NamibRand
Nature Reserve
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Results of the
NamibRand Nature Reserve
and Pro-Namib Conservancy
Annual Game Count
28 May 2022

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1. Introduction

This report provides summarized results and analysis of the annual game count held on the NamibRand Nature Reserve and the Pro-Namib Conservancy on the 28th of May 2022.

On the 28th of May 2022, NamibRand conducted our annual game count. NamibRand stakeholders attended the game count briefing at NaDEET the afternoon before the game count. At this briefing, Nils Odendaal and Jessica Steyn explained the count methodology and divided the participants into their different routes.

This year's result show that the gemsbok total population decreased by 3.45% and springbok increased by 67.17%. A much higher number of springboks were counted than last year, and animals were sighted closer to the road and easier to see. The distribution of gemsbok and springbok was widespread across the Reserve. The highest concentration of animals was seen in the north of the Reserve and most gemsbok were seen in the dune areas, while almost all springboks were counted on the Keerweder plains. This could be due, that the northern part of the reserve received higher rainfall than the southern part of the reserve, and more grass is available for animals to eat.

The Burchell's zebra population is concentrated on the plains at Vremdelingspoort, on the Keerweder Pan all the way to Wolwedans, on the Chateau Plains and the plains on Springbokvlakte. Their population decreased by 74.62%. This could be of them wandered outside of the Reserve's boundaries were other areas got higher rainfall.

Only three hartebeest were counted. Unfortunately, the prolonged drought over the past eight years has taken a heavy toll on these animals, whose population was once estimated to be around 200. While most animals have likely succumbed to the drought, some have migrated outside of the Reserve, searching for better grazing. Hartebeest have been seen on properties with higher rainfall and closer to the escarpment.

The increase in rain this year gave the wildlife a boost, which would indicate why there are such high numbers this year. However, there is still a decrease of the population of 6.74%, due that animals moved to others area due to good rain all over. Not only are we seeing many young animals being born, but favourable grazing from the abundant rainfall is also attracting animals from the surrounding areas into NamibRand and vice versa.

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 2022 game count was entered into our database and analysed.
The below results give a summary of all animals counted; this includes animals seen further than 500m. This gives an idea of what was seen on the count.

Table 1. Total number of game seen on the count for May 2022.

Total of Species							
Mammals			**Carnivores**			**Birds**	
Giraffe	**3**		Bat-eared Fox	**13**		Black-chested snake Eagle	**1**
Ground squirrel	**5**		Black-backed Jackal	**15**		Crow	**7**
Hartebeest	**3**		Hyena	**1**		Greater Kestrel	**8**
Kudu	**1**					Lanner Falcon	**3**
Hartmann Zebra	**94**					Lappet-faced Vulture	**13**
Oryx	**1,428**					Ludwig Bustard	**66**
Burchell Zebra	**235**					Martial eagle	**2**
Scrub Hare	**1**					Ostrich	**122**
Springbok	**563**					Pale Chanting Goshawk	**9**
Warthog	**2**					Rock Kestrel	**1**
White tailed mongoose	**2**					Rock Pigeon	**39**
						Rüppels Korhaan	**28**
Reptile						Southern Hawk	**1**
Sand Snake	**1**					Spotted eagle owl	**1**
						Unknown bird	**5**
						Vulture	**3**
						White-backed Vulture	**1**

The results below give you the total of species counted per route; this includes animals seen above 500m.

Table 2. Total number of game seen on each route for May 2022.

Total species counted per route	
1	**513**
2	**240**
3	**270**
4	**454**
5	**249**
6	**358**
7	**151**
8	**39**
9	**155**
10	**248**

The below table give you the total species per route seen under or by 500m. This is the amount we use to do the calculation for the rest of the document.

Table 3. Total number of game seen on each route less than 500m for May 2022.

Total species counted per route less than 500	
1	**513**
2	240
3	204
4	273
5	196
6	356
7	120
8	39
9	155
10	248

The results shown below are bearing our three core objectives in mind:

Objective 1: Population and biomass estimates:

Population estimates:

Table 4. Total number of game seen and the estimated numbers for May 2022.

Total estimated numbers of game (Zone 1-10, May 2022)		
Species	**No. Counted**	**Estimate 2022**
Gemsbok	1168	12564
Springbok	529	4818
Kudu	1	80
Steenbok	0	0
Ostrich	114	742
Ludwigs Bustard	66	2193
Ruppel's Korhaan	28	1774
B. zebra	266	2517
Hartebeest	3	8
Total	**2175**	**24698**
Giraffe*	13	13

** Total numbers known*

Biomass estimates

Table 5. Wildlife biomass estimates for May 2022.

Total wildlife numbers and wildlife biomass on NamibRand for May 2022 (Zone 1-10) , 224 209 ha)				
Species	**Mean mass (kg)**	**Estimated wildlife numbers from May 2022 game count**	**Species biomass (kg)**	**Biomass per ha (kg)**
Gemsbok	220	12564	2764149	14.80
Springbok	38	4818	183097	0.98
Kudu	180	80	14486	0.08
Steenbok	11	0	0	0.00
Ostrich	68	742	50482	0.27
B. Zebra	300	2517	755163	4.04
Hartebeest	130	8	1004	0.01
Total	**947**	**20730**	**19631749**	**20.18**

Objective 2: Wildlife distribution and density

Table 6. 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	56	513	22%
2	51.6	240	10%
3	47.3	204	9%
4	53.6	273	12%
5	71	196	8%
6	35	356	15%
7	58.5	120	5%
8	50	39	2%
9	70	155	7%
10	59	248	11%
Total	**552**	**2344**	

Objective 3: Population change

Table 7. The overall population estimate has increased by 0.29%

Total estimated numbers of game (Zone 1-10, May 2020 - May 2022)					
Species	May-21		May-22		Percentage change
	No. Counted	Total estimated number	No. Counted	Total estimated number	
Gemsbok	1765	13014	1168	12564	-3.45%
Springbok	302	2882	529	4818	67.17%
Kudu	1	0	1	0	#DIV/0!
Steenbok	0	0	0	0	#DIV/0!
Ostrich	69	722	114	742	2.83%
Ludwig's Bustard	31	334	66	2193	556.57%
Ruppel's Korhaan	26	1173	28	1774	51.26%
B. zebra	152	7654	266	1943	-74.62%
Hartebeest	0	0	3	8	#DIV/0!
Total	**2349**	**25787**	**2175**	**24043**	-6.74%
Giraffe*	11	11	13	13	18.18%
**** Total (estimate) numbers known***					

3. Count Methodology

The primary objectives of the game count are to determine the density and distribution of game and to estimate the total number of game in each, or total, area. For this reason, the survey methodology used is a combination of the road strip census and game distribution map 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 traveled) 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 5 below.

Table 5. 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 2022.

Count areas, area correction factors, effective strip widths and species correction factor for 2022

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
1	18072	12513	58	2.16	Oryx	124	4.04
					Springbok	75	6.70
					Burchell Zebra	100	5.00
2	18310	13779	53.5	2.58	Oryx	135	3.71
					Springbok	248	2.02
					Burchell Zebra	104	4.81
3	27039	26424	55	4.80	Oryx	197	2.54
					Springbok	200	2.50
4	21038	20996	50	4.20	Oryx	258	1.94
					Springbok	300	1.67
5	18038	17491	68	2.57	Oryx	275	1.82
					Springbok	200	2.50
					Burchell Zebra	60	8.33
6	19352	11589	36	3.22	Oryx	312	1.60
					Springbok	229	2.18
					Burchell Zebra	277	1.81
7	28343	18833	72	2.62	Oryx	186	2.69
					Springbok	200	2.50
					Burchell Zebra	210	2.38
8	22452	19291	57	3.38	Oryx	155	3.24
					Springbok	73	6.82
9	21710	21125	47	4.49	Oryx	327	1.53
					Springbok	150	3.33
10	29855	24721	59	4.19	Oryx	267	1.88
					Springbok	216	2.31
					Burchell Zebra	200	2.50
Total	**224209**	**186762**	**555.5**				

Species	Effective strip width (m) routes 1-10	Species correction factor routes 1-10
Ostrich	285	2
Kudu	20	25
Steenbok	0	0
Rüppells Korhaan	68	7
Ludwigs bastard	91	5

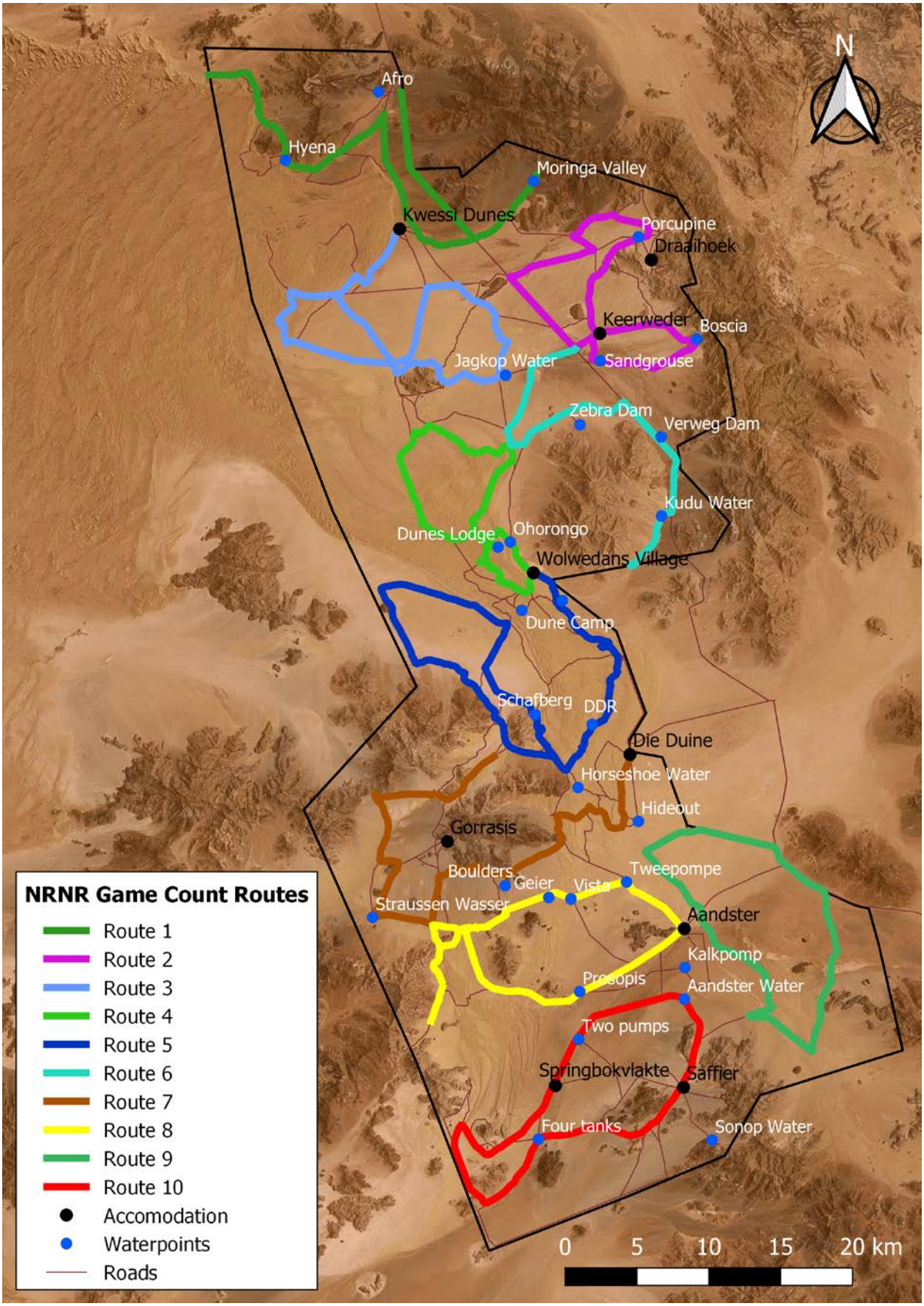


Figure 1. The game count area shows the ten zones used in May 2022 for the NamibRand Nature Reserve (1-8, 10) and the Pro-Namib Conservancy (9).

Game distribution maps

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.

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 each recorded animal.

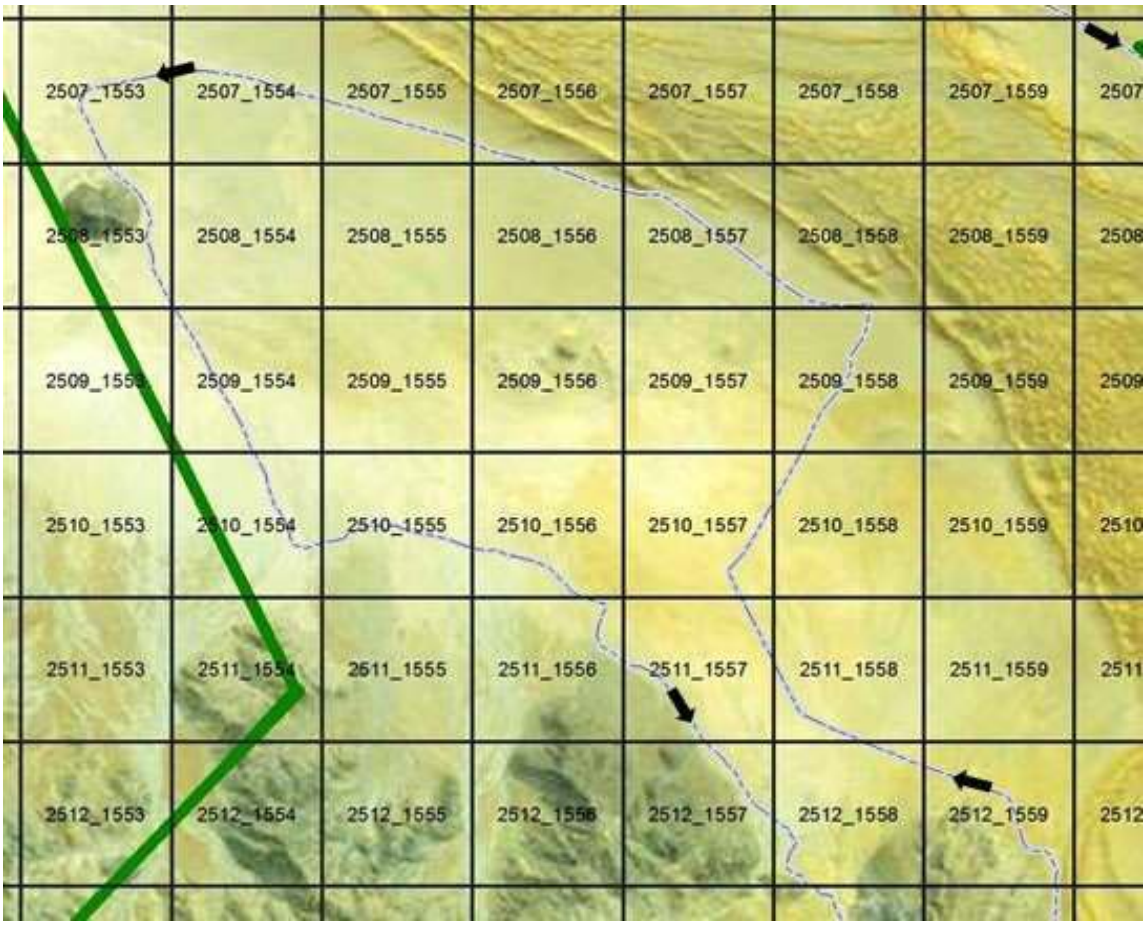


Figure 2. Monad maps.

4. Objectives and results of the May 2022 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.

S: Actual number of animals seen*
A: Area correction factor
B: Species correction factor
*Known numbers

Formula for calculating population estimates*
(S x A) x B=P

Note that where total numbers of species with small populations are known (e.g. for recently introduced species giraffe), these known totals are used for the final population estimates in reference to the above calculated estimates.

The total estimates per species per zone were then combined for all zones to determine the total population estimate for each plains game species in the count area (see Table 1 below).

Table 1. Total number of game seen and the estimated numbers for May 2022.

Total estimated numbers of game (Zone 1-10, May 2022)		
Species	**No. Counted**	**Estimate 2022**
Gemsbok	1168	12564
Springbok	529	4818
Kudu	1	80
Steenbok	0	0
Ostrich	114	742
Ludwigs Bustard	66	2193
Ruppel's Korhaan	28	1774
B. zebra	266	2517
Hartebeest	3	8
Total	**2175**	**24698**
Giraffe*	13	13

** 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.

E: Estimated wildlife numbers
M: Mean mass per species
H: Total no. of hectares
B: Biomass estimate

Formula for calculating biomass estimates
(E x M) ÷ 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. These two species are different in aspects such as grazing/browsing patterns and agricultural stocking. LSU are also in a fenced system opposed to the open, unfenced system within the Reserve.

Tables 6.1, 6.2 and 6.3 below show the biomass estimates for this year, and the biomass estimates for previous years compared to this year.

Table 6.1 Wildlife biomass estimates for May 2022.

Total wildlife numbers and wildlife biomass on NamibRand for May 2022 (Zone 1-10) , 224 209 ha)				
Species	**Mean mass (kg)**	**Estimated wildlife numbers from May 22 game count**	**Species biomass (kg)**	**Biomass per ha (kg)**
Gemsbok	220	12564	2764149	14.80
Springbok	38	4818	183097	0.98
Kudu	180	80	14486	0.08
Steenbok	11	0	0	0.00
Ostrich	68	742	50482	0.27
B. Zebra	300	2517	755163	4.04
Hartebeest	130	8	1004	0.01
Total	**947**	**20730**	**19631749**	**20.18**

** Total (estimate) numbers known*

The chart in figure 3 below shows the biomass composition of the different species across the total count area for the year 2022.

Figure 3. Biomass composition 2022.

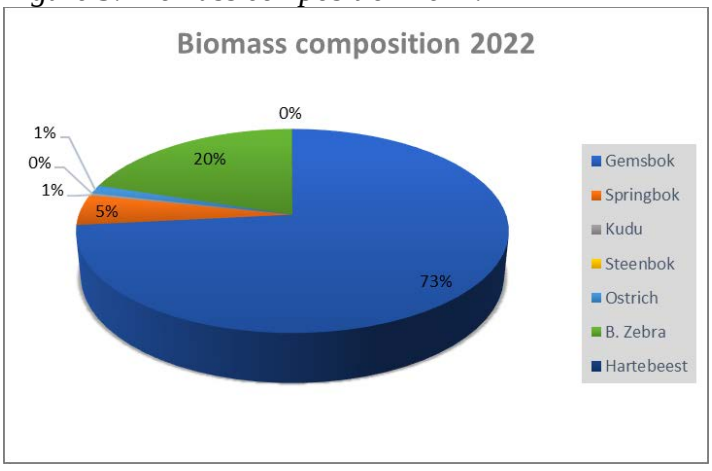


Table 6.2 Wildlife biomass (2020) percentage change compared to the count of May 2022.

Wildlife biomass on NamibRand for May 2020 and May 2022 (Zone 1-10) , 224 209 ha)								
Wildlife species	Mean mass (kg)	May-21			May-22			
		Estimated wildlife numbers from May 2017 game count	Species Biomass (kg)	Biomass per ha (kg) TOTAL	Estimated wildlife numbers from May 2018 game count	Species Biomass (kg)	Biomass per ha (kg) TOTAL	Biomass percentage change
Gemsbok	220	13014	2862981	15.33	12564	2764149	14.80	**-3.45%**
Springbok	38	2882	109526	0.59	4818	183097	0.98	*67.17%*
Kudu	180	0	0	0.00	80	14486	0.08	*#DIV/0!*
Steenbok	11	0	0	0.00	0	0	0.00	*#DIV/0!*
Ostrich	68	722	49094	0.26	742	50482	0.27	*2.83%*
B. zebra	300	7654	2296104	12.29	2517	755163	4.04	*-67.11%*
Red Hartebeest	130	0	0	0.00	8	1004	0.01	*#DIV/0!*
Total		**24271**	**5317704.3**	**28.47**	**20730**	**3768381.8**	**20.18**	*-29.13%*

Table 6.3 Wildlife biomass estimates from 2020-2022.

Total wildlife biomass estimates (kg/ha) on NamibRand May 2020 to May 2022					
Wildlife species	May-20	May-21	% change from May-20	May-22	% change from May 21
Gemsbok	7.96	15.33	*92.57%*	14.80	*-3.45%*
Springbok	1.83	0.59	*-67.91%*	0.98	*66.17%*
Kudu	0.00	0.00	*#DIV/0!*	0.08	*#DIV/0!*
Steenbok	0.00	0.00	*0.00%*	0.00	*0.00%*
Ostrich	0.47	0.26	*-44.14%*	0.27	*3.96%*
B. Zebra	3.31	12.29	*271.94%*	4.04	*-67.10%*
Hartebeest	0.00	0.00	*-100.00%*	0.01	*74.95%*
Total	**13.6**	**28.5**	***109.87%***	**5.3**	***-81.53%***

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 total number of animals seen per 100km.

S: Actual number of animals seen
R: Length of route
K: Wildlife density - i.e. Animals seen per 100km driven

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

For the purposes of this report, wildlife distribution is based on the number of animals seen in each monad. During the game count, each sighting is marked to the corresponding monad the animal(s) was seen in. This 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 were used in the (mapping) calculation. The total wildlife (species) distribution and density are shown in the maps below. 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).
The rain values were added with into the maps, to indicate where rain was recorded and indicate how much, the bigger the circle the more rain occurred there.

Figure 4.1 Total wildlife distribution

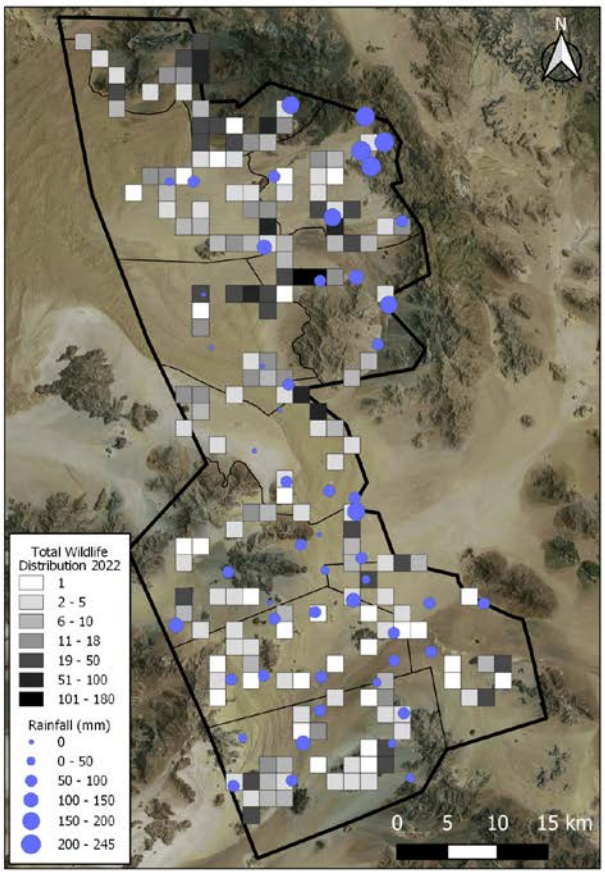


Figure 4.2 Total wildlife density

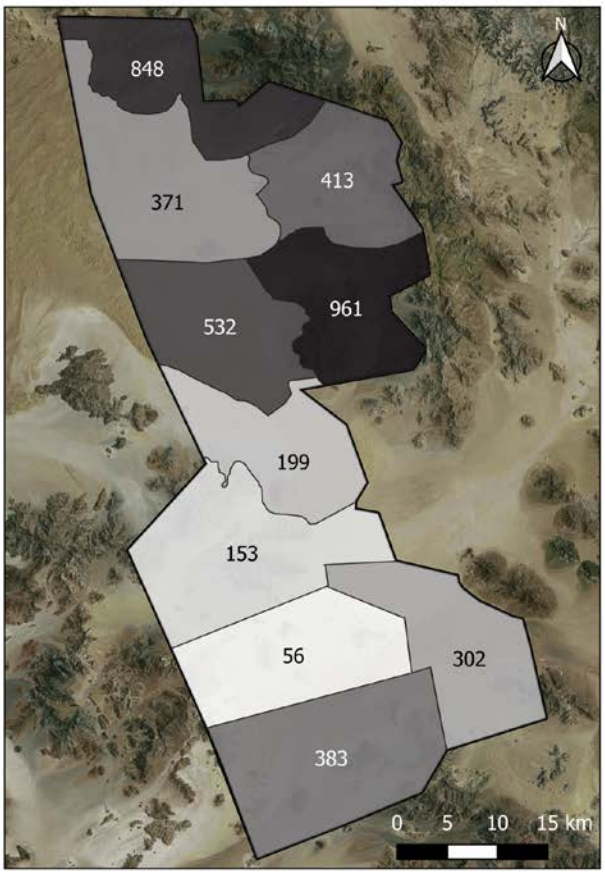


Figure 4.3 Distribution of gemsbok

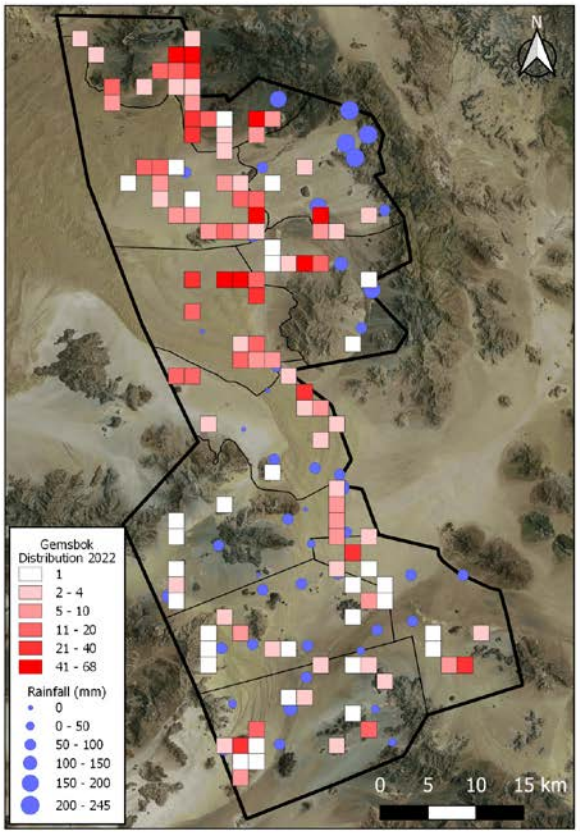


Figure 4.4 Density of gemsbok

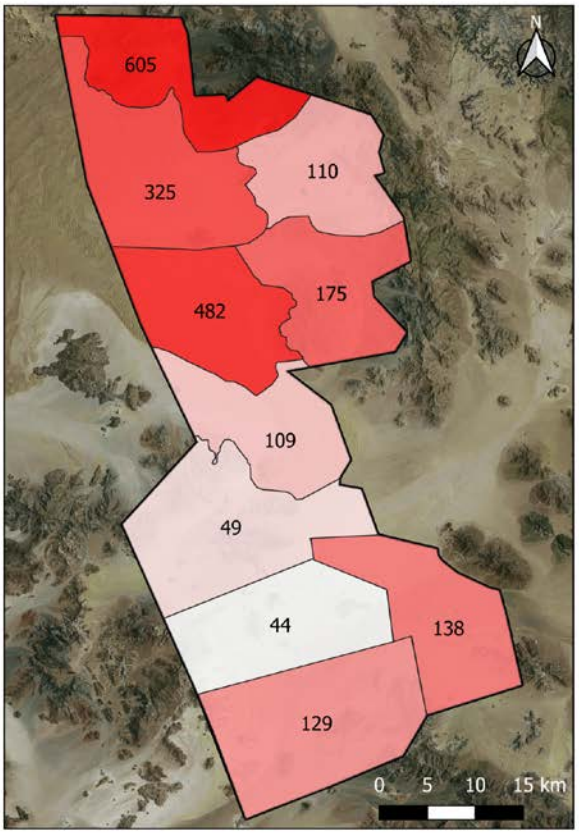


Figure 4.5 Distribution of springbok

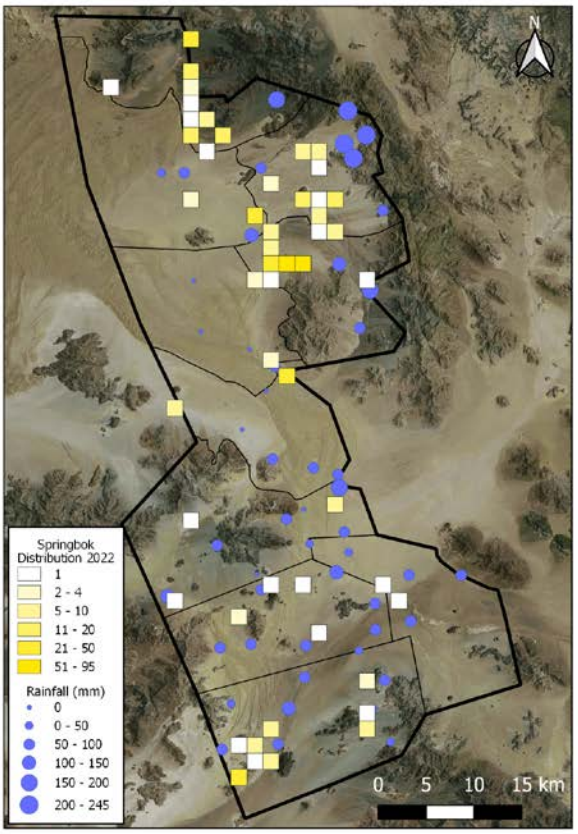


Figure 4.6 Density of springbok

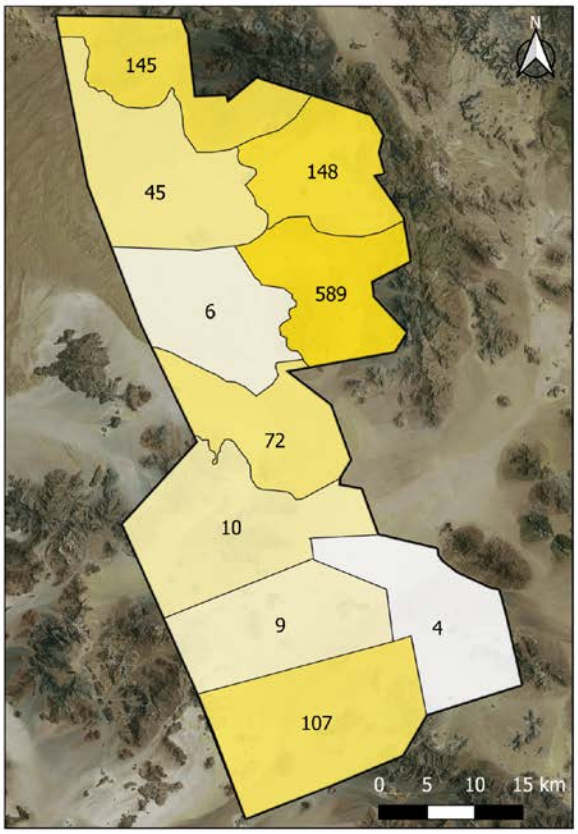


Figure 4.7 Distribution of B. zebra

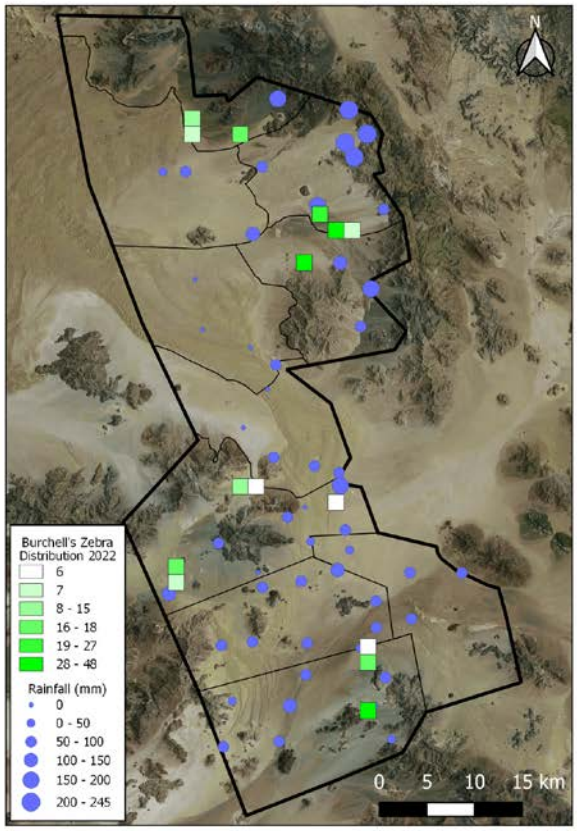


Figure 4.8 Density of B. Zebra

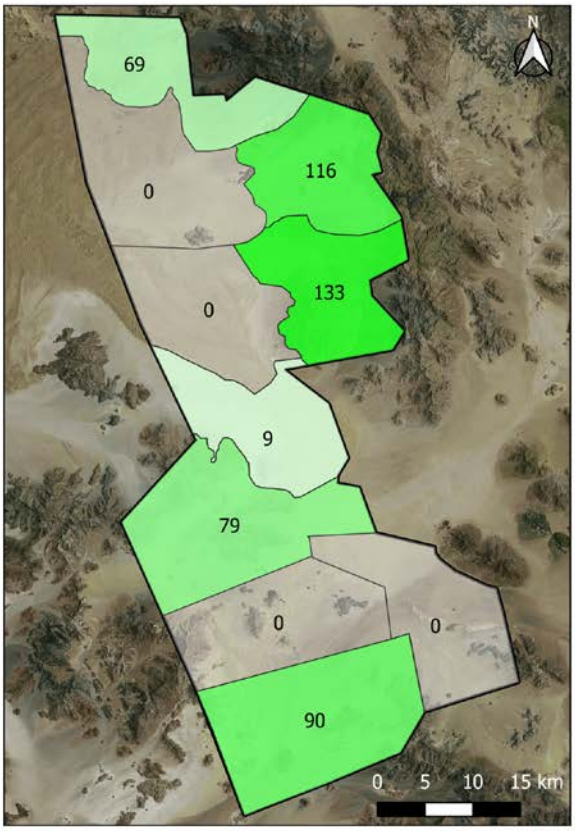


Figure 4.9 Distribution of ostrich

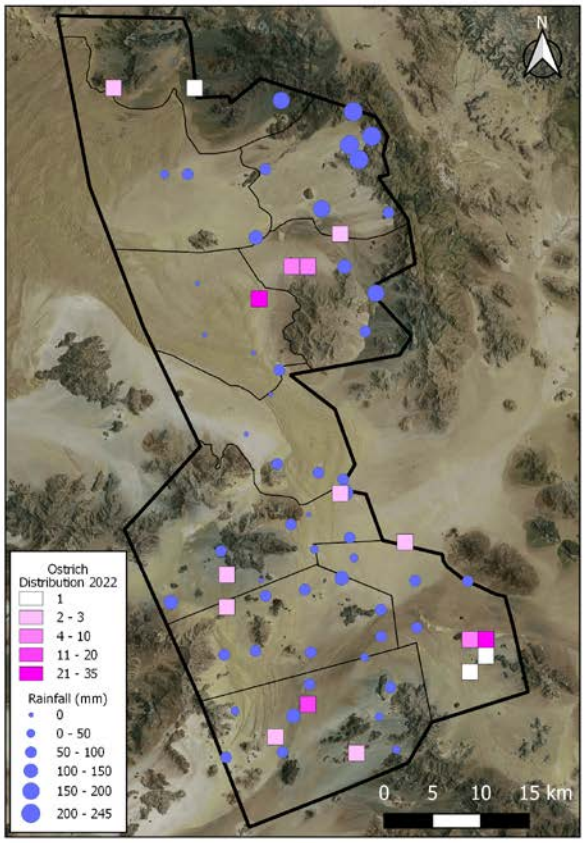


Figure 4.10 Density of ostrich

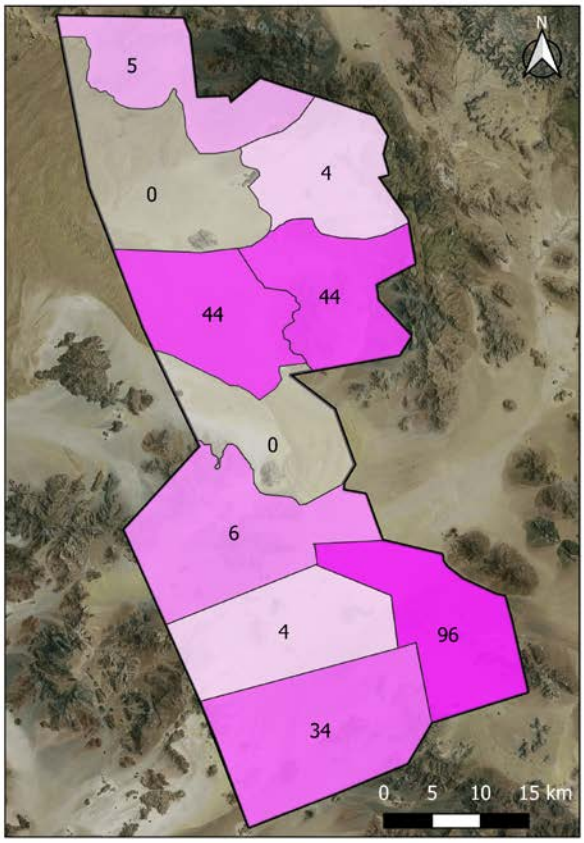


Figure 4.11 Distribution of Ludwig's Bustard

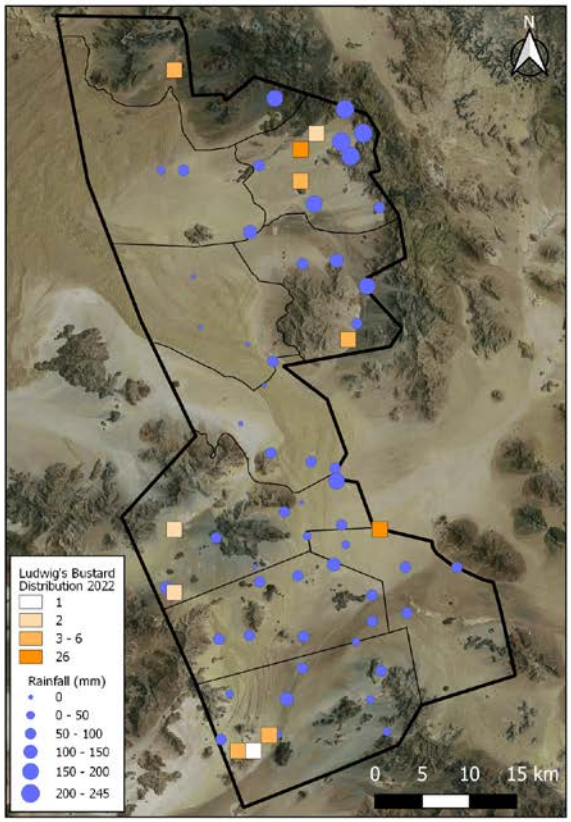


Figure 4.12 Density of Ludwig's Bustard

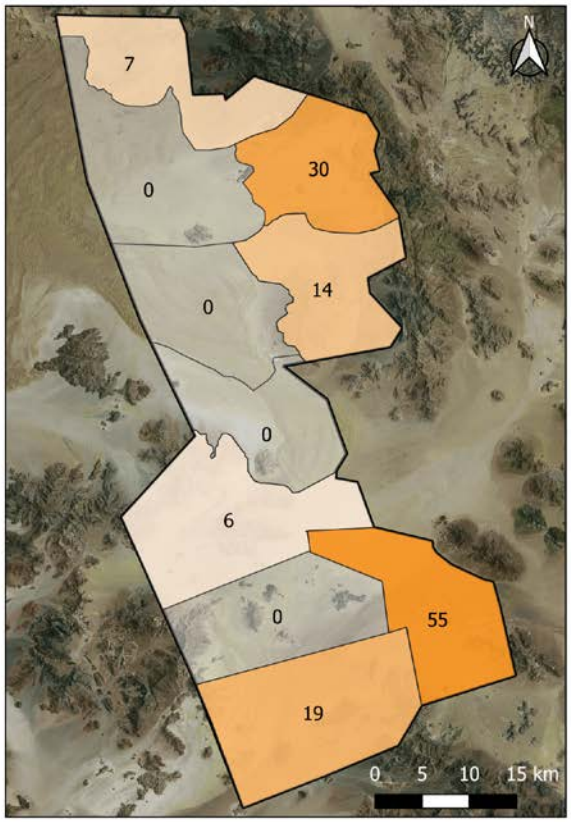


Figure 4.13 Distribution of Rüppel's Korhaan

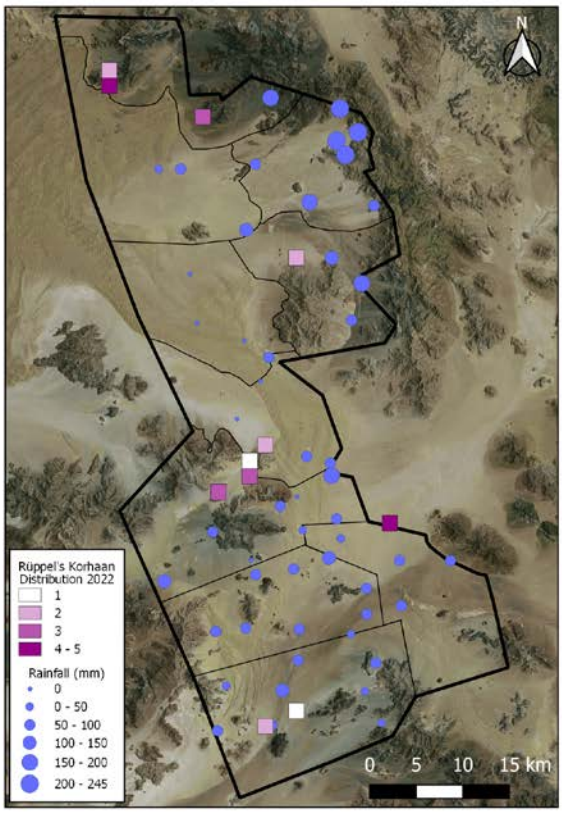


Figure 4.14 Density of Rüppel's Korhaan

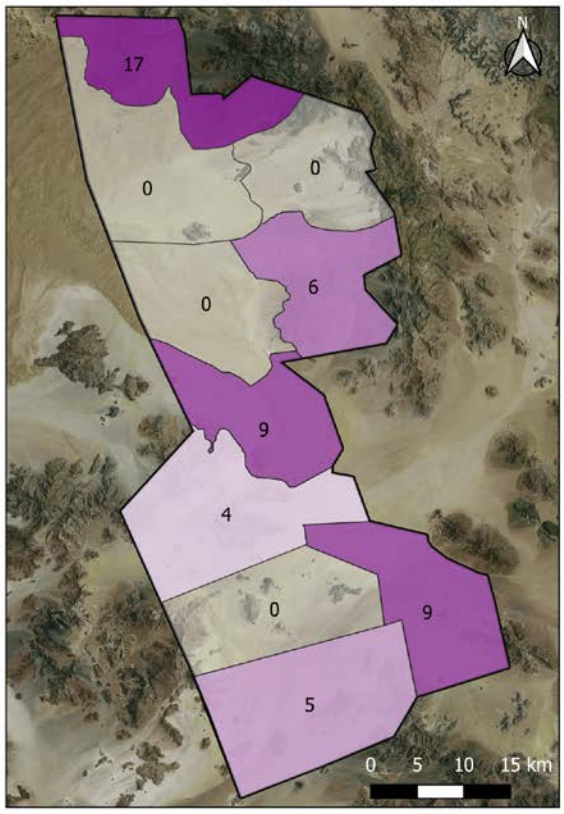


Figure 4.15 Distribution of Hartebeest

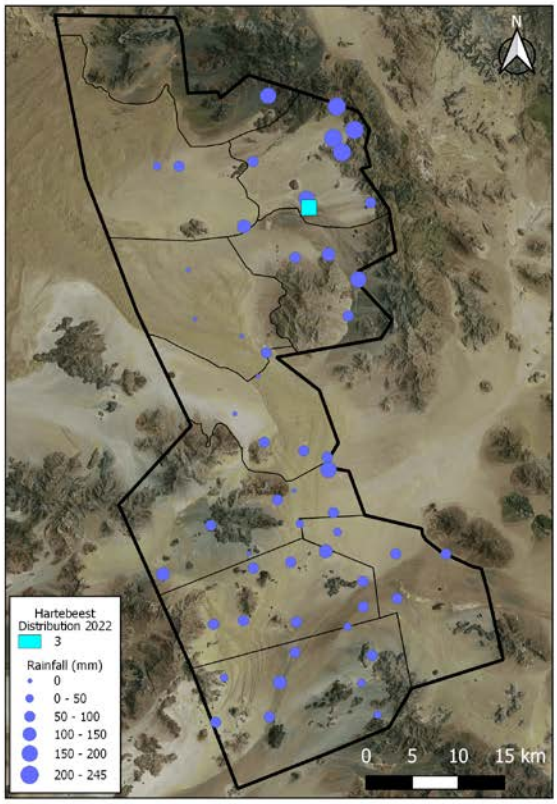
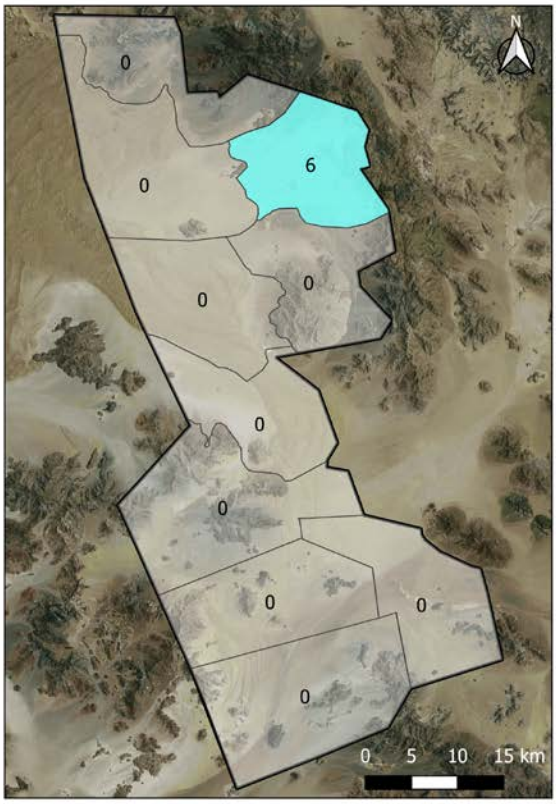


Figure 4.16 Density of Hartebeest



The population densities and actual number seen for individual species per zone are shown in tables 7.1-7.7 below.

Table 7.1

Gemsbok			
Route	**Route length**	**Actual number seen**	**Density**
1	58	351	605.17
2	53.5	59	110.28
3	55	179	325.45
4	50	241	482.00
5	68	74	108.82
6	36	63	175.00
7	72	35	48.61
8	57	25	43.86
9	47	65	138.30
10	59	76	128.81
Total	**555.5**	**1168**	**210.26**

Table 7.2

Springbok			
Route	**Route length**	**Actual number seen**	**Density**
1	58	84	144.83
2	53.5	79	147.66
3	55	25	45.45
4	50	3	6.00
5	68	49	72.06
6	36	212	588.89
7	72	7	9.72
8	57	5	8.77
9	47	2	4.26
10	59	63	106.78
Total	**555.5**	**529**	**95.23**

Table 7.3

Ostrich			
Route	**Route length**	**Actual number seen**	**Density**
1	58	3	5.17
2	53.5	2	3.74
3	55	0	0.00
4	50	22	44.00
5	68	0	0.00
6	36	16	44.44
7	72	4	5.56
8	57	2	3.51
9	47	45	95.74
10	59	20	33.90
Total	**555.5**	**114**	**20.52**

Table 7.4

Burchell's zebra			
Route	**Route length**	**Actual number seen**	**Density**
1	58	40	68.97
2	53.5	62	115.89
3	55	0	0.00
4	50	0	0.00
5	68	6	8.82
6	36	48	133.33
7	72	57	79.17
8	57	0	0.00
9	47	0	0.00
10	59	53	89.83
Total	**555.5**	**266**	**47.88**

Table 7.5

Red Hartebeest			
Route	**Route length**	**Actual number seen**	**Density**
1	58	0	0.00
2	53.5	3	5.61
3	55	0	0.00
4	50	0	0.00
5	68	0	0.00
6	36	0	0.00
7	72	0	0.00
8	57	0	0.00
9	47	0	0.00
10	59	0	0.00
Total	**555.5**	**3**	**0.54**

Table 7.6

Rüppell's korhaan			
Route	**Route length**	**Actual number seen**	**Density**
1	58	10	17.24
2	53.5	0	0.00
3	55	0	0.00
4	50	0	0.00
5	68	6	8.82
6	36	2	5.56
7	72	3	4.17
8	57	0	0.00
9	47	4	8.51
10	59	3	5.08
Total	**555.5**	**28**	**5.04**

Table 7.7

Ludwig's bustard			
Route	**Route length**	**Actual number seen**	**Density**
1	58	4	6.90
2	53.5	16	29.91
3	55	0	0.00
4	50	0	0.00
5	68	0	0.00
6	36	5	13.89
7	72	4	5.56
8	57	0	0.00
9	47	26	55.32

10	59	11	18.64
Total	**555.5**	**66**	**11.88**

The total wildlife density for all game species (including Ludwig's Bustard and Rüppel's Korhaan) combined in each count zone for May 2022 is shown in Table 8 below, and the percentage distribution in each zone is shown in Figure 5 that follows.

Table 8. Total number of animals counted per 100km for each route in 2022.

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	56	513	22%
2	51.6	240	10%
3	47.3	204	9%
4	53.6	273	12%
5	71	196	8%
6	35	356	15%
7	58.5	120	5%
8	50	39	2%
9	70	155	7%
10	59	248	11%
Total	**552**	**2344**	

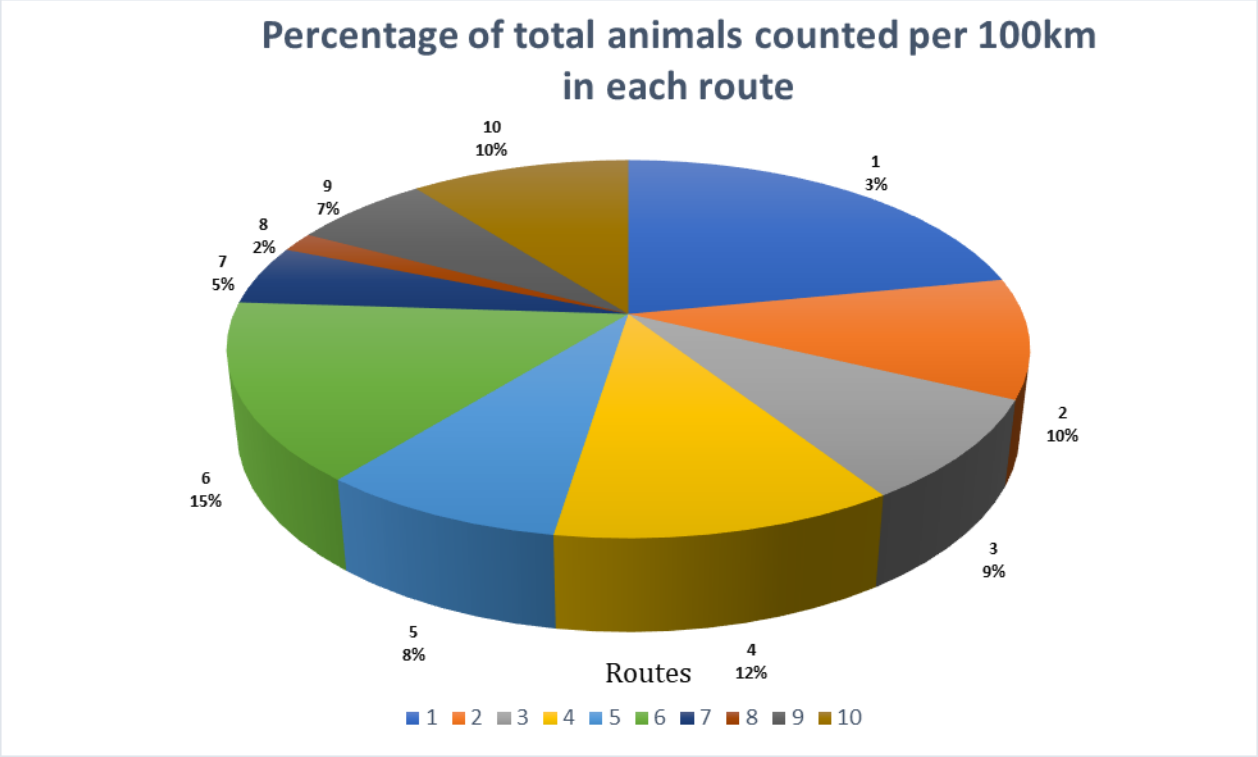


Figure 5. Population density percentages throughout the count area.

The total wildlife density for all species (including Ludwig's Bustard and Ruppel's Korhaan) combined per count zone in May 2022, compared to May 2020 and May 2021, is shown in Table 9 below.

Table 9. Total number of animals counted per 100km for each route in 2022 compared to 2021 and 2020.

Total no of animals counted per 100 km per route (May 2020 - May 2022)				
Route	**May-20**	**May-21**	**May-22**	**% change (May-20 to May-22)**
1	15	275	513	86.55%
2	142	212	240	13.21%
3	354	130	204	56.92%
4	8	533	273	-48.78%
5	35	244	196	-19.67%
6	182	83	356	328.92%
7	320	360	120	-66.67%
8	75	340	39	-88.53%
9	269	64	155	142.19%
10	25	129	248	92.25%
Total	**1425**	**2370**	**2344**	**-1.10%**

Figure 6.1 Total wildlife density changes from 2020-2022.

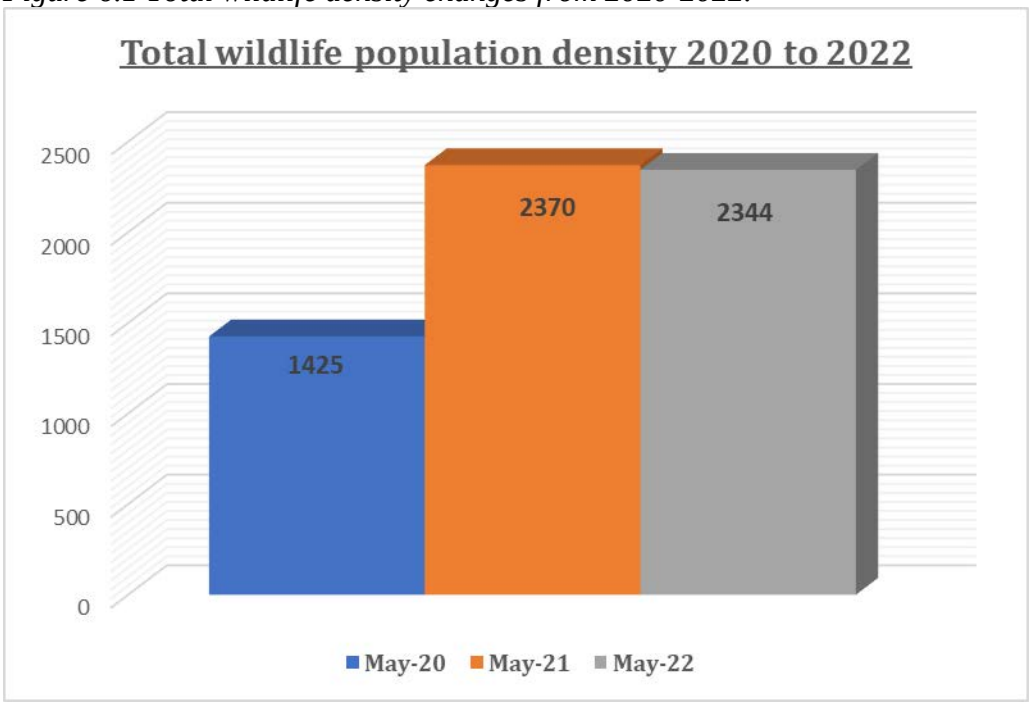
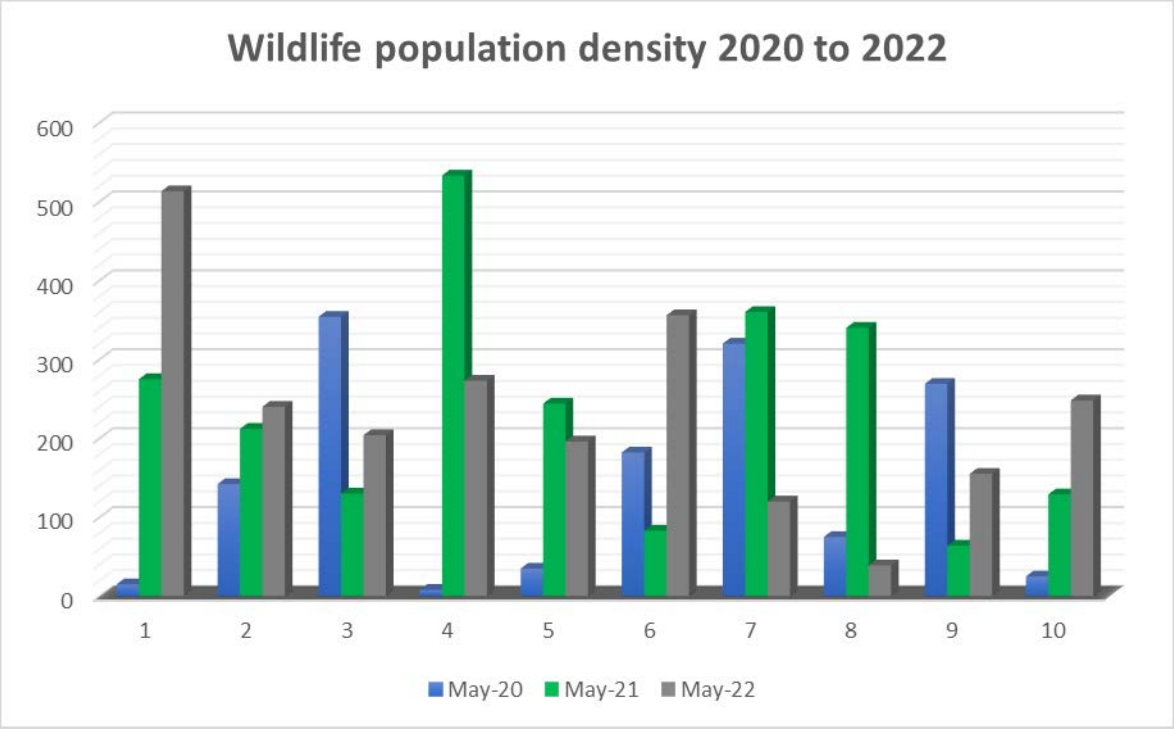


Figure 7.2 Wildlife population density per route from 2020 to 2022



Objective 3: Population change

The total estimated numbers of game for the May 2022 count are compared to those from previous years to illustrate the population change and are shown in Tables 10 and 11 below. The overall population estimate has increased by 43% and the number of animals counted per 100km per route has increased by 38.42%.

Table 10. Population estimates for 2021 compared to 2022.

Total estimated numbers of game (Zone 1-10, May 2020 - May 2022)					
Species	**May-21**		**May-22**		**Percentage change**
	No. Counted	**Total estimated number**	**No. Counted**	**Total estimated number**	
Gemsbok	1765	13014	1168	12564	-3.45%
Springbok	302	2882	529	4818	67.17%
Kudu	1	0	1	0	#DIV/0!
Steenbok	0	0	0	0	#DIV/0!
Ostrich	69	722	114	742	2.83%
Ludwigs Bustard	31	334	66	2193	556.57%
Ruppel's Korhaan	26	1173	28	1774	51.26%
B. zebra	152	7654	266	1943	-74.62%
Hartebeest	0	0	3	8	#DIV/0!
Total	**2349**	**25787**	**2175**	**24043**	-6.74%
Giraffe	11	11	13	13	18.18%

The long-term total population estimates are presented in the table below for all zone from 1 to 10.

Table 11. Population estimates for years 2011-2022.

Total estimated numbers of game (Jun 12 - May 2022)											
Species	**Jun-12**	**Jun-13**	**May-14**	**May-15**	**May-16**	**May-17**	**May-18**	**May-19**	**May-20**	**May-21**	**May-22**
Gemsbok	7493	8112	9087	7447	6650	10625	3699	3480	6758	13014	12564
Springbok	6225	5828	3024	3420	2944	3243	1720	1351	8981	2882	4818
Kudu	16	5	0	7	0	4	0	0	0	0	80
Steenbok	0	0	0	0	0	0	0	0	0	0	0
Ostrich	748	183	220	218	145	226	130	175	1293	722	742
Ludwigs Bustard	285	381	247	119	92	222	0	192	168	334	2193
Rüppel's Korhaan	468	388	229	145	362	234	119	293	984	1173	1774
Burchell's zebra	470	320	352	367	510	509	329	485	2058	7654	2517
Hartebeest	177	204	197	220	149	174	67	66	0	0	8
Giraffe*	6	6	7	7	9	9	9	10	10	10	13
Total population estimate	**15888**	**15427**	**13363**	**11950**	**10861**	**15246**	**6073**	**6052**	**20252**	**25779**	**24055**
Blesbok	7	3	0	0	0	0	0	0	0	0	0
% change	-12.54%	-2.90%	-13.38%	-10.57%	-9.11%	40.37%	-60.17%	-0.35%	234.63%	27.29%	-6.69%

The graphs in figure 7.1-7.4 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 Gemsbok population

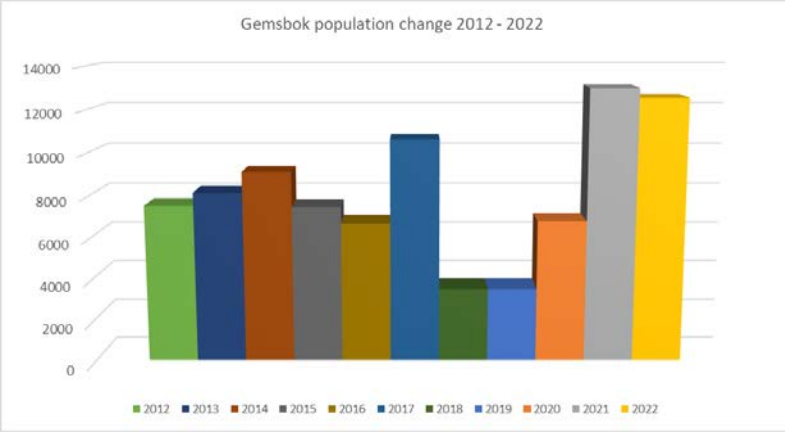


Figure 7.2 Springbok population

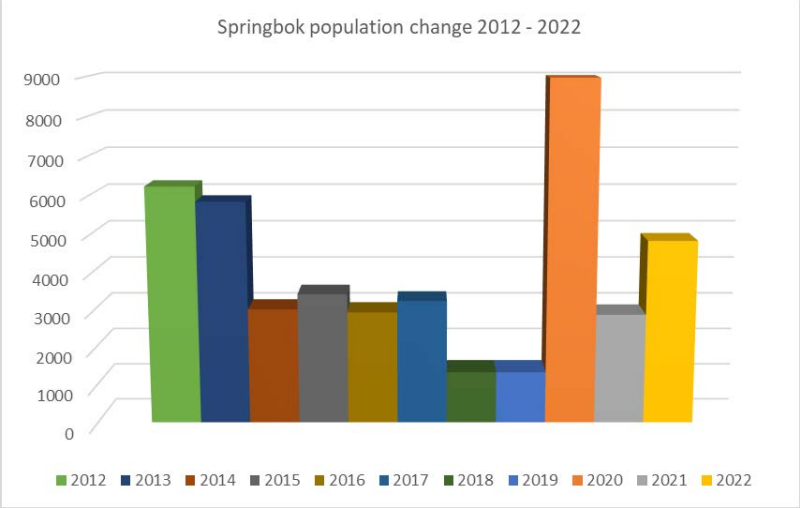


Figure 7.3 Burchell's Zebra population

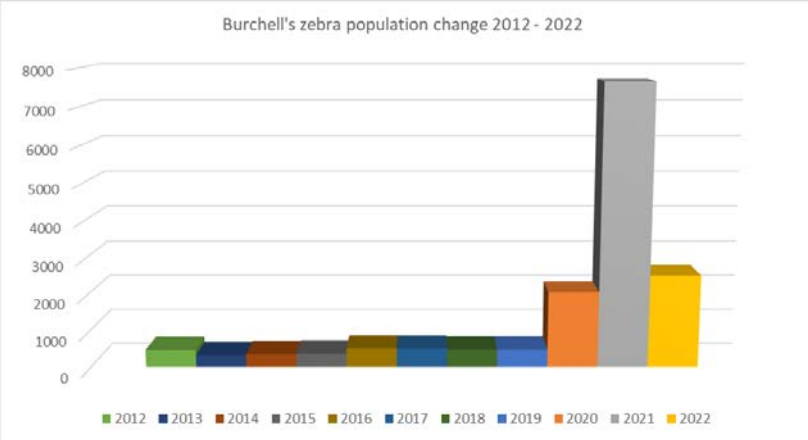


Figure 7.4 Hartebeest population

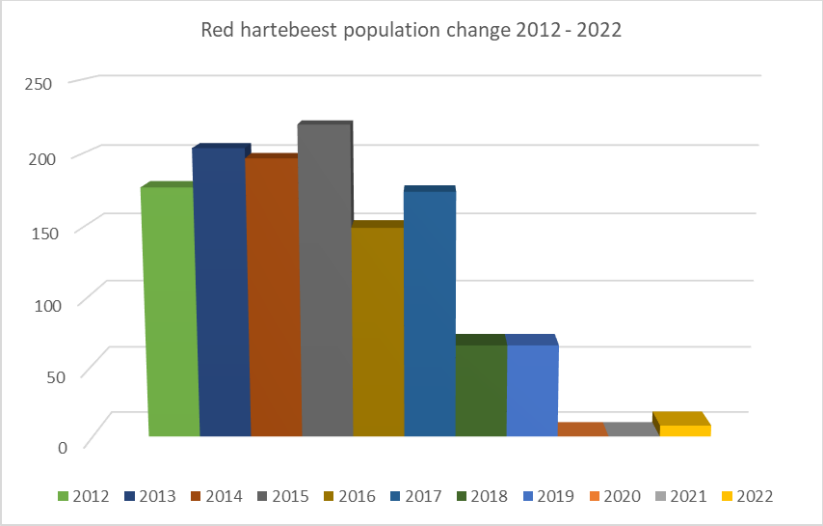


Figure 7.5 Ostrich population

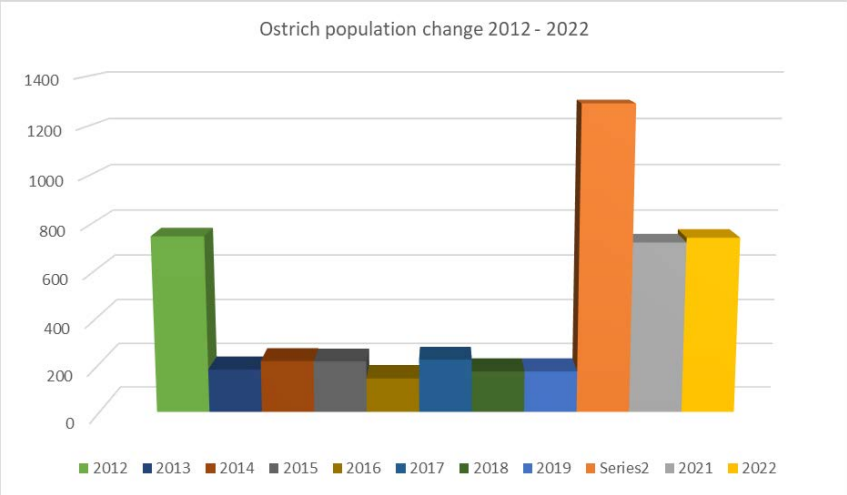


Figure 7.6 Ludwig Bustard population

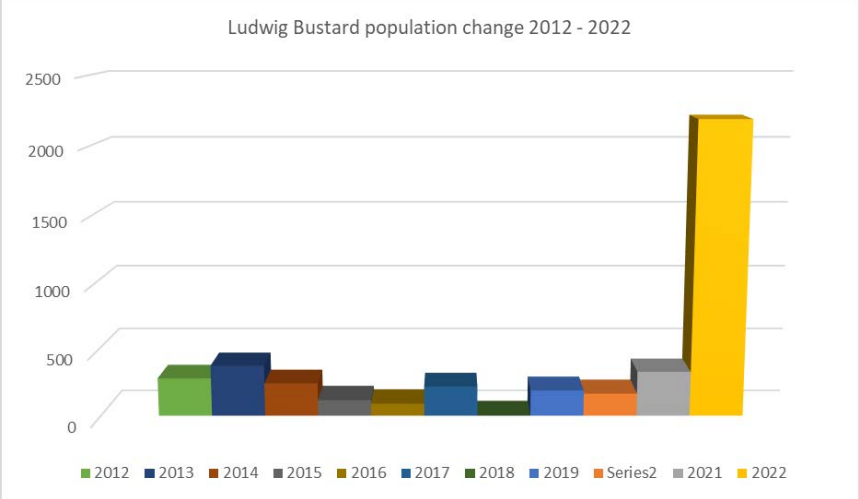
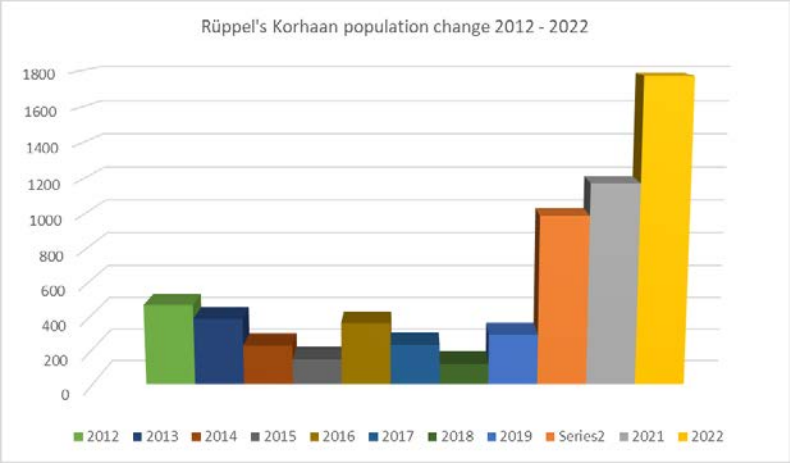
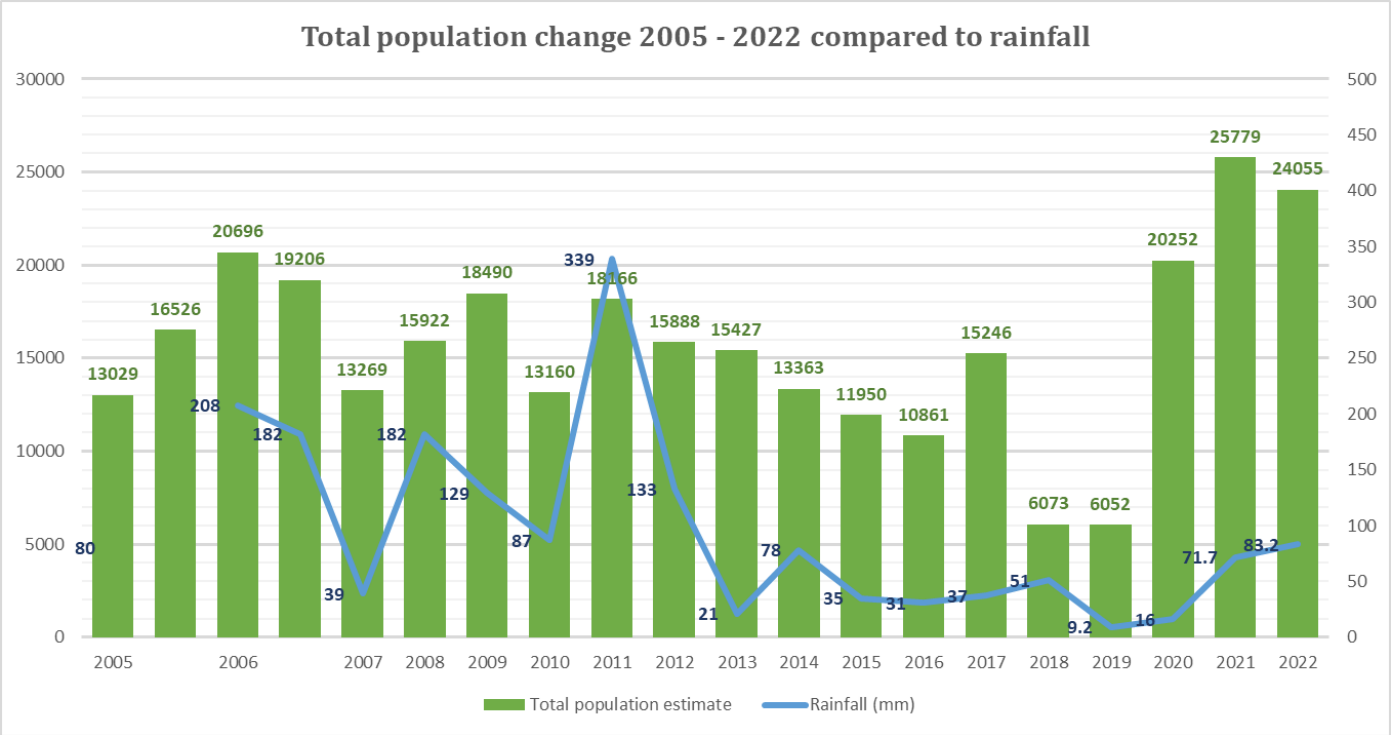


Figure 7.7 Rüppel's Korhaan population



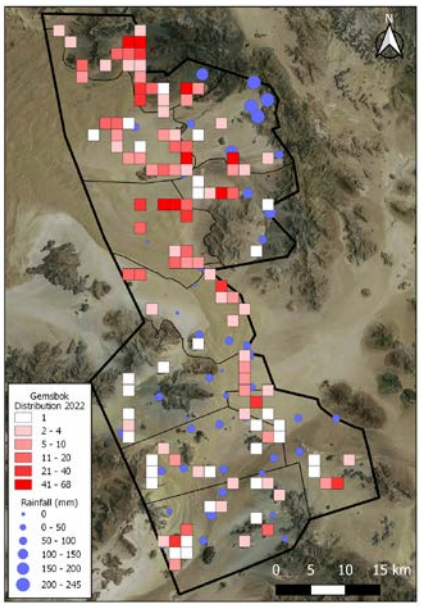
The graph in Figure 8 below shows long term total population estimate change compared to the average annual rainfall received for the same period. Please note that as with the previous graphs, the figure for this graph was taken from the total population estimates and from the maximum number of routes counted in each year.

Figure 8. Total population change 2005 to 2022 compared to average rainfall.



5. Discussion and conclusions

Gemsbok

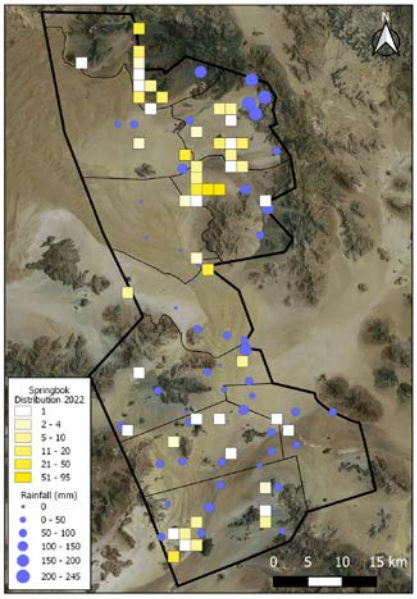


The results of the 2022 gemsbok population estimate show a decrease of 3.45% (12 564 gemsbok) from last year's estimate (13014 gemsbok). Even with the population decreasing only slightly, fewer animals were counted (1168 gemsbok) than to previous year (1765).

The highest density of gemsbok was recorded in Zone 1, which had a total of 351 individual gemsbok counted. The highest concentration of gemsbok was seen in the northern part of the reserve in the dune areas, as seen in the map to the right. This can also be due to high rainfall in the area and Keerweder pan filled water, which then would produce abundant amount of grass for the animals.

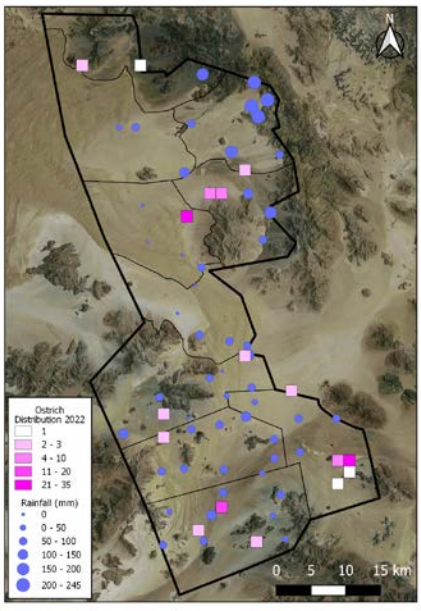
However still all over the reserve Gemsbok was found, given a good population to the reserve.

Springbok



The estimate number of Springbok for this year is 4848, which is an increase of 67.17% from last year estimate of 2882.

The same as the Gemsbok, the springbok were dominantly seen in the northern part of the reserve, as seen on the map on the right. Lower numbers were seen in the middle and lower part of the reserve, the same as the year before. Possibility could be that the springbok prefer the open plain area, then to the dunes and mountains area towards the south.

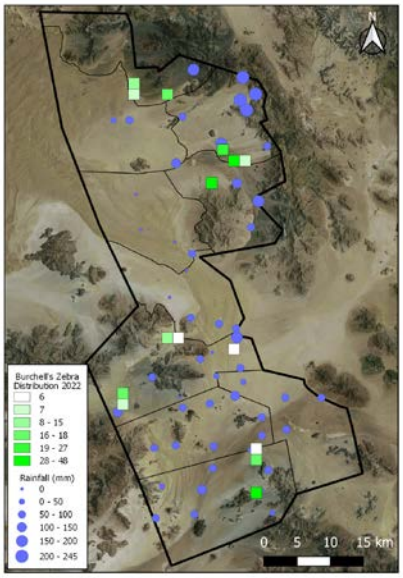


Ostrich

This year's ostrich population estimate is 742. This is a slight 2.83% increase from last year's population estimate of 722. Most of the sightings were in Zone 9 (45 ostrich) followed by zones 4 and 10 (22 and 20 ostrich respectively).

interest it was seen that no ostriches were seen in Zone 3 and 5, whereas everywhere ostriches are normally seen throughout the reserve. However, they do prefer the open areas.

Burchell's Zebra



This year, a total of 266 zebra were counted to give a total estimated population of 2517.

The Burchell's zebra population is concentrated on the plains at Vremdelingspoort, on the Keerweder Pan all the way to Wolwedans, on the Chateau Plains and the plains on Springbokvlakte. Their population decreased by 74.62%. This could be of them wandered outside of the Reserve's boundaries were other areas got higher rainfall.

Red Hartebeest

Three hartebeest were seen on route 2 on the game count. An estimate of 8 can be made, however it is known that only 3 are in the reserve.

Unfortunately, the prolonged drought over the past eight years has taken a heavy toll on these animals, whose population was once estimated to be around 200. While most animals have likely succumbed to the drought, some have migrated outside of the Reserve, searching for better grazing. Hartebeest have been seen on properties with higher rainfall and closer to the escarpment.

Giraffe

There were 3 giraffe sightinged during this year's game count on route 8. Although only 3 were seen, we know there is a population of 13 on the reserve for 2022. Hange Zazapamue from ProNamib was following the giraffes in NamibRand for 2 years for his master's project and could tell us how many are found. There are 12 in the southern part of the reserve and one loand bull in the Draaihoek and Toskaan area, sometimes moving to Verweg area. Occasionally there is another bull coming in from Geluck area, but he wasn't seen for a while.

Ludwig's Bustards

The estimated number of Ludwig's bustard increased by 556.57% this year compared to last year. The population estimate for this year is 2193, while the actual number counted is only 66. This could be that they were found closer to the road, making the ESW small, resulting in a higher species correction factor for the calculations. These were all counted in Zone 1, 2, 6, 7, 9 and 10. Zone 9 having the highest density 55.

Rüppel's Korhaan

The estimated number of Rüppel's korhaan increased by 51.26% this year compared to last year. This is the fourth consecutive year that the Rüppel's korhaaan population estimate has increased, since 2019. The population estimate for this year is 1774, while the actual number counted is only 28, were as last year the actual numbers were 26 and a population estimate only 1173, this could be the estimate is lower, as animals were further away from the road when counted. And these were all counted in Zone 1, 5, 6, 7, 9 and 10, with zone having the highest density of 17.

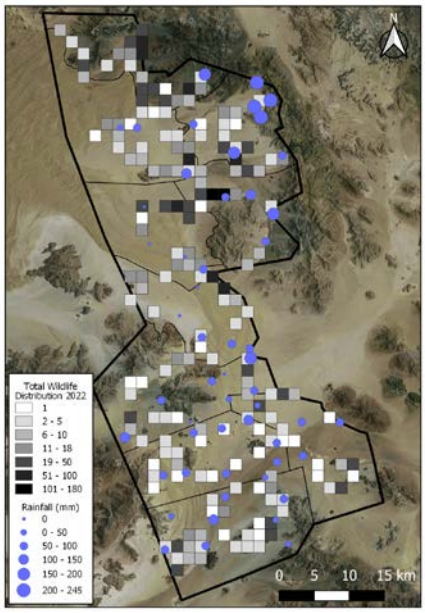
Kudu

Only one kudu was counted in this year's game count, in Zone 6. With the number counted corrected with the relevant area and species correction factors, the estimate amounts to 80 kudus in the total count area. One should remember that this census method is not well suited for kudu and thus we must rely on actual sightings and camera trap images to get a better indication of the kudu population. However, we are known that Kudus also occurs in other areas.

Below is a photo taken by a camera trap at Moringa waterhole in the 7th August 2022.

Total population change, distribution and densities

The total population estimate decreased by 6.74%, while the number of animals counted per 100km per is down by 1.10% from last year. The total wildlife population estimate this year is 24698 and the total number of plains game counted is 2175. The higher deficit in total population estimate, as opposed to the lower density deficit, compared to last year could be because of the wildlife concentrating in certain zones which then is influenced by various area correction factors.



For resource management purposes though, we use the actual numbers seem instead of the estimates, as these give a better reflection of where and how many animals there are. The long-term total population estimate shows that the total estimated wildlife population has been on an incline since 2019. This trend is directly proportional to the annual average rainfall received in the total count area over the given years as shown in figure 8 on page 27.

The total wildlife distribution compared to rainfall map (figure to the right) shows a correlation between the wildlife distribution this year and the rainfall received through the count area. The rainfall indicated in the map, is from this year January till May 2022. The highest wildlife population density was recorded in the northern part of the reserve, where Zones 6 had 961, followed by zone 1 of 848, and Zone 8 being the lowest with 56.

Carnivores on the reserve

Carnivores like Black-backed Jackal, Bat-ear fox, and a Hyena species (presumably Spotted) was seen on the game count. However, these animals are frequently seen by staff or guest. Leopards, cheetah, Cape fox, African Wild cat, striped pole cat, Small spotted genet and Aardwolf have also been seen, even if its an once a time sighting but it occurs. The camera traps that are in the northern part of the reserve, do record regular sightings of some of them.

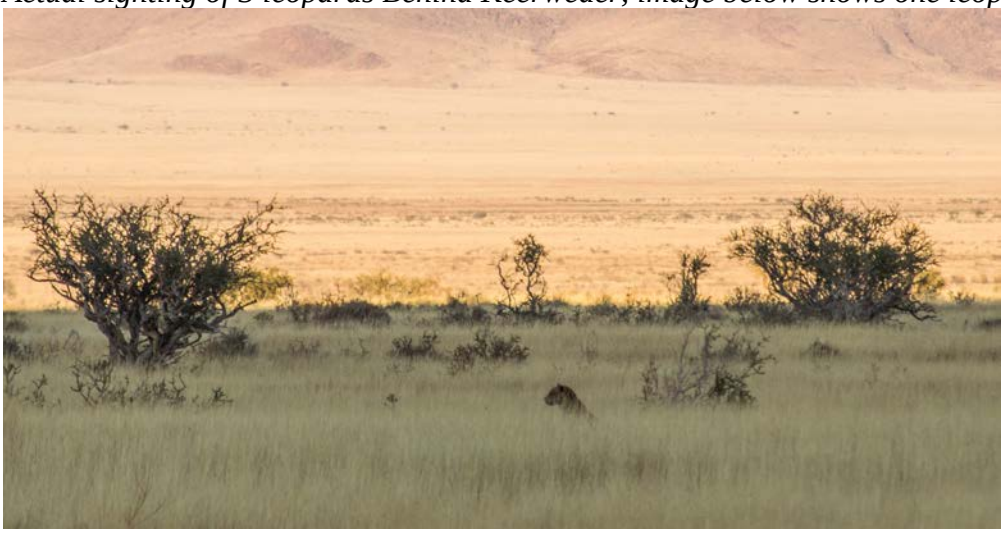
Below are some camera images of these:

Spotted Hyena at Porcupine waterhole

Cheetah at Porcupine waterhole

Cape Fox at Moringa waterhole

Actual sighting of 3 leopards Behind Keerweder, image below shows one leopard photographed.



6. Acknowledgments

The NamibRand Nature Reserve would like to thank all its concessionaires, stakeholders, neighbours, and participants for their enthusiastic involvement to make this year's game count another success.

This year's participants were:
Jessica Steyn, Andre Steyn, Danica Shaw, Nils Odendaal, Amelie Odendaal, Willem Lacanior Hanse, Reginald Visser, Gert Tsaobeb, Wolwedans staff/students :Johan, Victoria, Genny, Benny, Jomo, Anna, Nadine, Reinald; Andreas Brückner, Uda Nakamhela, Ester Kalenga, Syre Nchindo, Daniel Johannes, Abraham Tsabeb, Elton Vries, Thomas Soutschka, Nebraska students (Cordill, abby, jac, kaetlyn, henna), Nadeet and Totkokki staff (Domingo, Stanley, Jonah); Martin Verwey, Anrie Verwey, Marchell Vervey, Keady Strauss, Elizabeth Johannes, Ruben Bonifacio, Abraham Hamuhenya, Elmarie Naris, Lea Shikonta.

7. Appendix

Results per count route per zone

Tables 12.1 to 12.11 list the data collected on each route in May 2022, which were used as a basis for the analysis.

Table 12.1

Species	Route length	Total number counted	Density	Estimated population
Oryx	47	351	747	1285
Springbok	47	84	179	632
Plains Zebra	47	40	85	431
Scrub Hare	47	1	2	216
Hartebeest	47	0	0	
Kudu	47	0	0	
Ostrich	47	3	6	29
Rüppel Korhaan	47	10	21	925
Ludwig Bustard	47	4	9	216
Total	**47**	**492**	**1047**	**3518**
Black-backed Jackel*	47	3	6	81
Pale Chanting Goshawk*	47	2	4	173
Moutain Zebra*	47	13	28	47
Lappet-faced Vulture*	47	1	2	216
White-backed Vulture*	47	1	2	216

**Not included in count*

Table 12.2

Route 2				
Species	Route length	Total number counted	Density	Estimated population
Oryx	52	59	113	414
Springbok	52	79	152	652
Plains Zebra	52	62	119	768
Hartebeest	52	3	6	8
Kudu	52	0	0	
Ostrich	52	2	4	9
Rüppel's Korhaan	52	0	0	
Ludwig Bustard	52	16	31	515
Total	**52**	**240**	**462**	**2365**
Black-backed Jackal*	52	3	6	77
Spotted eagle owl*	52	1	2	64
Martial eagle *	52	2	4	258
Moutain Zebra*	52	13	25	56

**Not included in count*

Table 12.3

Route 3				
Species	Route length	Total number counted	Density	Estimated population
Oryx	60.7	179	295	1069
Springbok	60.7	25	41	300
Plains Zebra	60.7	0	0	
Hartebeest	60.7	0	0	
Kudu	60.7	0	0	
Ostrich	60.7	0	0	
Rüppel Korhaan	60.7	0	0	
Ludwig Bustard	60.7	0	0	
Total	**60.7**	**204**	**336**	**1369**

Table 12.4

Route 4				
Species	Route length	Total number counted	Density	Estimated population
Oryx	43	241	560	4212
Springbok	43	3	7	21
Plains Zebra	43	0	0	
Hartebeest	43	0	0	
Kudu	43	0	0	
Ostrich	43	22	51	183
Rüppel Korhaan	43	0	0	
Ludwig Bustard	43	0	0	
Total	**43**	**266**	**619**	**4416**
Black-backed Jackel*	43	1	2	10
Southern Hawk*	43	1	2	17
Greater Kestrel*	43	3	7	74

**Not included in count*

Table 12.5

Route 5				
Species	Route length	Total number counted	Density	Estimated population
Oryx	70	74	106	346
Springbok	70	49	70	315
Plains Zebra	70	6	9	129
Hartebeest	70	0	0	
Kudu	70	0	0	
Ostrich	70	0	0	
Rüppel Korhaan	70	6	9	56
Ludwig Bustard	70	0	0	
Total	**70**	**196**	**280**	**846**
Bat-eared Fox*	70	7	10	45
Greater Kestrel*	70	4	6	40
Crow*	70	7	10	71
Rock Pigeon*	70	39	56	836
Vulture*	70	3	4	23
Sand Snake*	70	1	1	1286

**Not included in count*

Table 12.6

Route 6				
Species	Route length	Total number counted	Density	Estimated population
Oryx	35	63	180	325
Springbok	35	212	606	1491
Plains Zebra	35	48	137	279
Hartebeest	35	0	0	
Kudu	35	1	3	80
Ostrich	35	16	46	161
Rüppel Korhaan	35	2	6	534
Ludwig Bustard	35	5	14	161
Total	**35**	**347**	**991**	**3031**
Black-backed Jackal	35	3	9	24
Moutain Zebra	35	6	17	24

**Not included in count*

Table 12.7

Route 7				
Species	Route length	Total number counted	Density	Estimated population
Oryx	55	35	64	1376
Springbok	55	7	13	46
Plains Zebra	55	57	104	355
Hartebeest	55	0	0	
Kudu	55	0	0	
Ostrich	55	4	7	17
Rüppel's Korhaan	55	3	5	78
Ludwig Bustard	55	4	7	34
Total	**55**	**110**	**200**	**1906**
Lappet-faced Vulture*	55	5	9	131
Black-chested S nake Eagle*	55	1	2	26
Black-backed Jackal*	55	1	2	131
Pale Chanting Goshawk*	55	3	5	54

**Not included in count*

Table 12.8

Route 8				
Species	Route length	Total number counted	Density	Estimated population
Oryx	50	25	50	1959
Springbok	50	5	10	115
Plains Zebra	50	0	0	
Hartebeest	50	0	0	
Kudu	50	0	0	
Ostrich	50	2	4	8
Rüppel's Korhaan	50	0	0	
Ludwig Bustard	50	0	0	
Total	**50**	**32**	**64**	**2083**
Lappet-faced Vulture*	50	3	6	203
Black-backed Jackal*	50	0	0	135
Bat-eared Fox*	50	1	2	34

**Not included in count*

Table 12.9

Route 9				
Species	Route length	Total number counted	Density	Estimated population
Oryx	52	65	125	447
Springbok	52	2	4	636
Plains Zebra	52	0	0	
Hartebeest	52	0	0	
Kudu	52	0	0	
Ostrich	52	45	87	230
Rüppel Korhaan	52	4	8	150
Ludwig Bustard	52	26	50	1169
Total	**52**	**142**	**273**	**2631**
Ground squirrel*	52	5	10	562
White tailed mongoose*	52	2	4	225
Lanner Falcon*	52	3	6	135
Rock Kestrel*	52	1	2	75
Pale Chanting Goshawk*	52	2	4	473

**Not included in count*

Table 12.10

Route 10				
Species	Route length	Total number counted	Density	Estimated population
Oryx	59	76	129	1131
Springbok	59	63	107	610
Plains Zebra	59	53	90	555
Hartebeest	59	0	0	
Kudu	59	0	0	
Ostrich	59	20	34	105
Rüppel Korhaan	59	3	5	31
Ludwig Bustard	59	11	19	99
Total	**59**	**226**	**383**	**2531**
Lappet-faced Vulture*	59	4	7	229
Hyena*	59	1	2	4
Black-backed Jackal*	59	4	7	45
Bat-eared Fox*	59	5	8	524
Greater Kestrel*	59	1	2	42
Warthog*	59	2	3	42
Unknown bird*	59	5	8	35

**Not included in count*

Table 12.11

Total number of game				
Species	Route length	Total number counted	Density	Estimated population
Oryx	552	1168	211.59	12564
Springbok	552	529	95.83	4818
Plains Zebra	552	266	48.19	2517
Hartebeest	552	3	0.54	8
Kudu	552	1	0.18	80
Ostrich	552	114	20.65	742
Rüppel Korhaan	552	28	5.07	1774
Ludwig Bustard	552	66	11.96	2193
Total	**552**	**2175**	**394.02**	**24698**
Mountain Zebra*	552	32	5.80	127
Scrub Hare*	552	1	0.18	216
Warthog*	552	2	0.36	42
Giraffe*	552	3	0.54	0
Ground squirrel*	552	5	0.91	562
White tailed mongoose*	552	2	0.36	225
Hyena*	552	1	0.18	4
Black-backed Jackal*	552	15	2.72	503
Bat-eared Fox*	552	13	2.36	603
Pale Chanting Goshawk*	552	9	1.63	741
White-backed Vulture*	552	1	0.18	216
Lappet-faced Vulture*	552	13	2.36	778
Spotted eagle owl*	552	1	0.18	64
Martial eagle *	552	2	0.36	258
Southern Hawk*	552	1	0.18	17
Greater Kestrel*	552	8	1.45	156
Crow*	552	7	1.27	71
Rock Pigeon*	552	39	7.07	836
Vulture*	552	3	0.54	23
Black-chested snake Eagle*	552	1	0.18	26
Lanner Falcon*	552	3	0.54	135
Rock Kestrel*	552	1	0.18	75
Unknown bird*	552	5	0.91	35
Sand Snake*	552	1	0.18	1286

**Not included in count*