→ Plant Ecologist

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AERIAL CENSUS OF ELEPHANTS IN ETOSHA NATIONAL PARK, DECEMBER 1983 - JANUARY 1984.

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1. INTRODUCTION

The main object of this census was to estimate the total number of elephants present in Etosha during the rainy season. It is well known that elephants leave Etosha during this season, but the number of individuals remaining has not been established. Furthermore, the distribution of resident elephant herds during the rainy season is still largely unknown.

Although the number of elephants was the main objective, all other large mammals and ostriches observed were counted, and a special effort was made to count the herds of wildebeest and zebra on the plains of Etosha. Fixed-wing aerial counts are known to be unreliable, but the relatively low operating costs of a light aircraft could outweigh this disadvantage. Results from this census should therefore be regarded as indicative of trends and the true value might perhaps only become apparent after regular seasonal censussing, using the same aircraft.

Additional information was collected on the number and distribution of seasonal water pools, to determine their effect on animal distribution.

2. METHODS

This census was conducted according to the same procedures used in the previous census (Berry and Nott, 1983). No investigation into bias, precision and accuracy has been carried out as yet due to mechanical problems and foul weather prior ro compiling this report. Such a survey should however be conducted at the earliest possible opportunity.

2.1 A fixed wing aircraft (Piper Super Cub) seating one observer was used. Transect widths were 3,5km, altitude 66m (200ft) and cruising speed 150km/h, except in areas with high animal densities, where 2,0km wide transects were flown at 33m (100ft) altitude. Similarly, in areas with dense, tall vegetative cover, altitude was increased to 120m (400ft) but counting strip width remained the same.

2.2 During aerial transects, herds sizes of all elephants (and other mammals) were seperately recorded, as well as the number of adult (fully grown) individuals, and the number of calves less than one year of age. The latter aspect is suspect to error, but only very small calves with their peculiar and destinctive "floppy" gait were recorded. All adults within a herd were assumed to be female.

2.3 All other animals were counted as individuals only and no attempt was made at ageing and sexing of herds. Herds were never estimated but counted individually, by circling above them until the count was completed. These manoeuvres required great navigational skills from the pilot but are definitely superior to group estimates.

2.4 The approximate localities of all elephant herds, carcases, and seasonal water pools were recorded on a 1 : 500 000 map.

2.5 Figure 1 illustrates the demarcation of census blocks used in this report.

3. RESULTS

3.1 Figure 2 illustrates the total number of elephants counted in each census block in Etosha. Comparisons between elephant numbers and herds in the Western, Central and Eastern Districts of Etosha, are presented in Table 1.

3.2 Figure 3 illustrates the number and distribution of elephant bull herds, while adult elephant bulls as a percentage of the total number of elephants counted in each census block, are presented in figure 4.

3.3 Figure 5 illustrates the approximate localities of elephant herds and the distribution of seasonal water pools and gravel pits containing water during the census period.

3.4 Figure 6 illustrates the number of seasonal water pools and gravel pits containing water in each census block in Etosha.

3.5 Only one fresh carcase was found, namely that of a Hartmann's zebra, approximately 10km SSW of Dolomietpunt.

3.6 Figure 7 illustrates the number and distribution of elephants found outside the boundaries of Etosha.

3.7 Table 2 presents estimates of numbers of other species counted in each census block.

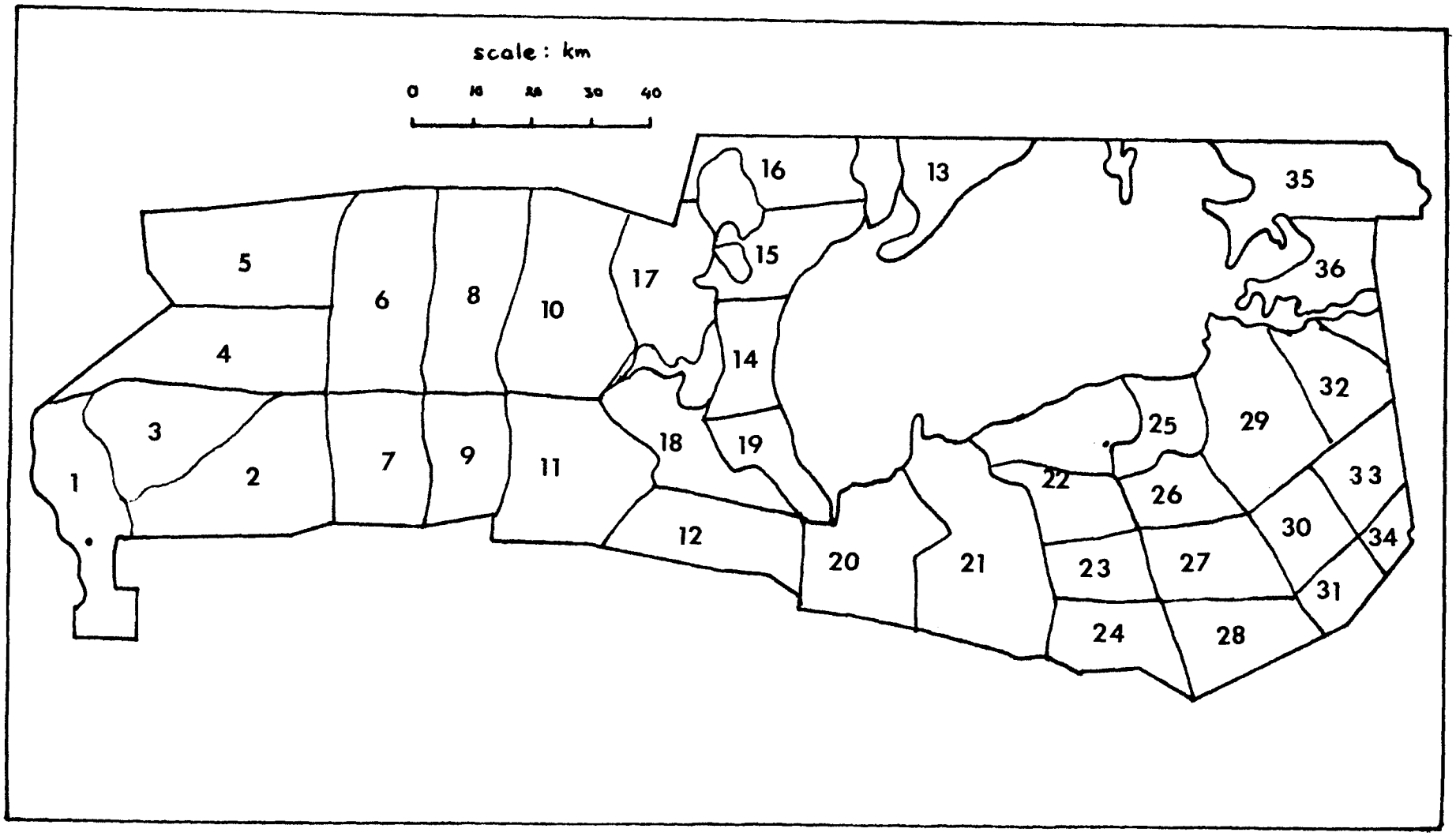

Figure 1: Census blocks in Etosha National Park

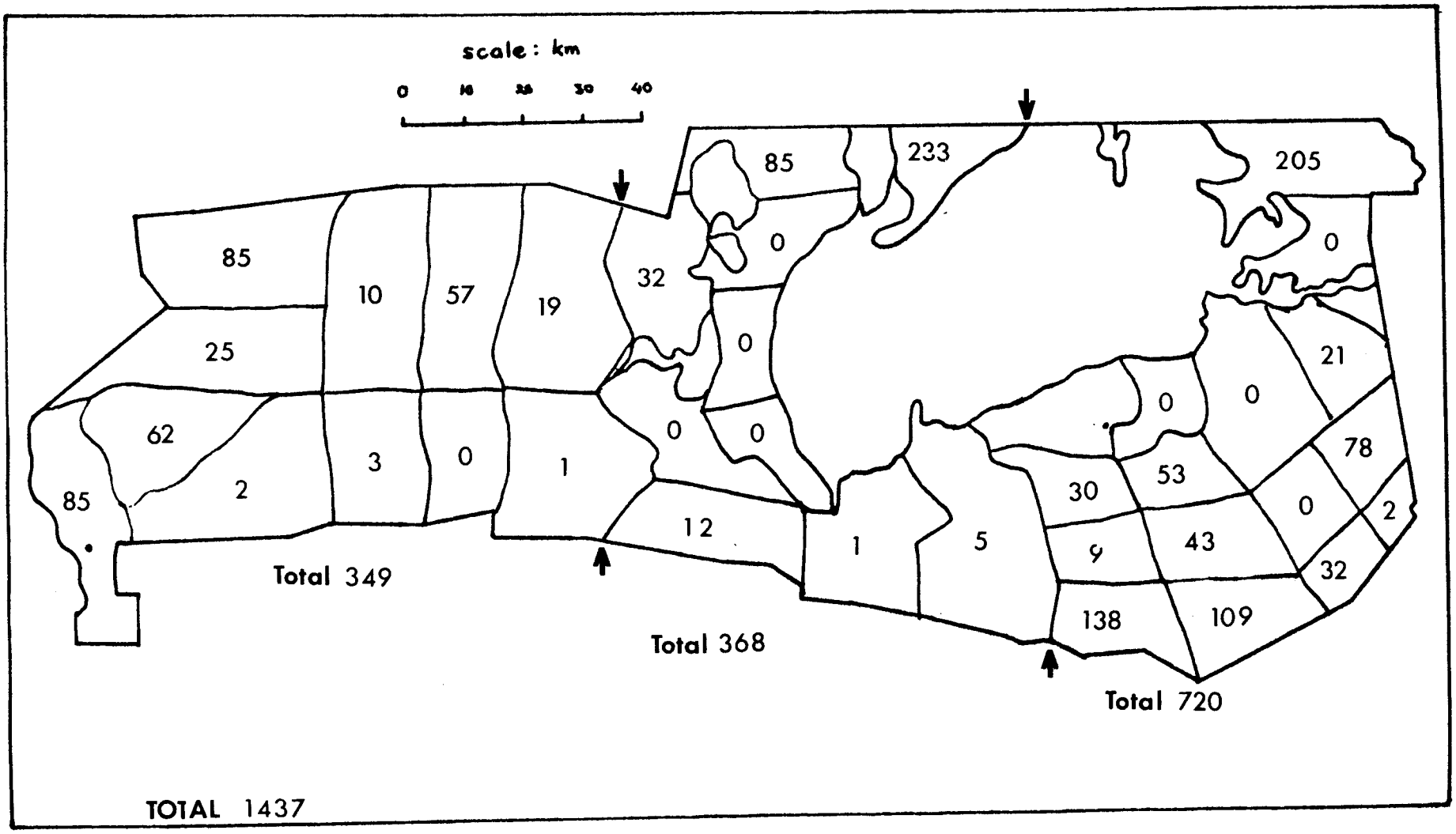

Figure 2: Total number of elephants counted in 36 census blocks in Etosha National Park

Table 1: Comparisons between elephant numbers and herds in the Western, Central and Eastern Districts of Etosha National Park.

	West	Central	East	Total
Total number counted	349	368	720	1 437
No. of breeding herds	34	30	37	101
No. of elephants in breeding herds	290	343	655	1 288
No. of bull herds	28	15	40	83
No. of elephants in bull herds	59	25	65	149
Mean size (±SE) of breeding herds	9,7 ± 0,9 (3 - 25)	11,4 ± 1,0 (2 - 25)	18,1 ± 2,0 (4 - 44)	
Mean size (±SE) of bull herds	2,1 ± 0,2 (1 - 6)	1,7 ± 0,3 (1 - 4)	1,6 ± 0,2 (1 - 5)	
Mean ratio (±SE) of 1 year old calves to adults in breeding herds (No. of herds)	0,46 ± 0,13 (0 - 0,33) 10	0,13 ± 0,04 (0 - 0,33) 15	0,25 ± 0,04 (0 - 0,50) 15	
% 1 Year old calves/ breeding herds	15,8	9,8	6,2	
% 1 Year old calves/ total elephants counted	6,0	8,4	5,8	
Breeding herds without 1 year old calves	26,7	33,3	20,6	
% Bulls (in bull herds)/total elephants counted	16,9	6,8	9,0	

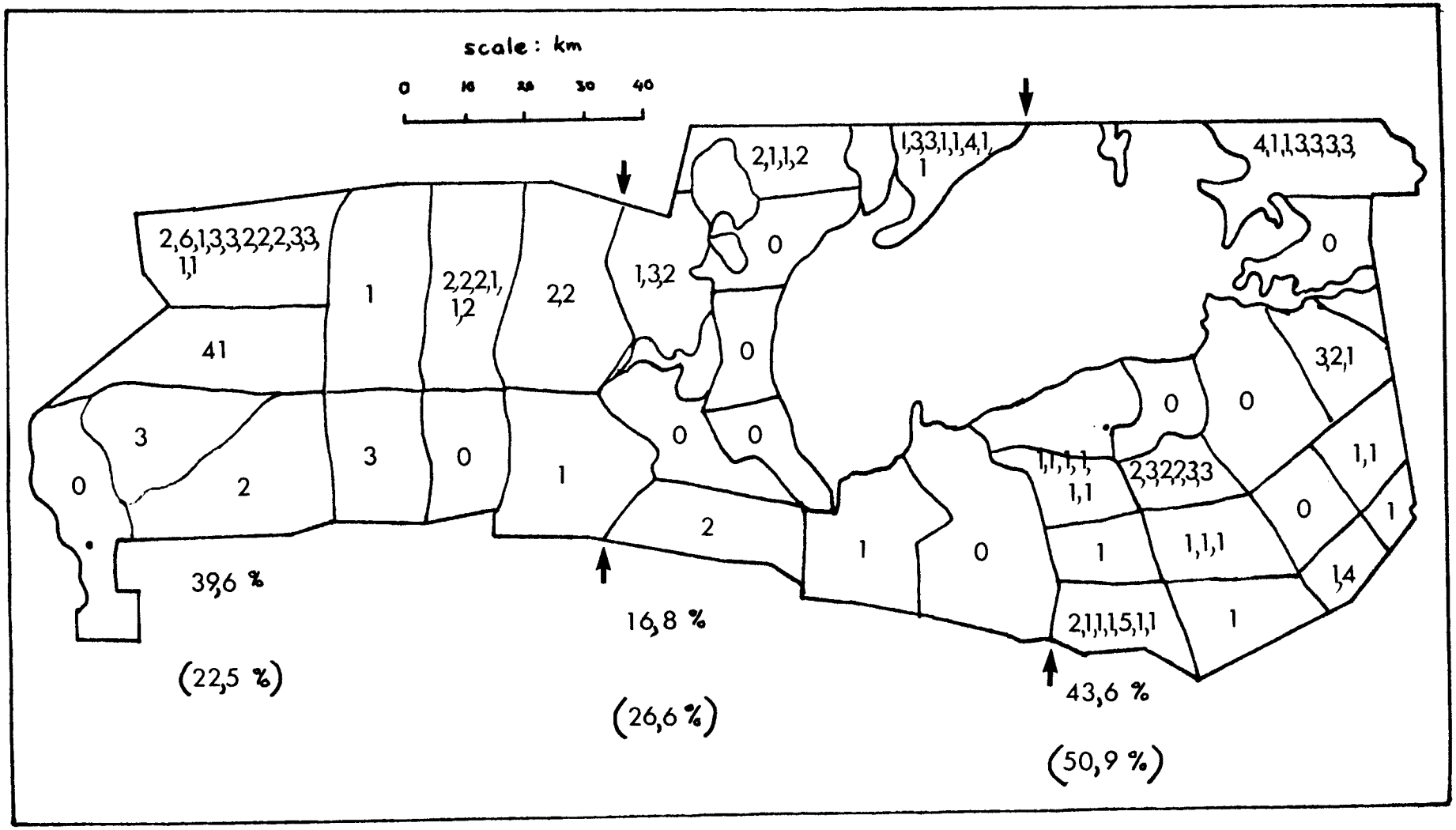

Figure 3: Number and distribution of elephant bull herds during December 1983 - January 1984 in Etosha National Park. Numbers indicate individual herds, percentages indicate the number of bulls in each district relative to the total. Percentages in brackets refer to the number of individuals in breeding herds in each district relative to the total number of individuals in breeding herds in Etosha.

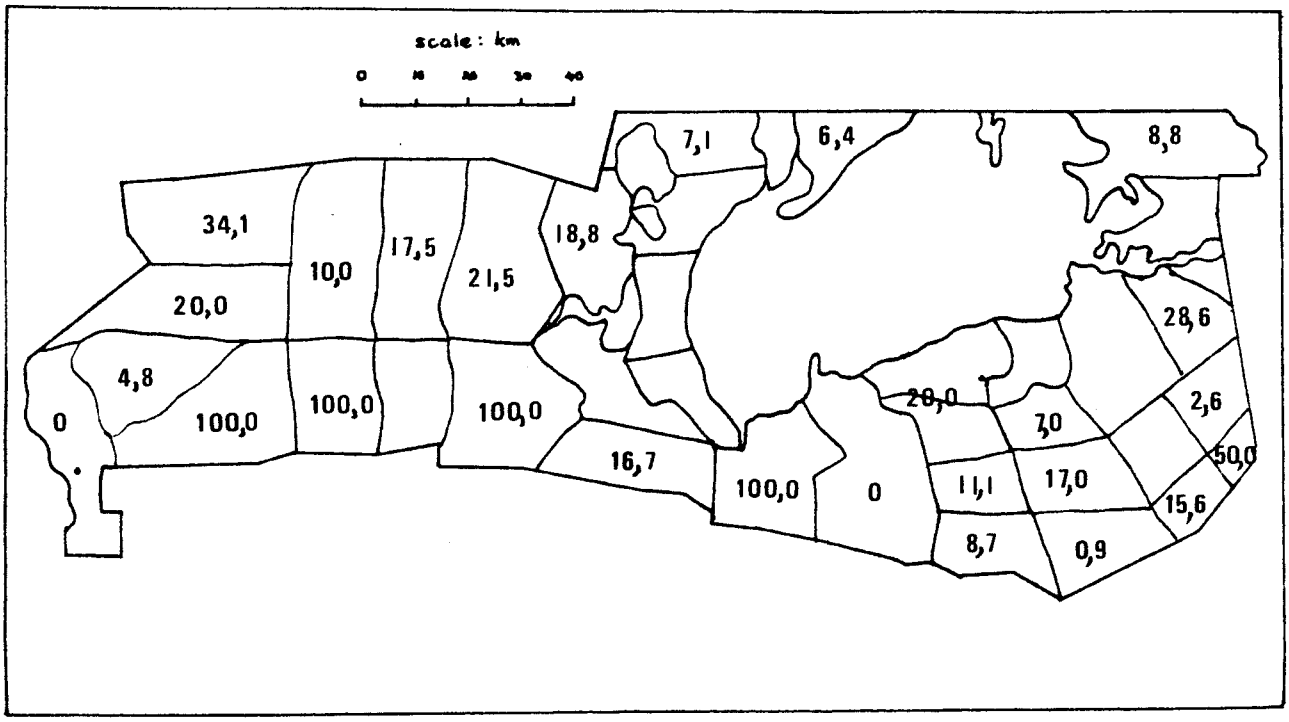

Figure 4: Adult elephant bulls as percentage of total number of elephants counted in each block in Etosha National Park.

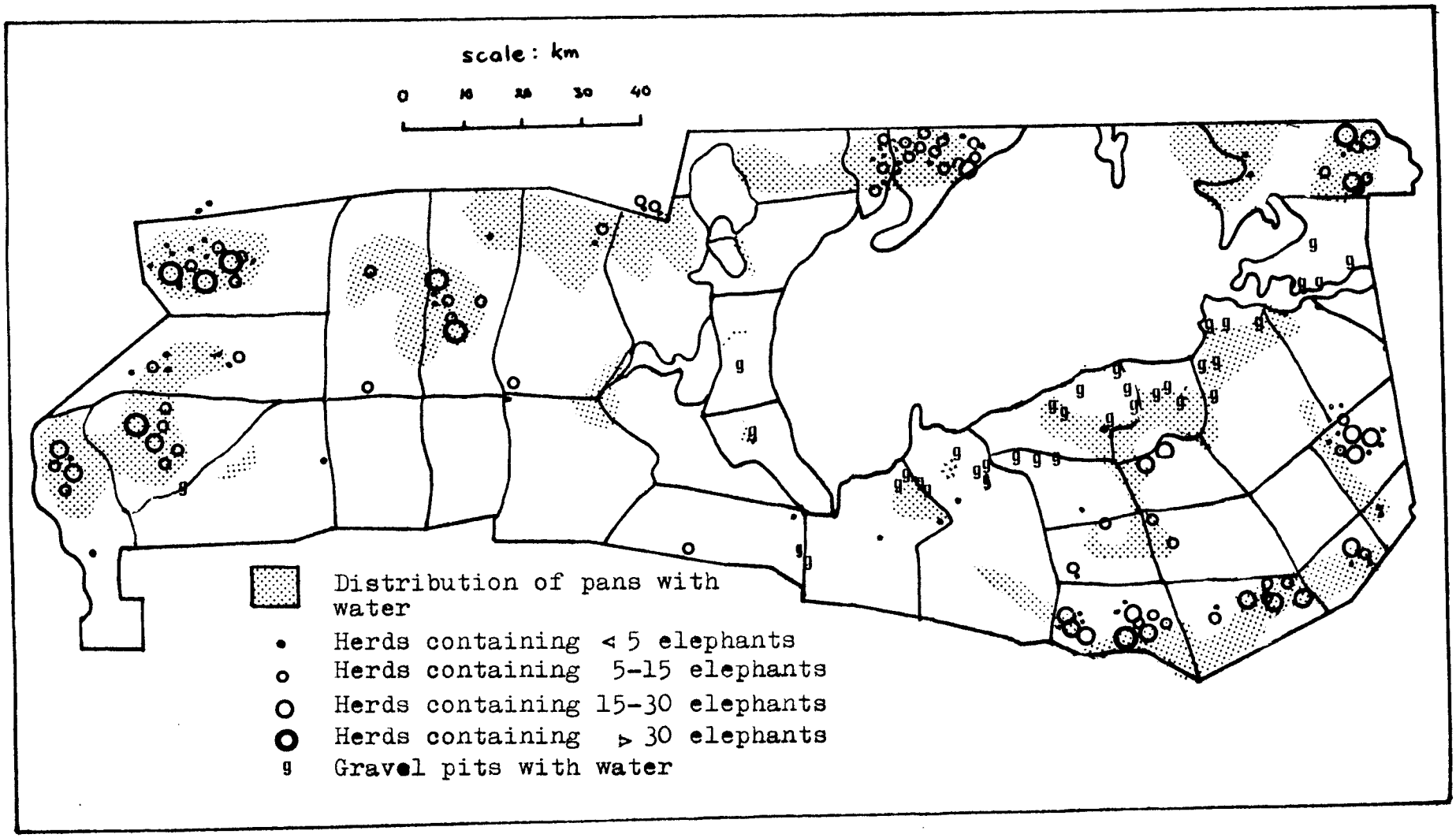

Figure 5: Distribution of water pools, seasonal pans and gravel pits in Etosha National Park during December 1983 - January 1984 and approximate localities of elephant herds.

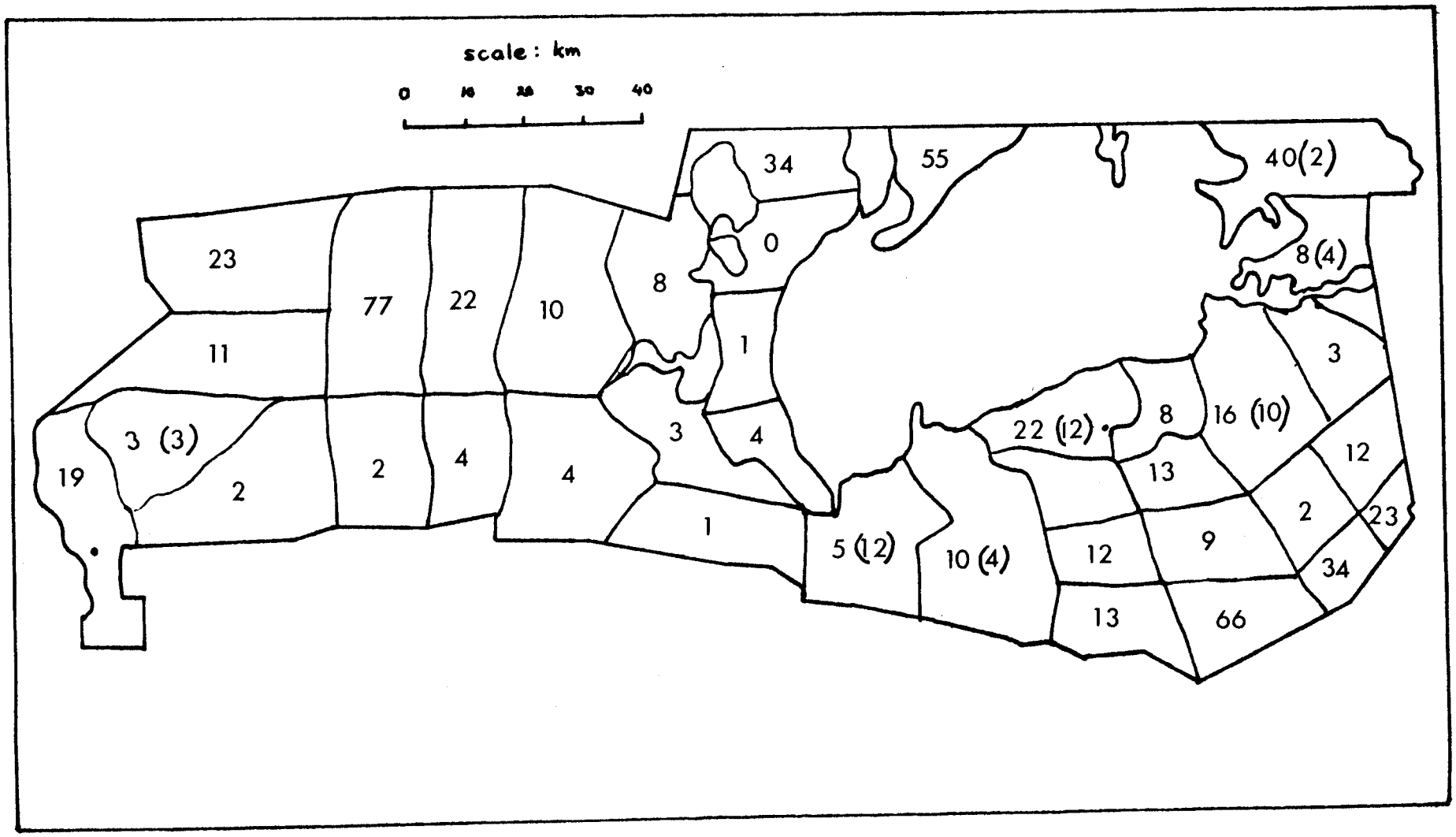

Figure 6: Number of seasonal pans and gravel pits (n) containing water in 36 census blocks in Etosha National Park.

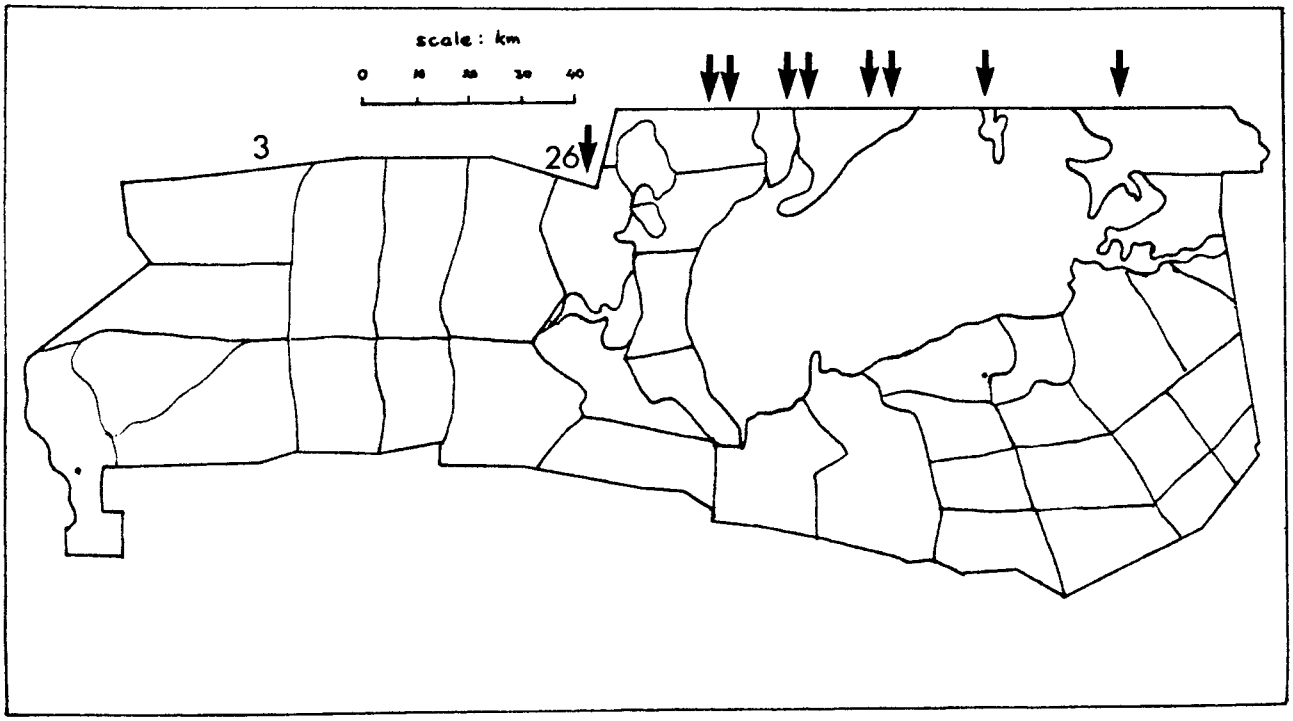

Figure 7: Numbers and distribution of elephants seen outside the Etosha National Park (elephant tracks outside Etosha indicated by arrows).

Table 2: Estimates of numbers of other species in 36 census blocks in Etosha National Park.

Block	Wilde-beest	Zebra+	Giraffe	Gemsbok	Black Rhinoceros	Ostrich
1	15	57	55	47	7	43
2	-	17	14	54	15	91
3	-	36	6	31	3	43
4	-	27	-	11	1	28
5	-	-	-	-	-	-
6	-	-	-	-	1	-
7	-	-	5	-	-	-
8	-	19	3	58	-	7
9	-	9	-	1	-	3
10	-	16	-	7	-	5
11	-	11	2	10	1	2
12	-	-	4	14	1	2
13	216	402	-	47	-	22
14	8	131	-	-	-	25
15	-	33	-	-	-	-
16	-	-	-	-	-	7
17	4	5	2	-	-	29
18	-	-	1	-	-	-
19	64	42	-	9	-	6
20	12	35	6	5	-	12
21	91	35	-	11	-	2
22	172	200	4	7	-	5
23	-	-	-	-	-	1
24	34	-	-	30	-	3
25	305	60	2	1	-	11
26	-	-	-	-	-	-
27	-	-	1	-	-	-
28	-	-	12	-	-	-
29	26	-	5	-	-	14
30	-	-	2	-	-	-
31	-	-	2	-	-	-
32	68	9	7	-	-	5
33	-	--	2	-	-	2
34	-	-	-	-	-	2
35	491	426	25	107	-	56
36	180	86	9	27	-	3
Total	1686	1656	169	452	29	429

+ No distinction was made between Burchell's zebra and Hartmann's zebra.

4. DISCUSSION

4.1 Elephant numbers and distribution

The total number of elephants in Etosha during the census period was only 60% of the total counted during May 1983 (incomplete census) (Berry and Nott, 1983). It is perhaps more significant to compare present results for the area west of M'Bari - Narawandu - Eindpaal with those of May 1983 when the same area was counted in full. Present numbers are 349 (19%) compared to 1 819 of the previous census. This indicates a drastic change in population size from the dry to the wet season.

Figure 8 illustrates the difference in number of elephants in each census block during the dry and wet seasons, and therefore the difference in distribution during those periods. It would appear that the area south of the 19th latitude is not as densily populated duding the wet summer season (1983 - 1984) as in the dry winter period (1983). This area has received little rainfall to date.

Areas with the greatest numbers of elephants are Ekuma —— Oshigambo——Natukanoaka; Gobaub——Nau - Obes——Tkai - Tkab and the Namutoni Sandveld regions. With the exception of the latter, these areas share a common feature, namely the seasonal availability of water. It would therefore appear that the Ekuma and Nau - Obes regions are prime summer (rainy season) feeding grounds. These two areas do not have sufficient permanent water points to sustain a large population of elephants throughout the year. These summer feeding grounds do not appear to be under- or over utilized, and should be regarded as seasonal feeding grounds only.

The Namutoni Sandveld region should at best be considered as a seperate unit, and indications are that the dry- and wet season populations are more stable than elsewhere in Etosha. Changes in population numbers in this area may be explained by this area being used as an exit-entrance point for the whole of the Eastern District of Etosha. The fact that most elephants were found in the Kameeldoring - Beisep region where no artificial water is provided at present, indicates the dependence of elephants on seasonal pools in this area.

Elephant distribution in general seems to be closely related to the distribution of rain, and elephants were almost exclusively found in areas containing numbers of seasonal pans and pools (figure 5). Almost all pools were heavily utilized as seen from tracks around them.

Elephant bulls displayed a somewhat disproportionate distribution (figure 3), where the percentage ratio of adult bulls relative to the total number of elephants counted in each block, differed greatly (figure 4). Because of the difficulties in sexing mature elephants from the air, an unknown number of adult bulls associating with a breeding herd could confuse the issue. It does however seem that elephant distribution is not equal for both sexes and this

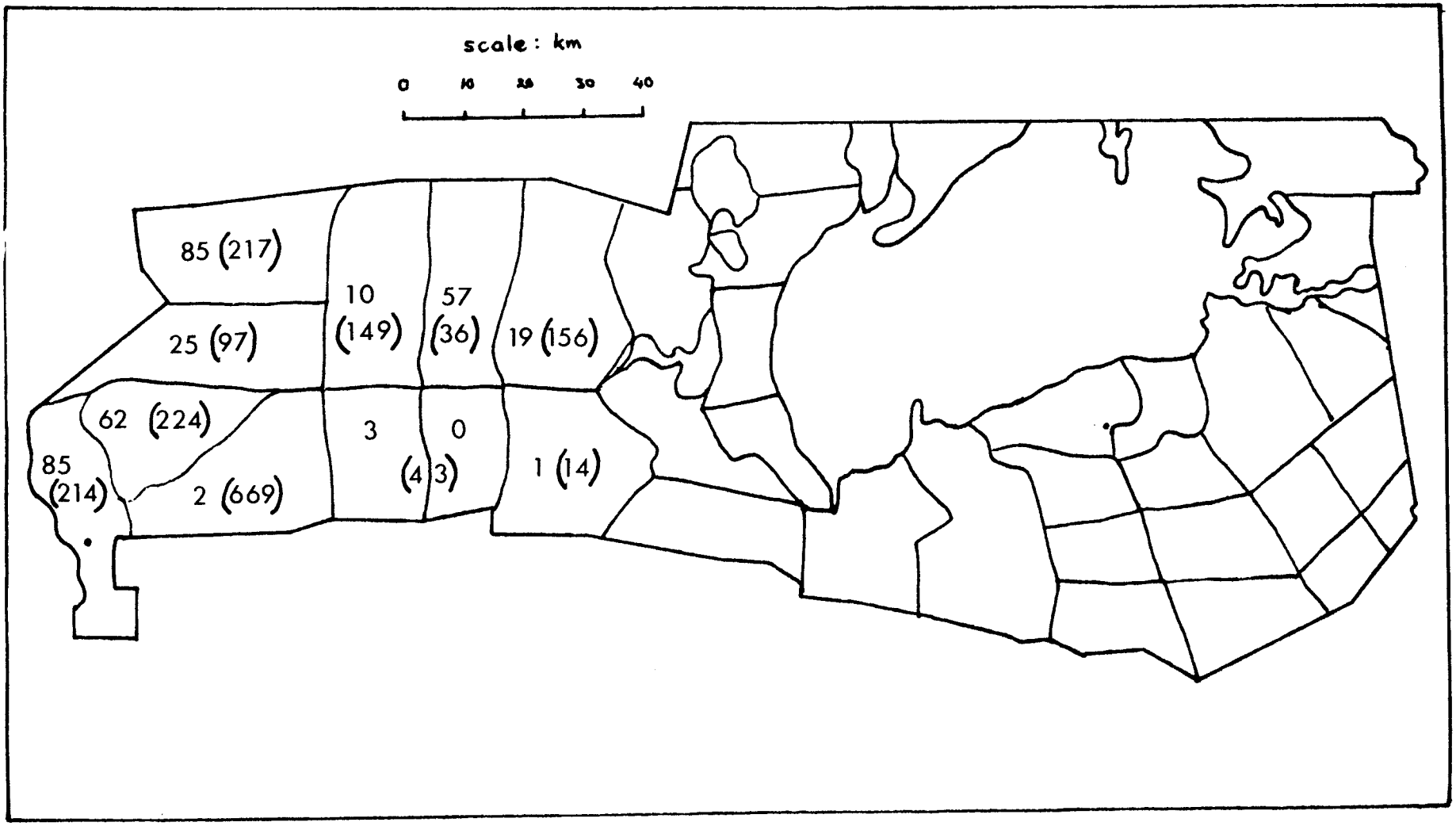

Figure 8: Number of elephants in 11 census blocks in the Western District of Etosha during the rainy season and dry season (n) (Berry & Nott, 1983).

could have grave consequences for future population control exercises.

4.2 Elephant herd composition and recruitment

Although not statistically significant, there appears to be a trend in increasing size of breeding herds from West to East in Etosha. An opposite trend is apparent for bull herds, although this might be the result of more bulls being incorporated into the breeding herds of the Eastern District at the time of census.

The mean ratio of one year old calves to adults could be confusing, since the ratio reflects on mortality as well as natality. The reason why the highest proportion of young calves was found in the more arid Western District, is not necessarily faster or more successful breeding, but could also imply proportionally higher adult mortality. As no reasonably fresh elephant carcases were found, this could indicate mortalities outside Etosha.

Alternatively, the higher incidence of young calves in the Western District might have been caused by the population control measures in that region. It is well known that animal populations respond to control measures by breeding faster. This aspect is however, dubious, since only seven months have lapsed since the cull.

4.3 Other species

The counts for other species were as expected, gross underestimates of true numbers. The reason for this seems to be inadequate observation from a relatively fast flying aircraft seating only one observer. It was virtually impossible to distinguish springbok and these results are not included in Table 2 for that reason. Small numbers of some of the rare species were also counted (eland : 65, hartebeest : 28) but these don't reflect the true situation.

It does seem feasible, however, to use the present aircraft for counting wildebeest. Approximately 1 700 wildebeest were counted out of an estimated declining population of 2 200 in 1982 (Berry and de Villiers, 1982). If previously determined error rates between fixed-wing and helicopter counts are applied (45% undercount with fixed-wing aircraft) the present census yields 3 770 wildebeest, a near impossible population increase in one year. In conclusion it seems that undercounting bias on wildebeest with the present aircraft is less than previously experienced. Unfortunately, results from the present census can not be compared with the previous one, but future counts could yield indications of trend. Less biased fixed-wing counts (of wildebeest), costing far less (Noli, in preparation) could be a viable monitoring system.

5. CONCLUSIONS

5.1 The number and distribution of elephants in Etosha differ greatly between the dry and wet seasons. Areas with the highest concentration of elephants in the Western District during the dry season, are currently either vacant or occupied by very few individuals.

5.2 The total wet season population of Etosha is approximately 50% less than in the dry season. There can be no longer any doubt that large scale movements of elephants out of the Park take place. The number of fence breaks at the start of the rainy season (to be analyzed in detail soon) will bear this out.

5.3 Elephant bulls seem to aggregate in different areas than breeding herds, during the wet season.

5.4 Recruitment appears to be higher in the Western District, but could possibly imply higher mortality rates among adults either or both inside and outside Etosha. This could also possibly reflect on the culling operation in this area. An urgent, in depth study into age and sex distributions of elephants in the Western District should be conducted as soon as possible.

6. RECOMMENDATIONS

6.1 To conduct identical aerial counts of elephants at 4 month intervals for a minimum period of five years. This can be justified by the need to determine:

- 6.1.1 the apparent erratic fluctuations in elephant numbers over years;
- 6.1.2 the extent of elephant movements out of the Park;
- 6.1.3 possible stimulatory effects of population control measures already applied;
- 6.1.4 the definition of seasonal ranges by resident herds inside Etosha. It can only be stressed that far-reaching management actions already in operation (culling) and planned (elephant proof Northern boundary), could be founded on possibly erroneous information and conclusions. I therefore regard repetitive counts as high priority and ask respectfully for permission to proceed accordingly.

6.2 To preserve the status quo on provisioning of artificial water holes in areas presently without. It would appear that these areas are significantly less damaged/ altered/over utilized than anywhere else in Etosha. If additional water holes are contemplated, these should only function during the wet season. Elephants in particular, seem to concentrate in areas receiving rainfall, and this

incentive to move about should not be eliminated by providing permanent water holes throughout the Park.

6.3 I recommend that an additional aerial census of elephants as well as a concurrent ground count be done prior to the envisaged culling operation in June - August 1984. I must stress that an aerial census only, will not be adequate, with regard to the over/under representation of age and sex classes in some areas. If a different culling area is envisaged by the Directorate, these aspects should be afforded some consideration if a vertically balanced proportion of age and sex classes are to be removed.

6.4 I respectfully request a reconsideration of the necessity to cull elephants in Etosha. It seems to be accepted that we have a surplus of approximately 1 000 individuals in the Western District. Not only are these surplus individuals not present in Etosha for a substantial portion of the year, but seem to be doomed to either the culling operations inside Etosha or the hunters outside the boundaries, or both.

With all respect to previous work done, culling can not be recommended on carrying capacity calculations only. The concept of carrying capacity for an animal such as the elephant is currently under sceptical review. In support, no agreement seems to exist on the methods used in estimating carrying capacity. I would like to suggest that the rate of habitat decline triggered by elephants be used in favour of other methods, to determine whether a situation of over-population really exists.

6.5 In view of the above paragraph I would suggest the following:

6.5.1. Cessation of culling operations until otherwise indicated by in depth studies on the rate of and factors responsible for habitat degeneration in the problem areas of Etosha.

6.5.2 Monitoring by aerial censussing, radio-telemtry and ground operations of numbers, movements and rate of population increase.

6.5.3 Monitoring the rate of structural and floristic decline as caused by elephants, using recognised methods.

7. ACKNOWLEDGEMENTS

The enthusiasm and expertize of the pilot are greatly appreciated. The Plant Ecologist and Botanist are especially thanked for assistance in the air and on the ground, and for much needed moral support.

8. REFERENCES

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