



AFRICAN CONSERVATION CENTRE



May 2024 Aerial Survey Report

Amboseli Ecosystem Aerial Count Analysis

By Victor N. Mose¹ and David Western

Introduction

The Amboseli Conservation Program (ACP) has conducted regular aerial sample counts of Amboseli and eastern Kajiado continuously since 1973. Details of the counting method and previous counts can be found in published papers (Mose & Western, 2015; Western & Mose, 2021) and on the [ACP website](#).

In May 2024 African Conservation Centre (ACC) and ACP, funded by the European Union-MOSAIC project and The Liz Claiborne & Art Ortenberg Foundation (LCAOF), commissioned the Department of Regional Surveys and Remote Sensing (DRSRS) and Flight Training Centre (FTC) to take stock of the recovery in wildlife and livestock in the aftermath of the 2022-2023 drought. The count was timed after the birthing seasons of wildebeest and cattle were delayed a year by the drought. The rain season count was flown across the 7,800 km² of Eastern Kajiado between May 21st and May 25th when the herds were maximally spread on migration and easily visible against the green vegetation.

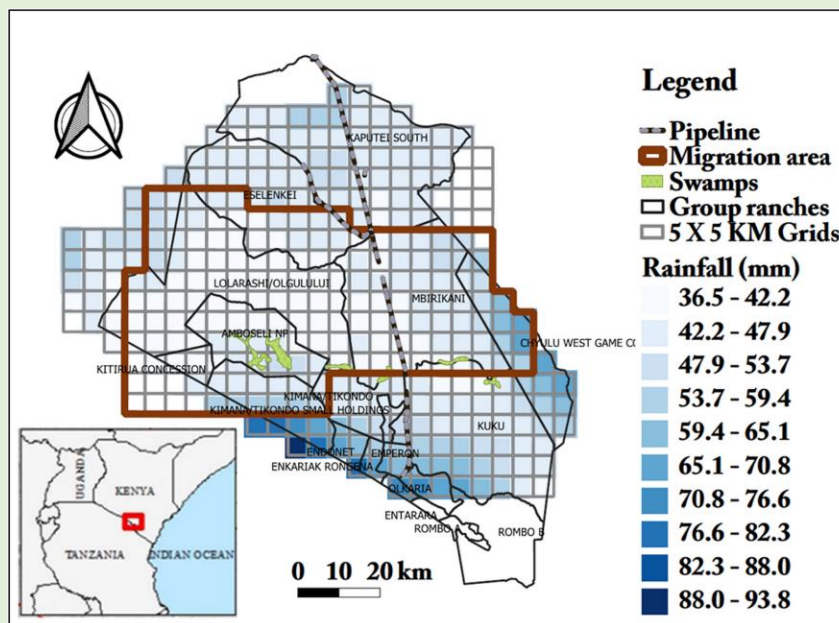


Figure 1. A map of the area monitored by aerial counts since 1974 showing Amboseli National Park, surrounding group ranches, rainfall isopleths and the 5 × 5 km grid overlay used in flying flight lines and spatially plotting wildlife and livestock (Western & Mose, 2021).

¹ Email : victor.mose@acc.or.ke

Aerial count results

The results of the aerial sample counts are given in Table 1 and the distribution of species in Figure 2.

Species	Sample	Population estimates	Std. error	CV
Sheep & goats (shoats)	10,131	183,864	26,275	0.14
Cattle	7,174	130,198	17,521	0.13
Zebra	486	8,820	1,857	0.21
Grant's gazelle	370	6,715	765	0.11
Giraffe	243	4,410	1,177	0.27
Wildebeest	188	3,412	1,035	0.3
Thomson's gazelle	139	2,523	1,586	0.63
Elephant	56	1,016	430	0.42
Ostrich	56	1,016	239	0.24
Buffalo	49	889	836	0.94
Donkey	36	653	213	0.33
Kongoni	29	526	325	0.62
Impala	29	526	300	0.57
Eland	5	91	69	0.76

Table 1: Population estimates of large herbivores species in the Amboseli Ecosystem and Eastern Kajiado in May 2024. The sample, standard error and the coefficient of variation (CV) are also shown. Grant's gazelles were most spread out (lowest CV value of 11%) while buffalo were the most clustered (CV=94%).

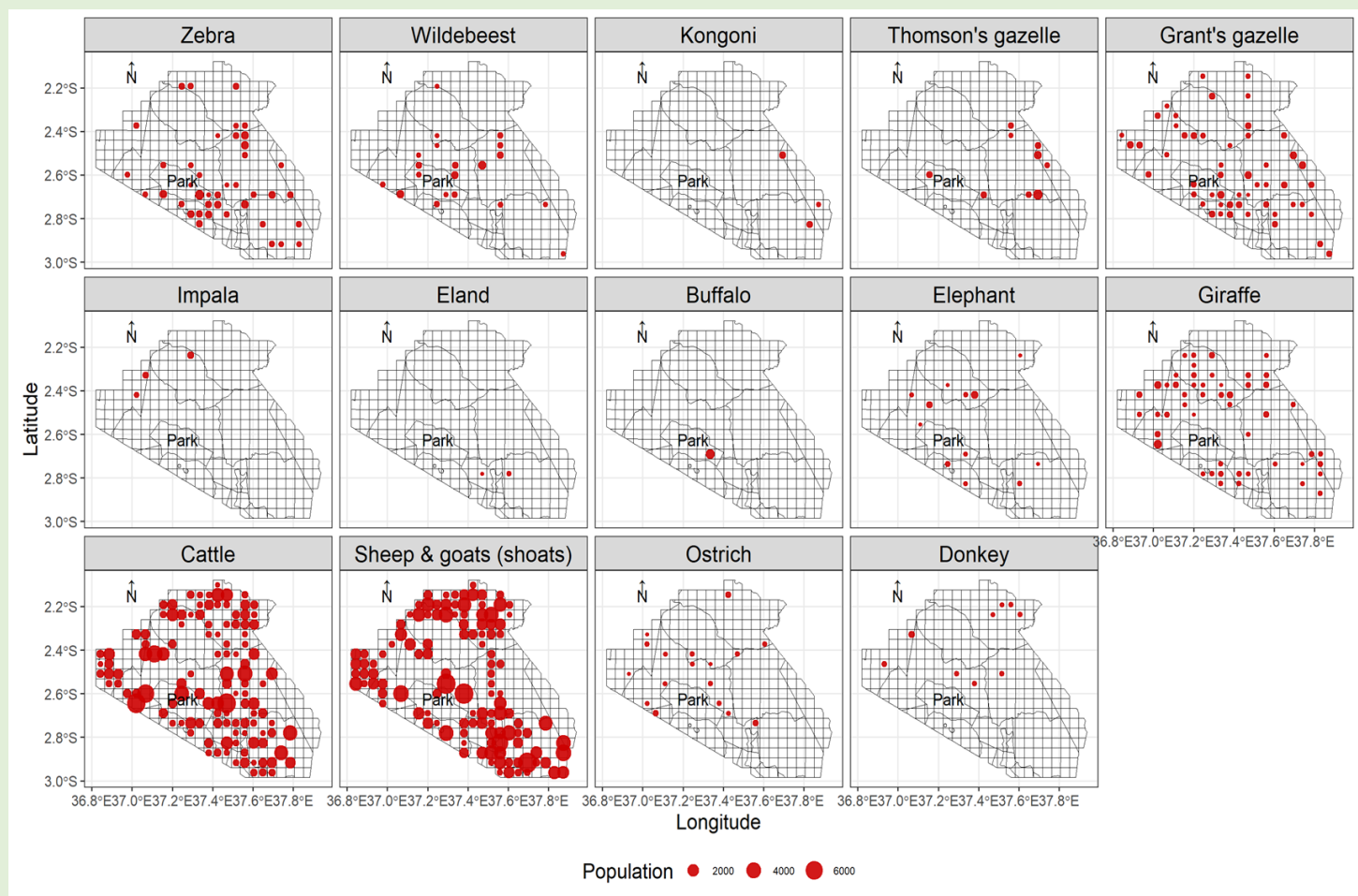


Figure 2: Distribution of each species tallied on the May 2024 count overlaid on 5 X 5 km grid showing Amboseli National Park and the surrounding group ranches.

Discussion

The impact of the 2022-2023 drought and beginning of population recoveries in 2024 is evident for livestock and wildlife. Table 2 gives a comparison of population numbers for all species counted in the aftermath of the 2009 drought through to the 2018, 2020 and 2022 full recovery, followed by the steep decline in numbers recorded in 2023 after the 2022-2023 drought broke. The conditions during the aerial flights were very cloudy, making counting far poorer than in sunny conditions. The cloudy conditions account for the lower counts than expected for most species except for livestock, which are hard to miss due to their large compact herds.

Species	Population Estimates						
	Feb 2010	May 2017	May 2018	Feb 2020	Feb 2022	Sep 2023	May 2024
Sheep & goats (Shoats)	95,047	179,184	184,907	249,478	296,810	156,936	183,864
Cattle	49,368	55,874	107,358	143,601	283,849	84,467	130,198
Zebra	3,056	6,423	15,902	17,239	20,466	8,112	8,820
Wildebeest	683	4,679	8,361	8,094	8,700	5,259	3,412
Grant's gazelle	2,961	6,807	10,839	12,515	10,732	5,223	6,715
Elephant	1,137	1,361	767	1,533	2,139	2,139	1,016
Camel		230	1,729	981	285	1,943	
Giraffe	2,682	3,202	6,667	6,828	5,562	1,284	4,410
Ostrich	1,215	882	1,266	1,052	428	909	1,016
Donkey	1,213	844	998	856	2,603	874	653
Impala	857	307	1,908	464	250	232	526
Eland	2,545	786	4,368	4,154	2,692	143	91
Warthog	259		107	303	89	125	
Lesser Kudu	171	77	18	36	0	36	
Gerenuk	155	38	18		18	18	
Kongoni	463	586	196	695	89		526
Thomson's gazelle	607	499	624	89	36		2,523
Buffalo		288	428	1,355	1,711		889
Oryx		72	464	89			
Dikdik		36					
Waterbuck		19					
Hippo			36				

Table 2. A comparison of aerial counts for 2010 to 2024 tracking the course of the 2009 and 2022-2023 drought losses and recoveries of all large herbivore species.

Cattle

The counts show cattle numbers building up to a peak of 143,600 in 2020 after a recovery from the drought of 2009 when numbers fell by 70 percent. As noted in the report on the 2022-2023 drought, the resident cattle population doubled due to the immigration of herders from Tanzania and Narok taking advantage of the better pastures in eastern Kajiado to avoid drought in their home locations. The large-scale immigration quickly depleted fodder and amplified the impact of drought in Amboseli. As a result of the pasture loss, Amboseli herders moved large numbers of animals north into Ukambani and west into the Rift Valley to evade the worst of the drought in late 2022. ACP, based on herder surveys (Kimiti, 2023), estimates cattle drought losses in Amboseli at around 40 percent. The drop in cattle from a peak of 143,000 in 2020 prior to the influx of cattle during the drought to the post-drought figure of 84,000 gives a similar mortality figure. The 2024 figure of 130,000 cattle indicates a strong recovery, partly due to a good calving after a one-year cessation in births caused by the drought, and perhaps due to local immigration from areas peripheral to the counting area.

Sheep and goats (shoats)

As with cattle, shoat numbers reached a peak of 249,000 in 2020 after recovery from the 2009 drought when two thirds of the animals died. The numbers rose to nearly 300,000 in 2022 due to immigration to avoid drought from surrounding areas. The drop in numbers to 156,000 from the pre-drought peak of 143,000 points to a similar 40 percent loss to the 2022-2023 drought, based on herder surveys (Kimiti, 2023). The numbers rose to 184,000 on the 2024 count, far short of a full recovery. The fewer numbers than expected in a full recovery are due to herders selling sheep and goats rather than cattle to rebuild their primary herd.

Zebra

Zebra numbers in Amboseli and eastern Kajiado have fluctuated greatly in response to rainfall over the last 50 years (Western & Mose, 2021). The recovery from the 2009 drought, when over two-third of the population died, peaked at 17,000 to 20,000 between 2020 and early 2022. The numbers fell to 8,110 in 2023 and rose slightly higher to 8,800 in 2024. Zebra losses in the 2022-2023 drought were estimated at 30% based on ground counts of dead animals. The figure would have fallen further due to predation before the year-delayed calving likely bottomed out at 10,000-12,000. The fewer animals than expected in 2023 and 2024 likely reflect the poor counting conditions and dispersal of animals beyond the counting area after the drought. We shall be able to get a better measure of numbers using ground counts when the migrants return to the Amboseli area.

Wildebeest

Wildebeest numbers in the 7,800km² count area fell by over 90% in the 2009 to under 1,000. The numbers climbed to a peak of 8,700 prior to the 2022-2023 drought. Based on carcass counts, we estimated the loss in the 2022-2023 drought to be 30 to 40%. This suggests the population in 2024 would have dropped to between 5,000 and 6,000. The recorded estimated figure of 3,400 in May 2024 is therefore lower than expected by 2,000 or so animals. The lower figure than expected, as for the zebra count, likely reflects the poor counting conditions and wide dispersal of wildebeest beyond our counting area due to the prolonged El Niño rains. This is verified by the 2023 count shortly after the end of the drought showing a surviving population of 5,259. The distribution map shows wildebeest extending up to the Tanzania border. We established over 1,200 wildebeest returning from across the Tanzania border in July during a total aerial counting, putting the minimum figure at some 4,600.

Elephant

The 1,016 elephants estimated from the May sample count is considerably lower than the 1,900 or so animals known to use the Amboseli according to the Amboseli Trust for Elephants (Annual Report 2023 www.elephanttrust.org). Given that the population spreads widely across the region and into Tanzania, the numbers are likely a reasonable reflection of animals in counting area. No new elephant carcasses were recorded on the count.

Giraffe

The 2023 count gave an estimated 1,284 giraffes, a sharp drop from the 6,600 to 6,800 recorded before the 2022-2023 drought. The extremely dry conditions during the 2023 count made counting giraffe far more difficult than during the rains. The post-drought figure of 4,400 suggests this was the case and not due to a heavy mortality. The current figure confirms giraffe numbers in the Amboseli region to have rebounded after a sharp decline due to poaching in the late 1990s and early 2000s.

Other species

Grants gazelle numbers at 6,700 were higher than the figure of 5,223 estimated in 2023, most likely due to better counting conditions in the rains than the dry condition of 2023. The number is well below the 10,000 to 12,000 recorded between 2018 and 2022 but well within the range recorded over the last 50 years.

Eland numbers at 91 were far below the peak of 2,600 to 4,300 recorded between 2009 and 2023. The low figure likely reflects the lack of animals moving into the lowlands from the Chyulu Hills and Kilimanjaro where the core populations reside most of the year.

Buffaloes in eastern Kajiado are now largely confined to the Amboseli Basin where regular aerial counts put the population at 400, down from 550 prior to the drought. The figure of 889 estimated on the May aerial count is therefore somewhat higher than the known population due to the small sampling size.

Estimated numbers of most other species are far lower than actual populations due to the difficulty of counting small discretely distributed species on aerial counts designed for large herbivores and livestock censuses. Two species are worth commenting on though, based on the long-term trends over the last five decades.

First, there has been a steady increase in warthog since a low point in the early 2000s. Second, there has been a very large increase in Thomson's gazelle ever since the drought of 2009. The increase in both species is largely due to the shorter more degraded pastures now prevailing in Amboseli due to heavy grazing (Western & Mose, 2021).

Conclusion

The May 2024 aerial counts show a strong but not yet full recovery of livestock after the 2022-2023 drought. Taking into account the poor counting conditions, wildlife estimates show drought losses of zebra and wildebeest in line with estimates from carcass counts. The populations survived the 2022-2023 drought in far healthier numbers than the 2009 drought, promising a recovery within three to five years barring any setbacks. ACP will continue to conduct regular counts of livestock and wildlife in Amboseli National Park and across the ecosystem to monitor the status of all large herbivore populations.

The regular ground counts ACP conducts in the dry season concentration area in and around Amboseli National Park give far better estimates of small and poorly detected species than aerial counts. We shall be summarizing counts conducted since 2009 shortly. Our intention is to expand the ground counts across the ecosystem to give more accurate and regular counts of all large herbivores. The ground counts directly engage community resource assessors.

Acknowledgements

We thank the DRSRS team and FTC for conducting the aerial survey despite weather challenges. We also acknowledge the ACP team, which includes Winfridah Kemunto, Immaculate Ombongi, Glen Paul, Kelvin Kiplagat, Peninah Minsari, Chricencia Odhach, Nicodemus Mwania, and Sakimba Kimiti, for their efforts in data preparation, along with funding from LCAOF and the European Union-MOSAIC project.

Reference

- Kimiti, K. S. (2023). *Post-drought perceptions of herders on livestock production in the Amboseli ecosystem: impacts, Coping strategies, and future sustainability*. <http://www.amboseliconservation.org/>
- Mose, V. N., & Western, D. (2015). Spatial cluster analysis for large herbivore distributions: Amboseli ecosystem, Kenya. *Ecological Informatics*, 30, 203–206.
- Western, D., & Mose, V. N. (2021). The changing role of natural and human agencies shaping the ecology of an African savanna ecosystem. *Ecosphere*, 12(6), e03536.

To cite this report:

Mose, Victor Nyaliki, and David Western. Rep. Amboseli Ecosystem Aerial Count Analysis. Nairobi: Amboseli Conservation Program-African Conservation Centre, 2024.