



# **AERIAL CENSUS OF WILDLIFE IN ETOSHA NATIONAL PARK**

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## **INTRODUCTION**

Aerial surveys have been conducted in Etosha National Park since 1968. These counts were strictly not comparable as they were undertaken at irregular intervals with different coverage. The first comprehensive sample count was done 1995, Since then sample counts were completed in 1998 and 2002. The 2002 survey is therefore the fourth complete sample count of Etosha.

The objectives of the 2002 survey were as follows:

1. To provide comparable estimates and trend data for the most important species surveyed in support of speies management plan.
2. To update estimates of numbers of elephants ahead of the CITES conference.
3. To update estimates of numbers of black rhino in support of the black rhino National Management Plan

The purpose of this report is to provide a comprehensive analysis of the population estimates of 12 selected species for 2002. The trends in population estimates for the 12 species from 1995 until 2002 is briefly addressed.

The survey was conducted between 20/09/2002 and 5/10/2002.

## METHODS

### Stratification

The survey covered an area of 18464 km<sup>2</sup>, excluding the Etosha pan. The survey area was stratified according to the known or expected distribution of the wildlife surveyed. The stratification was based on the aerial survey conducted in Namibia in 1998. Therefore, Etosha was stratified into 15 blocks according to the availability of permanent water, which are presented in Figure 1. The pan areas in north-eastern Etosha were added to strata ENP 10 and 11 to avoid potential under-estimation of wildlife (Craig 2001). The areas within 10 kilometers of perennial water points was counted at a planned sampling intensity of 40%, other areas counted at 10% sampling intensity. The 40% sampling intensity was chosen as a result of earlier experimental work illustrating that this intensity is optimal and cost-effective. Strata ENP 5 and 16, were counted at a planned 20% intensity due to fewer number of animals frequenting the areas in the vicinity of the 2 water points, Eindpaal and Narawandu respectively.

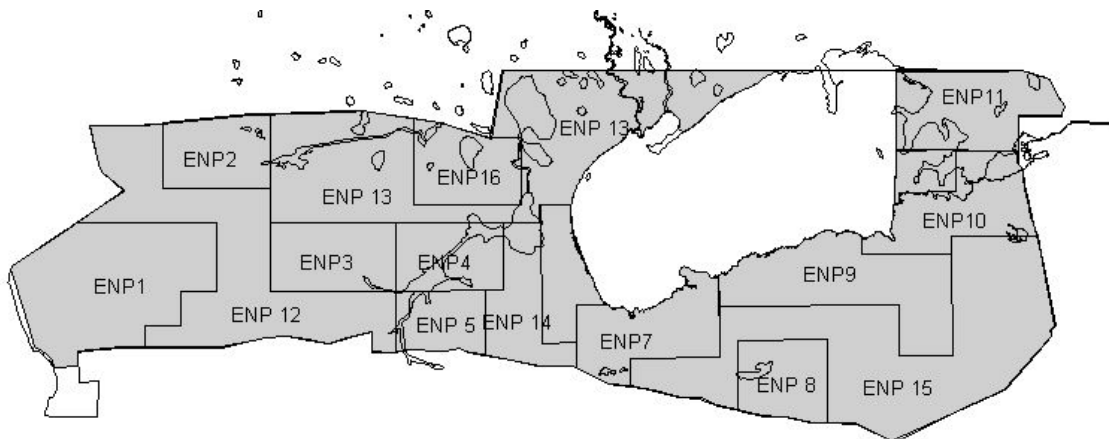
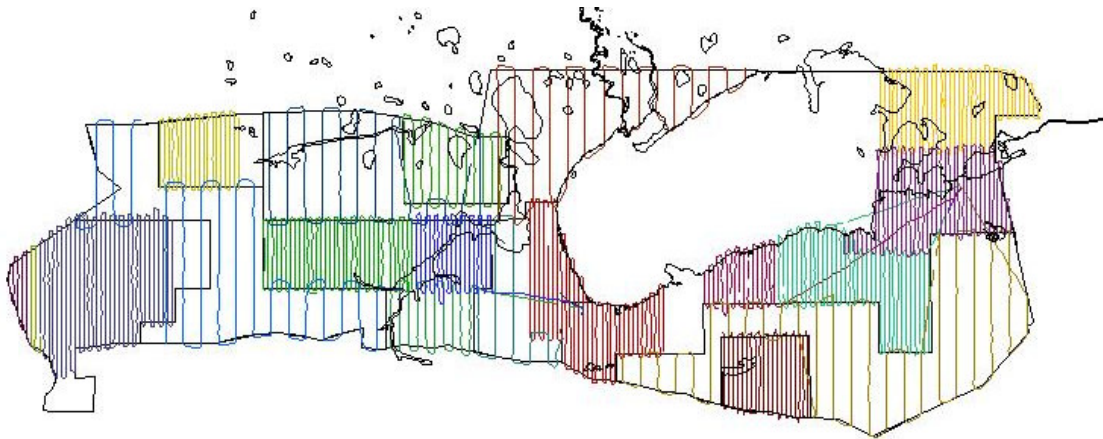


Figure 1.. Strata in the Etosha National Park.

### **Transect selection**

Transects in each stratum were selected at the required transect spacing. The transects were all orientated in a north-south direction. The actual flight lines flown during the aerial survey is presented in Figure 2. Summary of strata flights is presented in Table1. .



*Figure 2. Actual flight paths flown during the aerial survey in Etosha*

Figure 1. Summary of strata flights

Block	Size (km <sup>2</sup> )	Area sampled (km <sup>2</sup> )	Transect spacing (km <sup>2</sup> )	Sampling intensity (%)	Search rate (km <sup>2</sup> /min)
ENP 1	1586	513	1.25	32.35	1.34
ENP 2	629	213	1.25	33.86	1.38
ENP 3	704	239	1.25	33.95	1.41
ENP 4	603	226	1.25	37.48	1.45
ENP 5	442	85	2.5	19.23	1.57
ENP 7	1307	425	1.25	32.52	1.39
ENP 8	569	191	1.25	33.57	1.33
ENP 9	1293	494	1.25	38.21	1.37
ENP 10	1063	346	1.25	32.55	1.42
ENP 11	916	311	1.25	33.95	1.44
ENP 12	2272	186	5	8.19	1.52
ENP13	3014	274	5	9.09	1.49
ENP 14	543	48	5	8.84	1.54
ENP 15	2860	277	5	9.69	1.57
ENP 16	665	112	2.5	16.84	1.44

### Calibration

The survey was designed to calibrate the observers at a strip width of 250 meters on either side of the aircraft, following standard procedures. The boundaries of the strips on either side of the aircraft were defined by a pair of streamers fixed to the lift struts. The calculated strip width (Norton-Griffiths 1978) for each observer used in the survey is presented in Tables 1 to 2.

Table 1. Calibration data for each observer (Cessna 182, ISE)

	Observer	Height (a.g.l) (feet)	Outermost marker (O)	Innermost marker (I)	(O-I) + 1	Calculated strip width (m)
Cessna 182 ISE	Willem Kumub					
		300	30	9	22	
		300	30	11	20	
		300	30	12	19	
		400	40	9	32	
		180	19	8	12	
<b>Mean</b>		296			21	<b>212.8</b>
	Johannes Kapner					
		300	30	10	21	
		300	30	8	23	
		300	24	6	19	
		400	40	13	27	
		180	19	8	12	
<b>Mean</b>		296			20.4	<b>206.8</b>
<b>Total</b>						<b>419.6</b>

Table 2. Calibration data for each observer (Cessna 206, PRO)

	Observer	Height (a.g.l.) (feet)	Outermost marker (O)	Innermost marker (I)	(O-I) + 1	Calculated strip width (m)
Cessna 206, PRO	Patrick Haradoeb					
		305	28	5	24	
		290	28	5	24	
		305	26	6	21	
		300	28	6	23	
		300	22	4	19	
		330	27	6	22	
<b>Mean</b>		305			22.17	<b>218.1</b>
	Markus Augumub					
		305	26	5	20	
		290	30	6	25	
		305	25	4	22	
		300	29	4	26	
		300	26	5	22	
		330	28	4	25	
<b>Mean</b>		305			23.33	<b>229.5</b>
<b>Total</b>						<b>447.6</b>

### Data collection – transect surveys

Both aircraft used in the survey were equipped with two Garmin GPS12X models. This ensured accurate navigation along the pre-determined transects, which had been downloaded as route files. The two observers called out the sightings of animals within the demarcated strips. The front seat recorder noted waypoints for each sighting, which included the species and number. The recorder also noted the height a.g.l from the radar altimeter to allow for the calculation of the mean height for each survey block, and also recorded the starting and end times of each transect. The waypoint and flight data were downloaded to a personal computer using the Garmin programme “Ozi Explorer”, after each survey session.



## **Distribution mapping**

The localities of each sighting of the most important species were plotted on maps, using the Geographical Information System, Arcview.

## **Estimation of numbers and confidence limits**

The method Jolly number two for unequal sized sampling blocks was applied to the data. A spreadsheet model was developed to calculate total population size, 95% confidence limits and the 95% range for each species per stratum. The equations as per Krebs (1999) were used. In addition, the spreadsheet model allowed for the calculations to be performed at the 90% confidence limit. If the confidence limits were larger than 100%, the lower limit of the 95% range was taken as the actual number of animals seen within the demarcated strip.

All data referred to in this report are held in electronic copy at the Etosha Ecological Institute, Etosha National Park.

