NamibRand Nature Reserve

Annual Game Count

27 May 2023

A dazzle of zebras at the Ohorongo waterhole. (Jessica Steyn)

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Editorial input: Nils Odendaal – Chief Executive Officer

Contents

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 27 May 2023.

Participants of the annual game count attended a game count briefing at the Wolwedans base after the NamibRand Nature Reserve Annual General Meeting on the afternoon of 26 May 2023. Jessica Steyn explained the count methodology at this briefing and divided the participants into the different game count routes.

This year's results show that the total estimated oryx population increased by 10.49%, while springbok numbers decreased by 11.37%. The distribution of oryx and springbok was widespread across the Reserve. However, wildlife numbers are more concentrated in the central and northern parts of the Reserve. This is most likely due to good rainfall received in the area in late April 2023. The highest concentration of animals was seen in the north of the Reserve, and most oryx were seen in the dune area of Wolwedans. Almost all springbok were counted in the Keerweder and Draaihoek area.

The Burchell's zebra population is well distributed throughout the Reserve, with the highest density in the Keerweder and Draaihoek area. Their population increased by 21.16%.

This year five hartebeest were counted, compared to last year's sighting of three. This is because they have two calves that have survived this year. Unfortunately, the prolonged drought from 2013 to 2021 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 in search of better grazing. Hartebeest have been seen on neighbouring properties with higher rainfall and closer to the escarpment.

This year we received significantly less rainfall than last year. However, the little rain that was received and the grazing left over from last year resulted in an overall increase of 13.96% in the total wildlife population.

It is worth reiterating that this census method is best suited to large plains game such as oryx, springbok and Burchell's zebra. The methodology is less suited for counting smaller species such as steenbok, or species with different habitat requirements such as kudu or mountain zebra. *Population estimates* provided are intended to give an indication of population numbers on the Reserve. Wildlife management decisions are not based on population estimates, but rather on animal *distribution* (where are the animals) and the *trend (change)* in animal numbers (are there more or less individuals). *Distribution* and *trend* are calculated on the actual number of sightings and not on population estimate.

2. Summary

Data collected in the May 2023 game count was entered into our database and analysed.

The table below gives a summary of all animals counted, including animals seen at a distance farther than 500m. This gives an idea of what was actually seen on the count.

Table 1. Total number of animals seen on the May 2023 game count.

Total of Species								
Mammals				**Carnivores**			**Birds**	
Ground squirrel	28			Bat-eared Fox	97		Black korhaan	2
Hartebeest	5			Black-backed Jackal	30		Cape Crow	13
Klipspringer	5			Cape fox	2		Greater Kestrel	6
Mountain Zebra	46						Unknown Kestrel	1
Oryx	1579						Lappet-faced Vulture	13
Plains Zebra	355						Ludwig Bustard	104
Springbok	366						Ostrich	140
Steenbok	3						Pale Chanting Goshawk	14
Yellow mongoose	7						Rock Kestrel	1
							Rüppel's Korhaan	42
							Unknown Crows	4
							Unknown Eagle	2
							Unknown Vulture	14

The table below gives the total number of animals counted per route.

Table 2. Total number of animals seen on each route for May 2023.

Total species counted per route	
1	**343**
2	**491**
3	**329**
4	**661**
5	**378**
6	**122**
7	**206**
8	**132**
9	**62**
10	**155**

The table below gives the total number of animals seen per route under 500m. This is the amount we use to estimate the population for the rest of the document. (See Count Methodology on page 8,)

Table 3. Total number of animals seen on each route, under a distance of less than 500m for May 2023.

	Total species counted per route less than 500
1	**227**
2	433
3	317
4	608
5	270
6	118
7	187
8	114
9	59
10	132

Herewith the results of the 2023 game count as per out three core objectives:

Objective 1: Population and biomass estimates:

Population estimates:

*Table 4. Total number of animals seen and the **estimated** population for May 2023.*

Total estimated numbers of game (Zone 1-10, May 2023)		
Species	**No. Counted**	**Estimate 2023**
Oryx	1360	13882
Springbok	311	4271
Kudu	0	0
Steenbok	3	594
Ostrich	108	1371
Ludwigs Bustard	104	3315
Ruppel's Korhaan	42	851
B. zebra	258	2354
Hartebeest	5	13
Total	**2191**	**26651**
Giraffe*	15	15

** Total numbers known*

Biomass estimates

Table 5. Wildlife biomass estimates for May 2023.

Total wildlife numbers and wildlife biomass on NamibRand for May 2023 (Zone 1-10) , 224 209 ha)				
Species	**Mean mass (kg)**	**Estimated wildlife numbers from May 2023 game count**	**Species biomass (kg)**	**Biomass per ha (kg)**
Oryx	220	13882	3054095	16.35
Springbok	38	4271	162288	0.87
Kudu	180	0	0	0.00
Steenbok	11	594	6536	0.03
Ostrich	68	1371	93220	0.50
B. Zebra	300	2354	706067	3.78
Hartebeest	130	13	1659	0.01
Total	**947**	**22484**	**21292743**	**21.55**

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	54	227	9%
2	54	433	18%
3	53	317	13%
4	53	608	25%
5	70	270	11%
6	35	118	5%
7	61	187	8%
8	51	114	5%
9	53	59	2%
10	57	132	5%
Total	**541**	**2465**	

Objective 3: Population change

Table 7. The overall population estimate has increased by 10.48%
Note that the tend or change in the population is calculated on the actual number of animals seen. So, while the overall population estimate is just that – an estimate, the percentage change of the population cannot be disputed as it is based on the actual number of animals seen.

Total estimated numbers of game (Zone 1-10, May 2022 - May 2023)					
Species	**May-22**		**May-23**		**Percentage change**
	No. Counted	**Total estimated number**	**No. Counted**	**Total estimated number**	
Oryx	1168	12564	1360	13882	10.49%
Springbok	529	4818	311	4271	-11.37%
Kudu	1	80	0	0	-100.00%
Steenbok	0	0	3	594	100.00%
Ostrich	114	742	108	1371	84.66%
Ludwig's Bustard	66	2193	104	3315	51.15%
Ruppel's Korhaan	28	1774	42	851	-52.02%
B. zebra	266	1943	258	2354	21.16%
Hartebeest	3	8	5	13	65.12%
Total	**2175**	**24123**	**2191**	**26650**	10.48%
Giraffe*	13	13	15	15	15.38%
** Total (estimated) 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 animals in each or area. For this reason, the survey methodology used combines the *road strip count* 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 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 factor adjusts the number of animals seen, based on the percentage of the area sampled and assumes all animals within 500m of the transect line are detected. For example: If two animals were seen in the 30% of the area covered, the missing 60% of the area (not covered) assumes that there should be another four animals that were not seen. This example would result in an area correction factor of three (3)

The species correction factor then adjusts this estimate based on the detection curve (ESW) for the species. In other words, the species correction factor compensated for the likelihood that the farther an animal is away from the car, the less likely it will be seen.

The correction factors and route distances as used in the 2023 game count methodology, along with the area represented per zone can be seen in Table 5 below.

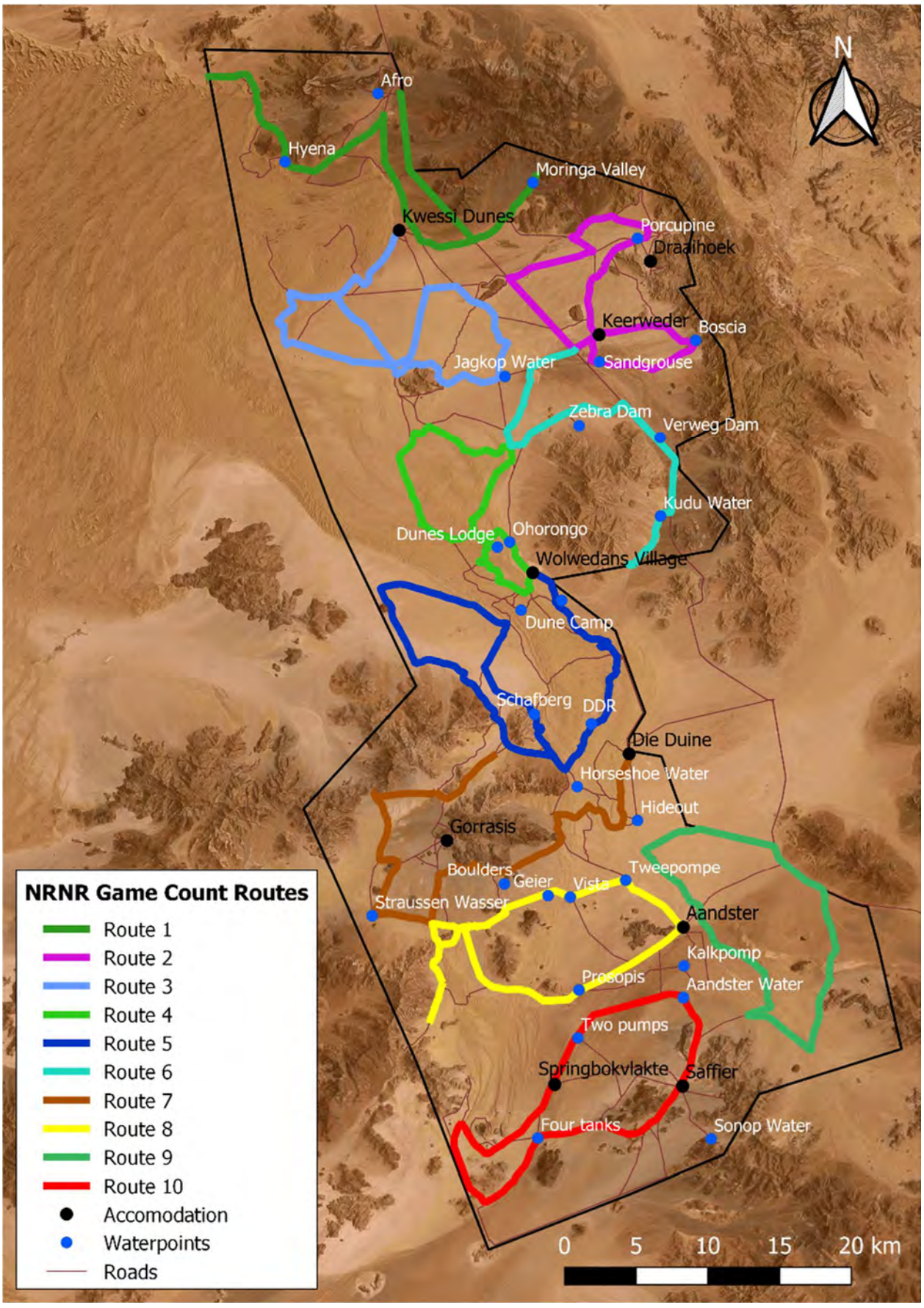
Table 5. Total count areas per zone (ha), route distances, area correction factors, effective strip widths and species correction factors for each species within each zone for 2023.

Count areas, area correction factors, effective strip widths and species correction factor for 2023

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	54	2.32	Oryx	271	1.84
					Springbok	204	2.45
					Burchell Zebra	377	1.33
2	18310	13779	54	2.55	Oryx	120	4.15
					Springbok	135	3.72
					Burchell Zebra	141	3.55
3	27039	26424	53	4.99	Oryx	181	2.77
					Springbok	167	3.00
4	21038	20996	53	3.96	Oryx	155	3.23
					Springbok	135	3.70
					Burchell Zebra	270	1.85
5	18038	17491	70	2.50	Oryx	119	4.20
					Springbok	67	7.50
					Burchell Zebra	225	2.22
6	19352	11589	35	3.31	Oryx	142	3.51
					Springbok	144	3.47
7	28343	18833	61	3.09	Oryx	298	1.68
					Springbok	201	2.49
					Burchell Zebra	60	8.33
8	22452	19291	51	3.78	Oryx	181	2.76
					Springbok	200	2.50
					Burchell Zebra	200	2.50
9	21710	21125	53	3.99	Oryx	46	10.87
					Springbok	100	5.00
					Burchell Zebra	75	6.67
10	29855	24721	57	4.34	Oryx	159	3.14
					Springbok	133	3.77
					Burchell Zebra	130	3.85
Total	**224209**	**186762**	**541**				

Species	Effective strip width (m) routes 1-10	Species correction factor routes 1-10
Ostrich	217	2.30
Kudu	0	0
Steenbok	10	50
Rüppells Korhaan	109	4.58
Ludwigs bastard	150	3.33

Figure 1. The game count area shows the ten routes used in May 2023 for the NamibRand Nature Reserve (1-8, 10) and the Pro-Namib Conservancy (9).

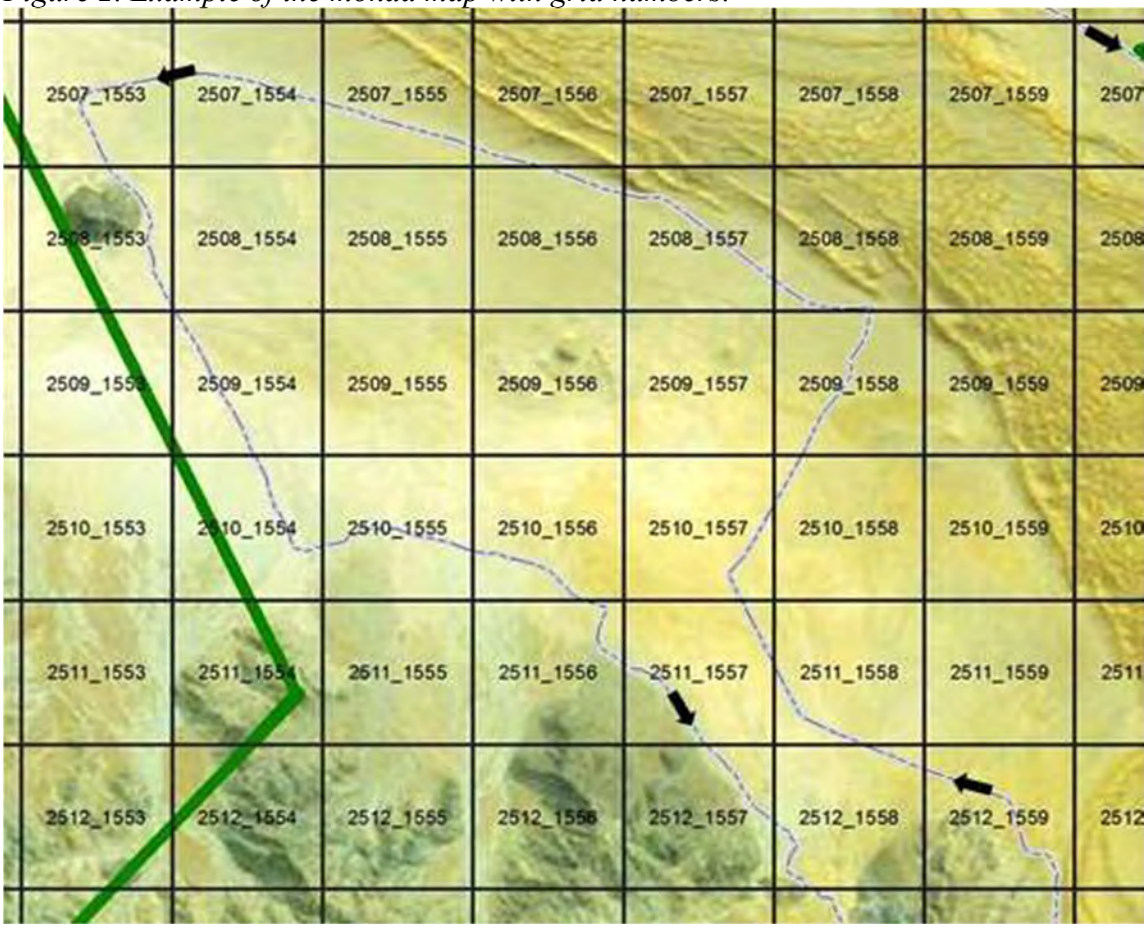


Game distribution maps

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. Example of the monad map with grid numbers.



4. Objectives and results of the May 2023 count:

Objective 1: Population and biomass estimates

Population estimates:

The population estimate for individual species in the total count area is 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 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 animals seen and the estimated numbers for May 2023.

Total estimated numbers of game (Zone 1-10, May 2023)		
Species	**No. Counted**	**Estimate 2023**
Oryx	1360	13882
Springbok	311	4271
Kudu	0	0
Steenbok	3	594
Ostrich	108	1371
Ludwigs Bustard	104	3315
Ruppel's Korhaan	42	851
B. zebra	258	2354
Hartebeest	5	13
Total	**2191**	**26651**
Giraffe*	15	15

** 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
$(E \times M) \div H = B$

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. 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 2023.

Total wildlife numbers and wildlife biomass on NamibRand for May 2023 (Zone 1-10) , 224 209 ha)				
Species	**Mean mass (kg)**	**Estimated wildlife numbers from May 2023 game count**	**Species biomass (kg)**	**Biomass per ha (kg)**
Oryx	220	13882	3054095	16.35
Springbok	38	4271	162288	0.87
Kudu	180	0	0	0.00
Steenbok	11	594	6536	0.03
Ostrich	68	1371	93220	0.50
B. Zebra	300	2354	706067	3.78
Hartebeest	130	13	1659	0.01
Total	**947**	**22484**	**21292743**	**21.55**

The chart in Figure 3 below shows the biomass composition of the different species across the total count area for the year 2023.

Figure 3. Biomass composition 2023.

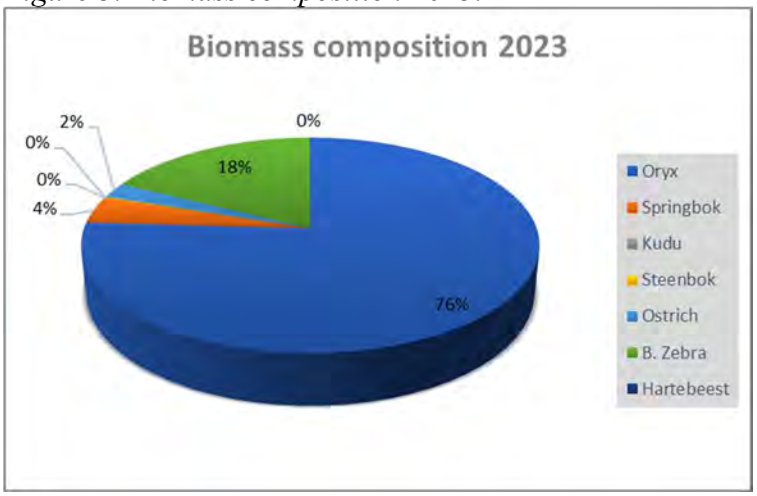


Table 6.2 Wildlife biomass (2022) percentage change compared to the count of May 2023.

Wildlife biomass on NamibRand for May 2022 and May 2023 (Zone 1-10) , 224 209 ha)								
Wildlife species	**Mean mass (kg)**	**May-22**			**May-23**			
		Estimated wildlife numbers from May 2022 game count	**Species Biomass (kg)**	**Biomass per ha (kg) TOTAL**	**Estimated wildlife numbers from May 2023 game count**	**Species Biomass (kg)**	**Biomass per ha (kg) TOTAL**	**Biomass percentage change**
Oryx	220	12564	2764149	14.80	13882	3054095	16.35	**10.49%**
Springbok	38	4818	183097	0.98	4271	162288	0.87	*-11.37%*
Kudu	180	80	14486	0.08	0	0	0.00	*-100.00%*
Steenbok	11	0	0	0.00	594	6536	0.03	*#DIV/0!*
Ostrich	68	742	50482	0.27	1371	93220	0.50	*84.66%*
B. zebra	300	2517	755163	4.04	2354	706067	3.78	*-6.50%*
Red Hartebeest	130	8	1004	0.01	13	1659	0.01	*65.12%*
Total		**20730**	**3768381.8**	**20.18**	**22484**	**4023865.8**	**21.55**	*6.78%*

Table 6.3 Wildlife biomass estimates from 2021-2023.

Total wildlife biomass estimates (kg/ha) on NamibRand May 2021 to May 2023					
Wildlife species	**May-21**	**May-22**	**% change from May-22**	**May-23**	**% change from May 23**
Oryx	15.33	14.80	*-3.45%*	16.35	*10.49%*
Springbok	0.59	0.98	*66.17%*	0.87	*-11.37%*
Kudu	0.00	0.08	*100%*	0.00	*-100.00%*
Steenbok	0.00	0.00	*0%*	0.03	*0.00%*
Ostrich	0.26	0.27	*3.96%*	0.50	*84.66%*
B. Zebra	12.29	4.04	*-67.10%*	3.78	*-6.50%*
Hartebeest	0.00	0.01	*74.95%*	0.01	*65.12%*
Total	**28.50**	**20.18**	***-29.19%***	**22.78**	***12.88%***

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

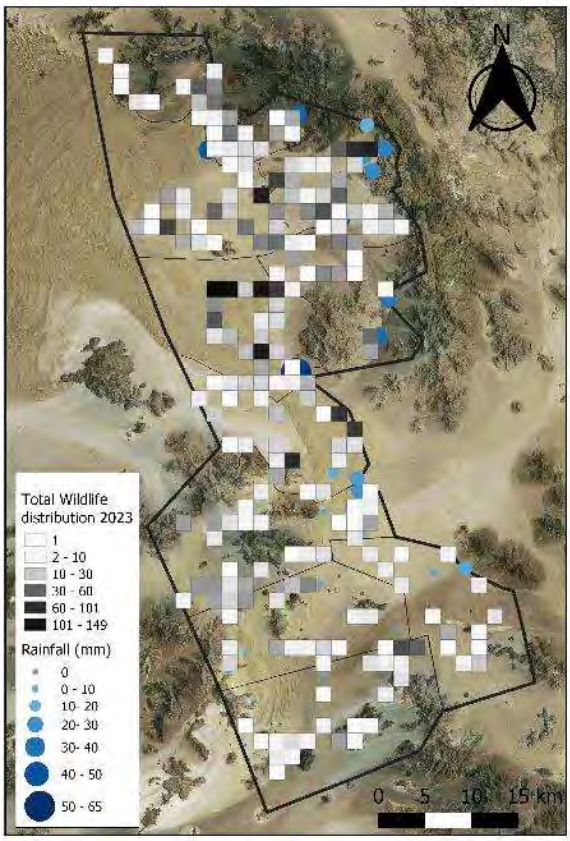


Figure 4.2 Total wildlife density

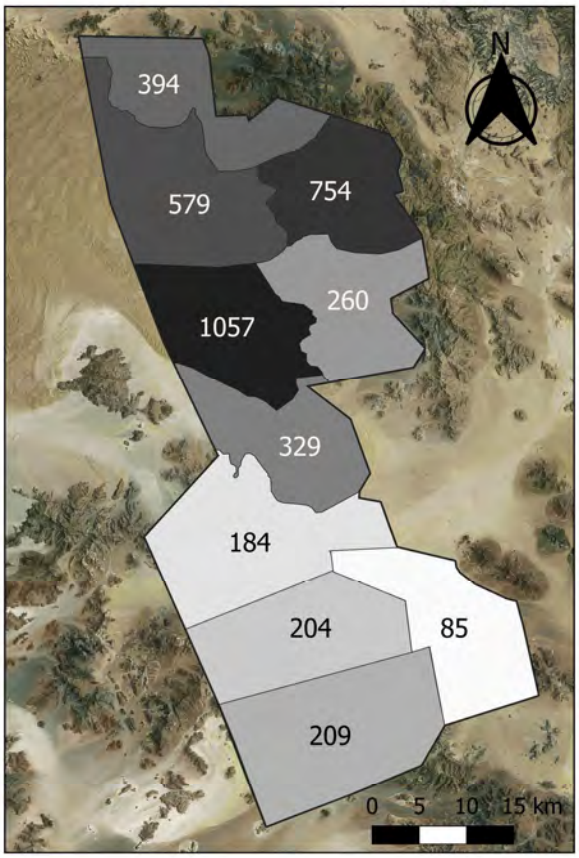


Figure 4.3 Distribution of oryx

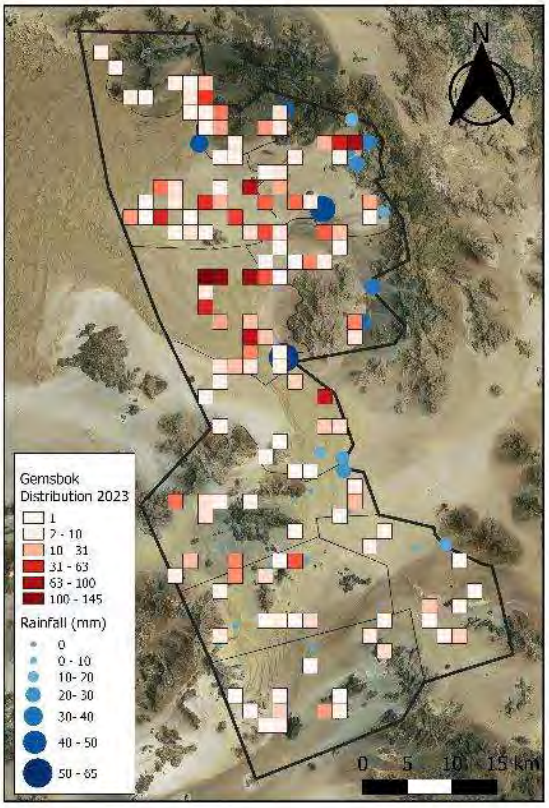


Figure 4.4 Density of oryx

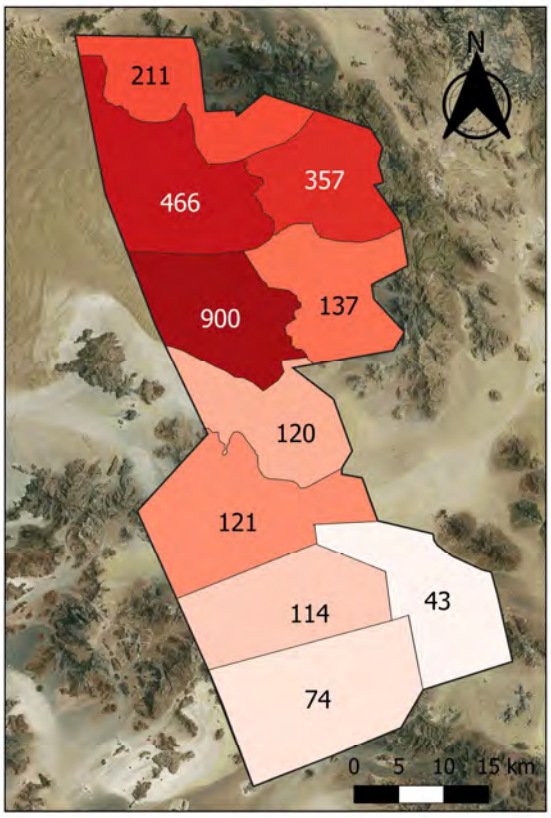


Figure 4.5 Distribution of springbok

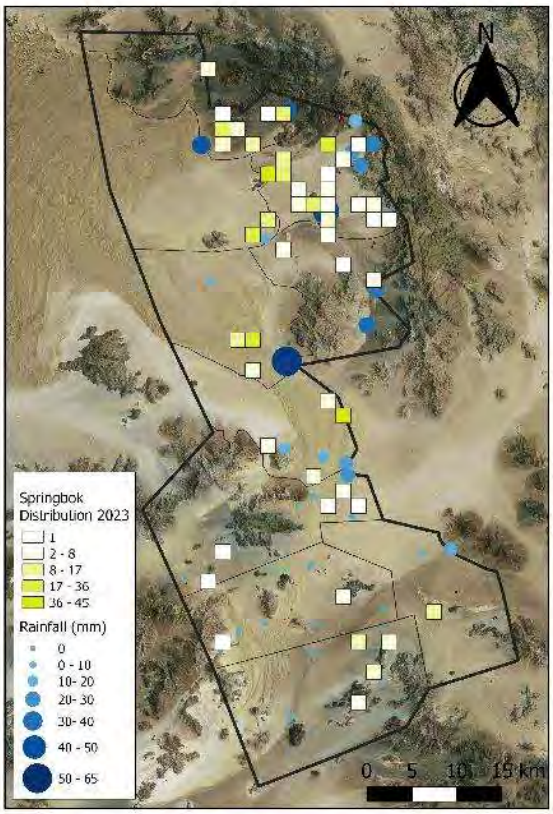


Figure 4.6 Density of springbok

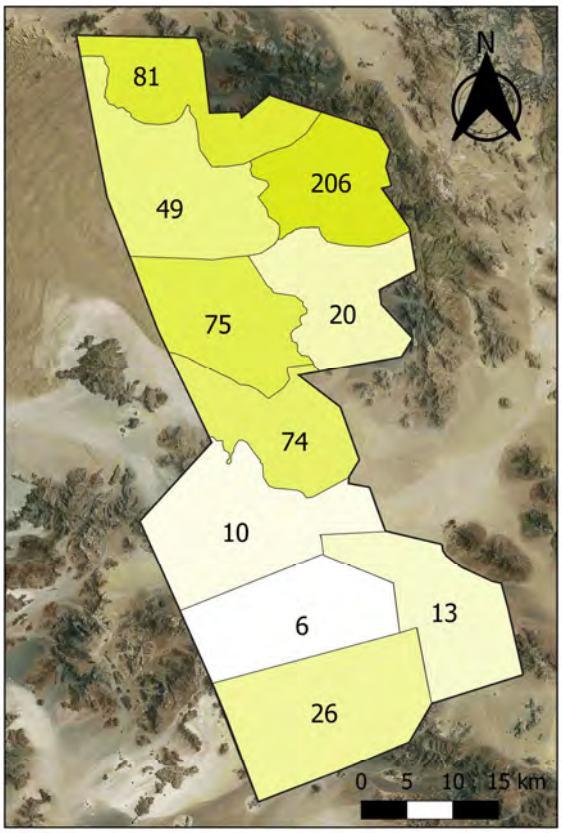


Figure 4.7 Distribution of B. zebra

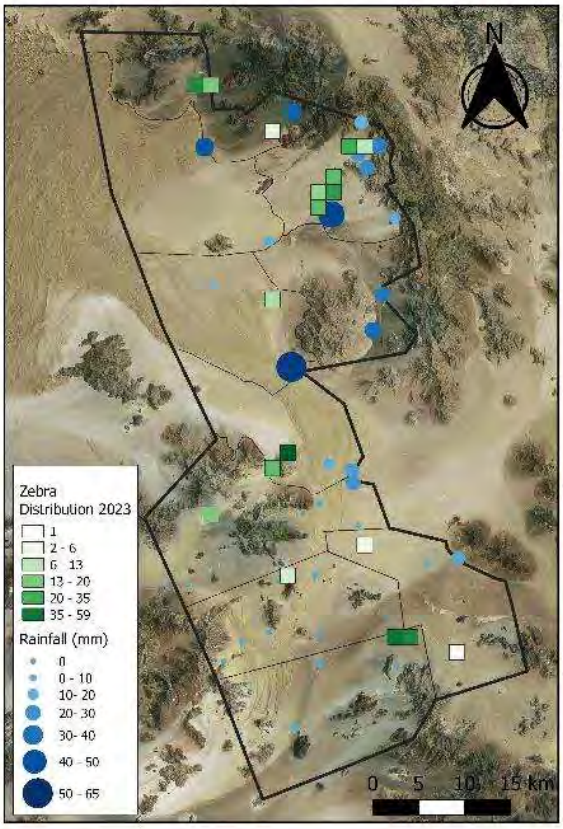


Figure 4.8 Density of B. Zebra

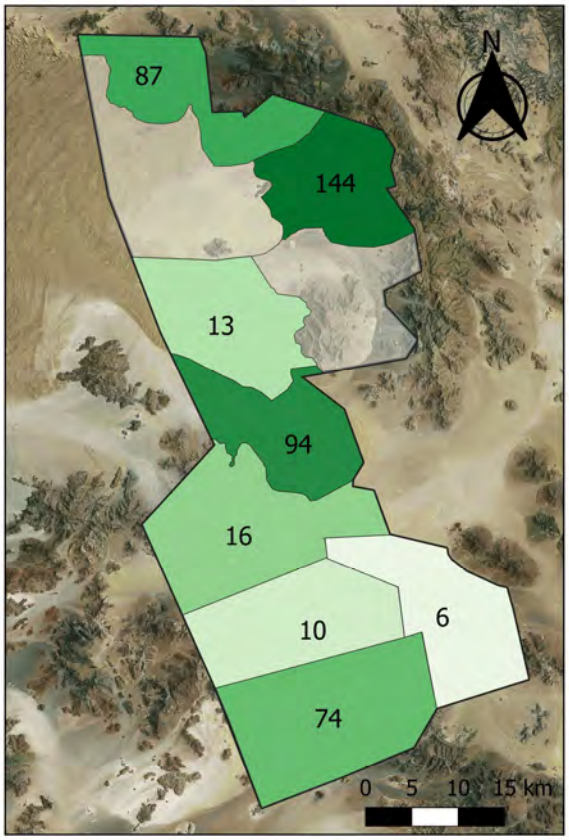


Figure 4.9 Distribution of ostrich

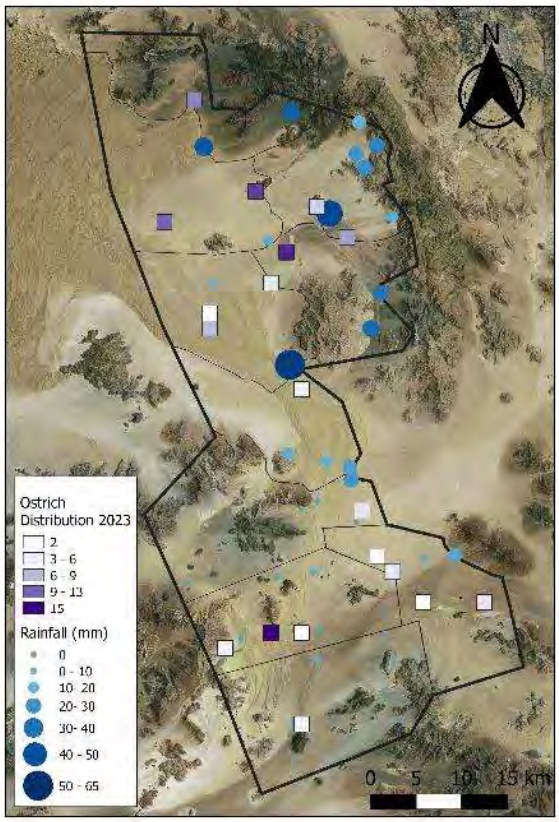


Figure 4.10 Density of ostrich

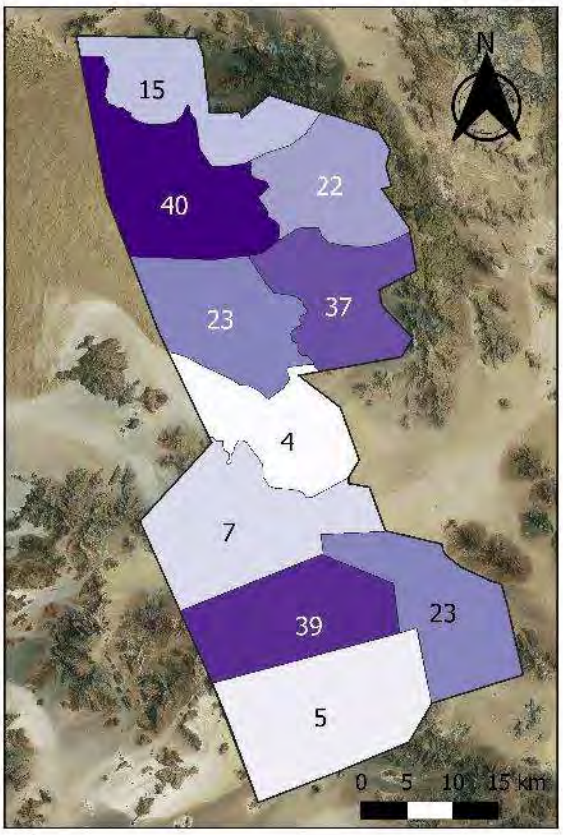


Figure 4.11 Distribution of Ludwig's Bustard

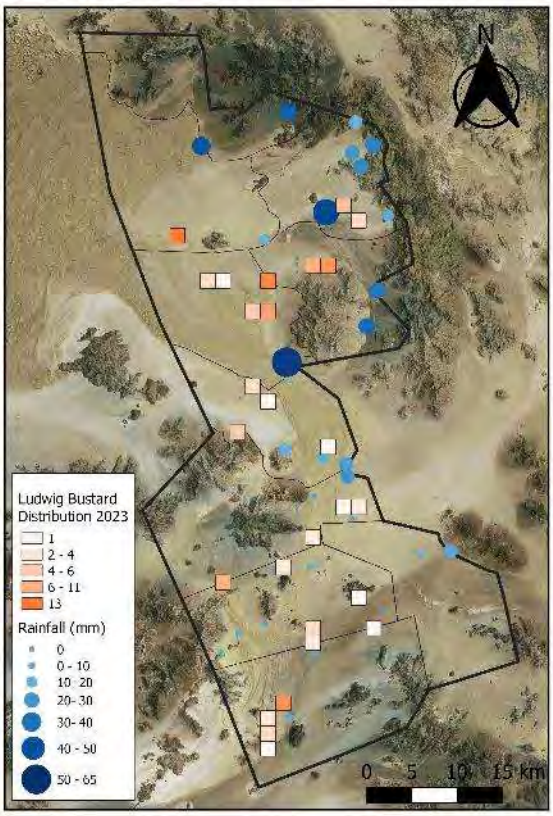


Figure 4.12 Density of Ludwig's Bustard

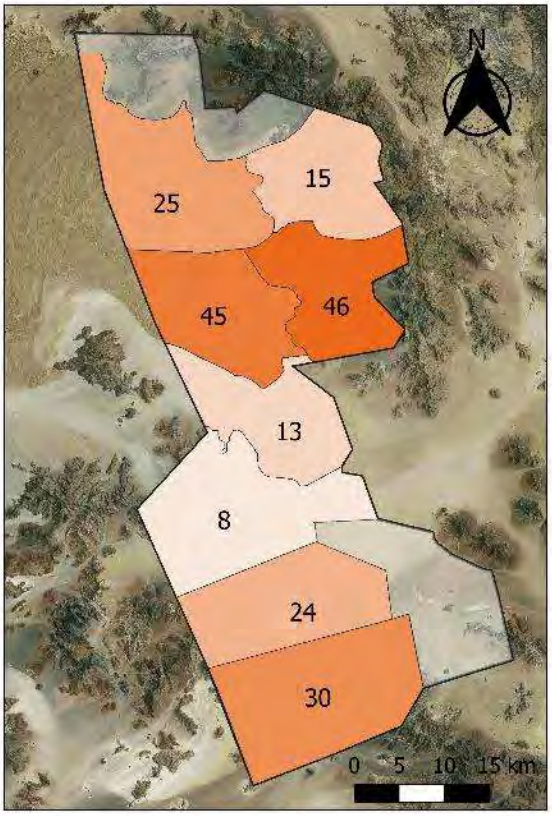


Figure 4.13 Distribution of Rüppel's Korhaan

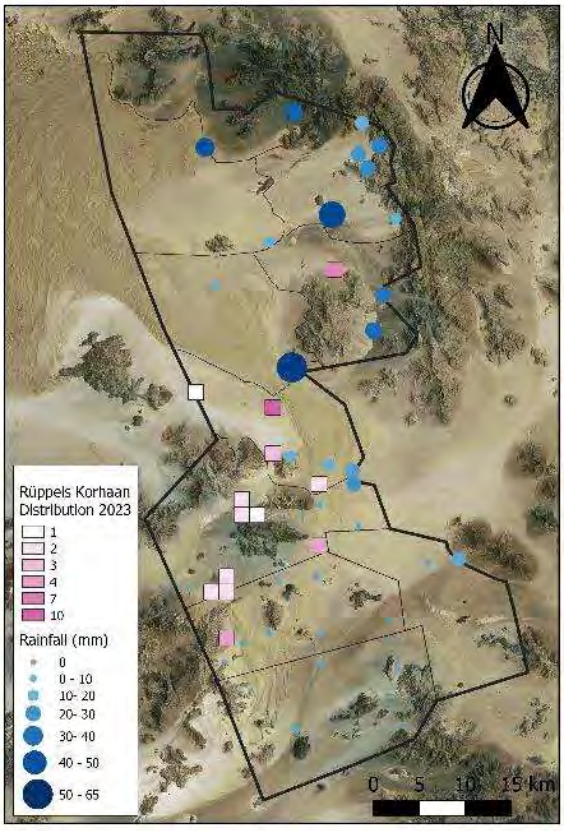


Figure 4.14 Density of Rüppel's Korhaan

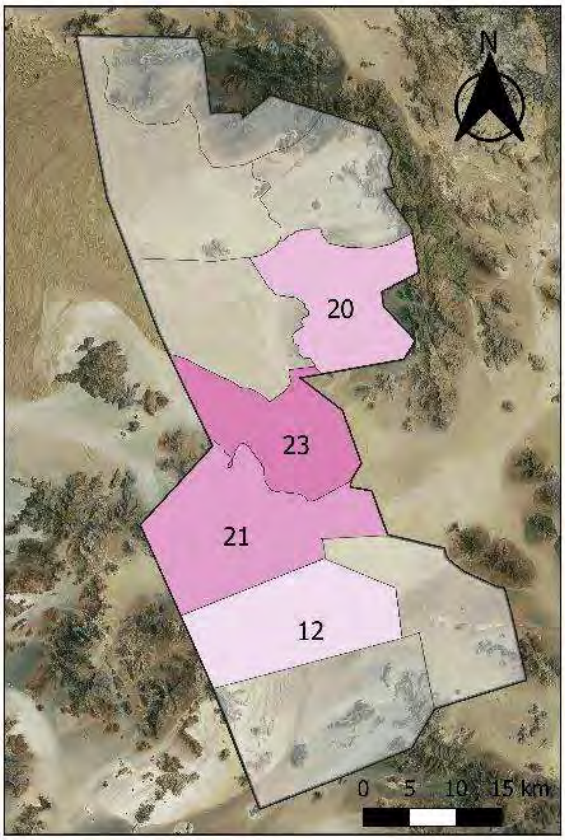


Figure 4.15 Distribution of Hartebeest

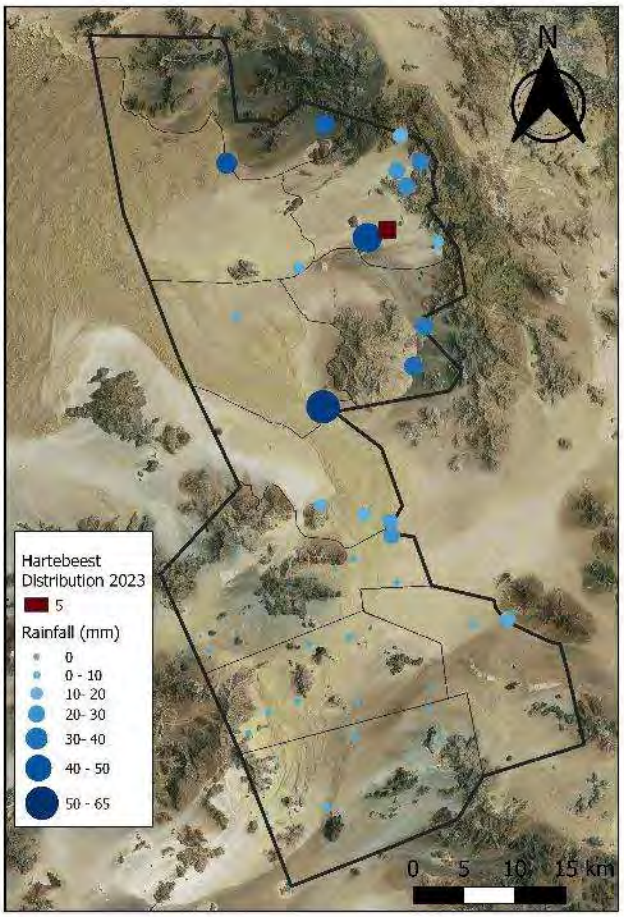
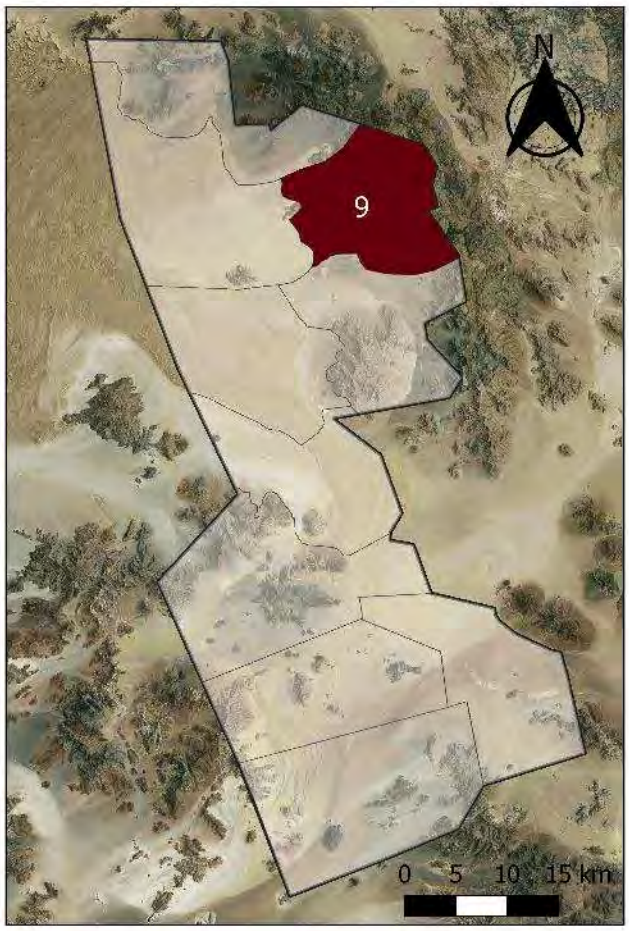


Figure 4.16 Density of Hartebeest



The population densities (animals per 100km driven) and actual number seen for individual species per zone are shown in tables 7.1-7.7 below.

Table 7.1

Oryx			
Route	**Route length**	**Actual number seen**	**Density**
1	54	114	211
2	54	193	357
3	53	247	466
4	53	477	900
5	70	84	120
6	35	48	137
7	61	74	121
8	51	58	114
9	53	23	43
10	57	42	74
Total	**541**	**1360**	**251**

Table 7.2

Springbok			
Route	**Route length**	**Actual number seen**	**Density**
1	54	44	81
2	54	111	206
3	53	26	49
4	53	40	75
5	70	52	74
6	35	7	20
7	61	6	10
8	51	3	6
9	53	7	13
10	57	15	26
Total	**541**	**311**	**57**

Table 7.3

Ostrich			
Route	**Route length**	**Actual number seen**	**Density**
1	54	8	15
2	54	12	22
3	53	21	40
4	53	12	23
5	70	3	4
6	35	13	37
7	61	4	7
8	51	20	39
9	53	12	23
10	57	3	5
Total	**541**	**108**	**20**

Table 7.4

Burchell's zebra			
Route	**Route length**	**Actual number seen**	**Density**
1	54	47	87
2	54	78	144
3	53	0	0
4	53	7	13
5	70	66	94
6	35	0	0
7	61	10	16
8	51	5	10
9	53	3	6
10	57	42	74
Total	**541**	**258**	**48**

Table 7.5

Red Hartebeest			
Route	**Route length**	**Actual number seen**	**Density**
1	54	0	0
2	54	5	9
3	53	0	0
4	53	0	0
5	70	0	0
6	35	0	0
7	61	0	0
8	51	0	0
9	53	0	0
10	57	0	0
Total	**541**	**5**	**1**

Table 7.6

Rüppell's korhaan			
Route	**Route length**	**Actual number seen**	**Density**
1	54	0	0
2	54	0	0
3	53	0	0
4	53	0	0
5	70	16	23
6	35	7	20
7	61	13	21
8	51	6	12
9	53	0	0
10	57	0	0
Total	**541**	**42**	**8**

Table 7.7

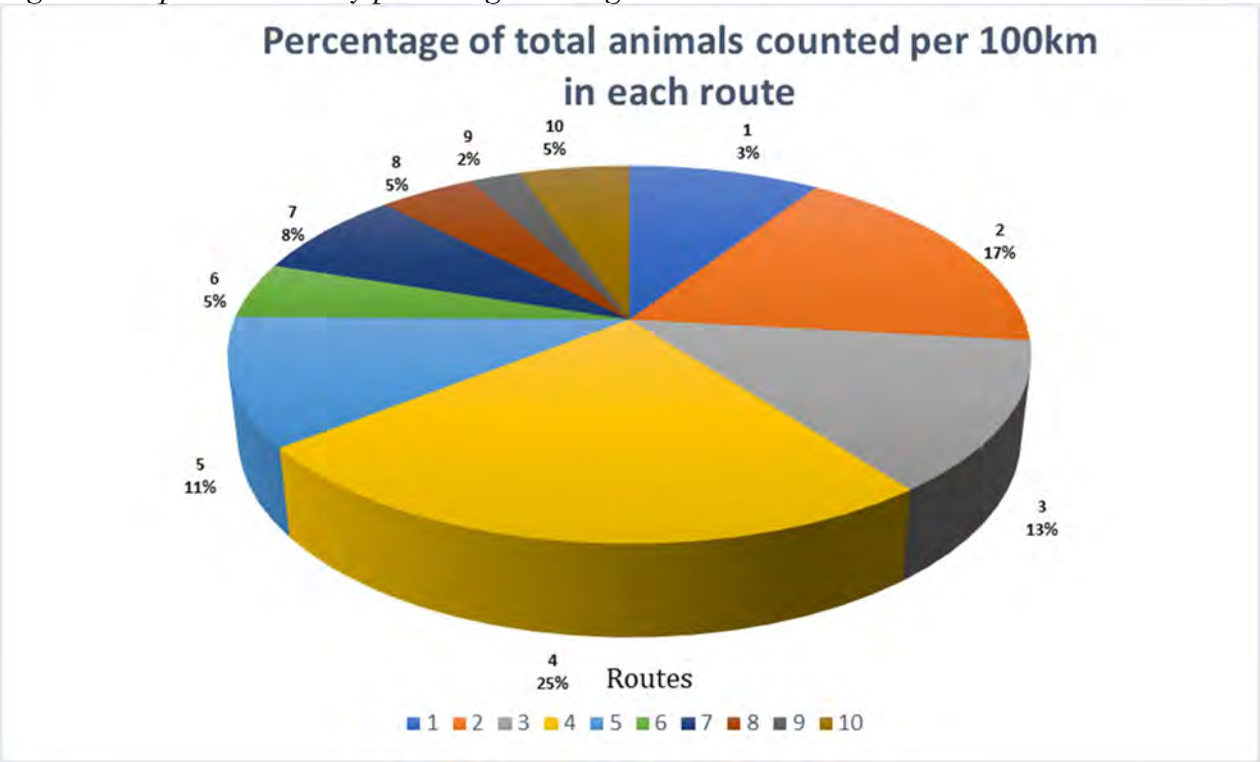
Ludwig's bustard			
Route	**Route length**	**Actual number seen**	**Density**
1	54	0	0
2	54	8	15
3	53	13	25
4	53	24	45
5	70	9	13
6	35	16	46
7	61	5	8
8	51	12	24
9	53	0	0
10	57	17	30
Total	**541**	**104**	**19**

The total wildlife density for all game species (including Ludwig's Bustard and Rüppel's Korhaan) combined in each count zone for May 2023 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 2023.

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	54	227	9%
2	54	433	18%
3	53	317	13%
4	53	608	25%
5	70	270	11%
6	35	118	5%
7	61	187	8%
8	51	114	5%
9	53	59	2%
10	57	132	5%
Total	**541**	**2465**	

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 2023, compared to May 2021 and May 2022, is shown in Table 9 below.

Table 9. Total number of animals counted per 100km for each route in 2023 compared to 2022 and 2021.

Total no of animals counted per 100 km per route (May 2021 - May 2023)				
Route	**May-21**	**May-22**	**May-23**	**% change (May-21 to May-23)**
1	275	513	227	-55.75%
2	212	240	433	80.42%
3	130	204	317	55.39%
4	533	273	608	122.71%
5	244	196	270	37.76%
6	83	356	118	-66.85%
7	360	120	187	55.83%
8	340	39	114	192.31%
9	64	155	59	-61.94%
10	129	248	132	-46.77%
Total	**2370**	**2344**	**2465**	**5.16%**

Figure 6.1 Total wildlife density changes from 2021-2023.

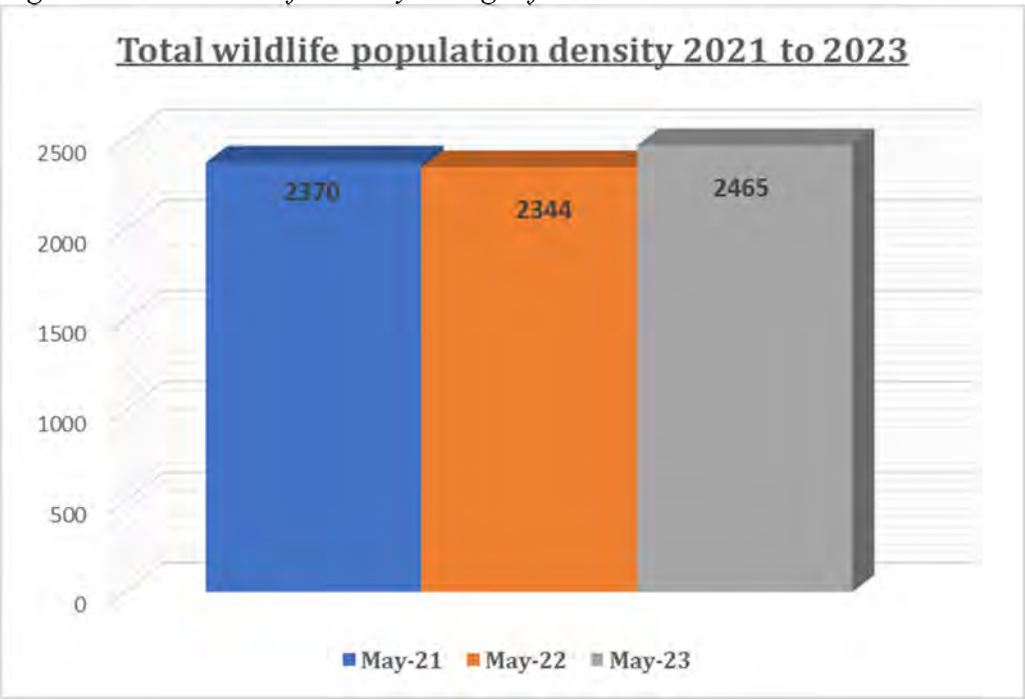
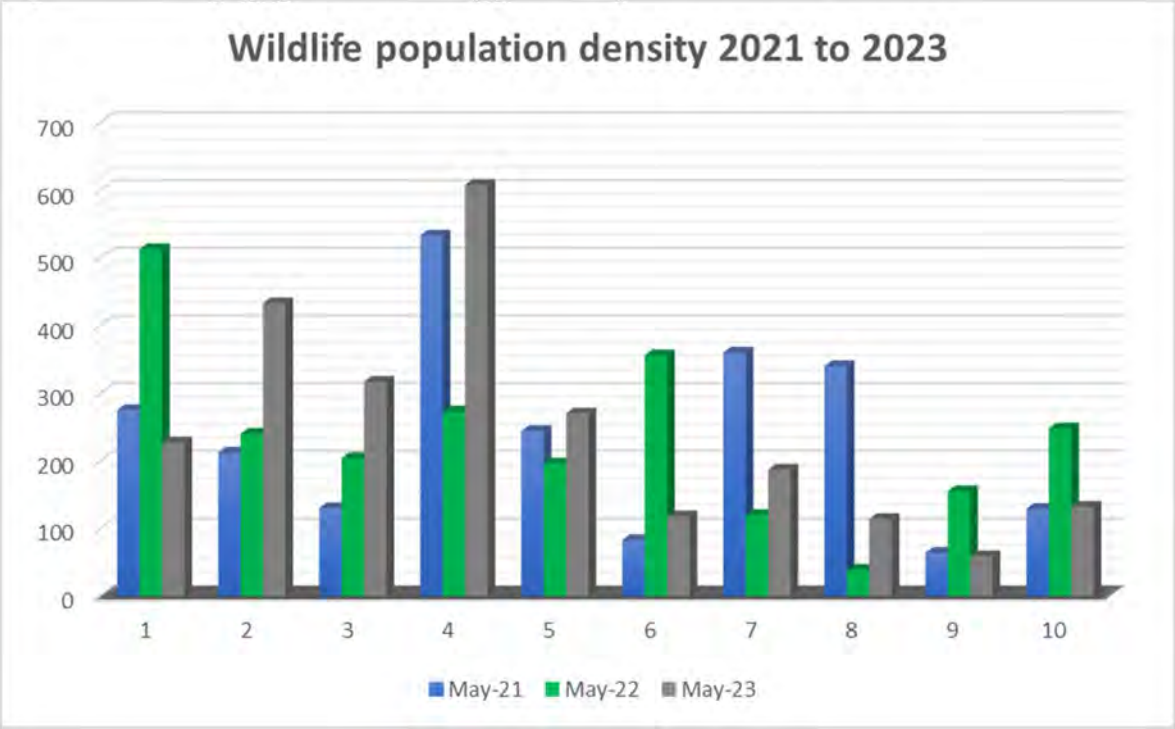


Figure 7.2 Wildlife population density per route from 2021 to 2023



Objective 3: Population change

The total estimated numbers of animals for the May 2023 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 13.96%, and the number of animals counted per 100km per route has increased by 5.16%.

Table 10. Population estimates from 2022 compared to 2023.

Total estimated numbers of game (Zone 1-10, May 2022 - May 2023)					
Species	**May-22**		**May-23**		**Percentage change**
	No. Counted	**Total estimated number**	**No. Counted**	**Total estimated number**	
Oryx	1168	12564	1360	13882	10.49%
Springbok	529	4818	311	4271	-11.37%
Kudu	1	80	0	0	-100.00%
Steenbok	0	0	3	594	#DIV/0!
Ostrich	114	742	108	1371	84.66%
Ludwig's Bustard	66	2193	104	3315	51.15%
Ruppel's Korhaan	28	1774	42	851	-52.02%
B. zebra	266	1943	258	2354	21.16%
Hartebeest	3	8	5	13	65.12%
Total	**2175**	**24123**	**2191**	**26650**	10.48%
Giraffe	13	13	15	15	15.38%

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 2013-2023.

Total estimated numbers of game (Jun 13 - May 2023)											
Species	**Jun-13**	**May-14**	**May-15**	**May-16**	**May-17**	**May-18**	**May-19**	**May-20**	**May-21**	**May-22**	**May-23**
Oryx	8112	9087	7447	6650	10625	3699	3480	6758	13014	12564	13882
Springbok	5828	3024	3420	2944	3243	1720	1351	8981	2882	4818	4271
Kudu	5	0	7	0	4	0	0	0	0	80	0
Steenbok	0	0	0	0	0	0	0	0	0	0	594
Ostrich	183	220	218	145	226	130	175	1293	722	742	1371
Ludwigs Bustard	381	247	119	92	222	0	192	168	334	2193	3315
Ruppel's Korhaan	388	229	145	362	234	119	293	984	1173	1774	851
Burchell's Zebra	320	352	367	510	509	329	485	2058	7654	1943	2354
Hartebeest*	204	197	220	149	174	67	66	0	0	8	13
Giraffe*	6	7	7	9	9	9	10	10	10	13	15
Total population estimate	15427	13363	11950	10861	15246	6073	6052	20252	25779	24123	26651
Blesbok*	3	0	0	0	0	0	0	0	0	0	0
% change	-2.90%	-13.38%	-10.57%	-9.11%	40.37%	-60.17%	-0.35%	234.63%	27.29%	-6.42%	10.48%
** Total numbers known*											

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 each year.

Figure 7.1 Oryx population

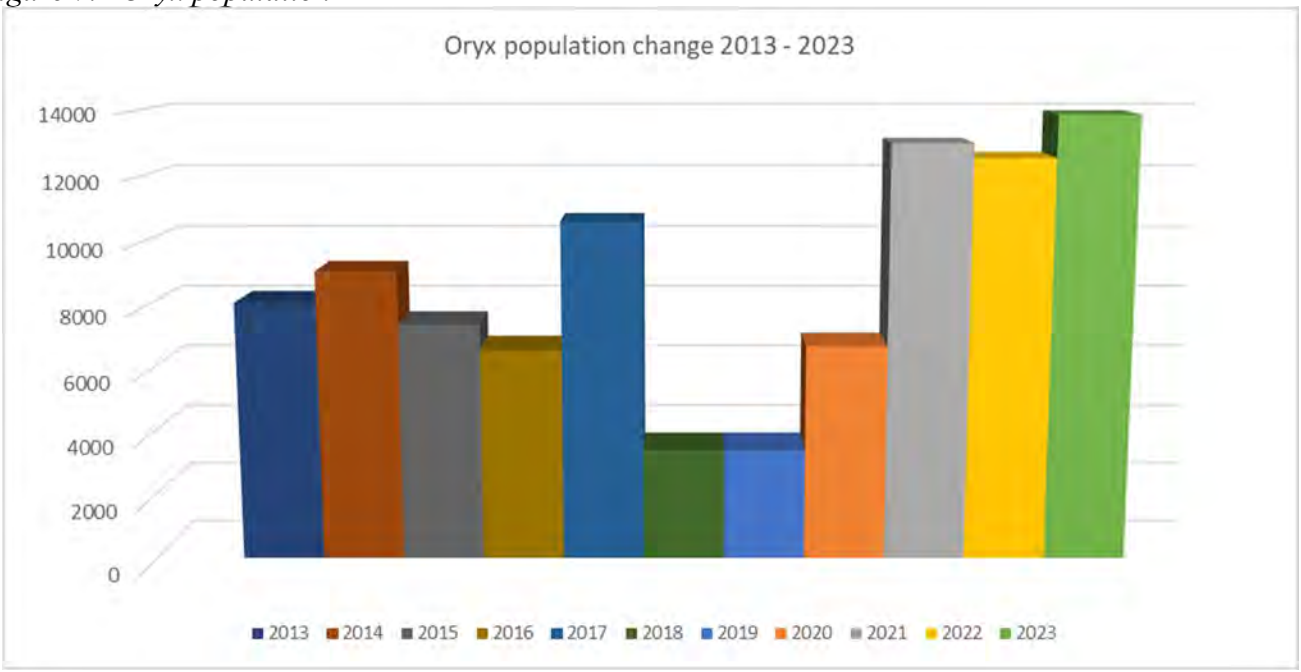


Figure 7.2 Springbok population

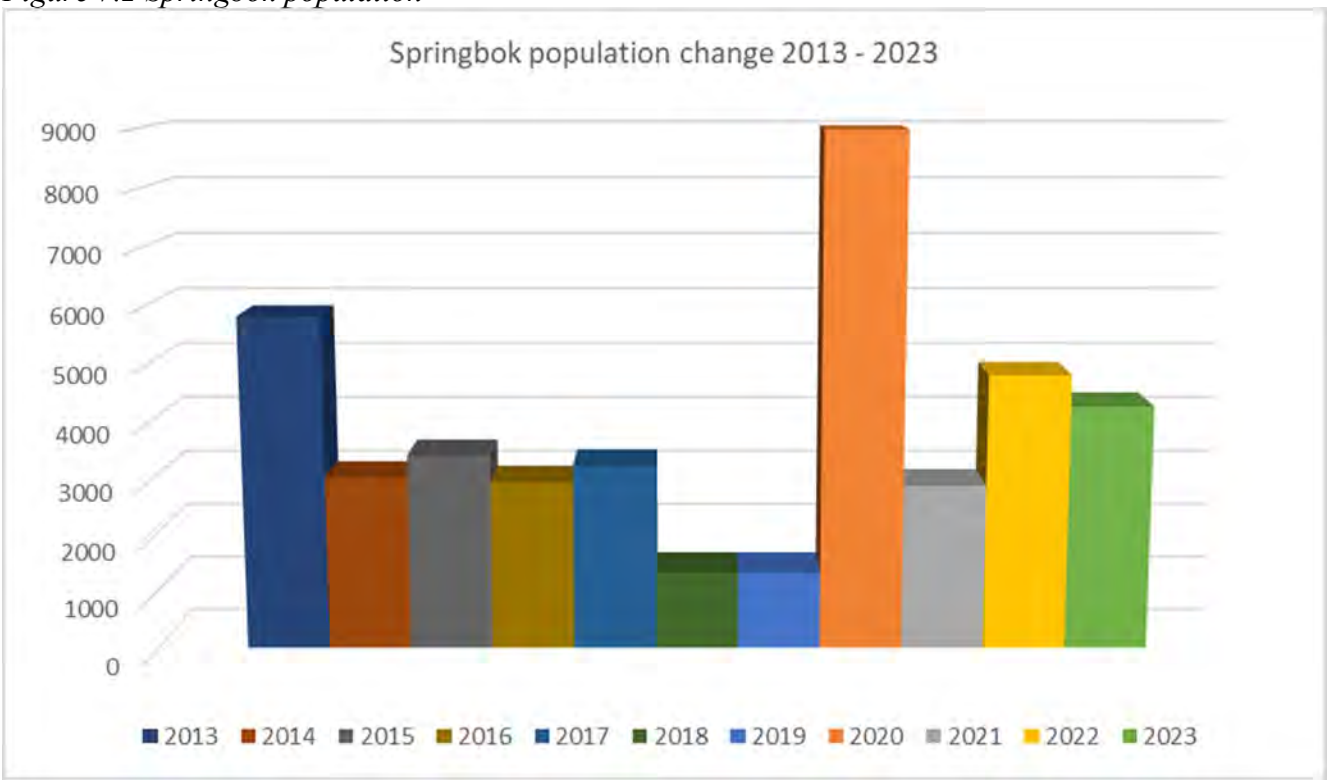


Figure 7.3 Burchell's Zebra population

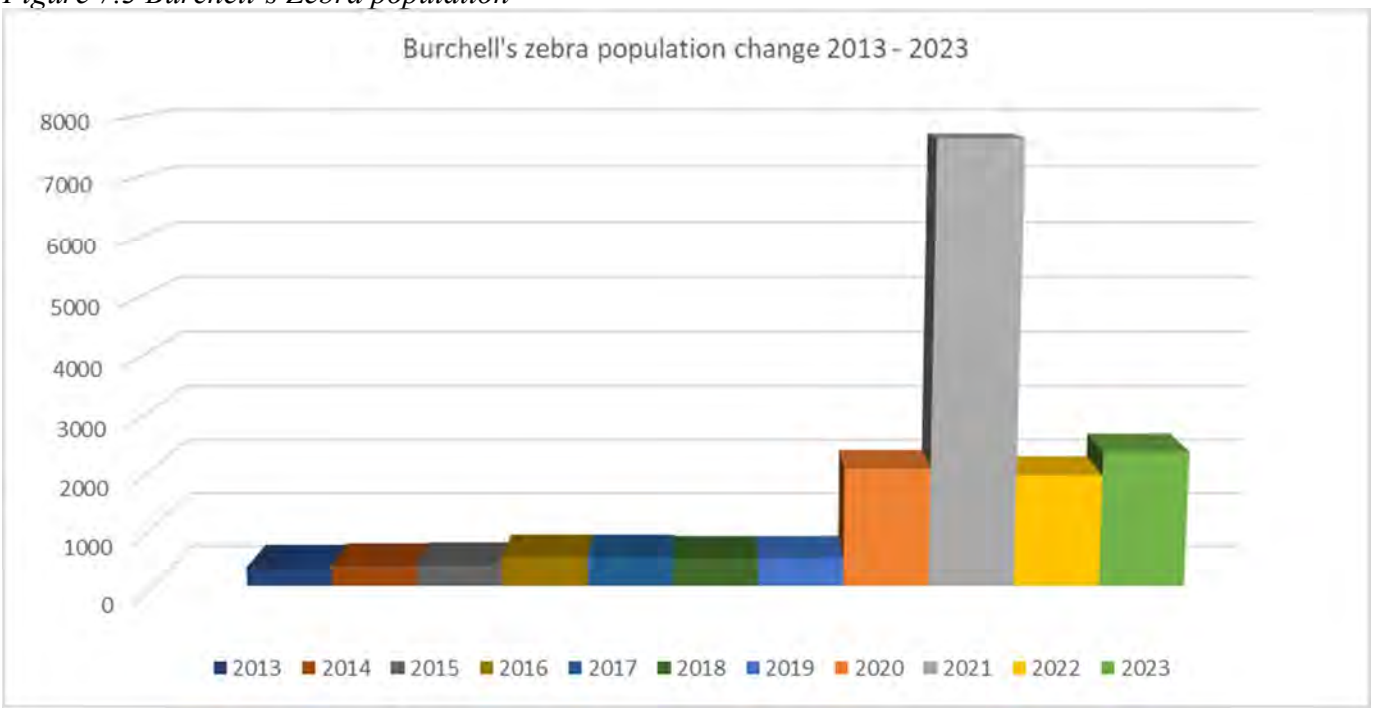


Figure 7.4 Hartebeest population

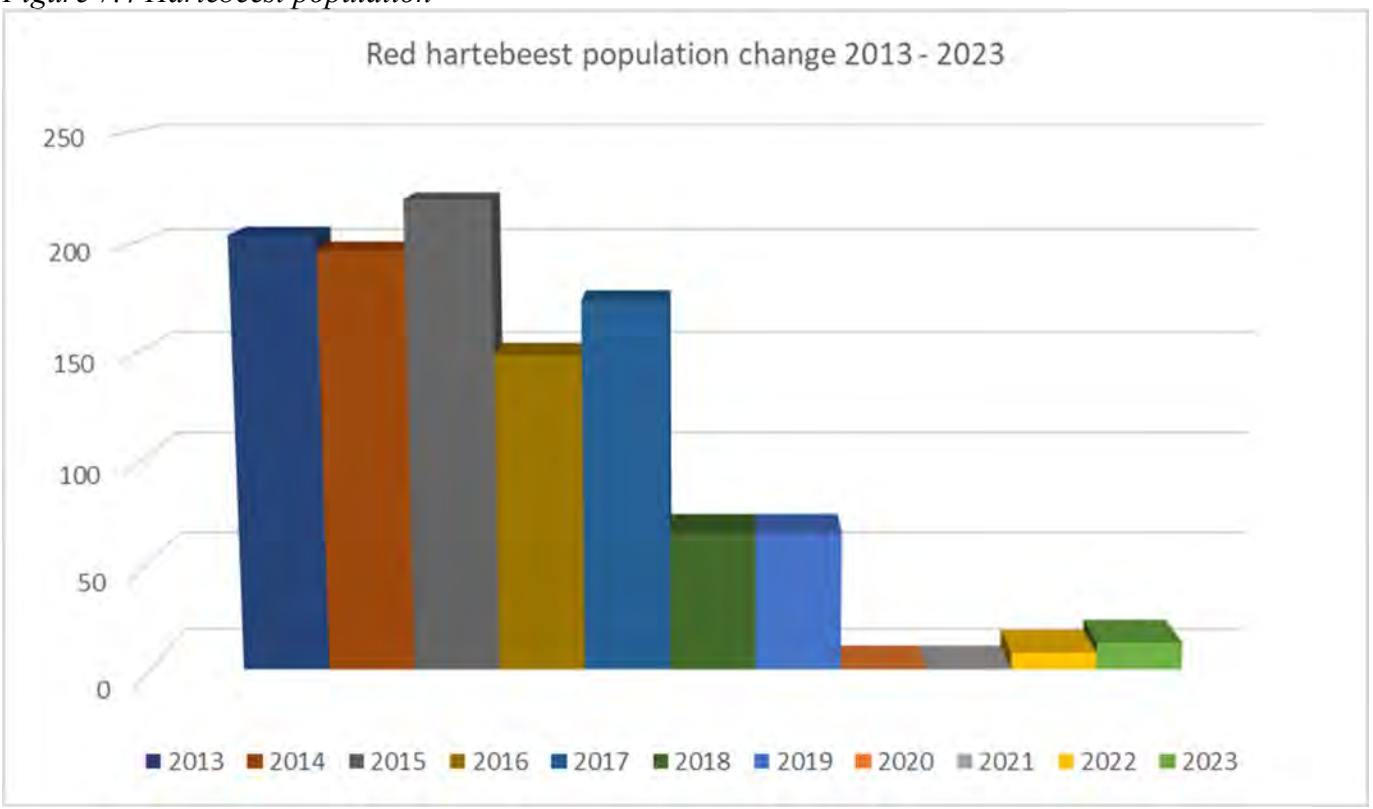


Figure 7.5 Ostrich population

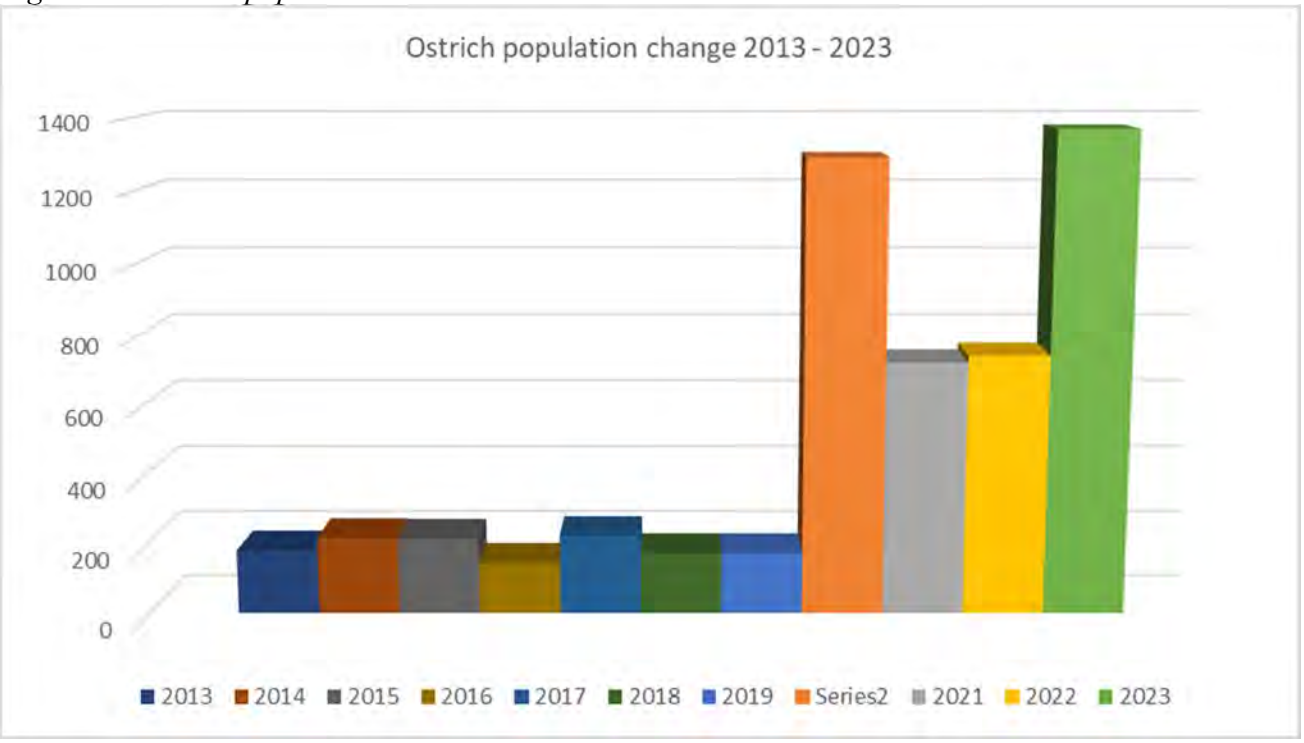


Figure 7.6 Ludwig Bustard population

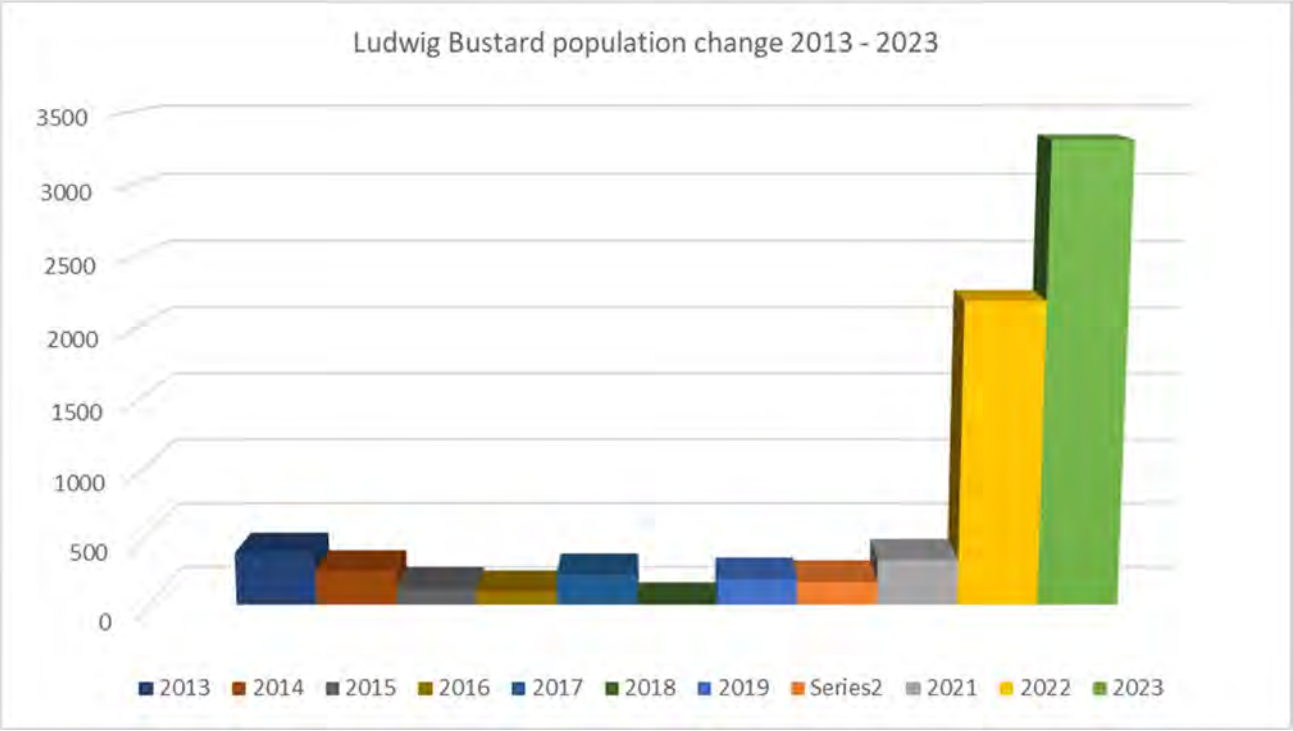
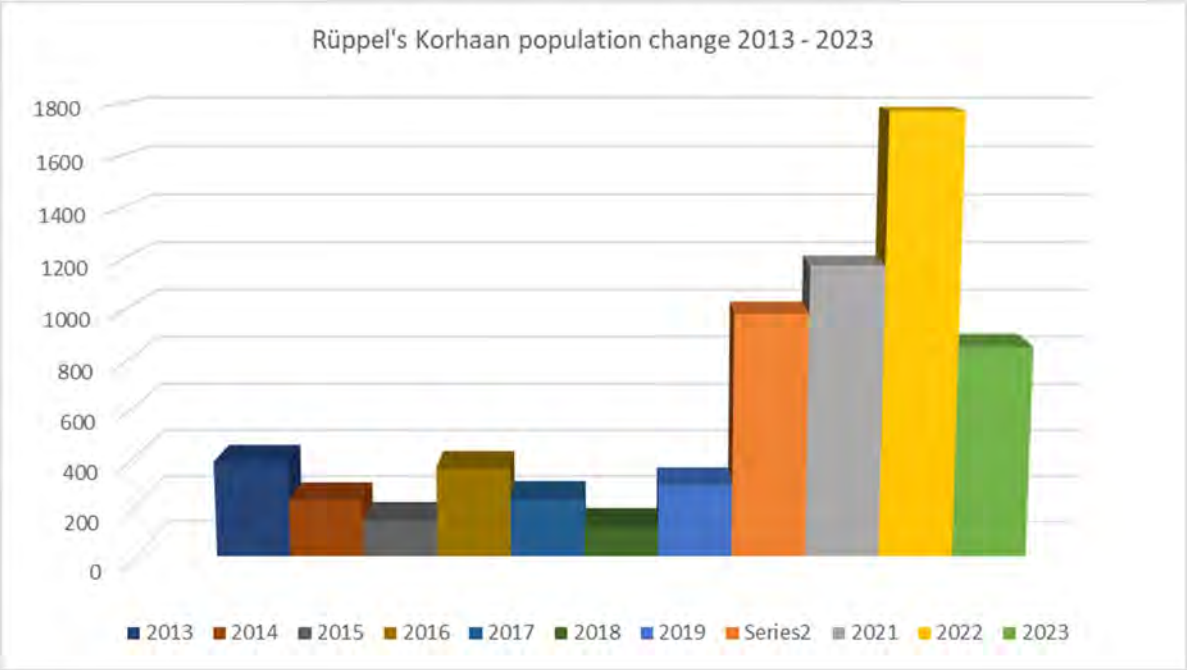
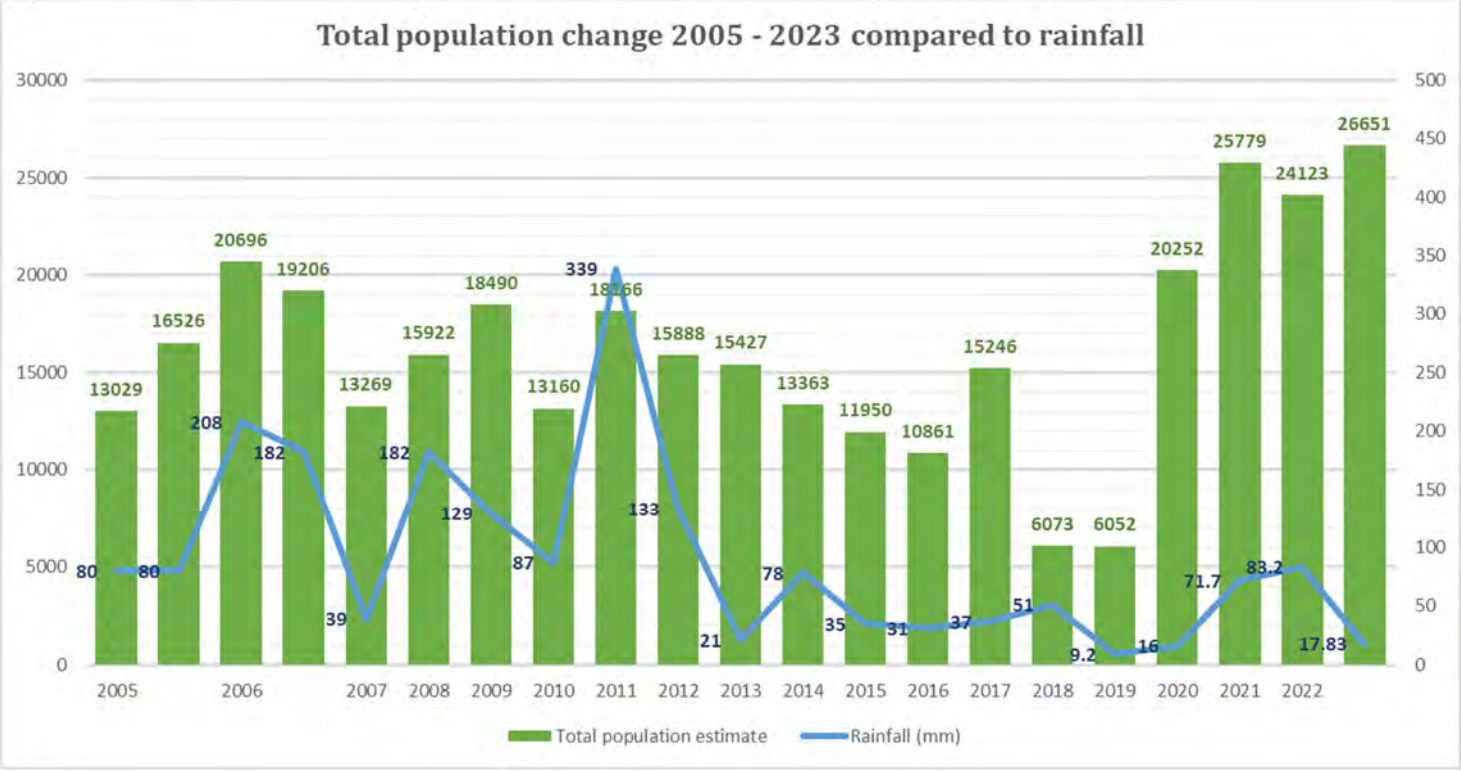


Figure 7.7 Rüppel's Korhaan population



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 2023 compared to average rainfall.

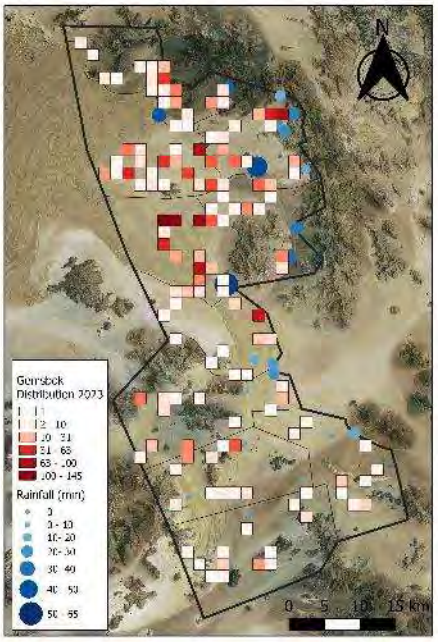


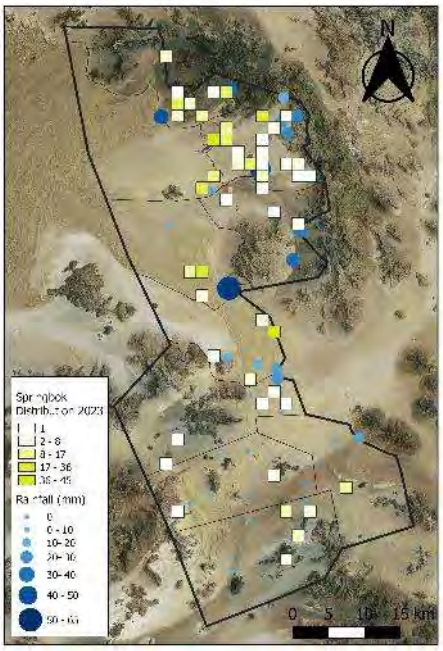
5. Discussion and conclusions

Oryx

The 2023 oryx population estimate shows an increase of 10.49%, this year's estimate is 13,882 from last year's estimate of 12,564.

The highest density of oryx was recorded in Zone 4, which had 477 individual oryx counted. The highest concentration of oryx was seen in the northern part of the Reserve in the dune areas, as seen in the map to the right.





Springbok

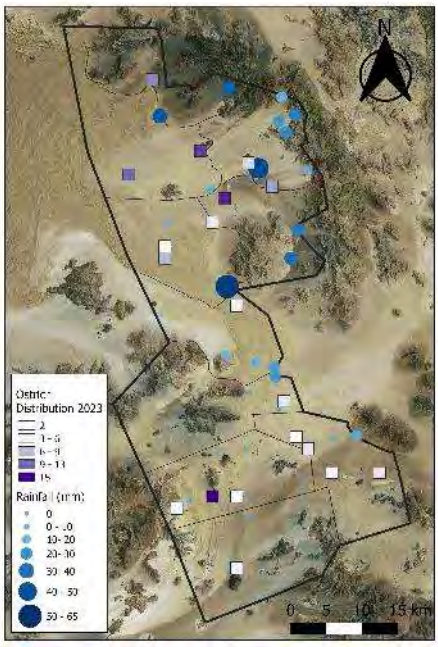
The estimated number of springbok for this year is 4,271, which is a decrease of 11.37% from last year's estimate of 4,818.

Like the oryx, the springbok were predominantly seen in the northern part of the Reserve, as seen on the map on the left. Lower numbers were seen in the central and southern parts of the Reserve. This was also the case last year.

Ostrich

This year's ostrich population estimate is 1,371. This is an 84.66% increase from last year's population estimate of 742.

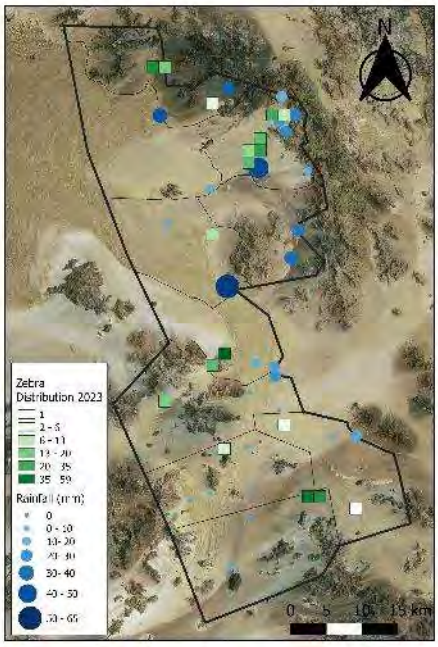
Most of the sightings were in Zone 3 (21 ostriches) followed by zones 8 and 6 (20 and 13 ostriches respectively).



Burchell's Zebra

This year 258 Burchell's zebra were counted to give a total estimated population of 2,354, compared to last year's estimate of 1,943.

The Burchell's zebra population is found all over the Reserve, with the highest concentration in Zone 2. Their population has increased by 21.16%. This could be that Zebras came into the Reserve due to fresh grass in the areas that received higher rainfall.



Red Hartebeest

Five hartebeest were seen on Route 2 of the game count. An estimate of 13 can be made. However, it is known that only five are currently on the Reserve. The three adults, one male and two females, received two calves by the end of last year.

The five Hartebeest seen at the Keerweder waterhole in November 2022. (Jessica Steyn)

Giraffe

There were no Giraffes sightings during the game count. Their population is known to consist of 15 animals.

Ludwig's Bustards

The estimated number of Ludwig's bustard increased by 51.15% this year compared to last year. The population estimate for this year is 3,315, while the actual number counted is only 104. These were all found over the Reserve except in Zone 1 and Zone 9, with Zone 4 having the highest number counted.

Rüppel's Korhaan

The estimated number of Rüppel's korhaan decreased by -52.02% this year compared to last year. The population estimate for this year is 851, while the actual number counted was 42, were as last years estimated population was 1,174. They were this year only sited in Zone 5, 6, 7, 8.

Kudu

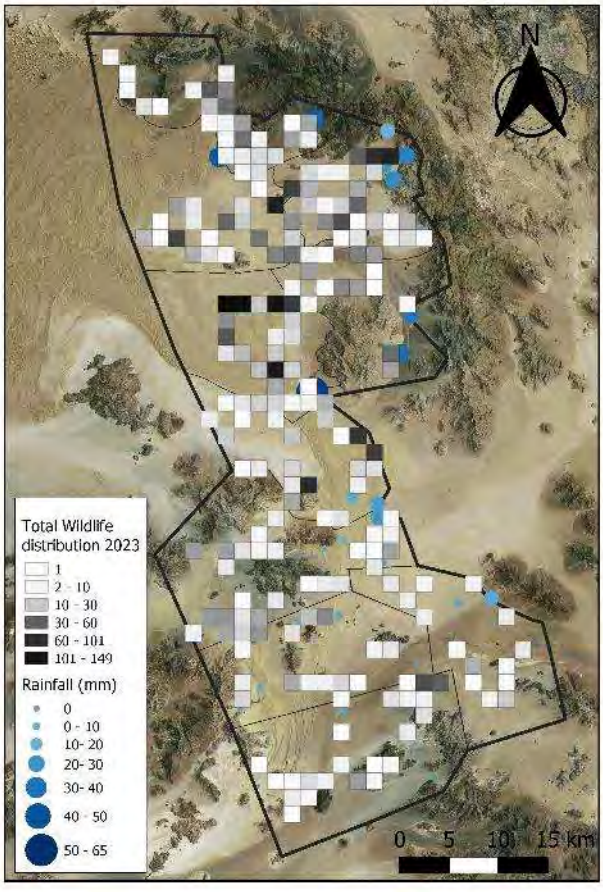
This year no Kudu were seen. One should remember that this census method is not well suited for kudu and thus we must rely on actual sightings and camera trap images to get a better indication of the kudu population. However, we known that Kudus occur on the Reserve especially in the Toskaan and Draaihoek area. Kudus are often seen at the Porcupine waterhole, in groups of three and four animals.

Total population change, distribution and densities

The total population estimate increased by 13.96%, while the number of animals counted per 100km per is up by 10.71% from last year. The total wildlife population estimate this year is 27,490. The highest concentration of animals was in the northern part of the Reserve.

For resource management purposes, we use the actual number of animals seen, instead of the estimates. This gives 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 increase 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 28.

The total wildlife distribution compared to the rainfall map on the right, shows a correlation between the wildlife distribution and the rainfall received this year.



Carnivores on the Reserve

Carnivores like Black-backed jackal, Bat-ear fox, and a Cape fox was seen on the game count. These animals are also frequently seen by staff or guests. Sightings of leopard, spotted hyena, cheetah, african wild cat, striped pole cat, small spotted genet and aardwolf have also been reported. The camera traps that are in the northern part of the Reserve, do record regular sightings of some of these animals.

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:
Andre Steyn, Karin Hoffman, Paul Russel, Gerhard, Nils Odendaal, Danica Odendaal, Amelie Odendaal Jonah Ndeuludila, Simon Lange, Michael Katambo, Kaino Angula, Geraldo Daniels, Eslie Shikongo, Uatezovakua Tjituezu, Alex Jossop, Theresia Shifiona, Adriaan Basson, Martha Paulus, Lake Bader, Julie von Garrier, Elton Vries, Albertine Kandjala, Abraham Tsaobeb, Christa & Ben D'Alton, Frankie Mukene, Stanley Brandt, Martin Verwey, Chantell Verwey, Marcel Verwey, Moses Hanse, Ettienne & Sanet Rossouw, Tresia Ipangelwa, Ruben Bonifacio, Festus Awene, Abraham Hamutenya

7. Appendix

Results per count route per zone

Tables 12.1 to 12.11 list the data collected on each route in May 2023, which were used as a basis for the analysis.

Table 12.1

Route 1				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	54	114	211	1285
Springbok	54	44	81	632
Plains Zebra	54	47	87	145
Hartebeest	54	0	0	0
Kudu	54	0	0	0
Ostrich	54	8	15	46
Rüppel Korhaan	54	0	0	0
Ludwig Bustard	54	0	0	0
Total	**54**	**213**	**394**	**2108**
Black-backed Jackel*	54	5	9	57
Bat-eared Fox*	54	4	7	93
Pale Chanting Goshawk*	54	2	4	58
Lappet-faced Vulture*	54	2	4	116
Rock kestrel*	54	1	2	58

**Not included in count*

Table 12.2

Route 2				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	54	193	357	414
Springbok	54	111	206	652
Plains Zebra	54	78	144	706
Hartebeest	54	5	9	13
Kudu	**54**	**0**	**0**	**0**
Ostrich	54	12	22	102
Rüppel Korhaan	54	0	0	0
Ludwig Bustard	54	8	15	31
Total	**54**	**407**	**754**	**1919**
Mountain Zebra*	54	5	9	40
Black-backed Jackel*	54	3	6	209
Bat-eared Fox*	54	11	20	601
Pale Chanting Goshawk*	54	2	4	510
Lappet-faced Vulture*	54	3	6	191
Black korhaan*	54	2	4	191

**Not included in count*

Table 12.3

Route 3				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	53	247	466	1069
Springbok	53	26	49	389
Plains Zebra	53	0	0	0
Hartebeest	53	0	0	0
Warthog	53	0	0	0
Kudu	53	0	0	0
Ostrich	53	21	40	209
Rüppel Korhaan	53	0	0	0
Ludwig Bustard	53	13	25	1620
Total	**53**	**307**	**579**	**2219**
Bat-eared Fox*	53	8	15	199
Pale Chanting Goshawk*	53	1	2	50
Greater Kestrel*	53	1	2	125

**Not included in count*

Table 12.4

Route 4				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	53	477	900	4212
Springbok	53	40	75	587
Plains Zebra	53	7	13	51
Hartebeest	53	0	0	0
Kudu	53	0	0	0
Ostrich	53	12	23	49
Rüppel Korhaan	53	0	0	0
Ludwig Bustard	53	24	45	543
Total	**53**	**560**	**1057**	**1231**
Steenbok*	53	3	6	594
Black-backed Jackel*	53	13	25	515
Pale Chanting Goshawk*	53	3	6	96
Unknown eagle *	53	2	4	14
Greater Kestrel*	53	1	2	7
Cape Crow*	53	13	25	276
Vulture*	**53**	**13**	**25**	**110**

**Not included in count*

Table 12.5

Route 5				
Species	Route length	Total number counted	Density	Estimated population
Oryx	70	84	120	882
Springbok	70	52	74	974
Plains Zebra	70	66	94	366
Kudu	70	0	0	0
Steenbok	70	0	0	0
Ostrich	70	3	4	25
Rüppel Korhaan	70	16	23	56
Ludwig Bustard	70	9	13	200
Total	**70**	**230**	**329**	**2503**
Mountain Zebra*	70	13	19	65
Black-backed Jackel*	70	1	1	4
Bat-eared Fox*	70	12	17	129
Pale Chanting Goshawk*	70	3	4	75
Lappet-faced Vulture*	70	2	3	50
Greater Kestrel*	70	4	6	33
Vulture*	70	1	1	12
Unknown Crows*	70	4	6	33

**Not included in count*

Table 12.6

Route 6				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	35	48	137	558
Springbok	35	7	20	80
Plains Zebra	35	0	0	0
Kudu	35	0	0	0
Steenbok	35	0	0	0
Ostrich	35	13	37	215
Rüppel Korhaan	35	7	20	534
Ludwig Bustard	35	16	46	193
Total	**35**	**91**	**260**	**1581**
Mountain Zebra*	35	23	66	127
Black-backed Jackel*	35	2	6	26
Pale Chanting Goshawk*	35	2	6	66

**Not included in count*

Table 12.7

Route 7				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	61	74	121	1376
Springbok	61	6	10	46
Plains Zebra	61	10	16	257
Kudu	61	0	0	0
Steenbok	61	0	0	0
Ostrich	61	4	7	35
Rüppel Korhaan	61	13	21	148
Ludwig Bustard	61	5	8	23
Total	**61**	**112**	**184**	**1885**
Ground squirrel*	61	28	46	393
Yellow mongoose*	61	7	11	432
Black-backed Jackel*	61	2	3	15
Bat-eared Fox*	61	27	44	131
Pale Chanting Goshawk*	61	1	2	19
Klipspringer*	61	5	8	154
Lappet-faced Vulture*	61	4	7	31
Kestrel*	61	1	2	77

**Not included in count*

Table 12.8

Route 8				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	51	58	114	1959
Springbok	51	3	6	28
Plains Zebra	51	5	10	47
Kudu	51	0	0	
Steenbok	51	0	0	
Ostrich	51	20	39	174
Rüppel Korhaan	51	6	12	113
Ludwig Bustard	51	12	24	130
Total	**51**	**104**	**204**	**2452**
Cape Fox*	51	2	4	101
Bat-eared Fox*	51	8	16	130

**Not included in count*

Table 12.9

Route 9				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	53	23	43	996
Springbok	53	7	13	636
Plains Zebra	53	3	6	80
Kudu	53	0	0	
Steenbok	53	0	0	
Ostrich	53	12	23	498
Rüppel Korhaan	53	0	0	
Ludwig Bustard	53	0	0	
Total	**53**	**45**	**85**	**2210**
Bat-eared Fox*	53	14	26	996

**Not included in count*

Table 12.10

Route 10				
Species	**Route length**	**Total number counted**	**Density**	**Estimated population**
Oryx	57	42	74	1131
Springbok	57	15	26	245
Plains Zebra	57	42	74	701
Kudu	57	0	0	0
Steenbok	57	0	0	0
Ostrich	57	3	5	16
Rüppel Korhaan	57	0	0	0
Ludwig Bustard	57	17	30	575
Total	**57**	**119**	**209**	**2668**
Black-backed Jackel*	57	3	5	372
Bat-eared Fox*	57	8	14	151
Lappet-faced Vulture*	57	2	4	434

**Not included in count*

Table 12.11

Total number of animals				
Species	Route length	**Total number counted**	**Density**	**Estimated population**
Oryx	541	1360	251	13882
Springbok	541	311	57	4271
Plains Zebra	541	258	48	2354
Kudu	541	0	0	0
Steenbok	541	3	1	594
Ostrich	541	108	20	1371
Rüppel Korhaan	541	42	8	851
Ludwig Bustard	541	104	19	3315
Total	**541**	**2186**	404	**26638**
Mountain Zebra*	541	41	7.58	232
Scrub Hare*	541	0	0.00	0
Hartebeest*	541	5	0.92	13
Ground squirrel*	541	28	5	393
Yellow mongoose*	541	7	1	432
Cape Fox*	541	2	0	101
Black-backed Jackel*	541	29	5	1333
Bat-eared Fox*	541	92	17	2430
Pale Chanting *Goshawk	541	14	3	875
Klipspringer*	541	5	1	154
Lappet-faced Vulture*	541	**13**	2	822
Unknown Kestrel*	**541**	1	0	77
Unknown eagle *	541	2	0	14
Greater Kestrel*	541	6	1	165
Cape Crow*	541	13	2	276
Unknown Vulture*	541	14	3	122
Black korhaan*	541	2	0	0
Rock kestrel*	541	1	0	58
Unknown Crows*	541	4	1	33

**Not included in the count*