LEWA WILDLIFE CONSERVANCY

A UNESCO World Heritage Site inscribed in 2013

BORANA CONSERVANCY

A collage of some of the wildlife on the Lewa – Borana landscape

AERIAL AND GROUND WILDLIFE SURVEY ON LEWA - BORANA LANDSCAPE

2016

1.0 Introduction

The Lewa -Borana Landscape (LBL) hosts diverse range of wildlife species. Determining the status and performance of these species, together with the associated environmental and habitat conditions are important in managing wildlife populations. One of the methods of estimating populations of wildlife is through regular aerial and ground counts. On Lewa, counts have been completed since 1977. On Borana, counts have been undertaken since 1991. In the past, both properties have conducted their counts independently using different methods (apart from 2014 and 2015 when a combined systematic count was completed).

1.2 Methods

On Lewa, a combination of both aerial and ground counts are used simultaneously on an annual basis. The aerial count is completed on blocks inaccessible by road (Fig. 1), using a two seater Super Cub aircraft, flown at an average of 300 feet above ground level with 500-metre transect widths. Transects follow in an East – West and North – South direction, although they vary in some areas due to terrain, direction of wind and sun position. Conversely, areas counted from the ground use one vehicle per block, traversing all the roads on each and counting wildlife seen on the way.

During the March 2016 count, concerns were raised over the total number of buffalo, giraffe and Grevy's zebra encountered. Therefore, a repeat aerial count was carried out over the entire block focusing on these three indicator species. This was done five weeks after the main Lewa count.

On Borana, three different methods have been used to count wildlife: Since 1991, the field monitoring teams have been counting and reporting all wildlife seen in their respective blocks, from an elevated vantage point on a hill, on a daily basis. These sightings are correlated and an annual estimate of the population of each species is derived by averaging the daily sightings.

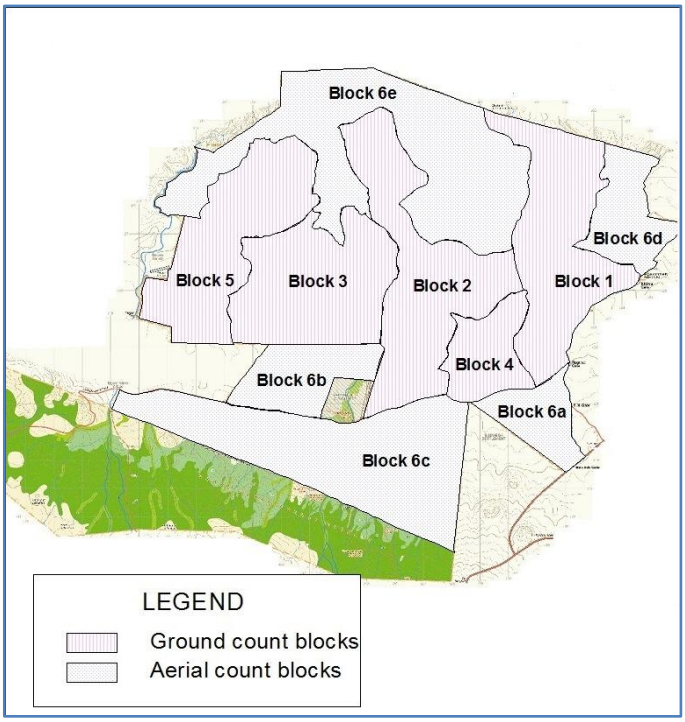

Figure 1: Map of Lewa showing the ground and aerial game counting blocks

In some of the years (2006, 2010, and 2016), a total aerial count on defined transect lines was undertaken and an estimate of the population of each species calculated. More recently (2014 and 2015), a systematic count that incorporated Borana, Lewa, Leparua and Il Ngwesi Group Ranch was initiated in an attempt to harmonize wildlife counts in the LBL area (Davidson *et al.,* 2014).

These three methods cannot be compared between each other, owing to inconsistent variability in observer bias and counting conditions. Therefore, where possible we will attempt to provide trends using averaged daily sightings of some of the large mammal species.

In future, the LRD will conduct systematic wildlife counts in the LBL area, using comparable and standardized methods drawn from the above, to provide comparable data.

1.3 Results and discussion

Results for the 2016 LBL wildlife survey are presented in Appendix 1. This is the first year that game count data from both properties is presented as one.

Over the LBL area, Lewa had the highest number of wildlife species counted compared to Borana. Livestock was not included in this survey. Plains zebra recorded the highest numbers (1,262) followed closely by buffalo (1,220) and then impala (1,113). A similar observation was made in 2014.

1.3.1 Borana game count

On Borana, from 1991 to 2016, using data averaged from the daily sighting reports, the annual estimates of the populations of species were highly variable. Some of the variability in these data may be due to the fact that Observation Points (OP) personnel are frequently rotated resulting in amplified observer bias.

Generally, all the populations in the area showed a decreasing trend. However, from 2011 to date, estimates of the populations between the years seem to have been less variable with most of the populations showing increasing trends (Appendix 2).

Note: A different report from Borana has been circulated highlighting game count figures from the aerial counts only.

1.3.2 Aerial and ground count on Lewa

Trends in population sizes over the last11 years are presented in Appendix 3.The populations that showed increasing trends had a corresponding high proportions of young (calves/foals/piglets) and juveniles thus enhancing the chances of recruitment into the adult age class. In addition, predation levels on these species have been lower than those with decreasing trends, as indicated by lion prey selectivity indices. These species include buffalo, Grants gazelle, impala, ostrich, warthog and waterbuck.

The section below presents the performance of indicator large-bodied mammal species counted on the LBL area. Where applicable, the status of these populations will be related with information derived from the monthly surveys of focal indicator species.

1.3.2.1Buffalo (*Syncerus caffer caffer*)

650 animals were counted on Lewa in the March 2016 game count, but a recount of this species gave a figure of 941 individuals. This represented a 33% population increase from the previous year.

Long-term trend on Lewa indicates an increasing population as supported by a strong R^2value (Fig. 2). Mortality levels in this population are low with six animals reported from January to June

2016.Jacob's Index (D) value (-0.5) calculated for this species indicate that they are not selected by lions, and in fact, may be generally avoided.

On Borana, the long-term trend averaged from daily sightings also indicates a slowly growing population (Fig.2) with a similarly positive R^2 value[1].

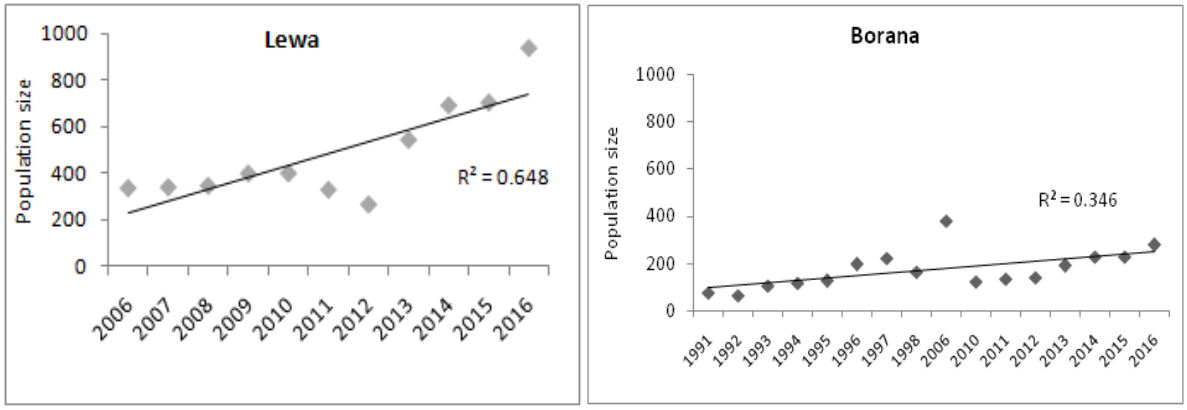

Figure 2: Trend in the population of buffalo on Lewa (2006 – 2016) and Borana (1991 – 2016).

[1]R^2 is simply the relationship between time and population size. The closer it is to 1 the more linear (stronger) the relationship is.

1.3.2.2 Plains zebra (*Equus burchelli*)

In total, 991 individuals were counted on Lewa in March 2016 compared to 836 in 2015, representing a 19% increase in population numbers. The long term trend on Lewa indicates a slowly decreasing population (Fig.3). The age structure of this population is significantly skewed towards adults (χ^2= 98.24, df = 2, p = 0.00001) (Fig.4). The proportion of juveniles and foals is 20% translating to low recruitment rate into adults and this could negatively affect the overall population numbers in the long term.

Jacob's selectivity index (D) shows that this species is the most highly selected by lion on Lewa. The number of mortality cases is high as well recording a total of 26 detected cases in 2016 resulting from predation, unknown or natural causes. This is the highest number recorded for any species.

On Borana, the total number counted was 437 compared to 478 in 2015. The long term trend shows a declining population. However, the population seems to have stabilized since 2010 (Fig.3).

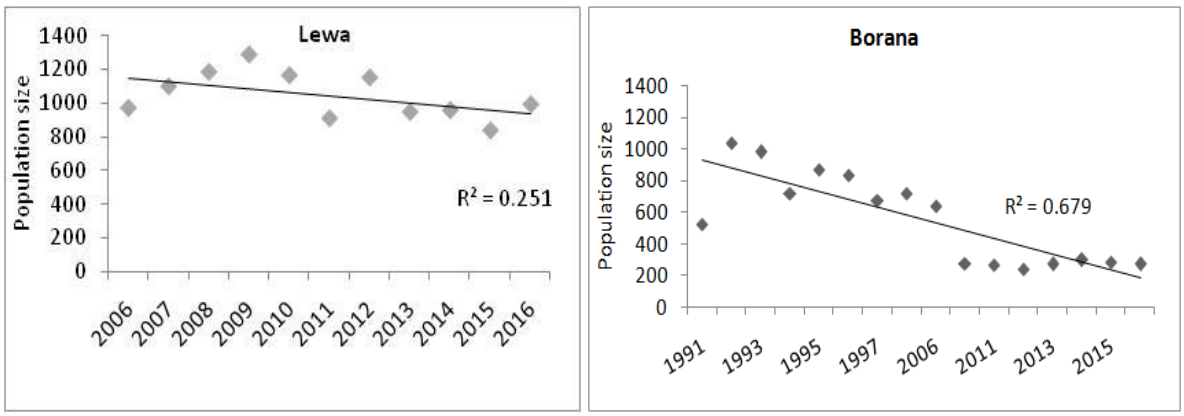

Figure 3: Plains zebra population trend on Lewa (2006 – 2016) and Borana (1991 – 2016)

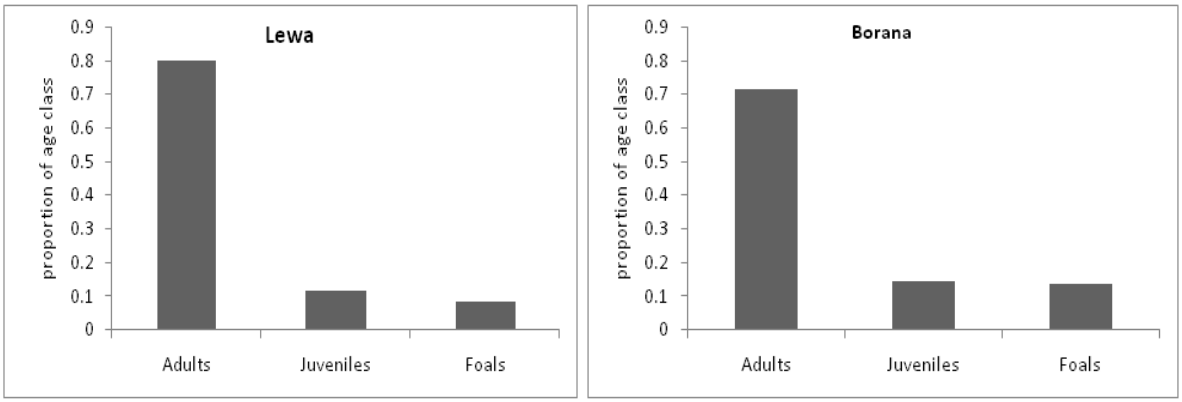

Figure 4: Proportional distribution of Plains zebra age classes on Lewa and Borana

1.3.2.3 Grevy's zebra (*Equus grevyi*)

Grevy's zebra continue to decline over the years (Fig.5). A total of 299 individuals were counted in the aerial count in 2016 compared to 325 in 2015. Similar to the Plains zebra, the sex structure of the Grevy's zebra is significantly skewed towards adults (χ^2 = 210.2, df = 2, p = 0.0001) (Fig. 6). This translates to low recruitment rate of foals to sub-adults, an indication that the population may not increase in numbers in the medium term. In addition, the adult sex ratio of male to female is 1:1 (Fig.7) and this may lead to low breeding rates. The species was predated by lion although the off-take was proportionate to its availability. There is no doubt that the decreasing trend is being measured by the consistent loss and lack of replacement in adults and sub-adults. This may suggest the near total loss of foals annually (see Q4 2015 for survival rates).Unless the survival rate of foals is raised, Lewas' population is likely to continue its downward trend. It should also be noted that this is not a unique situation and that many of the ungulates on Lewa are displaying similar characteristics.

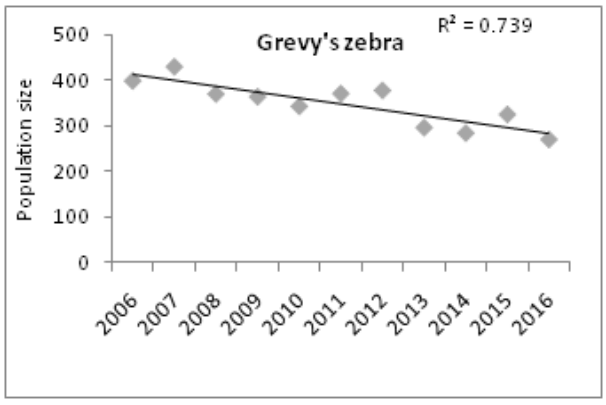

Figure 5*:* Grevy's zebra population trend on Lewa, 2006 – 2016Grevy's zebra age classes on Lewa

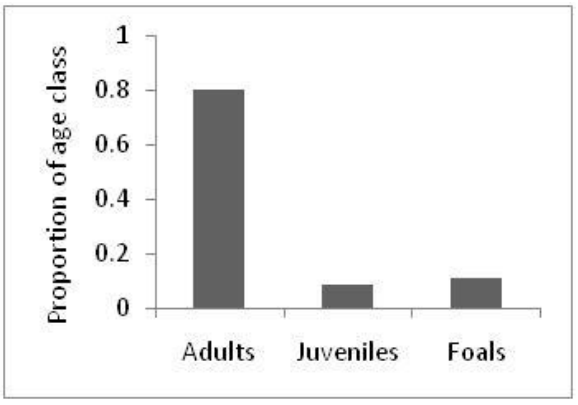

Figure 6: Proportional distribution of

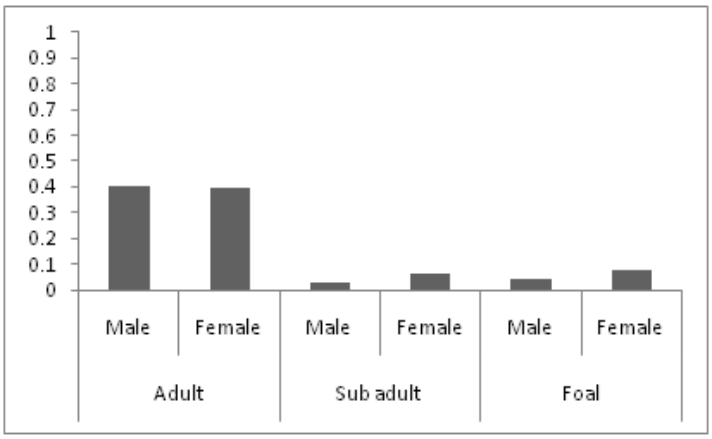

Figure7: Proportional distribution of Grevy's zebra sex structure on Lewa

1.3.2.4. Giraffe (*Giraffa camelopardalis reticulata).*

A total of 199 individuals were counted on Lewa during the aerial count in 2016 compared to 182 in 2015. The long-term trend indicates a slowly declining population (Fig. 8). This is underpinned by a population structure that is significantly adult heavy (χ^2 = 44.2632, df = 2, p = 0.0001), (Fig.9). Jacob's selectivity index (D) shows that this species was not selected by lion and the adult sex ratio is skewed towards females (Fig. 9). Therefore, the population has a potential to increase over time. However it is interesting to note that without the same predation pressure on the species, they are still in decline and demographically skewed as those species that are found to be selected by lion.

In Borana, the total number of giraffe counted was 74 up from 63 in 2015. However, the population trend shows a slowly decreasing population. The numbers have varied greatly over the years but the population seems to have stabilized since 2011 (Fig.8). The age structure is similar to Lewa. Therefore this population displays similar scenario across the LBL.

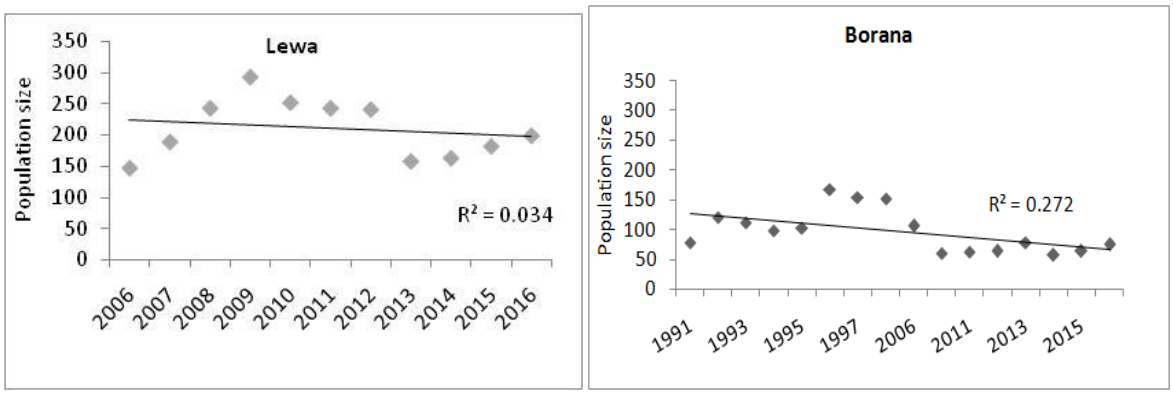

Figure 8*:* Giraffe population trend on Lewa (2006 – 2016) and Borana (1991 – 2016

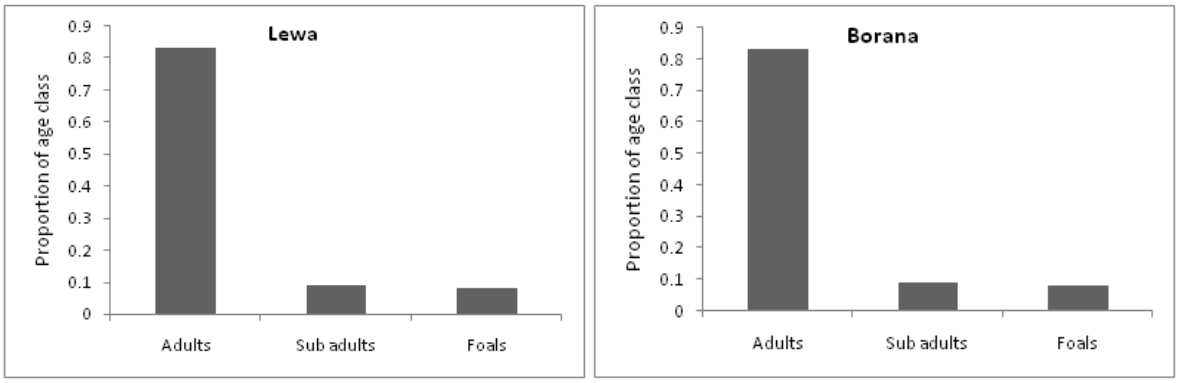

Figure9*:* Proportional distribution of giraffe age structure on Lewa and Borana.

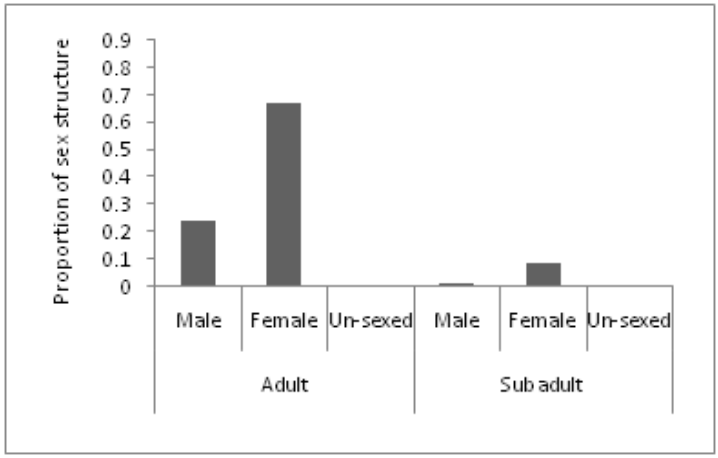

Figure 10: Proportional distribution of giraffe sex structure on Lewa

1.3.2.5 Warthog (*Pacocherus africanus*)

On Lewa, 68 individuals were counted in 2016 compared to 48 in 2015. This represents a 42% increase in population numbers. The long-term trend indicates a decreasing population. However, from 2012 to date, the medium-term trend indicates a recovering population. A similar trend is observed on the Borana population although no estimates were provided for 2016 and this may have been a counting error (Fig.11).

The Lewa population is supported by a strong growth potential reflected in the age structure, with high proportions of piglets and juveniles throughout the year (LRD, 2015).One of the strongholds of warthog is the area around Lewa HQ. Before 2012, this area used to be a core ranging area of two lionesses that were orphaned aged nine months, and had specialized in hunting this species. The two females have since grown and moved on to a different ranging area on Lewa, where they have possibly altered their prey selectivity.

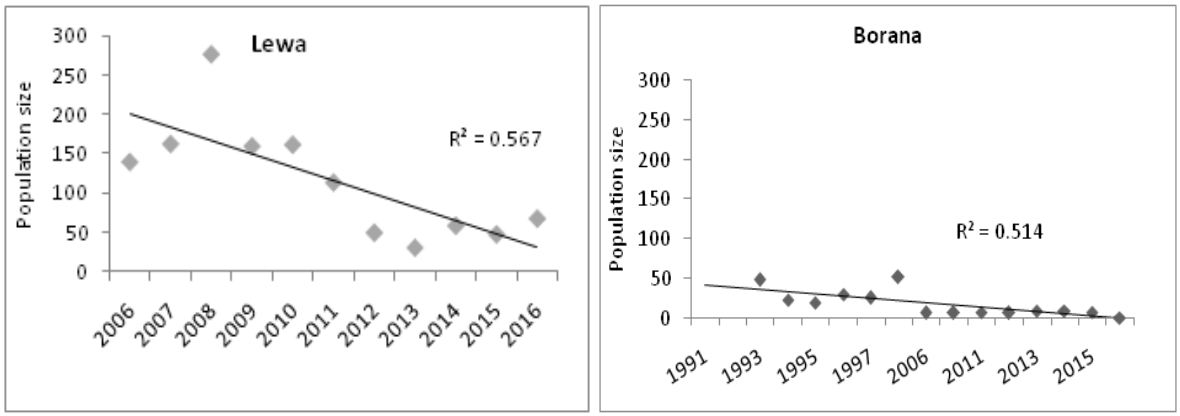

Figure11: Trend in the population of warthog on Lewa, 2006 – 2016 and Borana1991 – 2016

1.3.2.6 Deffasa waterbuck (*Kobus ellipsiprymnus*)

On Lewa, 117 individuals were counted in the March 2016 game count, 25 up from 92 in 2015.The long-term trend indicates a declining population (Fig. 12) although this seems to have stabilized due to low predation as suggested by Jacob's Index (D) since 2012.

On Borana, an average of 19 animals was counted in 2016 compared to 43 in 2015.From 1991 – 2010, the long-term trend indicates a declining population. However, from 2012, the trend indicates an increasing population (Fig. 12). In 2016, there appears to have been another decline and we are unable to ascertain whether this is actually a decrease or owing to counting error. This will be monitored for the next quarter to provide a short-term average for confirmation.

Data on the population structure for this population is not available on both Lewa and Borana at this time. To further understand the population dynamics of waterbuck on the LBL area, the department plans to enhance monitoring of this species when capacity allows.

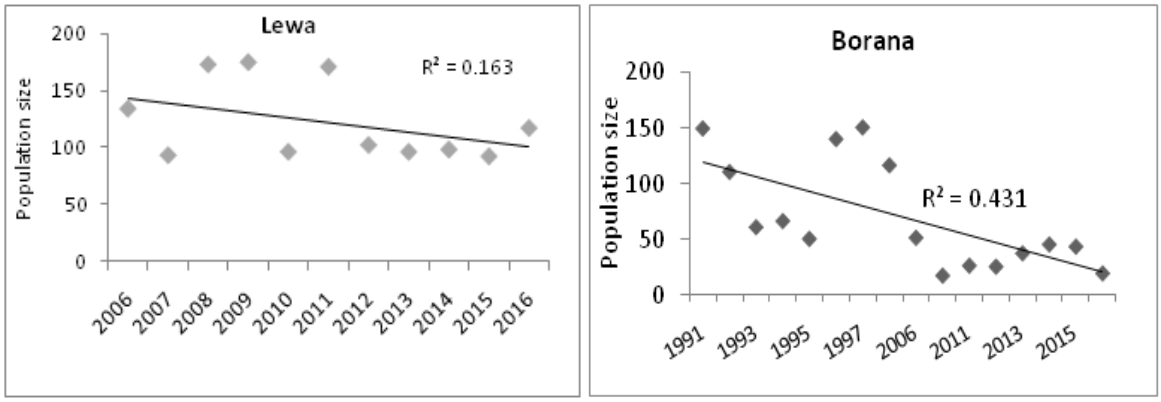

Figure 12: Trend in the population of waterbuck on Lewa, 2006 – 2016 and Borana, 1991 - 2016

1.4 Conclusion and recommendations

Overall, most of the populations of wildlife on LBL have showed either a stable or a declining trend. On the other hand, the population of wildlife on Borana seem to have reduced in numbers until 2010. However, these populations seem to have either stabilised or have been increasing in numbers since 2011. These trends will continue to be investigated in combination with the contributing environmental variables.

We highly recommend harmonisation of wildlife counting techniques to develop similar status and trends of wildlife. We also recommend that in future, targeted recounts of species be conducted a day after the main count.

Appendix 1: Combined game count figures on LBL, 2016

SPECIES	2016
Beisa Oryx	179
Black Rhino	81
Buffalo	1220
Bush Buck	15
Cheetah	8
Eland	280
Elephant	416
Gerunuk	10
Giraffe	273
Grants Gazelle	348
Greater Kudu	28
Hartebeest	30
Impala	1113
Klipspringer	8
Leopard	7
Lion	34
Ostrich	51
Thompson Gazelle	27
Warthog	68
Waterbuck	136
White Rhino	70
Zebra Burchells	1262
Zebra Grevy's	299

Appendix 2: Game count figures on Borana, 1991 – 2016 (based on averaged daily sightings)

SPECIES	1991	1992	1993	1994	1995	1996	1997	1998	2006	2010	2011	2012	2013	2014	2015	2016
Beisa oryx	38	112	83	78	47	101.5	88	111	70	30	25	19	26	29	33	41
Black rhino										0	0	0	21	21	20	20
Buffalo	78	66	105	118	127	196.5	222	165	380	122	133	141	190	229	228	279
Bush buck	20	18	13	9	6	8				0	1	1	0	1	3	0
Cheetah				2	1	2			3	0	0	1	0	0	0	0
Eland	105	257	261	212	176	203.5	185	372	104	37	34	51	53	60	59	107
Elephant		35	84		27	91.5	9	29	67	60	59	105	85	106	94	229
Gerunuk										1	1	1	0	1	2	0
Giraffe	77	120	111	98	102	166.5	153	151	105	60	61	63	78	56	63	74
Grants gazelle	88	140	110	83	94	93.5	109	55	74	12	14	16	30	30	26	26
Greater kudu	48	36	37	27	32	40	32	1	18	5	5	8	9	9	11	7
Hartebeeste	18	43	30	35	22	23	27	43	11	4	6	5	8	10	12	10
Impala	77	217	183	305	206	176	415	166	311	115	161	198	190	165	174	233
Leopard	4	7	8	7	5	6			6	0	0	0	0	9	0	0
Lion		6	3	9	5	7.5	5		20	2	10	8	3	3	2	0
Ostrich							14	14	0							0
Thompson gazelle										0	2	1	0	0	0	27
Warthog			48	22	19	30	25	51	6	6	7	6	9	9	7	0
Waterbuck	149	110	61	66	50	139.5	150	116	51	17	26	25	37	45	43	19
White rhino										0	0	0	0	0	2	
Zebra, burchell	524	1036	979	718	867	831	675	714	635	276	265	241	271	297	284	271
Zebra, Grevys						1	2		1	0	0	0	0	0	0	0

Appendix 3: Game count figures on Lewa, 2000 – 2016

Game count figures on Lewa: 2000 - 2016

SPECIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Beisa Oryx	126	84	86	62	85	49	69	91	115	65	76	72	76	74	102	140	138
Buffalo	238	125	161	203	233	255	339	343	349	402	403	332	269	547	695	707	941
Bush buck	0	0	0	>20	>20	>20	>20	>20	>20	>20	>20	>20	20	20	15	15	15
Cheetah	4	21	10	7	8	8	8	5	6	6	5	11	12	7	12	5	8
Eland	228	151	121	108	137	214	169	248	255	218	165	123	95	162	204	207	173
Elephant	193	150	28	157	216	297	392	256	177	211	207	184	297	166	151	150	187
Gerenuk	4	17	15	11	7	11	11	~10	~10	~10	~10	9	7	6	7	12	10
Giraffe	237	236	245	215	177	173	147	189	243	293	252	243	241	158	163	182	199
Grants gazelle	132	162	192	167	261	258	320	362	452	376	371	378	386	292	337	288	322
Greater kudu	13	38	37	33	36	>20	>20	>20	12	17	16	24	3	8	28	26	21
Hippo	0	1**	2**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Hartebeest	28	9	7	4	2	2	2	2	2	24	5	7	5	10	12	11	20
Impala	733	627	749	760	679	836	739	829	922	1029	1227	953	895	563	1021	814	880
Jackal (Silver backed)	0	0	0	>15	>12	>12	>12	>12	>12	>12	>12	>12	8	3	9	9	9
Klipsringer	>8	>8	>8	>8	>6	>8	>8	>8	>8	>8	>8	>10	2	6	8	8	8
Leopard	0	1	7	>8	>8	8	8	>8	8	8	8	10	12	6	8	7	7
Lion	0	8	20	18	28	24	16	12	12	16	19	17	21	23	22	26	17
Ostrich	84	119	98	65	68	48	36	48	74	44	50	**20**	41	26	37	43	51
Rhino, black	26	29	29	32	36	40	48	53	55	64	65	62	71	69	67	72	61*
Rhino, white	32	30	31	32	32	39	36*	36	38	45	46	53	58	56	63	65	70
Sitatunga	12	21	21	16	16	14	14	<10	<10	<10	<10	2	1	0	0	0	0
Warthog	304	88	194	136	129	170	140	163	277	160	162	114	50	31	59	48	68
Waterbuck	474	149	170	64*	52	116	134	93	173	175	96	171	102	96	98	92	117
Zebra, burchell	1467	1264	1039*	1025	1102	1094	970	1098	1184	1288	1164***	908	1151	946	956	836	991
Zebra, Grevy's	497	556	487	462*	435	448	399	430	370	364**	343***	371****	378	296	284	325	299