scanned on Acer
16 Nov '10

TANZANIA WILDLIFE

CONSERVATION MONITORING

TWCM is a joint project between Serengeti Wildlife Research Institute, the Wildlife Division, Tanzania National Parks, Ngorongoro Conservation Area Authority and Frankfurt Zoological Society.

2198 km² APS
2567 km² SRE

EYASI

October 1992

195 km/hr
vs 165 km/hr in 1987

SUMMARY

- A Systematic Reconnaissance Flight Survey and an Aerial Point Sample Survey were flown in October 1992 and covered an area of some 2500 km² south-east of Lake Eyasi
- Comparison of the results with a previous SRF survey flown in September 1989 showed little change in wildlife or livestock populations. Exceptions were: donkeys, which were only half the 1989 population; and Thomson's gazelle, which, being highly mobile, may simply not have been within the survey zone at the time of the survey.

LIST OF TABLES

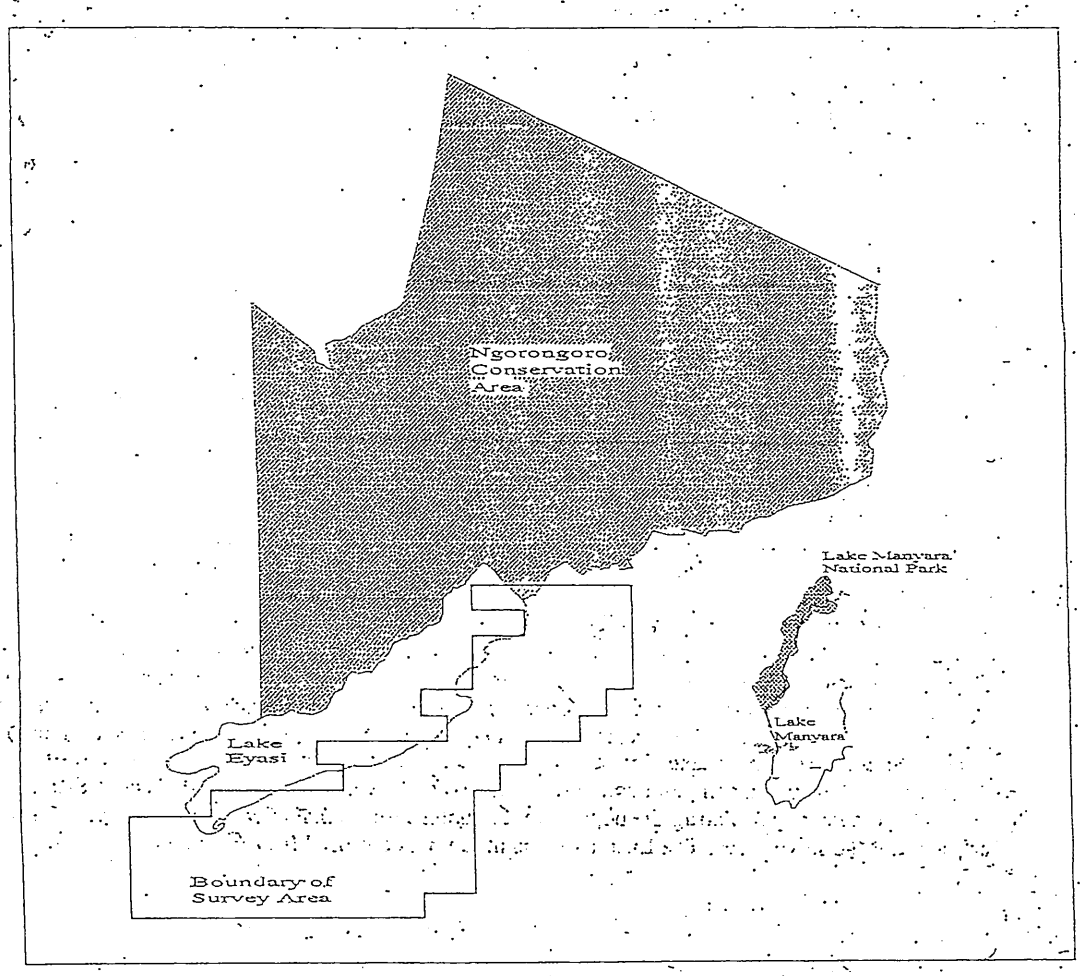
LIST OF FIGURES

1. INTRODUCTION

1.1 THE SURVEY AREA

The survey area (Figure 1) lies to the southwest of Lake Eyasi between Latitude 3° 25' to 4° S and Longitude 34° 30' to 35° 30' E. The present SRF and APS surveys were carried out to provide estimates of population numbers and distribution of wildlife species together with the extent, nature and distribution of human activities in the area. An SRF survey carried out in September 1989 (TWCM, 1989) also covered approximately the same area.

Figure 1. The Lake Eyasi Area Showing October 1992 SRF Survey Boundary



1.2 METHODS

Two surveys were carried out in October 1992: an Aerial Point Sample (APS) survey on the 23.10.92; and a Systematic Reconnaissance Flight (SRF) survey on the 24.10.92.

Aerial Point Sample Survey

The census was carried out using a light aircraft operated by Frankfurt Zoological Society and covered 2198 km². Personnel involved in the survey are indicated in Appendix A. The survey, interpretation and analysis methodology followed Norton-Griffiths (1988). A 35mm camera with 250 exposure cassette and data back was mounted in the aircraft's camera hatch so as to take vertical photos. The film used was Ektachrome 200 and the lens 18mm. Flight lines (transects) were marked on a 1:250,000 scale map from which the desired start and end positions of the transects were read off in latitude & longitude. Transects were spaced 5 km apart, located centrally within 5 km UTM grids and oriented east-west. A GPS was used to assist the accuracy of flight navigation and to record the actual start and stop co-ordinates of the transects. Any deviation from the planned flight line was recorded by the pilot at the time of flying. Each transect was divided into 30 second sub-units. The front seat observer (FSO) recorded the radar altimeter at the start of each sub-unit and simultaneously pressed the cable release to take a photograph.

A summary of survey parameters is shown in Table 1. Additional parameters are in Appendix B. A list of categories used in the interpretation is given in Appendix C. Analysis was done using computer software deveploped by K. Campbell for the analysis of APS survey data. Figure 2 shows the boundary of the survey area.

Systematic Reconnaissance Flight Survey

The census was carried out using a light aircraft operated by Frankfurt Zoological Society and covered 2567 km². Personnel involved in the survey are indicated in Appendix A. The Systematic Reconnaissance Flight (SRF) methodology followed Norton-Griffiths (1978). Flight lines (transects) were marked on a 1:250,000 scale map from which the desired start and end positions of the transects were read off in latitude & longitude. Transects were spaced 5 km apart, located centrally within 5 km UTM grids and oriented east-west. A GPS was used to assist the accuracy of flight navigation and to record the actual start and stop co-ordinates of the transects. Any deviation from the planned flight line was recorded by the pilot at the time of flying. Each transect was divided into 30 second sub-units. The front seat observer (FSO) called the start and number of each sub-unit and recorded the radar altimeter reading at the start of each sub-unit. Rear seat observers (RSO's) recorded onto cassette recorders all wildlife observed within defined counting strips. Observations were transcribed onto data sheets the same day.

Counting strips were defined by parallel fibreglass rods attached to the wing struts on both sides of the aircraft. Parallel marks on the window allowed observers to maintain constant position relative to the rods at the time of counting. Strip widths observed during the survey were calculated from regressions of observed strip against radar altimeter readings. These were obtained for each RSO by flying repeatedly at a number of different heights over a series of white-painted markers placed 20 metres apart along the airstrip. Summaries of parameters are given in Table 1. Additional parameters are given in Appendix B. Analysis was done using computer software developed by K. Campbell for the analysis of SRF survey data. The method of calculating the population estimates follows that of Jolly (1969). Figure 2 shows the boundary of the survey area. The Lake Eyasi boundary was digitised from 1:50,000 maps

Table 1. October 1992 Survey Parameters

Parameter		APS (5H-FZS)	SRF (5H-ZOO)
Survey code		EY01	EY02
Area surveyed (km²)		2,198	2,567
Transect spacing (km)		5	5
Flying height (ft a.g.l.):	average	1,288	349
	standard deviation	203.6	52.6
	minimum	600	150
	maximum	1,900	550
Mean strip width (m):	left observer	not applicable	183
	right observer	not applicable	181
	combined	not applicable	363
Number of transects		13	13
Total transect distance (km)		434	513
Elapsed transect time (min)		133	158
Mean speed (km/hr)		195	195
Total sub-units		270	323
Mean sub-unit length (km)		1.61	1.59
Total sample photo/strip area (ha)		11,137	18,716
Sample fraction (%)		5.07	7.29

2. RESULTS AND DISCUSSION

2.1. WILDLIFE

Estimates of wildlife species are presented in Table 2. The estimates from 1989 are given for comparison in Table 7, Appendix D. The majority of species which were observed in both the 1989 and 1992 surveys showed no change in population size between the two surveys. The estimate for impala appears at first sight to be rather different but is not statistically significant.

Thomson's gazelle had a significantly ($p < 0.05$) lower estimate than in 1989. Since this species is very mobile the lower estimate may simply be due to movement of animals out of the area. Although not statistically significant, the estimates for wildebeest and zebra, both migratory species, were also lower in 1992.

A number of species were seen in 1992 which had not been observed in 1989. These were klipspringer, reedbuck, waterbuck, bushbuck, buffalo and lion. All of these species are either likely to be present at low densities or are difficult to spot and are quite likely therefore not to be seen in every census.

2.2 LIVESTOCK

Cattle and shoats (sheep & goats) showed no significant change in population but the population of donkeys was highly significantly lower ($p<0.001$) (see Tables 2 & 7). The 1992 estimate for donkeys was approximately half the 1989 estimate. As commented in the 1989 report, it is sometimes very difficult to count donkeys if they are mixed with groups of cattle and they may therefore be underestimated. However, assuming the biases remained constant between surveys the decrease could be real. It is not possible to say, purely on the basis of these survey results whether the decrease is due to a temporary absence from the area, emigration or disease. Information from other sources would be needed to interpret this result correctly.

Figure 2. SRF and APS Survey Boundaries 1992

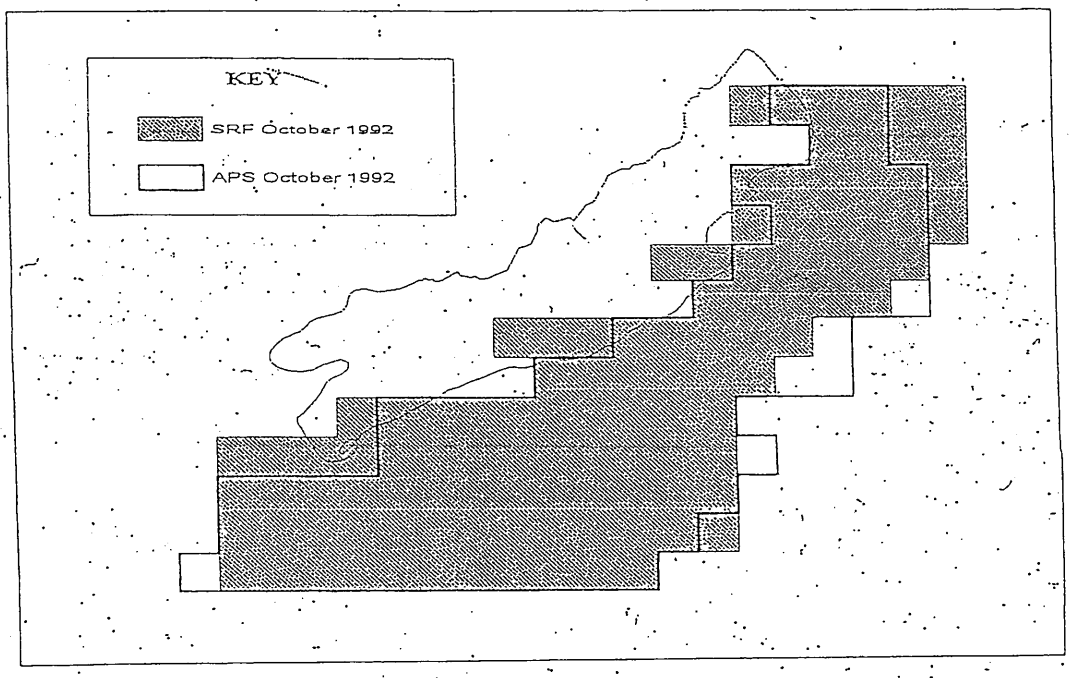


Figure 3. Density & Distribution of All Wildlife Species Combined - SRF Survey

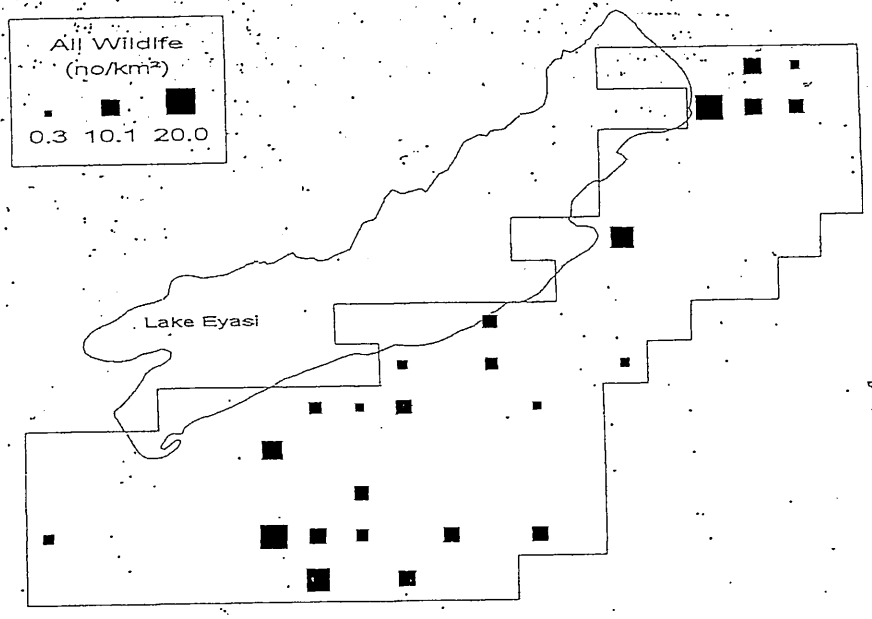


Figure 4. Distribution of All Human Activities Combined - APS Survey

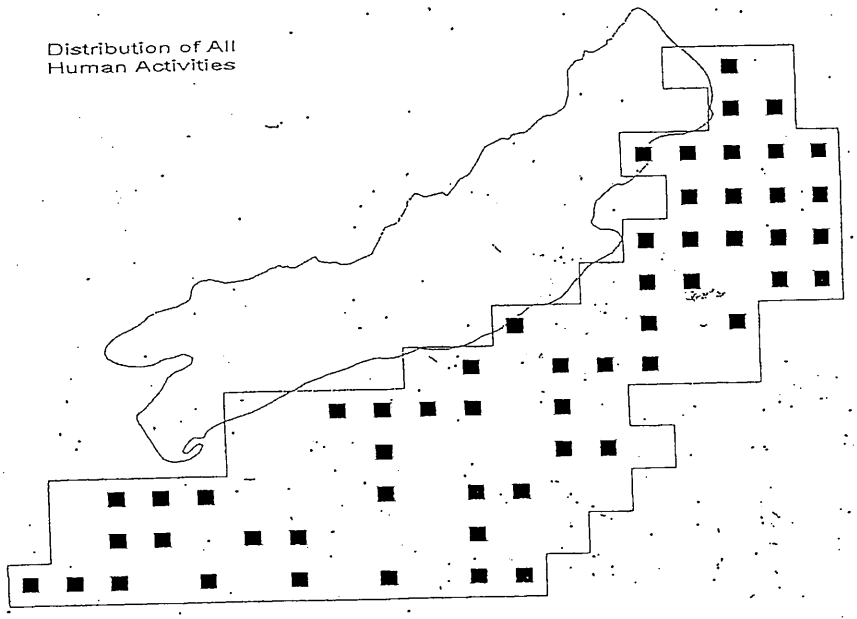


Figure 5. Density & Distribution of Buffalo - SRF Survey

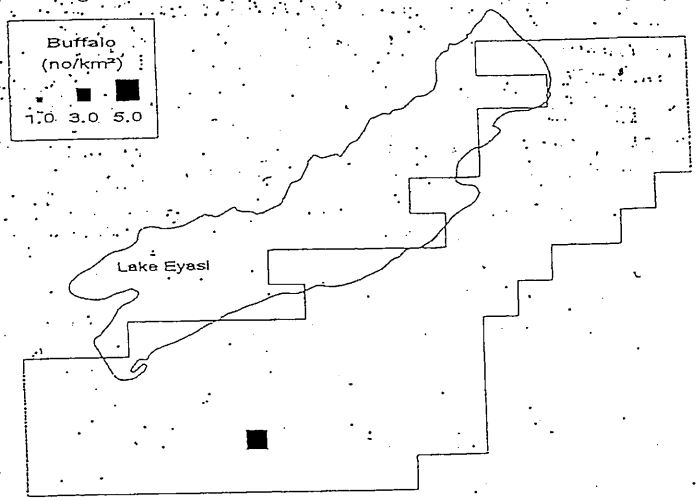


Figure 6. Density & Distribution of Giraffe - SRF Survey

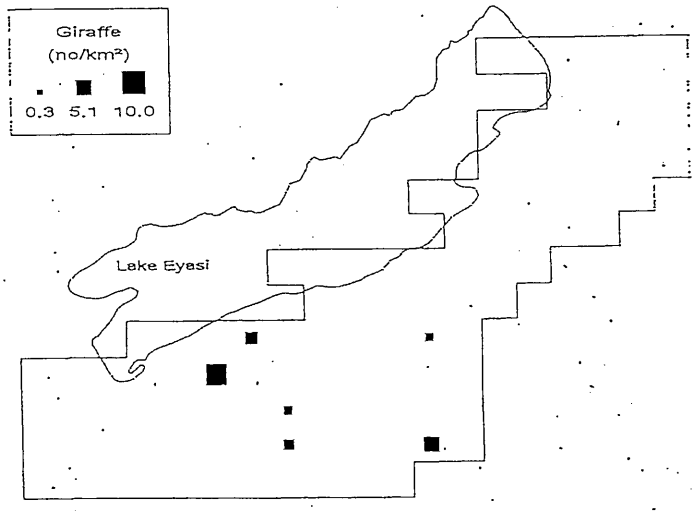


Figure 7. Density & Distribution of Grant's Gazelle - SRF Survey

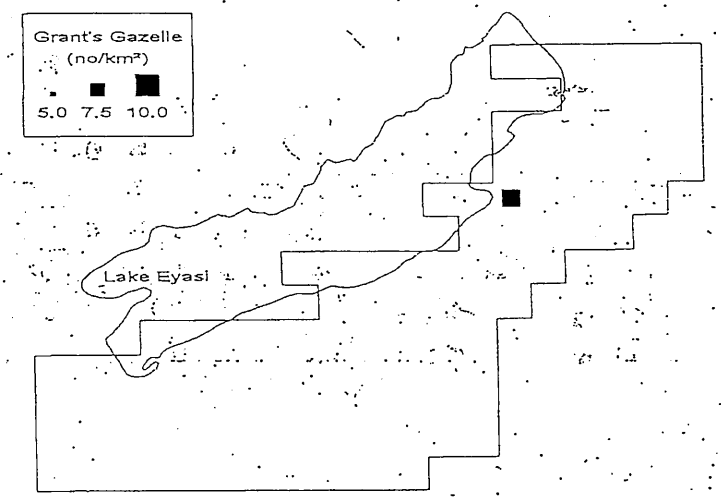


Figure 8. Density & Distribution of Impala - SRF Survey

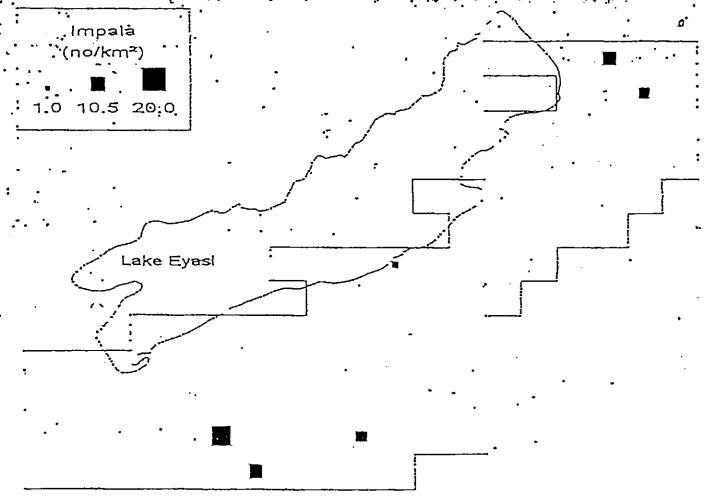


Figure 9. Density & Distribution of Ostrich - SRF Survey

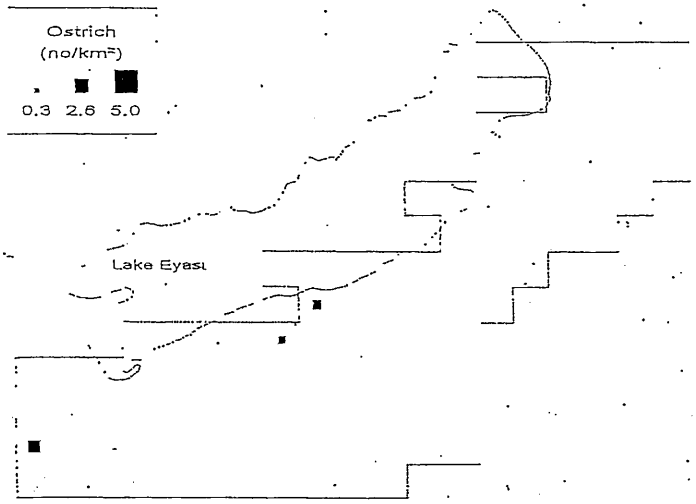


Figure 10. Density & Distribution of Thomson's Gazelle - SRF Survey

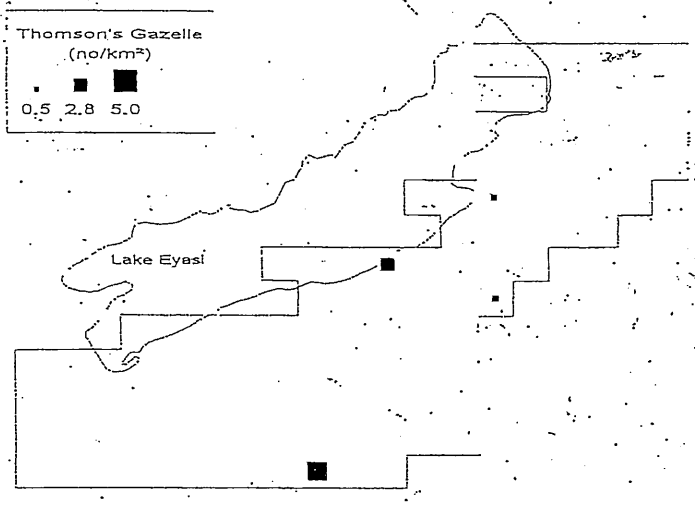


Figure 11. Density & Distribution of Warthog - SRF Survey

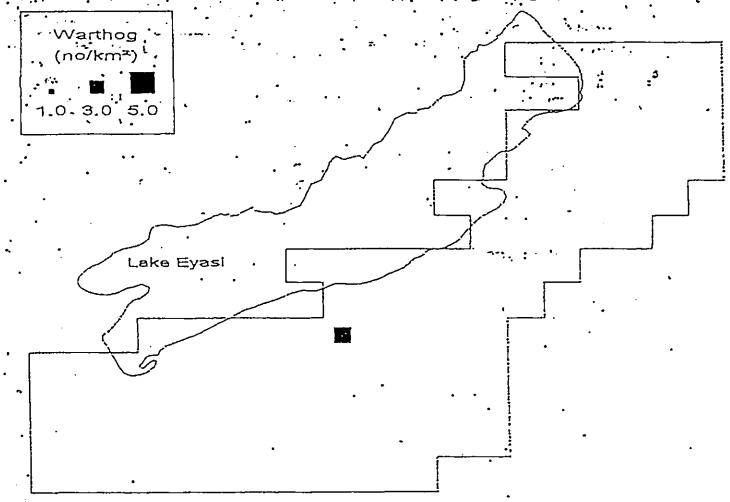


Figure 12. Density & Distribution of Wildebeest - SRF Survey

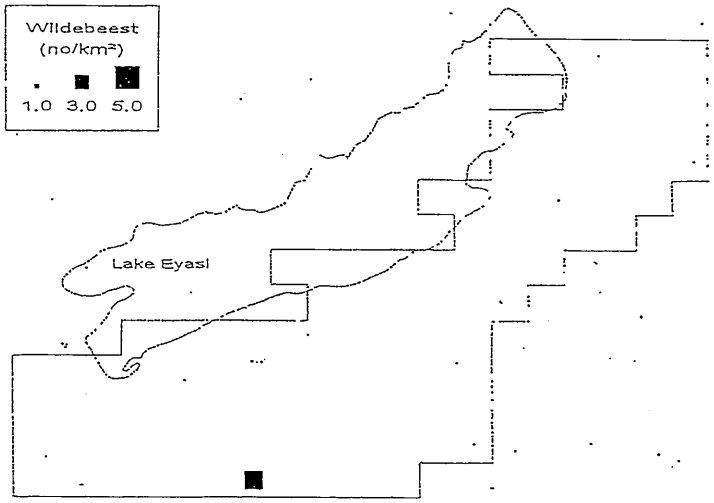


Figure 13. Density & Distribution of Zebra - SRF Survey

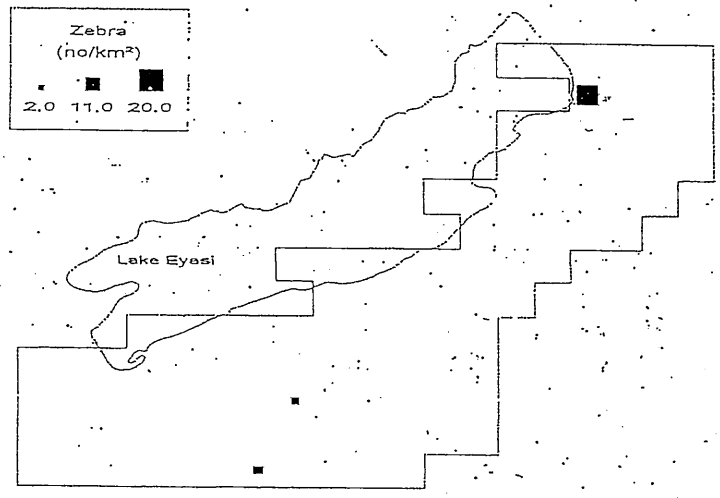


Figure 14. Density & Distribution of Cattle - SRF Survey

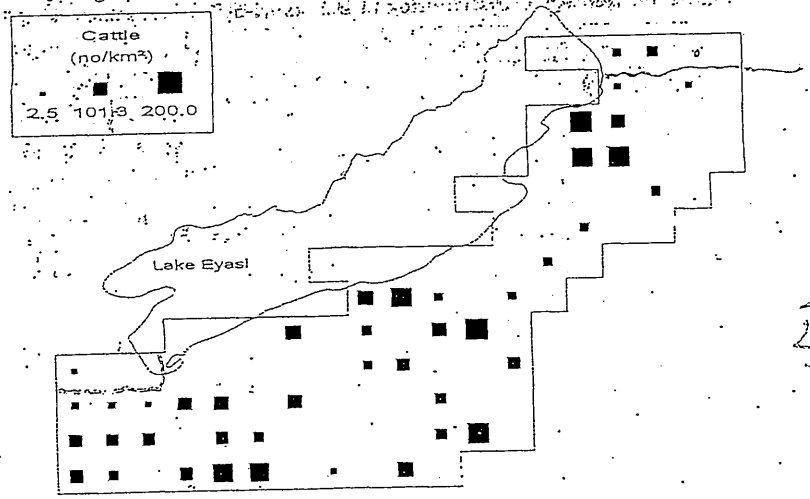


Figure 15. Density & Distribution of Sheep & Goats - SRF Survey

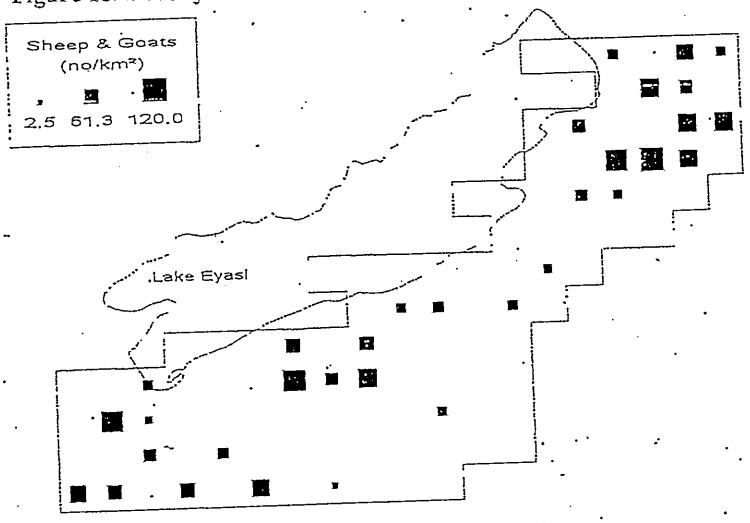


Figure 16. Density & Distribution of Donkey - SRF Survey

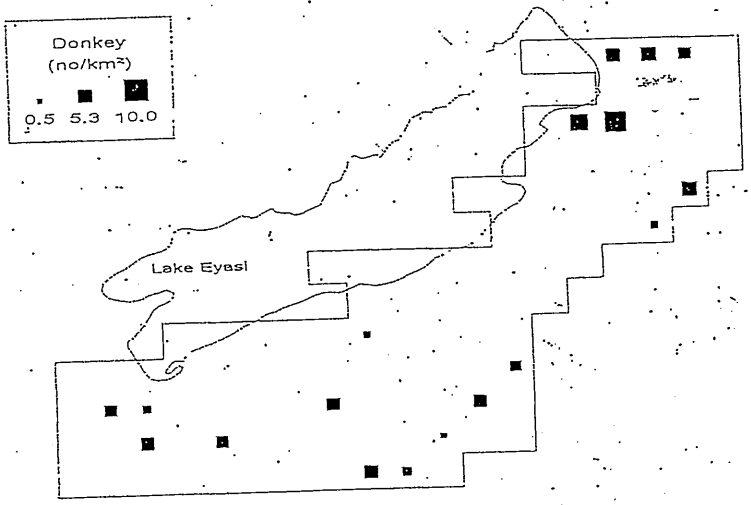


Figure 17. Density & Distribution of Bomas with Houses Inside - APS Survey

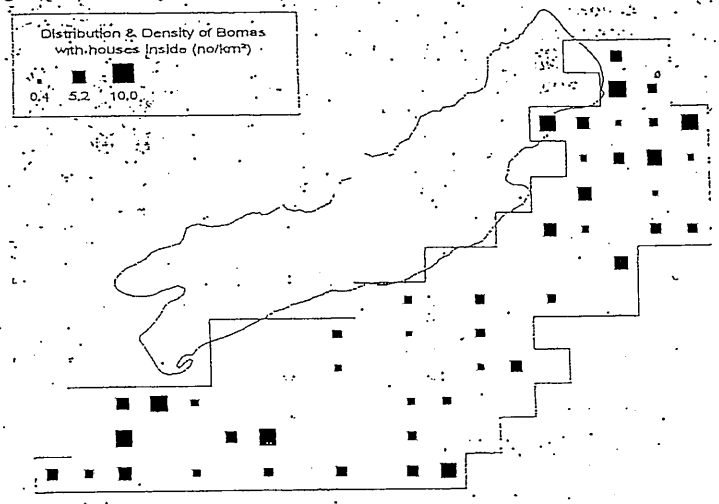


Figure 18. Density & Distribution of Bomas without Houses Inside - APS Survey

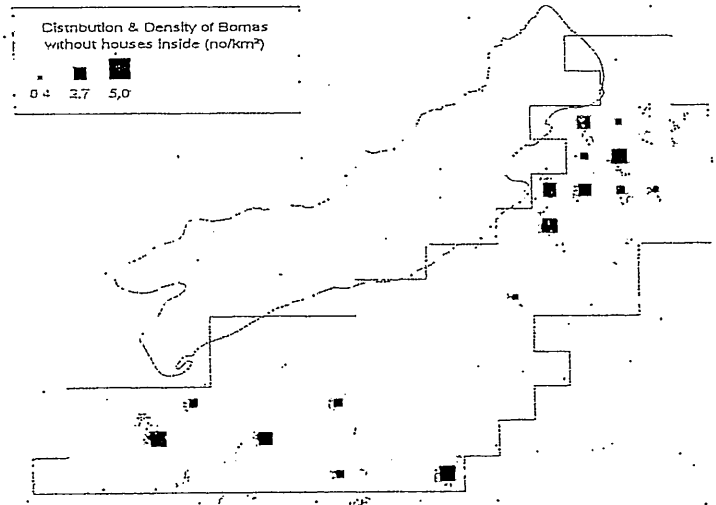


Figure 19. Density & Distribution of Abandoned Bomas - APS Survey

Figure 17. Density & Distribution of Bomas with Houses Inside - APS Survey

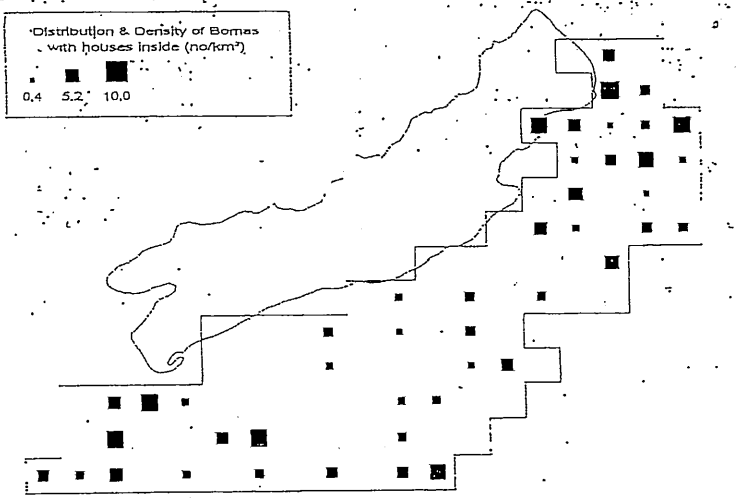


Figure 18. Density & Distribution of Bomas without Houses Inside - APS Survey

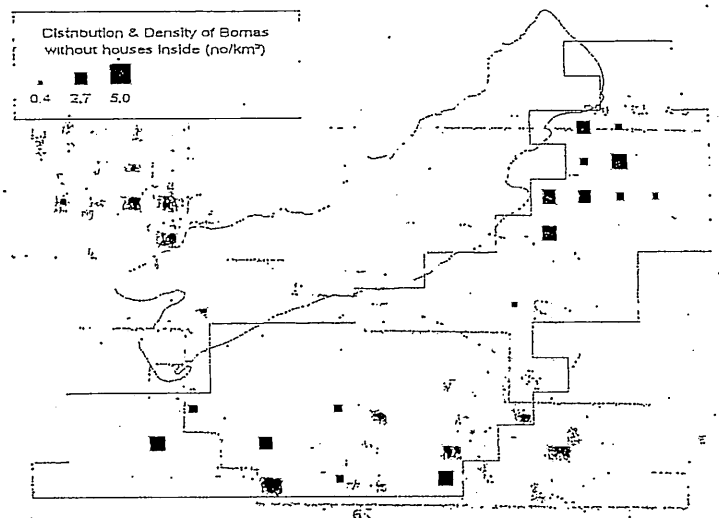


Figure 19. Density & Distribution of Abandoned Bomas - APS Survey

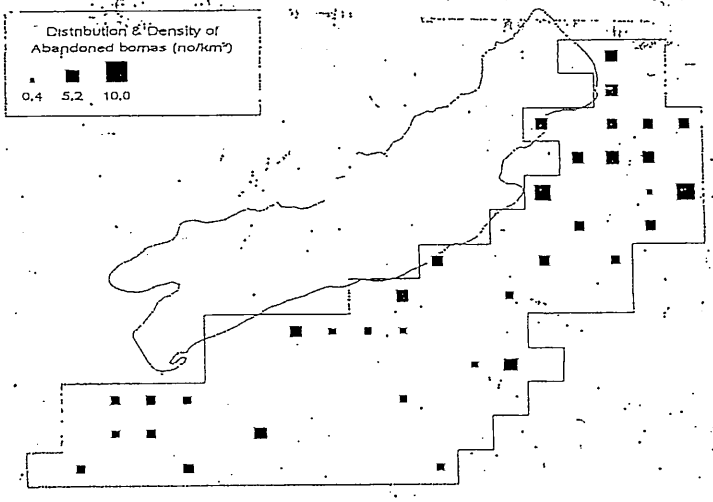


Figure 20. Density & Distribution of Huts Inside Bomas - APS Survey

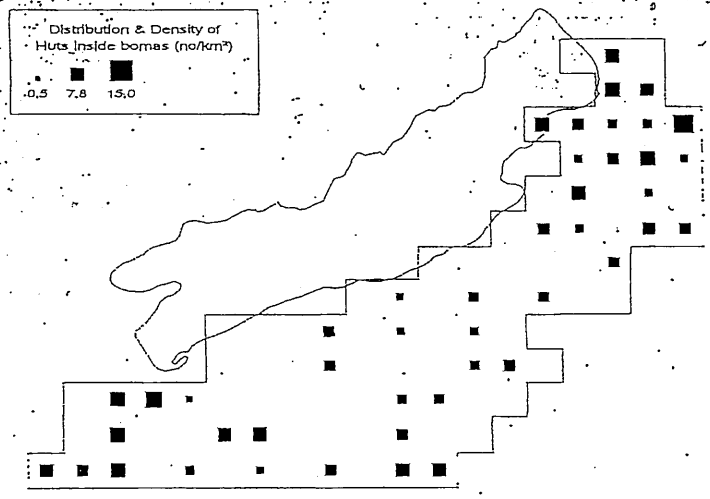


Figure 21. Density & Distribution of Huts Outside Bomas - APS Survey

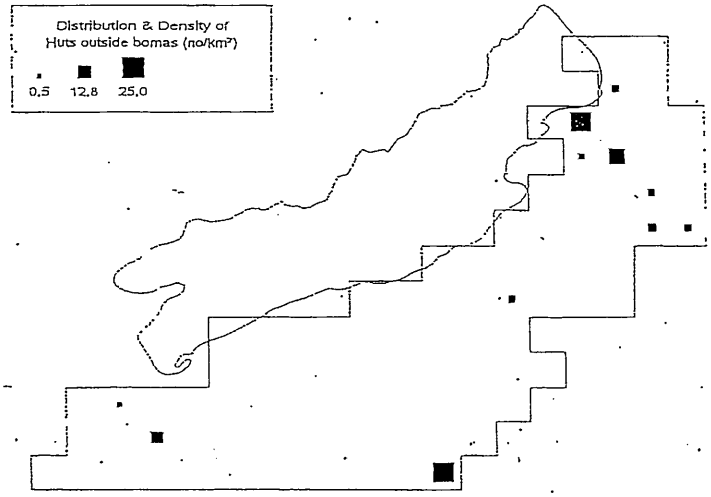


Figure 22. Density & Distribution of Mabati Roofs - APS Survey

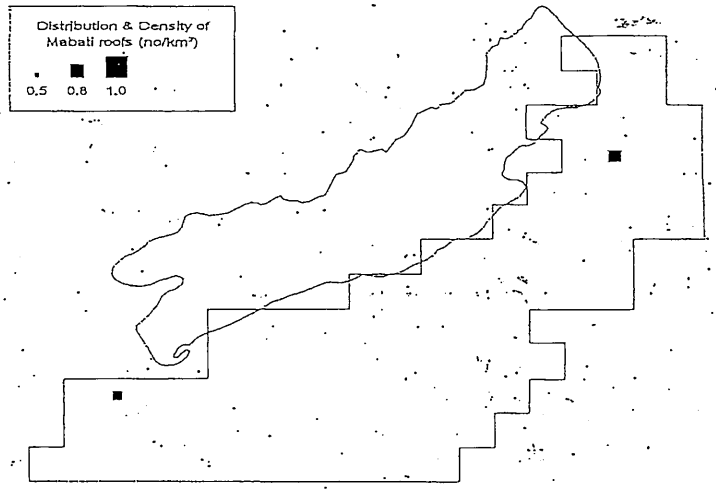


Figure 23. Density & Distribution of Grazing Exclosures - APS Survey

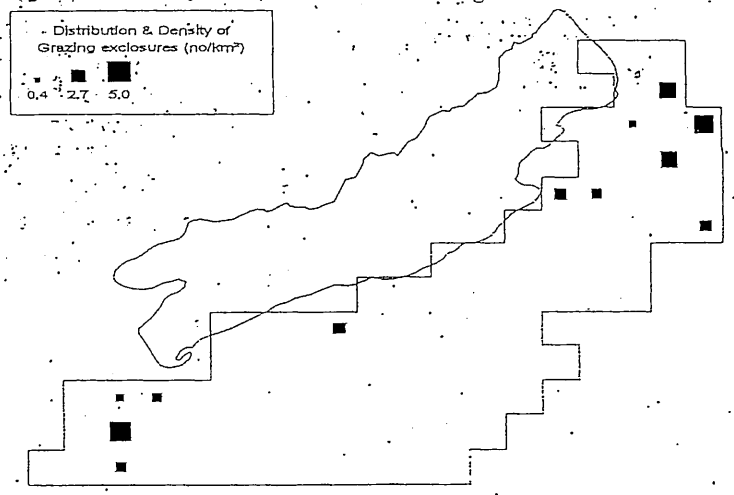


Figure 24. Distribution and Percentage Land Cover for Agriculture - APS Survey

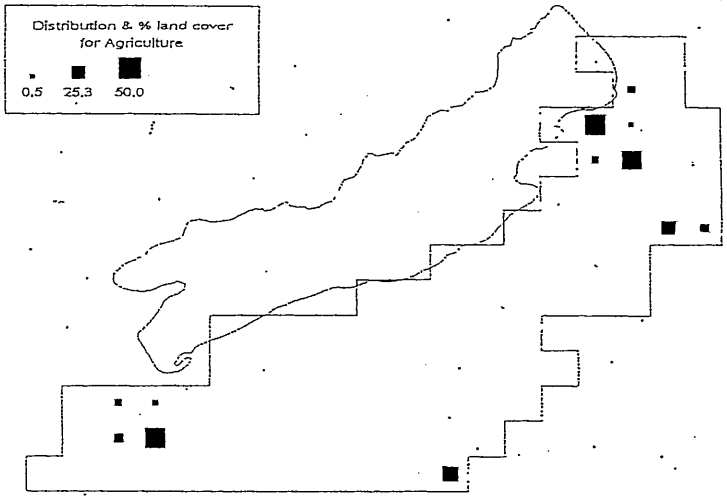


Figure 25. Distribution and Percentage Land Cover for Fallow Land - APS Survey

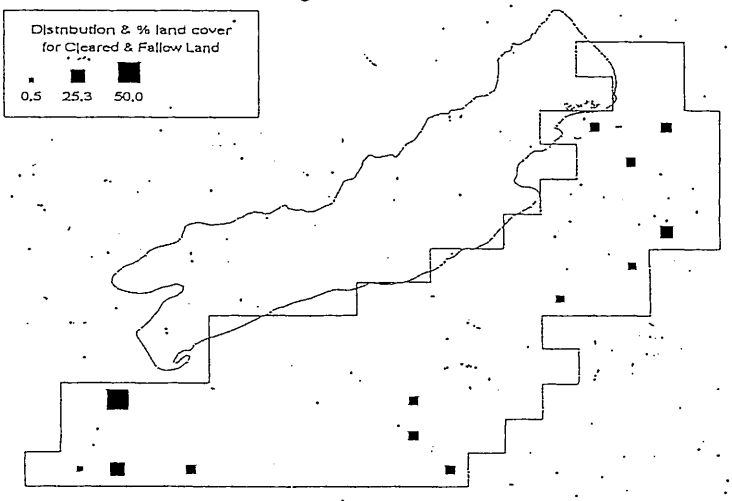


Figure 26. Distribution and Percentage Land Cover for Recently Cleared Land - APS Survey

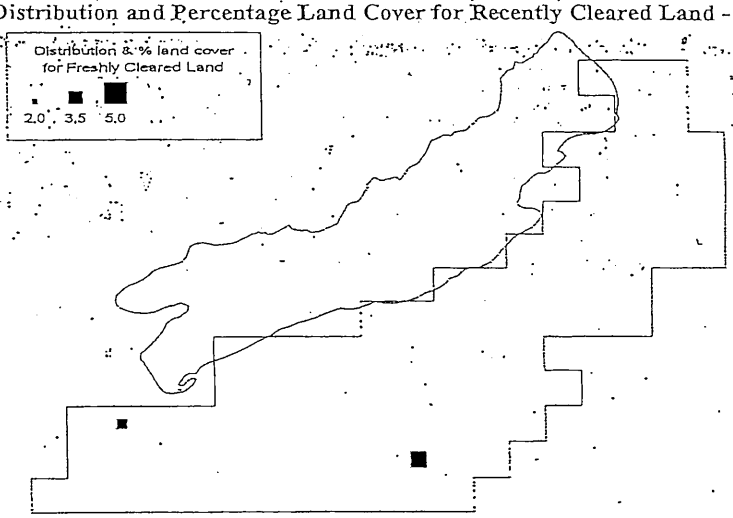


Figure 27. Distribution and Percentage Land Cover for Tree & Bush - APS Survey

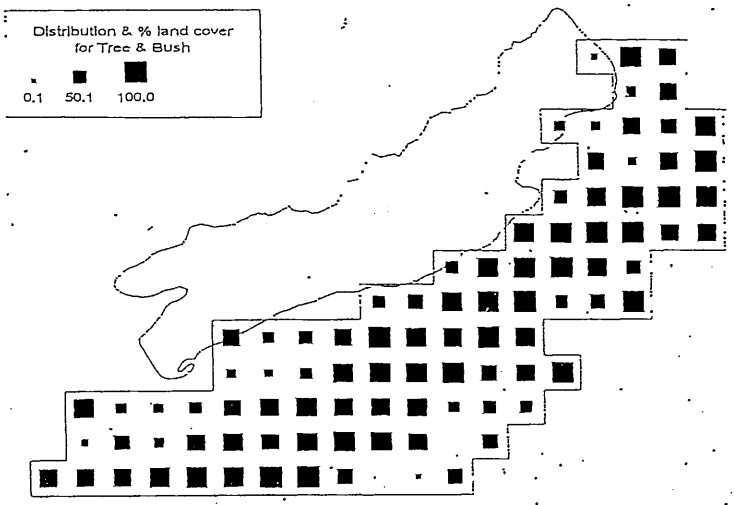


Figure 28. Distribution and Percentage Land Cover for Open Area - APS Survey

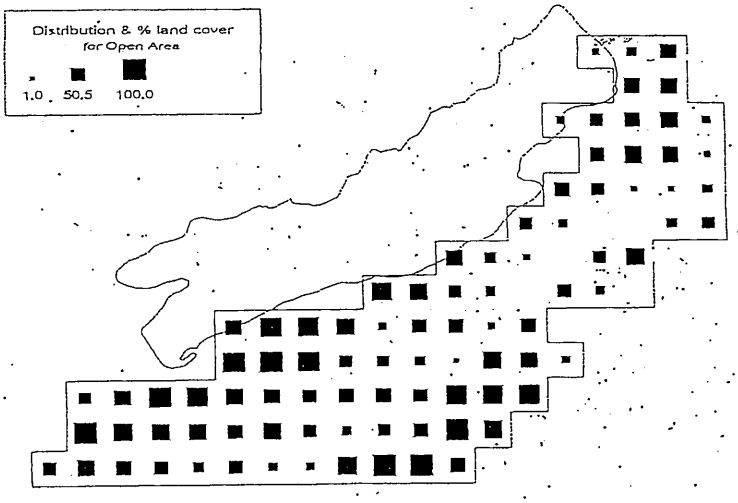


Figure 29. Distribution and Percentage Land Cover for Bare Ground - APS Survey

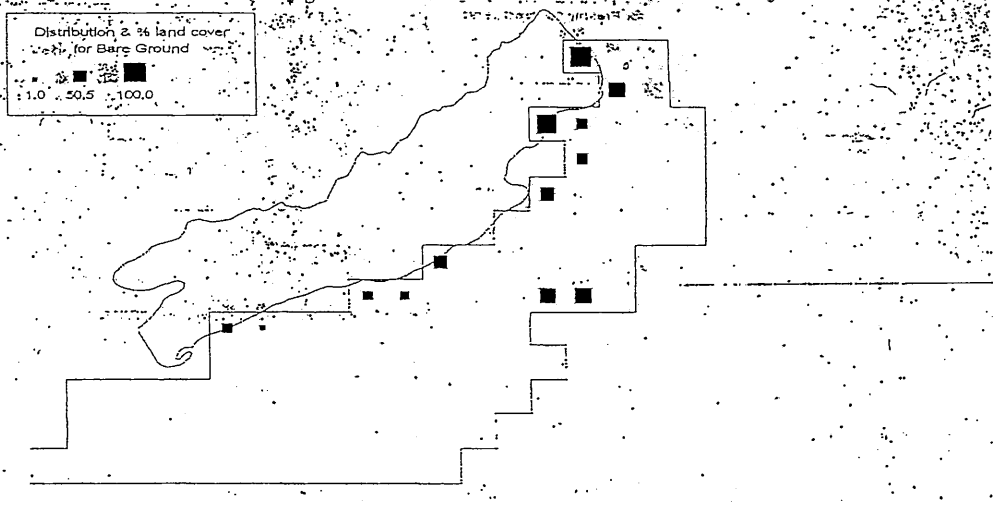
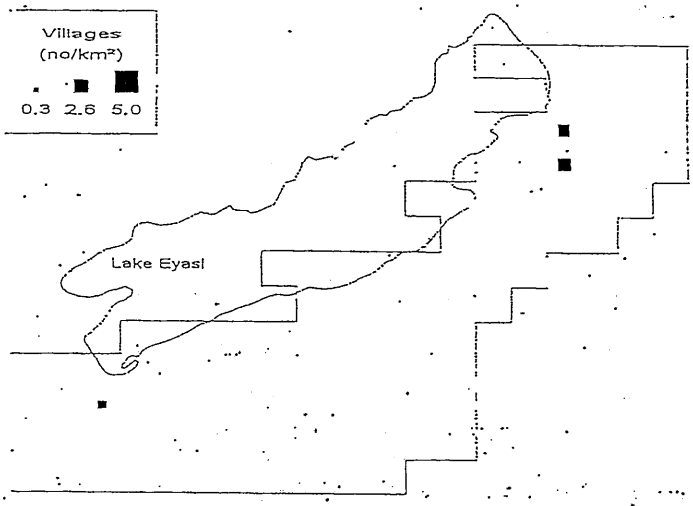


Figure 30. Distribution and Density of Villages - SRF Survey



BIBLIOGRAPHY

Jolly, G.M. 1969. Sampling Methods for Aerial Census of Wildlife Populations. E. Afr. Agric. For. J. 34: 46-49.

Norton-Griffiths, M. 1978. Counting Animals. African Wildlife Foundation, Box 48177, Nairobi.

Norton-Griffiths, M. 1988. Aerial point sampling for land use surveys. J. Biogeography 15: 149-156.

Tanzania Wildlife Conservation Monitoring. (TWCM) 1989. Eyasi Wildlife Survey, September 1989. 13pp

APPENDIX A. SURVEY CREW

Aircraft

SRF Survey		APS Survey	
Cessna 185	5H-ZOO	Cessna 182	5H-FZS

Survey Personnel

Flight Crew

	SRF Survey	APS Survey
Pilot	S. Tham (FZS)	M. Borner (FZS)
FSO	S.E. Tham (FZS)	J. Hando (TNP)
RSO-R	J.L. ole Kuwai (TWCM/SWRI)	F. Msoffe (TWCM)
RSO-L	C.N. Mufungo (TWCM)	-

Logistics and Organisation

J.L. ole Kuwai

Data Analysis, Photo-interpretation and Reporting

S.A. Huish (TWCM/FZS); C.N. Mufungo

APPENDIX B. ADDITIONAL SURVEY PARAMETERS

Table 5. Observer Strip Calibration Regressions - SRF Survey

Aircraft	RSO	Intercept	Slope	Correlation Coefficient
5H-ZOO	JLK	-11.75	0.551	0.931
5H-ZOO	CMN	-5.70	0.540	0.932

Figure 31. Frequency Distribution of Radar Altimeter Readings - SRF Survey

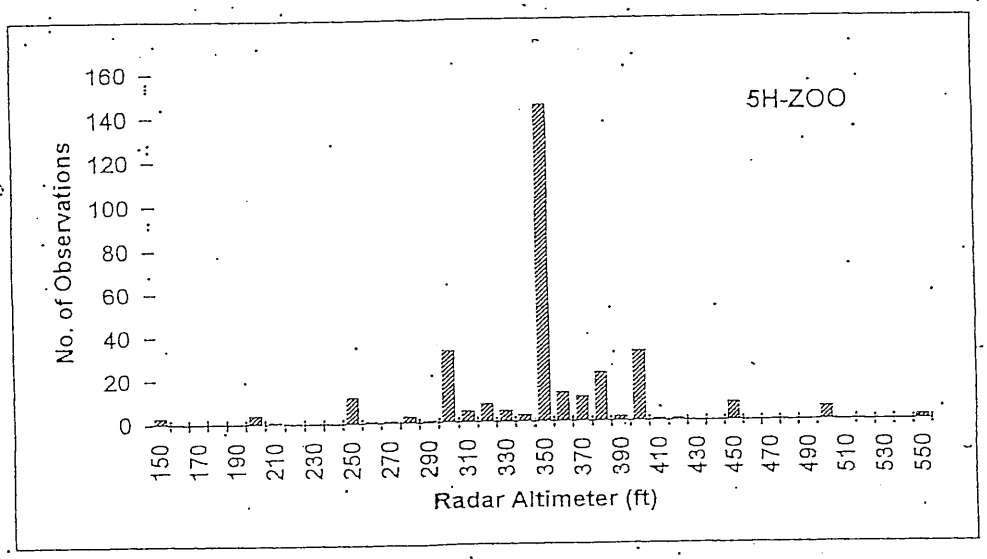


Figure 32. Frequency Distribution of Radar Altimeter Readings - APS Survey

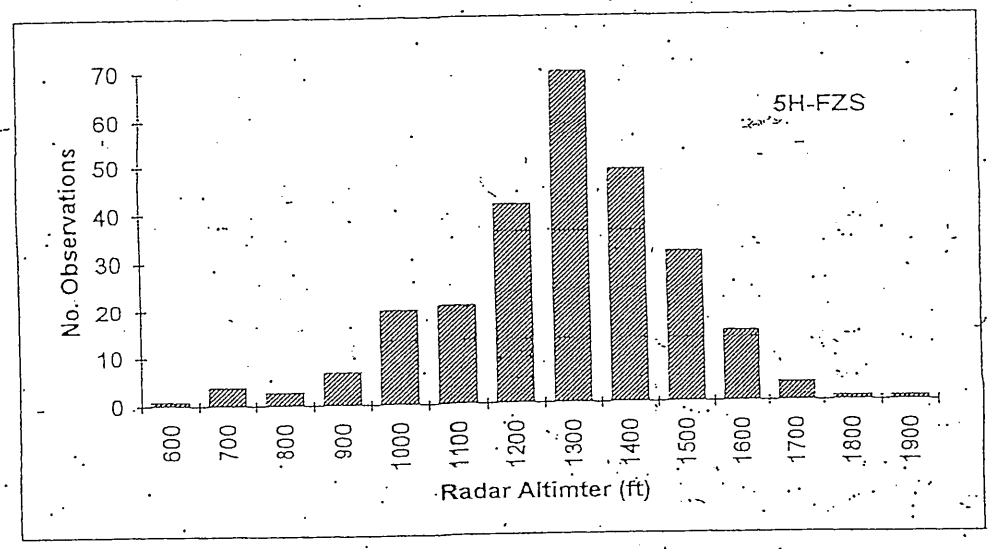


Figure 33. Sub-unit Locations - APS Survey EY01

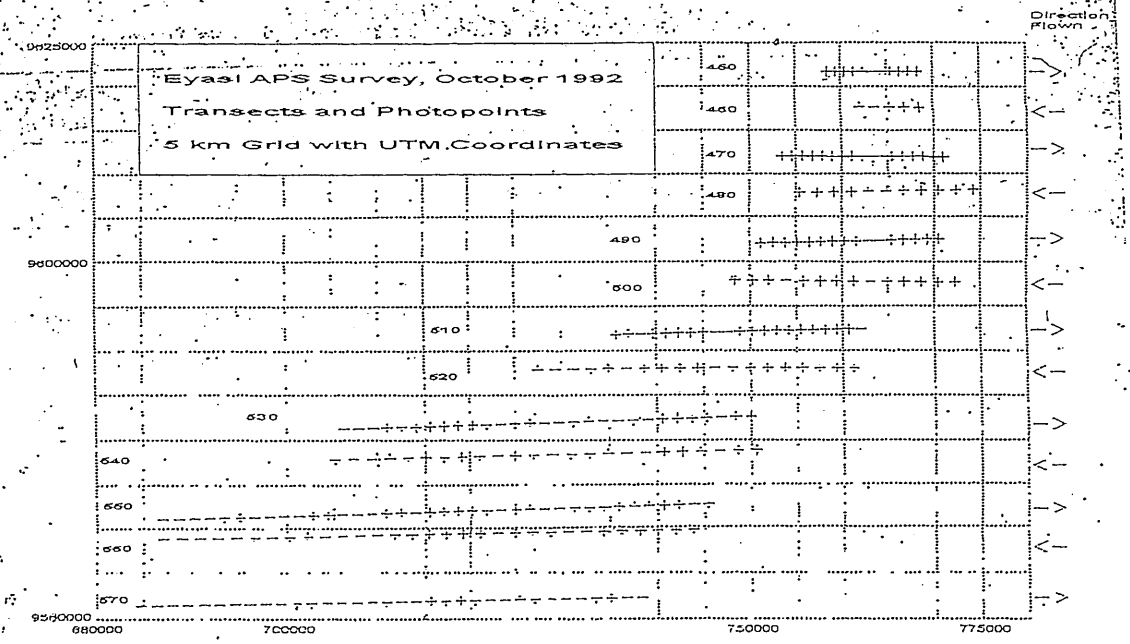


Figure 34. Sub-unit Locations - SRF Survey EY02

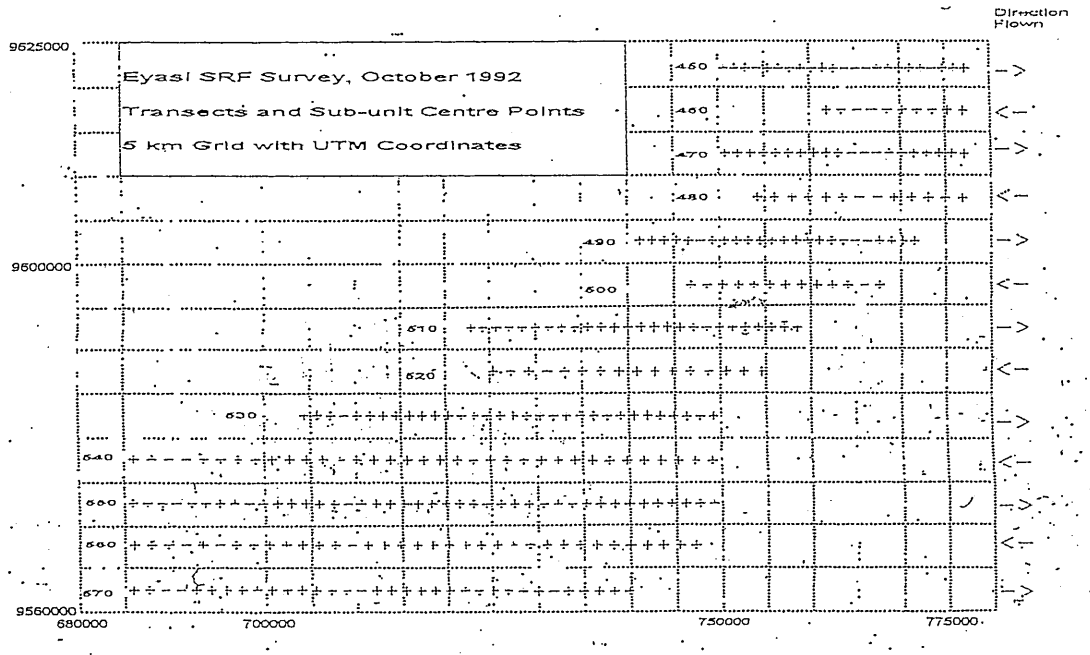
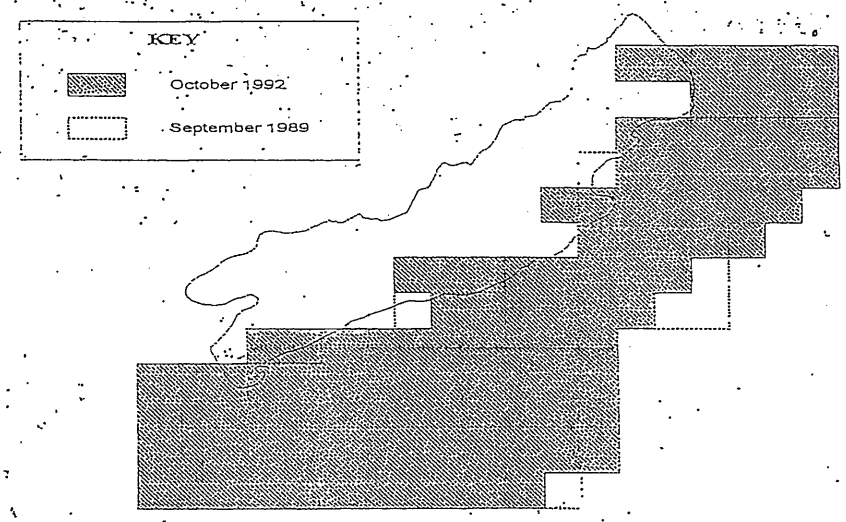


Figure 35. SRF Survey Boundaries 1989 & 1992



APPENDIX C: PHOTO-INTERPRETATION CATEGORIES

Table 6. Categories Used During Photo-interpretation

Category	Type of Measurement
Tree or bush canopy	Area
Open area (dominant cover grassland)	Area
Riparian vegetation	Area
River	Area
Rock	Area
Bare ground	Area
Cleared or fallow land	Area
Freshly burnt or cleared land	Area
Ploughed or cultivated land	Area
Paths and tracks	Index of Abundance
Bomas with houses inside	Area and number
Houses in bomas-with-houses (flat, earthen roof)	Number
Stockpen subdivisions in bomas-with-houses	Number
Entrances in bomas-with-houses	Number
Bomas without houses inside	Area and number
Stockpen divisions in bomas-without-houses	Number
Abandoned bomas	Area and number
Thatch roof (A-frame, not in boma)	Number
Mabati roof (not in boma)	Number
Circular grass thatch hut	Number
Grazing exclosure	Area and number

APPENDIX D. COMPARISON WITH EARLIER DATA

Table 7. Comparison of Population Estimates from 1992 & 1989 Surveys with Merged Estimates[2]

	1992		1989				
Species	Estimate	SE	Estimate	SE	D Value	Merged estimate	Merged SE
Elephant skeleton	18	13.5	17	15.7			
Giraffe	314	135.5	278	91.5	-0.220	289	76.1
Grant's gazelle	222	202.9	194	196.6	-0.099	207	141.3
Impala	916	381	547	267.4	-0.793	668	218.7
Ostrich	55	28.5	94	65.6	0.542	61	26.2
Thomson's gazelle	199	70.6	1360	488.0	*2.355		
Warthog	55	52.6	74	65.5	0.225	62	41.1
Wildebeest	88	77.6	415	261.9	1.197	114	74.4
Zebra	381	281.1	1632	589.9	1.914	612	253.8
Cattle	48,413	11,157.8	60,579	11,023.8	0.776	54,569	7,842.0
Donkey	1,053	59.1	2150	197.8	**5.309		
Shoats	29,287	4,771.2	30,224	5,721.0	0.126	29,671	3,664.2
Occupied boma	1,507	410.4	1,696	463.8	0.305	1,589	307.4
Unoccupied boma	684	118.1	901	180.0	1.008	749	98.7
Mabati roof	64	56.2	283	186.8	1.122	82	53.8
Village	66	33.4	175	59.8	1.813	99	27.8

Where estimates from the two surveys are not significantly different they have been merged to give a single estimate for the period 1989-1992.

[2]Note: Huts were not recorded consistently in the two SRF surveys, making comparison problematical

* Significant $p<0.05$ ** $p<0.001$