. In days when fires were late, the animals had to rely on unburned areas for perhaps two months or less. When early burning was introduced, this period will have extended to upwards of 5 months. Mwabvi is still subject to early burning on an extensive scale. While not disputing that this may favour trees (actual growth being largely confined to the wet season), I suggest that it subjects a variety of browsing animals to lengthy periods of nutritional stress. Thus rhino may be limited to the thickets (which do not burn) by official burning policies.

A transect was walked through the Malema thicket to seek evidence of rhino use. Immediately after, P. Bannister made a similar transect into the Ntaya Thumba thicket. In Malema 7 rhino middens were found, 1 fresh, 1 a week or so old, and 5 since the last rain fell (c. April). These were fairly evenly distributed along the transect. In Ntaya Thumba Bannister found 5 middens, 1 very fresh and 4 since the previous rain. They were also evenly distributed along the transect. In the Malema thicket fresh tracks of a pair of rhino (the female and sub-adult seen from the air?) and a singleton were seen. In Ntaya Thumba fresh tracks of one individual were seen. Throughout both thickets there was abundant sign of rhino browsing; that is twigs up to 7 mm diameter on many shrubs (and particularly a *Grewia* ? sp) were nipped through as though with secateurs. The impression gained from both thicket transects was that sign of rhino was easy to come by throughout and that the available food supply was being well (but not over) used. With this in mind, it is perhaps worth noting that if Mwabvi's rhino habitat is essentially the thicket, the density of rhino is of the order of 0.38 - 0.56 per square mile (0.15 - 0.25 km²), depending on whether there are 4 or 7 rhino. This compares with 0.83 per square mile in Tanzania's Ngorongoro (Goddard 1967b), 0.40 per square mile in Tanzania's Olduvai Gorge (Goddard 1967b), 0.83 per square mile for the Tsavo National Park in

Kenya (Goddard 1969), and 1.04 per square mile in the Luangwa Valley (Caughley 1973).

In summary : Mwabvi contains a small group of black rhino that does not appear to have exceeded 10 animals over the past 50 years. The present count suggests that they may be declining slowly. However, only one skeleton has been recorded in the past 20 years. This is odd, for rhino are not immortal and their larger bones remain obvious for very long periods (a matter of years). If the Game Guards patrol rigorously it is inconceivable that they would not find the occasional skeleton. For reasons not yet understood the Mwabvi rhino are confined to thickets, and absent from apparently suitable woodlands. The pattern of annual grass burning may be responsible for this. Another alternative is to disbelieve the lack of evidence on poaching and assume that human predation is responsible for current numbers. Some inconclusive evidence in this direction will be presented in a later section.

The number of rhino in Mwabvi are so few that they cannot be considered a "viable" population. Given protection from human interference and natural calamity, and given that the general Mwabvi habitat is or can be made congenial for the species, and given that there is at least a parity of sexes, this little group could expand. However, even if there were 7 of them, a 10% annual increase (which is unlikely) would take 32 years to reach a similar density to the Luangwa Valley National Parks', while at a 5% annual increase it would take 63 years to attain the same density. The quickest way to boost the rate of increase would be to introduce fresh stock from elsewhere; either from within the country or from other states.

OTHER LARGE MAMMALS

Any large mammals seen during the aerial searches for rhino were recorded. Similarly those seen from the ground were counted. The results are presented below in Table 1.

Species	A I R		G R O U N D	
	Group Size	Total	Group Size	Total
Nyala	2.1.1.	4	-	-
Kudu	4.8.20.8.	39	7.2.11.5.4.4.	33
Sable	2.1.1.24.24.19. 20.1.	92	2.	2
Impala	4.	4	-	-
Rushbuck	1.1.	2	1.1.	2
Warthog	not counted	-	1.6.2.1.3.1.	14
Hartebeest	-	-	-	-
Buffalo	-	-	-	-
Zebra	-	-	-	-
Elephant	-	-	-	-

TABLE 1. Aerial and Ground Sightings of Large Mammals

No attempt was made to estimate total numbers of any species other than rhino. The following comments on abundance are highly subjective and relative to the Ntaya situation.

Nyala (Tragelaphus angasi)

Only 4 males were seen from the air; 2 in the Ntaya Thumba thicket and 2 in Malema. P. Bannister recovered one skull on his transect through Ntaya Thumba (interestingly the Game Guards were adamant that it was a kudu skull). This is now in his possession at Ngabu. As with the Tragelaphinae as a whole, nyala are cryptic and difficult to count from the air. Nevertheless the relative ease with which they can be seen from

an aircraft in the nearby Lengwe National Park indicates that they are a scarce animal in Mwabvi. Ridding (1975) estimated that there might be between 40 and 50 in the Reserve and N. Hunter (pers. comm.) felt that on the basis of his experience in Mwabvi, this was not unrealistic. Both Ridding's and Hunter's data derive in the main from still watching around watering places and from tracks. Accepting that they are right and the Mwabvi population is of the order of 50, one is immediately drawn to comparisons with the Lengwe situation.

The nyala habitat in Lengwe is a dry deciduous forest (also referred to locally as "thicket") in which *Pterocarpus antunesii* and *Lecaniodiscus fragrinifolius* are prominent. This vegetation covers 13.9 square miles (36.4 km²) and as recently as 1963 was thought to hold as few as 50 nyala (Anon 1976a). The provision of water, the prevention of hunting and the protection of the vegetation have led to a prodigious increase and there are now thought to be between 1,500 and 2,000 nyala in the area. The density increase postulated is from 3.6 per square mile (1.4 km²) to over 108 per square mile (41.2 km²) in 13 years. Even if the original population was under-estimated, the increase in numbers is nonetheless dramatic. Why hasn't protection produced a similar effect on the species in Mwabvi?

The Mwabvi "thickets" are of a different composition to those in Lengwe; the more common trees being *Brachystegia bussei*, *Pterocarpus angolensis*, *Dialopsis africana*, *Adansonia digitata* and *Ceiba pentandra* (Ridding 1975). Nevertheless this vegetation is in form very similar to the Lengwe thickets - albeit subjectively, with less undergrowth. The Mwabvi nyala are largely associated with it, water is readily available and there is no obvious limiting factor to prevent a response to protection. If the population is about 50 animals and Ntaya Thumba, Malema and north Nyantoko comprise their habitats, their density is 4.7 per square mile (1.8 km²) and very similar to the earlier Lengwe estimate.

Sanha
(misidentifications: "Ceiba" is *Bombax rhodognaphalon*
Brachystegia is q. no 1 in C. Palgrave, not bussei.
Pterocarpus angolensis is not in thickets, this must
have been confused with *P. antunesii*.

Mwabvi has been a reserve since 1951 and there is no evidence that nyala have been poached in it since that date. Their failure to increase may be due to one or a combination of three reasons :

1. they have not been afforded protection and hunting has taken place but not reported,
2. the different Mwabvi habitat will not support a large nyala population, or
3. some other species absent from Lengwe is occupying the potential nyala niche in Mwabvi.

There is evidence to warrant further investigation into all 3 possibilities. In the following section it will be shown that hunting has taken place, if not in the Reserve, then all around the boundaries. The comment has already been made that the understorey in the Mwabvi thickets appears to be lighter than in Lengwe and there may well be less food available for nyala. There is also a probability that rhino compete directly with nyala for forage. Both occupy the same vegetation type in Mwabvi. Both are catholic browsers, able to take leaves and twigs from ground level up to a height of c.7 feet (2.2 m). Examination of heavily browsed plants in Lengwe showed that nyala were taking leaves and twigs (up to 4 mm in diameter) and I have little doubt that in Lengwe and Mwabvi there would be a substantial overlap between the diets of the two species. However to establish this conclusively would call for a study of their respective diets at all phases of the annual cycle.

Kudu (*Tragelaphus strepsiceros*)

This species is difficult to see from the air. Quoting from earlier attempts to census kudu in Botswana (Parker 1975) :

"Kudu proved particularly cryptic, even at the very low levels flown (3-10 m). On the approach of the aircraft they seemed to prefer to face it, presenting a narrow profile, and to stand rather than to flee. On one occasion a group of 5 remained under a bush although the 'plane flew within 3 m over the top of them. In view of this behaviour it seems probable that

the species is not susceptible to counting from the air, except perhaps from a slow flying helicopter."

In Mwabvi they were no different and it is thus not surprising that on a single 12 mile walk, nearly as many were seen (33) as during 19 hours flying (39). Their tracks were seen throughout the areas covered on foot, other than in the thickets. Many of these tracks dated from the previous rains when the ground was soft. Ridding's belief that there may be c.300 kudu in Mwabvi does not seem unreasonable.

Sable (*Hippotragus niger*)

In contrast to kudu, sable show up clearly from the air. A total of 92 were counted, although there may have been 2 herds recounted within this (24 and 19). During ground transects sable tracks were seen as widely as kudu's, though they were not quite so abundant.

Impala (*Aepyceros melampus*)

One group of 4 females was seen from the air. The tracks of a similarly sized group (possibly the same one) were seen in the same general area while walking. The species shows up well from the air, particularly when in open mopane woodland. Ridding (1975) referred to Duckworth, a former game ranger, who stated that impala were "common" in the vicinity of the Matope Guard Post (fig. 2). She herself recorded seeing 3 herds in the same general area in 1975. While it is quite conceivable that several herds may have been overlooked during the 1976 aerial searches, the species cannot be ranked as "common". It would thus appear that since Duckworth's time it has declined.

Warthog (*Phacocoerus aethiopicus*)

Although this species was seen from time to time from the air, it was not counted. However from these sightings, those made on the ground and the abundance of tracks seen, warthog are very common in Mwabvi.

Bushbuck (*Tragelaphus scriptus*)

Only 2 were seen from the air and 2 were seen from the ground. Occasional tracks were seen and the apparent density was lower than expected.

Hartebeest (*Alcelaphus lichtensteini*), Buffalo (*Syncerus caffer*), Zebra (*Equus burchelli*) and Elephant (*Loxodonta africana*)

All 4 species show up well from the air. None were seen in 1976. Ridding reported the first 3 as present in 1975 (hartebeest from droppings only) - in very small numbers. She also reported old elephant tracks. All 4 species are probably occasional vagrants from across the Mozambique border.

Leopard (*Panthera pardus*)

The tracks of 5 different leopards were seen along the 12 mile transect shown in fig. 2.

Other species : Duiker (*Sylvicapra*), Suni (*Nesotragus*), Grysbok (*Raphicerus sharpei*), Red rock hare (*Pronolagus rupestris*), Hyraxes (either *Procavia* or *Heterohyrax*), Porcupines (*Hystrix*), Shrews (both *Rhynchocyon* and *Petrodonus*) were seen. From tracks and droppings it appeared that porcupines were exceptionally abundant. The tracks of Hyaena (*Crocuta*) were recorded on several occasions, as were numerous signs of smaller carnivores - especially Viverridae.

The overall impression obtained was of a very diverse fauna in which the larger mammals were at comparatively low densities. Indeed the rate at which sightings were made from the aircraft was so low as to suggest that animals were being missed on a large scale. Including the rhino sightings, 148 large mammals were seen in 19 hours; that is a sighting rate of 1 animal per 7.7 minutes. This rate was so low that a test flight was made over the nearby Lengwe National Park for comparison. On the whole the Lengwe habitat was more difficult to see animals in than Mwabvi.

Nevertheless a total of 53 large mammals (nyala, kudu and buffalo) were counted in 35 minutes; a sighting rate of 1 animal every 0.7 of a minute. This crude comparison between fairly similar areas strongly supports the impression that large mammals are sparse in Mwabvi.

The occasional appearance of buffalo, zebra etc. implies movement across the international border. Whether or not sable, kudu or impala follow suit has not been established. Hall-Martin (1975) presented a synopsis of local lore in reference to the Lengwe Park which did indicate seasonal movement :

"When the rains broke, the herds moved rapidly southwards to the higher ground along the Zambesi-Shire watershed."

Presumably such movement would have involved crossing the watershed and have some relevance to Mwabvi. While flying near the border over Mwabvi it was possible to see far into Mozambique. Most of what could be seen was uninhabited and it is clear that the Reserve is in reality a very small extrusion into Malawi, of an extensive Mozambique wilderness. In these circumstances I would expect an ebb and flow across the political frontier of all but the most sedentary larger mammal species. This is of consequence to the future of the Mwabvi Reserve.

HUMAN INFLUENCES

The status of large mammals in the Mwabvi Game Reserve raises

3 points :

1. Why are rhino and nyala confined to the thickets?
2. Why are general numbers of large mammals low?
3. Why has there been no apparent response to protection over the past 25 years?

While all three may be the result of some intrinsic aspect of the Mwabvi environment, they could be the product of human activities. From the vegetation map in fig. 2 it can be seen that 6% of the Reserve's area is classified as recently cultivated grassland. Ridding (1975) also indicated that some of the areas classified as open woodland were under cultivation more than 20 years previously. Without knowing the manner or detail of local human/animal inter-relationships, it is difficult to determine the effect that previous human residence will have had on the area's fauna. Suffice it in the light of findings presented later in this section, it is likely to have been significant.

Illegal hunting within the Reserve has been assumed to be a primary cause for low large mammal densities (e.g. Ridding 1975, Anon 1976a, Hunter and Hayes pers. comm.), but little factual evidence is quoted in support of the assumption. Questioning the Game Guards produced the data tabulated in Table 2 below.

Offences	Instances	Men arrested	Animals killed
Simple trespass	2	Not ascertained	
Cutting timber	4	7	
Hunting	10	18	1 kudu, 1 warthog, ? cane rats, 2 hyrax, 4 tortoises, 4 lizards
Totals	16	25 minimum	12 minimum

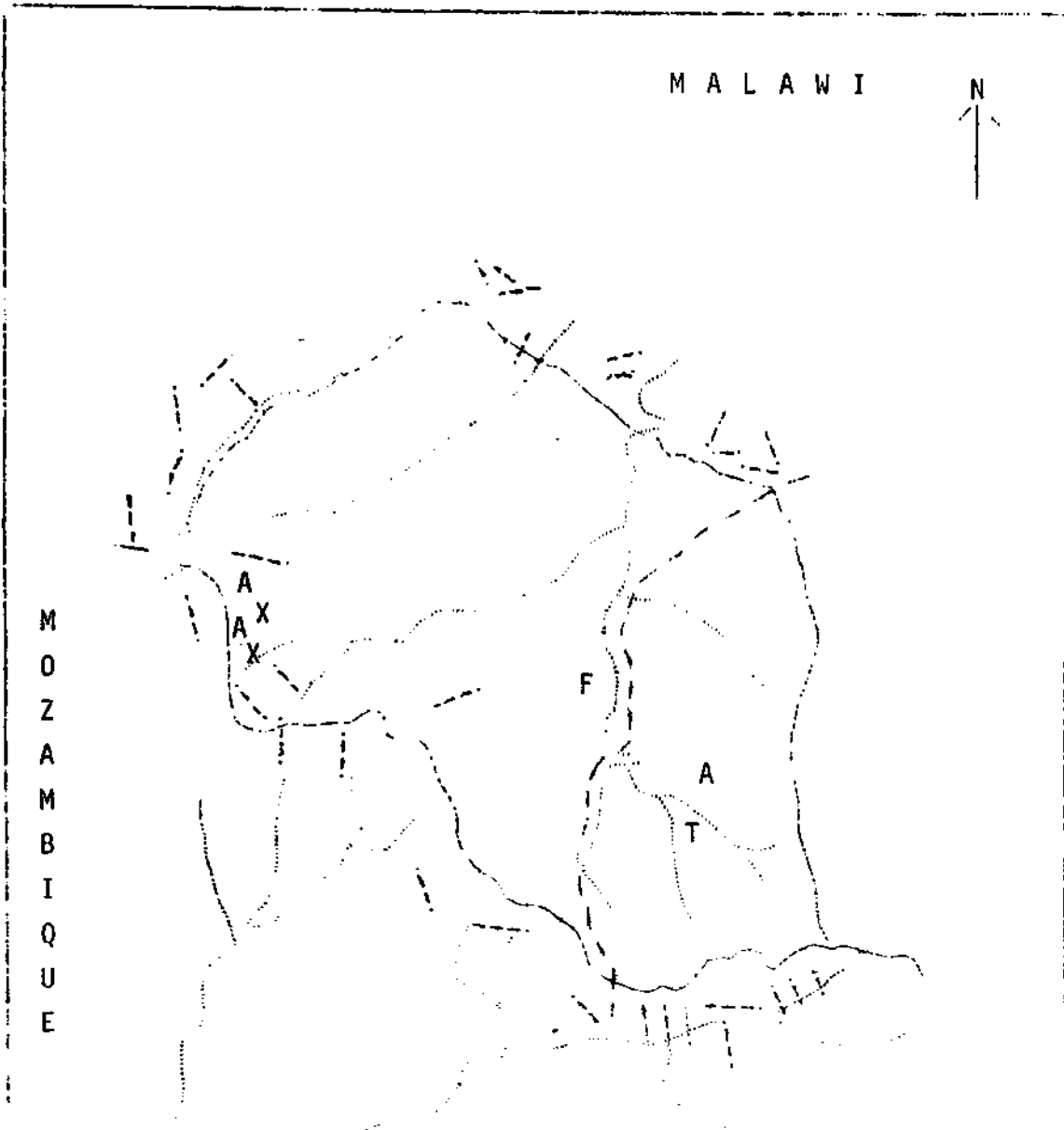
TABLE 2. Illegal activities in the Mwabvi Reserve between 1.1.75 and 30.9.76 (21 months)

The Guards claimed that some of their number patrolled in some manner or another 5 days out of every week. If this is the case they found evidence of illegal activity less than once a month. Together with the number of animals known to have been killed, it is hardly evidence of serious poaching. However, there are grounds for believing that the patrol activity has in fact been very much less than claimed.

During aerial searches, trespassers were seen on 4 occasions. A man was seen fishing in a pool in the Thangadzi river. Parties of 1, 4 and 5 were seen on a well defined trail that runs through the Reserve from its north-east corner, along the Thangadzi and into Mozambique (fig. 6). A newly built hut was seen near Manchichi (fig. 6); 2 substantial houses and several acres of cultivation were found in the upper reaches of the Mwabvi stream (fig. 6) and 5 old "bush-fence" trapping lines were found in the same area. Some freshly cut planks were also seen near the confluence of the Dzikulowa and Thangadzi rivers (fig. 6). This evidence of human activity and residence within the Game Reserve confirms that the Game Guards are failing in their duties.

Numerous bush-fences were seen within 1 mile (1.6 km) of the Reserve boundary, in some instances these actually intruded into the protected area. Not only were these recorded from the northern and western boundaries of the Reserve in Malawi, but when flying near the international border, many could be seen in Mozambique. No attempt was made to count all of them, but 33 were seen and their approximate positions are shown in fig. 6.

The bush-fences varied in length from a minimum of c.400 yards (368 m) to over 1 mile. They were built of brush and saplings heaped to a height of 3 feet. Every 20 to 30 paces along their entire lengths were gaps in which there was an ingenious drop-trap, snare or pit. Some of these fences formed the boundary of cultivated areas, but others had no immediate connection with tilled land. The majority were within



- | | | | |
|-----------|---------------|-----------|------------------|
| - - - - - | = Bushfence | | = River course |
| X | = Cultivation | - - - - - | = Trail |
| A | = House | T | = Timber cutting |
| F | = Fisherman | | |

F i g. 6. Mwabvi Game Reserve showing the distribution of bushfences, houses, cultivation, trails etc.

1 mile of human habitation. It was obvious that they needed much labour to construct. Some had firebreaks along either side. From this it would seem that these traps lines are locally important.

One bush-fence was examined from the ground. The drop-trap comprised a large log (estimated to weigh between 300 and 700 lbs) suspended in such a way that it fell on any animal trying to pass through the gap in the bush-fence beneath it. Simple and humane, these log-traps were capable of killing animals up to the size of a bush-buck (and a female nyala?). In the occasional gaps without log-traps, there were snares or pits capable of taking far larger animals. From such remains as were seen in the vicinity of the fence line visited, it appeared that most of the animals caught recently were small - porcupines, francolins, guinea-fowl etc.

At an average of 500 yards per fence, the combined length of the 33 bush-fences seen would be 16,500 yds (i.e. 9.4 miles or 15.2 km). With a trap, snare or pit every 25 paces, these fences represent 660 active devices for the capture of animals around the periphery of the Game Reserve. Only the eastern boundary where Mwabvi is contiguous to the Matandwe Forest Reserve were no bush-fences seen. The estimate of fence length and the number of active traps are minimal. It is most unlikely that all fences were seen and recorded and the average length is likely to be greater than 500 yds. However, even at the minimum estimate it is apparent that any animals moving across the Game Reserve boundaries have been and are subject to substantial hunting pressure. The 5 old bush-fences found in the extension area show that this influence was recently active within what is now the Reserve.

It is unlikely that a people given to trapping so extensively would not also use other techniques for securing wild animals. However, other than to establish that they use gin traps, bows and arrows, muzzle-loaders and shot guns, no quantitative data on other forms of hunting

were obtained. Incidental evidence, such as the seizure of dried game meat being offered for sale elsewhere in the Shire valley (A. Kombe pers. comm.) merely confirms the presence of a market for wild life produce in the area.

The evidence we now have indicates that local people enter the Game Reserve to reach Mozambique, they fish in the Thangadzi pools, some are still cutting timber, others reside and cultivate in the new extension and that there is widespread and intense hunting along the northern, western and southern boundaries. The Departmental staff within the Reserve are demonstrably inefficient and there are adequate grounds for assuming that the fauna of the Mwabvi Reserve has not received effective protection from human influences. This is the most likely reason for the relatively low density of large mammals. Until effective control of human influences is obtained, it will be difficult to isolate any intrinsic ecological factors which may augment this condition.

The land being cleared in contiguous areas of Mozambique will effectively isolate Mwabvi in the near future from the very extensive woodlands over the border. This human influence will prevent gratuitous recruitment to the Reserve's stocks.

The Maravi kingdoms declined in both power and cohesion in the 18th century (Alpers *op. cit.*). This disorganisation was completed by the Portuguese, Yao and Arab slavers in the 19th century, whose activities caused substantial population decrease. The extent of cultivation will have diminished correspondingly and wild vegetation increased. It is probably no coincidence that the Mwabvi, Lengwe and intervening Shire Valley baobabs seem to date from this era. Thus when Livingstone first knew the area in the 1850s, it was probably at its "wildest" for several centuries.

Modern evidence of human interference in the Mwabvi Game Reserve is extensive. Seasonal burning has been in vogue throughout the century (Hall-Martin 1975). Some 6% of the Reserve was under cultivation within the last 10 years and even more than this 25 years or so ago (Ridding 1975). The area may contain some elements that are "older", i.e. in a later successional phase, than the bulk of the woodlands in the Valley, but that is all.

Human effects upon the flora will have determined much of the form and distribution of large mammal populations in the Lower Shire Valley. As with the wild vegetations, the wild animals would have benefited from the decline of the Maravi and the rise of slavery. Elephant may have been exceptions to this. They were hunted through the ascendancy of Maravi power, for these people are known to have traded ivory (Alpers 1975). The Portuguese with their "Chikunda" hunters will have taken over this role when the Maravi declined. Later the arrival of Yao and Arab adventurers will have raised the pressure on elephants yet again, for they were above all seekers of ivory. Evidence that the Shire elephants were under severe hunting stresses comes from Livingstone's observations of very large herds (summed in Alpers 1975 p.27). Though the sight of large herds may give an impression of abundant elephants, their occurrence is now known to be a consequence of continuous harassment (Laws, Parker & Johnstone 1975; Parker, Douglas-Hamilton and Bell in prep.).

The market for the Shire Valley's ivory has, through the years, been largely oriental and has traditionally been associated with a demand for rhino horn. In view of this, it is unlikely that people seeking ivory for the eastern merchants would not also acquire rhino horn when and where they could. Thus it would be curious if the Shire Valley's rhino had not been subjected to similar hunting pressures as those experienced by its elephants. In addition to this there were also internal African demands for rhino bone. Powdered, the Yao held it to be a potent talisman to prevent theft, to attract women and, among many other properties, to permit men to commit adultery without detection by their wives (Greenstein pers. comm.). Herein may lie explanation for the modern absence of rhino skeletons in the Mwabvi Reserve.

The early written records, e.g. Johnston 1898, Duff 1906, indicate that in the late 19th and early 20th centuries, Malawi's game populations were discontinuous when compared to others of the same era elsewhere in East and Central Africa. This was particularly the case with both black rhino and nyala. Indeed rhino were sufficiently scarce throughout Malawi to warrant special legal status (see the Game Ordinance, no. 2 of 1911).

The foregoing speculative historical perspective of the Lower Shire Valley will be considerably refined by the archeological work that is due to commence there in 1977 (Greenstein pers. comm.). Nevertheless the available data suggest that, whatever the intrinsic values of Mwabvi's present flora and fauna, they do not warrant the belief that the Reserve is an ecosystem *virgo intacta*. The converse is more probably true: it is at least in part the product of multiple human influences over several hundred years. This appreciation was absent from Ridding (1975) and the management plan for the Reserve (Anon 1976a). It is of some significance in formulating future policy for it reduces the case for keeping things either as they were at a given point in time or as they are today. It is of consequence when considering black rhino. While there is no evidence that Mwabvi has ever had other than small numbers in the past, it is poor

reason for not now developing a larger population if this is what is wanted.

Having cleared the decks of necessity to maintain links with the past simply because it is the past, we can now consider other influences upon Mwabvi's continuity. Human attitudes and needs so dominate life in the Lower Shire Valley that the current status of the population warrants review. The 1976 estimate is that there are 305,000 people in the Valley, increasing at c. 2.7% annually (Anon 1976b). At this rate the population will double in less than 30 years. The present density of humans is in excess of 230 per square mile (87.8 km²) and as a result little woodland remains along the Valley's eastern slopes or on its fertile floor. Only the western scarp along the crest of the Shire/Zambesi watersheds is wooded. The greater part of this zone is within the conservation units of the Majete and Mwabvi Game Reserves, the Lengwe National Park and the Matandwe Forest Reserve (fig. 8). All are barred to human residence. Nevertheless there is considerable pressure to enter and cultivate in these conservation areas. The Departmental file (14/12/2 - formerly 14/12/31/06/01) on the Matandwe Forest Reserve which was proclaimed in 1923, is largely a record of issues concerning its integrity. With the predicted growth in human numbers the pressure to occupy the conservation areas must increase. If this is to be withstood, the land uses of game preservation and forestry must contribute directly to local welfare as well as to the national need. Currently they do not do this.

The Shire Valley's western woodlands, for all that they are legally barred to human occupation, have many areas in which clearing and cultivation is taking place. These include the new extensions of the Lengwe National Park and the Mwabvi Reserve. Woodcutting occurs in both Lengwe and Mwabvi, grazing takes place in Lengwe, there is widespread hunting in defiance of the Game Laws and people enter Park and Game Reserves without permission. Sympathy for at least some of these transgressions seems implicit in the police refusal to prosecute men arrested for trespass in Mwabvi. The local

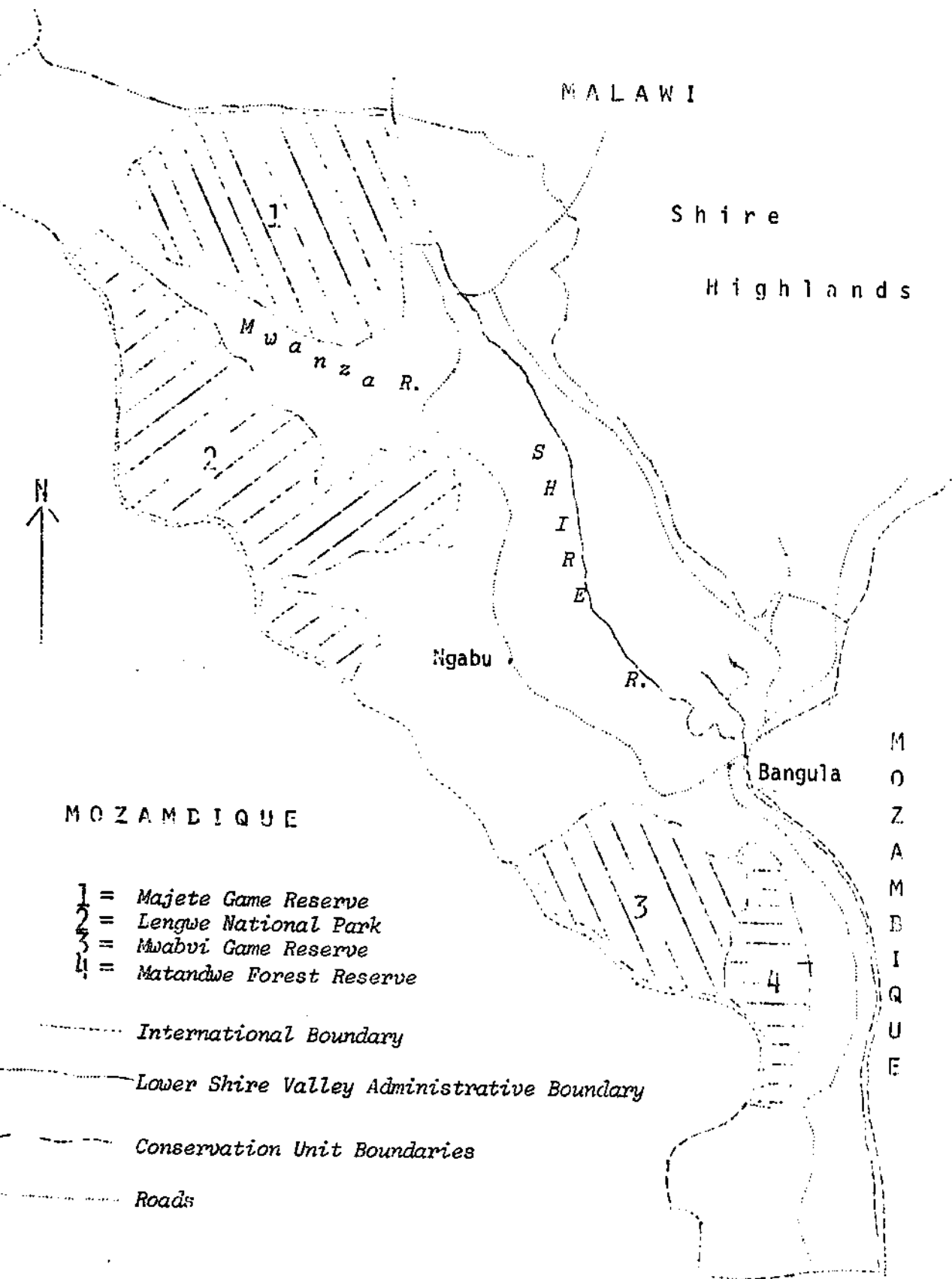


Fig. 8. Lower Shire Valley Conservation Areas.

people are so hostile toward Forest Reserve staff that a local Guard admitted to the Chief Game Warden (D. Anstey pers. comm.) that he took to his heels if he ever came across them in the Matandwe Reserve. In the same vein the locals refuse to sell the Mwabvi Guards any food (Ridding 1975, A. Kombe and Game Guards pers. comms.). It is quite clear that the Park and Reserves are resented and that the matter needs attention.

The original Lengwe and Mwabvi sanctuaries were made for the respective and specific purposes of preserving nyala and black rhino. However, the Matandwe Forest Reserve and the extensions to Lengwe and Mwabvi, which form their greater parts, were made for a very different reason: the maintenance of a vegetation cover on the steeper slopes of the western Shire watersheds. This required the prohibition of human residence, cultivation and *bad* animal husbandry. The Forest and Game laws provide ready legislation with which to ban such activities and it seems that it was administratively expedient to gazette the steep slopes as park or reserves. Such use of conservation laws was widely used throughout what was "British" Africa (e.g. what is now the Kabalega National Park in Uganda and parts of the Selous Game Reserve in Tanzania were originally declared game reserves in order to keep people out of trypanosomiasis areas). I do not wish to imply that this approach is "wrong"; it is positive and preferable to not using areas barred to residence and cultivation. At the same time it seems important to me that conservationists do not delude themselves into believing that the preservation of flora and fauna is anything other than a secondary justification for the bulk of the Lower Shire park and reserve land. The maintenance of a vegetation cover on the steeper slopes does not, *per se*, need the prohibition of all human activities other than residence, cultivation and poor stockmanship. If forest and wildlife management policies are so obnoxious to the local people that they become politically insupportable, the primary goal of preventing erosion *can* be achieved by means other than making parks, game or forest reserves. In such circumstances, it seems imperative to ensure that they do not cause needless irritation.

In the light of the foregoing one might ask if, in order to preserve black rhino in Mwabvi, it is necessary to ban the collection of firewood, use of timber, fishing the Thangadzi pools or access to a right of way? I do not think that these prohibitions are essential to the objective and if I am right they deprive the locals gratuitously. We should perhaps clarify in our minds just how this sort of situation has arisen. Much seems to stem from tradition. The game reserves and national parks established widely in Africa this century have tended to develop in areas of low human density. In these circumstances it has been easier to ban all human activities (other than tourism) within the sanctuaries, than to police and regulate specific undertakings. On the whole the approach seems sensible. Losses and injustices suffered by local residents were slight when compared to the communal advantages of administrative economy and simplicity. However a policy of blanket prohibitions loses many of its benefits in situations of high human density. Its administrative expediency is outweighed by an inability to enforce it in the face of local opposition. Recognition of the need to change the mode of conservation in the face of changes in local human conditions is remarkably absent from the literature. The most usual response to the problem has been to try and broaden the basis for conservation. Thus Mwabvi, which was set up to preserve rhino, is now claimed to be a unique example of a relatively (sic) intact ecosystem (Anon 1976a). Elsewhere it has been common to try and widen conservation goals by seeking financial profit - usually through tourism. However, other than temporarily, such tactics do not resolve the real issue. The removal of unnecessary prohibitions though, would diminish the problem.

Malawi is densely populated. In this it differs from those countries with large and extensive game populations in which the current systems of African fauna conservation have developed. Thus it does not follow that because the system works elsewhere, it is appropriate to Malawi. Indeed the modes of conservation in high density Europe may provide better models. In these there is less emphasis on blanket prohibition and more on

regulating only those human activities that affect the conservation goal. The extreme examples of this are surely in the English system which in some cases countenance farming and human residence within national parks. The local resentments over Mwabvi might be resolved through reference to these European examples, which foster a flexible and humane approach. The Department of National Parks and Wildlife should not compromise itself by adherence to a false image of what an African Game Reserve should be.

A major need in any attempt to better relations between the conservation authorities and the local Mang'anja people is some understanding of local attitudes toward wildlife. Currently there is a wide chasm between official outlook and local interests. Nowhere was this more apparent than in a rather smug statement made by the Department's Park Planner (Anon 1976a) in reference to the Lengwe extensions :

"As a result of this landuse analysis it was *unanimously agreed* that the most appropriate use for the land was as a National Park extension" (my italics).

This unanimity clearly did not include those to whom the decision was most critical - the Mang'anja who are still living in the extensions!

As things stand the Department of National Parks and Wildlife do not know why the people around Mwabvi hunt, how many animals they kill or what role these play in the local economy. It is not known what use the very extensive bush fences play in local crop protection. There is no data filed in its records about local feelings toward the wild or Mwabvi in particular. The mould of policy is essentially expatriate as though there were no grounds for an indigenous conservation "ethic". Yet Chewa and Mang'anja country is bestrewn with small copses of wild vegetation. They denote burial sites, but in effect are a series of "mini-parks" which exist to ensure the peace of ancestral spirits. Does this not show an acute association of tranquility with habitats undisturbed by man? May it not offer a base upon which the Malawians themselves might develop a wider concept of conservation? Such questions must be considered if conservation

is to gain the local sympathy and understanding that are crucial to the survival of the Mwabvi Reserve.

So much for the need to better relations in the present and to reduce current irritants. Two issues need attention to forestall future conflict. The first is the necessity for a physical barrier between the Game Reserve and surrounding cultivation. Already parts of the northern boundary are demarcated by cleared and cultivated land and these will expand rapidly in the next decade. Animals from the Reserve will pose a growing problem to the peripheral cultivators and a constant incentive to poach. An adequate barrier to prevent animal egress and human ingress is the only measure that will prevent it.

The second issue concerns the Valley inhabitants' growing demand for fuel. As already pointed out, the timber on the Valley floor and its eastern slopes has largely gone. The only remaining stands are on the western scarp and mostly in conservation areas. Already these are subject to a growing attrition. People, bicycles and vehicles carrying firewood away from the western woodlands were seen constantly throughout my time in the Lower Shire. Currently it is crudely estimated that there are c.66,000 families in the Lower Valley and that each may consume c.18 cubic yards of firewood annually. Yield from clear-felled *Brachystegia* woodland is c.55 cubic yards per acre. On these data (which were obtained during discussion with Forest Department officials in Lilongwe) the Valley residents' present fuel consumption is equivalent to clear-felling 21,600 acres (33 square miles - 87 km²) of *Brachystegia* a year. While these data are too inaccurate for planning purposes they serve to illustrate that demand for firewood is a matter for serious concern to those who wish to retain a cover of indigenous vegetation on the western slopes of the Valley, or who wish to preserve its fauna.

The fuel problem might be met by importing firewood from the much larger woodlands of neighbouring Mozambique. However, if it is to be

resolved from within Malawi's own resources, there will be pressure to plant quick growing exotic timbers. These often form poor habitats for African fauna. In view of the predicted human population increase it is unlikely that there will be much room on the Valley floor for extensive timber plantation. A case will exist to establish such fuel sources on the western slopes *in place of* the present indigenous woods. This would bring about the loss of native plants and animals, but would not impinge upon the primary conservation aim of protecting water catchments.

An alternative, but hitherto unexplored prospect, is to develop the indigenous woodlands as fuel sources on a substantial basis. Presently there are few data on the permanent management of Malawi's indigenous trees for firewood, but there is no reason in principle for not exploring the possibilities. The extraction of firewood need not necessarily conflict with the preservation of rhino. Indeed the shrubby growth that follows the breaking of a mature woodland or forest canopy might provide substantially more browse for rhino than currently exists (this happens in Uganda's Budongo forest with elephants - Laws *et al.* 1975). The forests of Britain and Europe offer innumerable examples of management for both timber and game. It also occurs in the Budongo and Kibale forests of Uganda. The failure to develop multiple uses for woodland in much of Africa is largely the consequence of not having had to do so and reliance on exotic species (eucalypts and conifers) unsuited to the local faunas. As with the case for removing blanket prohibitions in the use of Malawi's parks and reserves, there are also strong grounds for adopting a more ecumenical approach toward forestry and game management. There seems to me to be no reason why game in the forest reserves should not be used within the dictates of sound forestry. Likewise there is no case for not using the timbers in game reserves within the requirements of wild animal management. The lack of knowledge prevents me advocating the immediate use of the Mwabvi Reserve as a source of timber. Nevertheless it is a matter that warrants immediate and impartial research, for it may contain the solution not only to the impending Shire Valley fuel crisis, but to

any aspects of fauna conservation in future Africa.

One final aspect of the Mwabvi's political environment needs attention. Currently the Reserve is undeveloped and the plan for the period 1977-81 indicates that this poverty will persist. Less than 15% of capital budgeted for development of the Lower Shire fauna sanctuaries (Lengwe, Majete and Mwabvi) is destined for Mwabvi. Thus the *relative* lack of development will seem even greater in 5 years time. Rightly or wrongly, people will be more likely to base their attitudes upon such comparisons and Mwabvi will seem even more of a void than it is now. This will fuel pressures to develop other uses of the area.

Ridding (1975) and Anon (1976a) held that the Mwabvi Reserve has low tourist appeal. This in part may have influenced the low development budget for 1977-81. One gets the impression when reading the Master Plan for Mwabvi that had it had greater tourist potential, more funds would have been made immediately available. As the Reserve is now, I agree with the previous authors that it is unattractive to the normal "wildlife visitor". However, this is not to say that it cannot be made more amenable. Animals are currently shy, but would rapidly become tame if hunting ceased and they were exposed to frequent non-alarming contact with man and his devices. They would not become tame if merely left alone, even if hunting stopped. The provision of reasonable access tracks would on its own lead to tamer animals. It is beyond my brief to suggest re-allocation of resources between the Shire Valley sanctuaries. However, the points I wish to make are (i) that the current lack of tourist attraction should not be used as an implement to delay development and (ii) that further non-development will, on its own, detract from long term prospects.

We can now turn to the Reserve's internal environment, the most urgent aspect of which is the Game Guards' failure to enforce the law. Their poor morale is understandable. They lack adequate leadership and supervision. They are unpopular among the local people and the

underdevelopment of Mwabvi, when compared to the activity in nearby Lengwe, has produced a chronic "Cinderella" complex. The attempt to have the I.F.P.S. substitute for Departmental Officers in providing leadership, discipline and supervision failed through no fault of the parties concerned.

The issues seem fairly clear. If the Reserve is to be staffed as an entity on its own, then surely it should be equipped to function on its own? With the junior staff the Mwabvi Reserve is an identifiable concern: they are the *Mwabvi* Guards. However with senior staff the Mwabvi is a part of the Lengwe administration. The same applies to equipment such as transport. The senior man responsible for the running of Mwabvi does not suffer from the Cinderella complex because he is also involved with running the more favoured Lengwe. If the Mwabvi Guards were based at Lengwe as part of a combined Lengwe/Mwabvi team, it would banish any feelings of being less favoured or "country cousins". If their families were at Lengwe it would remove them from the hostile Mwabvi environment. For the greater time the men themselves would be under supervision from the officer responsible for them.

Ridding (1975) suggested that a headquarters be established outside the Mwabvi Reserve so that the staff could overcome local refusal to sell food by cultivating it for themselves. She failed to include the rider that they would then have to be given time off for cultivating! She also recommended that two "base camps" be established within the Reserve as patrol centres. In these proposals she was supported by the Park Planner (Anon 1976a). I disagree with both of them. The Mwabvi Reserve is so small that it can be patrolled easily from one centre. There is no need for fixed bases from which to conduct patrols; the men should be able to bivouac when and where necessary while in the field. What they require is leadership and discipline; without this no other measures will improve their performance. I therefore suggest that until such time as the Mwabvi Reserve has a Warden in residence, equipped with adequate transport etc.,

the Mwabvi Guards be withdrawn to Lengwe to form an amalgamated law enforcement team. Sections from this could be dispatched for 10 day patrols in Mwabvi, unaccompanied by wives and families. These patrols could not operate from any fixed base, but move and camp as and where necessary throughout the Reserve. The only permanent staff in the Reserve would then be the caretakers of the simple visitor facilities at Mwabvi itself.

Until the political and administrative well-being of Mwabvi has been attended to there is no point in taking expensive measures to augment the area's rhino numbers. As matters stand it will be several years before such action is justified. In the interim the Mwabvi rhino will remain in a somewhat precarious situation. This raises a question that, while it is beyond the brief of this consultancy to consider, should nonetheless be recorded. Is the Mwabvi Reserve the most suitable place in the Lower Shire Valley (or the whole of Malawi for that matter) in which to base a major rhino conservation effort? Is there a case for moving the few Mwabvi rhino to some other more secure Park or Reserve?

Assuming that Mwabvi will become politically stable, adequately financed and effectively administered, the management of black rhino presents no obvious problems. The quickest way to increase numbers will be by introducing fresh stock from elsewhere. There are odd pockets of rhino scattered through Central and Northern Malawi, some of which are not in fauna conservation areas. These could be caught and moved to Mwabvi and there would obviously be some national satisfaction in acquiring such transfer stock from within the country. However, small numbers of rhino hidden in inaccessible pockets might be difficult and expensive to secure. It may therefore be cheaper to acquire additional stock from elsewhere (e.g. Zambia). No rhino should be introduced into Mwabvi until its boundaries are adequately fenced. Black rhino have been known to wander widely on release in new ranges (personal observation). In an unfenced Mwabvi there would be a high risk of them moving into the much larger

zambique wilderness and not returning.

Two important, but simple questions need immediate answers. Does early burning produce a greater seasonal shortage of browse than late burning (as I suspect)? Do nyala and rhino compete directly for the same parts of the same food plants?

If the greatest possible amount of browse is desired to encourage rhino increase, all burning should be prohibited. This will only be achieved through administrative competence and efficiency. The present deliberate policy of widespread early burning should be continued *only* if it is shown *both* that it produces a lesser loss of rhino browse than late burning *and* that late fires are impossible to stop.

If nyala and rhino are found to compete directly for food, the Department of National Parks and Wildlife will have to make a decision on how much of this negative influence can be afforded in the interests of a more diverse fauna in Mwabvi. Nyala are doing so well in Lengwe that there need be no immediate concern about their status in Mwabvi. If, in the course of time, it becomes advisable to augment the Mwabvi stock, it would be an easy matter to transfer some from Lengwe.

Where other large animals are concerned, changes in the burning regimes of Mwabvi will have unavoidable consequences upon their numbers. Those which are browsers will be favoured, those that are grazers will ultimately suffer from diminishing resources. Without further data, it is not possible to make more than these very general predictions. However, there is little point in more detailed research until the Reserve is effectively established - politically and administratively.

RECOMMENDATIONS

The following recommendations are made for the future management of the Mwabvi Game Reserve :

1. As a matter of principle the Reserve should be run to benefit the people in its immediate vicinity and the Lower Shire Valley as a whole, in as far as any such management does not compromise the welfare of black rhino.

2. Consequent to 1. above, it should be a matter of principle to encourage the use of natural resources within the Reserve, provided that the Department of National Parks and Wildlife can regulate such uses and terminate them if necessary.

3. In view of present and predicted development in the Nnacali and adjacent watersheds of Mozambique and in view of the lack of Malawian control over human activity across the border, it is recommended that the Mwabvi Game Reserve be considered as an entity on its own and not as an adjunct to any Mozambique land use.

4. The Department of National Parks and Wildlife should engage in immediate research into the development of fuel supplies for the Lower Shire Valley. In particular, attention should be given to the potential of indigenous woodlands as sustainable sources of firewood and timber.

5. The Department should determine which of early or late burning produces the greater forage shortage for black rhino and other large browsing mammals.

6. In view of the possible overlap between black rhino and nyala food requirements, this should be investigated before embarking on any specific attempt to foster increases of nyala in Mwabvi.

7. Immediate research is necessary into interactions between the people and wildlife in the vicinity of Mwabvi. Specifically traditions and attitudes towards animals should be described, past uses of Mwabvi's flora and fauna understood and the current reasons for hunting established. It is suggested that such research would be better

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