

**Results of the
NamibRand Nature Reserve
and Pro-Namib Conservancy
Annual Game Count
28 May 2016**



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1. Introduction

This report provides summarised results and analysis of the annual game count held on the NamibRand Nature Reserve and the Pro-Namib Conservancy on the 28th of May 2016. This is the twelfth consecutive year that the count was held since its inception in 2005.

A game count briefing was held at the NamibRand Nature Reserve AGM on the day preceding the count where the newly appointed Control Warden Murray Tindall highlighted the objectives of the count and outlined the methodology and rules for the teams who would conduct the count. This helps to ensure consistency over consecutive years and allows a more accurate comparison from year to year.

Previous years data has been entered into a purpose designed database which generates the estimates used in this report in terms of total population, density and biomass. A few minor adjustments have been made to the database in order to improve its accuracy and this has slightly altered the figures for previous years as well as this years' count.

Unsurprisingly, as a result of the fourth year of drought the population estimates as well as overall density showed marked decreases this year. Individual populations of the two major grazers in this ecosystem, oryx and springbok, showed decreases of 10.7% and 13.9% respectively. However, the population of Burchell's zebra showed an increase of approximately 16.7% which can be attributed to their continued range expansion across the Reserve. The population of red hartebeest showed a decrease of 17.1%, although it is likely that this estimate is inaccurate as the population occurs in isolated areas on the Reserve and a number of zones where they are known to be present failed to record any on the day of the count.

The distribution of animals across the Reserve showed a slight trend of southwards migration with Zone 9, the Pro-Namib Conservancy, showing an unprecedented number of oryx, springbok and, for the first time in the count history, Burchell's zebra. The central areas of the Reserve maintained a high relative density of animals with the northern zones showing a marked decrease in numbers seen as well as overall density.

It is worth reiterating that this census method is best suited to large plains game such as oryx, springbok and Burchell's zebra and is less suited to smaller species such as steenbok, or species with different habitat requirements such as kudu or mountain zebra. In addition, the estimates provided are intended to give an indication of population numbers and enable a comparison from year to year and may not be an entirely accurate reflection of the actual number of animals on the Reserve.

2. Summary

Data collected in the May 2016 game count was entered into our database and analysed, and is shown below bearing our three core objectives in mind:

Objective 1: Population and biomass estimates:

Population estimates:

The total number of game seen and the estimated numbers is shown in the table below.

Total estimated numbers of game (Zone 1-10; May 2016)		
Species	No. Counted	Estimate 2016
Gemsbok	1778	6650
Springbok	690	2944
Kudu	0	0
Steenbok	0	0
Ostrich	55	144
Ludwigs Bustard	11	92
Ruppel's Korhaan	29	363
B. zebra	280	440
Hartebeest	72	149
Total	2915	10782
Giraffe*	9	9

* Total numbers known

Biomass estimates

The table below shows the wildlife biomass estimates for May 2016.

Total wildlife numbers and wildlife biomass on NamibRand for May 2016 (Zone 1-10) ; 224 209 ha)				
Species	Mean mass (kg)	Estimated wildlife numbers from May 16 game count	Species biomass (kg)	Biomass per ha (kg)
Gemsbok	220	6650	1463000	7,83
Springbok	38	2944	111872	0,60
Kudu	180	0	0	0,00
Steenbok	11	0	0	0,00
Ostrich	68	144	9792	0,05
B. Zebra	300	440	132000	0,71
Hartebeest	130	149	19370	0,10
Total	947	10782	1736034	9,29

Objective 2: Wildlife distribution and density

The table below shows the total number of animals counted per 100km in each route and the respective density percentage per zone.

Total no of animals counted per 100 km per route			
Route	Route length (km)	No of animals counted/100km	% of total animals counted per 100km
1	51	154	3%
2	52	261	5%
3	54	383	7%
4	56	721	14%
5	63	612	12%
6	57	639	12%
7	55	785	15%
8	56	380	7%
9	52	1050	20%
10	59	25	5%
Total	555	5236	

Objective 3: Population change

The overall population estimate is down by 11.33% and the number of animals counted per 100km per route has decreased by 6.58%.

Total estimated numbers of game (Zone 1-10; May 2015 - May 2016)					
Species	May-15		May-16		Percentage change
	No. Counted	Total estimated number	No. Counted	Total estimated number	
Gemsbok	2099	7447	1778	6650	-10,70%
Springbok	633	3420	690	2944	-13,92%
Kudu	2	7	0	0	-100,00%
Steenbok	0	0	0	0	0,00%
Ostrich	80	218	55	144	-33,94%
Ludwigs Bustard	13	119	11	92	-22,68%
Ruppel's Korhaan	11	145	29	363	150,34%
B. zebra	219	377	280	440	16,71%
Hartebeest	66	180	72	149	-17,22%
Total	3123	11913	2915	10782	-9,49%
Giraffe*	9	9	9	9	0,00%

* Total (estimate) numbers known

3. Count Methodology

The primary objectives of the game count is to determine the density and distribution of game and to estimate the total number of game in a given; or the total; area. For this reason, the survey methodology used is a combination of the road strip census and game distribution maps techniques. In layman’s terms, these can be explained as follows:

Road strip count

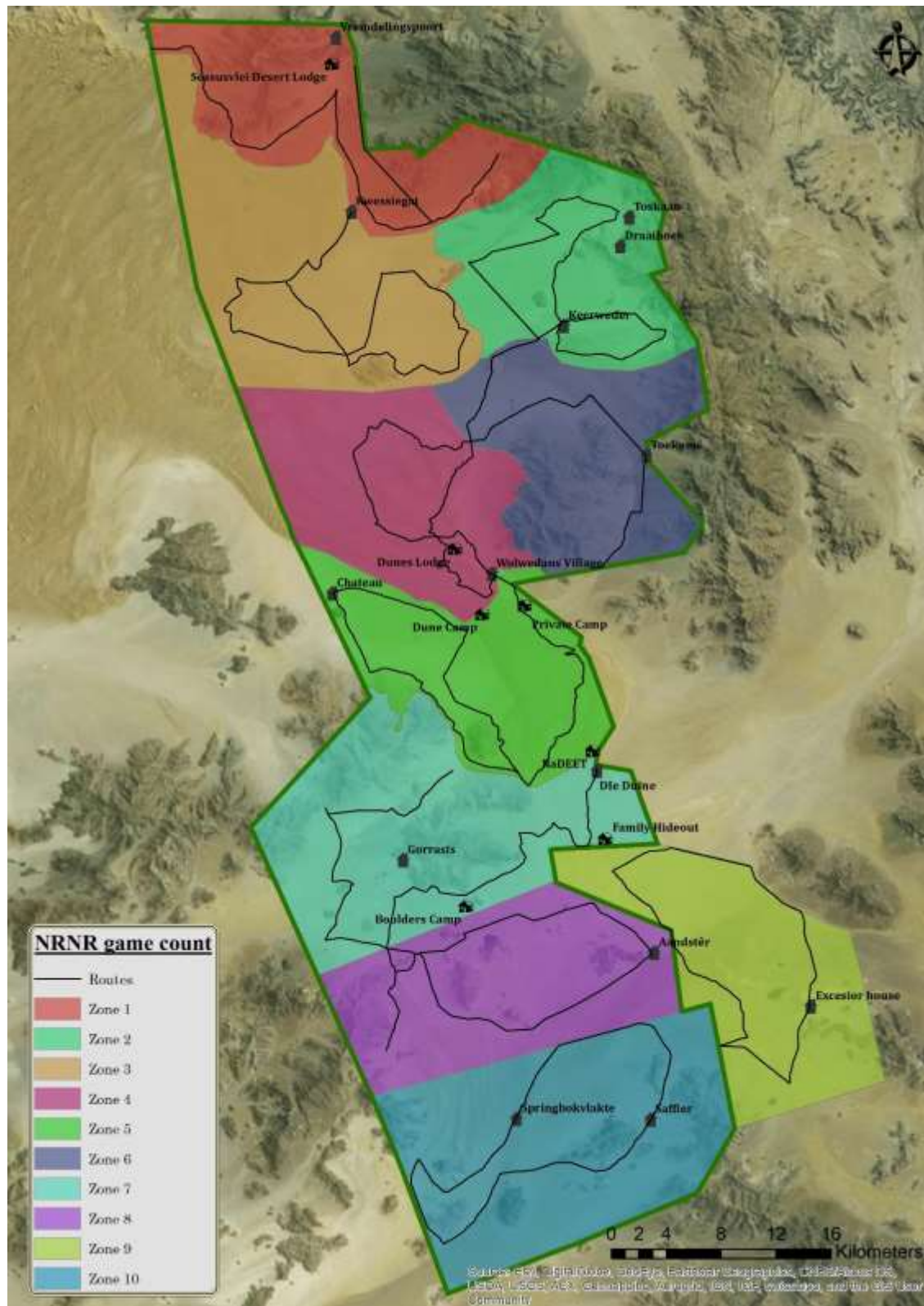
This is one of the most effective methods to use when counting in a relatively open and homogenous landscape. For the purposes of the count, the total area is divided into game count zones, each with its own standardized route, as shown in figure 1 on the next page. The game count zones were, as far as possible, deliberately, predetermined into homogenous habitats because the visibility of animals differs in each habitat. Each route forms a strip transect through its zone within which the animals are counted. A transect width of 1km is used (500m on either side of the road). During the count, all animals on either side of the road are recorded, and the distances (at right angles to the vehicle and road) from the road to the animal or group of animals is recorded. These distance records are important, as they shape the effective strip width (ESW) values, which are automatically adjusted each year when data is entered into the database.

The length of the transect (distance travelled) and its relation to the area represented in the zone is used to calculate the area correction factors for each zone, i.e. area represented/route length = area correction factor. The respective effective strip width (ESW) values and transect width then determines the relevant species correction factors, i.e. transect width (1000m) divided by (ESW x 2) = species correction factor. The area correction factors and species correction factors, adjusted by the relevant effective strip widths, i.e. how far each species is readily seen, is then used to calculate the population estimates. So basically, the area correction factor multiplies the number seen up based on the percentage of the area sampled and assumes all animals within 500m of the transect line are detected. The species correction factor then adjusts this estimate based on the detection curve (ESW) for the species. The correction factors and route distances as used in the 2015 game count methodology, along with the area represented per zone can be seen in table 1 below.

Table 1. Total count areas per zone (ha), route distances, area correction factors, effective strip widths and species correction factors for each species within each zone for 2016

Count areas, area correction factors, effective strip widths and species correction factors										
Route No.	Total area per zone (ha)	Area represented per route	Route distance (km)	Area correction factor	Species	Effective strip width (m)	Species correction factor	Species	Effective strip width (m) routes 1 - 10	Species correction factor (m) routes 1 - 10
1	18 072	12 513	52	2,41	Gemsbok	392	1,28	Ostrich	667	0,75
					Springbok	328	1,52	Kudu	417	1,20
2	18 310	13 779	52	2,65	Gemsbok	310	1,61	Steenbok	51	9,80
					Springbok	226	2,21	Ruppells korhaan	141	3,55
3	27 039	26 424	58	4,56	Gemsbok	463	1,08	Ludwigs bustard	208	2,40
					Springbok	193	2,59			
4	21 038	20 996	47	4,47	Gemsbok	622	0,80			
					Springbok	479	1,04			
5	18 038	17 491	72	2,43	Gemsbok	540	0,93			
					Springbok	325	1,54			
6	19 352	11 589	34	3,41	Gemsbok	541	0,92			
					Springbok	346	1,45			
7	28 343	18 833	55	3,42	Gemsbok	509	0,98			
					Springbok	263	1,90			
8	22 452	19 291	52	3,71	Gemsbok	607	0,82			
					Springbok	419	1,19			
9	21 710	21 125	50	4,23	Gemsbok	400	1,25			
					Springbok	436	1,15			
10	29 855	24 721	59	4,20	Gemsbok	324	1,54			
					Springbok	501	1,00			
Total	224 209	186 762	531							

Figure 1. The game count area show the ten zones used in May 2015 for the NamibRand Nature Reserve (1-8, 10) and the Pro-Namib Conservancy (9).



Game distribution maps

In order to determine and show the distribution and density of game in the various zones of the count area, monad grids are used to map the locality of the animals counted. Each route is supplied with a map containing the monad, with reference numbers, of the zone in which that route is set as seen in the image below.

Figure 2: Monad maps.



During the count the monad grid number in which animal counted is seen, is recorded. This grid number is then used to map the distribution of the each recorded animal.

4. Objectives and results of the May 2016 count:

Objective 1: Population and biomass estimates

Population estimates:

The population estimates for individual species in the total count area are derived from the actual number of animals seen during the count and the relevant species and area correction factors that are applied to that number. The actual numbers seen is multiplied by the relevant area and species correction factors to get the population estimates.

Actual number of animals seen* (S)
Area correction factor (A)
Species correction factor (B)

Formula for calculating population estimates*
 $(S \times A) \times B = P$

*Known numbers

Note that where total numbers of species with small populations are known (e.g. for recently introduced species such as red hartebeest, burchell's zebra and giraffe), these known totals are used for the final population estimates in preference to the above calculated estimates.

The total estimates per species per zone were then combined for all zones in order to determine the total population estimate for each plains game species in the count area (see table 2.1 below).

Table 2: Total estimated numbers of game for 2016

Total estimated numbers of game (Zone 1-10; May 2016)		
Species	No. Counted	Estimate 2016
Gemsbok	1 778	6 650
Springbok	690	2 944
Kudu	0	0
Steenbok	0	0
Ostrich	55	144
Ludwigs Bustard	11	92
Ruppel's Korhaan	29	363
B. zebra*	280	440
Hartebeest*	72	149
Total	2 915	10 782
Giraffe*	9	9

* Total numbers known

Biomass estimates

Population estimates are multiplied by the mean weight of the species and divided by the total count area (ha) to get the estimated biomass per species.

Estimated wildlife numbers (E)
Mean mass per species (M)
Total no. of hectares (H)

Formula for calculating biomass estimates
 $(E \times M) \div H = B$

Biomass estimates are important in terms of managing habitat conditions and inter-specific competition. Note that agricultural Livestock Units (LSU) are not used for determining the biomass of wildlife species, due to differences between domestic and wild animals in aspects such as grazing/browsing patterns, and agricultural stocking according to a camps system as opposed to the open, unfenced system within the Reserve.

The tables 3.1, 3.2 and 3.3 below show the biomass estimates for this year, and the biomass estimates for previous years compared to this year.

Table 3.1: Wildlife biomass estimates for May 2016.

Total wildlife numbers and wildlife biomass on NamibRand for May 2016 (Zone 1-10) ; 224 209 ha				
Species	Mean mass (kg)	Estimated wildlife numbers from June 16 game count	Species biomass (kg)	Biomass per ha (kg)
Gemsbok	220	6650	1463000	7,83
Springbok	38	2944	111872	0.60
Kudu	180	0	0	0,00
Steenbok	11	0	0	0,00
Ostrich	68	144	9792	0,05
B. Zebra	300	440	132000	0,71
Hartebeest	130	149	19370	0,10
Total	947	10782	11062854	9,29

The chart in figure 3 below shows the biomass composition of the different species across the total count area for the year 2016.

Figure 3: Biomass composition 2016

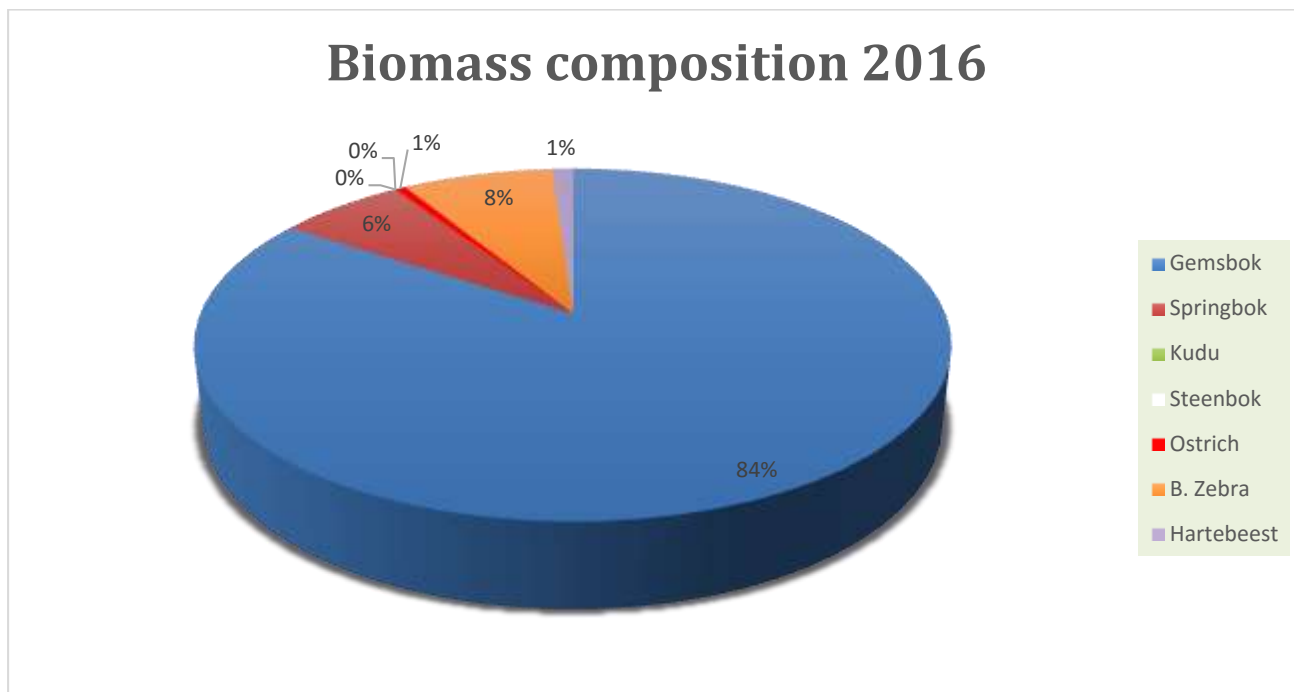


Table 3.2 Wildlife Biomass (2016) percentage change compared to the count of May 2015.

Wildlife biomass on NamibRand for May 2015 and May 2016 (Zone 1-10) ; 224 209 ha)								
Wildlife species	Mean mass (kg)	May-15			May-16			
		Estimated wildlife numbers from May 2015 game count	Species Biomass (kg)	Biomass per ha (kg)	Estimated wildlife numbers from May 2016 game count	Species Biomass (kg)	Biomass per ha (kg)	Biomass percentage change
				TOTAL			TOTAL	
Gemsbok	220	7447	1638340	8,77	6650	1463000	7,83	-10,70%
Springbok	38	3420	129960	0,70	2944	111872	0,60	-13,92%
Kudu	180	7	1260	0,01	0	0	0,00	-100,00%
Steenbok	11	0	0	0,00	0	0	0,00	0,00%
Ostrich	68	218	14824	0,08	144	9792	0,05	-33,50%
B. zebra	300	377	113100	0,59	440	132000	0,71	18,92%
Red Hartebeest	130	180	23400	0,15	149	19370	0,10	-32,27%
Total		11649	1920884	10,30	10327	1736034	9,30	-9,77%

Table 3.3 Wildlife Biomass estimates from 2014 to 2016.

Total wildlife biomass estimates (kg/ha) on NamibRand May 2014 to May 2016					
Wildlife species	May-14	May-15	% change from May-14	May-16	% change from May 15
Gemsbok	10,70	8,77	-18,02%	7,83	-10,70%
Springbok	0,62	0,70	12,24%	0,60	-13,92%
Kudu	0,00	0,01	40,00%	0,00	-100,00%
Steenbok	0,00	0,00	0,00%	0,00	0,00%
Ostrich	0,08	0,08	-0,78%	0,05	-33,49%
B. Zebra	0,57	0,59	4,27%	0,71	18,92%
Hartebeest	0,14	0,15	9,45%	0,10	-32,27%
Total	12,1	10,3	-14,96%	9,3	-9,77%

Objective 2: Wildlife density and distribution

To calculate the population density, the actual number of animals per species counted in each zone is divided by the respective route length and then multiplied by 100 to get the number of animals seen per 100km.

Actual number of animals seen (S)

Length of route (R)

Wildlife density - i.e. Animals seen per 100km driven (K)

$$\text{Formula for calculating wildlife density} \\ (S \div R) \times 100 = K$$

For the purposes of this report, wildlife distribution is based on the amount of animals seen in each monad. During the game count, each sighting is marked to the corresponding monad the animal(s) was seen in. That data is then used to map the distribution of the animals (i.e. where animals were seen).

Please note that for the total wildlife distribution, all game species counted used in the (mapping) calculation. The wildlife (species) densities are shown in the maps on the right. These densities were calculated using the formula prescribed above.

Note that the data is indicated on a gradient from light (low values) to dark (high values).

Figure 4.1 Total wildlife distribution

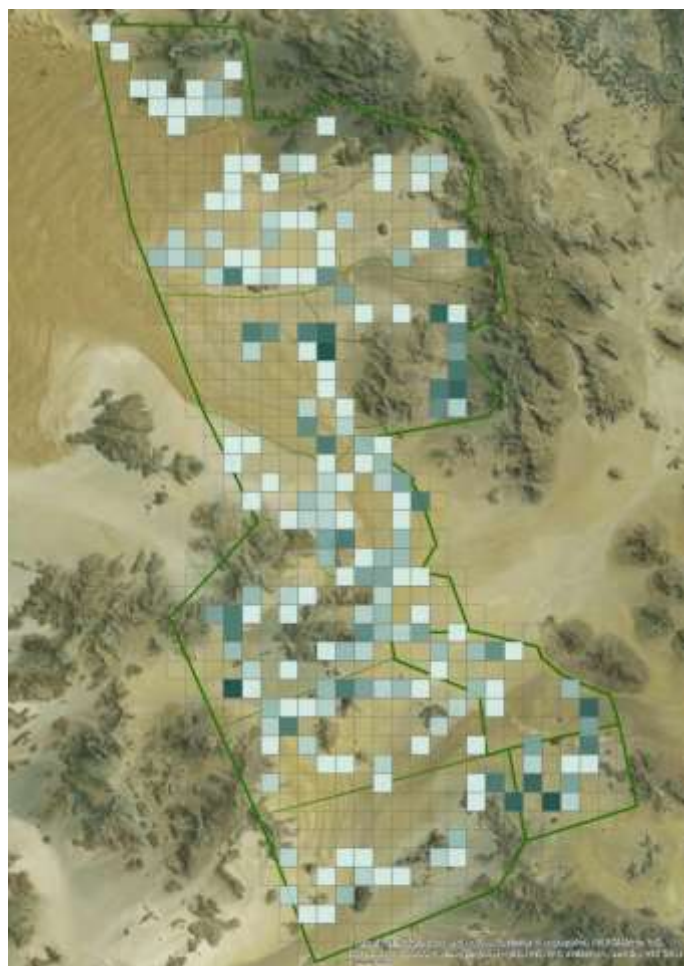


Figure 4.2 Total wildlife density

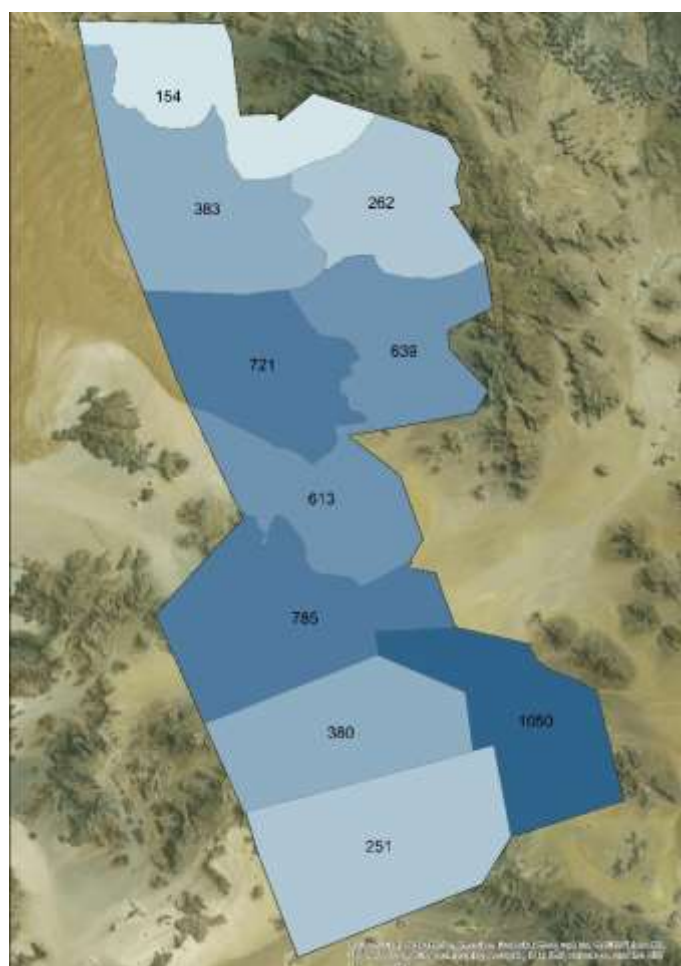


Figure 4.3 Distribution of gemsbok

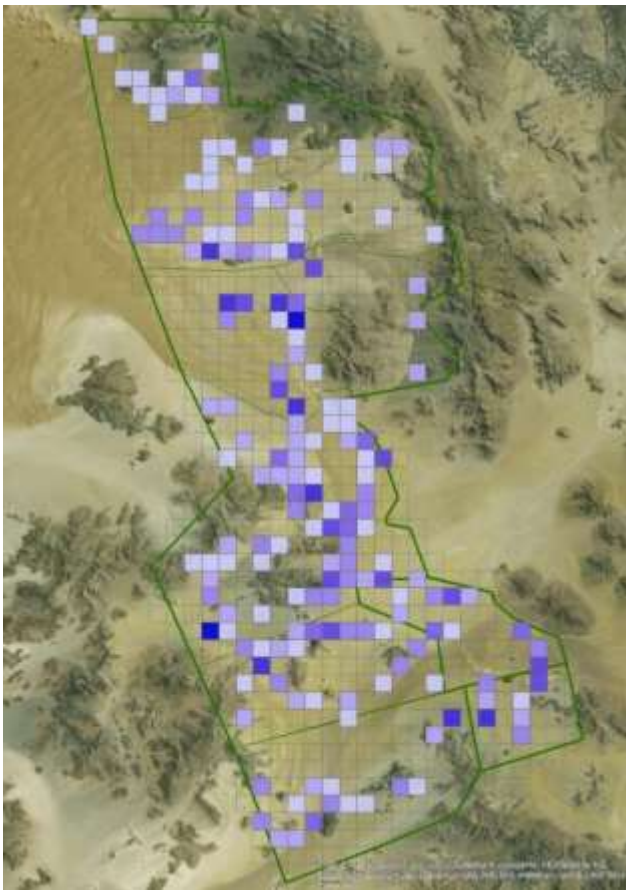


Figure 4.4 Density of gemsbok

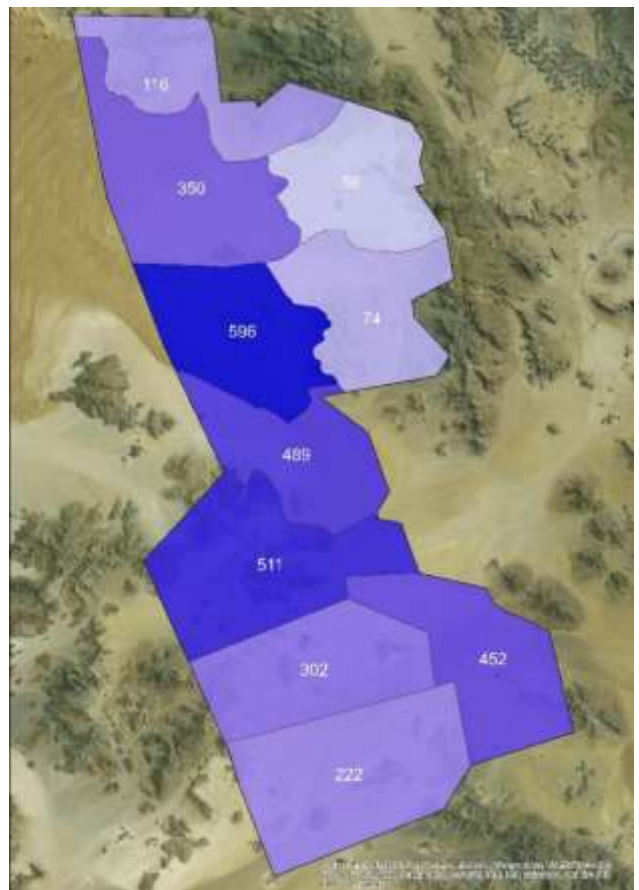


Figure 4.5 Distribution of springbok



Figure 4.6 Density of springbok

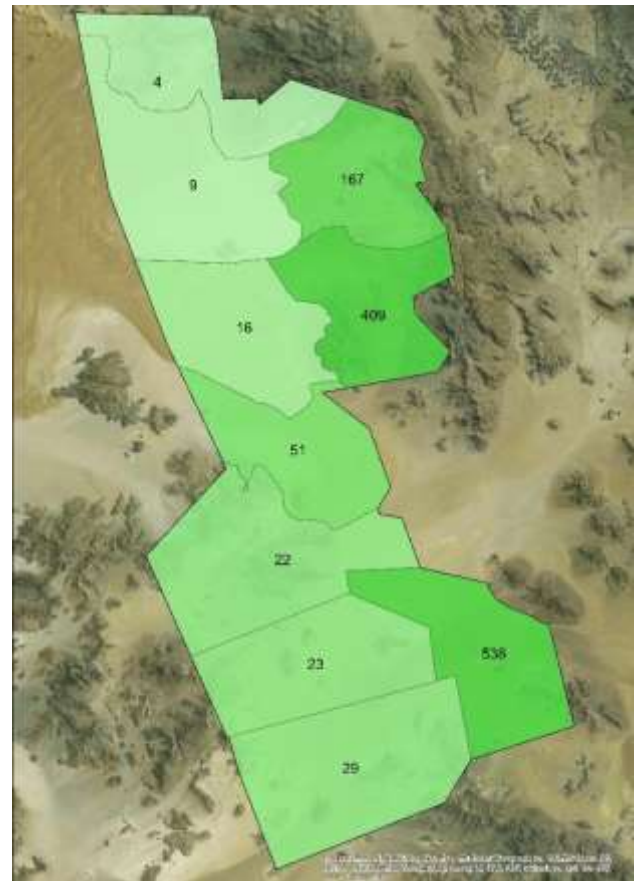


Figure 4.7 Distribution of *B. zebra*



Figure 4.8 Density of *B. zebra*

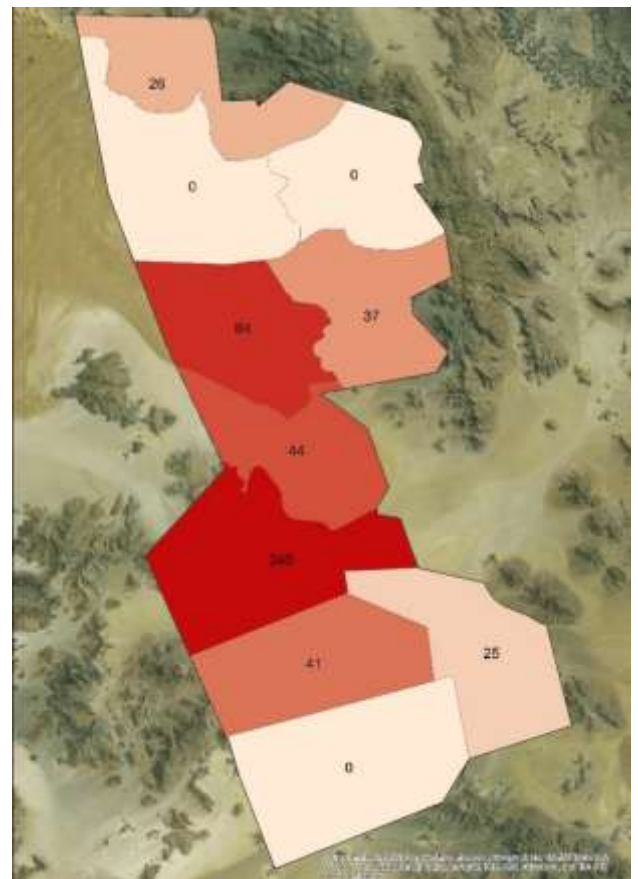


Figure 4.9 Distribution of ostrich



Figure 4.10 Density of ostrich



The population densities and actual number seen for individual species per zone is shown in the tables below.

Table 4.1

Gemsbok			
Route	Route length	Actual number seen	Density
1	51	59	116
2	52	29	56
3	54	190	352
4	56	334	596
5	63	308	489
6	57	42	74
7	55	281	511
8	56	169	302
9	52	235	452
10	59	131	222
		1778	3170

Table 4.2

Springbok			
Route	Route length	Actual number seen	Density
1	51	2	4
2	52	87	167
3	54	5	9
4	56	9	16
5	63	32	51
6	57	233	409
7	55	12	22
8	56	13	23
9	52	280	538
10	59	17	29
		690	1268

Table 4.3

Ostrich			
Route	Route length	Actual number seen	Density
1	51	2	4
2	52	20	38
3	54	6	11
4	56	0	0
5	63	0	0
6	57	0	0
7	55	1	2
8	56	8	14
9	52	18	35
10	59	0	0
		55	104

Table 4.4

Burchell's zebra			
Route	Route length	Actual number seen	Density
1	51	13	25
2	52	0	0
3	54	0	0
4	56	47	84
5	63	28	44
6	57	21	37
7	55	135	245
8	56	23	41
9	52	13	25
10	59	0	0
		280	501

Table 4.5

Red Hartebeest			
Route	Route length	Actual number seen	Density
1	51	0	0
2	52	0	0
3	54	0	0
4	56	0	0
5	63	4	6
6	57	68	119
7	55	0	0
8	56	0	0
9	52	0	0
10	59	0	0
		72	125

Table 4.6

Ruppels Korhaan			
Route	Route length	Actual number seen	Density
1	51	2	4
2	52	0	0
3	54	7	13
4	56	6	11
5	63	11	17
6	57	0	0
7	55	3	5
8	56	0	0
9	52	0	0
10	59	0	0
		29	50

Table 4.7

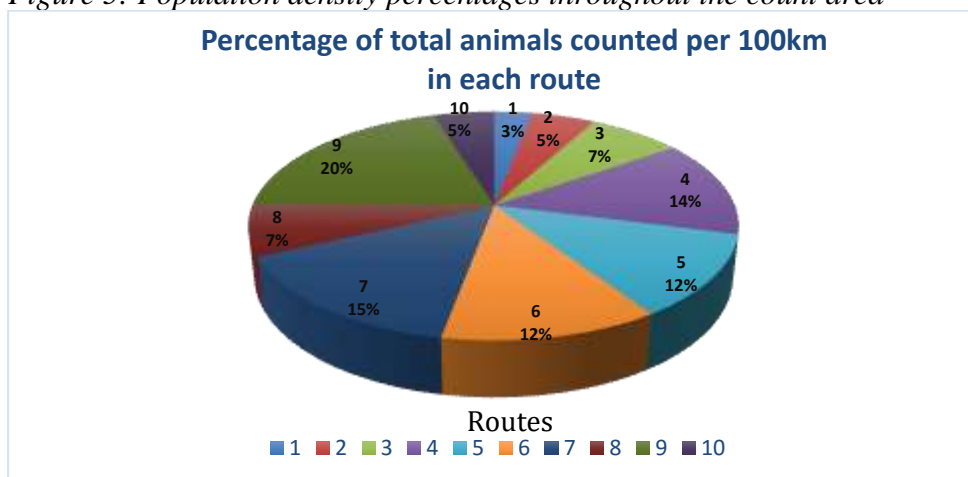
Ludwigs Bustards			
Route	Route length	Actual number seen	Density
1	51	0	0
2	52	0	0
3	54	0	0
4	56	8	14
5	63	3	5
6	57	0	0
7	55	0	0
8	56	0	0
9	52	0	0
10	59	0	0
		11	19

The total wildlife density for all game species (including ludwig’s bustard and ruppel’s korhaan) combined in each count zone in May 2016 shown in table 5 below and the percentage distribution in each zone is showed in figure 6 that follows.

Table 5: Total number of animals counted per 100km per route in 2016

Total no of animals counted per 100 km per route			
Route	Route length (km)	No of animals counted/100km	% of total animals counted per 100km
1	51	154	3%
2	52	261	5%
3	54	383	7%
4	56	721	14%
5	63	612	12%
6	57	639	12%
7	55	785	15%
8	56	380	7%
9	52	1050	20%
10	59	25	5%
Total	555	5236	

Figure 5: Population density percentages throughout the count area

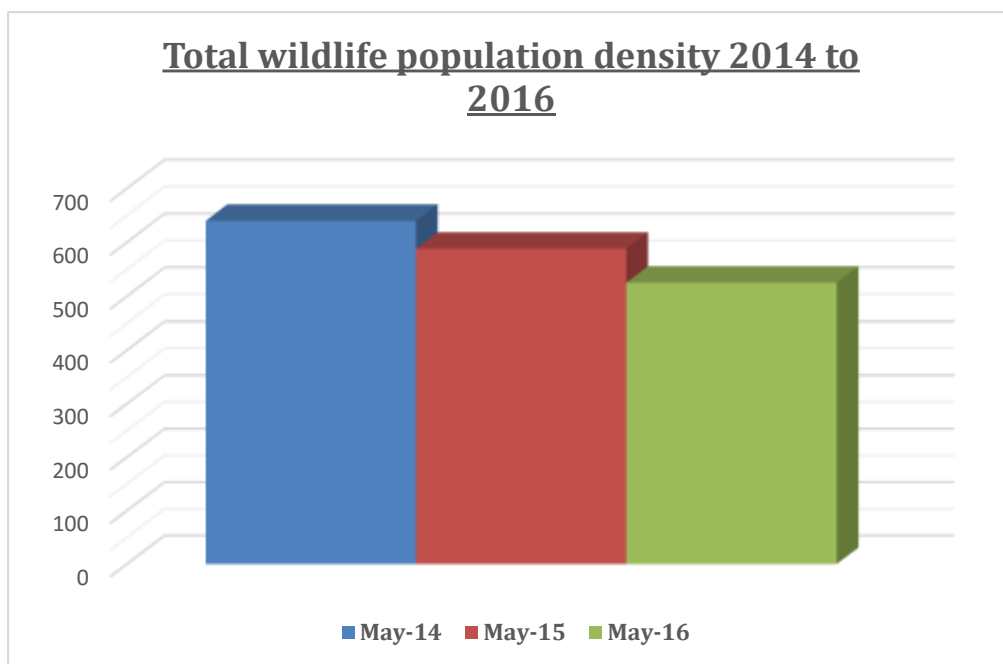


The total wildlife density for all species (including ludwig’s bustard and ruppel’s korhaan) combined per count zone in May 2016, compared to May 2015 and May 2014, is shown in table 6 below.

Table 6: Total number of animals counted per 100km per route in 2016 compared to 2015 and 2014

Total no of animals counted per 100 km per route (May 2014 - May 2016)				
Route	May-14	May-15	May-16	% change (May-15 to May-16)
1	629	155	154	-0,94%
2	574	817	261	-67,99%
3	620	579	383	-33,85%
4	520	1182	721	-38,97%
5	514	814	612	-24,73%
6	556	901	639	-29,12%
7	421	731	785	7,45%
8	1090	563	380	-32,44%
9	396	76	1050	1281,58%
10	729	171	25	-46,69%
Total	640	588	525	-10,71%

Figure 6: Total wildlife density change from 2014 to 2016



Objective 3: Population change

The total estimated numbers of game for the May 2016 count is compared to those from previous years to illustrate the population change. These comparisons are shown in tables below. The overall population estimate is down by 11.33% and the number of animals counted per 100km per route has decreased by 6.58%.

Table 7: Population estimates for 2016 compared to 2015

Total estimated numbers of game (Zone 1-10; May 2015 - May 2016)					
Species	May-15		May-16		Percentage change
	No. Counted	Total estimated number	No. Counted	Total estimated number	
Gemsbok	2099	7447	1778	6650	-10,70%
Springbok	633	3420	690	2944	-13,92%
Kudu	2	7	0	0	-100,00%
Steenbok	0	0	0	0	0,00%
Ostrich	80	218	55	145	-33,49%
Ludwigs Bustard	13	119	11	92	-22,69%
Ruppel's Korhaan	11	145	29	362	149,66%
B. zebra	219	370	280	440	18,92%
Hartebeest	66	220	72	149	32,27%
Total	3123	11946	2915	10782	-9,74%
Giraffe*	9	9	9	9	0,00%

* Total (estimate) numbers known

The long term total population estimates are presented in the table below.

Table 8: Population estimates for years 2005 to 2016

Total estimated numbers of game (Jun 05 - May 2016)												
Species	Jun-05	Jun-06	Jun-07	Jun-08	Jun-09 (1-9)	Jun-10 (1-9)	Jun-11 (1-9)	Jun-12 (1-10)	Jun-13 (1-10)	May-14 (1-10)	May-15 (1-10)	May-16 (1-10)
Gemsbok	4320	1447	3571	2938	5069	3972	6696	7493	8112	9087	7447	6650
Springbok	7733	17900	7704	11705	11938	7359	9968	6225	5828	3024	3420	2944
Kudu	290	583	151	23	31	10	15	16	5	0	7	0
Steenbok	53	44	123	151	40	0	0	0	0	0	0	0
Ostrich	409	213	550	312	733	448	365	748	183	220	218	145
Ludwigs Bustard	0	0	286	45	53	693	286	285	381	247	119	92
Ruppel's Korhaan	0	0	127	0	224	210	335	468	388	229	145	362
B. zebra	174	439	677	668	318	350	370	470	320	352	370	440
Hartebeest	50	70	80	80	80	110	125	177	204	197	220	149
Giraffe*	0	0	0	0	4	8	6	6	6	7	9	9
Total	13029	20696	13269	15922	18490	13160	18166	15888	15427	13363	11953	10789
Blesbok*	10	15	20	20	23	19	18	7	3	0	0	0
% change		58,85%	-35,89%	19,99%	16,13%	-28,83%	38,04%	-12,54%	-2,90%	-13,38%	-10,55%	-9,74%

* Total numbers known

The graphs in figure 8 below, show the total long term individual estimate changes for the four most common species. Please note that the figures of these graphs are taken from the respective species estimates from the maximum number of routes counted in each year.

Figure 7.1

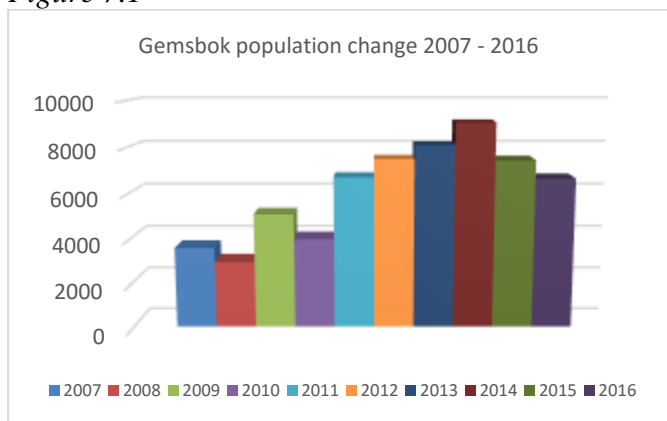


Figure 7.2

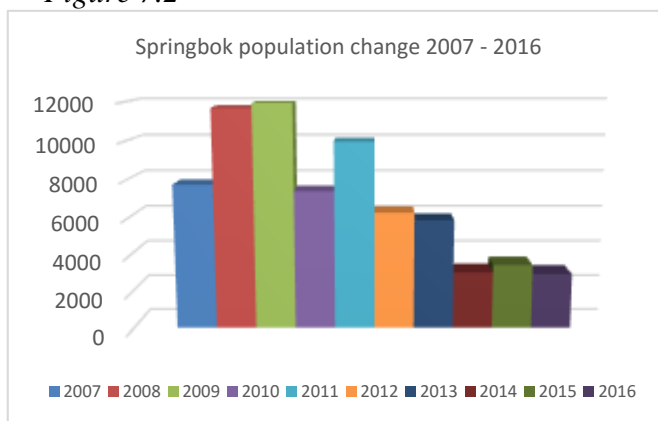


Figure 7.3

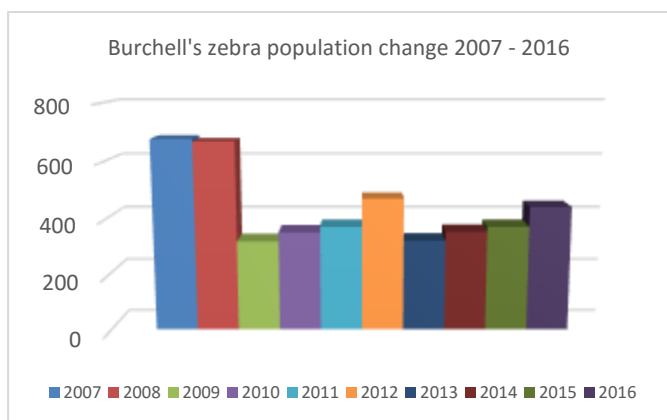
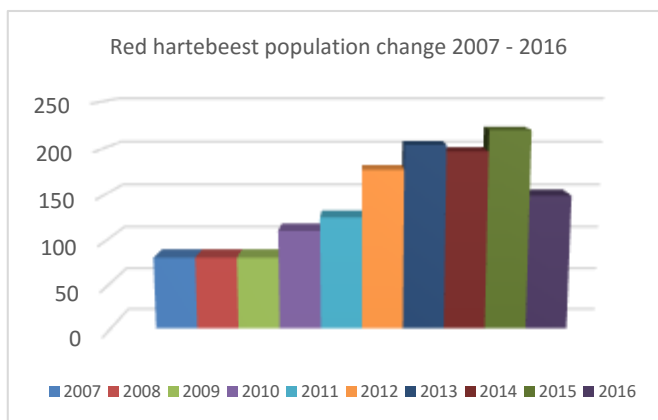
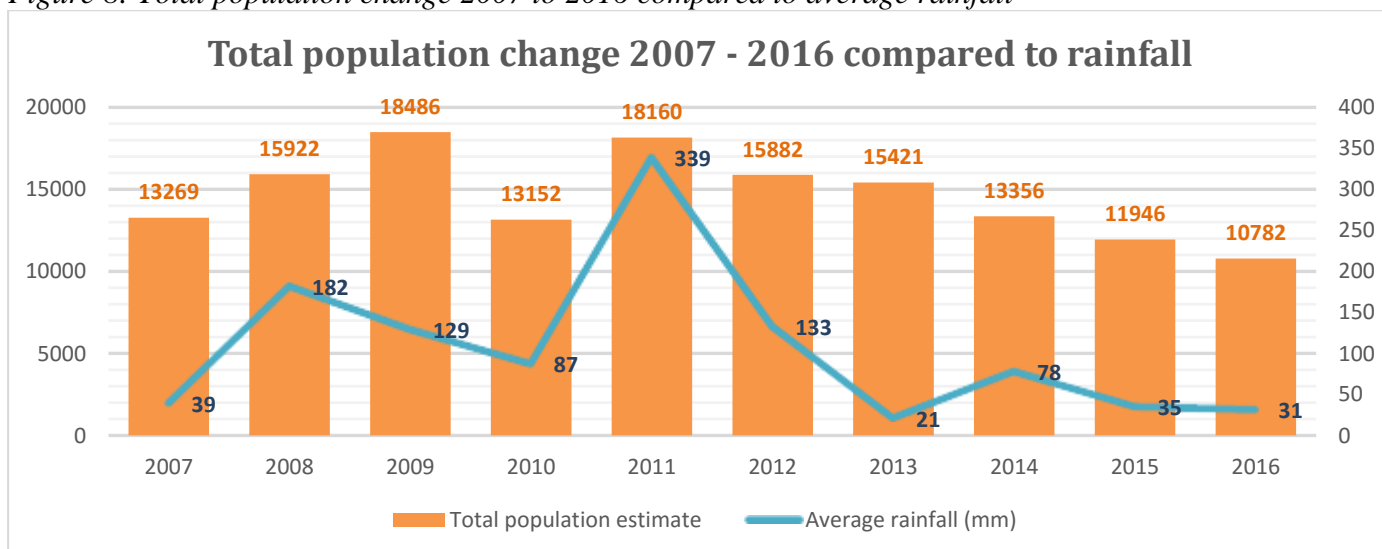


Figure 7.4



The graphs in figure 10 below show the total long term total population estimate change compared to the average annual rainfall received for the same period. Please note that as with the previous graphs, the figures for these graphs are taken from the total population estimates from the maximum number of routes counted in each year.

Figure 8: Total population change 2007 to 2016 compared to average rainfall



5. Discussion and conclusions

Gemsbok

For the second consecutive year the oryx population has shown a decrease from the previous years estimates. This year a total of 1778 oryx were counted (a decrease of 15,29% from 2015's 2099 counted) giving a total estimate of 6650 in 2016. This is a 10,70% decrease from last year's estimate of 7447. While this is a significant decrease in the population it should be noted that it is less of a decrease than was observed from 2014 to 2015, where the population decreased 18,05%. While the oryx population is widespread throughout the Reserve an unusually high density was recorded in Zone 9, which last year recorded the lowest density across the Reserve. Overall there seems to have been a slight shift in the population towards the south of the Reserve with greater densities occurring in the central to southern zones where in previous years the highest densities were recorded in the central to northern zones.

The highest density of gemsbok recorded was in Zone 4, at 596 animals per 100 kilometres. This is consistent with the previous year indicating a marked preference for the habitat found in this zone, namely vegetated dunes. The second highest density was recorded in Zone 7 this year (511 animals per 100 kilometres) which represents the southerly shift mentioned above, as in the previous year the second highest density was recorded in Zone 5. The lowest density this year was recorded in Zone 2 (56 animals per 100km), a significant drop from the previous years 171 animals per 100 kilometres.

Springbok

The estimated population of springbok this year is 2944. This is a 13.44% decrease from the previous years 3420. Interestingly the actual number of springbok counted this year increased from 633 in 2015 to 690 in 2016. The distribution of springbok on the Reserve showed a similar pattern of southwards shift from 2015 with Zone 9 once again showing an unusually high density of springbok of 538 animals per 100 kilometres compared with 2015's 16 animals per 100 kilometres.

Overall the springbok population was concentrated in three zones, namely Zones 2, 6 and 9 with 600 of the 690 springbok, or 87%, being counted in just these three zones. The remaining zones each showed significantly lower densities although there were no zones where springbok were wholly absent.

Kudu

No kudus were counted on this year's game count. While there have been a number of reported cases of rabid kudus on the reserve it has certainly not reached a point where there are none left on the Reserve as can be seen on a number of camera trap photos as well as other sightings. However, it is still likely that the disease has had an impact on their numbers. The reduced number of kudus coupled with the unsuitability of this game count method for this species is the most likely explanation for the fact that none were seen this year.

Steenbok

For the third year in a row, no steenbok were seen during the game count. As with kudu this is more likely a reflection of the unsuitability of the game count method for this species and not a true reflection of their numbers.

Ostrich

The estimated number of ostrich (145) as well as the total number of ostrich actually seen (55) decreased by roughly a third (33.49% and 31.25% correspondingly) from last year's count where the estimated number was 218 and the number actually seen was 80. Sightings were recorded in Zones 1,2,3, 7,8 and 9 with the majority seen in Zones 2 and 9. The percentage decrease in the ostrich population was the highest out of all the animals counted indicating that perhaps they are more susceptible to drought than some of the other species.

Ludwig's bustard

The estimated number of Ludwig's bustard decreased from 119 last year to 92 this year, a 22.7% decrease. This indicates a steady decline in the population from 2012. Only eleven birds were counted across the entire Reserve and only in Zones 4 and 5 with the majority (8) being counted in Zone 4.

Rüppell's Korhaan

The estimated number of Rüppell's korhaan increased dramatically this year from 145 last year to 363 this year! This increase is almost certainly attributable to the birds increased visibility as a result of shorter grass due to drought rather than an actual population increase of this magnitude. Overall 29 Rüppell's korhaan were seen as opposed to 11 last year. These were recorded in exactly half of the game count zones, namely 1,3,4,5 and 7.

Burchell's Zebra

In previous years the Burchell's zebra population was concentrated in a few areas on the Reserve and this made it relatively easy to conduct total counts for this species. Over the last few years however the situation has changed and the range has expanded to cover most zones making total counts more challenging. It was decided this year to use the calculated estimates, but first some modifications to the database were required. By adjusting the Effective Strip Width (ESW) to account for the greater visibility of Burchell's zebra it was possible to get the estimates for the previous two years to match very closely with the total count numbers and it is therefore safe to assume that the new estimates are also similarly close to the actual numbers. This year, a total of 280 zebra were counted to give a total estimated population of 440. This is an 18.92% increase from the previous year. As indicated previously the population is widespread across the Reserve and zebra were only absent, or not counted, in zones 2,3 and 10. Zone 7 had by far the highest density of 245 zebra per 100km and accounted for just over half of the estimated population. This is also the first year since the inclusion of zone 9 into the game count where Burchell's zebra were recorded in this zone! While Burchell's zebra are generally considered to be less drought tolerant than either Oryx or Springbok the continued increase in their population despite the dry conditions is most likely attributable to their relatively low overall populations and the widespread provision of water. It is unlikely that their numbers would continue to rise indefinitely and at some point in the future would reach a threshold from which point their numbers would begin to decline as has been seen in the oryx population.

Red Hartebeest

Due to an increase in the overall range of red hartebeest on the Reserve total counts as were done in the past are substantially more difficult. This year, it was decided to use the estimates calculated from the database developed for the Greater Sossusvlei-Namib Landscape for the purposes of this report. The estimates showed a decline in the population from 220 last year to 149 this year, or a 32.27% decline. However, this is almost certainly a low estimate as hartebeest were only seen in Zone 5 & 6 despite regular

reports of them being present in other zones, particularly 7 and 10. In fact the majority of actual sightings were in zone 6 where 68 were counted. Subsequent to the game count, a herd of approximately 80 was seen in zone 7 which were entirely unrecorded the game count. If these are factored into the calculations then it would show an increase in the population. For the sake of continuity going forward, it was decided to keep the estimates as is and not attempt a total count of individuals.

Giraffe

None of the nine giraffe on the Reserve were recorded during this year's game count. However, regular sightings of six giraffes in the southern parts of the Reserve as well as a further three giraffe in the northern parts of the Reserve result in an accurate idea of the total number of giraffe. It has now been more than three years since a group of four were relocated to the southern parts of the Reserve, where the two adult cows gave birth to two calves, and since the intention of that move was to separate the cows and the bulls it is unlikely that the number of giraffe will change in the near future without further intervention.

Total population change, distribution and densities

The total population estimate decreased by 9.49% this year to 10,782 animals. The actual number of animals counted also decreased from 3123 animals in 2015 to 2915 animals in 2016, a decrease of 6.66%. This is no doubt a result of the persisting drought conditions and the depletion of food reserves in a number of key areas across the Reserve. The total population estimate is now at its lowest point for the period during which game counts have been undertaken. It is no coincidence that it is also the longest consecutive period of below average rainfall since the inception of the count. Increases in some species populations were not enough to counter the losses in others. The two main animal species, oryx and springbok, showed large population decreases.

The overall density showed a 10.71% decrease from the previous year consistent with the estimated population decrease. This year a total density of 525 animals per 100 kilometres was observed compared to 588 the previous year.

Driven largely by the shift in oryx and springbok distribution, the overall wildlife distribution showed a shift towards the southern count zones with Zone 9 recording record numbers of oryx, springbok and even Burchell's zebra. Total population, density and actual numbers of animals seen in the far northern zones were particularly low this year, with only very few exceptions.

6. Acknowledgments

The NamibRand Nature Reserve would like to thank all its concessionaires, stakeholders, neighbours and all the participants for their enthusiastic involvement to make this year's game count another success. Participants were: Peter Woolfe, Etienne Rossouw, Elton Vries, Jaques Swartbooi, John Bernstein, Dominic Fitzpatrick, Andrew Shapin, Willem Rooi, Eben Tsaobeb, Fritz Tsaobeb, Aloysius Hanse, Christiane Berker, Alex Boll, K. Garbade, Sakeus, H. Nghuumbwa, Bravo Kasupi, Bernhard, Quintin Hartung, Greg Yries, Manuella Schmid, Thomas Kelin, Kerstin Klein, Willie, Agnes, Elizabeth Johannes, Franziska Keresztesi, Esme, Elia, Nina and Ruben Bonifacious.

7. Appendix

Results per count route per Zone

Tables 9.1 to 9.10 list the data collected on each route in May 2016, which were used as a basis for the analysis.

Table 9.1

Route 1			
Species	Total number counted	Density	Estimated population
Gemsbok	59	116	185
Springbok	2	4	8
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	2	4	4
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	2	4	17
B. zebra	13	26	20
Hartebeest	0	0	0
Total	78	154	234

Table 9.2

Route 2			
Species	Total number counted	Density	Estimated population
Gemsbok	29	56	124
Springbok	87	167	510
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	20	38	40
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra	0	0	0
Hartebeest	0	0	0
Total	136	262	674

Table 9.3

Route 3			
Species	Total number counted	Density	Estimated population
Gemsbok	190	350	998
Springbok	5	9	63
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	6	11	22
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	7	13	121
B. zebra	0	0	0
Hartebeest	0	0	0
Total	208	383	1204

Table 9.4

Route 4			
Species	Total number counted	Density	Estimated population
Gemsbok	334	596	1007
Springbok	9	16	35
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	0	0	0
Ludwig's Bustard	8	14	72
Ruppel's Korhaan	6	11	80
B. zebra	47	84	71
Hartebeest	0	0	0
Total	404	721	1265

Table 9.5

Route 5			
Species	Total number counted	Density	Estimated population
Gemsbok	308	489	792
Springbok	32	51	137
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	0	0	0
Ludwig's Bustard	3	5	20
Ruppel's Korhaan	11	17	108
B. zebra	28	44	36
Hartebeest	4	6	11
Total	386	613	1104
Lappet Faced Vulture**	12		
White-backed Vulture**	20		

** Not included in count

Table 9.6

Route 6			
Species	Total number counted	Density	Estimated population
Gemsbok	42	74	79
Springbok	233	409	685
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	0	0	0
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra	21	37	20
Hartebeest	68	119	138
Total	364	639	922

Table 9.7

Route 7			
Species	Total number counted	Density	Estimated population
Gemsbok	281	511	945
Springbok	12	22	78
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	1	2	3
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	3	5	36
B. zebra	135	245	227
Hartebeest	0	0	0
Total	432	785	1289
Lappett faced Vulture**	1		
Klipspringer**	4		

** Not included in count

Table 9.8

Route 8			
Species	Total number counted	Density	Estimated population
Gemsbok	169	302	480
Springbok	13	23	53
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	8	14	21
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra	23	41	33
Hartebeest	0	0	0
Total	213	380	587
Jackal	2		
Ground Squirrel**	3		
Lappet Faced Vulture**	10		
Klipspringer**	2		

** Not included in count

Table 9.9

Route 9			
Species	Total number counted	Density	Estimated population
Gemsbok	235	452	1193
Springbok	280	538	1304
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	18	35	55
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra	13	25	33
Hartebeest	0	0	0
Total	546	1050	2585
Bat Eared Fox**	4		
Aardwolf**	1		
Lappett faced Vulture**	2		

** Not included in count

Table 9.10

Route 10			
Species	Total number counted	Density	Estimated population
Gemsbok	131	222	847
Springbok	17	29	71
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	0	0	0
Ludwig's Bustard	0	0	0
Ruppel's Korhaan	0	0	0
B. zebra*	0	0	0
Hartebeest*	0	0	0
Total	148	251	918

** Not included in count

Table 9.11

Total number of Game			
Species	Total number counted	Density	Estimated population
Gemsbok	1778	320	6650
Springbok	690	124	2944
Kudu	0	0	0
Steenbok	0	0	0
Ostrich	55	10	145
Ludwig's Bustard	11	2	92
Ruppel's Korhaan	29	5	362
B. zebra*	280	50	440
Hartebeest*	72	13	149
Total	2915	525	10782
Jackal**	2		
Bat Eared Fox**	4		
Aardwolf **	1		
Brown Hyena**	0		
Giraffe**	0		
Ground Squirrel**	3		
Lappet Faced Vulture**	25		
Leopard**	0		
Scrub Hare**	0		
Secretary Bird**	0		
White Backed Vulture**	20		
Klipspringer**	6		
H. Zebra**	9		

** Not included in count