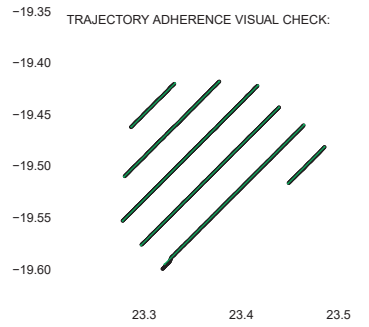
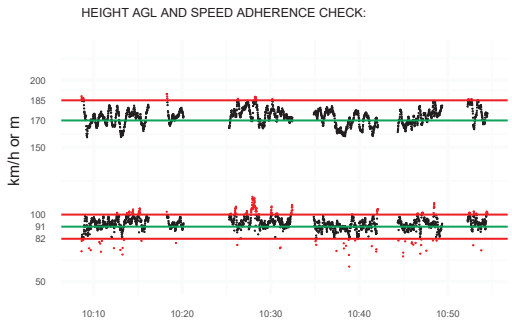
NG31 – NG 31 BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220930A





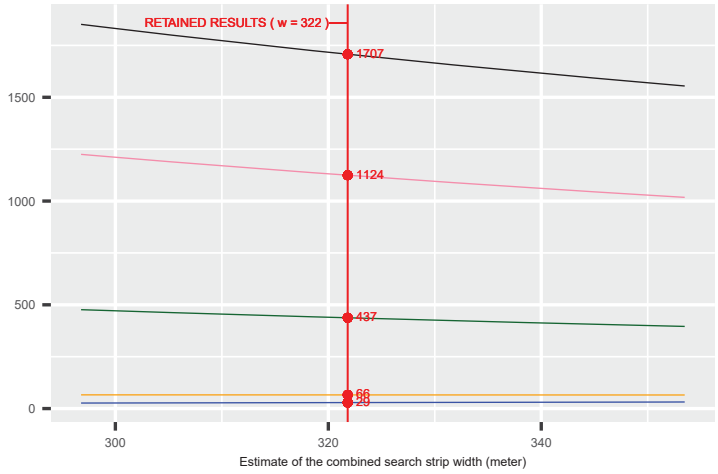
SPEED
Average: 172.6 km/h
Standard dev.: 6 km/h

HEIGHT AGL
Average: 93.1 m (305.5 ft)
Standard dev.: 5.3 m (17.5 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [156 – 179]
C02 – Right: [136 – 188]



LIVE ELEPHANT ESTIMATE: [1851 – 1554]
CONFIDENCE INTERVAL: ± [1225 – 1018]
SAMPLE AREA: [27 – 32] sqkm
SE: [477 – 396]
PRP: [66 – 65] %

NG31 – NG 31 BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NG31 **N:** 57 S_a^2: 5,548
STRATUM NAME: NG 31 **w:** 322 **df:** 5

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	23	0	228	340	0,796	17536	132,42	0	569	149	37,767	3,151
buffalo	Syncerus caffer	15	0	149	219	0,519	7226	85,01	0	367	147	19,900	6,213
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	37	18	367	313	1,281	14854	121,88	54	681	85	29,767	3,181
elephant family	Loxodonta africana family	135	187	1340	989	4,673	148070	384,80	351	2329	74	537,100	37,667
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	3	0	30	40	0,104	248	15,74	0	70	136	0,700	1,193
giraffe	Giraffa giraffa	6	0	60	88	0,208	1183	34,39	0	148	148	1,600	-1,459
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	14	4	139	155	0,485	3653	60,44	0	294	112	11,467	5,380
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	131	0	1300	671	4,535	68148	261,05	629	1971	52	287,767	28,770
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	3	0	30	66	0,104	654	25,57	0	96	221	1,500	0,998
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	104	1	1032	1291	3,600	252390	502,38	0	2324	125	615,867	23,030
reedbuck	Redunca arundinum	5	0	50	70	0,173	731	27,04	0	119	140	1,767	1,215
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	7	0	69	151	0,242	3437	58,62	0	220	217	8,167	2,859
warthog	Phacochoerus africanus	13	0	129	124	0,450	2319	48,15	5	253	96	3,767	0,105
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	15	0	149	241	0,519	8814	93,88	0	390	162	15,100	-1,571
zebra	Equus spp,	38	0	377	494	1,315	36969	192,27	0	871	131	106,267	14,982
all elephants	Loxodonta africana all	172	205	1707	1124	5,954	191352	437,44	583	2832	66	685,467	40,849
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	3	0	30	40	0,104	248	15,74	0	70	136	0,700	1,193
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	3	0	30	40	0,104	248	15,74	0	70	136	0,700	1,193

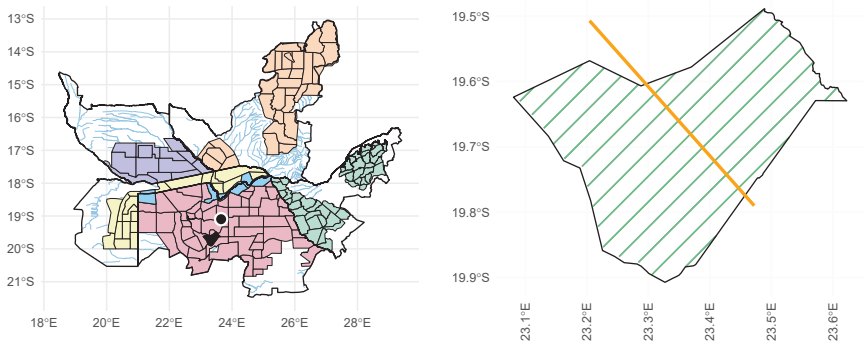
NG32 – NG 32 BOTSWANA – NORTHERN BOTSWANA

SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NG32
STRATUM NAME: NG 32
■ STRATUM AREA: 1232.68 sqkm
• SURVEY BASE: Khwai
DISTANCE TO SURVEY BASE: 75 km

– TRANSECTS: 14 (408 km)
TRANSECT ORIENTATION: 46.6°
PLANNED SAMPLING INTENSITY: 9.9 %

– BASELINE DISTANCE: 42.06 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.6 h
Crew(s): C02
KES2022_V5LJB20220930A 06:34–11:12

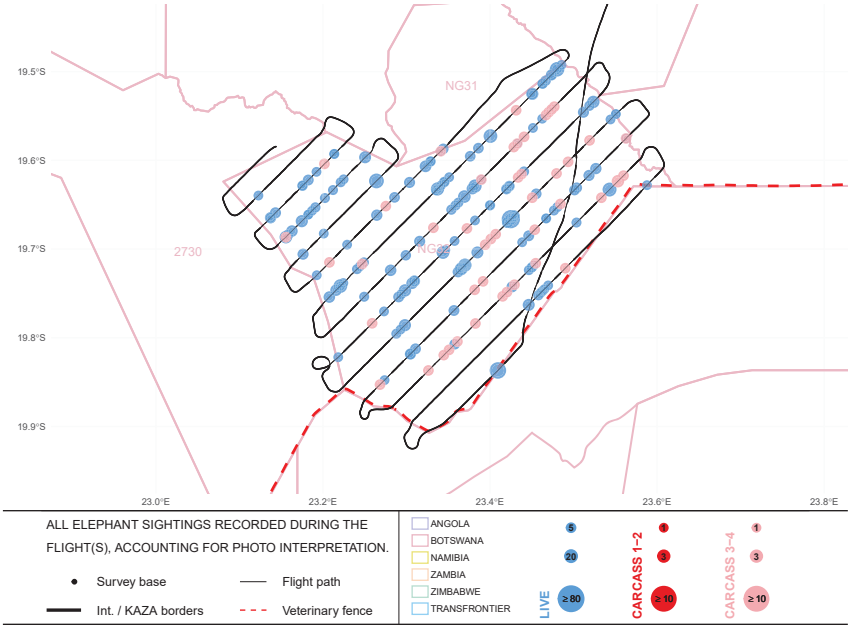
Actual sampling intensity: 10.6 %
Transect flying time: 2.4 h
Transects: 14 – 408 km – 46.6°
Search effort: 1.08 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	49	51
% individuals:	51	49

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	275	0	
Live elephant (>9):	8	0	
Elephant carcass:	37	0	
Live elephant (<10):	67	0	





LIVE ELEPHANTS

IN SAMPLE:	**355 (75)**
Bulls:	83 (36)
Family:	272 (39)
NOT IN SAMPLE:	**513 (88)**
Outside search strip:	513
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**37 (37)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	36 (36)
NOT IN SAMPLE:	**10 (9)**
Outside search strip:	10
Off transect:	0

OTHER SPECIES

Other wildlife species:	17
Other wildlife count:	1988
Domestic count:	27

ELEPHANT DATA ANALYSIS

t = 2.16, N = 131, w = 321

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3346	3346	349	349
Variance of estimate	$Var\hat{Y}$	407643	407643	5951	5951
Standard error	$SE\hat{Y}$	638	638	77	77
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 1379	± 1379	± 167	± 167
Percentage of relative precision	$PRP_{\hat{Y}}$	41 %	41 %	48 %	48 %
Density per sqkm	$R_{\hat{Y}}$	2.714	2.714	0.283	0.283
Variance between transect counts	s_y^2	545.786	545.786	10.093	10.093
Variance between transect areas	s_a^2	27.886	27.886	27.886	27.886
Covariance between counts & areas	s_{ay}	70.048	70.048	12.211	12.211

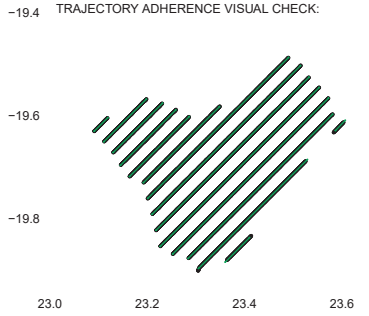
CARCASS RATIOS

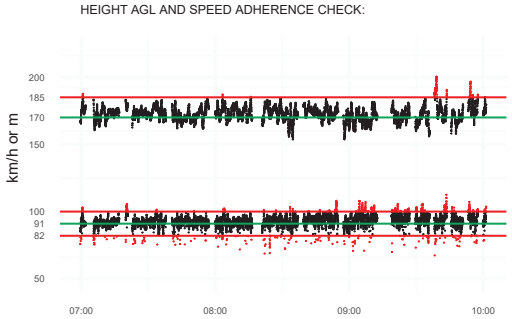
$CR_{1:4}$ = 9.4 %
$CR_{1:2}$ = 0 %

NG32 – NG 32 BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220930A





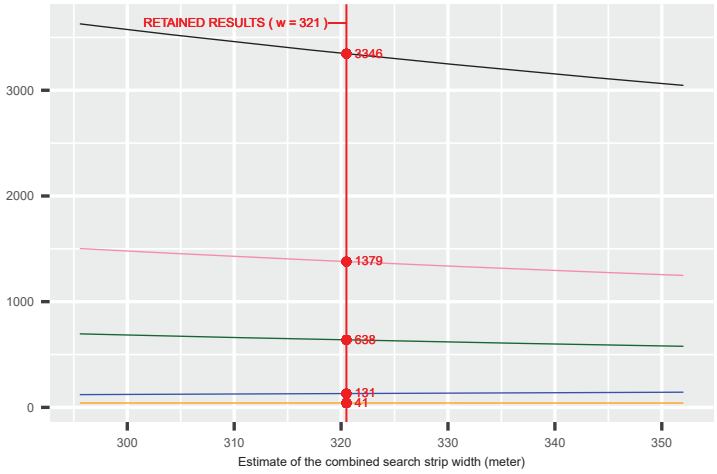
SPEED
Average: 172.7 km/h
Standard dev.: 5.4 km/h

HEIGHT AGL
Average: 92.7 m (304.3 ft)
Standard dev.: 4.3 m (14.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [156 – 178]
C02 – Right: [135 – 187]



LIVE ELEPHANT ESTIMATE: [3628 – 3046]
CONFIDENCE INTERVAL: ± [1503 – 1248]
SAMPLE AREA: [121 – 144] sqkm
SE: [696 – 578]
PRP: [41 – 41] %

NG32 – NG 32 BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NG32 **N:** 131 S_a^2: 27,886
STRATUM NAME: NG 32 **w:** 321 **df:** 13

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	89	0	839	762	0,681	124366	352,66	77	1601	91	116,093	11,630
buffalo	Syncerus caffer	90	0	848	612	0,688	80302	283,38	236	1460	72	92,571	23,758
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	26	0	245	531	0,199	60374	245,71	0	776	217	48,286	-13,971
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	83	90	782	638	0,635	87245	295,37	144	1420	82	61,918	-4,923
elephant family	Loxodonta africana family	272	423	2564	1341	2,080	385062	620,53	1223	3904	52	541,648	74,971
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	9	18	0,008	73	8,54	0	28	196	0,071	0,439
elephant carcass four	Loxodonta africana carcass four	36	10	339	167	0,275	5971	77,27	172	506	49	9,802	11,773
giraffe	Giraffa giraffa	60	7	566	344	0,459	25353	159,23	222	910	61	34,374	18,713
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	82	0	773	460	0,627	45321	212,89	313	1233	60	57,055	21,351
horse	Equus caballus	1	0	9	19	0,008	73	8,57	0	28	196	0,071	0,411
impala	Aepyceros melampus	609	0	5740	3117	4,656	2081646	1442,79	2623	8857	54	3361,346	222,443
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	29	0	273	254	0,222	13778	117,38	20	527	93	16,379	11,751
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	7	0	66	47	0,054	474	21,78	19	113	71	0,577	2,102
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	351	4	3308	1730	2,684	641613	801,01	1578	5039	52	520,533	25,615
reedbuck	Redunca arundinum	15	0	141	102	0,115	2218	47,10	40	243	72	2,379	3,172
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	35	1	330	299	0,268	19104	138,22	31	628	91	20,115	8,831
warthog	Phacochoerus africanus	61	2	575	288	0,466	17733	133,17	287	863	50	24,247	15,196
waterbuck	Kobus ellipsiprymnus	70	1	660	697	0,535	104173	322,76	0	1357	106	107,385	19,217
wildebeest	Connochaetes taurinus	99	0	933	564	0,757	68045	260,86	370	1497	60	91,918	30,366
zebra	Equus spp,	346	4	3261	1413	2,646	427895	654,14	1848	4674	43	431,912	44,921
all elephants	Loxodonta africana all	355	513	3346	1379	2,714	407643	638,47	1967	4725	41	545,786	70,048
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	37	10	349	167	0,283	5951	77,14	182	515	48	10,093	12,211
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	37	10	349	167	0,283	5951	77,14	182	515	48	10,093	12,211

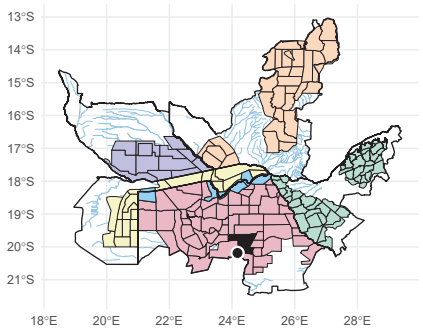
NG40 – NG 40 BOTSWANA – NORTHERN BOTSWANA

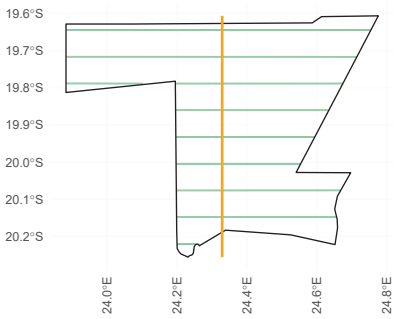
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NG40
STRATUM NAME: NG 40
■ STRATUM AREA: 3732.12 sqkm
• SURVEY BASE: Matopi
DISTANCE TO SURVEY BASE: 38 km

– TRANSECTS: 9 (479 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 3.9 %

– BASELINE DISTANCE: 71.85 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4 h
Crew(s): C02
KES2022_V5LJB20220917A 06:56–10:54

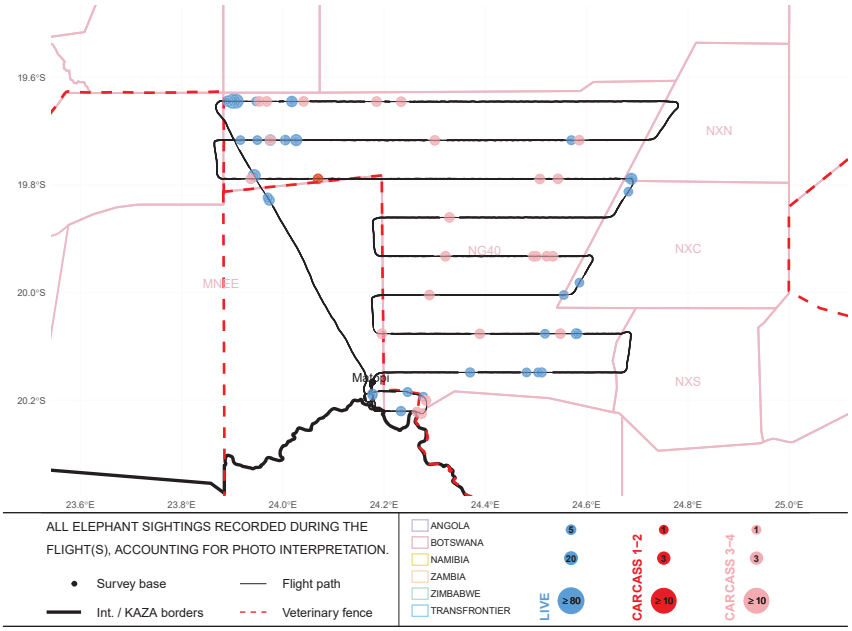
Actual sampling intensity: 4.1 %
Transect flying time: 2.8 h
Transects: 9 – 479 km – 90°
Search effort: 1.08 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	62	38
% individuals:	62	38

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	42	38.1	6.25
Live elephant (>9):	1	0	
Elephant carcass:	19	68.42	0
Live elephant (<10):	5	60	33.33



LIVE ELEPHANTS



IN SAMPLE:	**22 (6)**
Bulls:	5 (4)
Family:	17 (2)
NOT IN SAMPLE:	**160 (28)**
Outside search strip:	100
Off transect:	60

ELEPHANT CARCASSES



IN SAMPLE:	**19 (19)**
Category 1:	1 (1)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	18 (18)
NOT IN SAMPLE:	**6 (6)**
Outside search strip:	2
Off transect:	4

OTHER SPECIES

Other wildlife species:	9
Other wildlife count:	71
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.306, N = 222, w = 323

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	506	531	458	458
Variance of estimate	$Var\hat{Y}$	64520	68915	11425	11425
Standard error	$SE\hat{Y}$	254	263	107	107
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 586	± 605	± 246	± 246
Percentage of relative precision	$PRP_{\hat{Y}}$	116 %	114 %	54 %	54 %
Density per sqkm	$R_{\hat{Y}}$	0.136	0.142	0.123	0.123
Variance between transect counts	s_y^2	15.75	17.028	2.611	2.611
Variance between transect areas	s_a^2	93.806	93.806	93.806	93.806
Covariance between counts & areas	s_{ay}	19.323	20.601	7.57	7.57

CARCASS RATIOS

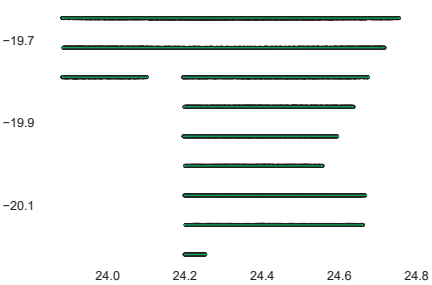
$CR_{1:4} = 46.3$ %
$CR_{1:2} = 4.3$ %

NG40 – NG 40 BOTSWANA – NORTHERN BOTSWANA

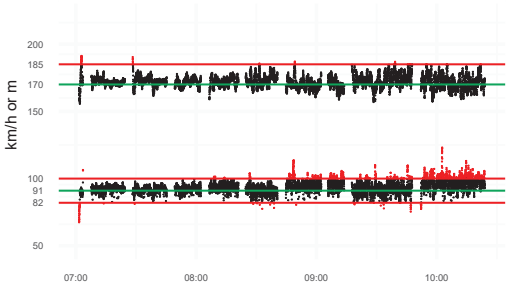
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220917A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



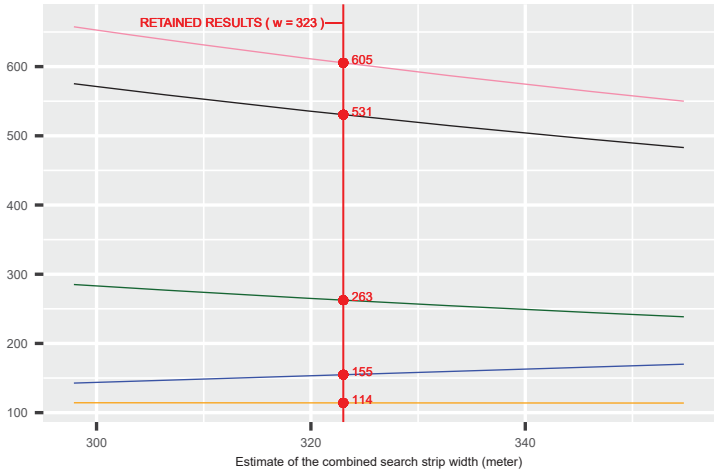
SPEED
Average: 172 km/h
Standard dev.: 4.5 km/h

HEIGHT AGL
Average: 93.5 m (306.7 ft)
Standard dev.: 4.3 m (14.3 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [157 – 180]
C02 – Right: [136 – 188]



LIVE ELEPHANT ESTIMATE: [575 – 483]
CONFIDENCE INTERVAL: ± [658 – 550]
SAMPLE AREA: [143 – 170] sqkm
SE: [285 – 239]
PRP: [114 – 114] %

NG40 – NG 40 BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NG40 **N:** 222 S_a^2: 93,806
STRATUM NAME: NG 40 **w:** 323 **df:** 8

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	24	53	0,006	520	22,80	0	77	218	0,111	1,277
eland	Tragelaphus oryx	19	10	458	996	0,123	186604	431,98	0	1454	217	40,111	25,024
elephant bulls	Loxodonta africana males	5	46	121	142	0,032	3815	61,76	0	263	118	0,528	-1,511
elephant family	Loxodonta africana family	17	114	410	553	0,110	57411	239,61	0	962	135	14,611	22,112
elephant carcass one	Loxodonta africana carcass one	1	0	24	60	0,006	688	26,23	0	85	251	0,111	-1,197
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	18	5	434	236	0,116	10441	102,18	198	670	54	2,750	8,767
giraffe	Giraffa giraffa	19	36	458	457	0,123	39218	198,04	2	915	100	6,361	1,381
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	5	1	121	262	0,032	12923	113,68	0	383	217	2,778	6,585
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	8	7	193	421	0,052	33256	182,36	0	613	218	7,111	10,219
ostrich	Struthio camelus	1	1	24	58	0,006	623	24,96	0	82	239	0,111	-0,236
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	8	11	193	410	0,052	31545	177,61	0	602	212	7,111	13,356
all elephants	Loxodonta africana all	22	160	531	605	0,142	68915	262,52	0	1136	114	17,028	20,601
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	24	60	0,006	688	26,23	0	85	251	0,111	-1,197
all elephant carcasses	Loxodonta africana carcass all	19	6	458	246	0,123	11425	106,89	212	705	54	2,611	7,570
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	18	6	434	236	0,116	10441	102,18	198	670	54	2,750	8,767

NGWN – Ngwasha North

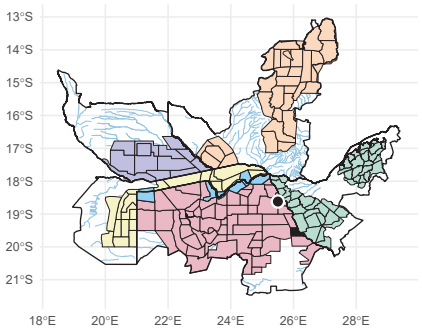
BOTSWANA – NORTHERN BOTSWANA

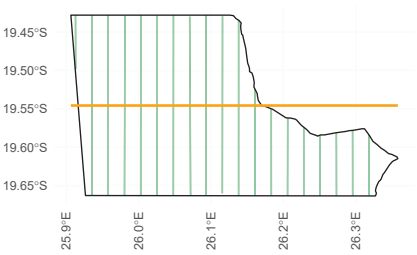
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NGWN
STRATUM NAME: Ngwasha North
■ STRATUM AREA: 841.91 sqkm
• SURVEY BASE: Pandamatenga
DISTANCE TO SURVEY BASE: 117 km

– TRANSECTS: 19 (353 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 12.6 %

– BASELINE DISTANCE: 47.42 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C03
KES2022_V5WOT20220913A 06:28–10:50

Actual sampling intensity: 13.1 %
Transect flying time: 2.1 h
Transects: 19 – 353 km – 0°
Search effort: 1.13 min/sqkm

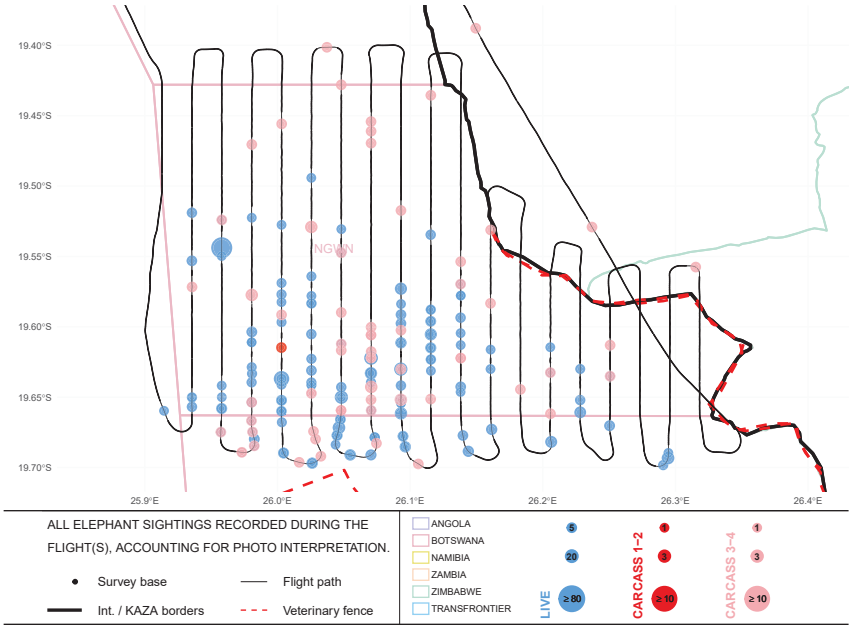
OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	50	50
% individuals:	56	44

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	154	12.99	0
Live elephant (>9):	2	0	
Elephant carcass:	29	44.83	23.08
Live elephant (<10):	48	16.67	0

Undetected live elephant: 1
Undetected elephant carcass: 0





LIVE ELEPHANTS

IN SAMPLE:	**170 (51)**
Bulls:	46 (31)
Family:	124 (20)
NOT IN SAMPLE:	**650 (122)**
Outside search strip:	295
Off transect:	355



ELEPHANT CARCASSES

IN SAMPLE:	**29 (29)**
Category 1:	0 (0)
Category 2:	1 (1)
Category 3:	18 (18)
Category 4:	10 (10)
NOT IN SAMPLE:	**43 (42)**
Outside search strip:	23
Off transect:	20

OTHER SPECIES

Other wildlife species:	7
Other wildlife count:	74
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.101, N = 151, w = 313

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	1263	1294	213	221
Variance of estimate	$\mathrm{Var}\hat{Y}$	103011	102308	2004	2031
Standard error	$\mathrm{SE}\hat{Y}$	321	320	45	45
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 674	± 672	± 94	± 95
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	53 %	52 %	44 %	43 %
Density per sqkm	$R_{\hat{Y}}$	1.501	1.537	0.253	0.262
Variance between transect counts	s_y^2	131.427	132.83	2.819	2.93
Variance between transect areas	s_a^2	6.532	6.532	6.532	6.532
Covariance between counts & areas	s_{ay}	16.203	16.728	2.647	2.778

CARCASS RATIOS

$CR_{1:4} = 14.6\ \%$
$CR_{1:2} = 0.6\ \%$

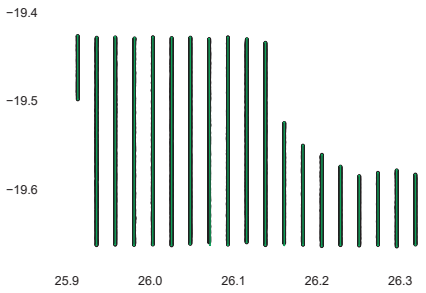
NGWN – Ngwasha North

BOTSWANA – NORTHERN BOTSWANA

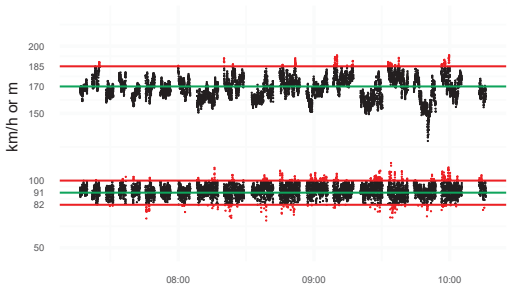
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20220913A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



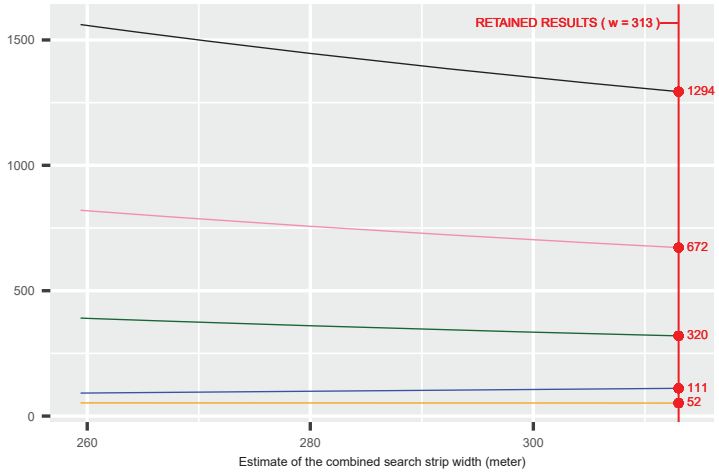
SPEED
Average: 168.7 km/h
Standard dev.: 8.1 km/h

HEIGHT AGL
Average: 92.1 m (302.3 ft)
Standard dev.: 4.5 m (14.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C03 – Left: [103 – 156]
C03 – Right: [145 – 173]



LIVE ELEPHANT ESTIMATE: [1561 – 1294]
CONFIDENCE INTERVAL: ± [821 – 672]
SAMPLE AREA: [92 – 111] sqkm
SE: [391 – 320]
PRP: [53 – 52] %

NGWN – Ngwasha North — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NGWN **N:** 151 S_a^2: 6,532
STRATUM NAME: Ngwasha North **w:** 313 **df:** 18

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	4	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	15	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	6	0	46	34	0,054	260	16,12	12	80	74	0,228	0,013
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	46	228	350	148	0,416	4955	70,39	202	498	42	7,368	4,578
elephant family	Loxodonta africana family	124	422	944	622	1,121	87695	296,13	322	1566	66	102,041	12,150
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	1	0	8	15	0,009	54	7,32	0	23	202	0,053	0,134
elephant carcass three	Loxodonta africana carcass three	18	29	137	70	0,163	1103	33,20	67	207	51	1,497	1,925
elephant carcass four	Loxodonta africana carcass four	10	14	76	54	0,090	667	25,82	22	130	71	0,708	0,719
giraffe	Giraffa giraffa	39	34	297	270	0,353	16540	128,61	27	567	91	16,164	1,872
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	27	0	206	269	0,244	16345	127,85	0	474	131	16,702	3,317
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	3	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	170	650	1294	672	1,537	102308	319,86	622	1966	52	132,830	16,728
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	8	15	0,009	54	7,32	0	23	202	0,053	0,134
all elephant carcasses	Loxodonta africana carcass all	29	43	221	95	0,262	2031	45,06	126	315	43	2,930	2,778
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	28	43	213	94	0,253	2006	44,79	119	307	44	2,819	2,644

NGWS – Ngwasha South

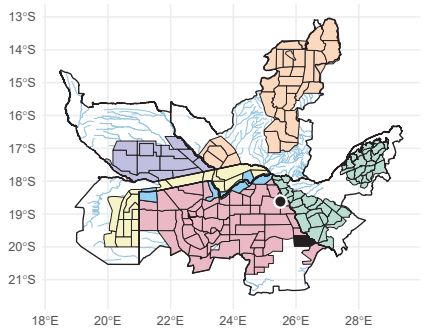
BOTSWANA – NORTHERN BOTSWANA

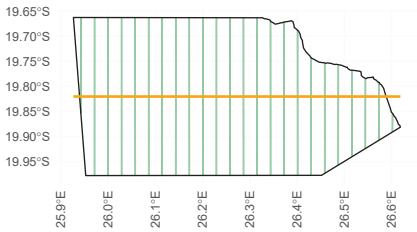
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NGWS
STRATUM NAME: Ngwasha South
■ STRATUM AREA: 2095.62 sqkm
• SURVEY BASE: Pandamatenga
DISTANCE TO SURVEY BASE: 156 km

– TRANSECTS: 24 (703 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 10.1 %

– BASELINE DISTANCE: 72.54 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 8.1 h
Crew(s): C01, C03
KES2022_V5WOT20220912A 06:08–09:52
KES2022_V5IIM20220912A 06:13–10:35

Actual sampling intensity: 10.6 %
Transect flying time: 4.2 h
Transects: 24 – 703 km – 0°
Search effort: 1.12 min/sqkm

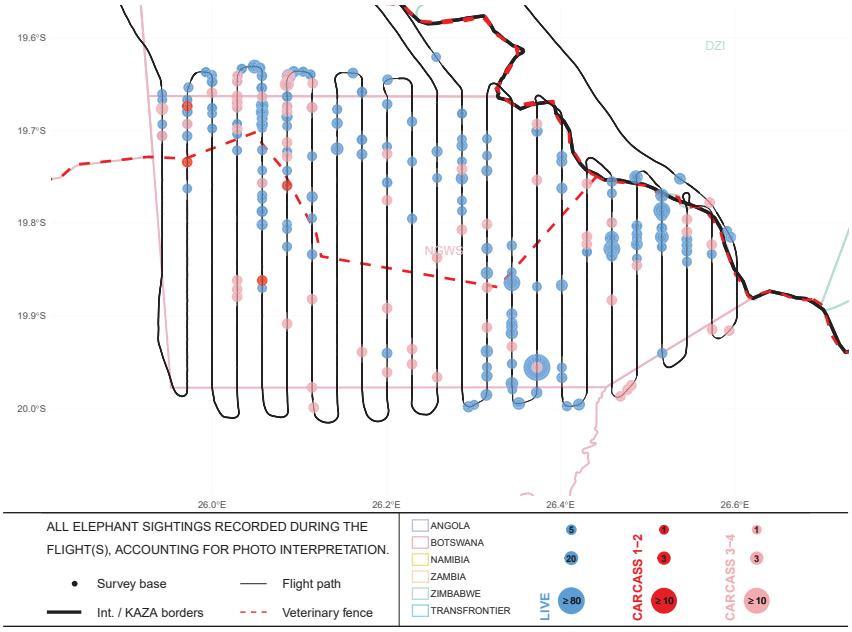
OBSERVER CONTRIBUTION

Crew(s):	C03		C01	
Side:	L	R	L	R
% sightings:	43	57	44	56
% individuals:	40	60	43	57

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	215	33.49	15.28
Live elephant (>9):	8	37.5	0
Elephant carcass:	45	60	18.52
Live elephant (<10):	83	50.6	19.05

Undetected live elephant: 1
Undetected elephant carcass: 1



LIVE ELEPHANTS



IN SAMPLE:	**383 (92)**
Bulls:	93 (53)
Family:	290 (39)
NOT IN SAMPLE:	**901 (161)**
Outside search strip:	515
Off transect:	386

ELEPHANT CARCASSES



IN SAMPLE:	**47 (46)**
Category 1:	0 (0)
Category 2:	2 (2)
Category 3:	22 (22)
Category 4:	23 (22)
NOT IN SAMPLE:	**24 (21)**
Outside search strip:	7
Off transect:	17

OTHER SPECIES

Other wildlife species:	11
Other wildlife count:	101
Domestic count:	260

ELEPHANT DATA ANALYSIS

t = 2.069, N = 229, w = 316

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3480	3612	406	443
Variance of estimate	$Var\hat{Y}$	476765	556099	3886	5947
Standard error	$SE\hat{Y}$	690	746	62	77
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1428	± 1543	± 129	± 160
Percentage of relative precision	$PRP\hat{Y}$	41 %	43 %	32 %	36 %
Density per sqkm	$R\hat{Y}$	1.66	1.723	0.193	0.211
Variance between transect counts	s^2_y	254.679	294.737	2.172	3.346
Variance between transect areas	s^2_a	8.261	8.261	8.261	8.261
Covariance between counts & areas	s_{ay}	10.44	10.471	1.299	1.625

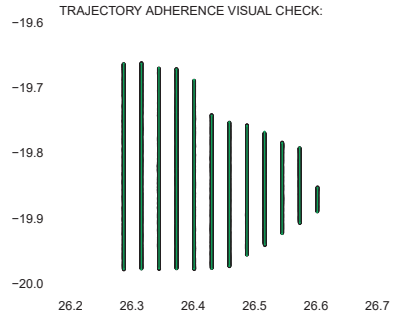
CARCASS RATIOS

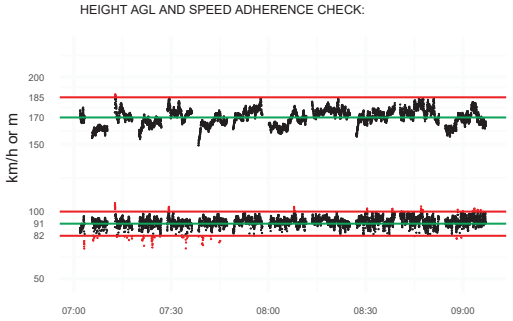
$CR_{1:4} = 10.9$ %
$CR_{1:2} = 0.5$ %

NGWS – Ngwasha South — BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20220912A

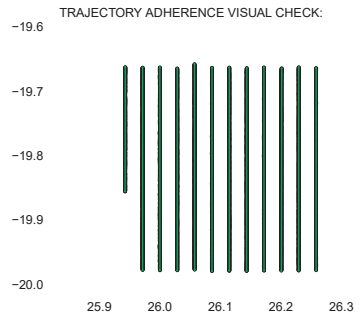


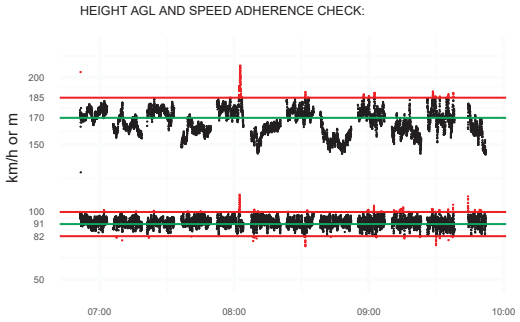


SPEED
Average: 170.1 km/h
Standard dev.: 5.8 km/h

HEIGHT AGL
Average: 92.2 m (302.5 ft)
Standard dev.: 3.4 m (11.2 ft)

KES2022_ V5IIM20220912A





SPEED
Average: 166.8 km/h
Standard dev.: 9.5 km/h

HEIGHT AGL
Average: 92.3 m (303 ft)
Standard dev.: 3.5 m (11.6 ft)

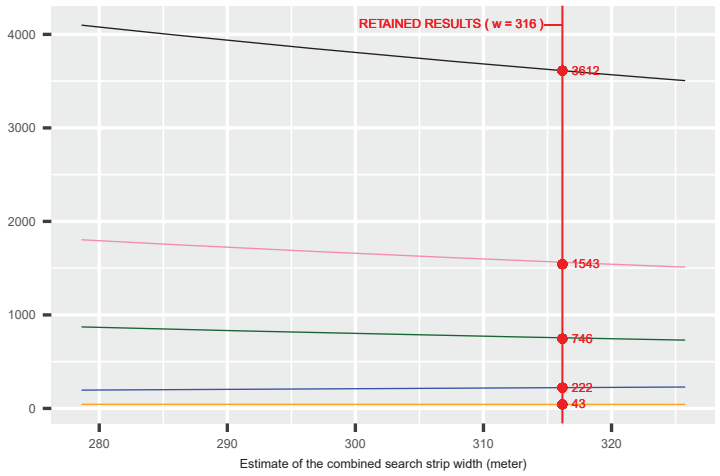
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 192]
C01 – Right: [121 – 161]

C03 – Left: [103 – 156]
C03 – Right: [145 – 173]

LIVE ELEPHANT ESTIMATE: [4098 – 3506]
CONFIDENCE INTERVAL: ± [1804 – 1511]
SAMPLE AREA: [196 – 229] sqkm
SE: [872 – 731]
PRP: [44 – 43] %



NGWS – Ngwasha South — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NGWS **N:** 229 S_a^2: 8,261
STRATUM NAME: Ngwasha South **w:** 316 **df:** 23

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	13	52	123	146	0,058	4965	70,46	0	268	119	2,607	0,913
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	189	115	1782	1538	0,850	552995	743,64	244	3321	86	275,418	-0,123
donkey	Equus asinus	1	0	9	19	0,004	85	9,20	0	28	202	0,042	-0,144
duiker	Sylvicapra grimmia	3	0	28	41	0,013	393	19,84	0	69	145	0,201	0,083
eland	Tragelaphus oryx	2	20	19	37	0,009	324	18,00	0	56	197	0,167	0,130
elephant bulls	Loxodonta africana males	93	156	877	609	0,418	86696	294,44	268	1486	69	45,592	3,453
elephant family	Loxodonta africana family	290	745	2735	1298	1,305	393616	627,39	1437	4033	47	204,688	7,017
elephant carcass one	Loxodonta africana carcass one	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	2	1	19	26	0,009	152	12,34	0	44	135	0,080	0,156
elephant carcass three	Loxodonta africana carcass three	22	16	207	110	0,099	2829	53,19	97	318	53	1,384	0,122
elephant carcass four	Loxodonta africana carcass four	23	6	217	106	0,103	2611	51,10	111	323	49	1,520	1,347
giraffe	Giraffa giraffa	12	16	113	96	0,054	2141	46,27	17	209	85	1,130	0,595
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	2	0	19	37	0,009	323	17,96	0	56	197	0,167	0,169
impala	Aepyceros melampus	20	0	189	292	0,090	19922	141,14	0	481	155	10,145	0,372
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	12	0	113	107	0,054	2668	51,65	6	220	94	1,391	0,525
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	4	6	38	51	0,018	607	24,63	0	89	135	0,319	0,350
ostrich	Struthio camelus	9	7	85	64	0,040	957	30,93	21	149	75	0,505	0,392
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	1	0	9	19	0,004	82	9,03	0	28	198	0,042	0,036
shoat	Capra hircus - Ovis aries	68	0	641	1263	0,306	372975	610,72	0	1905	197	192,667	5,734
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	22	7	207	298	0,099	20802	144,23	0	506	144	10,862	1,770
all elephants	Loxodonta africana all	383	901	3612	1543	1,723	556099	745,72	2069	5154	43	294,737	10,471
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	2	2	19	26	0,009	152	12,34	0	44	135	0,080	0,156
all elephant carcasses	Loxodonta africana carcass all	47	24	443	160	0,211	5947	77,11	284	603	36	3,346	1,625
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	45	22	424	158	0,202	5868	76,61	266	583	37	3,245	1,469

NOGA – Nogatsaa

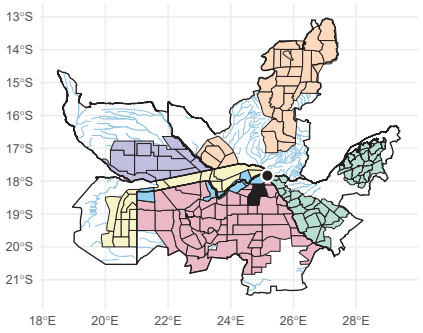
BOTSWANA – NORTHERN BOTSWANA

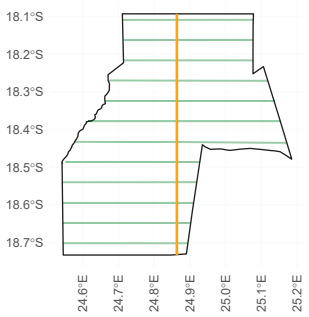
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NOGA
STRATUM NAME: Nogatsaa
■ STRATUM AREA: 3090.97 sqkm
• SURVEY BASE: Kasane
DISTANCE TO SURVEY BASE: 71 km

– TRANSECTS: 12 (526 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5.1 %

– BASELINE DISTANCE: 70.86 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.6 h
Crew(s): C01
KES2022_V5IIM20220910A 07:35–12:12

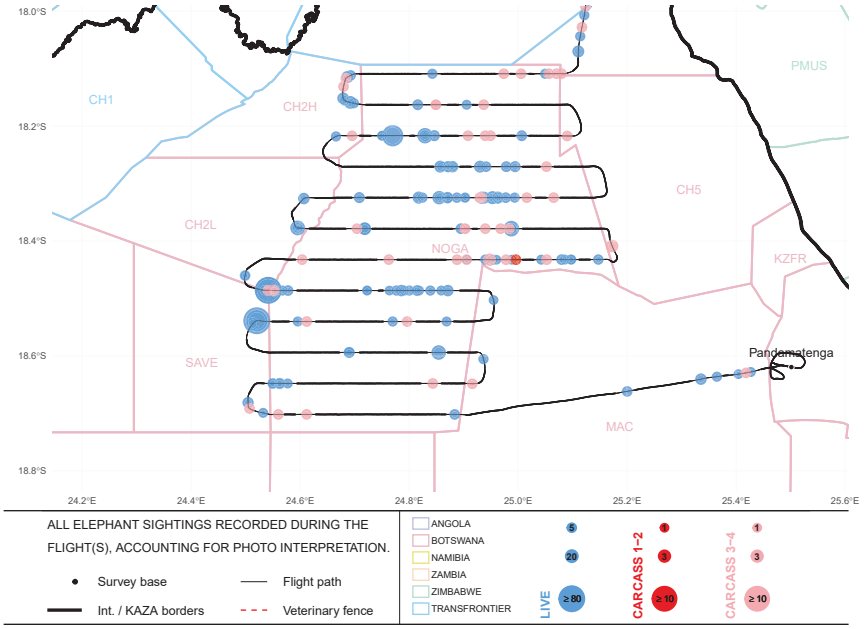
Actual sampling intensity: 5.5 %
Transect flying time: 3.1 h
Transects: 12 – 526 km – 90°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	37	63
% individuals:	53	47

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	122	0	
Live elephant (>9):	9	0	
Elephant carcass:	33	0	
Live elephant (<10):	40	0	



LIVE ELEPHANTS



IN SAMPLE:	**320 (49)**
Bulls:	22 (15)
Family:	298 (34)
NOT IN SAMPLE:	**940 (82)**
Outside search strip:	252
Off transect:	688



ELEPHANT CARCASSES

IN SAMPLE:	**34 (33)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	8 (8)
Category 4:	26 (25)
NOT IN SAMPLE:	**19 (17)**
Outside search strip:	2
Off transect:	17

OTHER SPECIES

Other wildlife species:	10
Other wildlife count:	31
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.201, N = 220, w = 321

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	5853	5853	622	622
Variance of estimate	$Var\hat{Y}$	3725815	3725815	13080	13080
Standard error	$SE\hat{Y}$	1930	1930	114	114
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 4248	± 4248	± 252	± 252
Percentage of relative precision	$PRP_{\hat{Y}}$	73 %	73 %	40 %	40 %
Density per sqkm	$R_{\hat{Y}}$	1.894	1.894	0.201	0.201
Variance between transect counts	s^2_y	951.515	951.515	5.242	5.242
Variance between transect areas	s^2_a	8.089	8.089	8.089	8.089
Covariance between counts & areas	s_{ay}	2.27	2.27	5.362	5.362

CARCASS RATIOS

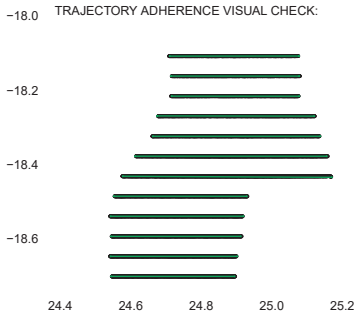
$CR_{1:4} = 9.6$ %
$CR_{1:2} = 0$ %

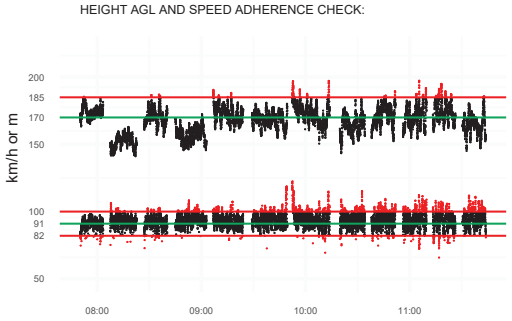
NOGA – Nogatsaa

BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20220910A





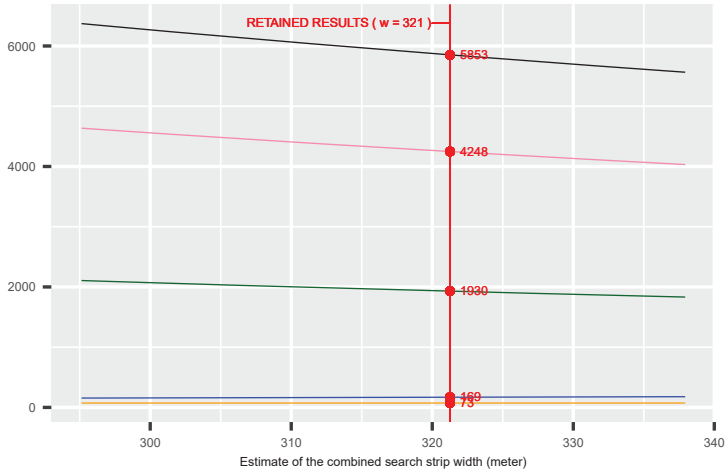
SPEED
Average: 167.7 km/h
Standard dev.: 9.5 km/h

HEIGHT AGL
Average: 93.2 m (305.8 ft)
Standard dev.: 5.3 m (17.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [161 – 194]
C01 – Right: [122 – 163]



LIVE ELEPHANT ESTIMATE: [6371 – 5564]
CONFIDENCE INTERVAL: ± [4635 – 4033]
SAMPLE AREA: [155 – 178] sqkm
SE: [2106 – 1832]
PRP: [73 – 72] %

NOGA – Nogatsaa — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NOGA **N:** 221 S_a^2: 8,089
STRATUM NAME: Nogatsaa **w:** 321 **df:** 11

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	7	1	128	156	0,041	5023	70,87	0	284	122	1,356	0,721
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	1	0	18	40	0,006	326	18,05	0	58	217	0,083	-0,117
elephant bulls	Loxodonta africana males	22	86	402	390	0,130	31385	177,16	12	792	97	9,606	5,976
elephant family	Loxodonta africana family	298	854	5451	4274	1,763	3770065	1941,67	1177	9724	78	945,242	-3,705
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	8	1	146	113	0,047	2617	51,16	34	259	77	0,788	1,302
elephant carcass four	Loxodonta africana carcass four	26	17	476	193	0,154	7677	87,62	283	668	41	3,061	4,061
giraffe	Giraffa giraffa	6	6	110	136	0,036	3813	61,75	0	246	124	1,000	0,219
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	6	0	110	233	0,036	11252	106,07	0	343	213	3,000	1,056
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	2	0	37	76	0,012	1207	34,74	0	113	209	0,333	0,829
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	1	0	18	40	0,006	326	18,05	0	58	217	0,083	-0,114
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	6	0	110	170	0,036	5992	77,41	0	280	155	1,545	-0,103
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	15	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	320	940	5853	4248	1,894	3725815	1930,24	1605	10102	73	951,515	2,270
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	34	19	622	252	0,201	13080	114,37	370	874	40	5,242	5,362
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	34	18	622	252	0,201	13080	114,37	370	874	40	5,242	5,362

NXC – Nxai Pan Centre

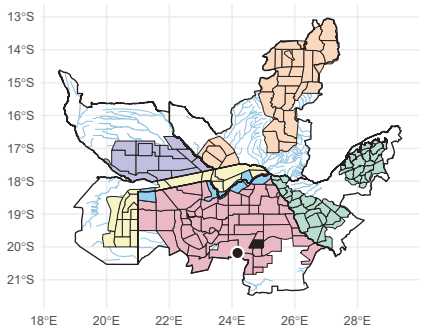
BOTSWANA – NORTHERN BOTSWANA

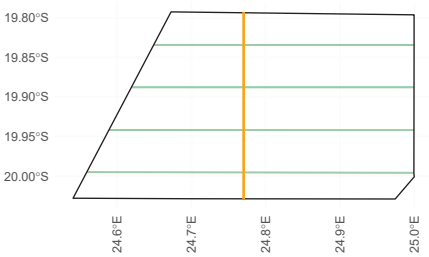
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NXC
STRATUM NAME: Nxai Pan Centre
■ STRATUM AREA: 1064.72 sqkm
• SURVEY BASE: Matopi
DISTANCE TO SURVEY BASE: 72 km

– TRANSECTS: 4 (165 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 4.7 %

– BASELINE DISTANCE: 26.19 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.2 h
Crew(s): C03
KES2022_V5WOT20220916A 06:22–10:35

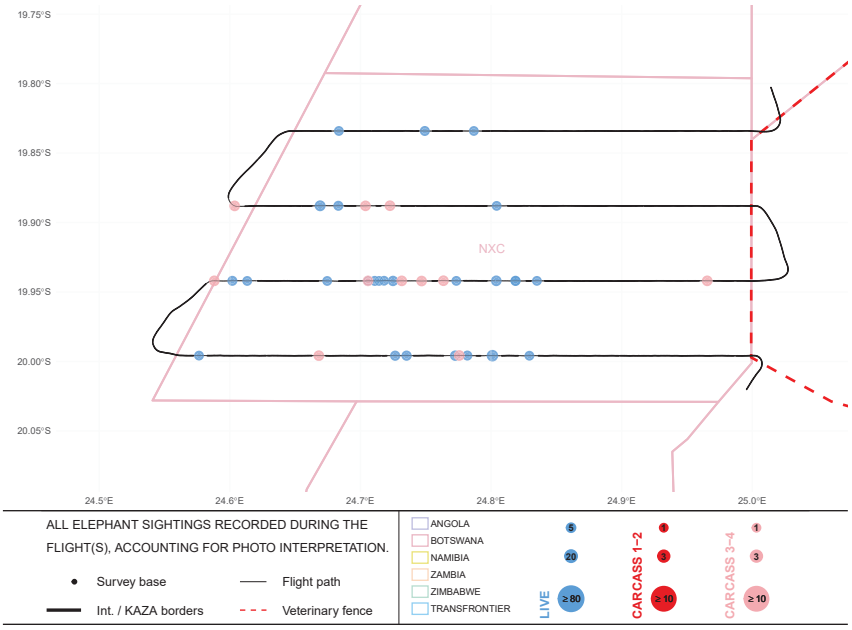
Actual sampling intensity: 4.9 %
Transect flying time: 1 h
Transects: 4 – 165 km – 90°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	40	60
% individuals:	29	71

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	36	19.44	0
Live elephant (>9):	0		
Elephant carcass:	7	71.43	0
Live elephant (<10):	9	22.22	0



LIVE ELEPHANTS



IN SAMPLE:	**15 (9)**
Bulls:	8 (7)
Family:	7 (2)
NOT IN SAMPLE:	**47 (21)**
Outside search strip:	47
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**7 (7)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	4 (4)
Category 4:	3 (3)
NOT IN SAMPLE:	**4 (4)**
Outside search strip:	3
Off transect:	1

OTHER SPECIES

Other wildlife species:	6
Other wildlife count:	28
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 3.182, N = 83, w = 312

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	309	309	144	144
Variance of estimate	$Var\hat{Y}$	22719	22719	4131	4131
Standard error	$SE\hat{Y}$	151	151	64	64
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 480	± 480	± 205	± 205
Percentage of relative precision	$PRP_{\hat{Y}}$	155 %	155 %	142 %	142 %
Density per sqkm	$R_{\hat{Y}}$	0.29	0.29	0.136	0.136
Variance between transect counts	s_y^2	14.917	14.917	2.917	2.917
Variance between transect areas	s_a^2	1.884	1.884	1.884	1.884
Covariance between counts & areas	s_{ay}	2.612	2.612	1.794	1.794

CARCASS RATIOS

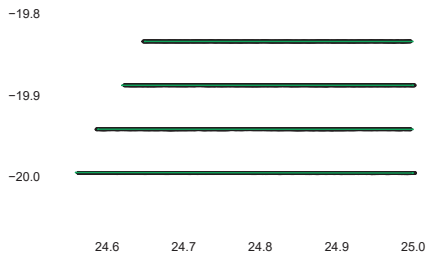
$CR_{1:4} = 31.8$ %
$CR_{1:2} = 0$ %

NXC – Nxai Pan Centre — BOTSWANA – NORTHERN BOTSWANA

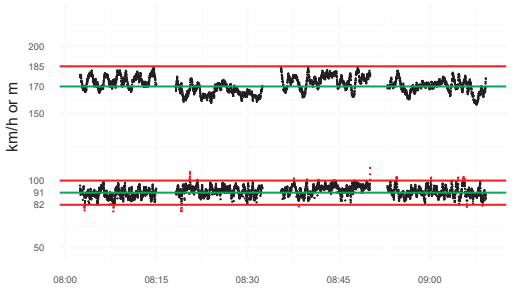
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20220916A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



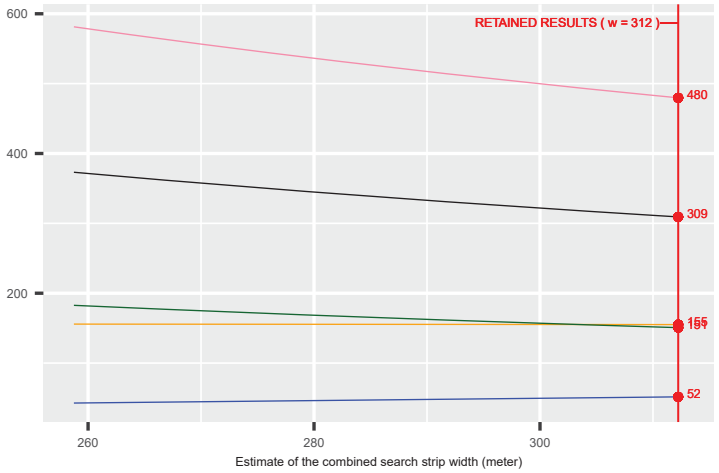
SPEED
Average: 171 km/h
Standard dev.: 5.5 km/h

HEIGHT AGL
Average: 91.9 m (301.5 ft)
Standard dev.: 3.8 m (12.5 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C03 – Left: [103 – 156]
C03 – Right: [144 – 173]



LIVE ELEPHANT ESTIMATE: [373 – 309]
CONFIDENCE INTERVAL: ± [581 – 480]
SAMPLE AREA: [43 – 52] sqkm
SE: [183 – 151]
PRP: [156 – 155] %

NXC – Nxai Pan Centre — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NXC **N:** 84 S_a^2: 1,884
STRATUM NAME: Nwai Pan Centre **w:** 312 **df:** 3

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	21	63	0,019	390	19,75	0	83	305	0,250	0,466
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	8	36	165	352	0,155	12211	110,50	0	517	213	8,000	2,447
elephant family	Loxodonta africana family	7	11	144	268	0,136	7104	84,29	0	413	186	4,250	0,166
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	4	2	82	180	0,077	3212	56,68	0	263	219	2,000	0,610
elephant carcass four	Loxodonta africana carcass four	3	2	62	115	0,058	1316	36,28	0	177	187	0,917	1,184
giraffe	Giraffa giraffa	8	2	165	418	0,155	17243	131,31	0	583	253	11,333	3,513
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	4	1	82	195	0,077	3749	61,23	0	277	236	2,000	-1,459
ostrich	Struthio camelus	3	2	62	192	0,058	3633	60,28	0	254	310	2,250	0,758
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	10	0	206	660	0,194	42970	207,29	0	866	320	25,000	-1,480
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	2	10	41	132	0,039	1719	41,46	0	173	320	1,000	-0,296
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	15	47	309	480	0,290	22719	150,73	0	789	155	14,917	2,612
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	7	4	144	205	0,136	4131	64,27	0	349	142	2,917	1,794
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	7	4	144	205	0,136	4131	64,27	0	349	142	2,917	1,794

NXN – Nxai Pan North

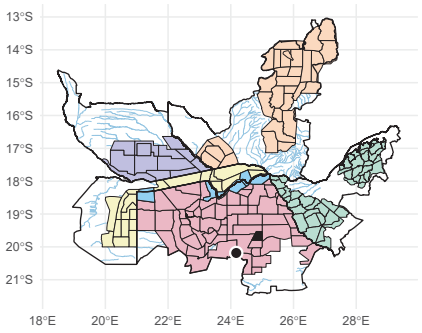
BOTSWANA – NORTHERN BOTSWANA

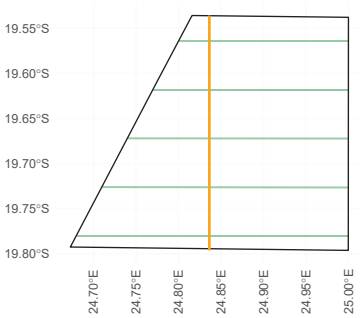
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NXN
STRATUM NAME: Nxai Pan North
■ STRATUM AREA: 765.55 sqkm
• SURVEY BASE: Matopi
DISTANCE TO SURVEY BASE: 90 km

– TRANSECTS: 5 (136 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5.3 %

– BASELINE DISTANCE: 28.79 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.2 h
Crew(s): C03
KES2022_V5WOT20220916A 06:22–10:35

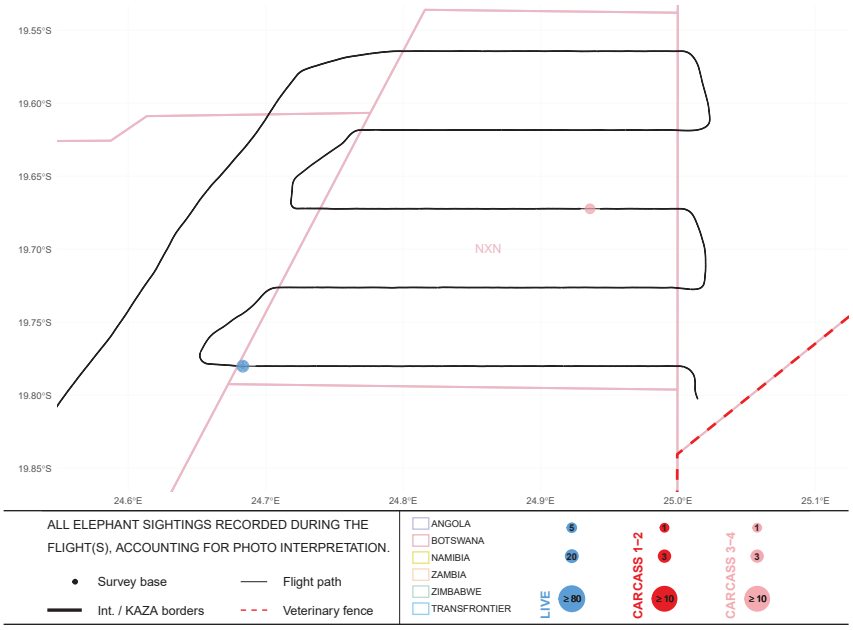
Actual sampling intensity: 5.5 %
Transect flying time: 0.8 h
Transects: 5 – 136 km – 90°
Search effort: 1.14 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	57	43
% individuals:	32	68

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	3	33.33	0
Live elephant (>9):	0		
Elephant carcass:	1	0	
Live elephant (<10):	1	100	0





LIVE ELEPHANTS

IN SAMPLE:	**9 (1)**
Bulls:	9 (1)
Family:	0 (0)
NOT IN SAMPLE:	**12 (2)**
Outside search strip:	12
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	4
Other wildlife count:	11
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.776, N = 92, w = 310

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	164	164	18	18
Variance of estimate	$Var\hat{Y}$	23657	23657	330	330
Standard error	$SE\hat{Y}$	154	154	18	18
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 427	± 427	± 50	± 50
Percentage of relative precision	$PRP_{\hat{Y}}$	261 %	261 %	278 %	278 %
Density per sqkm	$R_{\hat{Y}}$	0.214	0.214	0.024	0.024
Variance between transect counts	s_y^2	16.2	16.2	0.2	0.2
Variance between transect areas	s_a^2	2.426	2.426	2.426	2.426
Covariance between counts & areas	s_{ay}	4.306	4.306	−0.01	−0.01

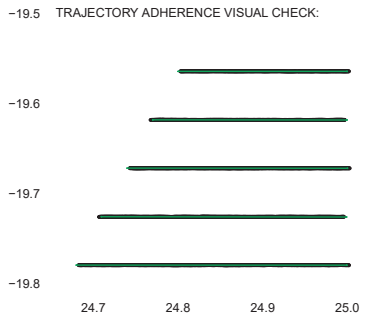
CARCASS RATIOS

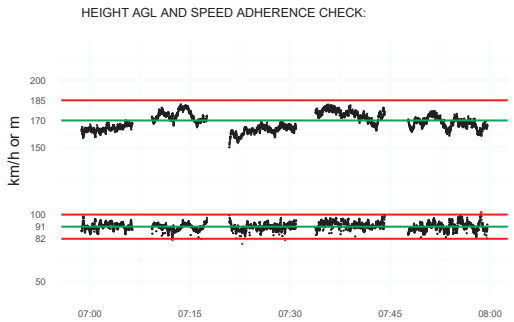
$CR_{1:4}$ = 10 %
$CR_{1:2}$ = 0 %

NXN – Nxai Pan North — BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20220916A





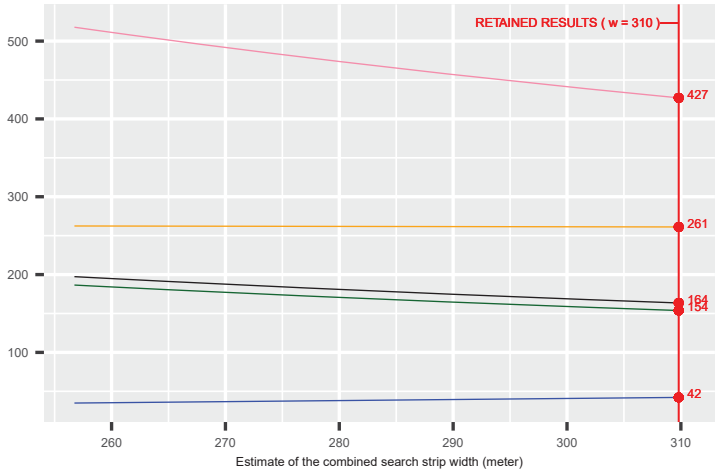
SPEED
Average: 168.6 km/h
Standard dev.: 5.9 km/h

HEIGHT AGL
Average: 91.2 m (299.1 ft)
Standard dev.: 2.8 m (9.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C03 – Left: [102 – 155]
C03 – Right: [143 – 172]



LIVE ELEPHANT ESTIMATE: [197 – 164]
CONFIDENCE INTERVAL: ± [518 – 427]
SAMPLE AREA: [35 – 42] sqkm
SE: [187 – 154]
PRP: [262 – 261] %

NXN – Nxai Pan North — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NXN **N:** 93 S_a^2: 2,426
STRATUM NAME: Nxai Pan North **w:** 310 **df:** 4

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	9	6	164	427	0,214	23657	153,81	0	591	261	16,200	4,306
elephant family	Loxodonta africana family	0	6	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	18	50	0,024	330	18,16	0	69	278	0,200	-0,010
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	7	12	127	286	0,166	10595	102,93	0	413	225	6,800	1,161
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	1	0	18	49	0,024	308	17,55	0	67	268	0,200	0,274
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	2	0	36	97	0,047	1232	35,09	0	134	268	0,800	0,549
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	9	12	164	427	0,214	23657	153,81	0	591	261	16,200	4,306
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	0	18	50	0,024	330	18,16	0	69	278	0,200	-0,010
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	18	50	0,024	330	18,16	0	69	278	0,200	-0,010

NXS – Nxai Pan South

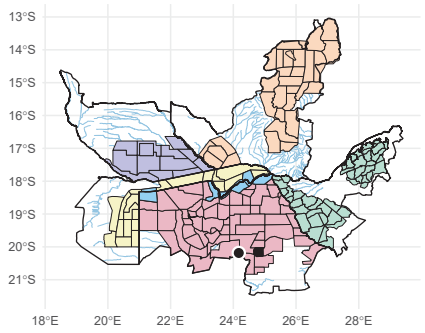
BOTSWANA – NORTHERN BOTSWANA

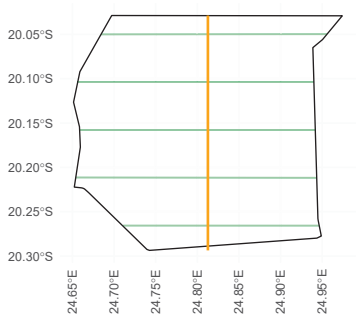
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NXS
STRATUM NAME: Nxai Pan South
■ STRATUM AREA: 814.15 sqkm
• SURVEY BASE: Matopi
DISTANCE TO SURVEY BASE: 66 km

– TRANSECTS: 5 (142 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5.2 %

– BASELINE DISTANCE: 29.32 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.2 h
Crew(s): C03
KES2022_V5WOT20220916A 06:22–10:35

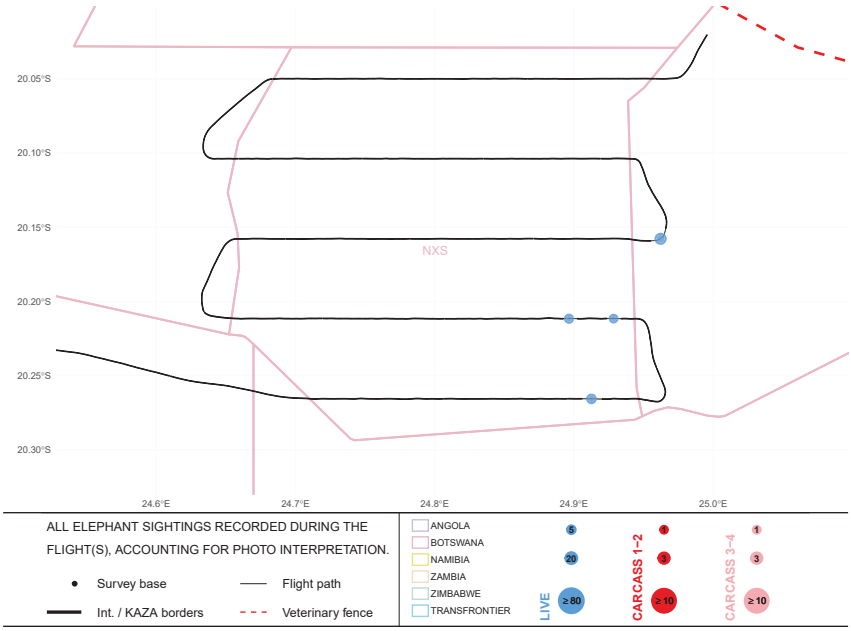
Actual sampling intensity: 5.5 %
Transect flying time: 0.8 h
Transects: 5 – 142 km – 90°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	50	50
% individuals:	58	42

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	3	33.33	0
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	2	50	0





LIVE ELEPHANTS

IN SAMPLE:	**2 (2)**
Bulls:	2 (2)
Family:	0 (0)
NOT IN SAMPLE:	**19 (3)**
Outside search strip:	7
Off transect:	12



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	5
Other wildlife count:	10
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.776, N = 93, w = 315

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	36	36	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	508	508	–	–
Standard error	$\mathrm{SE}\hat{Y}$	23	23	–	–
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 63	± 63	–	–
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	172 %	172 %	–	–
Density per sqkm	$R_{\hat{Y}}$	0.045	0.045	–	–
Variance between transect counts	s_y^2	0.3	0.3	–	–
Variance between transect areas	s_a^2	0.499	0.499	–	–
Covariance between counts & areas	s_{ay}	−0.091	−0.091	–	–

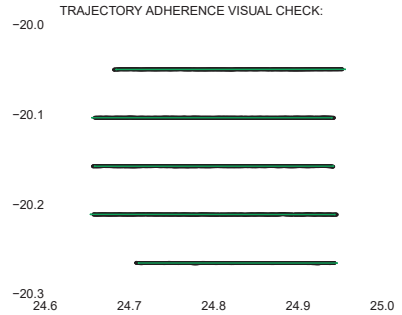
CARCASS RATIOS

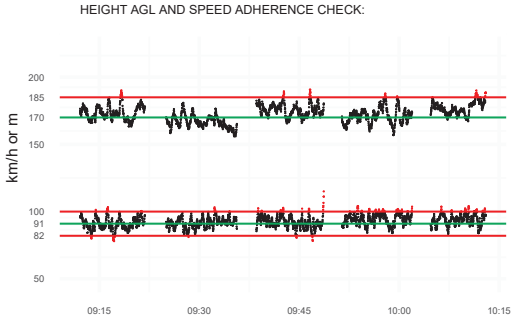
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

NXS – Nxai Pan South — BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20220916A





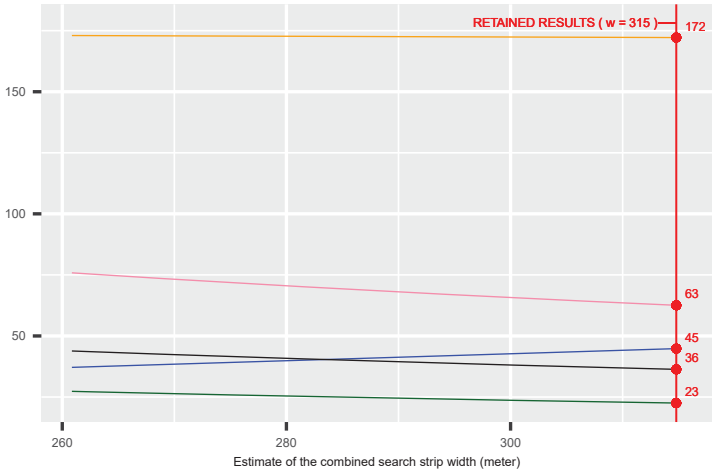
SPEED
Average: 172.6 km/h
Standard dev.: 6.2 km/h

HEIGHT AGL
Average: 92.6 m (303.9 ft)
Standard dev.: 4.6 m (14.9 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C03 – Left: [104 – 157]
C03 – Right: [145 – 174]



LIVE ELEPHANT ESTIMATE: [44 – 36]
CONFIDENCE INTERVAL: ± [76 – 63]
SAMPLE AREA: [37 – 45] sqkm
SE: [27 – 23]
PRP: [173 – 172] %

NXS – Nxai Pan South — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: NXS **N:** 93 S_a^2: 0,499
STRATUM NAME: Nxai Pan South **w:** 315 **df:** 4

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	1	36	60	0,045	475	21,78	0	97	166	0,300	0,135
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	2	7	36	63	0,045	508	22,53	0	99	172	0,300	-0,091
elephant family	Loxodonta africana family	0	12	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	2	0	36	101	0,045	1331	36,48	0	138	279	0,800	-0,103
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	3	0	54	150	0,067	2914	53,98	0	204	275	1,800	0,208
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	3	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	3	3	54	102	0,067	1348	36,72	0	156	187	0,800	-0,139
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	2	19	36	63	0,045	508	22,53	0	99	172	0,300	-0,091
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

PAND – Pandamatenga Farms

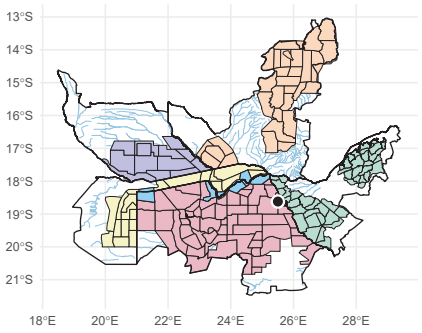
BOTSWANA – NORTHERN BOTSWANA

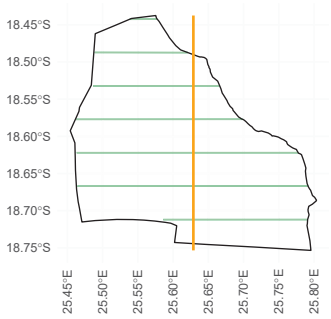
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: PAND
STRATUM NAME: Pandamatenga Farms
■ STRATUM AREA: 820.24 sqkm
• SURVEY BASE: Pandamatenga
DISTANCE TO SURVEY BASE: 10 km

– TRANSECTS: 7 (154 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5.6 %

– BASELINE DISTANCE: 34.96 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 1.6 h
Crew(s): C03
KES2022_V5WOT20220910B 16:30–18:05

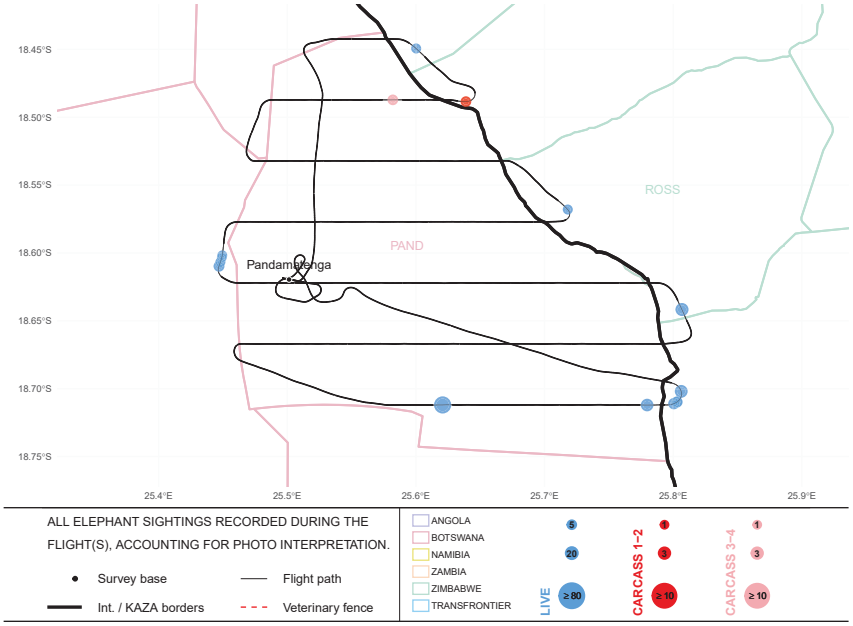
Actual sampling intensity: 5.7 %
Transect flying time: 0.9 h
Transects: 7 – 154 km – 90°
Search effort: 1.13 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	20	80
% individuals:	15	85

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	5	20	0
Live elephant (>9):	2	0	
Elephant carcass:	1	100	0
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**49 (2)**
Bulls:	0 (0)
Family:	49 (2)
NOT IN SAMPLE:	**66 (11)**
Outside search strip:	0
Off transect:	66



ELEPHANT CARCASSES

IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	0 (0)
NOT IN SAMPLE:	**1 (1)**
Outside search strip:	0
Off transect:	1

OTHER SPECIES

Other wildlife species:	5
Other wildlife count:	93
Domestic count:	25

ELEPHANT DATA ANALYSIS

t = 2.447, N = 114, w = 306

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	855	855	17	17
Variance of estimate	$\mathrm{Var}\hat{Y}$	619153	619153	291	291
Standard error	$\mathrm{SE}\hat{Y}$	787	787	17	17
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 1925	± 1925	± 42	± 42
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	225 %	225 %	239 %	239 %
Density per sqkm	$R_{\hat{Y}}$	1.043	1.043	0.021	0.021
Variance between transect counts	s_y^2	343	343	0.143	0.143
Variance between transect areas	s_a^2	11.342	11.342	11.342	11.342
Covariance between counts & areas	s_{ay}	0.684	0.684	−0.432	−0.432

CARCASS RATIOS

$CR_{1:4} = 2\ \%$
$CR_{1:2} = 0\ \%$

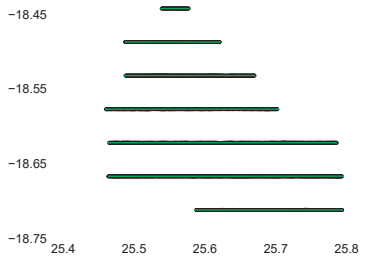
PAND – Pandamatenga Farms

BOTSWANA – NORTHERN BOTSWANA

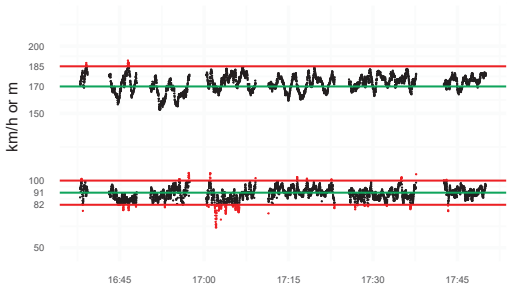
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20220910B

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



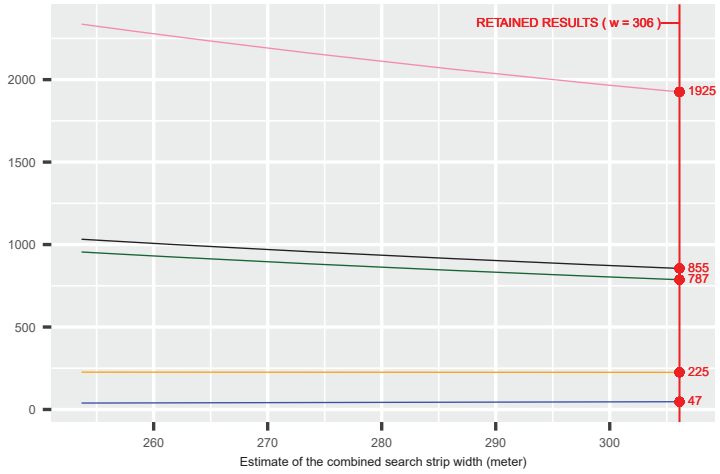
SPEED
Average: 172.2 km/h
Standard dev.: 6 km/h

HEIGHT AGL
Average: 90.1 m (295.6 ft)
Standard dev.: 4.8 m (15.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C03 – Left: [101 – 153]
C03 – Right: [141 – 169]



LIVE ELEPHANT ESTIMATE: [1032 – 855]
CONFIDENCE INTERVAL: ± [2336 – 1925]
SAMPLE AREA: [39 – 47] sqkm
SE: [955 – 787]
PRP: [226 – 225] %

PAND – Pandamatenga Farms BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: PAND **N:** 114 S_a^2: 11,342
STRATUM NAME: Pandamatenga Farms **w:** 306 **df:** 6

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	5	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	17	39	0,021	258	16,06	0	57	225	0,143	0,014
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	8	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	49	58	855	1925	1,043	619153	786,86	0	2781	225	343,000	0,684
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	17	42	0,021	291	17,06	0	59	239	0,143	-0,432
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	3	0	52	116	0,064	2233	47,26	0	168	221	1,286	0,434
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	2	0	35	71	0,043	840	28,99	0	106	203	0,571	1,312
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	9	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	25	0	436	887	0,532	131286	362,33	0	1323	203	89,286	16,403
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	5	0	87	132	0,106	2931	54,14	0	220	152	2,238	3,249
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	82	39	1431	2912	1,745	1416415	1190,13	0	4343	203	960,571	53,149
all elephants	Loxodonta africana all	49	66	855	1925	1,043	619153	786,86	0	2781	225	343,000	0,684
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	1	17	42	0,021	291	17,06	0	59	239	0,143	-0,432
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	17	42	0,021	291	17,06	0	59	239	0,143	-0,432

SAVE – Savuti East

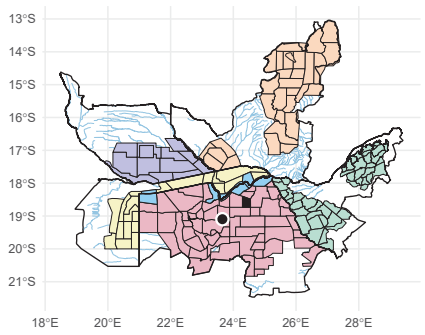
BOTSWANA – NORTHERN BOTSWANA

SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: SAVE
STRATUM NAME: Savuti East
■ STRATUM AREA: 834.14 sqkm
• SURVEY BASE: Khwai
DISTANCE TO SURVEY BASE: 97 km

– TRANSECTS: 5 (160 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 5.8 %

– BASELINE DISTANCE: 26.5 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C01
KES2022_V5IIM20220930A 06:42–11:05

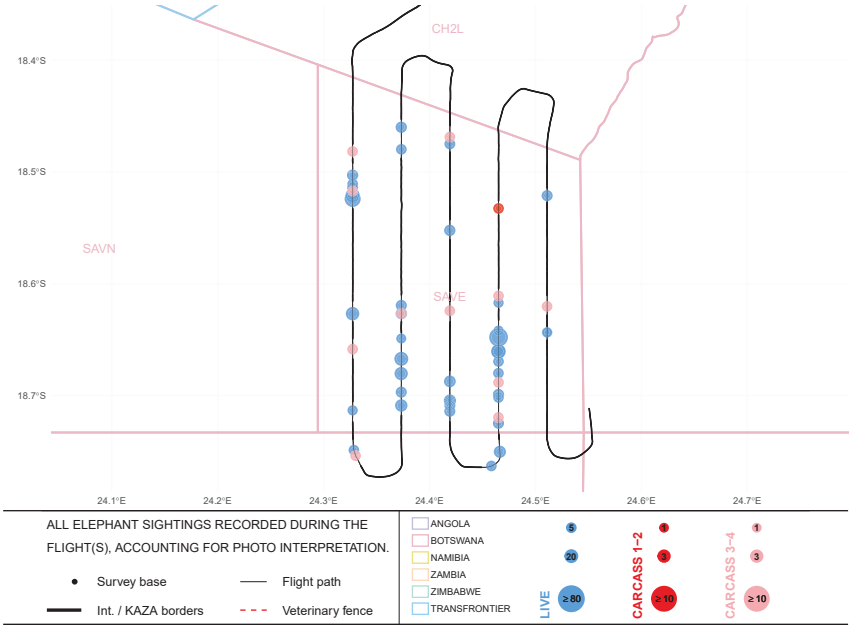
Actual sampling intensity: 6.1 %
Transect flying time: 1 h
Transects: 5 – 160 km – 0°
Search effort: 1.13 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	54	46
% individuals:	57	43

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	47	23.4	0
Live elephant (>9):	3	66.67	0
Elephant carcass:	11	27.27	0
Live elephant (<10):	14	42.86	0





LIVE ELEPHANTS

IN SAMPLE:	**113 (17)**
Bulls:	8 (3)
Family:	105 (14)
NOT IN SAMPLE:	**332 (35)**
Outside search strip:	253
Off transect:	79



ELEPHANT CARCASSES

IN SAMPLE:	**11 (11)**
Category 1:	0 (0)
Category 2:	1 (1)
Category 3:	6 (6)
Category 4:	4 (4)
NOT IN SAMPLE:	**1 (1)**
Outside search strip:	0
Off transect:	1

OTHER SPECIES

Other wildlife species:	10
Other wildlife count:	30
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.776, N = 83, w = 318

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	1848	1848	180	180
Variance of estimate	$Var\hat{Y}$	384295	384295	2182	2182
Standard error	$SE\hat{Y}$	620	620	47	47
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1721	± 1721	± 130	± 130
Percentage of relative precision	$PRP\hat{Y}$	93 %	93 %	72 %	72 %
Density per sqkm	$R\hat{Y}$	2.216	2.216	0.216	0.216
Variance between transect counts	s^2_y	280.8	280.8	1.7	1.7
Variance between transect areas	s^2_a	0.991	0.991	0.991	0.991
Covariance between counts & areas	s_{ay}	−2.003	−2.003	0.17	0.17

CARCASS RATIOS

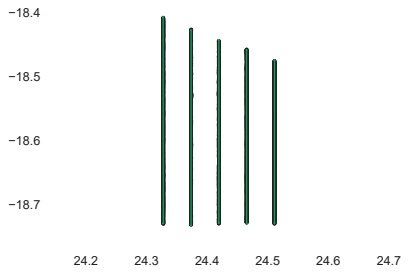
$CR_{1:4} = 8.9\ \%$
$CR_{1:2} = 0.9\ \%$

SAVE – Savuti East — BOTSWANA – NORTHERN BOTSWANA

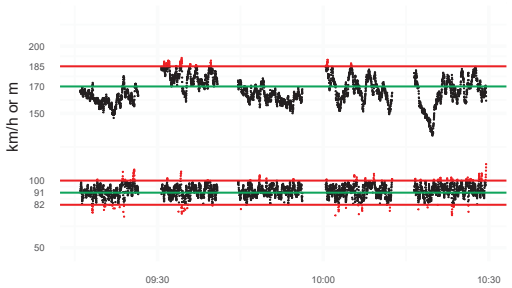
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20220930A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



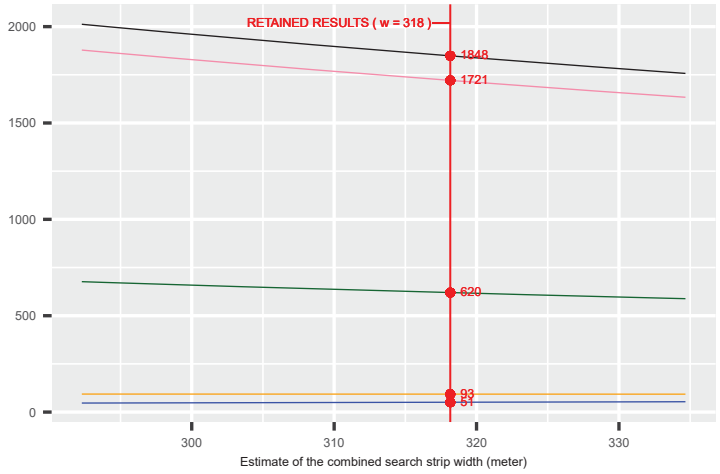
SPEED
Average: 166.7 km/h
Standard dev.: 9.6 km/h

HEIGHT AGL
Average: 92.3 m (302.9 ft)
Standard dev.: 4.7 m (15.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 192]
C01 – Right: [120 – 161]



LIVE ELEPHANT ESTIMATE: [2012 – 1757]
CONFIDENCE INTERVAL: ± [1878 – 1634]
SAMPLE AREA: [47 – 54] sqkm
SE: [677 – 588]
PRP: [93 – 93] %

SAVE – Savuti East — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: SAVE **N:** 83 S_a^2: 0,991
STRATUM NAME: Savuti East **w:** 318 **df:** 4

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	8	37	131	268	0,157	9303	96,45	0	399	205	6,800	-0,974
elephant family	Loxodonta africana family	105	295	1718	1462	2,059	277171	526,47	256	3179	85	204,000	-1,029
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	1	0	16	46	0,020	269	16,42	0	62	279	0,200	-0,157
elephant carcass three	Loxodonta africana carcass three	6	1	98	121	0,118	1897	43,55	0	219	123	1,700	1,104
elephant carcass four	Loxodonta africana carcass four	4	0	65	136	0,078	2385	48,84	0	201	207	1,700	-0,776
giraffe	Giraffa giraffa	2	4	33	52	0,039	345	18,56	0	84	158	0,300	0,477
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	5	0	82	231	0,098	6926	83,22	0	313	282	5,000	-1,523
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	1	0	16	46	0,020	269	16,42	0	62	279	0,200	-0,157
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	1	1	16	43	0,020	245	15,64	0	60	265	0,200	0,329
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	1	0	16	44	0,020	254	15,93	0	61	270	0,200	0,149
warthog	Phacochoerus africanus	2	0	33	90	0,039	1049	32,39	0	123	275	0,800	-0,031
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	8	0	131	360	0,157	16782	129,55	0	491	275	12,800	-0,123
zebra	Equus spp,	8	0	131	360	0,157	16782	129,55	0	491	275	12,800	-0,123
all elephants	Loxodonta africana all	113	332	1848	1721	2,216	384295	619,92	127	3570	93	280,800	-2,003
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	16	46	0,020	269	16,42	0	62	279	0,200	-0,157
all elephant carcasses	Loxodonta africana carcass all	11	1	180	130	0,216	2182	46,72	50	310	72	1,700	0,170
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	10	1	164	96	0,196	1187	34,45	68	259	58	1,000	0,327

SAVM – Savuti Marsh

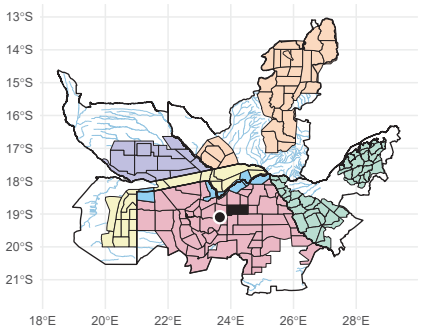
BOTSWANA – NORTHERN BOTSWANA

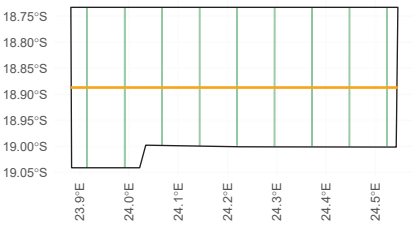
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: SAVM
STRATUM NAME: Savuti Marsh
■ STRATUM AREA: 2128.47 sqkm
• SURVEY BASE: Khwai
DISTANCE TO SURVEY BASE: 64 km

– TRANSECTS: 9 (277 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 3.9 %

– BASELINE DISTANCE: 69.89 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C01
KES2022_V5IIM20220930A 06:42–11:05

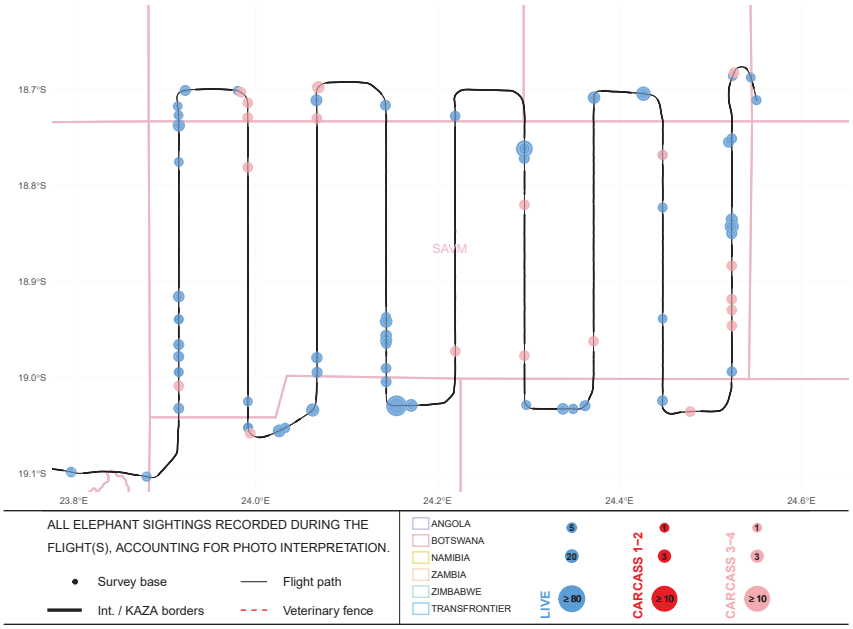
Actual sampling intensity: 4.1 %
Transect flying time: 1.6 h
Transects: 9 – 277 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	44	56
% individuals:	47	53

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	48	45.83	0
Live elephant (>9):	3	100	0
Elephant carcass:	12	83.33	30
Live elephant (<10):	19	47.37	0





LIVE ELEPHANTS

IN SAMPLE:	**100 (22)**
Bulls:	29 (12)
Family:	71 (10)
NOT IN SAMPLE:	**371 (49)**
Outside search strip:	132
Off transect:	239



ELEPHANT CARCASSES

IN SAMPLE:	**12 (12)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	5 (5)
Category 4:	7 (7)
NOT IN SAMPLE:	**8 (7)**
Outside search strip:	0
Off transect:	8

OTHER SPECIES

Other wildlife species:	9
Other wildlife count:	68
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.306, N = 220, w = 317

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	2425	2425	291	291
Variance of estimate	$\mathrm{Var}\hat{Y}$	856295	856295	6708	6708
Standard error	$\mathrm{SE}\hat{Y}$	925	925	82	82
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 2134	± 2134	± 189	± 189
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	88 %	88 %	65 %	65 %
Density per sqkm	$R_{\hat{Y}}$	1.139	1.139	0.137	0.137
Variance between transect counts	s_y^2	168.361	168.361	1.25	1.25
Variance between transect areas	s_a^2	0.411	0.411	0.411	0.411
Covariance between counts & areas	s_{ay}	1.709	1.709	−0.128	−0.128

CARCASS RATIOS

$CR_{1:4} = 10.7\ \%$
$CR_{1:2} = 0\ \%$

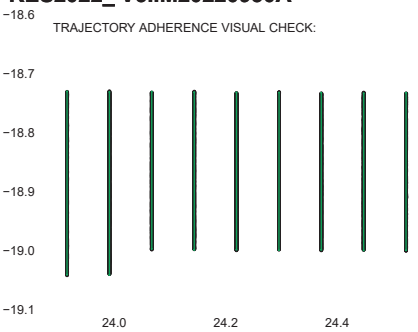
SAVM – Savuti Marsh

BOTSWANA – NORTHERN BOTSWANA

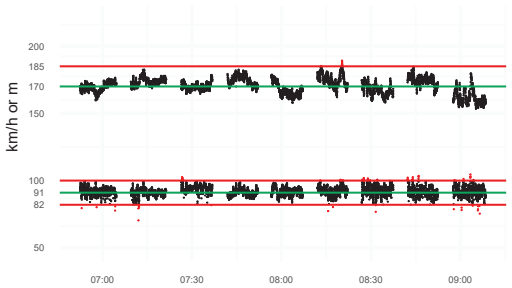
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20220930A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



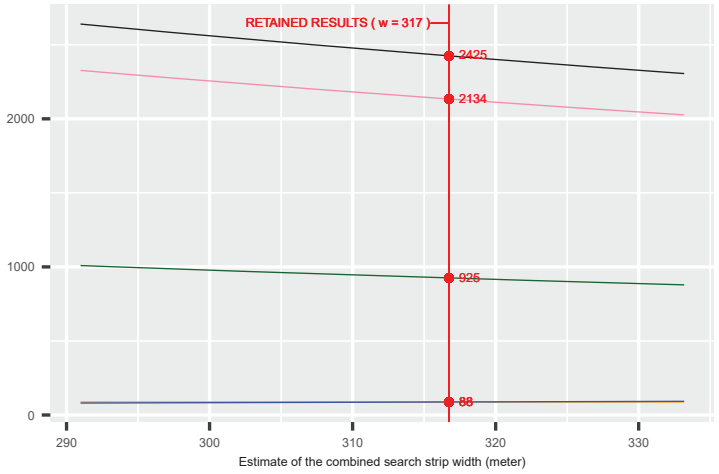
SPEED
Average: 170.3 km/h
Standard dev.: 6 km/h

HEIGHT AGL
Average: 91.9 m (301.5 ft)
Standard dev.: 3.5 m (11.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [159 – 191]
C01 – Right: [120 – 161]



LIVE ELEPHANT ESTIMATE: [2640 – 2305]
CONFIDENCE INTERVAL: ± [2327 – 2026]
SAMPLE AREA: [81 – 92] sqkm
SE: [1009 – 879]
PRP: [88 – 88] %

SAVM – Savuti Marsh — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: SAVM **N:** 221 S_a^2: 0,411
STRATUM NAME: Savuti Marsh **w:** 317 **df:** 8

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	29	75	703	667	0,330	83544	289,04	37	1370	95	16,194	0,214
elephant family	Loxodonta africana family	71	296	1722	1580	0,809	469460	685,17	142	3302	92	92,611	1,496
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	5	5	121	169	0,057	5355	73,18	0	290	139	1,028	-0,024
elephant carcass four	Loxodonta africana carcass four	7	3	170	113	0,080	2406	49,05	57	283	67	0,444	-0,104
giraffe	Giraffa giraffa	4	1	97	164	0,046	5065	71,17	0	261	169	1,028	0,579
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	45	0	1091	1717	0,513	554148	744,41	0	2808	157	104,500	-2,117
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	1	0	24	55	0,011	578	24,05	0	80	229	0,111	-0,013
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	3	1	73	167	0,034	5239	72,38	0	240	229	1,000	-0,133
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	7	1	170	203	0,080	7770	88,15	0	373	120	1,444	-0,315
warthog	Phacochoerus africanus	3	2	73	116	0,034	2523	50,23	0	189	159	0,500	0,209
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	1	0	24	56	0,011	582	24,13	0	80	229	0,111	-0,044
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	100	371	2425	2134	1,139	856295	925,36	291	4559	88	168,361	1,709
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	12	8	291	189	0,137	6708	81,90	102	480	65	1,250	-0,128
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	12	8	291	189	0,137	6708	81,90	102	480	65	1,250	-0,128

SAVN – Savuti North

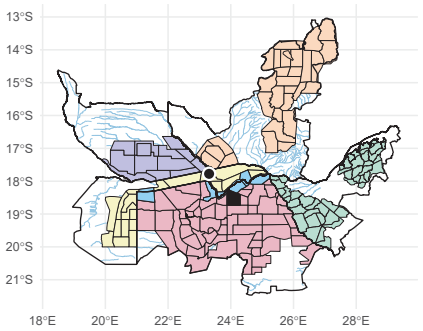
BOTSWANA – NORTHERN BOTSWANA

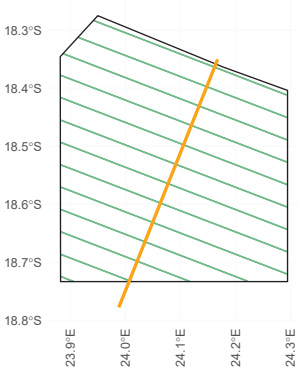
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: SAVN
STRATUM NAME: Savuti North
■ STRATUM AREA: 1914.03 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 120 km

– TRANSECTS: 13 (489 km)
TRANSECT ORIENTATION: 112.8°
PLANNED SAMPLING INTENSITY: 7.7 %

– BASELINE DISTANCE: 50.93 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.5 h
Crew(s): C04
KES2022_V5WOT20221004A 06:31–11:01

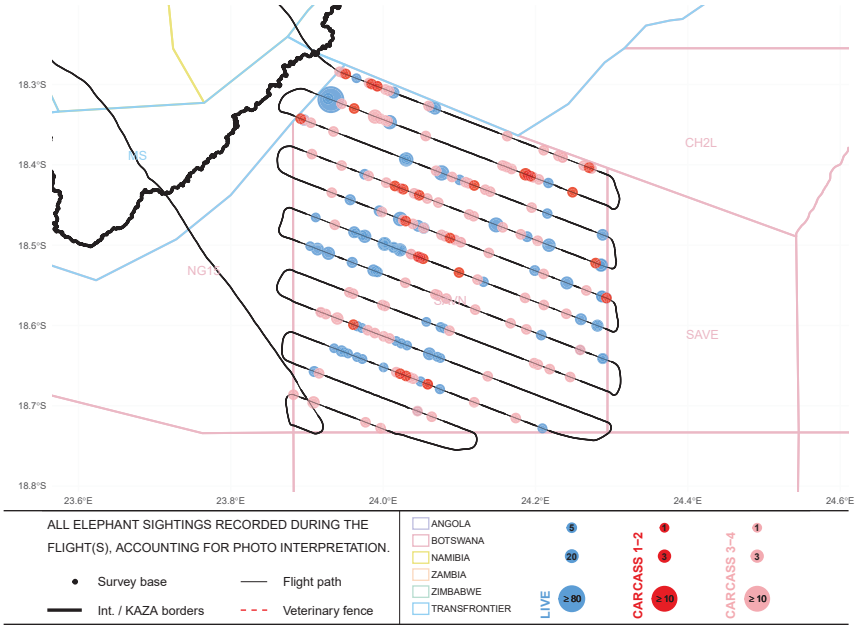
Actual sampling intensity: 7.9 %
Transect flying time: 2.8 h
Transects: 13 – 489 km – 112.8°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C04	
Side:	L	R
% sightings:	35	65
% individuals:	26	74

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	233	41.2	8.33
Live elephant (>9):	19	68.42	30.77
Elephant carcass:	115	59.13	47.06
Live elephant (<10):	42	40.48	17.65





LIVE ELEPHANTS

IN SAMPLE:	**450 (60)**
Bulls:	34 (21)
Family:	416 (39)
NOT IN SAMPLE:	**313 (31)**
Outside search strip:	313
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**117 (115)**
Category 1:	3 (3)
Category 2:	18 (17)
Category 3:	47 (46)
Category 4:	49 (49)
NOT IN SAMPLE:	**28 (25)**
Outside search strip:	28
Off transect:	0

OTHER SPECIES

Other wildlife species:	14
Other wildlife count:	482
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.179, N = 165, w = 309

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	5476	5705	1420	1483
Variance of estimate	$Var\hat{Y}$	2513659	2494954	19640	19552
Standard error	$SE\hat{Y}$	1585	1580	140	140
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 3454	± 3442	± 305	± 305
Percentage of relative precision	$PRP\hat{Y}$	63 %	60 %	22 %	21 %
Density per sqkm	$R\hat{Y}$	2.861	2.98	0.742	0.775
Variance between transect counts	s^2_y	1605.192	1617.09	25.256	25.5
Variance between transect areas	s^2_a	19.455	19.455	19.455	19.455
Covariance between counts & areas	s_{ay}	80.858	83.518	17.384	17.458

CARCASS RATIOS

$CR_{1:4} = 20.6\ \%$
$CR_{1:2} = 4.5\ \%$

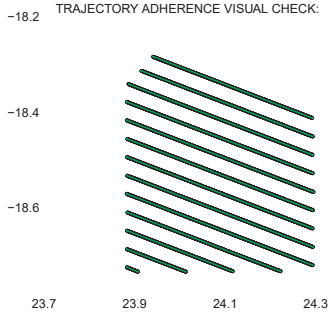
SAVN – Savuti North

BOTSWANA – NORTHERN BOTSWANA

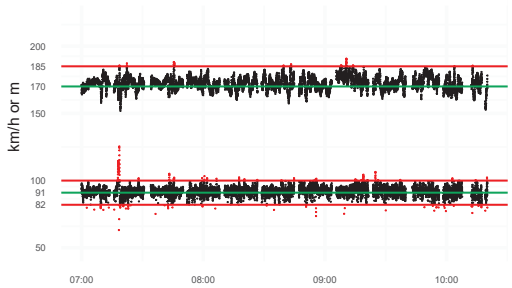
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221004A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 172.4 km/h
Standard dev.: 4.7 km/h

HEIGHT AGL
Average: 91.9 m (301.6 ft)
Standard dev.: 3.8 m (12.5 ft)

SAVN – Savuti North — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: SAVN **N:** 165 S_a^2: 19,455
STRATUM NAME: Savuti North **w:** 309 **df:** 12

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	61	17	773	1412	0,404	419696	647,84	0	2185	183	220,731	8,116
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	134	10	1699	2731	0,888	1570692	1253,27	0	4429	161	845,231	26,556
elephant bulls	Loxodonta africana males	34	16	431	419	0,225	36925	192,16	12	850	97	19,756	3,598
elephant family	Loxodonta africana family	416	297	5274	3504	2,755	2585818	1608,05	1770	8777	66	1631,833	79,920
elephant carcass one	Loxodonta africana carcass one	3	0	38	56	0,020	664	25,77	0	94	148	0,359	0,569
elephant carcass two	Loxodonta africana carcass two	18	6	228	117	0,119	2881	53,67	111	345	51	1,923	2,968
elephant carcass three	Loxodonta africana carcass three	47	12	596	144	0,311	4345	65,92	452	739	24	5,590	8,392
elephant carcass four	Loxodonta africana carcass four	49	10	621	199	0,325	8341	91,33	422	820	32	5,859	5,529
giraffe	Giraffa giraffa	26	2	330	268	0,172	15088	122,83	62	597	81	8,333	3,184
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	55	1	697	669	0,364	94283	307,06	28	1366	96	44,692	-2,131
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	1	0	13	26	0,007	145	12,02	0	39	207	0,077	0,222
ostrich	Struthio camelus	9	2	114	107	0,060	2391	48,90	8	221	93	1,397	1,914
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	2	0	25	52	0,013	579	24,06	0	78	207	0,308	0,424
sable	Hippotragus niger	20	1	254	419	0,132	37065	192,52	0	673	165	19,269	1,570
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	14	0	177	230	0,093	11120	105,45	0	407	129	6,077	2,618
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	58	70	735	1148	0,384	277578	526,86	0	1883	156	144,269	4,413
zebra	Equus spp,	46	26	583	593	0,305	74145	272,30	0	1176	102	42,436	9,591
all elephants	Loxodonta africana all	450	313	5705	3442	2,980	2494954	1579,54	2263	9146	60	1617,090	83,518
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	21	6	266	129	0,139	3506	59,21	137	395	48	2,423	3,537
all elephant carcasses	Loxodonta africana carcass all	117	28	1483	305	0,775	19552	139,83	1179	1788	21	25,500	17,458
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	96	22	1217	239	0,636	12074	109,88	978	1456	20	16,090	13,921

SK – Seh&kwe

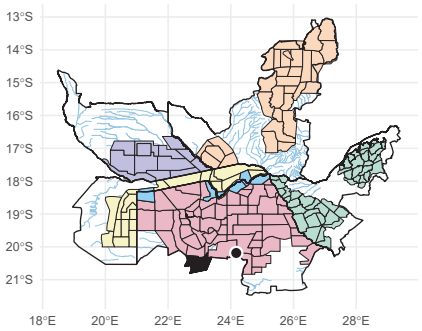
BOTSWANA – NORTHERN BOTSWANA

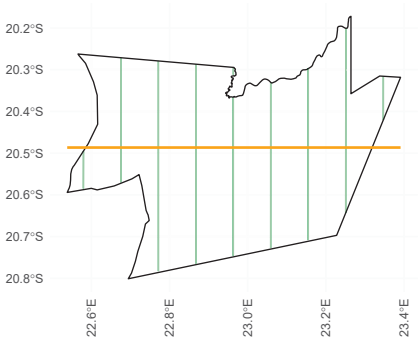
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: SK
STRATUM NAME: Seh&kwe
■ STRATUM AREA: 3469.73 sqkm
• SURVEY BASE: Matopi
DISTANCE TO SURVEY BASE: 133 km

– TRANSECTS: 9 (352 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 3 %

– BASELINE DISTANCE: 89.01 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4 h
Crew(s): C02
KES2022_V5LJB20220918A 06:00–10:03

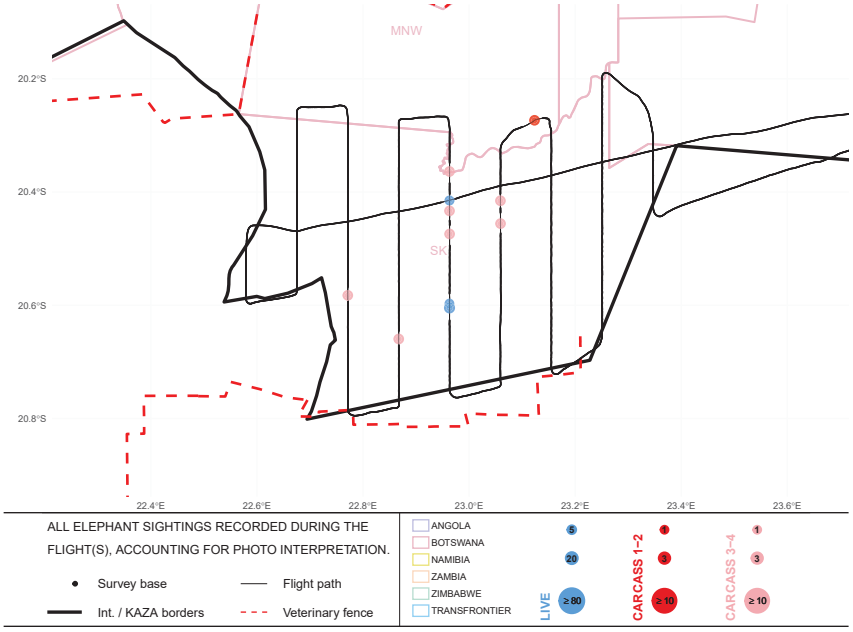
Actual sampling intensity: 3.2 %
Transect flying time: 2 h
Transects: 9 – 352 km – 0°
Search effort: 1.08 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	50	50
% individuals:	53	47

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	29	65.52	36.84
Live elephant (>9):	0		
Elephant carcass:	6	33.33	0
Live elephant (<10):	1	100	0





LIVE ELEPHANTS

IN SAMPLE:	**2 (1)**
Bulls:	2 (1)
Family:	0 (0)
NOT IN SAMPLE:	**29 (8)**
Outside search strip:	8
Off transect:	21



ELEPHANT CARCASSES

IN SAMPLE:	**6 (6)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	3 (3)
Category 4:	3 (3)
NOT IN SAMPLE:	**3 (3)**
Outside search strip:	1
Off transect:	2

OTHER SPECIES

Other wildlife species:	7
Other wildlife count:	66
Domestic count:	823

ELEPHANT DATA ANALYSIS

t = 2.306, N = 277, w = 320

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	62	62	185	185
Variance of estimate	$Var\hat{Y}$	3599	3599	9336	9336
Standard error	$SE\hat{Y}$	60	60	97	97
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 138	± 138	± 223	± 223
Percentage of relative precision	$PRP_{\hat{Y}}$	225 %	225 %	121 %	121 %
Density per sqkm	$R_{\hat{Y}}$	0.018	0.018	0.053	0.053
Variance between transect counts	s^2_y	0.444	0.444	1.25	1.25
Variance between transect areas	s^2_a	29.974	29.974	29.974	29.974
Covariance between counts & areas	s_{ay}	0.569	0.569	1.972	1.972

CARCASS RATIOS

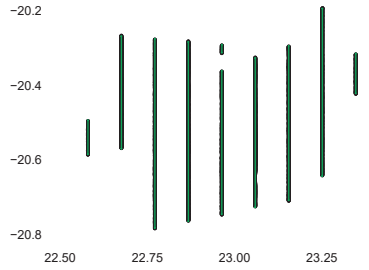
$CR_{1:4} = 75$ %
$CR_{1:2} = 0$ %

SK – Seh&kwe — BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220918A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



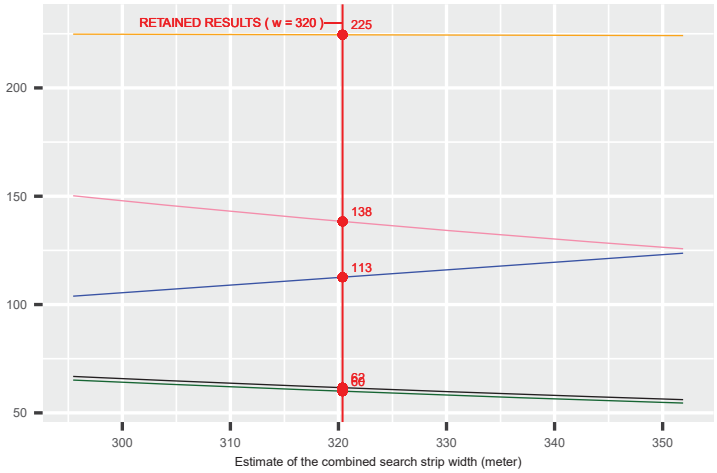
SPEED
Average: 173.2 km/h
Standard dev.: 5.3 km/h

HEIGHT AGL
Average: 92.7 m (304.1 ft)
Standard dev.: 4.3 m (14.2 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [156 – 178]
C02 – Right: [135 – 187]



LIVE ELEPHANT ESTIMATE: [67 – 56]
CONFIDENCE INTERVAL: ± [150 – 126]
SAMPLE AREA: [104 – 124] sqkm
SE: [65 – 55]
PRP: [225 – 224] %

SK – Seh&kwe — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: SK **N:** 278 S_a^2: 29,974
STRATUM NAME: She&kwe **w:** 320 **df:** 8

	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	538	99	16575	11308	4,777	24047147	4903,79	5267	27883	68	4311,944	219,626
donkey	Equus asinus	7	7	216	254	0,062	12091	109,96	0	469	118	0,944	-3,191
duiker	Sylvicapra grimmia	5	0	154	142	0,044	3786	61,53	12	296	92	0,528	1,471
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	2	20	62	138	0,018	3599	59,99	0	200	225	0,444	0,569
elephant family	Loxodonta africana family	0	9	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	3	0	92	96	0,027	1719	41,46	0	188	103	0,250	1,203
elephant carcass four	Loxodonta africana carcass four	3	2	92	146	0,027	3986	63,13	0	238	158	0,500	0,769
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	47	18	1448	1417	0,417	377478	614,39	31	2865	98	55,194	17,887
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	30	4	924	862	0,266	139619	373,66	63	1786	93	17,500	5,261
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	13	3	401	434	0,115	35447	188,27	0	835	108	4,528	2,841
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	231	0	7117	5596	2,051	5889172	2426,76	1521	12713	79	1070,750	118,770
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	2	0	62	139	0,018	3649	60,41	0	201	226	0,444	0,400
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	5	15	154	348	0,044	22806	151,02	0	502	226	2,778	1,000
all elephants	Loxodonta africana all	2	29	62	138	0,018	3599	59,99	0	200	225	0,444	0,569
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	6	3	185	223	0,053	9336	96,62	0	408	121	1,250	1,972
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	6	2	185	223	0,053	9336	96,62	0	408	121	1,250	1,972

SUSH – Sankuyu Shorobe

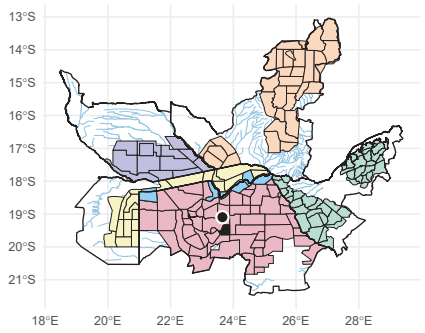
BOTSWANA – NORTHERN BOTSWANA

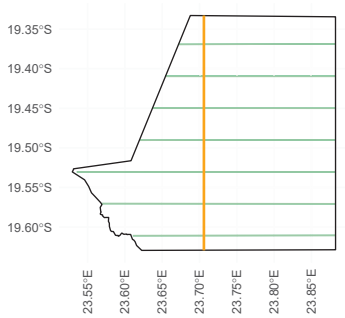
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: SUSH
STRATUM NAME: Sankuyu Shorobe
■ STRATUM AREA: 905.84 sqkm
• SURVEY BASE: Khwai
DISTANCE TO SURVEY BASE: 38 km

– TRANSECTS: 7 (200 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 6.6 %

– BASELINE DISTANCE: 32.85 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2 h
Crew(s): C02
KES2022_V5LJB20220926B 15:58–17:58

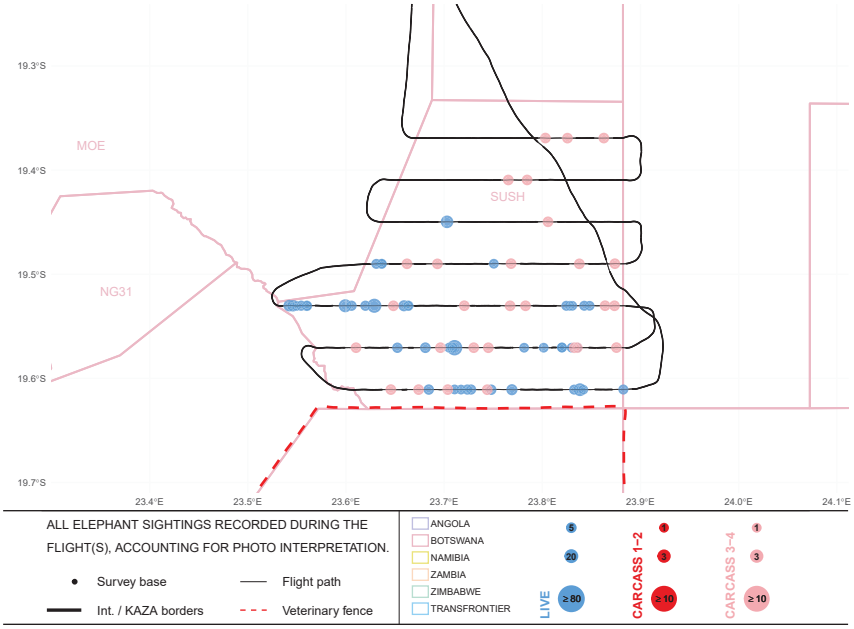
Actual sampling intensity: 7.1 %
Transect flying time: 1.2 h
Transects: 7 – 200 km – 90°
Search effort: 1.08 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	57	43
% individuals:	65	35

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	76	0	
Live elephant (>9):	0		
Elephant carcass:	22	0	
Live elephant (<10):	22	0	



LIVE ELEPHANTS



IN SAMPLE:	**62 (22)**
Bulls:	13 (11)
Family:	49 (11)
NOT IN SAMPLE:	**143 (26)**
Outside search strip:	143
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**22 (22)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	5 (5)
Category 4:	17 (17)
NOT IN SAMPLE:	**6 (6)**
Outside search strip:	6
Off transect:	0

OTHER SPECIES

Other wildlife species:	8
Other wildlife count:	178
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.447, N = 101, w = 323

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	871	871	309	309
Variance of estimate	$Var\hat{Y}$	253639	253639	3270	3270
Standard error	$SE\hat{Y}$	504	504	57	57
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1232	± 1232	± 140	± 140
Percentage of relative precision	$PRP\hat{Y}$	141 %	141 %	45 %	45 %
Density per sqkm	$R\hat{Y}$	0.962	0.962	0.341	0.341
Variance between transect counts	s^2_y	222.476	222.476	3.81	3.81
Variance between transect areas	s^2_a	2.513	2.513	2.513	2.513
Covariance between counts & areas	s_{ay}	21.074	21.074	2.53	2.53

CARCASS RATIOS

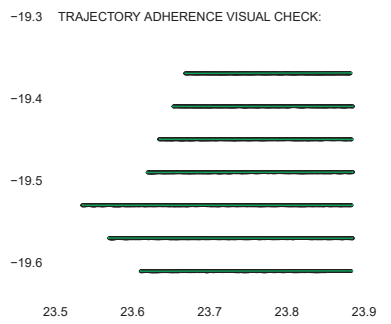
$CR_{1:4} = 26.2$ %
$CR_{1:2} = 0$ %

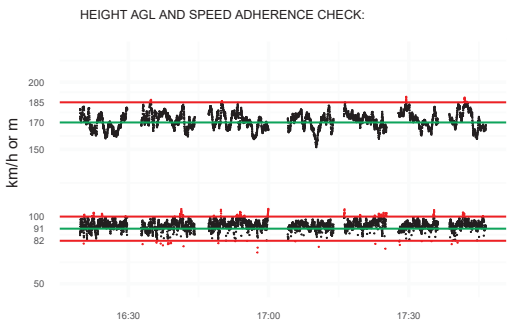
SUSH – Sankuyu Shorobe

BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220926B





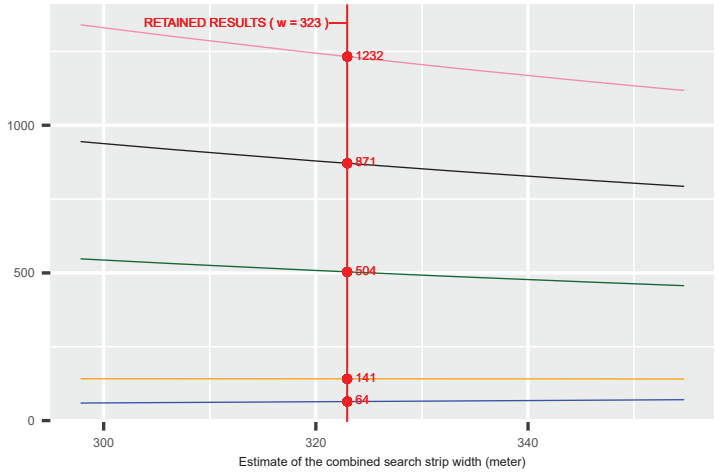
SPEED
Average: 171.4 km/h
Standard dev.: 6 km/h

HEIGHT AGL
Average: 93.5 m (306.6 ft)
Standard dev.: 3.5 m (11.6 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [157 – 180]
C02 – Right: [136 – 188]



LIVE ELEPHANT ESTIMATE: [945 – 793]
CONFIDENCE INTERVAL: ± [1340 – 1118]
SAMPLE AREA: [59 – 71] sqkm
SE: [548 – 457]
PRP: [142 – 141] %

SUSH – Sankuyu Shorobe — BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: SUSH **N:** 102 S_a^2: 2,513
STRATUM NAME: Sankuyu Shorobe **w:** 323 **df:** 6

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	14	35	0,016	207	14,39	0	49	251	0,143	-0,224
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	13	16	183	167	0,202	4671	68,34	15	350	92	4,476	2,939
elephant family	Loxodonta africana family	49	127	688	1137	0,760	215947	464,70	0	1826	165	183,000	18,135
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	5	1	70	91	0,078	1397	37,38	0	162	130	1,238	1,534
elephant carcass four	Loxodonta africana carcass four	17	5	239	115	0,264	2205	46,96	124	354	48	1,952	0,996
giraffe	Giraffa giraffa	22	0	309	306	0,341	15635	125,04	3	615	99	13,476	3,531
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	105	0	1475	1253	1,629	262121	511,98	223	2728	85	255,000	21,870
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	20	0	281	312	0,310	16222	127,37	0	593	111	14,810	5,264
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	7	0	98	229	0,109	8733	93,45	0	327	232	7,000	3,156
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	6	0	84	206	0,093	7088	84,19	0	290	244	5,143	0,083
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	4	0	56	88	0,062	1283	35,82	0	144	156	0,952	0,242
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	13	0	183	395	0,202	26098	161,55	0	578	216	20,143	3,186
all elephants	Loxodonta africana all	62	143	871	1232	0,962	253639	503,63	0	2103	141	222,476	21,074
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	22	6	309	140	0,341	3270	57,18	169	449	45	3,810	2,530
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	22	6	309	140	0,341	3270	57,18	169	449	45	3,810	2,530

WOKS – W Okavango South

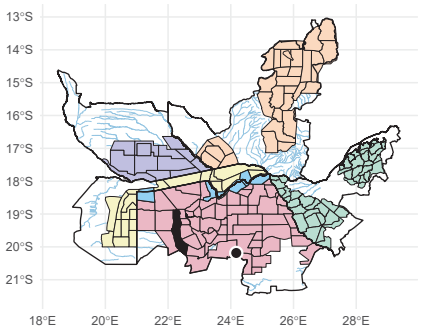
BOTSWANA – NORTHERN BOTSWANA

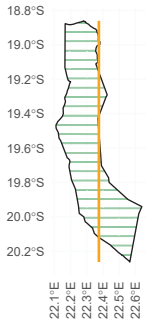
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: WOKS
STRATUM NAME: W Okavango South
■ STRATUM AREA: 3635.78 sqkm
• SURVEY BASE: Matopi
DISTANCE TO SURVEY BASE: 212 km

– TRANSECTS: 26 (607 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5 %

– BASELINE DISTANCE: 155.15 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 6.2 h
Crew(s): C02
KES2022_V5LJB20220919A 06:09–10:42
KES2022_V5LJB20220919B 16:20–18:00

Actual sampling intensity: 5.4 %
Transect flying time: 3.5 h
Transects: 26 – 607 km – 90°
Search effort: 1.08 min/sqkm

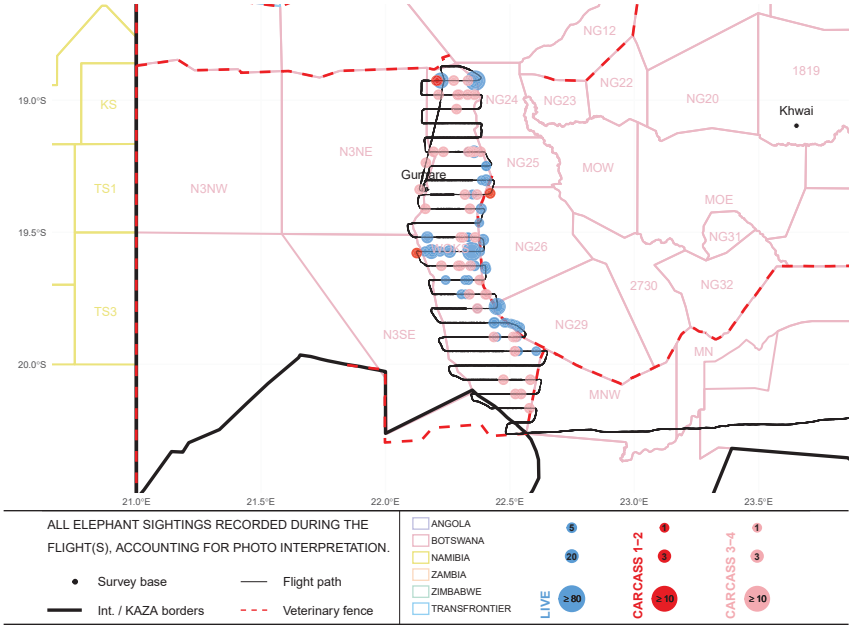
OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	53	47
% individuals:	64	36

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	134	68.66	28.26
Live elephant (>9):	7	100	28.57
Elephant carcass:	38	63.16	12.5
Live elephant (<10):	19	78.95	26.67

Undetected live elephant: 0
Undetected elephant carcass: 2





LIVE ELEPHANTS

IN SAMPLE:	**204 (25)**
Bulls:	23 (14)
Family:	181 (11)
NOT IN SAMPLE:	**190 (29)**
Outside search strip:	89
Off transect:	101



ELEPHANT CARCASSES

IN SAMPLE:	**40 (40)**
Category 1:	0 (0)
Category 2:	2 (2)
Category 3:	9 (9)
Category 4:	29 (29)
NOT IN SAMPLE:	**8 (8)**
Outside search strip:	4
Off transect:	4

OTHER SPECIES

Other wildlife species:	14
Other wildlife count:	227
Domestic count:	2114

ELEPHANT DATA ANALYSIS

t = 2.06, N = 480, w = 323

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3790	3790	743	743
Variance of estimate	$\mathrm{Var}\hat{Y}$	2464405	2591520	31352	31798
Standard error	$\mathrm{SE}\hat{Y}$	1570	1610	177	178
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 3233	± 3315	± 365	± 367
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	85 %	87 %	49 %	49 %
Density per sqkm	$R_{\hat{Y}}$	1.042	1.042	0.204	0.204
Variance between transect counts	s_y^2	287.415	302.375	3.538	3.618
Variance between transect areas	s_a^2	5.778	5.778	5.778	5.778
Covariance between counts & areas	s_{ay}	0.37	0.298	0.131	0.197

CARCASS RATIOS

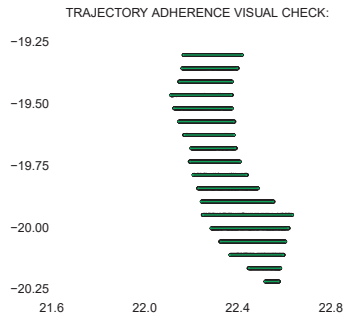
$CR_{1:4} = 16.4\ \%$
$CR_{1:2} = 1\ \%$

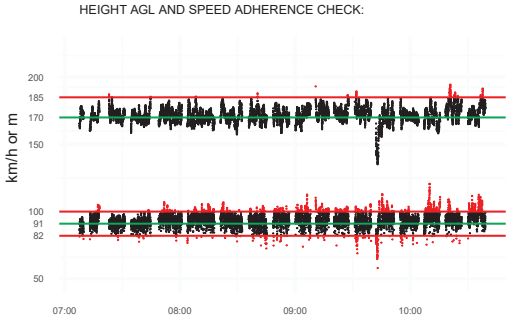
WOKS – W Okavango South

BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220919A

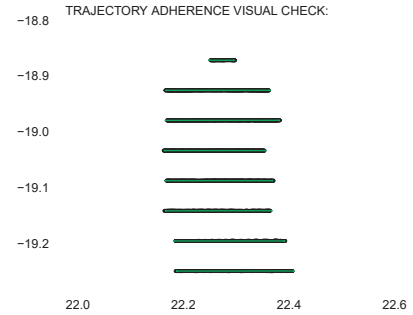


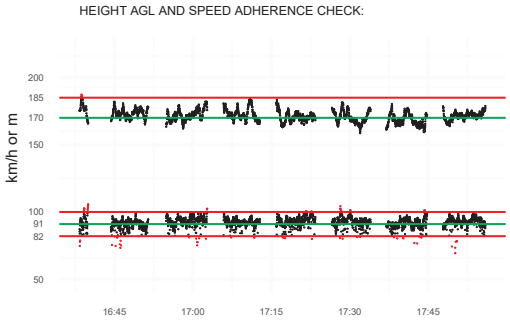


SPEED
Average: 171.8 km/h
Standard dev.: 5.8 km/h

HEIGHT AGL
Average: 93.8 m (307.6 ft)
Standard dev.: 5.2 m (16.9 ft)

KES2022_ V5LJB20220919B





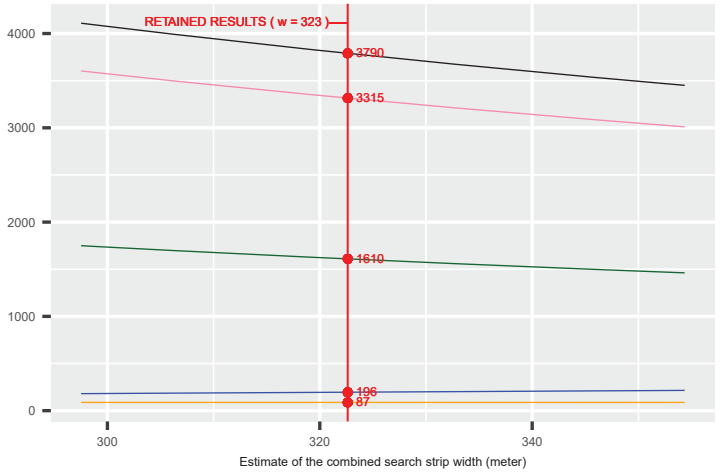
SPEED
Average: 171.4 km/h
Standard dev.: 4.6 km/h

HEIGHT AGL
Average: 92.2 m (302.5 ft)
Standard dev.: 3.7 m (12.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [157 – 180]
C02 – Right: [136 – 188]



LIVE ELEPHANT ESTIMATE: [4110 – 3451]
CONFIDENCE INTERVAL: ± [3603 – 3010]
SAMPLE AREA: [180 – 215] sqkm
SE: [1750 – 1462]
PRP: [88 – 87] %

WOKS – W Okavango South

BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: WOKS **N:** 481 S_a^2: 5,778
STRATUM NAME: W Okavango South **w:** 323 **df:** 25

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	4	0	74	148	0,020	5139	71,69	0	222	199	0,615	0,169
bushbuck	Tragelaphus scriptus	2	0	37	74	0,010	1291	35,93	0	111	199	0,154	0,049
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	1166	419	21662	6617	5,958	10322209	3212,82	15045	28279	31	1414,055	32,919
donkey	Equus asinus	225	33	4180	2446	1,150	1410460	1187,63	1734	6626	59	149,675	-4,495
duiker	Sylvicapra grimmia	1	0	19	37	0,005	319	17,86	0	55	198	0,038	0,067
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	23	36	427	251	0,118	14860	121,90	176	678	59	1,866	0,765
elephant family	Loxodonta africana family	181	154	3363	3150	0,925	2338887	1529,34	213	6512	94	272,198	-0,466
elephant carcass one	Loxodonta africana carcass one	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	2	1	37	75	0,010	1314	36,25	0	112	201	0,154	-0,084
elephant carcass three	Loxodonta africana carcass three	9	4	167	107	0,046	2717	52,12	60	275	64	0,315	0,051
elephant carcass four	Loxodonta africana carcass four	29	2	539	298	0,148	20907	144,59	241	837	55	2,426	0,229
giraffe	Giraffa giraffa	2	0	37	74	0,010	1285	35,84	0	111	199	0,154	0,085
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	41	3	762	772	0,210	140534	374,88	0	1534	101	16,734	0,676
impala	Aepyceros melampus	15	0	279	296	0,077	20657	143,73	0	575	106	2,654	1,516
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	16	3	297	249	0,082	14613	120,88	48	546	84	1,766	0,415
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	82	26	1523	1182	0,419	329496	574,02	341	2706	78	40,375	2,656
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	682	113	12670	6067	3,485	8678279	2945,89	6603	18737	48	852,825	-15,569
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	2	0	37	74	0,010	1308	36,16	0	112	200	0,154	-0,049
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	75	25	1393	1397	0,383	460012	678,24	0	2790	100	52,986	-1,100
all elephants	Loxodonta africana all	204	190	3790	3315	1,042	2591520	1609,82	474	7105	87	302,375	0,298
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	2	2	37	75	0,010	1314	36,25	0	112	201	0,154	-0,084
all elephant carcasses	Loxodonta africana carcass all	40	8	743	367	0,204	31798	178,32	376	1110	49	3,618	0,197
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	38	6	706	353	0,194	29340	171,29	353	1059	50	3,378	0,280

WONE – W Okavango North–East

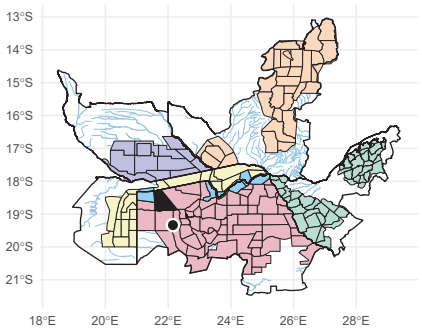
BOTSWANA – NORTHERN BOTSWANA

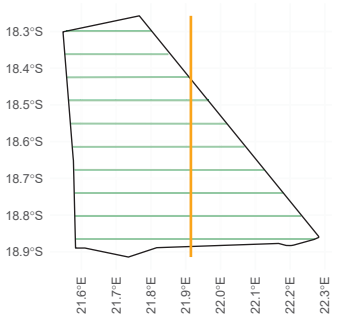
SURVEY DESIGN

COUNTRY: Botswana
SUPERSTRATUM: Northern Botswana
STRATUM CODE: WONE
STRATUM NAME: W Okavango North–East
■ STRATUM AREA: 3391.09 sqkm
• SURVEY BASE: Gumare
DISTANCE TO SURVEY BASE: 105 km

– TRANSECTS: 10 (494 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 4.4 %

– BASELINE DISTANCE: 72.74 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C02
KES2022_V5LJB20220920A 06:15–10:39

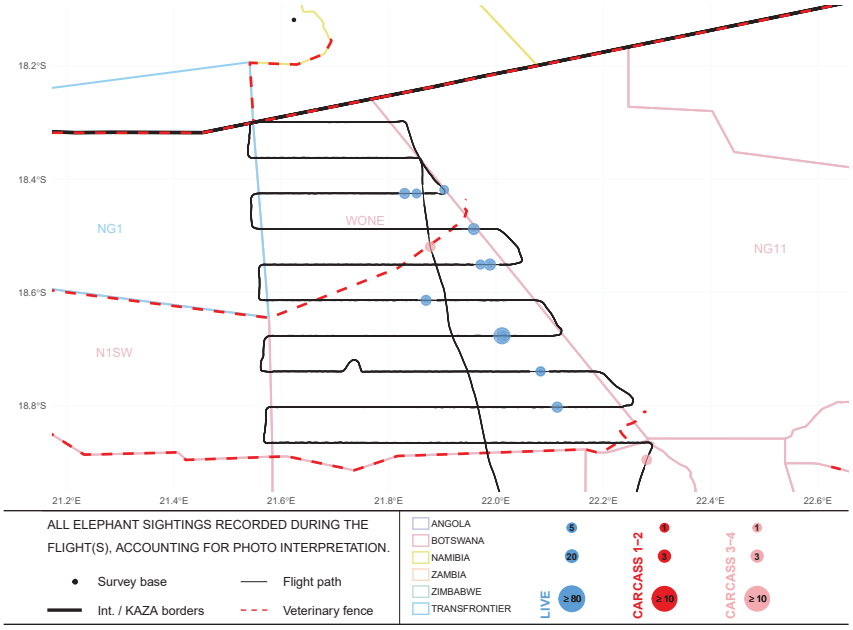
Actual sampling intensity: 4.6 %
Transect flying time: 2.9 h
Transects: 10 – 490 km – 90°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	44	56
% individuals:	55	45

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	15	40	83.33
Live elephant (>9):	2	50	100
Elephant carcass:	0		
Live elephant (<10):	2	50	0



LIVE ELEPHANTS



IN SAMPLE:	**31 (4)**
Bulls:	19 (3)
Family:	12 (1)
NOT IN SAMPLE:	**80 (10)**
Outside search strip:	64
Off transect:	16

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**2 (2)**
Outside search strip:	0
Off transect:	2

OTHER SPECIES

Other wildlife species:	5
Other wildlife count:	5
Domestic count:	363

ELEPHANT DATA ANALYSIS

t = 2.262, N = 226, w = 322

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	646	667	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	150306	159362	–	–
Standard error	$\mathrm{SE}\hat{Y}$	388	399	–	–
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 877	± 903	–	–
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	136 %	135 %	–	–
Density per sqkm	$R_{\hat{Y}}$	0.19	0.197	–	–
Variance between transect counts	s_y^2	28.889	30.544	–	–
Variance between transect areas	s_a^2	26.656	26.656	–	–
Covariance between counts & areas	s_{ay}	−2.415	−2.676	–	–

CARCASS RATIOS

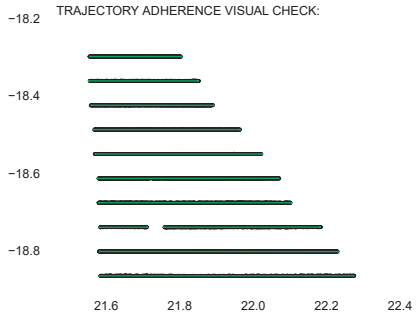
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

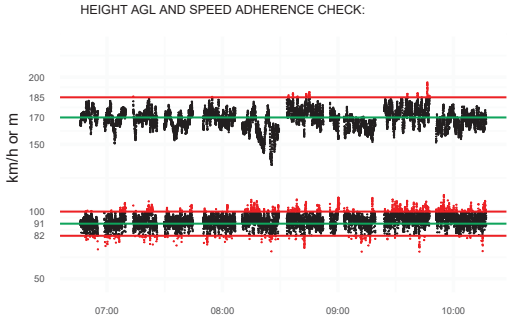
WONE – W Okavango North–East

BOTSWANA – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20220920A





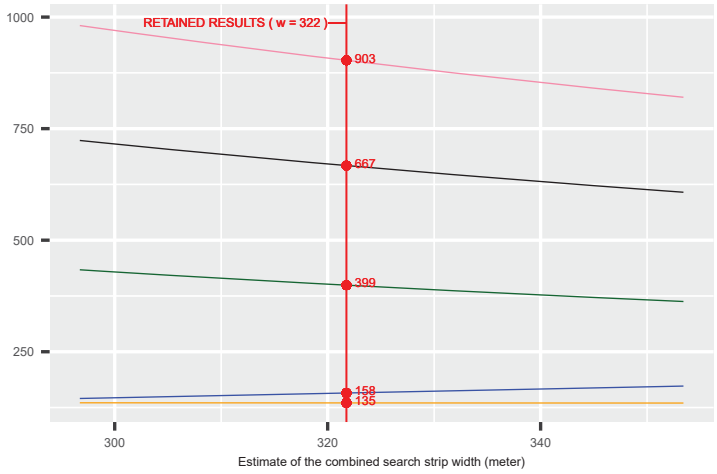
SPEED
Average: 168.8 km/h
Standard dev.: 7.1 km/h

HEIGHT AGL
Average: 93.1 m (305.5 ft)
Standard dev.: 5 m (16.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [156 – 179]
C02 – Right: [136 – 188]



LIVE ELEPHANT ESTIMATE: [724 – 607]
CONFIDENCE INTERVAL: ± [981 – 820]
SAMPLE AREA: [145 – 173] sqkm
SE: [434 – 363]
PRP: [136 – 135] %

WONE – W Okavango North–East BOTSWANA – NORTHERN BOTSWANA

STRATUM CODE: WONE **N:** 226 S_a^2: 26,656
STRATUM NAME: W Okavango North-East **w:** 322 ***df*:** 9

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	243	157	5230	3597	1,542	2528906	1590,25	1633	8827	69	366,011	-28,650
donkey	Equus asinus	61	25	1313	1381	0,387	372816	610,59	0	2694	105	61,656	-13,796
duiker	Sylvicapra grimmia	3	0	65	99	0,019	1929	43,93	0	164	154	0,456	1,843
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	19	37	409	593	0,121	68739	262,18	0	1002	145	13,211	-1,971
elephant family	Loxodonta africana family	12	43	258	605	0,076	71609	267,60	0	864	234	14,400	-0,704
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	3	0	65	107	0,019	2236	47,28	0	172	166	0,456	0,196
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	1	6	22	51	0,006	510	22,58	0	73	237	0,100	-0,261
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	56	0	1205	2116	0,355	874592	935,20	0	3321	176	153,600	-31,096
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	15	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	31	80	667	903	0,197	159362	399,20	0	1570	135	30,544	-2,676
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

NAMIBIA



14HNA – NG14 high Namibia

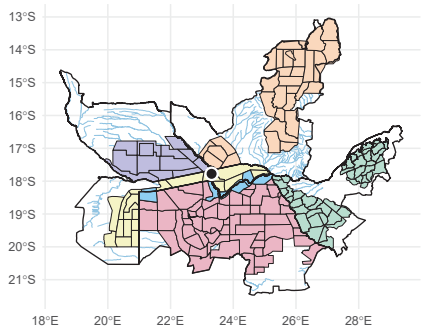
NAMIBIA – KAVANGO ZAMBEZI

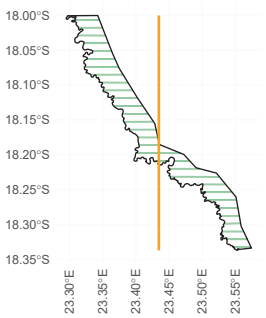
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: 14HNA
STRATUM NAME: NG14 high Namibia
■ STRATUM AREA: 164.7 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 45 km

– TRANSECTS: 30 (129 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 23.5 %

– BASELINE DISTANCE: 37.24 km





SURVEY IMPLEMENTATION

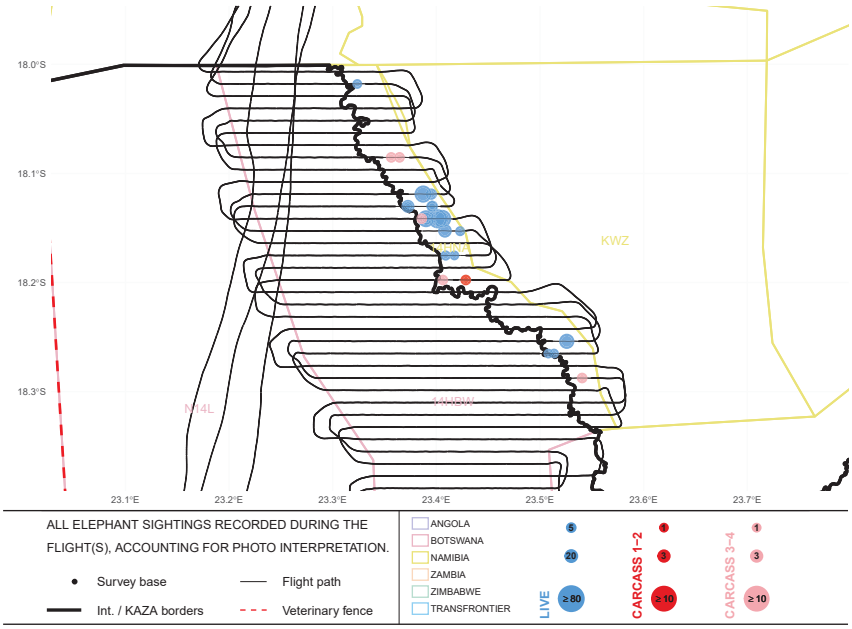
Number of flight(s): 3
Combined flying time: 11.4 h
Crew(s): C01, C02, C04
KES2022_V5IIM20221006A 06:45–10:46
KES2022_V5WOT20221007A 07:19–11:01
KES2022_V5LJB20221007A 06:50–10:30
Actual sampling intensity: 24.8 %
Transect flying time: 0.7 h
Transects: 30 – 129 km – 0°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01		C04		C02	
Side:	L	R	L	R	L	R
% sightings:	42	58	44	56	39	61
% individuals:	66	34	33	67	35	65

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	46	39.13	50
Live elephant (>9):	4	100	25
Elephant carcass:	5	20	0
Live elephant (<10):	7	28.57	0



LIVE ELEPHANTS



IN SAMPLE:	**101 (11)**
Bulls:	3 (2)
Family:	98 (9)
NOT IN SAMPLE:	**156 (11)**
Outside search strip:	156
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**5 (5)**
Category 1:	0 (0)
Category 2:	1 (1)
Category 3:	2 (2)
Category 4:	2 (2)
NOT IN SAMPLE:	**1 (1)**
Outside search strip:	1
Off transect:	0

OTHER SPECIES

Other wildlife species:	9
Other wildlife count:	760
Domestic count:	186

ELEPHANT DATA ANALYSIS

t = 2.132, N = 111, 119, 106, w = 321

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	404	408	20	20
Variance of estimate	$Var\hat{Y}$	62186	63103	91	91
Standard error	$SE\hat{Y}$	249	251	10	10
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 534	± 537	± 20	± 20
Percentage of relative precision	$PRP\hat{Y}$	132 %	132 %	99 %	99 %
Density per sqkm	$R\hat{Y}$	2.456	2.478	0.122	0.122
Variance between transect counts	s_y^2	140.023	141.964	0.213	0.213
Variance between transect areas	s_a^2	0.138	0.138	0.138	0.138
Covariance between counts & areas	s_{ay}	0.022	0.026	0.052	0.052

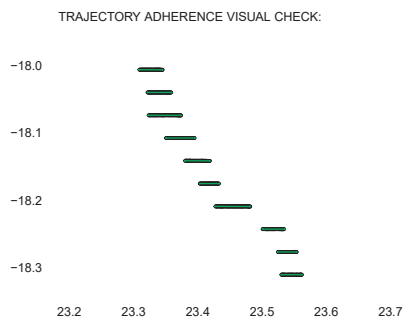
CARCASS RATIOS

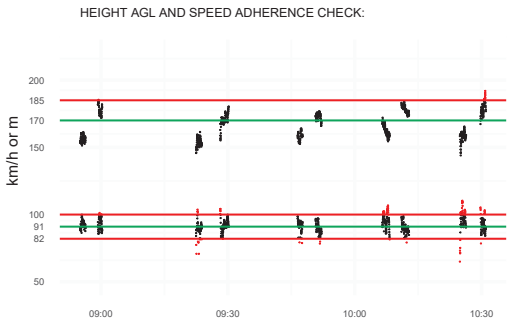
$CR_{1:4} = 4.7\ \%$
$CR_{1:2} = 0.9\ \%$

14HNA – NG14 high Namibia — NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221006A

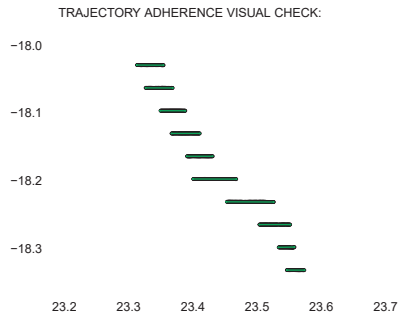


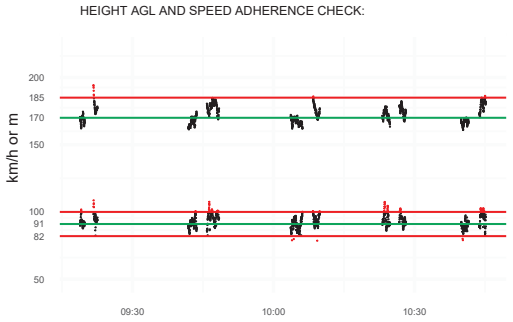


SPEED
Average: 167 km/h
Standard dev.: 10.1 km/h

HEIGHT AGL
Average: 92.3 m (302.9 ft)
Standard dev.: 5.8 m (18.9 ft)

KES2022_ V5WOT20221007A

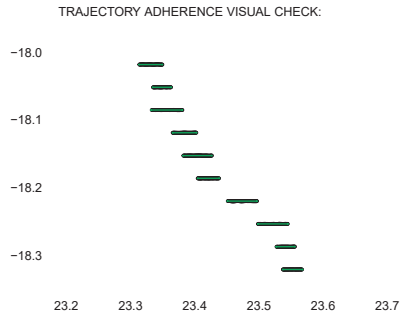


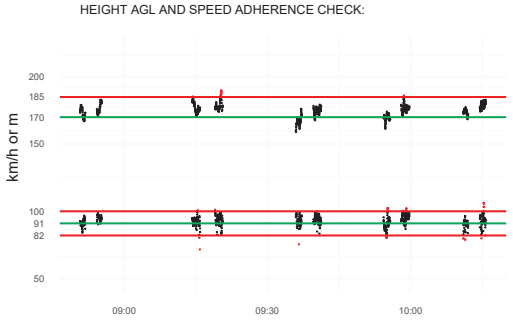


SPEED
Average: 172.5 km/h
Standard dev.: 6.1 km/h

HEIGHT AGL
Average: 93.2 m (305.8 ft)
Standard dev.: 4.8 m (15.8 ft)

KES2022_ V5LJB20221007A





SPEED
Average: 174.8 km/h
Standard dev.: 5 km/h

HEIGHT AGL
Average: 92.8 m (304.5 ft)
Standard dev.: 4.1 m (13.5 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

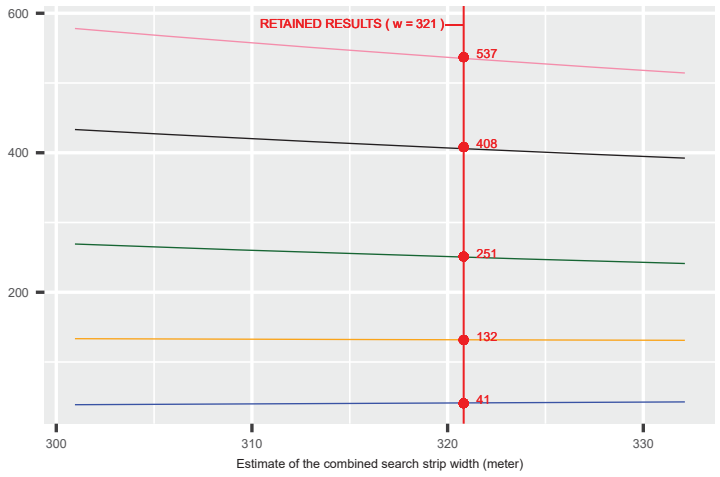
Range of search strip width estimates (m):

C01 – Left: [159 – 192]
C01 – Right: [120 – 161]

C02 – Left: [156 – 179]
C02 – Right: [135 – 187]

C04 – Left: [156 – 156]
C04 – Right: [157 – 157]

LIVE ELEPHANT ESTIMATE: [433 – 392]
CONFIDENCE INTERVAL: ± [578 – 514]
SAMPLE AREA: [39 – 43] sqkm
SE: [269 – 241]
PRP: [133 – 131] %



14HNA – NG14 high Namibia NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: 14HNA **N:** 88, 94, 84 S_a^2: 0,138
STRATUM NAME: NG14 high Namibia **w:** 321 **df:** 29

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	523	220	2036	1603	12,363	575602	758,68	433	3639	79	1724,668	9,897
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	167	31	675	553	4,099	68841	262,38	122	1228	82	168,185	0,479
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	3	6	11	18	0,067	67	8,17	0	30	167	0,162	0,015
elephant family	Loxodonta africana family	98	150	397	531	2,411	61375	247,74	0	928	134	138,340	0,011
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	1	0	4	8	0,022	13	3,62	0	12	222	0,033	0,028
elephant carcass three	Loxodonta africana carcass three	2	1	8	11	0,048	27	5,22	0	19	139	0,064	0,025
elephant carcass four	Loxodonta africana carcass four	2	0	8	11	0,052	24	4,90	0	20	131	0,064	-0,001
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	8	0	33	58	0,201	670	25,88	0	91	176	1,651	0,077
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	49	0	205	298	1,246	17552	132,48	0	503	145	42,171	-0,110
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	141	44	584	377	3,548	31622	177,83	208	961	64	80,562	0,709
reedbuck	Redunca arundinum	10	0	42	86	0,255	1454	38,13	0	128	205	3,333	-0,096
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	19	0	81	154	0,490	4616	67,94	0	234	190	12,033	0,221
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	10	0	42	65	0,252	845	29,07	0	107	157	2,161	0,149
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	1	0	4	9	0,026	15	3,84	0	13	207	0,033	-0,012
zebra	Equus spp,	16	0	68	89	0,410	1789	42,30	0	156	131	4,120	-0,058
all elephants	Loxodonta africana all	101	156	408	537	2,478	63103	251,20	0	945	132	141,964	0,026
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	4	8	0,022	13	3,62	0	12	222	0,033	0,028
all elephant carcasses	Loxodonta africana carcass all	5	1	20	20	0,122	91	9,52	0	40	99	0,213	0,052
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	4	1	16	15	0,100	51	7,16	2	31	90	0,120	0,024

BUF – Buffalo

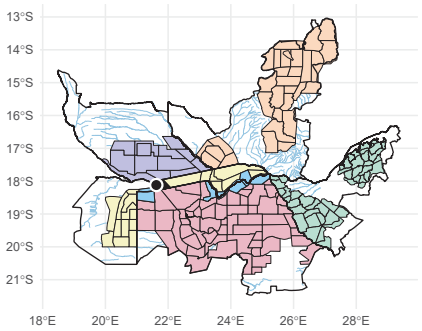
NAMIBIA – KAVANGO ZAMBEZI

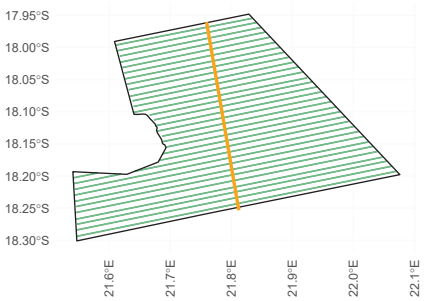
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: BUF
STRATUM NAME: Buffalo
■ STRATUM AREA: 1177.2 sqkm
• SURVEY BASE: Bagani
DISTANCE TO SURVEY BASE: 23 km

– TRANSECTS: 32 (1168 km)
TRANSECT ORIENTATION: 79.8°
PLANNED SAMPLING INTENSITY: 29.8 %

– BASELINE DISTANCE: 32.85 km





SURVEY IMPLEMENTATION

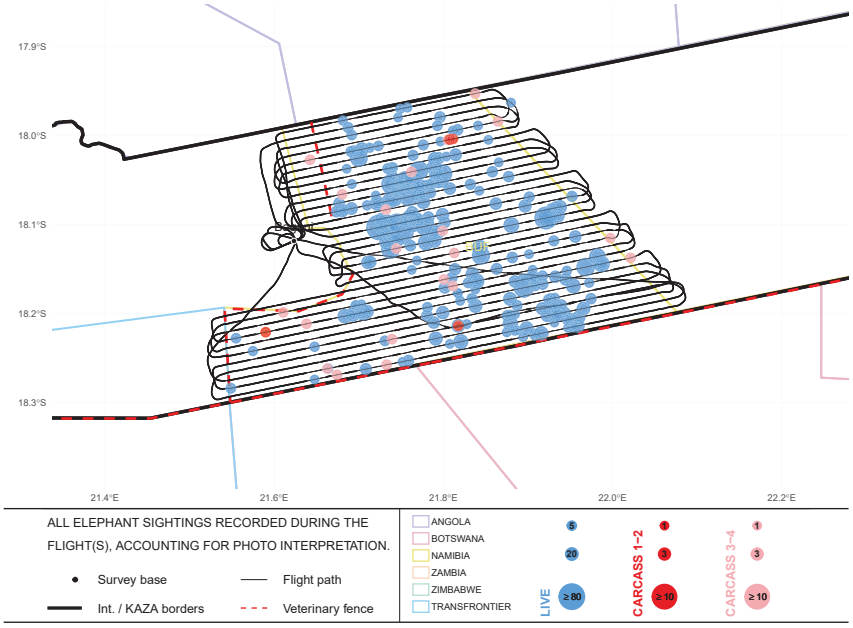
Number of flight(s): 3
Combined flying time: 9.2 h
Crew(s): C01, C02, C04
KES2022_V5IIM20221010A 06:59–10:11
KES2022_V5LJB20221010A 06:47–09:57
KES2022_V5WOT20221010A 06:30–09:22
Actual sampling intensity: 31.3 %
Transect flying time: 6.8 h
Transects: 32 – 1168 km – 79.8°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01		C02		C04	
Side:	L	R	L	R	L	R
% sightings:	42	58	56	44	43	57
% individuals:	47	53	60	40	50	50

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	320	15.31	36.73
Live elephant (>9):	47	25.53	75
Elephant carcass:	21	19.05	0
Live elephant (<10):	66	30.3	10





LIVE ELEPHANTS

IN SAMPLE:	**1258 (112)**
Bulls:	82 (37)
Family:	1176 (75)
NOT IN SAMPLE:	**1943 (142)**
Outside search strip:	1927
Off transect:	16



ELEPHANT CARCASSES

IN SAMPLE:	**21 (21)**
Category 1:	1 (1)
Category 2:	3 (3)
Category 3:	3 (3)
Category 4:	14 (14)
NOT IN SAMPLE:	**3 (3)**
Outside search strip:	1
Off transect:	2

OTHER SPECIES

Other wildlife species:	22
Other wildlife count:	2594
Domestic count:	62

ELEPHANT DATA ANALYSIS

t = 2.04, N = 104, w = 315

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3867	4020	67	67
Variance of estimate	$Var\hat{Y}$	427140	495118	153	153
Standard error	$SE\hat{Y}$	654	704	12	12
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1333	± 1435	± 25	± 25
Percentage of relative precision	$PRP\hat{Y}$	34 %	36 %	38 %	38 %
Density per sqkm	$R\hat{Y}$	3.285	3.415	0.057	0.057
Variance between transect counts	s^2_y	2005.512	2318.028	0.684	0.684
Variance between transect areas	s^2_a	13.493	13.493	13.493	13.493
Covariance between counts & areas	s_{ay}	50.668	53.848	0.67	0.67

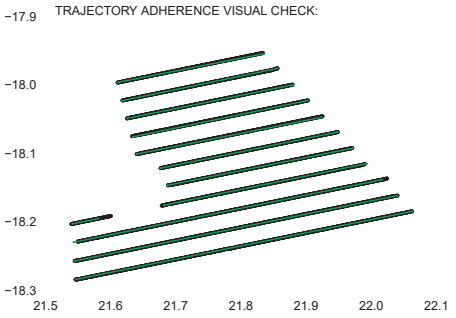
CARCASS RATIOS

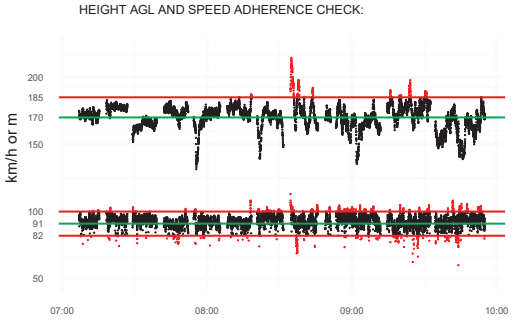
$CR_{1:4}$ = 1.6 %
$CR_{1:2}$ = 0.3 %

BUF – Buffalo — NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221010A

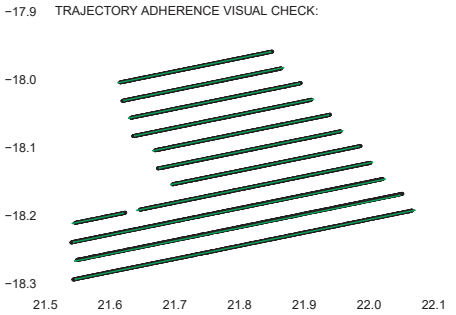


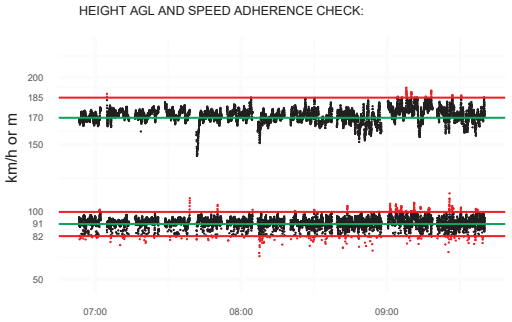


SPEED
Average: 170.1 km/h
Standard dev.: 9.6 km/h

HEIGHT AGL
Average: 92.7 m (304 ft)
Standard dev.: 4.7 m (15.5 ft)

KES2022_ V5LJB20221010A

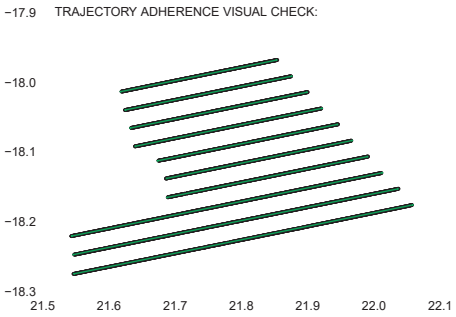


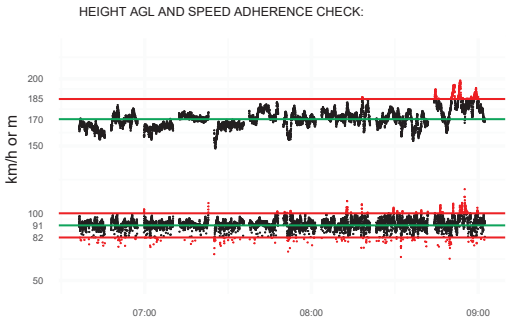


SPEED
Average: 171.8 km/h
Standard dev.: 5.3 km/h

HEIGHT AGL
Average: 92.1 m (302.1 ft)
Standard dev.: 3.8 m (12.4 ft)

KES2022_ V5WOT20221010A





SPEED
Average: 170.4 km/h
Standard dev.: 6.9 km/h

HEIGHT AGL
Average: 91.7 m (301 ft)
Standard dev.: 4.2 m (13.6 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

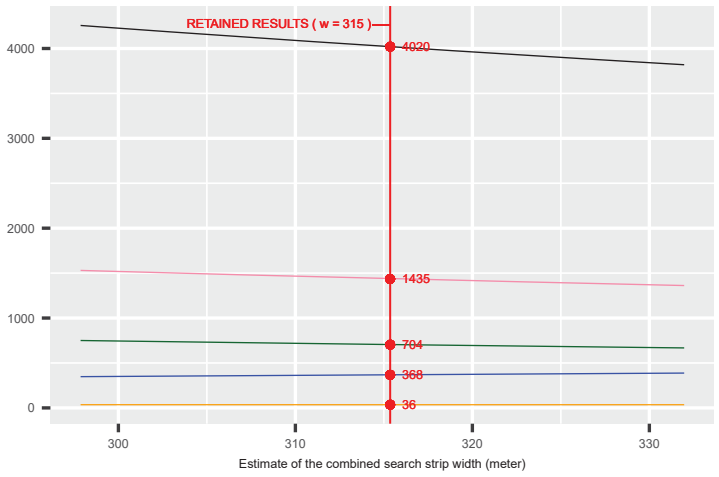
Range of search strip width estimates (m):

C01 – Left: [160 – 192]
C01 – Right: [121 – 162]

C02 – Left: [155 – 177]
C02 – Right: [134 – 186]

C04 – Left: [154 – 154]
C04 – Right: [154 – 154]

LIVE ELEPHANT ESTIMATE: [4256 – 3819]
CONFIDENCE INTERVAL: ± [1530 – 1362]
SAMPLE AREA: [348 – 388] sqkm
SE: [750 – 668]
PRP: [36 – 36] %



BUF – Buffalo — NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: BUF **N:** 104 S_a^2: 13,493
STRATUM NAME: Buffalo **w:** 315 **df:** 31

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	19	0	61	103	0,052	2574	50,73	0	164	170	11,281	3,506
buffalo	Syncerus caffer	989	688	3161	1405	2,685	474331	688,72	1756	4565	44	2351,249	79,968
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	62	0	198	159	0,168	6109	78,16	39	358	80	25,931	0,915
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	6	11	0,005	30	5,47	0	18	175	0,125	-0,200
eland	Tragelaphus oryx	11	7	35	50	0,030	608	24,66	0	85	143	2,555	-0,361
elephant bulls	Loxodonta africana males	82	120	262	190	0,223	8651	93,01	72	452	72	40,448	9,633
elephant family	Loxodonta africana family	1176	1823	3758	1427	3,192	489433	699,60	2331	5185	38	2228,194	44,215
elephant carcass one	Loxodonta africana carcass one	1	0	3	5	0,003	7	2,67	0	9	170	0,031	0,194
elephant carcass two	Loxodonta africana carcass two	3	0	10	12	0,008	36	6,01	0	22	128	0,152	-0,043
elephant carcass three	Loxodonta africana carcass three	3	1	10	9	0,008	21	4,56	0	19	97	0,088	0,002
elephant carcass four	Loxodonta africana carcass four	14	2	45	19	0,038	85	9,24	26	64	42	0,383	0,517
giraffe	Giraffa giraffa	20	0	64	64	0,054	986	31,40	0	128	100	4,435	2,552
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	244	24	780	716	0,662	123127	350,89	64	1495	92	571,339	40,112
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	274	9	876	567	0,744	77326	278,08	308	1443	65	347,351	17,247
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	97	13	310	122	0,263	3583	59,86	188	432	39	17,967	6,931
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	15	9	48	30	0,041	211	14,54	18	78	62	1,031	1,887
puku	Kobus vardonii	2	0	6	11	0,005	29	5,35	0	17	171	0,125	0,309
red lechwe	Kobus leche	260	72	831	560	0,706	75286	274,38	271	1390	67	376,048	44,130
reedbuck	Redunca arundinum	2	0	6	11	0,005	29	5,37	0	17	171	0,125	0,262
roan	Hippotragus equinus	36	10	115	63	0,098	951	30,83	52	178	55	4,113	0,998
sable	Hippotragus niger	398	136	1272	792	1,080	150868	388,42	480	2064	62	618,899	-3,500
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	30	0	96	120	0,081	3472	58,92	0	216	125	15,480	4,846
warthog	Phacochoerus africanus	47	0	150	79	0,128	1490	38,60	71	229	52	7,741	6,338
waterbuck	Kobus ellipsiprymnus	28	6	89	91	0,076	1996	44,68	0	181	102	8,823	2,647
wildebeest	Connochaetes taurinus	0	10	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	88	10	281	186	0,239	8352	91,39	95	468	66	38,323	7,410
all elephants	Loxodonta africana all	1258	1943	4020	1435	3,415	495118	703,65	2585	5455	36	2318,028	53,848
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	4	0	13	13	0,011	41	6,43	0	26	103	0,177	0,151
all elephant carcasses	Loxodonta africana carcass all	21	3	67	25	0,057	153	12,38	42	92	38	0,684	0,670
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	17	3	54	19	0,046	86	9,28	35	73	35	0,386	0,519

BWA – Bwabwata

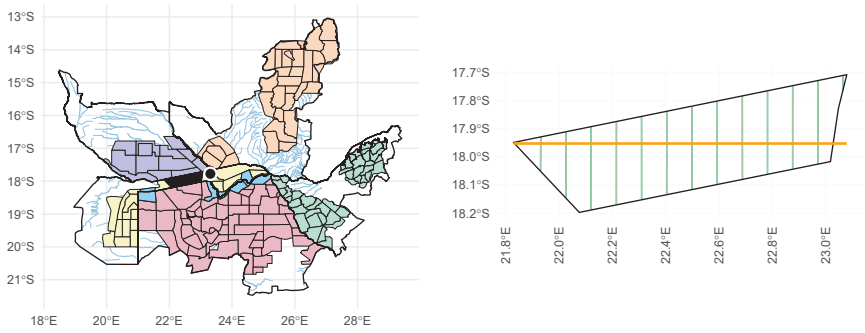
NAMIBIA – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: BWA
STRATUM NAME: Bwabwata
■ STRATUM AREA: 3810.53 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 94 km

– TRANSECTS: 13 (379 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 3 %

– BASELINE DISTANCE: 132.46 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.7 h
Crew(s): C01
KES2022_V5IIM20221009A 06:30–10:11

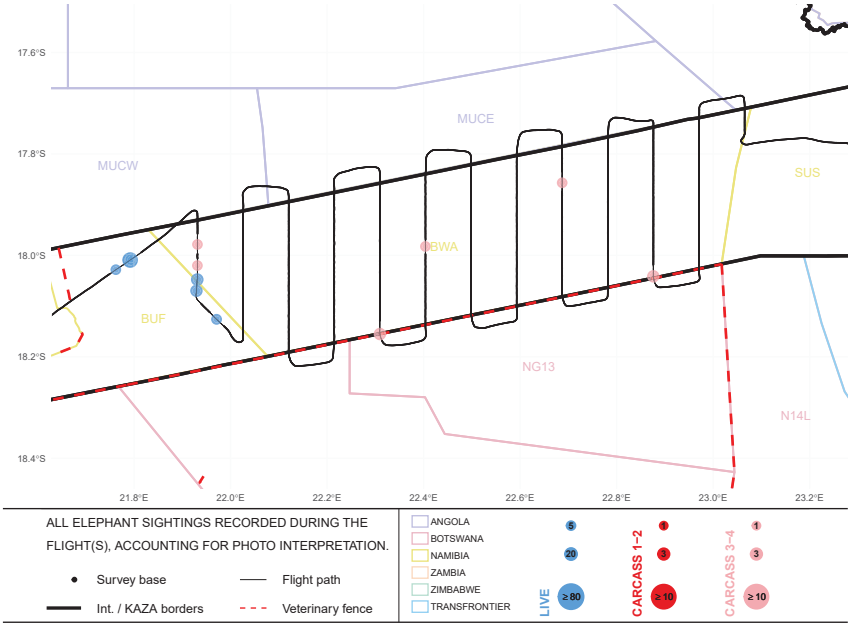
Actual sampling intensity: 3.2 %
Transect flying time: 2.3 h
Transects: 13 – 379 km – 0°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	43	57
% individuals:	52	48

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	10	30	33.33
Live elephant (>9):	0		
Elephant carcass:	6	33.33	0
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**101 (7)**
Outside search strip:	14
Off transect:	87

ELEPHANT CARCASSES



IN SAMPLE:	**8 (6)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	8 (6)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	6
Other wildlife count:	44
Domestic count:	28

ELEPHANT DATA ANALYSIS

t = 2.179, N = 415, w = 319

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	–	–	252	252
Variance of estimate	$\mathrm{Var}\hat{Y}$	–	–	10394	10394
Standard error	$\mathrm{SE}\hat{Y}$	–	–	102	102
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	–	–	± 222	± 222
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	–	–	88 %	88 %
Density per sqkm	$R\hat{Y}$	–	–	0.066	0.066
Variance between transect counts	s_y^2	–	–	0.756	0.756
Variance between transect areas	s_a^2	–	–	8.043	8.043
Covariance between counts & areas	s_{ay}	–	–	−0.135	−0.135

CARCASS RATIOS

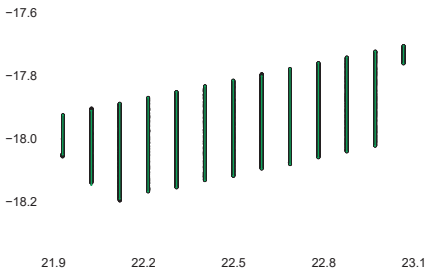
$CR_{1:4}$ = 100 %
$CR_{1:2}$ = n/a

BWA – Bwabwata NAMIBIA – KAVANGO ZAMBEZI

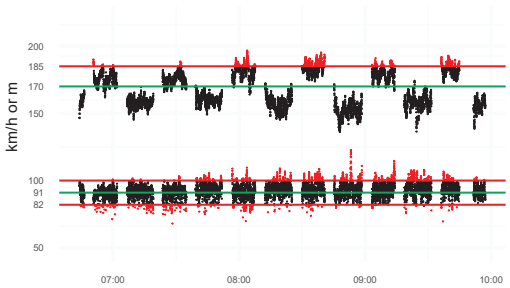
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221009A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 167.6 km/h
Standard dev.: 12.6 km/h

HEIGHT AGL
Average: 92.6 m (303.8 ft)
Standard dev.: 5.3 m (17.5 ft)

BWA – Bwabwata NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: BWA **N:** 415 S_a^2: 8,043
STRATUM NAME: Bwabwata **w:** 319 **df:** 12

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	28	15	882	1901	0,231	761505	872,64	0	2783	216	60,308	3,101
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	4	0	126	152	0,033	4861	69,72	0	278	121	0,397	0,418
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	5	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	96	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	8	0	252	222	0,066	10394	101,95	30	474	88	0,756	-0,135
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	6	0	189	184	0,050	7168	84,66	5	373	98	0,603	0,647
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	2	0	63	136	0,017	3899	62,44	0	199	216	0,308	0,190
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	16	0	504	950	0,132	190242	436,17	0	1454	189	14,859	0,697
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	15	0	472	1021	0,124	219753	468,78	0	1494	216	17,308	1,282
all elephants	Loxodonta africana all	0	101	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	8	0	252	222	0,066	10394	101,95	30	474	88	0,756	-0,135
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	8	0	252	222	0,066	10394	101,95	30	474	88	0,756	-0,135

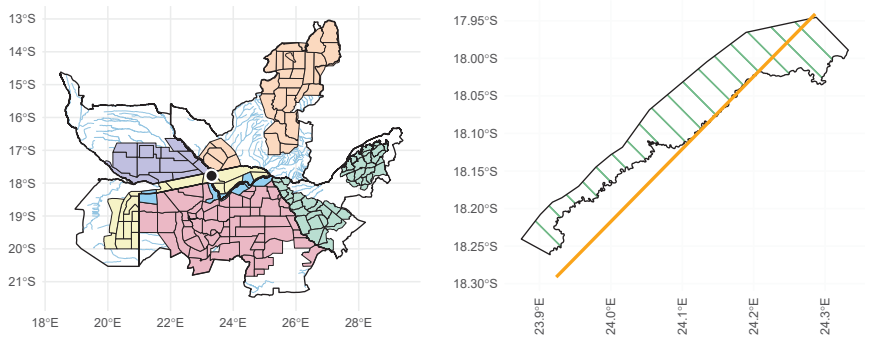
CH1NA – CH1 Namibia — NAMIBIA – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: CH1NA
STRATUM NAME: CH1 Namibia
■ STRATUM AREA: 294.4 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 89 km

– TRANSECTS: 17 (93 km)
TRANSECT ORIENTATION: 136°
PLANNED SAMPLING INTENSITY: 9.5 %

– BASELINE DISTANCE: 54.55 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.9 h
Crew(s): C01
KES2022_V5IIM20221004A 06:26–11:20

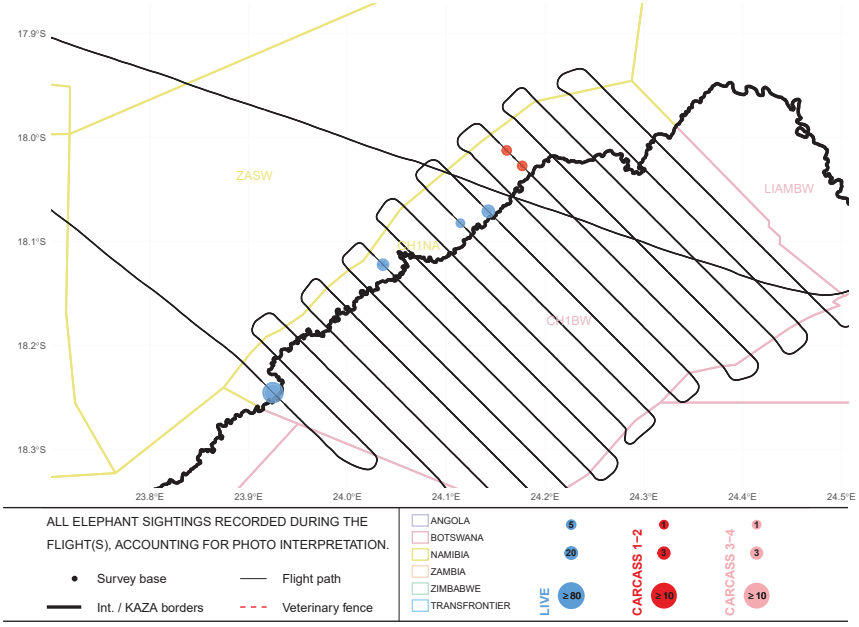
Actual sampling intensity: 10.1 %
Transect flying time: 0.6 h
Transects: 17 – 93 km – 136°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	35	65
% individuals:	32	68

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	38	31.58	58.33
Live elephant (>9):	2	50	100
Elephant carcass:	2	50	0
Live elephant (<10):	1	100	0



LIVE ELEPHANTS



IN SAMPLE:	**52 (3)**
Bulls:	3 (1)
Family:	49 (2)
NOT IN SAMPLE:	**40 (3)**
Outside search strip:	40
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**2 (2)**
Category 1:	0 (0)
Category 2:	2 (2)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	4
Other wildlife count:	641
Domestic count:	871

ELEPHANT DATA ANALYSIS

t = 2.12, N = 171, w = 319

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	445	515	20	20
Variance of estimate	$Var\hat{Y}$	91537	107898	365	365
Standard error	$SE\hat{Y}$	303	328	19	19
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 641	± 696	± 40	± 40
Percentage of relative precision	$PRP\hat{Y}$	144 %	135 %	204 %	204 %
Density per sqkm	$R\hat{Y}$	1.513	1.749	0.067	0.067
Variance between transect counts	s^2_y	58.368	69.434	0.235	0.235
Variance between transect areas	s^2_a	0.631	0.631	0.631	0.631
Covariance between counts & areas	s_{ay}	0.265	0.516	0.023	0.023

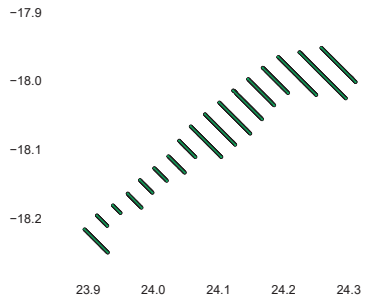
CARCASS RATIOS

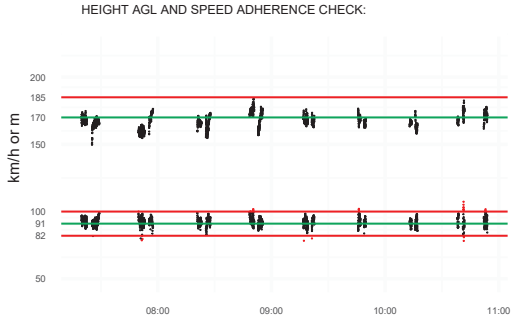
$CR_{1:4}$ = 3.7 %
$CR_{1:2}$ = 3.7 %

CH1NA – CH1 Namibia — NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221004A





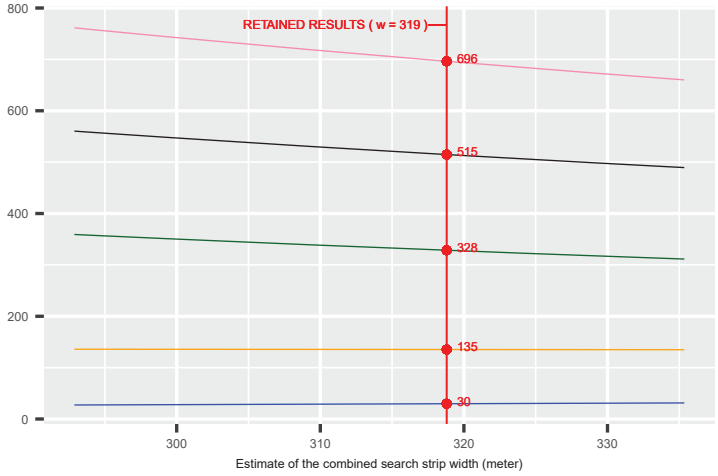
SPEED
Average: 167.3 km/h
Standard dev.: 5.9 km/h

HEIGHT AGL
Average: 92.5 m (303.4 ft)
Standard dev.: 3.2 m (10.6 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 192]
C01 – Right: [121 – 162]



LIVE ELEPHANT ESTIMATE: [560 – 489]
CONFIDENCE INTERVAL: ± [761 – 660]
SAMPLE AREA: [27 – 31] sqkm
SE: [359 – 311]
PRP: [136 – 135] %

CH1NA – CH1 Namibia NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: CH1NA **N:** 152 S_a^2: 0,631
STRATUM NAME: CH1 Namibia **w:** 319 **df:** 16

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	80	110	792	1054	2,690	247018	497,01	0	1846	133	163,596	1,657
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	871	96	8622	6433	29,288	9207184	3034,33	2190	15055	75	5488,191	1,607
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	3	1	30	62	0,101	862	29,37	0	92	210	0,529	-0,100
elephant family	Loxodonta africana family	49	39	485	697	1,648	108068	328,74	0	1182	144	69,985	0,616
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	2	0	20	40	0,067	365	19,10	0	60	204	0,235	0,023
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	7	0	69	139	0,235	4275	65,39	0	208	200	2,882	0,342
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	11	0	109	200	0,370	8877	94,22	0	309	183	5,868	0,313
zebra	Equus spp,	543	299	5375	4079	18,259	3702933	1924,30	1296	9455	76	2812,934	17,423
all elephants	Loxodonta africana all	52	40	515	696	1,749	107898	328,48	0	1211	135	69,434	0,516
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	2	0	20	40	0,067	365	19,10	0	60	204	0,235	0,023
all elephant carcasses	Loxodonta africana carcass all	2	0	20	40	0,067	365	19,10	0	60	204	0,235	0,023
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

CRNA – Chobe River NE Namibia

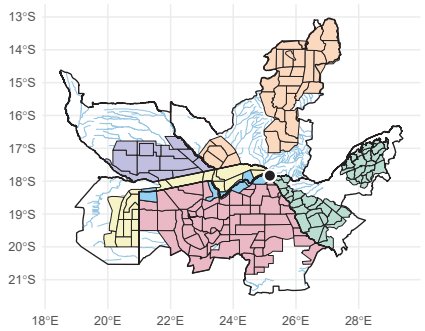
NAMIBIA – KAVANGO ZAMBEZI

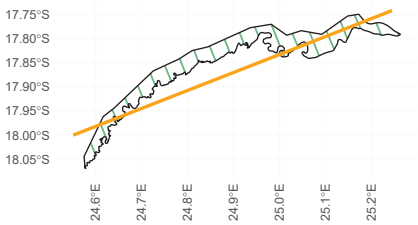
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: CRNA
STR. NAME: Chobe River NE Namibia
■ STRATUM AREA: 274.2 sqkm
• SURVEY BASE: Kasane
DISTANCE TO SURVEY BASE: 50 km

– TRANSECTS: 21 (73 km)
TRANSECT ORIENTATION: 159.6°
PLANNED SAMPLING INTENSITY: 8 %

– BASELINE DISTANCE: 78.74 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.2 h
Crew(s): C02
KES2022_V5LJB20221001A 07:09–11:19

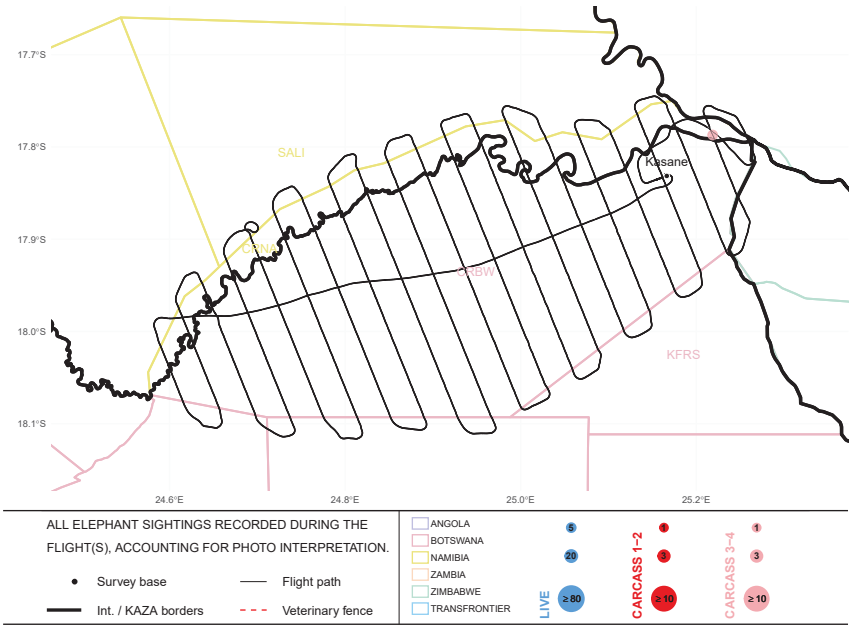
Actual sampling intensity: 8.6 %
Transect flying time: 0.4 h
Transects: 21 – 73 km – 0°
Search effort: 1.08 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	48	52
% individuals:	51	49

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	17	41.18	57.14
Live elephant (>9):	0		
Elephant carcass:	1	0	
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	1 (1)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	5
Other wildlife count:	225
Domestic count:	285

ELEPHANT DATA ANALYSIS

t = 2.086, N = 243, w = 324

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	12	12
Variance of estimate	$Var\hat{Y}$	–	–	133	133
Standard error	$SE\hat{Y}$	–	–	12	12
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	± 24	± 24
Percentage of relative precision	$PRP\hat{Y}$	–	–	208 %	208 %
Density per sqkm	$R\hat{Y}$	–	–	0.042	0.042
Variance between transect counts	s^2_y	–	–	0.048	0.048
Variance between transect areas	s^2_a	–	–	0.203	0.203
Covariance between counts & areas	s_{ay}	–	–	−0.044	−0.044

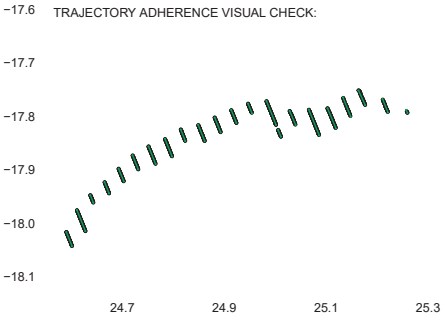
CARCASS RATIOS

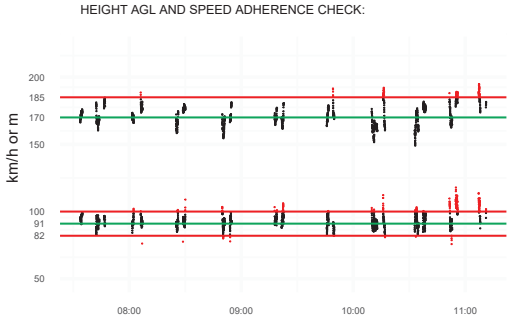
$CR_{1:4}$ = 100 %
$CR_{1:2}$ = n/a

CRNA – Chobe River NE Namibia NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221001A





SPEED
Average: 171.5 km/h
Standard dev.: 8.2 km/h

HEIGHT AGL
Average: 93.5 m (306.8 ft)
Standard dev.: 5.8 m (18.9 ft)

CRNA – Chobe River NE Namibia NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: CRNA **N:** 225 S_a^2: 0,203
STRATUM NAME: Chobe River NE Namibia **w:** 324 **df:** 20

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	30	0	347	699	1,266	112328	335,15	0	1046	201	42,857	-0,158
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	278	20	3216	2562	11,728	1508371	1228,16	654	5778	80	565,990	0,370
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	1	0	12	24	0,042	133	11,54	0	36	208	0,048	-0,044
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	1	0	12	23	0,042	121	10,99	0	34	198	0,048	0,013
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	15	0	174	346	0,633	27467	165,73	0		199	10,714	0,110
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	7	0	81	163	0,295	6088	78,03	0	244	201	2,333	-0,019
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	173	74	2001	2296	7,298	1211497	1100,68	0	4297	115	487,890	1,963
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	0	12	24	0,042	133	11,54	0	36	208	0,048	-0,044
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	12	24	0,042	133	11,54	0	36	208	0,048	-0,044

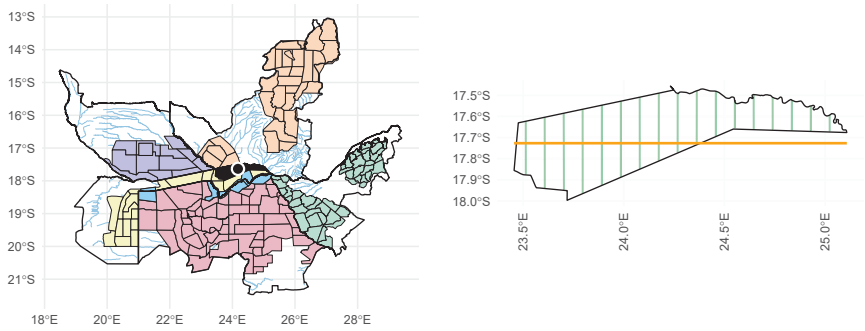
EZN – E Zambezi North — NAMIBIA – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: EZN
STRATUM NAME: E Zambezi North
■ STRATUM AREA: 4792.03 sqkm
• SURVEY BASE: Katima Mulilo
DISTANCE TO SURVEY BASE: 29 km

– TRANSECTS: 17 (480 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 3 %

– BASELINE DISTANCE: 175.31 km



SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 5.1 h
Crew(s): C02, C04
KES2022_V5LJB20221002A 09:25–11:46
KES2022_V5WOT20221002A 09:22–12:07

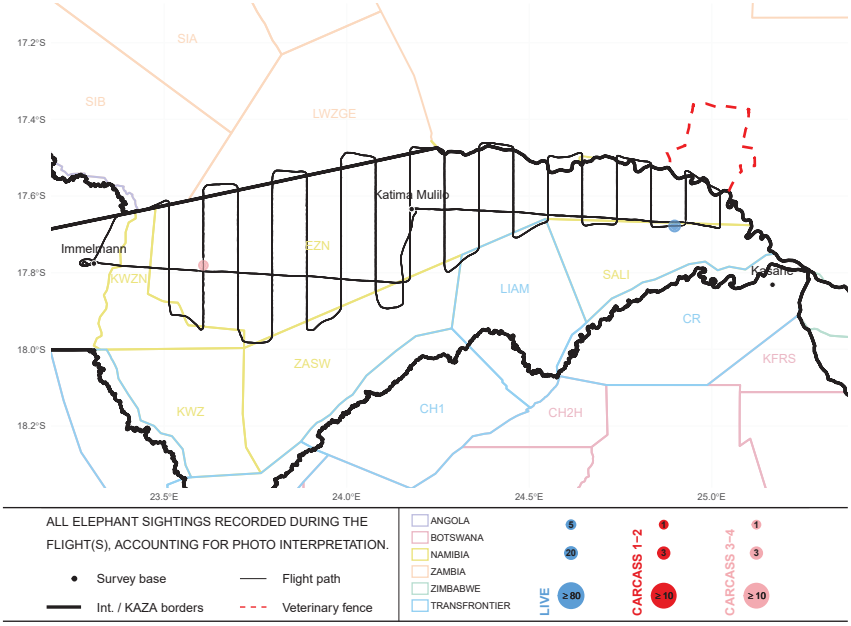
Actual sampling intensity: 3.2 %
Transect flying time: 2.8 h
Transects: 17 – 480 km – 0°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02		C04	
Side:	L	R	L	R
% sightings:	51	49	38	62
% individuals:	64	36	28	72

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	70	27.14	73.68
Live elephant (>9):	0		
Elephant carcass:	1	0	
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**15 (1)**
Outside search strip:	0
Off transect:	15



ELEPHANT CARCASSES

IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	1 (1)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	6
Other wildlife count:	31
Domestic count:	2162

ELEPHANT DATA ANALYSIS

t = 2.12, N = 557, w = 314

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	–	–	32	32
Variance of estimate	$Var\hat{Y}$	–	–	1008	1008
Standard error	$SE\hat{Y}$	–	–	32	32
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	–	–	± 67	± 67
Percentage of relative precision	$PRP\hat{Y}$	–	–	212 %	212 %
Density per sqkm	$R\hat{Y}$	–	–	0.007	0.007
Variance between transect counts	s_y^2	–	–	0.059	0.059
Variance between transect areas	s_a^2	–	–	14.33	14.33
Covariance between counts & areas	s_{ay}	–	–	0.202	0.202

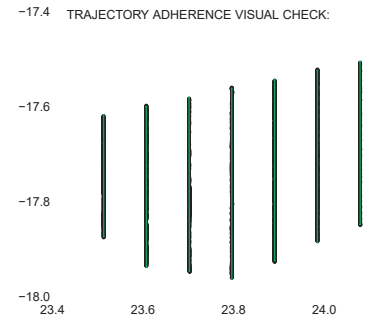
CARCASS RATIOS

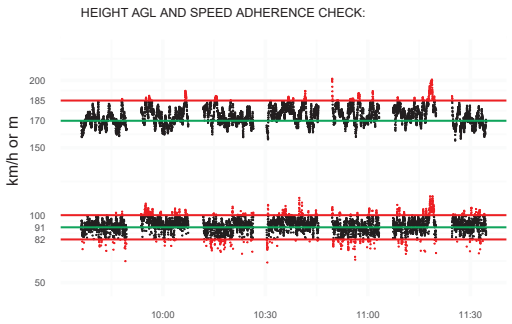
$CR_{1:4}$ = 100 %
$CR_{1:2}$ = n/a

EZN – E Zambezi North NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221002A

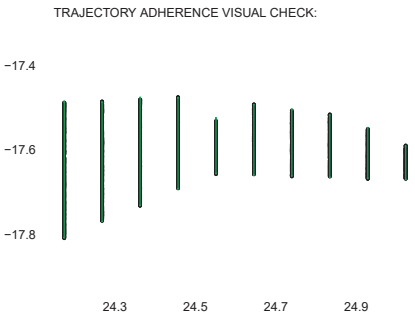


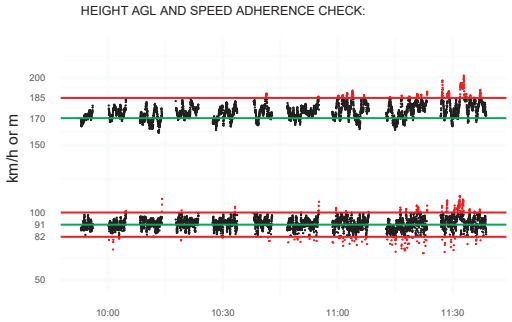


SPEED
Average: 173.8 km/h
Standard dev.: 6.9 km/h

HEIGHT AGL
Average: 92.5 m (303.4 ft)
Standard dev.: 5.6 m (18.5 ft)

KES2022_ V5WOT20221002A





SPEED
Average: 175.3 km/h
Standard dev.: 6.2 km/h

HEIGHT AGL
Average: 91.6 m (300.5 ft)
Standard dev.: 4.8 m (15.7 ft)

EZN – E Zambezi North NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: EZN **N:** 558 S_a^2: 14,330
STRATUM NAME: E Zambezi North **w:** 314 **df:** 16

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	1	0	32	69	0,007	1046	32,34	0	100	216	0,059	0,039
bushpig	Potamochoerus larvatus	0	24	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	1999	178	63448	36878	13,240	302626249	17396,16	26570	100326	58	9002,132	-209,204
donkey	Equus asinus	2	0	63	142	0,013	4504	67,11	0	206	224	0,235	-0,605
duiker	Sylvicapra grimmia	12	1	381	277	0,079	17094	130,74	104	658	73	1,221	2,188
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	15	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	1	0	32	67	0,007	1008	31,74	0	99	212	0,059	0,202
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	16	5	508	1135	0,106	286406	535,17	0	1642	223	15,059	-4,342
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	161	0	5110	4181	1,066	3889938	1972,29	929	9291	82	234,390	14,757
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	192	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	15	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	0	32	67	0,007	1008	31,74	0	99	212	0,059	0,202
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	32	67	0,007	1008	31,74	0	99	212	0,059	0,202

KWZ – Kwando Zambezi

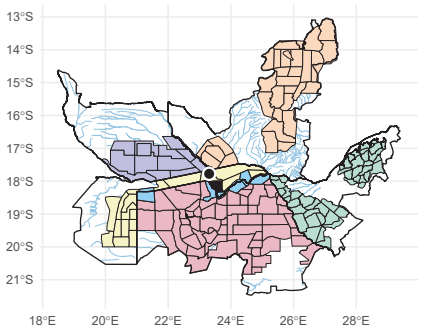
NAMIBIA – KAVANGO ZAMBEZI

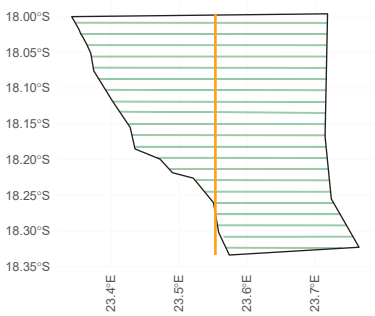
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: KWZ
STRATUM NAME: Kwando Zambezi
■ STRATUM AREA: 1057.25 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 51 km

– TRANSECTS: 21 (601 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 17.1 %

– BASELINE DISTANCE: 37.32 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.9 h
Crew(s): C01
KES2022_V5IIM20221007A 06:20–11:16

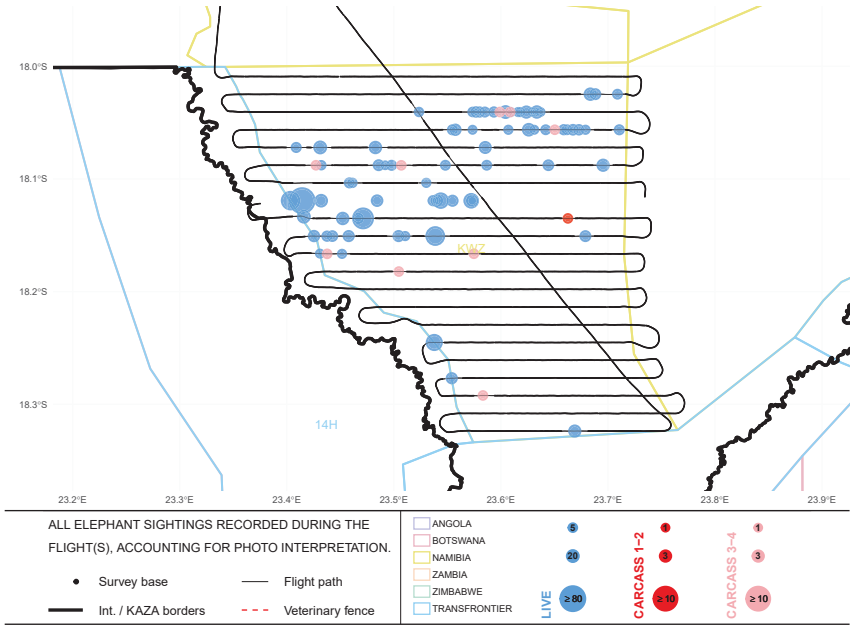
Actual sampling intensity: 17.9 %
Transect flying time: 3.6 h
Transects: 21 – 601 km – 90°
Search effort: 1.13 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	42	58
% individuals:	44	56

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	138	16.67	60.87
Live elephant (>9):	20	60	41.67
Elephant carcass:	10	10	0
Live elephant (<10):	36	5.56	100



LIVE ELEPHANTS



IN SAMPLE:	**499 (54)**
Bulls:	19 (9)
Family:	480 (45)
NOT IN SAMPLE:	**439 (29)**
Outside search strip:	333
Off transect:	106

ELEPHANT CARCASSES



IN SAMPLE:	**10 (10)**
Category 1:	0 (0)
Category 2:	1 (1)
Category 3:	5 (5)
Category 4:	4 (4)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	15
Other wildlife count:	511
Domestic count:	1085

ELEPHANT DATA ANALYSIS

t = 2.086, N = 118, w = 315

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	2662	2785	56	56
Variance of estimate	$Var\hat{Y}$	472245	532734	282	282
Standard error	$SE\hat{Y}$	687	730	17	17
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 1433	± 1523	± 35	± 35
Percentage of relative precision	$PRP\hat{Y}$	54 %	55 %	63 %	63 %
Density per sqkm	$R\hat{Y}$	2.518	2.634	0.053	0.053
Variance between transect counts	s_y^2	1032.914	1156.69	0.562	0.562
Variance between transect areas	s_a^2	5.358	5.358	5.358	5.358
Covariance between counts & areas	s_{ay}	41.15	42.539	0.599	0.599

CARCASS RATIOS

$CR_{1:4} = 2$ %
$CR_{1:2} = 0.2$ %

KWZ – Kwando Zambezi — NAMIBIA – KAVANGO ZAMBEZI

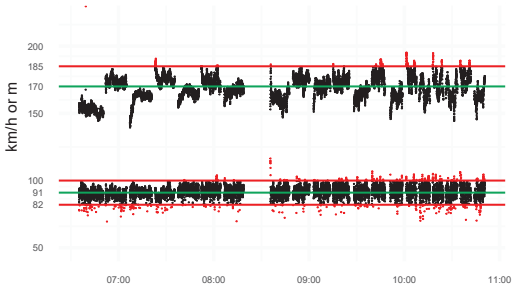
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221007A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 168.1 km/h
Standard dev.: 8.7 km/h

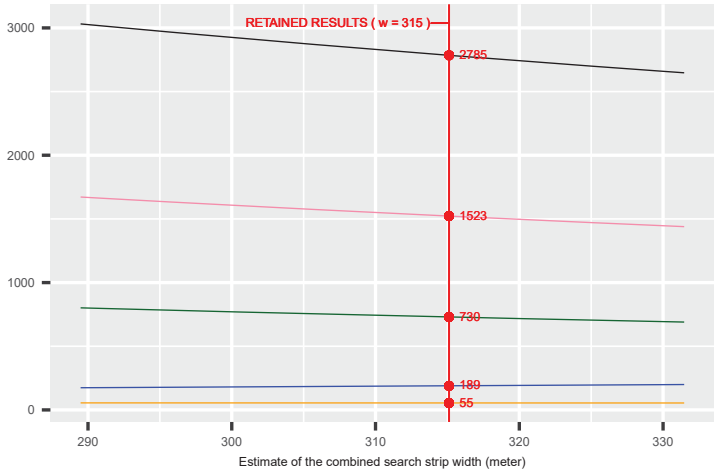
HEIGHT AGL
Average: 91.4 m (299.9 ft)
Standard dev.: 4.1 m (13.5 ft)

The laser altimeter did not record data throughout transect KWZ−14.

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 − Left: [158 − 190]
C01 − Right: [119 − 160]



LIVE ELEPHANT ESTIMATE: [3031 − 2647]
CONFIDENCE INTERVAL: ± [1672 − 1439]
SAMPLE AREA: [174 − 199] sqkm
SE: [801 − 690]
PRP: [55 − 54] %

KWZ – Kwando Zambezi NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: KWZ **N:** 118 S_a^2: 5,358
STRATUM NAME: Kwando Zambezi **w:** 315 **df:** 20

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	114	435	636	1149	0,602	303533	550,94	0	1785	181	534,057	-13,744
bushbuck	Tragelaphus scriptus	10	0	56	105	0,053	2547	50,47	0	161	189	4,762	1,323
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	1054	255	5882	3783	5,564	3288933	1813,54	2099	9665	64	4795,462	-92,177
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	19	23	106	99	0,100	2256	47,50	7	205	93	4,490	2,178
elephant family	Loxodonta africana family	480	416	2679	1470	2,534	496385	704,55	1209	4149	55	1073,729	40,361
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	1	0	6	11	0,005	26	5,09	0	16	190	0,048	0,054
elephant carcass three	Loxodonta africana carcass three	5	0	28	25	0,026	149	12,21	2	53	91	0,290	0,429
elephant carcass four	Loxodonta africana carcass four	4	0	22	25	0,021	142	11,94	0	47	112	0,262	0,117
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	1	0	6	11	0,005	27	5,20	0	16	194	0,048	-0,134
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	58	5	324	318	0,306	23226	152,40	6	642	98	39,690	-3,407
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	8	0	45	63	0,042	923	30,38	0	108	142	1,748	0,915
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	74	0	413	509	0,391	59567	244,06	0	922	123	100,762	-8,772
reedbuck	Redunca arundinum	4	0	22	44	0,021	435	20,86	0	66	195	0,762	-0,667
roan	Hippotragus equinus	24	4	134	119	0,127	3247	56,99	15	253	89	6,329	1,986
sable	Hippotragus niger	35	0	195	182	0,185	7581	87,07	14	377	93	15,333	4,642
shoat	Capra hircus - Ovis aries	31	0	173	248	0,164	14170	119,04	0	421	144	24,762	-2,715
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	2	0	11	21	0,011	102	10,12	0	32	189	0,190	0,223
warthog	Phacochoerus africanus	8	0	45	40	0,042	359	18,95	5	84	89	0,648	0,038
waterbuck	Kobus ellipsiprymnus	8	0	45	87	0,042	1729	41,58	0	131	194	3,048	-1,070
wildebeest	Connochaetes taurinus	28	61	156	151	0,148	5259	72,52	5	308	97	10,033	1,951
zebra	Equus spp,	136	2	759	434	0,718	43355	208,22	325	1193	57	94,962	13,095
all elephants	Loxodonta africana all	499	439	2785	1523	2,634	532734	729,89	1262	4307	55	1156,690	42,539
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	6	11	0,005	26	5,09	0	16	190	0,048	0,054
all elephant carcasses	Loxodonta africana carcass all	10	0	56	35	0,053	282	16,80	21	91	63	0,562	0,599
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	9	0	50	35	0,048	284	16,86	15	85	70	0,557	0,545

KWZN – Kwando Zambezi North

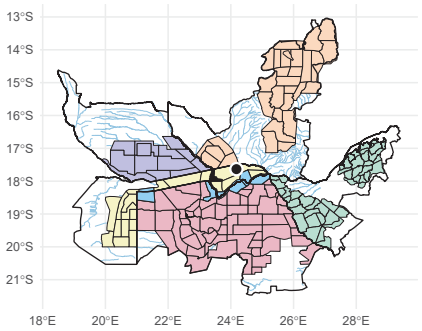
NAMIBIA – KAVANGO ZAMBEZI

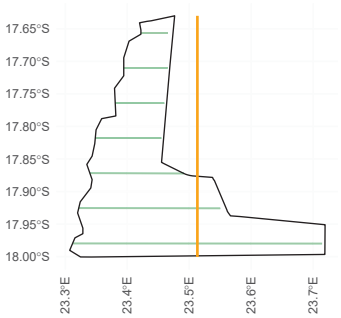
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: KWZN
STRATUM NAME: Kwando Zambezi North
■ STRATUM AREA: 685.89 sqkm
• SURVEY BASE: Katima Mulilo
DISTANCE TO SURVEY BASE: 85 km

– TRANSECTS: 7 (116 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5.1 %

– BASELINE DISTANCE: 41 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.9 h
Crew(s): C01
KES2022_V5IIM20221002A 09:19–12:10

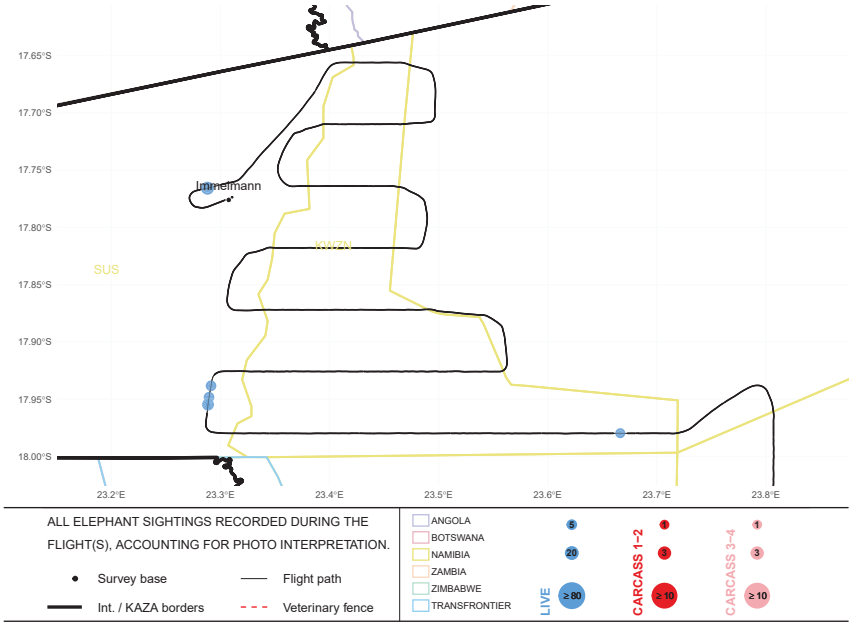
Actual sampling intensity: 5.5 %
Transect flying time: 0.7 h
Transects: 7 – 116 km – 90°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	40	60
% individuals:	49	51

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	23	39.13	88.89
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	1	100	0



LIVE ELEPHANTS



IN SAMPLE:	**2 (1)**
Bulls:	0 (0)
Family:	2 (1)
NOT IN SAMPLE:	**38 (5)**
Outside search strip:	0
Off transect:	38

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	5
Other wildlife count:	42
Domestic count:	574

ELEPHANT DATA ANALYSIS

t = 2.447, N = 125, w = 326

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	36	36	–	–
Variance of estimate	$Var\hat{Y}$	700	700	–	–
Standard error	$SE\hat{Y}$	26	26	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 65	± 65	–	–
Percentage of relative precision	$PRP\hat{Y}$	178 %	178 %	–	–
Density per sqkm	$R\hat{Y}$	0.053	0.053	–	–
Variance between transect counts	s^2_y	0.571	0.571	–	–
Variance between transect areas	s^2_a	18.331	18.331	–	–
Covariance between counts & areas	s_{ay}	2.789	2.789	–	–

CARCASS RATIOS

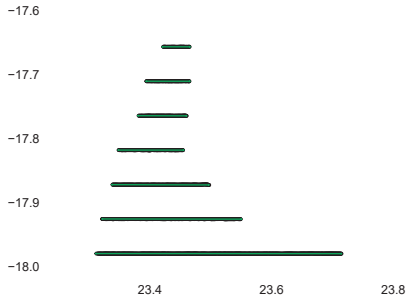
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

KWZN – Kwando Zambezi North — NAMIBIA – KAVANGO ZAMBEZI

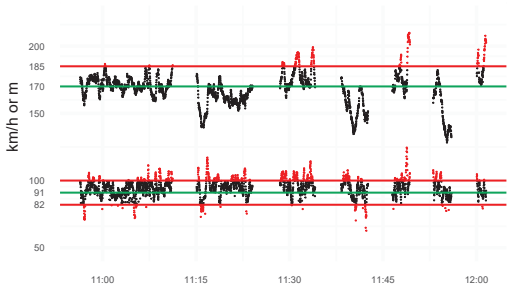
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221002A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



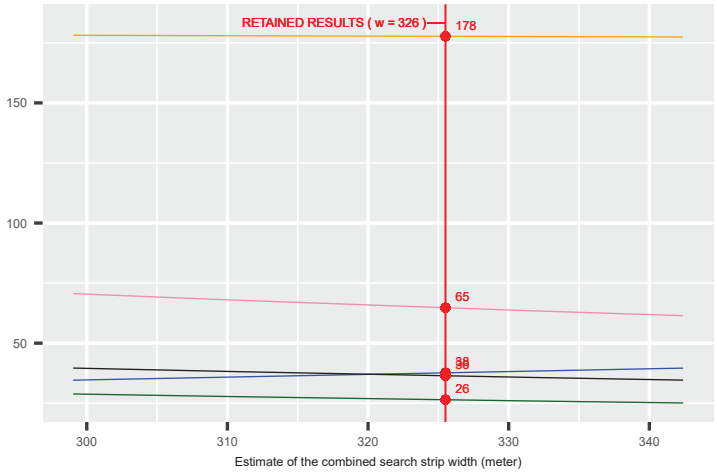
SPEED
Average: 168 km/h
Standard dev.: 12.8 km/h

HEIGHT AGL
Average: 94.4 m (309.8 ft)
Standard dev.: 6.8 m (22.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [163 – 196]
C01 – Right: [123 – 165]



LIVE ELEPHANT ESTIMATE: [40 – 35]
CONFIDENCE INTERVAL: ± [71 – 61]
SAMPLE AREA: [35 – 40] sqkm
SE: [29 – 25]
PRP: [178 – 177] %

KWZN – Kwando Zambezi North NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: KWZN **N:** 126 S_a^2: 18,331
STRATUM NAME: Kwando Zambezi North **w:** 326 **df:** 6

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	2	0	36	65	0,053	700	26,45	0	101	178	0,571	2,789
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	406	32	7394	5100	10,780	4344392	2084,32	2294	12494	69	1610,000	79,344
donkey	Equus asinus	1	0	18	49	0,027	407	20,17	0	68	271	0,143	-0,644
duiker	Sylvicapra grimmia	2	0	36	35	0,053	207	14,39	1	72	97	0,238	1,817
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	6	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	2	32	36	65	0,053	700	26,45	0	101	178	0,571	2,789
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	37	0	674	984	0,982	161656	402,06	0	1658	146	151,571	47,708
shoat	Capra hircus - Ovis aries	167	0	3041	6515	4,434	7089951	2662,70	0	9557	214	3510,143	62,945
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	2	38	36	65	0,053	700	26,45	0	101	178	0,571	2,789
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

LIAMNA – Liambezi Namibia

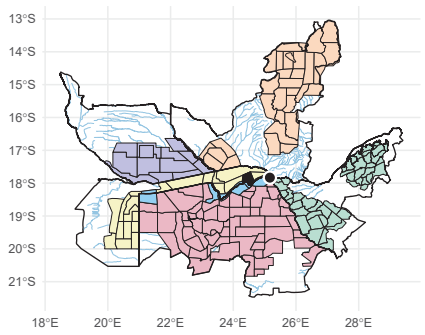
NAMIBIA – KAVANGO ZAMBEZI

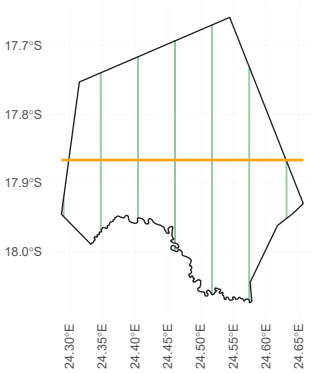
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: LIAMNA
STRATUM NAME: Liambezi Namibia
■ STRATUM AREA: 1074.1 sqkm
• SURVEY BASE: Kasane
DISTANCE TO SURVEY BASE: 75 km

– TRANSECTS: 7 (179 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 5 %

– BASELINE DISTANCE: 39.1 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.8 h
Crew(s): C03
KES2022_V5WOT20221001A 07:25–11:10

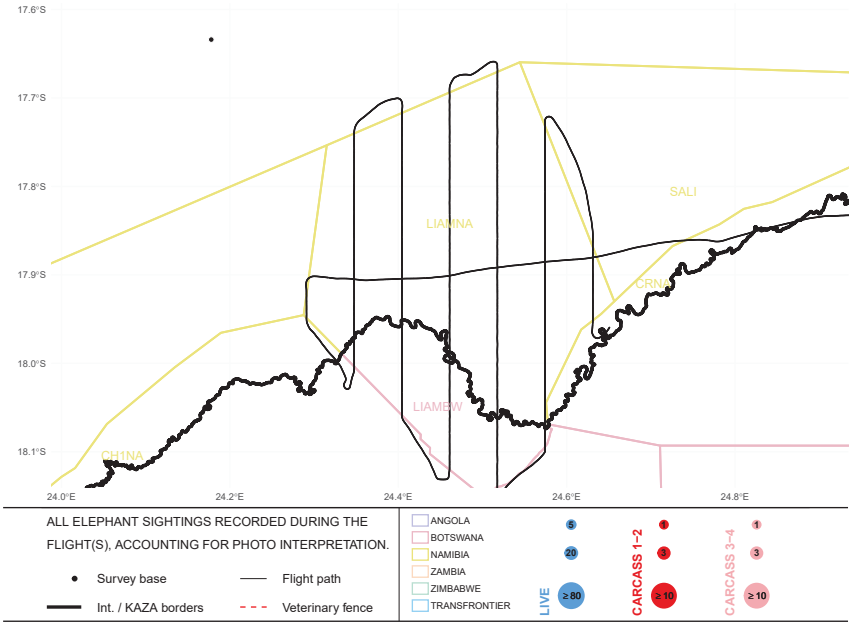
Actual sampling intensity: 5.2 %
Transect flying time: 1 h
Transects: 7 – 179 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	36	64
% individuals:	32	68

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	24	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	6
Other wildlife count:	84
Domestic count:	560

ELEPHANT DATA ANALYSIS

t = 2.447, N = 124, w = 314

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

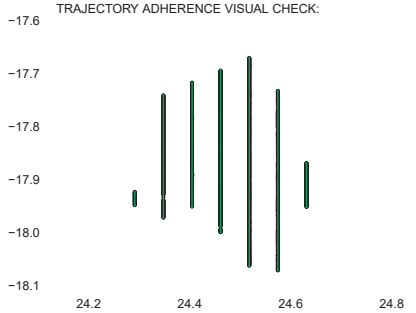
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

LIAMNA – Liambezi Namibia — NAMIBIA – KAVANGO ZAMBEZI

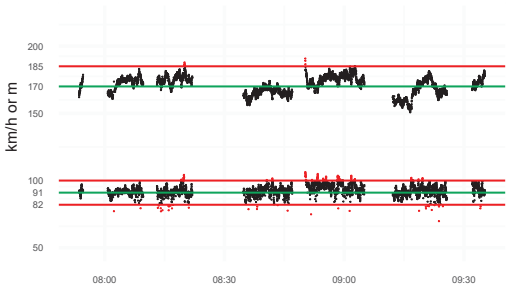
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221001A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 170.9 km/h
Standard dev.: 6.5 km/h

HEIGHT AGL
Average: 92.4 m (303.3 ft)
Standard dev.: 3.8 m (12.6 ft)

LIAMNA – Liambezi Namibia NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: LIAMNA **N:** 124 S_a^2: 22,098
STRATUM NAME: Liambezi Namibia **w:** 314 **df:** 6

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	502	0	9613	3839	8,950	2461249	1568,84	5774	13452	40	3302,905	217,564
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	1	0	19	40	0,018	267	16,33	0	59	209	0,143	0,622
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	7	0	134	303	0,125	15365	123,96	0	437	226	7,000	-0,055
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	1	0	19	38	0,018	238	15,42	0	57	197	0,143	1,009
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	58	0	1111	1420	1,034	336976	580,50	0	2531	128	176,571	18,778
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	3	0	57	113	0,053	2141	46,27	0	171	197	1,286	3,027
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	69	159	1321	1640	1,230	449386	670,36	0	2962	124	328,476	59,635
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

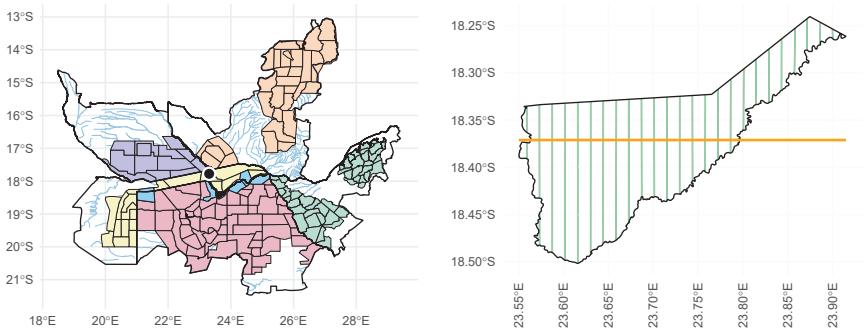
MSNA – Mamili South Namibia — NAMIBIA – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: MSNA
STRATUM NAME: Mamili South Namibia
■ STRATUM AREA: 390.6 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 77 km

– TRANSECTS: 25 (262 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 20.1 %

– BASELINE DISTANCE: 38.53 km



SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 5.4 h
Crew(s): C01, C04
KES2022_V5IIM20221004B 15:17–17:55
KES2022_V5WOT20221004B 15:15–18:03

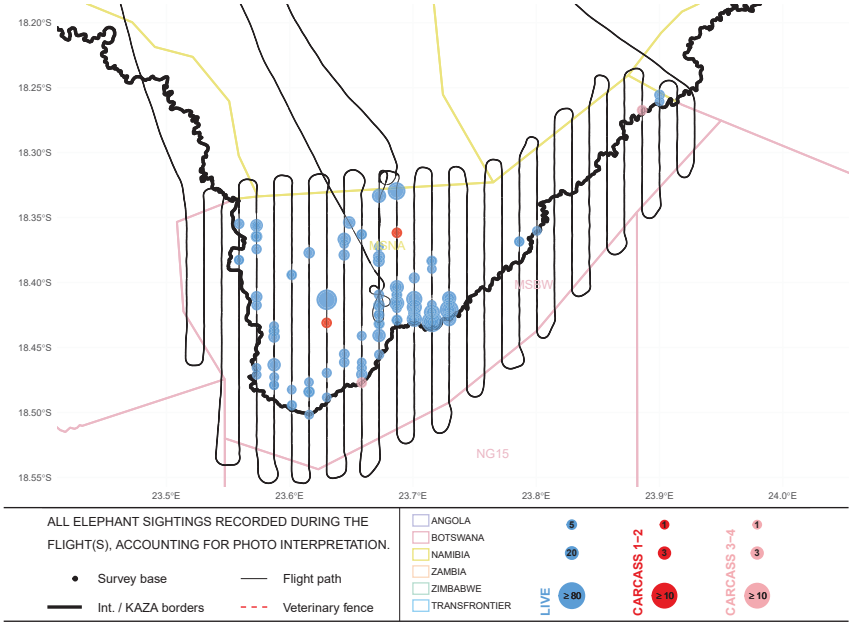
Actual sampling intensity: 21.1 %
Transect flying time: 1.5 h
Transects: 25 – 262 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01		C04	
Side:	L	R	L	R
% sightings:	40	60	39	61
% individuals:	47	53	26	74

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	171	12.28	42.86
Live elephant (>9):	13	69.23	33.33
Elephant carcass:	4	100	0
Live elephant (<10):	73	1.37	100





LIVE ELEPHANTS

IN SAMPLE:	**497 (85)**
Bulls:	91 (41)
Family:	406 (44)
NOT IN SAMPLE:	**389 (31)**
Outside search strip:	364
Off transect:	25



ELEPHANT CARCASSES

IN SAMPLE:	**4 (4)**
Category 1:	1 (1)
Category 2:	1 (1)
Category 3:	2 (2)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species: 15
Other wildlife count: 2722
Domestic count: 169

ELEPHANT DATA ANALYSIS

t = 2.064, N = 122, w = 315

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	2330	2354	19	19
Variance of estimate	$Var\hat{Y}$	177524	182729	65	65
Standard error	$SE\hat{Y}$	421	427	8	8
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 870	± 882	± 17	± 17
Percentage of relative precision	$PRP\hat{Y}$	37 %	37 %	88 %	88 %
Density per sqkm	$R\hat{Y}$	5.965	6.026	0.048	0.048
Variance between transect counts	s_y^2	546.227	561.193	0.14	0.14
Variance between transect areas	s_a^2	2.996	2.996	2.996	2.996
Covariance between counts & areas	s_{ay}	23.425	23.703	0.098	0.098

CARCASS RATIOS

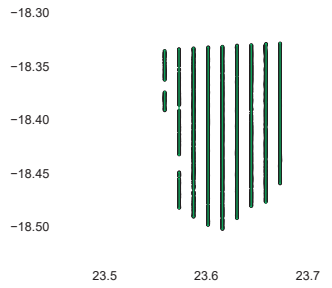
$CR_{1:4} = 0.8$ %
$CR_{1:2} = 0.4$ %

MSNA – Mamili South Namibia — NAMIBIA – KAVANGO ZAMBEZI

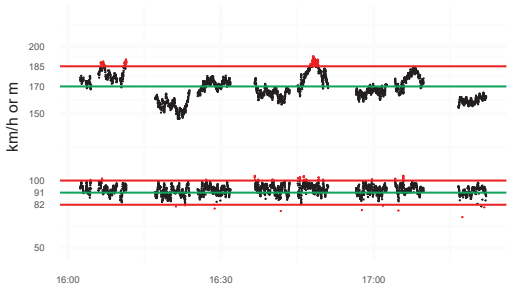
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221004B

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:

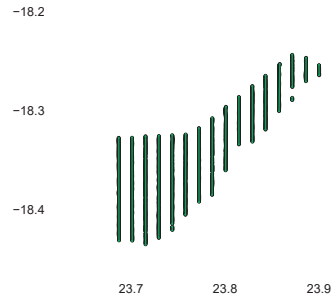


SPEED
Average: 168.6 km/h
Standard dev.: 9.4 km/h

HEIGHT AGL
Average: 93.1 m (305.4 ft)
Standard dev.: 3.5 m (11.5 ft)

KES2022_ V5WOT20221004B

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 174.3 km/h
Standard dev.: 7.1 km/h

HEIGHT AGL
Average: 92 m (301.8 ft)
Standard dev.: 3.3 m (10.7 ft)

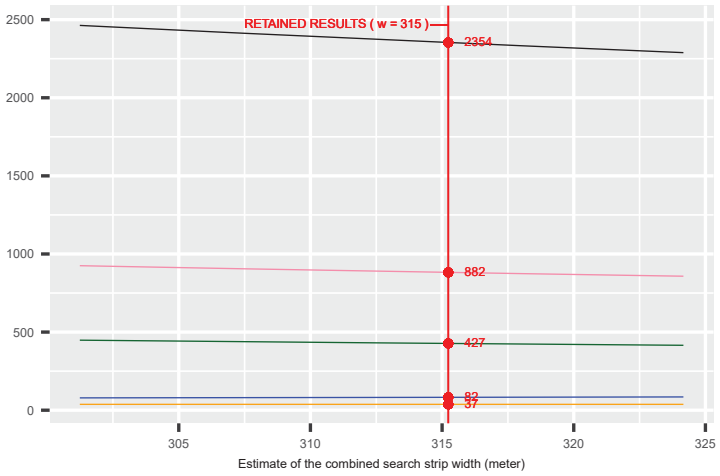
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [161 – 193]
C01 – Right: [122 – 163]

C04 – Left: [154 – 154]
C04 – Right: [155 – 155]

LIVE ELEPHANT ESTIMATE: [2463 – 2289]
CONFIDENCE INTERVAL: ± [925 – 858]
SAMPLE AREA: [79 – 85] sqkm
SE: [448 – 416]
PRP: [38 – 37] %



MSNA – Mamili South Namibia — NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: MSNA **N:** 122 S_a^2: 2,996
STRATUM NAME: Mamili South Namibia **w:** 315 **df:** 24

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	8	0	38	45	0,097	478	21,86	0	83	119	1,143	0,857
buffalo	Syncerus caffer	719	719	3405	2511	8,718	1480729	1216,85	894	5917	74	3254,773	21,120
bushbuck	Tragelaphus scriptus	1	0	5	9	0,012	18	4,24	0	13	185	0,040	0,110
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	169	108	800	795	2,049	148367	385,18	5	1595	99	259,357	-9,786
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	91	45	431	149	1,103	5234	72,35	282	580	35	19,990	5,723
elephant family	Loxodonta africana family	406	344	1923	883	4,923	183066	427,86	1040	2806	46	489,440	17,980
elephant carcass one	Loxodonta africana carcass one	1	0	5	9	0,012	19	4,37	0	14	191	0,040	0,010
elephant carcass two	Loxodonta africana carcass two	1	0	5	9	0,012	18	4,24	0	13	185	0,040	0,106
elephant carcass three	Loxodonta africana carcass three	2	0	9	13	0,024	38	6,14	0	22	134	0,077	-0,018
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	158	15	748	306	1,916	22032	148,43	442	1055	41	57,977	5,907
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	303	15	1435	597	3,674	83780	289,45	838	2032	42	270,860	18,386
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	2	0	9	18	0,024	76	8,73	0	27	190	0,160	0,033
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	1032	52	4887	1938	12,512	881582	938,93	2950	6825	40	2662,377	51,041
reedbuck	Redunca arundinum	37	1	175	113	0,449	2980	54,59	63	288	64	6,593	1,035
roan	Hippotragus equinus	2	0	9	18	0,024	76	8,74	0	28	190	0,160	0,024
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	427	9	2022	600	5,177	84439	290,58	1422	2622	30	363,993	25,757
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	16	42	76	107	0,194	2688	51,85	0	183	141	5,990	1,158
zebra	Equus spp,	4	0	19	36	0,048	305	17,48	0	55	190	0,640	0,048
all elephants	Loxodonta africana all	497	389	2354	882	6,026	182729	427,47	1471	3236	37	561,193	23,703
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	2	0	9	12	0,024	35	5,88	0	22	128	0,077	0,116
all elephant carcasses	Loxodonta africana carcass all	4	0	19	17	0,048	65	8,09	2	36	88	0,140	0,098
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	2	0	9	13	0,024	38	6,14	0	22	134	0,077	-0,018

NG1NA – NG 1 Namibia

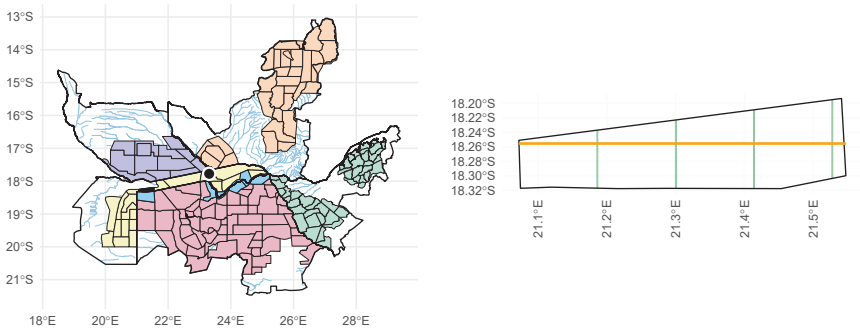
NAMIBIA – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: NG1NA
STRATUM NAME: NG 1 Namibia
■ STRATUM AREA: 515.13 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 219 km

– TRANSECTS: 4 (43 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 2.5 %

– BASELINE DISTANCE: 50.21 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.8 h
Crew(s): C04
KES2022_V5WOT20221009A 06:29–09:16

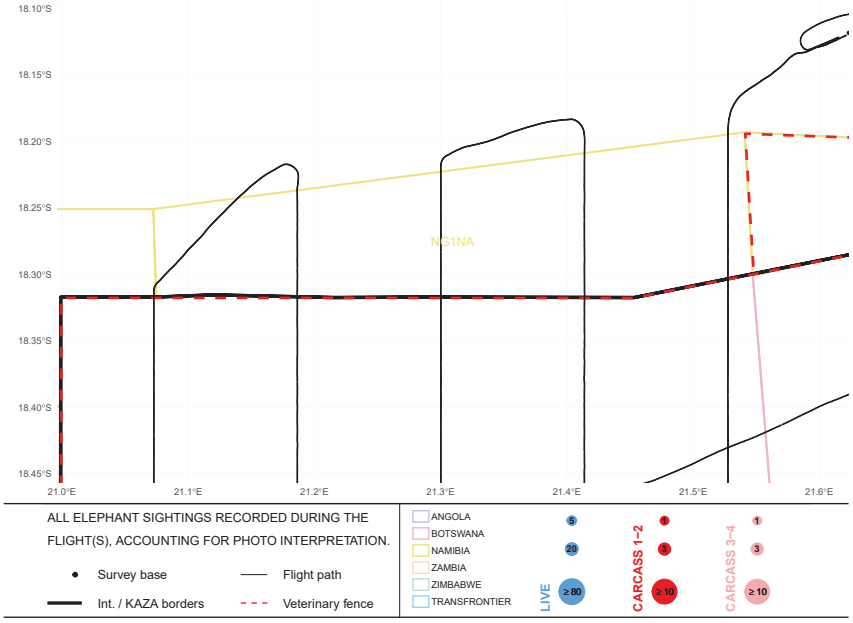
Actual sampling intensity: 2.6 %
Transect flying time: 0.2 h
Transects: 4 – 43 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C04	
Side:	L	R
% sightings:	53	47
% individuals:	67	33

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	1	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	1
Other wildlife count:	1
Domestic count:	80

ELEPHANT DATA ANALYSIS

t = 3.182, N = 162, w = 309

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

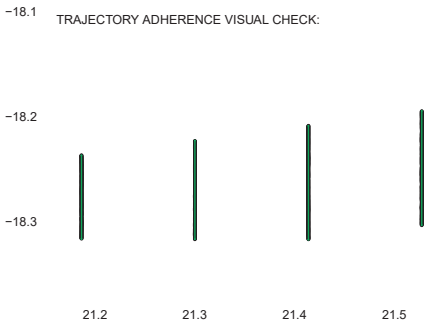
CARCASS RATIOS

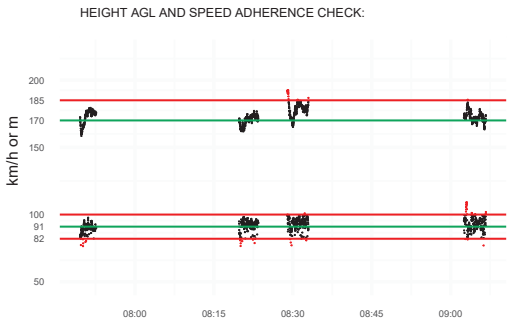
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

NG1NA – NG 1 Namibia — NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221009A





SPEED
Average: 173.6 km/h
Standard dev.: 5.7 km/h

HEIGHT AGL
Average: 92.2 m (302.6 ft)
Standard dev.: 4.7 m (15.5 ft)

NG1NA – NG 1 Namibia — NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: NG1NA **N:** 162 S_a^2: 0,291
STRATUM NAME: NG1 Namibia **w:** 309 **df:** 3

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	74	11	2833	3241	5,499	1037049	1018,36	0	6074	114	240,333	7,961
donkey	Equus asinus	6	0	230	778	0,446	59776	244,49	0	1008	339	9,000	-0,286
duiker	Sylvicapra grimmia	1	0	38	136	0,074	1838	42,88	0	175	356	0,250	-0,234
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

SALI – Salamimpa

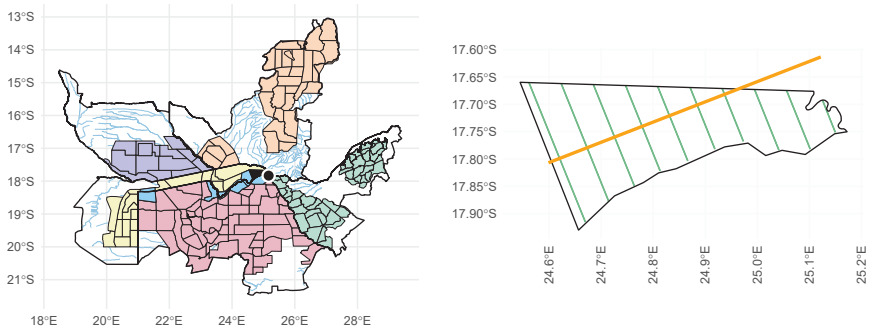
NAMIBIA – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: SALI
STRATUM NAME: Salamimpa
■ STRATUM AREA: 1002.78 sqkm
• SURVEY BASE: Kasane
DISTANCE TO SURVEY BASE: 45 km

– TRANSECTS: 10 (176 km)
TRANSECT ORIENTATION: 159.7°
PLANNED SAMPLING INTENSITY: 5.3 %

– BASELINE DISTANCE: 59.48 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.8 h
Crew(s): C03
KES2022_V5WOT20221001A 07:25–11:10

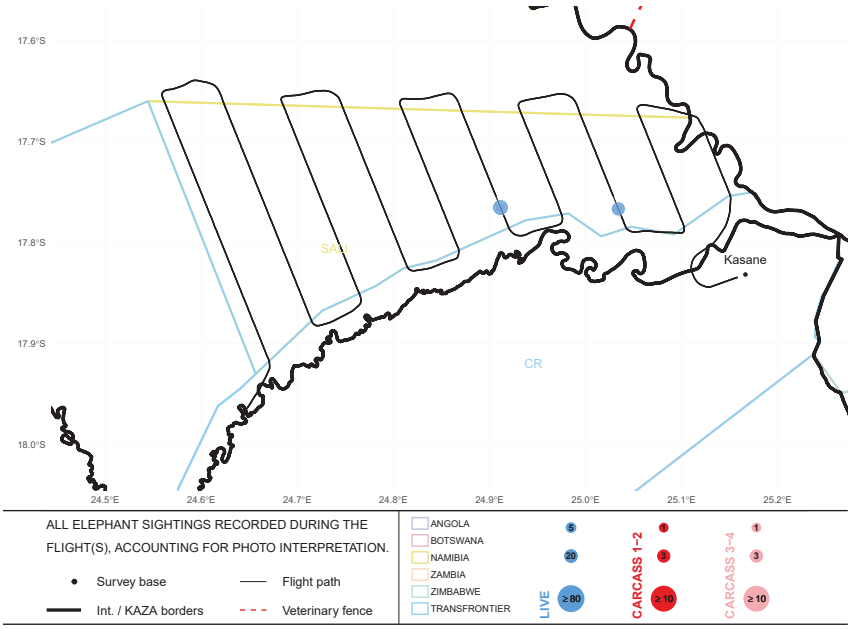
Actual sampling intensity: 5.5 %
Transect flying time: 1 h
Transects: 10 – 176 km – 159.7°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	36	64
% individuals:	47	53

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	49	0	
Live elephant (>9):	1	0	
Elephant carcass:	0		
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**17 (1)**
Bulls:	0 (0)
Family:	17 (1)
NOT IN SAMPLE:	**25 (1)**
Outside search strip:	25
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	2
Other wildlife count:	89
Domestic count:	1080

ELEPHANT DATA ANALYSIS

t = 2.262, N = 189, w = 313

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	309	309	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	104894	104894	–	–
Standard error	$\mathrm{SE}\hat{Y}$	324	324	–	–
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 733	± 733	–	–
Percentage of relative precision	$\mathrm{PRP}_{\hat{Y}}$	237 %	237 %	–	–
Density per sqkm	$R_{\hat{Y}}$	0.309	0.309	–	–
Variance between transect counts	s_y^2	28.9	28.9	–	–
Variance between transect areas	s_a^2	4.88	4.88	–	–
Covariance between counts & areas	s_{ay}	−2.143	−2.143	–	–

CARCASS RATIOS

$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

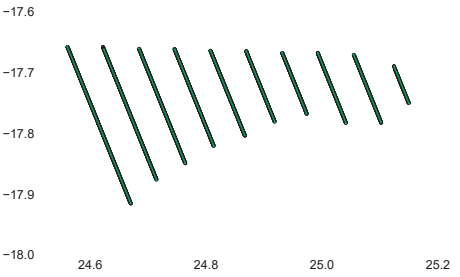
SALI – Salamimpa

NAMIBIA – KAVANGO ZAMBEZI

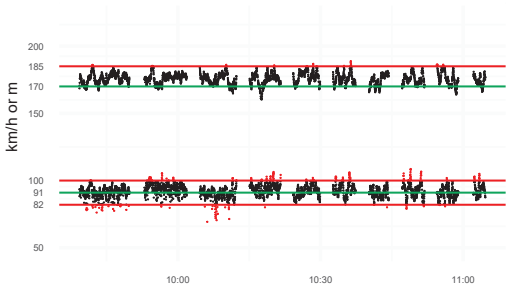
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221001A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



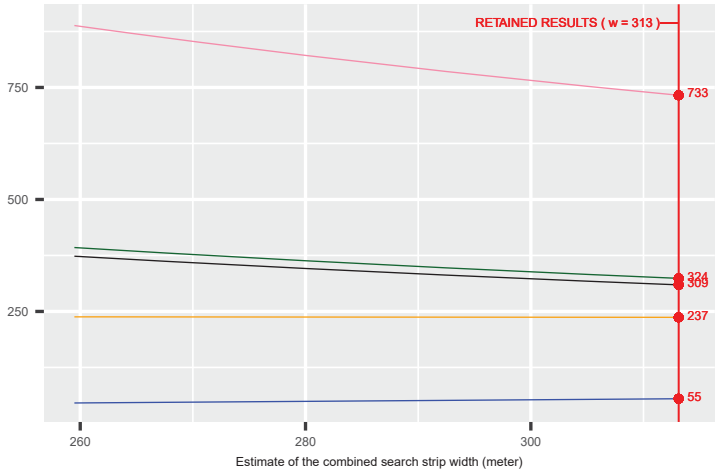
SPEED
Average: 175.7 km/h
Standard dev.: 4.3 km/h

HEIGHT AGL
Average: 92.1 m (302.3 ft)
Standard dev.: 4.7 m (15.3 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C03 – Left: [103 – 156]
C03 – Right: [145 – 173]



LIVE ELEPHANT ESTIMATE: [373 – 309]
CONFIDENCE INTERVAL: ± [888 – 733]
SAMPLE AREA: [46 – 55] sqkm
SE: [393 – 324]
PRP: [238 – 237] %

SALI – Salamimpa NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: SALI **N:** 190 S_a^2: 4,880
STRATUM NAME: Salamimpa **w:** 313 **df:** 9

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	1070	0	19472	15199	19,418	45143183	6718,87	4272	34671	78	8676,889	-69,265
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	17	25	309	733	0,309	104894	323,87	0	1042	237	28,900	-2,143
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	10	0	182	398	0,181	30917	175,83	0	580	219	10,000	3,075
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	88	72	1601	3664	1,597	2623216	1619,63	0	5265	229	774,400	6,080
all elephants	Loxodonta africana all	17	25	309	733	0,309	104894	323,87	0	1042	237	28,900	-2,143
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

SUS – Susuwe

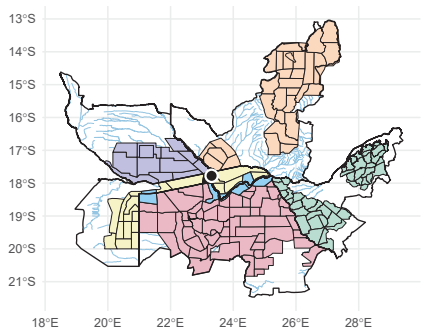
NAMIBIA – KAVANGO ZAMBEZI

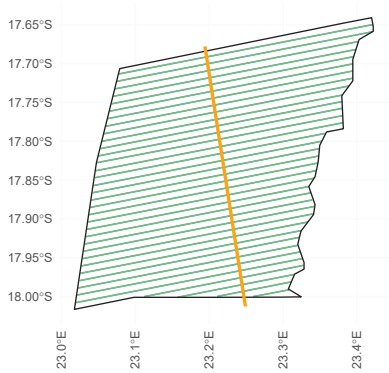
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: SUS
STRATUM NAME: Susuwe
■ STRATUM AREA: 1171.43 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 14 km

– TRANSECTS: 36 (1152 km)
TRANSECT ORIENTATION: 80.7°
PLANNED SAMPLING INTENSITY: 29.5 %

– BASELINE DISTANCE: 37.54 km





SURVEY IMPLEMENTATION

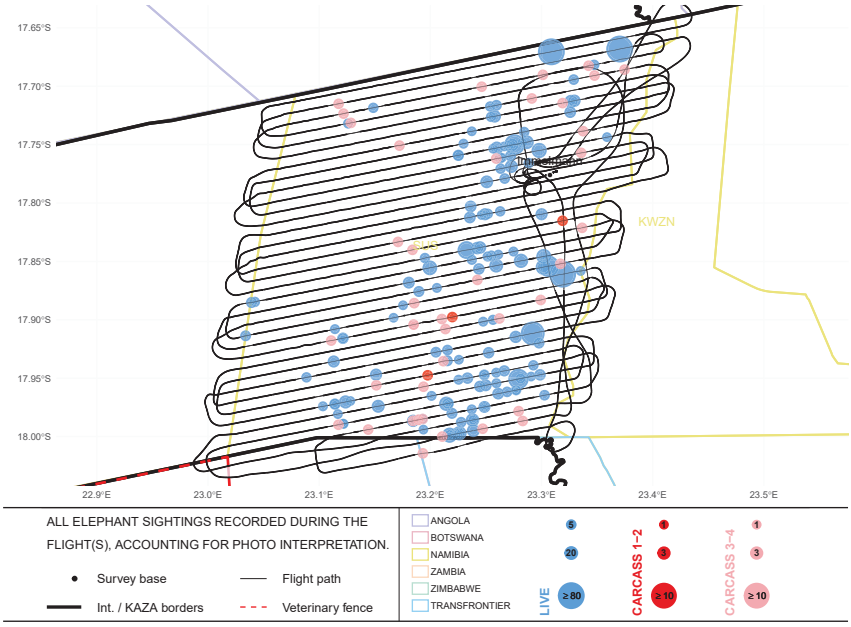
Number of flight(s): 3
Combined flying time: 9.5 h
Crew(s): C01, C02, C04
KES2022_V5IIM20221008A 06:43–10:00
KES2022_V5LJB20221008A 07:15–10:29
KES2022_V5WOT20221008A 07:05–10:06
Actual sampling intensity: 31.3 %
Transect flying time: 6.7 h
Transects: 36 – 1152 km – 80.7°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01		C02		C04	
Side:	L	R	L	R	L	R
% sightings:	50	50	55	45	42	58
% individuals:	54	46	57	43	39	61

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	229	25.33	25.86
Live elephant (>9):	16	62.5	40
Elephant carcass:	37	59.46	0
Live elephant (<10):	60	21.67	15.38



LIVE ELEPHANTS



IN SAMPLE:	**580 (76)**
Bulls:	51 (28)
Family:	529 (48)
NOT IN SAMPLE:	**1041 (78)**
Outside search strip:	1035
Off transect:	6

ELEPHANT CARCASSES



IN SAMPLE:	**37 (37)**
Category 1:	1 (1)
Category 2:	2 (2)
Category 3:	9 (9)
Category 4:	25 (25)
NOT IN SAMPLE:	**7 (7)**
Outside search strip:	5
Off transect:	2

OTHER SPECIES

Other wildlife species:	22
Other wildlife count:	1833
Domestic count:	110

ELEPHANT DATA ANALYSIS

t = 2.03, N = 117, w = 319

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	1650	1851	118	118
Variance of estimate	$Var\hat{Y}$	82883	120707	390	390
Standard error	$SE\hat{Y}$	288	347	20	20
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 584	± 705	± 40	± 40
Percentage of relative precision	$PRP\hat{Y}$	35 %	38 %	34 %	34 %
Density per sqkm	$R\hat{Y}$	1.408	1.58	0.101	0.101
Variance between transect counts	s^2_y	270.237	405.53	1.399	1.399
Variance between transect areas	s^2_a	5.118	5.118	5.118	5.118
Covariance between counts & areas	s_{ay}	−10.366	−10.304	−0.021	−0.021

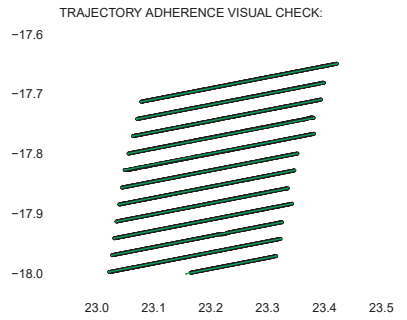
CARCASS RATIOS

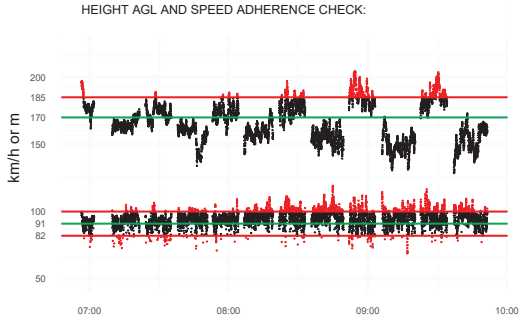
$CR_{1:4}$ = 6 %
$CR_{1:2}$ = 0.5 %

SUS – Susuwe NAMIBIA – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221008A

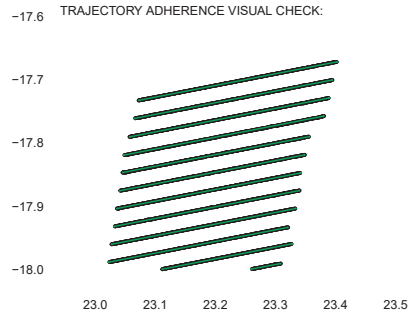


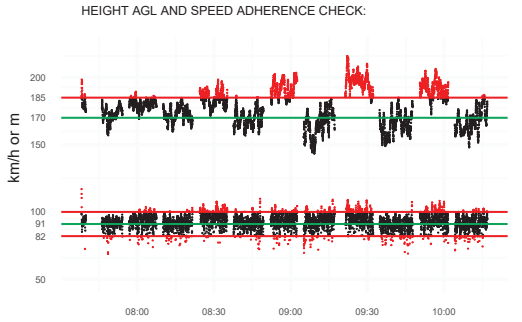


SPEED
Average: 166.3 km/h
Standard dev.: 14.3 km/h

HEIGHT AGL
Average: 94.5 m (310.1 ft)
Standard dev.: 5.7 m (18.8 ft)

KES2022_ V5LJB20221008A

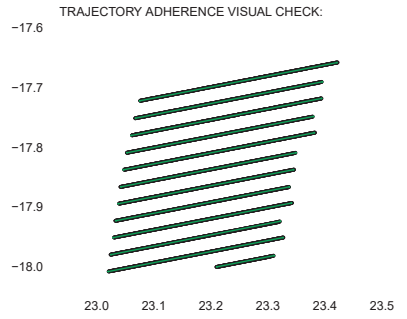


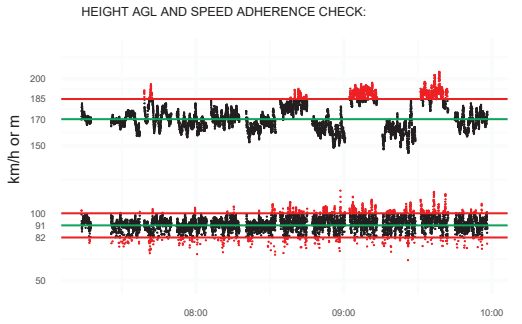


SPEED
Average: 177.3 km/h
Standard dev.: 13 km/h

HEIGHT AGL
Average: 92.8 m (304.5 ft)
Standard dev.: 5.2 m (17 ft)

KES2022_ V5WOT20221008A





SPEED
Average: 171.9 km/h
Standard dev.: 10.3 km/h

HEIGHT AGL
Average: 92.1 m (302.1 ft)
Standard dev.: 5.4 m (17.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

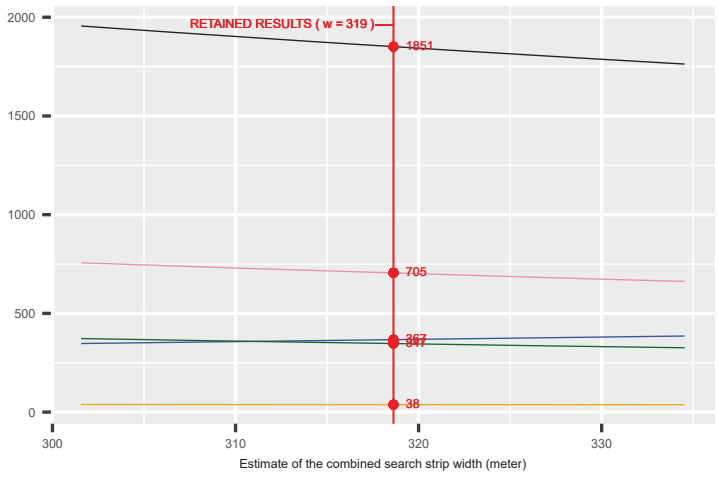
Range of search strip width estimates (m):

C01 – Left: [163 – 196]
C01 – Right: [123 – 165]

C02 – Left: [156 – 179]
C02 – Right: [136 – 187]

C04 – Left: [154 – 154]
C04 – Right: [155 – 155]

LIVE ELEPHANT ESTIMATE: [1956 – 1763]
CONFIDENCE INTERVAL: ± [756 – 662]
SAMPLE AREA: [347 – 385] sqkm
SE: [373 – 326]
PRP: [39 – 38] %



SUS – Susuwe NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: SUS **N:** 118 S_a^2: 5,118
STRATUM NAME: Susuwe **w:** 319 **df:** 35

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	18	0	57	58	0,049	802	28,32	0	115	100	3,000	0,159
buffalo	Syncerus caffer	142	162	453	354	0,387	30486	174,60	99	808	78	107,083	-7,784
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	2	0	6	11	0,005	30	5,45	0	17	174	0,111	0,011
cattle	Bos taurus	110	0	351	409	0,300	40491	201,22	0	760	116	152,740	3,262
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	6	8	0,005	15	3,83	0	14	122	0,054	-0,066
eland	Tragelaphus oryx	1	8	3	6	0,003	7	2,72	0	9	173	0,028	0,021
elephant bulls	Loxodonta africana males	51	52	163	98	0,139	2321	48,18	65	261	60	8,707	0,488
elephant family	Loxodonta africana family	529	989	1688	684	1,441	113531	336,94	1004	2372	41	382,333	-10,792
elephant carcass one	Loxodonta africana carcass one	1	0	3	6	0,003	7	2,72	0	9	173	0,028	0,023
elephant carcass two	Loxodonta africana carcass two	2	0	6	8	0,005	15	3,81	0	14	121	0,054	-0,009
elephant carcass three	Loxodonta africana carcass three	9	1	29	17	0,025	67	8,18	12	45	58	0,250	0,068
elephant carcass four	Loxodonta africana carcass four	25	6	80	34	0,068	283	16,81	46	114	43	1,018	-0,104
giraffe	Giraffa giraffa	41	3	131	58	0,112	812	28,50	73	189	44	3,094	0,554
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	71	0	227	128	0,193	3966	62,98	99	354	56	14,999	0,973
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	195	50	622	335	0,531	27159	164,80	288	957	54	98,079	-1,810
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	43	0	137	73	0,117	1280	35,78	65	210	53	4,847	0,579
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	4	5	13	13	0,011	42	6,48	0	26	103	0,159	0,119
puku	Kobus vardonii	2	1	6	11	0,005	30	5,46	0	17	174	0,111	-0,008
red lechwe	Kobus leche	750	60	2393	704	2,043	120252	346,77	1689	3097	29	470,771	10,515
reedbuck	Redunca arundinum	13	0	41	44	0,035	480	21,90	0	86	107	1,780	-0,070
roan	Hippotragus equinus	19	2	61	51	0,052	641	25,32	9	112	85	2,371	-0,095
sable	Hippotragus niger	246	45	785	289	0,670	20271	142,38	496	1074	37	75,400	1,479
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	19	1	61	54	0,052	717	26,77	6	115	90	2,656	-0,065
warthog	Phacochoerus africanus	11	0	35	30	0,030	221	14,88	5	65	86	0,847	0,410
waterbuck	Kobus ellipsiprymnus	2	0	6	8	0,005	15	3,87	0	14	123	0,054	-0,167
wildebeest	Connochaetes taurinus	28	27	89	73	0,076	1279	35,76	17	162	81	4,692	-0,356
zebra	Equus spp,	219	84	699	400	0,597	38746	196,84	299	1098	57	144,193	1,080
all elephants	Loxodonta africana all	580	1041	1851	705	1,580	120707	347,43	1146	2556	38	405,530	-10,304
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	3	0	10	9	0,008	21	4,59	0	19	97	0,079	0,014
all elephant carcasses	Loxodonta africana carcass all	37	7	118	40	0,101	390	19,74	78	158	34	1,399	-0,021
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	34	7	109	37	0,093	334	18,27	71	146	34	1,197	-0,036

ZASW – Zambezi South–West

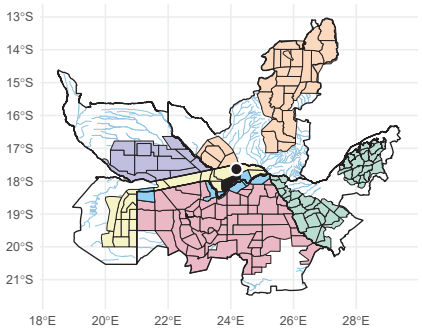
NAMIBIA – KAVANGO ZAMBEZI

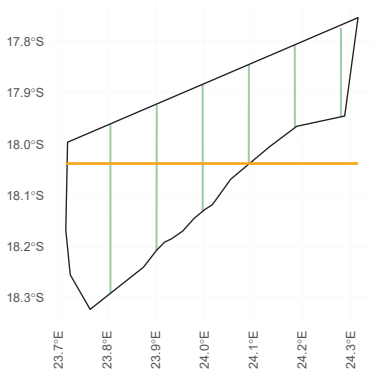
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: ZASW
STRATUM NAME: Zambezi South–West
■ STRATUM AREA: 1646.75 sqkm
• SURVEY BASE: Katima Mulilo
DISTANCE TO SURVEY BASE: 53 km

– TRANSECTS: 6 (155 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 2.8 %

– BASELINE DISTANCE: 63.53 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.9 h
Crew(s): C01
KES2022_V5IIM20221002A 09:19–12:10

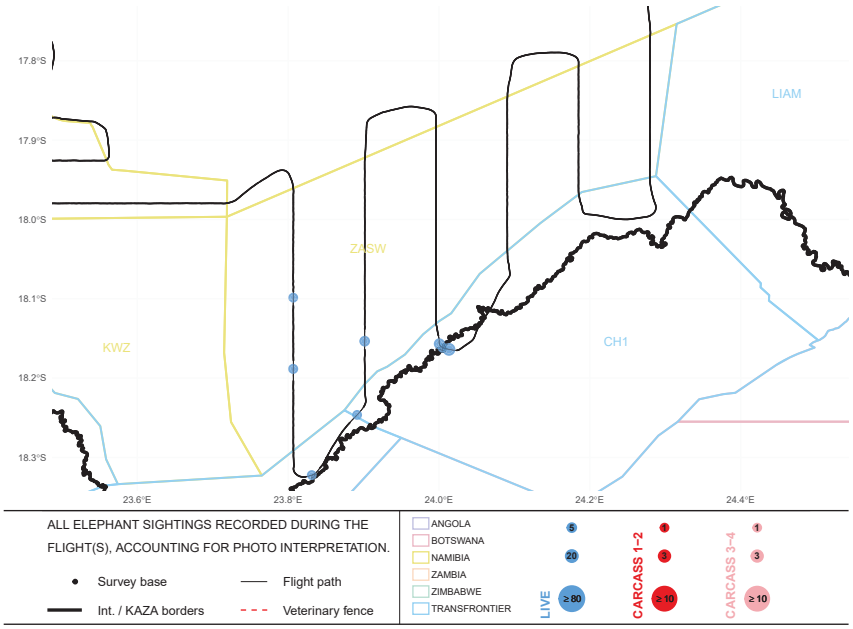
Actual sampling intensity: 3 %
Transect flying time: 0.9 h
Transects: 6 – 155 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	53	47
% individuals:	60	40

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	31	12.9	50
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	1	100	0





LIVE ELEPHANTS

IN SAMPLE:	**2 (1)**
Bulls:	2 (1)
Family:	0 (0)
NOT IN SAMPLE:	**33 (7)**
Outside search strip:	6
Off transect:	27



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	2
Other wildlife count:	3
Domestic count:	701

ELEPHANT DATA ANALYSIS

t = 2.571, N = 198, w = 320

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	67	67	–	–
Variance of estimate	$Var\hat{Y}$	3549	3549	–	–
Standard error	$SE\hat{Y}$	60	60	–	–
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 153	± 153	–	–
Percentage of relative precision	$PRP\hat{Y}$	230 %	230 %	–	–
Density per sqkm	$R\hat{Y}$	0.04	0.04	–	–
Variance between transect counts	s_y^2	0.667	0.667	–	–
Variance between transect areas	s_a^2	6.142	6.142	–	–
Covariance between counts & areas	s_{ay}	1.487	1.487	–	–

CARCASS RATIOS

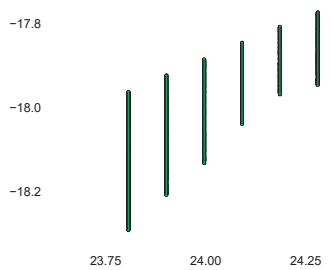
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

ZASW – Zambezi South–West — NAMIBIA – KAVANGO ZAMBEZI

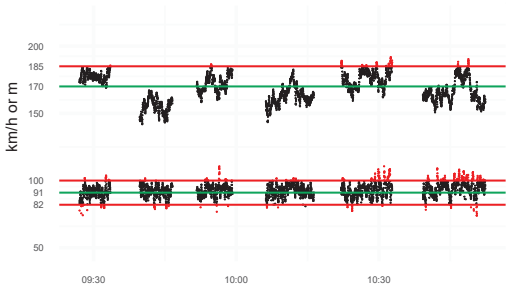
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221002A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



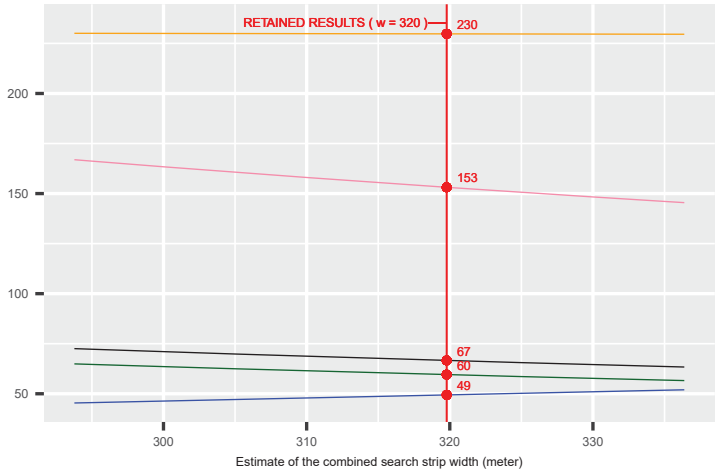
SPEED
Average: 168.2 km/h
Standard dev.: 9.9 km/h

HEIGHT AGL
Average: 92.8 m (304.4 ft)
Standard dev.: 5.2 m (17 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 193]
C01 – Right: [121 – 162]



LIVE ELEPHANT ESTIMATE: [73 – 63]
CONFIDENCE INTERVAL: ± [167 – 145]
SAMPLE AREA: [45 – 52] sqkm
SE: [65 – 57]
PRP: [230 – 230] %

ZASW – Zambezi South–West NAMIBIA – KAVANGO ZAMBEZI

STRATUM CODE: ZASW **N:** 199 S_a^2: 6,142
STRATUM NAME: Zambezi South-West **w:** 320 **df:** 5

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	658	175	21927	14368	13,315	31242111	5589,46	7559	36295	66	2459,067	-50,696
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	3	0	100	160	0,061	3858	62,11	0	260	160	0,700	0,971
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	2	18	67	153	0,040	3549	59,57	0	220	230	0,667	1,487
elephant family	Loxodonta africana family	0	15	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	43	43	1433	3537	0,870	1893408	1376,01	0	4970	247	260,167	-18,403
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	2	33	67	153	0,040	3549	59,57	0	220	230	0,667	1,487
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

KC – KC

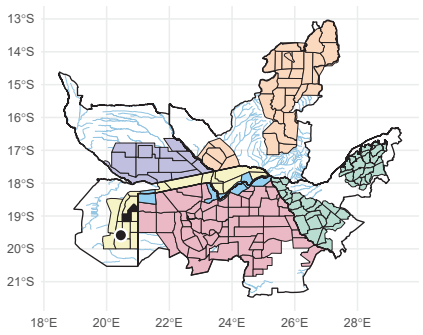
NAMIBIA – KHAUDUM NYAE–NYAE

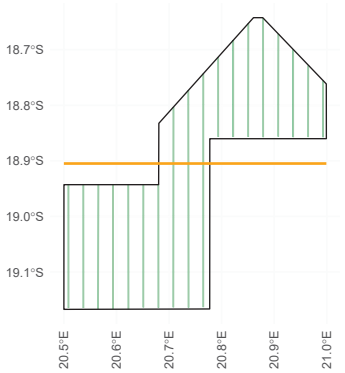
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: KC
STRATUM NAME: KC
■ STRATUM AREA: 1343.26 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 81 km

– TRANSECTS: 18 (454 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 10.1 %

– BASELINE DISTANCE: 52.59 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C01
KES2022_V5IIM20221015A 06:20–10:43

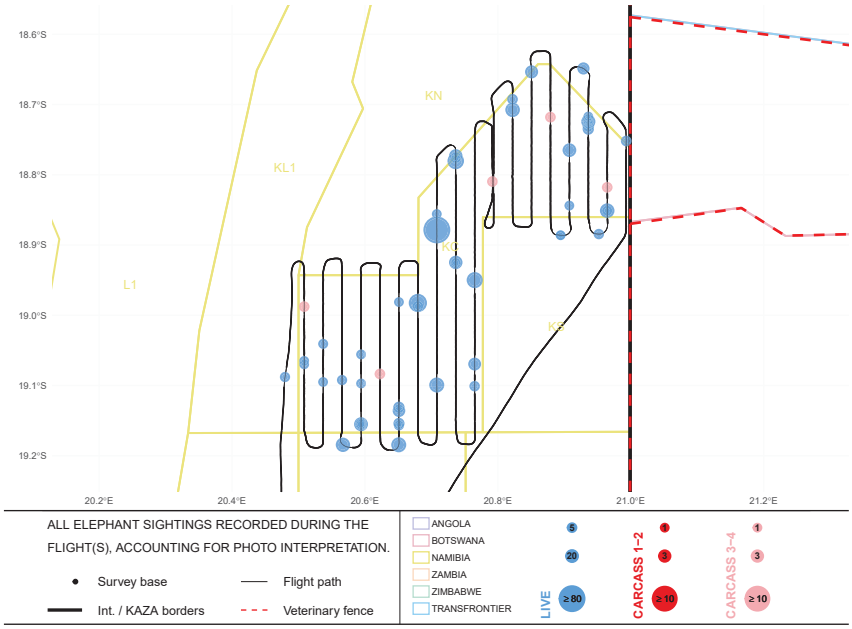
Actual sampling intensity: 10.5 %
Transect flying time: 2.6 h
Transects: 18 – 454 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	41	59
% individuals:	55	45

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	49	22.45	9.09
Live elephant (>9):	10	80	12.5
Elephant carcass:	4	25	0
Live elephant (<10):	18	0	



LIVE ELEPHANTS



IN SAMPLE:	**321 (28)**
Bulls:	20 (13)
Family:	301 (15)
NOT IN SAMPLE:	**250 (26)**
Outside search strip:	171
Off transect:	79



ELEPHANT CARCASSES

IN SAMPLE:	**4 (4)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	3 (3)
Category 4:	1 (1)
NOT IN SAMPLE:	**1 (1)**
Outside search strip:	0
Off transect:	1

OTHER SPECIES

Other wildlife species:	11
Other wildlife count:	124
Domestic count:	55

ELEPHANT DATA ANALYSIS

t = 2.11, N = 168, w = 311

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3002	3049	38	38
Variance of estimate	$\mathrm{Var}\hat{Y}$	921556	928311	287	287
Standard error	$\mathrm{SE}\hat{Y}$	960	963	17	17
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 2025	± 2033	± 36	± 36
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	67 %	67 %	94 %	94 %
Density per sqkm	$R\hat{Y}$	2.235	2.27	0.028	0.028
Variance between transect counts	s_y^2	814.379	816.618	0.183	0.183
Variance between transect areas	s_a^2	8.645	8.645	8.645	8.645
Covariance between counts & areas	s_{ay}	46.339	45.363	−0.224	−0.224

CARCASS RATIOS

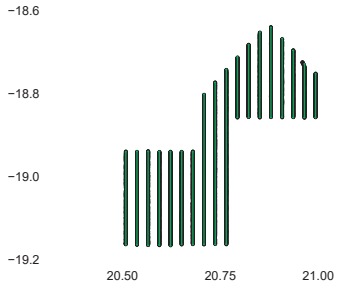
$CR_{1:4} = 1.2$ %
$CR_{1:2} = 0$ %

KC – KC NAMIBIA – KHAUDUM NYAE–NYAE

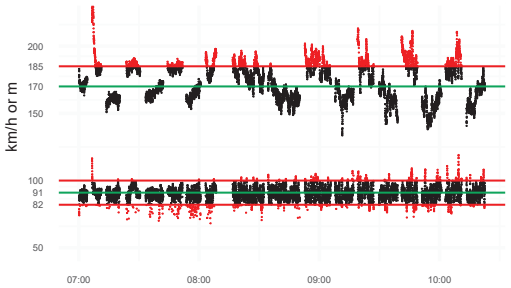
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221015A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



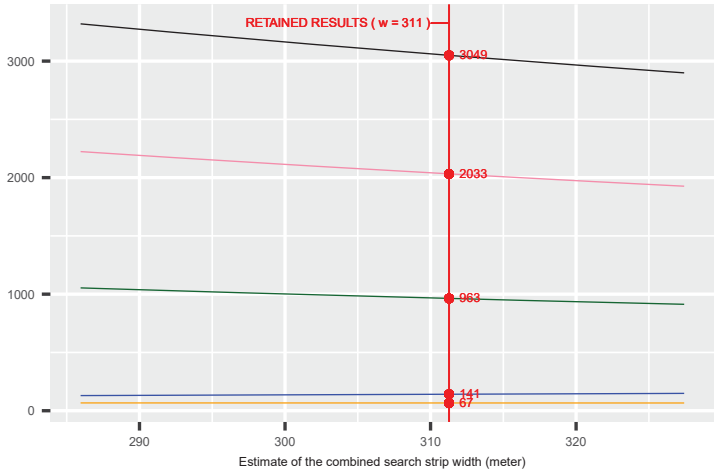
SPEED
Average: 173.5 km/h
Standard dev.: 14 km/h

HEIGHT AGL
Average: 90.3 m (296.2 ft)
Standard dev.: 5.1 m (16.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [156 – 188]
C01 – Right: [118 – 158]



LIVE ELEPHANT ESTIMATE: [3319 – 2899]
CONFIDENCE INTERVAL: ± [2223 – 1926]
SAMPLE AREA: [130 – 149] sqkm
SE: [1054 – 913]
PRP: [67 – 66] %

KC – KC NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: KC **N:** 169 S_a^2: 8,645
STRATUM NAME: KC **w:** 311 **df:** 17

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	1	0	9	19	0,007	80	8,94	0	28	198	0,056	-0,026
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	5	0	47	94	0,035	1986	44,57	0	142	198	1,389	-0,031
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	19	26	0,014	151	12,28	0	45	136	0,105	-0,003
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	20	24	190	103	0,141	2395	48,94	87	293	54	2,340	2,907
elephant family	Loxodonta africana family	301	226	2859	2010	2,129	907826	952,80	849	4870	70	782,330	42,457
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	3	1	28	32	0,021	228	15,08	0	60	112	0,147	-0,227
elephant carcass four	Loxodonta africana carcass four	1	0	9	19	0,007	79	8,90	0	28	198	0,056	0,003
giraffe	Giraffa giraffa	14	0	133	120	0,099	3261	57,11	13	253	91	2,536	1,610
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	11	0	104	143	0,078	4603	67,85	0	248	137	3,193	-0,026
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	30	15	285	199	0,212	8853	94,09	86	484	70	7,059	2,827
ostrich	Struthio camelus	1	1	9	19	0,007	81	8,99	0	28	200	0,056	-0,072
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	32	0	304	315	0,226	22296	149,32	0	619	104	15,595	0,665
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	50	0	475	940	0,354	198620	445,67	0	1415	198	138,889	-0,306
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	9	0	85	95	0,064	2011	44,84	0	180	111	1,559	1,373
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	13	15	123	245	0,092	13493	116,16	0	369	198	9,389	-0,333
zebra	Equus spp,	8	0	76	150	0,057	5086	71,32	0	226	198	3,556	-0,058
all elephants	Loxodonta africana all	321	250	3049	2033	2,270	928311	963,49	1017	5082	67	816,618	45,363
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	4	1	38	36	0,028	287	16,94	2	74	94	0,183	-0,224
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	4	1	38	36	0,028	287	16,94	2	74	94	0,183	-0,224

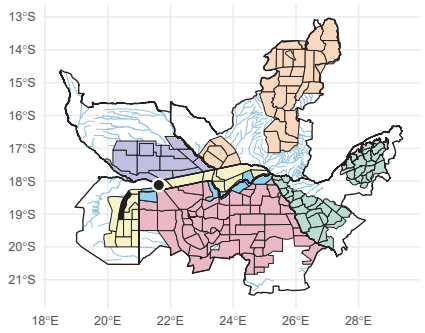
KL1 – KL1 NAMIBIA – KHAUDUM NYAE–NYAE

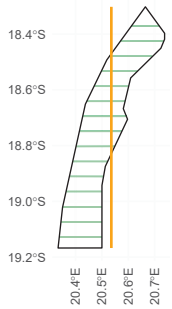
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: KL1
STRATUM NAME: KL1
■ STRATUM AREA: 1413.6 sqkm
● SURVEY BASE: Bagani
DISTANCE TO SURVEY BASE: 142 km

– TRANSECTS: 15 (232 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 4.9 %

– BASELINE DISTANCE: 95.78 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.5 h
Crew(s): C02
KES2022_V5LJB20221011A 06:30–10:03

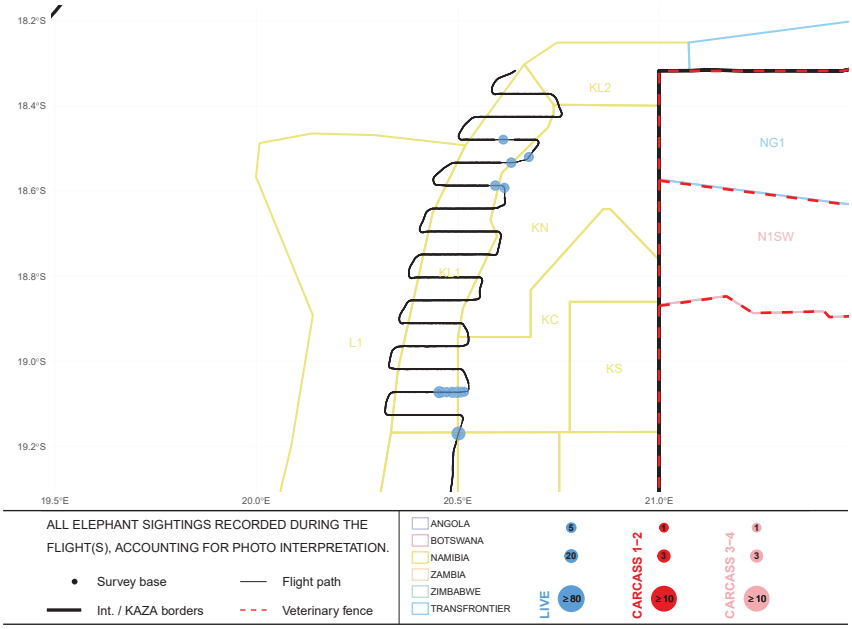
Actual sampling intensity: 5.2 %
Transect flying time: 1.3 h
Transects: 15 – 232 km – 90°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	61	39
% individuals:	73	27

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	12	33.33	25
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	5	60	0





LIVE ELEPHANTS

IN SAMPLE:	**16 (5)**
Bulls:	16 (5)
Family:	0 (0)
NOT IN SAMPLE:	**61 (12)**
Outside search strip:	28
Off transect:	33



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	8
Other wildlife count:	33
Domestic count:	82

ELEPHANT DATA ANALYSIS

t = 2.145, N = 301, w = 318

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	307	307	–	–
Variance of estimate	$Var\hat{Y}$	49522	49522	–	–
Standard error	$SE\hat{Y}$	223	223	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 477	± 477	–	–
Percentage of relative precision	$PRP\hat{Y}$	156 %	156 %	–	–
Density per sqkm	$R\hat{Y}$	0.217	0.217	–	–
Variance between transect counts	s^2_y	8.638	8.638	–	–
Variance between transect areas	s^2_a	0.266	0.266	–	–
Covariance between counts & areas	s_{ay}	0.068	0.068	–	–

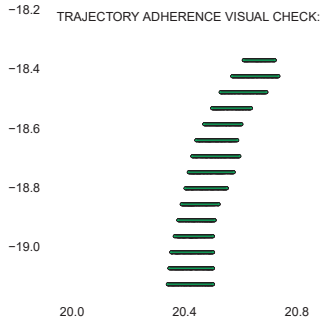
CARCASS RATIOS

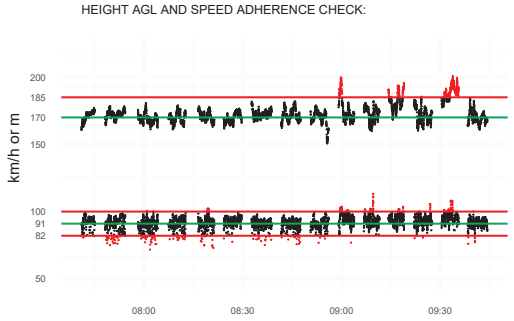
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

KL1 – KL1 NAMIBIA – KHAUDUM NYAE–NYAE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221011A





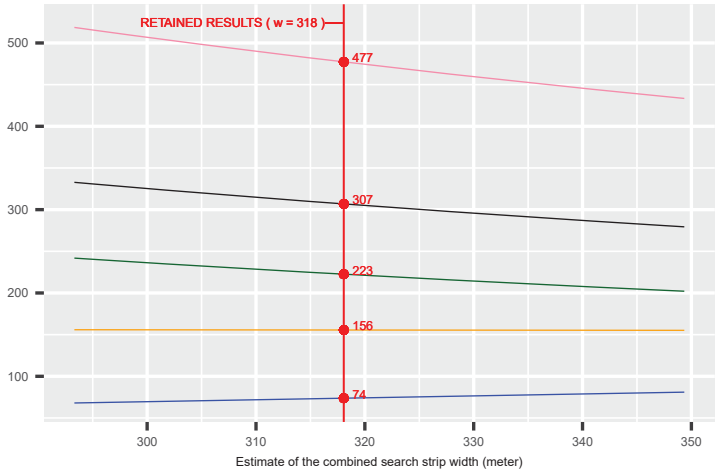
SPEED
Average: 172.8 km/h
Standard dev.: 6.9 km/h

HEIGHT AGL
Average: 92 m (301.8 ft)
Standard dev.: 4.3 m (14.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [155 – 177]
C02 – Right: [134 – 185]



LIVE ELEPHANT ESTIMATE: [333 – 279]
CONFIDENCE INTERVAL: ± [519 – 433]
SAMPLE AREA: [68 – 81] sqkm
SE: [242 – 202]
PRP: [156 – 155] %

KL1 – KL1 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: KL1 **N:** 301 S_a^2: 0,266
STRATUM NAME: KL1 **w:** 318 **df:** 14

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	82	7	1573	1312	1,112	374024	611,57	261	2884	83	61,124	-1,645
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	8	0	153	120	0,109	3131	55,95	33	273	78	0,552	0,048
eland	Tragelaphus oryx	17	14	326	714	0,231	110840	332,93	0	1040	219	19,267	-0,033
elephant bulls	Loxodonta africana males	16	41	307	477	0,217	49522	222,54	0	784	156	8,638	0,068
elephant family	Loxodonta africana family	0	20	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	3	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	9	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	5	12	96	170	0,068	6297	79,35	0	266	177	1,095	0,002
ostrich	Struthio camelus	2	2	38	58	0,027	732	27,05	0	96	151	0,124	-0,063
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	16	61	307	477	0,217	49522	222,54	0	784	156	8,638	0,068
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

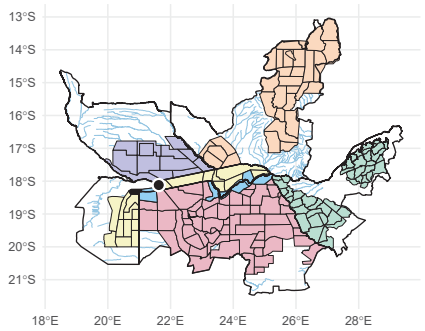
KL2 – KL2 NAMIBIA – KHAUDUM NYAE–NYAE

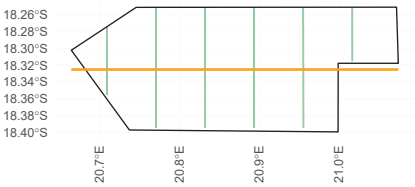
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: KL2
STRATUM NAME: KL2
■ STRATUM AREA: 568.27 sqkm
• SURVEY BASE: Bagani
DISTANCE TO SURVEY BASE: 86 km

– TRANSECTS: 6 (82 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 4.3 %

– BASELINE DISTANCE: 43.34 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.5 h
Crew(s): C02
KES2022_V5LJB20221011A 06:30–10:03

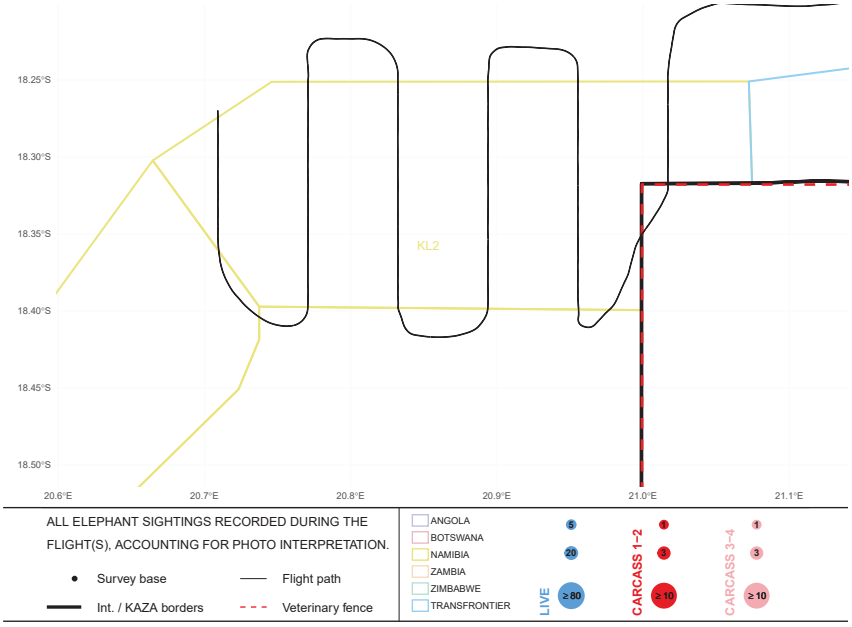
Actual sampling intensity: 4.6 %
Transect flying time: 0.5 h
Transects: 6 – 82 km – 0°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	48	52
% individuals:	59	41

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	1	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	3
Other wildlife count:	13
Domestic count:	62

ELEPHANT DATA ANALYSIS

t = 2.571, N = 137, w = 316

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

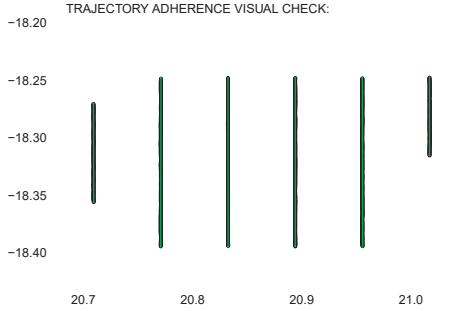
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

KL2 – KL2 NAMIBIA – KHAUDUM NYAE-NYAE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221011A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED

Average:	172.6 km/h
Standard dev.:	4 km/h

HEIGHT AGL

Average:	91.3 m	(299.7 ft)
Standard dev.:	4.1 m	(13.4 ft)

KL2 – KL2 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: KL2 **N:** 137 S_a^2: 1,685
STRATUM NAME: KL2 **w:** 316 ***df*:** 5

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	55	0	1204	1655	2,119	414463	643,79	0	2859	137	112,567	-4,207
donkey	Equus asinus	1	0	22	63	0,039	600	24,50	0	85	288	0,167	-0,397
duiker	Sylvicapra grimmia	4	0	88	161	0,154	3918	62,59	0	248	184	1,467	0,657
eland	Tragelaphus oryx	0	20	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	1	0	22	56	0,039	471	21,70	0	78	255	0,167	0,162
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	7	3	153	240	0,270	8739	93,48	0	394	157	3,367	1,076
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	5	0	109	278	0,193	11713	108,23	0	388	254	4,167	0,857
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

KN – KN

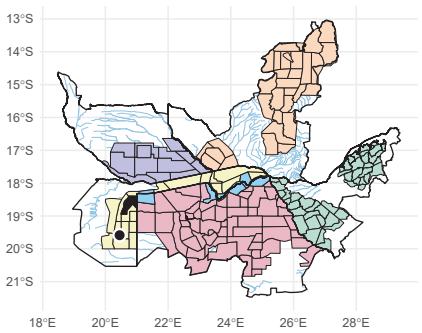
NAMIBIA – KHAUDUM NYAE–NYAE

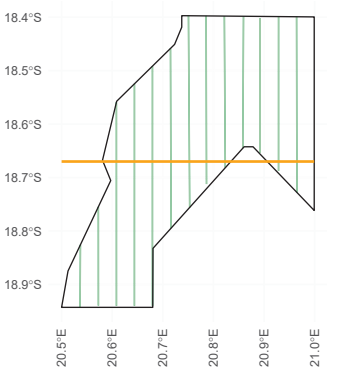
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: KN
STRATUM NAME: KN
■ STRATUM AREA: 1715.16 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 103 km

– TRANSECTS: 14 (480 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 8.4 %

– BASELINE DISTANCE: 52.64 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C01
KES2022_V5IIM20221013A 06:34–11:01

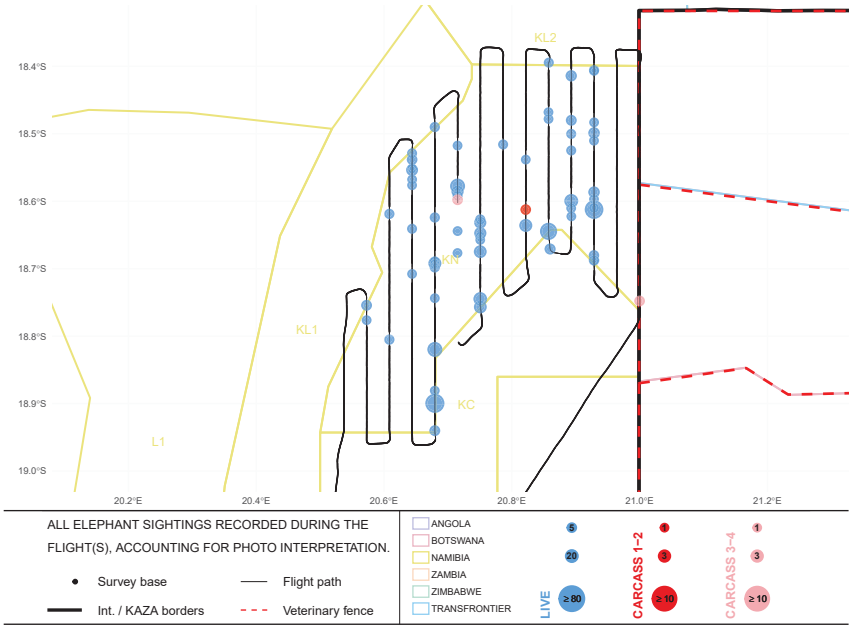
Actual sampling intensity: 8.1 %
Transect flying time: 2.6 h
Transects: 14 – 444 km – 0°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	40	60
% individuals:	57	43

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	67	20.9	7.14
Live elephant (>9):	7	85.71	16.67
Elephant carcass:	3	66.67	0
Live elephant (<10):	32	15.62	0



LIVE ELEPHANTS



IN SAMPLE:	**207 (39)**
Bulls:	41 (26)
Family:	166 (13)
NOT IN SAMPLE:	**242 (30)**
Outside search strip:	189
Off transect:	53

ELEPHANT CARCASSES



IN SAMPLE:	**3 (3)**
Category 1:	1 (1)
Category 2:	0 (0)
Category 3:	2 (2)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	8
Other wildlife count:	190
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.16, N = 167, w = 313

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	2613	2551	37	37
Variance of estimate	$Var\hat{Y}$	792617	756153	336	336
Standard error	$SE\hat{Y}$	890	870	18	18
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 1923	± 1879	± 40	± 40
Percentage of relative precision	$PRP\hat{Y}$	74 %	74 %	107 %	107 %
Density per sqkm	$R\hat{Y}$	1.524	1.488	0.022	0.022
Variance between transect counts	s_y^2	472.44	450.489	0.181	0.181
Variance between transect areas	s_a^2	12.455	12.455	12.455	12.455
Covariance between counts & areas	s_{ay}	23.703	23.08	0.117	0.117

CARCASS RATIOS

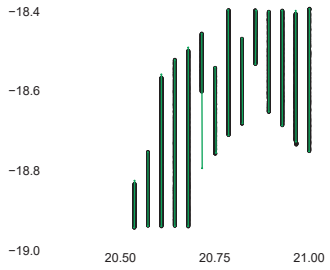
$CR_{1:4}$ = 1.4 %
$CR_{1:2}$ = 0.5 %

KN – KN NAMIBIA – KHAUDUM NYAE–NYAE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221013A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



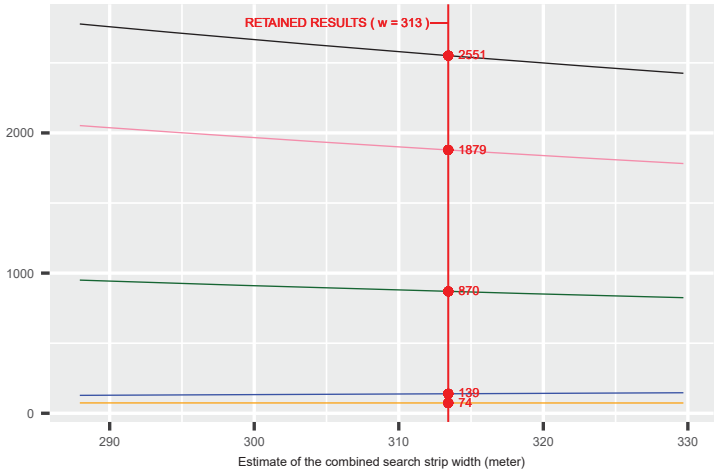
SPEED
Average: 171.6 km/h
Standard dev.: 6.7 km/h

HEIGHT AGL
Average: 91 m (298.7 ft)
Standard dev.: 5 m (16.5 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [157 – 189]
C01 – Right: [119 – 159]



LIVE ELEPHANT ESTIMATE: [2777 – 2426]
CONFIDENCE INTERVAL: ± [2052 – 1782]
SAMPLE AREA: [128 – 146] sqkm
SE: [950 – 825]
PRP: [74 – 73] %

KN – KN NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: KN **N:** 168 S_a^2: 12,455
STRATUM NAME: KN **w:** 313 **df:** 13

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	11	2	136	177	0,079	6698	81,84	0	312	130	3,874	2,058
elephant bulls	Loxodonta africana males	41	43	505	294	0,295	18470	135,90	212	799	58	12,841	6,656
elephant family	Loxodonta africana family	166	199	2046	1820	1,193	709939	842,58	226	3866	89	405,824	16,424
elephant carcass one	Loxodonta africana carcass one	1	0	12	25	0,007	138	11,75	0	38	206	0,071	-0,184
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	2	0	25	33	0,014	232	15,24	0	58	134	0,132	0,301
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	13	9	160	298	0,093	19090	138,17	0	459	186	10,225	-0,006
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	42	17	518	296	0,302	18831	137,23	221	814	57	13,538	7,418
ostrich	Struthio camelus	2	1	25	33	0,014	237	15,40	0	58	135	0,132	0,212
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	20	0	247	293	0,144	18363	135,51	0	539	119	9,341	-1,196
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	15	0	185	185	0,108	7363	85,81	0	370	100	3,764	-0,362
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	81	6	998	1255	0,582	337254	580,74	0	2253	126	176,335	-1,748
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	207	242	2551	1879	1,488	756153	869,57	673	4430	74	450,489	23,080
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	12	25	0,007	138	11,75	0	38	206	0,071	-0,184
all elephant carcasses	Loxodonta africana carcass all	3	0	37	40	0,022	336	18,34	0	77	107	0,181	0,117
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	2	0	25	33	0,014	232	15,24	0	58	134	0,132	0,301

KS – KS

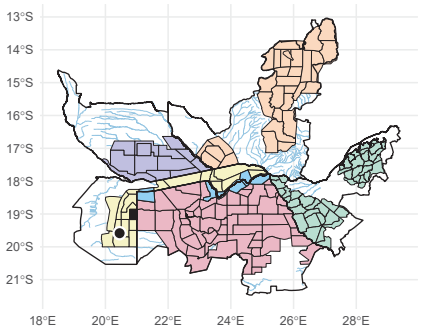
NAMIBIA – KHAUDUM NYAE–NYAE

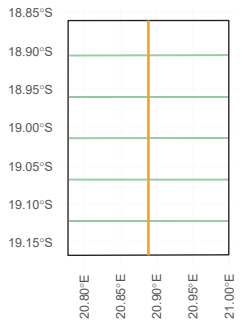
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: KS
STRATUM NAME: KS
■ STRATUM AREA: 790.64 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 78 km

– TRANSECTS: 5 (117 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 4.4 %

– BASELINE DISTANCE: 33.91 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 1.7 h
Crew(s): C04
KES2022_V5WOT20221013B 15:35–17:18

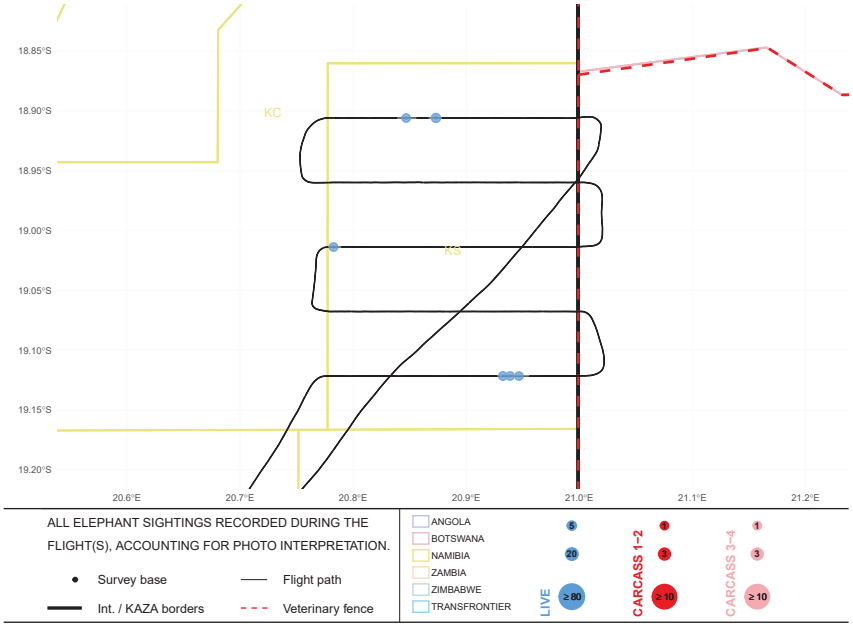
Actual sampling intensity: 4.6 %
Transect flying time: 0.7 h
Transects: 5 – 117 km – 90°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C04	
Side:	L	R
% sightings:	33	67
% individuals:	18	82

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	6	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	1	0	





LIVE ELEPHANTS

IN SAMPLE:	**1 (1)**
Bulls:	1 (1)
Family:	0 (0)
NOT IN SAMPLE:	**9 (5)**
Outside search strip:	9
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	3
Other wildlife count:	10
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.776, N = 109, w = 311

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	22	22	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	458	458	–	–
Standard error	$\mathrm{SE}\hat{Y}$	21	21	–	–
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 59	± 59	–	–
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	272 %	272 %	–	–
Density per sqkm	$R\hat{Y}$	0.028	0.028	–	–
Variance between transect counts	s_y^2	0.2	0.2	–	–
Variance between transect areas	s_a^2	0.01	0.01	–	–
Covariance between counts & areas	s_{ay}	−0.027	−0.027	–	–

CARCASS RATIOS

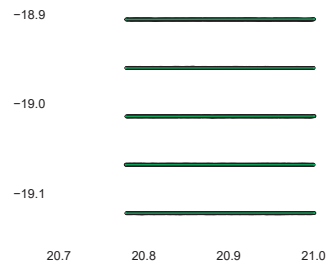
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

KS – KS NAMIBIA – KHAUDUM NYAE-NYAE

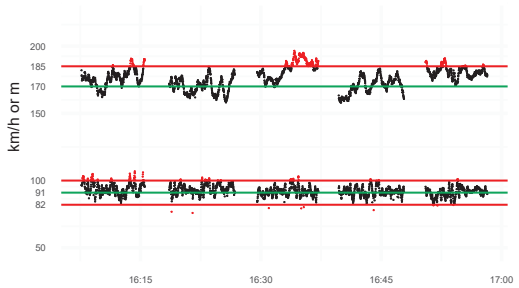
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221013B

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 175.9 km/h
Standard dev.: 7.8 km/h

HEIGHT AGL
Average: 92.6 m (303.7 ft)
Standard dev.: 4 m (13.1 ft)

KS – KS NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: KS **N:** 109 S_a^2: 0,010
STRATUM NAME: KS **w:** 311 **df:** 4

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	1	9	22	59	0,028	458	21,41	0	81	272	0,200	-0,027
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	7	0	153	273	0,193	9656	98,26	0	426	178	4,300	0,146
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	3	0	66	118	0,083	1803	42,46	0	183	180	0,800	0,046
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	1	9	22	59	0,028	458	21,41	0	81	272	0,200	-0,027
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

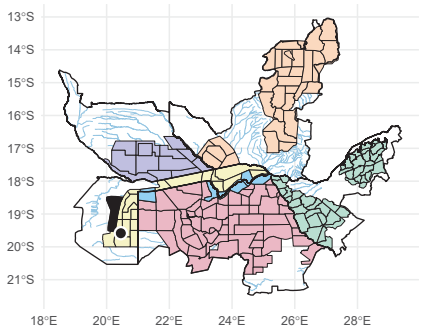
L1 – L1 NAMIBIA – KHAUDUM NYAE–NYAE

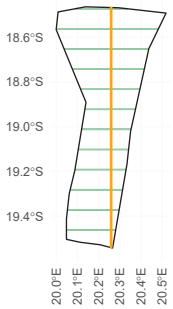
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: L1
STRATUM NAME: L1
■ STRATUM AREA: 3630.54 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 73 km

– TRANSECTS: 12 (364 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 3 %

– BASELINE DISTANCE: 119.36 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.1 h
Crew(s): C02
KES2022_V5LJB20221013A 06:31–10:36

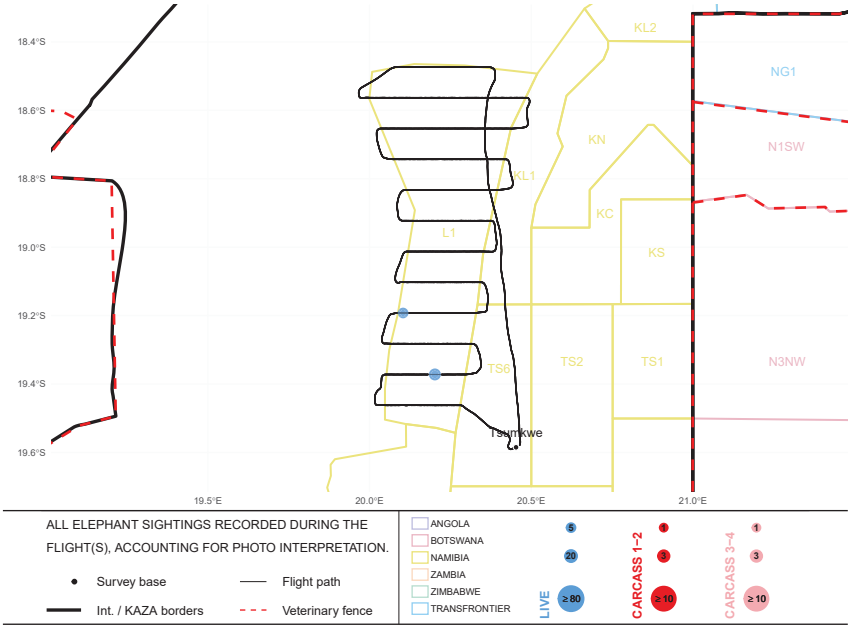
Actual sampling intensity: 3.2 %
Transect flying time: 2.1 h
Transects: 12 – 364 km – 90°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	51	49
% individuals:	67	33

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	10	70	57.14
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	1	100	0





LIVE ELEPHANTS

IN SAMPLE:	**5 (1)**
Bulls:	5 (1)
Family:	0 (0)
NOT IN SAMPLE:	**11 (1)**
Outside search strip:	11
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	7
Other wildlife count:	48
Domestic count:	242

ELEPHANT DATA ANALYSIS

t = 2.201, N = 375, w = 318

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	157	157	–	–
Variance of estimate	$\widehat{Var}$	24560	24560	–	–
Standard error	$\widehat{SE}$	157	157	–	–
95% confidence interval	$\widehat{CI}^{95\%}$	± 345	± 345	–	–
Percentage of relative precision	$\widehat{PRP}$	220 %	220 %	–	–
Density per sqkm	$\hat{R}$	0.043	0.043	–	–
Variance between transect counts	s_y^2	2.083	2.083	–	–
Variance between transect areas	s_a^2	7.447	7.447	–	–
Covariance between counts & areas	s_{ay}	−0.718	−0.718	–	–

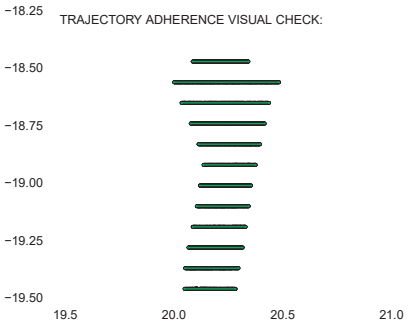
CARCASS RATIOS

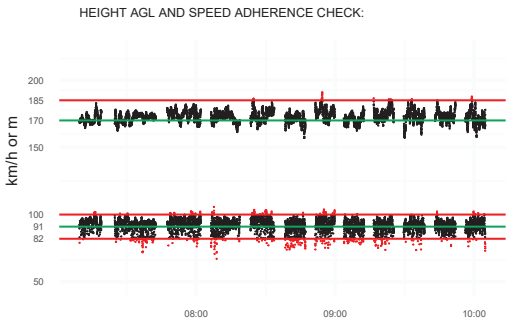
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

L1 – L1 NAMIBIA – KHAUDUM NYAE–NYAE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221013A





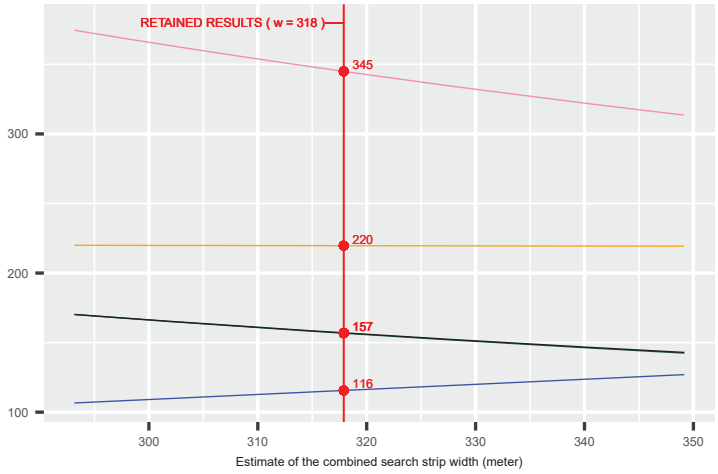
SPEED
Average: 172.8 km/h
Standard dev.: 4.3 km/h

HEIGHT AGL
Average: 92 m (301.8 ft)
Standard dev.: 4.6 m (15 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [155 – 177]
C02 – Right: [134 – 185]



LIVE ELEPHANT ESTIMATE: [170 – 143]
CONFIDENCE INTERVAL: ± [375 – 314]
SAMPLE AREA: [107 – 127] sqkm
SE: [170 – 142]
PRP: [220 – 219] %

L1 – L1 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: L1 **N:** 375 S_a^2: 7,447
STRATUM NAME: L1 **w:** 318 **df:** 11

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	3	0	94	191	0,026	7537	86,82	0	285	203	0,750	1,779
cattle	Bos taurus	182	0	5716	5462	1,574	6158738	2481,68	253	11178	96	739,424	68,723
donkey	Equus asinus	6	0	188	289	0,052	17231	131,27	0	477	153	1,545	0,487
duiker	Sylvicapra grimmia	17	1	534	400	0,147	33109	181,96	133	934	75	2,447	-1,030
eland	Tragelaphus oryx	20	0	628	1382	0,173	394408	628,02	0	2010	220	33,333	-3,241
elephant bulls	Loxodonta africana males	5	0	157	345	0,043	24560	156,72	0	502	220	2,083	-0,718
elephant family	Loxodonta africana family	0	11	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	2	0	63	134	0,017	3690	60,74	0	197	213	0,333	0,322
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	2	0	63	138	0,017	3944	62,80	0	201	220	0,333	-0,324
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	2	0	63	138	0,017	3941	62,77	0	201	220	0,333	-0,315
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	52	0	1633	1755	0,450	635700	797,31	0	3388	107	63,697	10,350
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	5	11	157	345	0,043	24560	156,72	0	502	220	2,083	-0,718
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

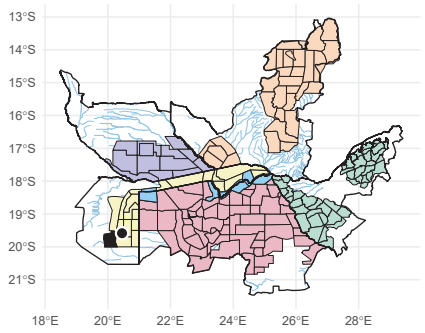
T1 – T1 NAMIBIA – KHAUDUM NYAE–NYAE

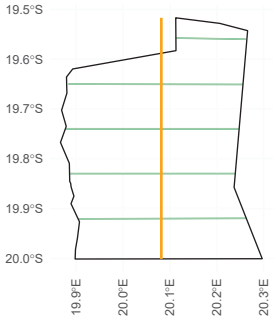
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: T1
STRATUM NAME: T1
■ STRATUM AREA: 1838.71 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 45 km

– TRANSECTS: 5 (168 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 2.7 %

– BASELINE DISTANCE: 53.6 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.1 h
Crew(s): C01
KES2022_V5IIM20221013B 15:31–17:37

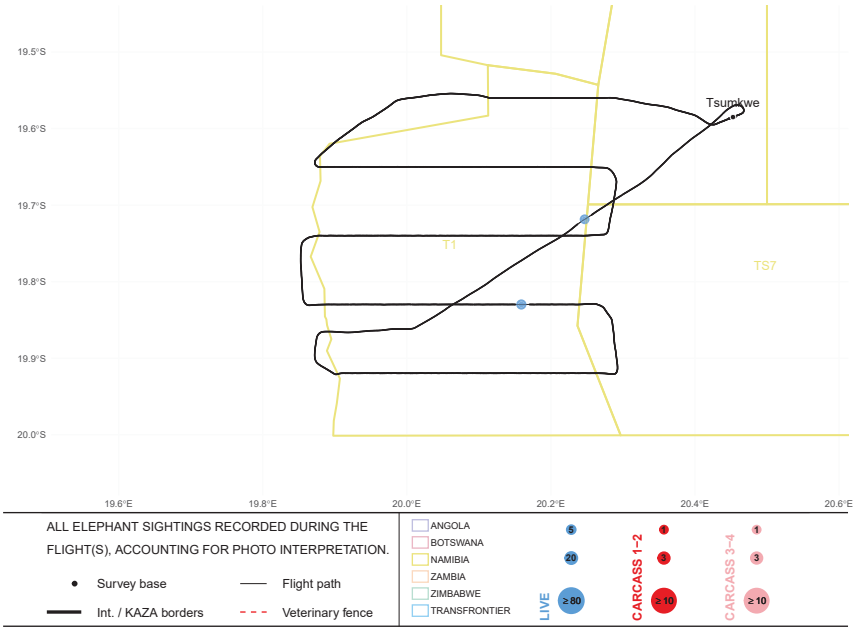
Actual sampling intensity: 2.9 %
Transect flying time: 1 h
Transects: 5 – 168 km – 90°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	50	50
% individuals:	50	50

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	1	100	0
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	1	100	0





LIVE ELEPHANTS

IN SAMPLE:	**2 (1)**
Bulls:	2 (1)
Family:	0 (0)
NOT IN SAMPLE:	**2 (2)**
Outside search strip:	1
Off transect:	1



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	1
Other wildlife count:	2
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.776, N = 168, w = 318

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	69	69	–	–
Variance of estimate	$Var\hat{Y}$	4297	4297	–	–
Standard error	$SE\hat{Y}$	66	66	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 182	± 182	–	–
Percentage of relative precision	$PRP\hat{Y}$	265 %	265 %	–	–
Density per sqkm	$R\hat{Y}$	0.037	0.037	–	–
Variance between transect counts	s^2_y	0.8	0.8	–	–
Variance between transect areas	s^2_a	10.402	10.402	–	–
Covariance between counts & areas	s_{ay}	0.448	0.448	–	–

CARCASS RATIOS

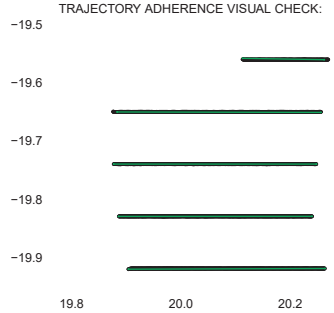
$CR_{1:4}$ = 0 %
$CR_{1:2}$ = 0 %

T1 – T1 NAMIBIA – KHAUDUM NYAE–NYAE

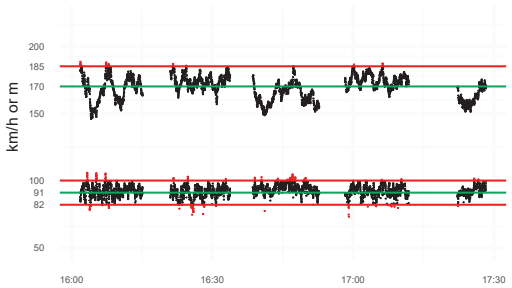
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221013B

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



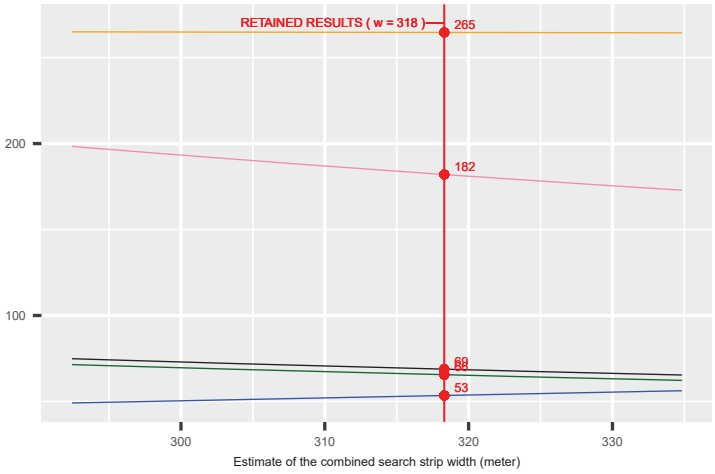
SPEED
Average: 169 km/h
Standard dev.: 8.5 km/h

HEIGHT AGL
Average: 92.4 m (303.1 ft)
Standard dev.: 4.4 m (14.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 192]
C01 – Right: [121 – 161]



LIVE ELEPHANT ESTIMATE: [75 – 65]
CONFIDENCE INTERVAL: ± [198 – 173]
SAMPLE AREA: [49 – 56] sqkm
SE: [71 – 62]
PRP: [265 – 264] %

T1 – T1 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: T1 **N:** 168 S_a^2: 10,402
STRATUM NAME: T1 **w:** 318 **df:** 4

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	2	2	69	182	0,037	4297	65,55	0	251	265	0,800	0,448
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	2	1	69	178	0,037	4132	64,28	0	247	260	0,800	0,849
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	2	2	69	182	0,037	4297	65,55	0	251	265	0,800	0,448
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

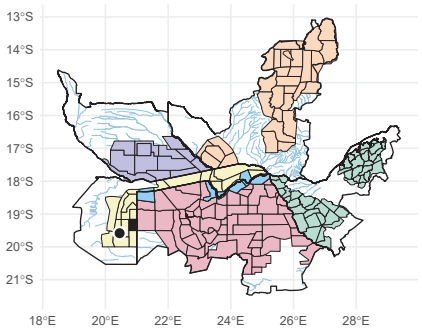
TS1 – TS1 NAMIBIA – KHAUDUM NYAE–NYAE

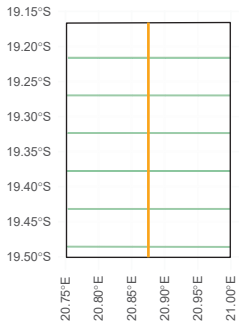
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: TS1
STRATUM NAME: TS1
■ STRATUM AREA: 963.6 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 52 km

– TRANSECTS: 6 (156 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 4.8 %

– BASELINE DISTANCE: 37.08 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 1.6 h
Crew(s): C02
KES2022_V5LJB20221013B 15:29–17:06

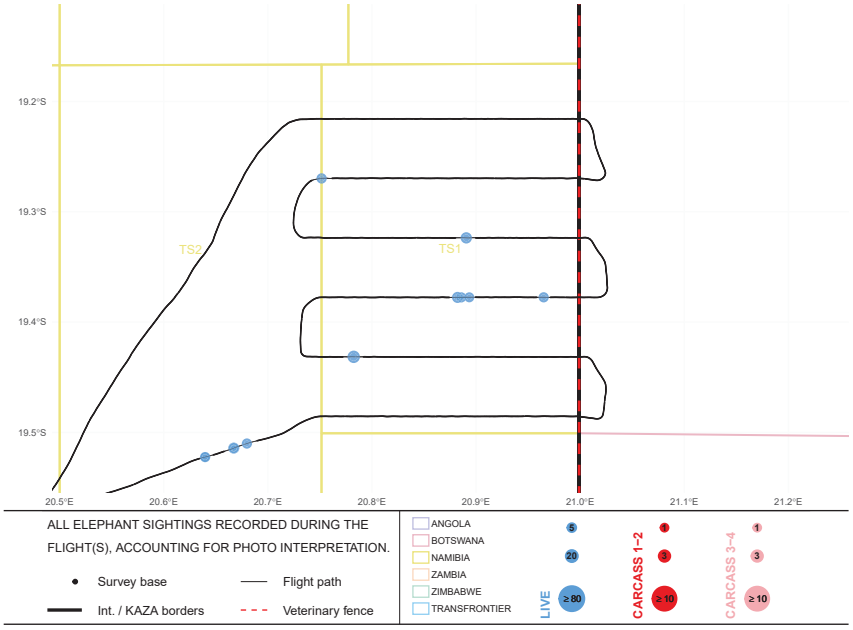
Actual sampling intensity: 5.2 %
Transect flying time: 0.9 h
Transects: 6 – 156 km – 90°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	53	47
% individuals:	53	47

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	7	14.29	0
Live elephant (>9):	1	100	0
Elephant carcass:	0		
Live elephant (<10):	1	0	





LIVE ELEPHANTS

IN SAMPLE:	**13 (2)**
Bulls:	3 (1)
Family:	10 (1)
NOT IN SAMPLE:	**44 (11)**
Outside search strip:	26
Off transect:	18



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	4
Other wildlife count:	23
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.571, N = 115, w = 320

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	251	251	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	34488	34488	–	–
Standard error	$\mathrm{SE}\hat{Y}$	186	186	–	–
95% confidence interval	$\mathrm{CI}^{95\%}_{\hat{Y}}$	± 477	± 477	–	–
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	190 %	190 %	–	–
Density per sqkm	$R\hat{Y}$	0.261	0.261	–	–
Variance between transect counts	s^2_y	16.167	16.167	–	–
Variance between transect areas	s^2_a	0.005	0.005	–	–
Covariance between counts & areas	s_{ay}	−0.155	−0.155	–	–

CARCASS RATIOS

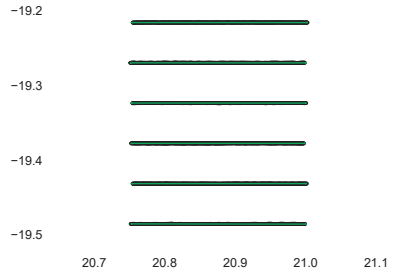
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

TS1 – TS1 NAMIBIA – KHAUDUM NYAE–NYAE

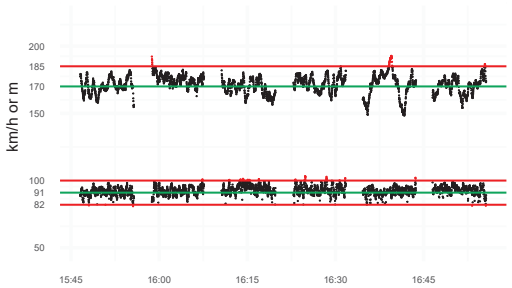
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221013B

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



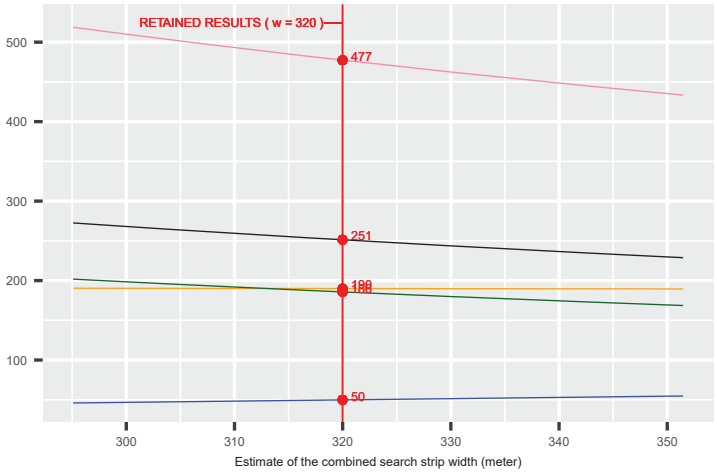
SPEED
Average: 171.3 km/h
Standard dev.: 6.9 km/h

HEIGHT AGL
Average: 92.6 m (303.8 ft)
Standard dev.: 3.2 m (10.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [156 – 178]
C02 – Right: [135 – 187]



LIVE ELEPHANT ESTIMATE: [273 – 229]
CONFIDENCE INTERVAL: ± [519 – 433]
SAMPLE AREA: [46 – 55] sqkm
SE: [202 – 169]
PRP: [190 – 189] %

TS1 – TS1 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: TS1 **N:** 116 S_a^2: 0,005
STRATUM NAME: TS1 **w:** 320 **df:** 5

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	8	0	155	143	0,160	3111	55,77	11	298	93	1,467	0,004
eland	Tragelaphus oryx	5	0	97	241	0,100	8821	93,92	0	338	250	4,167	0,054
elephant bulls	Loxodonta africana males	3	26	58	145	0,060	3181	56,40	0	203	250	1,500	0,013
elephant family	Loxodonta africana family	10	18	193	484	0,201	35520	188,47	0	678	251	16,667	-0,168
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	7	1	135	191	0,140	5494	74,12	0	326	141	2,567	-0,077
ostrich	Struthio camelus	3	0	58	145	0,060	3176	56,35	0	203	250	1,500	0,032
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	10	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	13	44	251	477	0,261	34488	185,71	0	729	190	16,167	-0,155
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

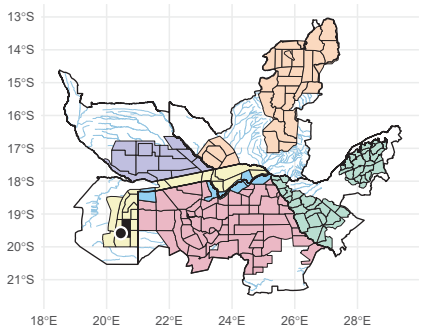
TS2 – TS2 NAMIBIA – KHAUDUM NYAE–NYAE

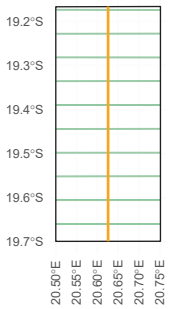
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: TS2
STRATUM NAME: TS2
■ STRATUM AREA: 1554.95 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 33 km

– TRANSECTS: 10 (264 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5.1 %

– BASELINE DISTANCE: 58.92 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.3 h
Crew(s): C04
KES2022_V5WOT20221015A 06:39–08:59

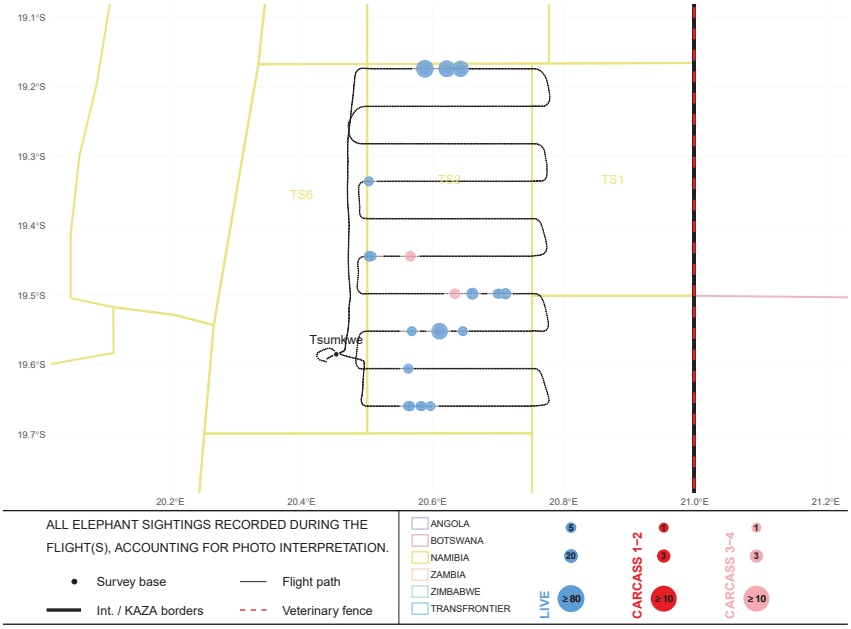
Actual sampling intensity: 5.2 %
Transect flying time: 1.5 h
Transects: 10 – 264 km – 90°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C04	
Side:	L	R
% sightings:	41	59
% individuals:	26	74

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	24	16.67	25
Live elephant (>9):	2	50	100
Elephant carcass:	2	0	
Live elephant (<10):	7	42.86	0





LIVE ELEPHANTS

IN SAMPLE:	**46 (9)**
Bulls:	7 (5)
Family:	39 (4)
NOT IN SAMPLE:	**134 (13)**
Outside search strip:	134
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**2 (2)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	1 (1)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	8
Other wildlife count:	35
Domestic count:	82

ELEPHANT DATA ANALYSIS

t = 2.262, N = 190, w = 309

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	859	878	38	38
Variance of estimate	$Var\hat{Y}$	188240	201292	614	614
Standard error	$SE\hat{Y}$	434	449	25	25
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 981	± 1015	± 56	± 56
Percentage of relative precision	$PRP\hat{Y}$	114 %	116 %	147 %	147 %
Density per sqkm	$R\hat{Y}$	0.552	0.565	0.025	0.025
Variance between transect counts	s^2_y	54.278	58.044	0.178	0.178
Variance between transect areas	s^2_a	0.006	0.006	0.006	0.006
Covariance between counts & areas	s_{ay}	−0.214	−0.221	−0.003	−0.003

CARCASS RATIOS

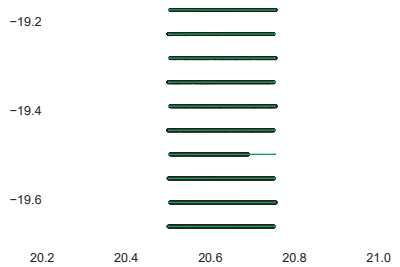
$CR_{1:4}$ = 4.2 %
$CR_{1:2}$ = 0 %

TS2 – TS2 NAMIBIA – KHAUDUM NYAE-NYAE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221015A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED

Average:	172.3 km/h
Standard dev.:	4.5 km/h

HEIGHT AGL

Average:	92 m	(301.8 ft)
Standard dev.:	2.6 m	(8.5 ft)

TS2 – TS2 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: TS2 **N:** 191 S_a^2: 0,006
STRATUM NAME: TS2 **w:** 309 **df:** 9

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	69	0	1317	2022	0,847	799097	893,92	0	3339	154	231,656	0,139
donkey	Equus asinus	2	4	38	84	0,025	1378	37,12	0	122	220	0,400	0,021
duiker	Sylvicapra grimmia	3	0	57	64	0,037	808	28,43	0	122	112	0,233	-0,010
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	7	15	134	141	0,086	3873	62,23	0	274	105	1,122	0,004
elephant family	Loxodonta africana family	39	119	744	982	0,479	188320	433,96	0	1726	132	54,322	-0,225
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	19	42	0,012	346	18,61	0	61	221	0,100	-0,011
elephant carcass four	Loxodonta africana carcass four	1	0	19	42	0,012	345	18,56	0	61	220	0,100	0,008
giraffe	Giraffa giraffa	11	0	210	462	0,135	41745	204,32	0	672	220	12,100	0,039
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	2	5	38	84	0,025	1385	37,21	0	122	221	0,400	-0,022
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	2	10	38	84	0,025	1380	37,15	0	122	220	0,400	0,007
ostrich	Struthio camelus	4	12	76	93	0,049	1691	41,12	0	169	122	0,489	-0,007
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	11	0	210	462	0,135	41672	204,14	0	672	220	12,100	0,117
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	4	0	76	112	0,049	2459	49,59	0	189	147	0,711	-0,010
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	9	25	172	378	0,110	27917	167,08	0	550	220	8,100	0,069
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	46	134	878	1015	0,565	201292	448,66	0	1893	116	58,044	-0,221
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	2	0	38	56	0,025	614	24,79	0	94	147	0,178	-0,003
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	2	0	38	56	0,025	614	24,79	0	94	147	0,178	-0,003

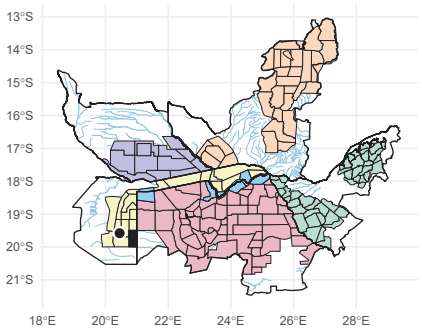
TS3 – TS3 NAMIBIA – KHAUDUM NYAE–NYAE

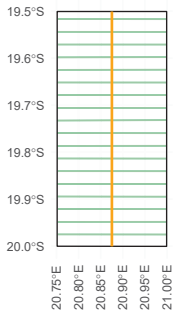
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: TS3
STRATUM NAME: TS3
■ STRATUM AREA: 1435.52 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 50 km

– TRANSECTS: 18 (465 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 9.7 %

– BASELINE DISTANCE: 55.34 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.9 h
Crew(s): C01
KES2022_V5IIM20221014A 06:32–10:27

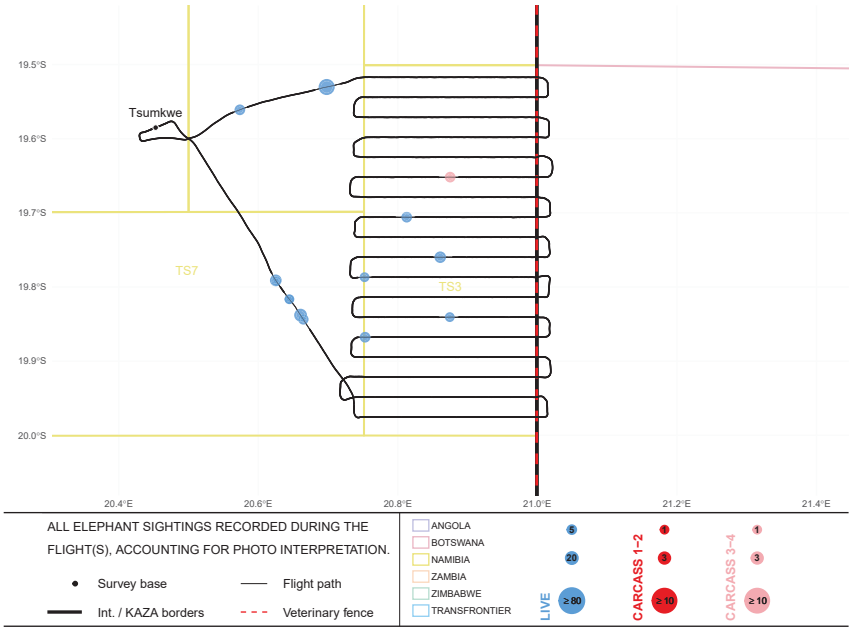
Actual sampling intensity: 10.3 %
Transect flying time: 2.7 h
Transects: 18 – 465 km – 90°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	35	65
% individuals:	22	78

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	10	40	25
Live elephant (>9):	0		
Elephant carcass:	1	0	
Live elephant (<10):	4	25	0



LIVE ELEPHANTS



IN SAMPLE:	**20 (4)**
Bulls:	6 (2)
Family:	14 (2)
NOT IN SAMPLE:	**68 (9)**
Outside search strip:	1
Off transect:	67

ELEPHANT CARCASSES



IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	1 (1)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	11
Other wildlife count:	134
Domestic count:	11

ELEPHANT DATA ANALYSIS

t = 2.11, N = 173, w = 319

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	194	194	10	10
Variance of estimate	$\mathrm{Var}\hat{Y}$	9646	9646	83	83
Standard error	$\mathrm{SE}\hat{Y}$	98	98	9	9
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 207	± 207	± 19	± 19
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	107 %	107 %	199 %	199 %
Density per sqkm	$R\hat{Y}$	0.135	0.135	0.007	0.007
Variance between transect counts	s_y^2	6.458	6.458	0.056	0.056
Variance between transect areas	s_a^2	0.019	0.019	0.019	0.019
Covariance between counts & areas	s_{ay}	0.115	0.115	−0.003	−0.003

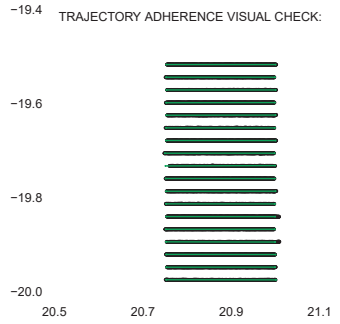
CARCASS RATIOS

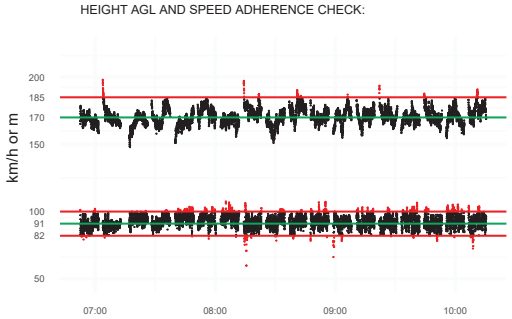
$CR_{1:4} = 4.8$ %
$CR_{1:2} = 0$ %

TS3 – TS3 NAMIBIA – KHAUDUM NYAE–NYAE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221014A





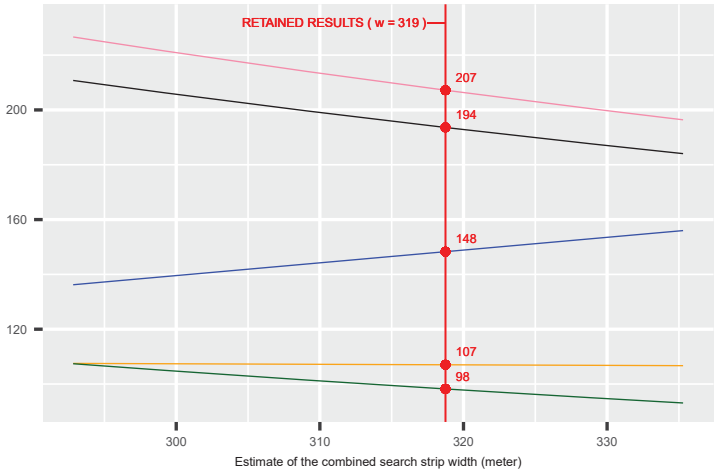
SPEED
Average: 170.6 km/h
Standard dev.: 6.1 km/h

HEIGHT AGL
Average: 92.5 m (303.5 ft)
Standard dev.: 4.5 m (14.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 192]
C01 – Right: [121 – 162]



LIVE ELEPHANT ESTIMATE: [211 – 184]
CONFIDENCE INTERVAL: ± [227 – 196]
SAMPLE AREA: [136 – 156] sqkm
SE: [107 – 93]
PRP: [108 – 107] %

TS3 – TS3 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: TS3 **N:** 174 S_a^2: 0,019
STRATUM NAME: TS3 **w:** 319 **df:** 17

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	11	27	106	212	0,074	10102	100,51	0	319	199	6,722	-0,054
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	10	19	0,007	83	9,13	0	29	199	0,056	-0,001
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	6	13	58	97	0,040	2109	45,92	0	155	167	1,412	0,083
elephant family	Loxodonta africana family	14	55	136	193	0,094	8388	91,59	0	329	143	5,595	0,033
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	1	0	10	19	0,007	83	9,13	0	29	199	0,056	-0,003
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	1	0	10	19	0,007	84	9,14	0	29	199	0,056	-0,007
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	8	0	77	85	0,054	1619	40,23	0	162	110	1,085	0,060
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	15	1	145	164	0,101	6030	77,66	0	309	113	4,029	0,058
ostrich	Struthio camelus	11	15	106	109	0,074	2688	51,84	0	216	103	1,781	-0,065
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	28	0	271	382	0,189	32770	181,03	0	653	141	21,791	-0,112
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	3	0	29	42	0,020	397	19,91	0	71	145	0,265	0,013
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	55	31	532	743	0,371	123866	351,95	0	1275	139	82,644	0,160
zebra	Equus spp,	7	0	68	135	0,047	4078	63,86	0	202	199	2,722	0,054
all elephants	Loxodonta africana all	20	68	194	207	0,135	9646	98,21	0	401	107	6,458	0,115
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	0	10	19	0,007	83	9,13	0	29	199	0,056	-0,003
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	10	19	0,007	83	9,13	0	29	199	0,056	-0,003

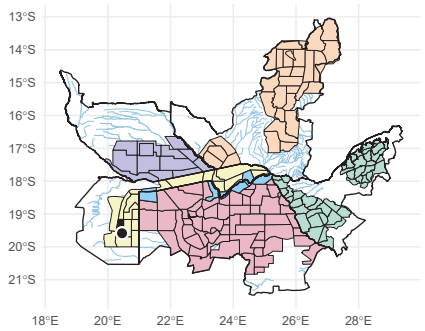
TS6 – TS6 NAMIBIA – KHAUDUM NYAE–NYAE

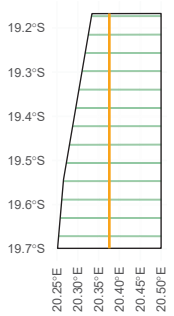
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: TS6
STRATUM NAME: TS6
■ STRATUM AREA: 1311.33 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 26 km

– TRANSECTS: 13 (289 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 6.6 %

– BASELINE DISTANCE: 58.87 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.7 h
Crew(s): C02
KES2022_V5LJB20221014A 06:47–09:30

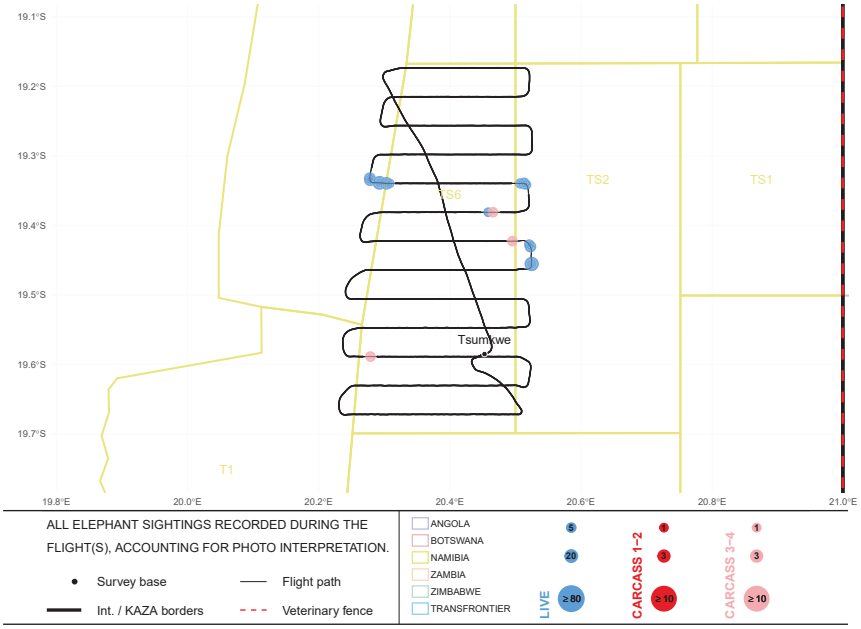
Actual sampling intensity: 7 %
Transect flying time: 1.7 h
Transects: 13 – 289 km – 90°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	62	38
% individuals:	53	47

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	12	58.33	28.57
Live elephant (>9):	0		
Elephant carcass:	3	100	0
Live elephant (<10):	1	100	0





LIVE ELEPHANTS

IN SAMPLE:	**2 (1)**
Bulls:	2 (1)
Family:	0 (0)
NOT IN SAMPLE:	**111 (11)**
Outside search strip:	1
Off transect:	110



ELEPHANT CARCASSES

IN SAMPLE:	**3 (3)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	2 (2)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	12
Other wildlife count:	77
Domestic count:	159

ELEPHANT DATA ANALYSIS

t = 2.179, N = 185, w = 317

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	29	29	43	43
Variance of estimate	$Var\hat{Y}$	769	769	469	469
Standard error	$SE\hat{Y}$	28	28	22	22
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 60	± 60	± 47	± 47
Percentage of relative precision	$PRP\hat{Y}$	211 %	211 %	110 %	110 %
Density per sqkm	$R\hat{Y}$	0.022	0.022	0.033	0.033
Variance between transect counts	s^2_y	0.308	0.308	0.192	0.192
Variance between transect areas	s^2_a	0.764	0.764	0.764	0.764
Covariance between counts & areas	s_{ay}	−0.075	−0.075	0.053	0.053

CARCASS RATIOS

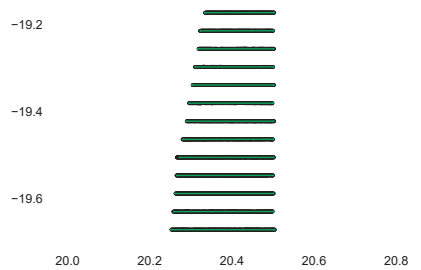
$CR_{1:4}$ = 60 %
$CR_{1:2}$ = 0 %

TS6 – TS6 NAMIBIA – KHAUDUM NYAE–NYAE

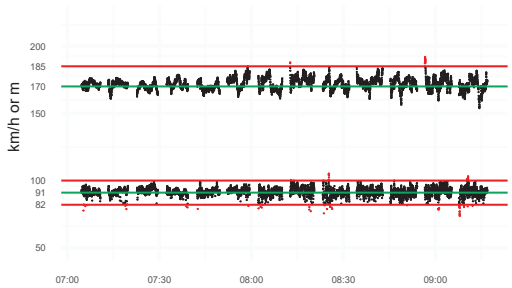
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221014A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



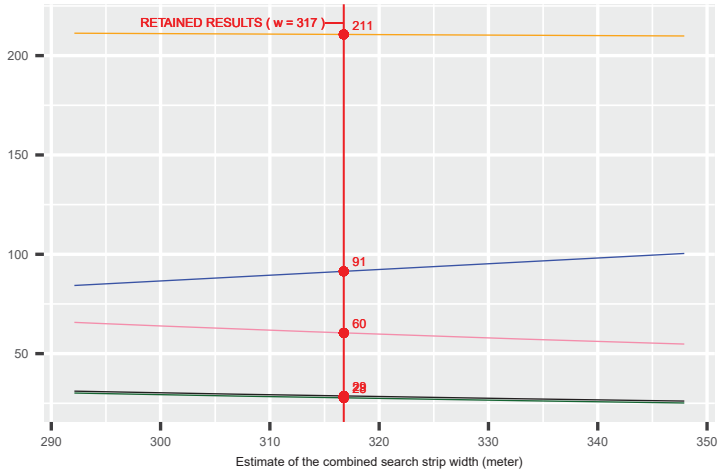
SPEED
Average: 171.8 km/h
Standard dev.: 4.7 km/h

HEIGHT AGL
Average: 91.7 m (300.7 ft)
Standard dev.: 3 m (9.9 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [154 – 176]
C02 – Right: [134 – 185]



LIVE ELEPHANT ESTIMATE: [31 – 26]
CONFIDENCE INTERVAL: ± [66 – 55]
SAMPLE AREA: [84 – 100] sqkm
SE: [30 – 25]
PRP: [211 – 210] %

TS6 – TS6 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: TS6 **N:** 186 S_a^2: 0,764
STRATUM NAME: TS6 **w:** 317 **df:** 12

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	5	42	72	149	0,055	4703	68,58	0	221	208	1,923	0,201
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	155	28	2223	4579	1,695	4415796	2101,38	0	6802	206	1822,410	11,091
donkey	Equus asinus	4	0	57	119	0,044	2983	54,62	0	176	207	1,231	0,285
duiker	Sylvicapra grimmia	7	0	100	106	0,077	2378	48,76	0	207	106	0,936	-0,142
eland	Tragelaphus oryx	25	1	359	715	0,273	107669	328,13	0	1074	199	44,077	1,028
elephant bulls	Loxodonta africana males	2	21	29	60	0,022	769	27,74	0	89	211	0,308	-0,075
elephant family	Loxodonta africana family	0	90	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	14	30	0,011	186	13,65	0	44	207	0,077	0,071
elephant carcass four	Loxodonta africana carcass four	2	0	29	41	0,022	351	18,74	0	70	142	0,141	-0,018
giraffe	Giraffa giraffa	7	0	100	212	0,077	9501	97,48	0	313	212	3,769	-0,466
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	4	0	57	94	0,044	1872	43,27	0	152	164	0,731	-0,292
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	11	9	158	186	0,120	7324	85,58	0	344	118	2,974	0,090
ostrich	Struthio camelus	13	2	186	274	0,142	15791	125,66	0	460	147	6,333	-0,147
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	4	0	57	121	0,044	3099	55,67	0	179	211	1,231	-0,249
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	2	111	29	60	0,022	769	27,74	0	89	211	0,308	-0,075
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	3	0	43	47	0,033	469	21,65	0	90	110	0,192	0,053
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	3	0	43	47	0,033	469	21,65	0	90	110	0,192	0,053

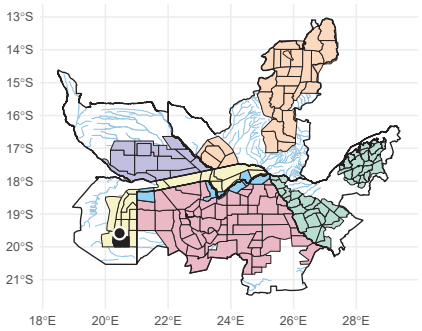
TS7 – TS7 NAMIBIA – KHAUDUM NYAE–NYAE

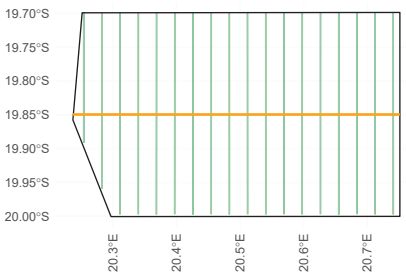
SURVEY DESIGN

COUNTRY: Namibia
SUPERSTRATUM: Khaudum Nyae–Nyae
STRATUM CODE: TS7
STRATUM NAME: TS7
■ STRATUM AREA: 1737.77 sqkm
• SURVEY BASE: Tsumkwe
DISTANCE TO SURVEY BASE: 22 km

– TRANSECTS: 18 (588 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 10.1 %

– BASELINE DISTANCE: 53.9 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.2 h
Crew(s): C04
KES2022_V5WOT20221013A 06:47–11:02

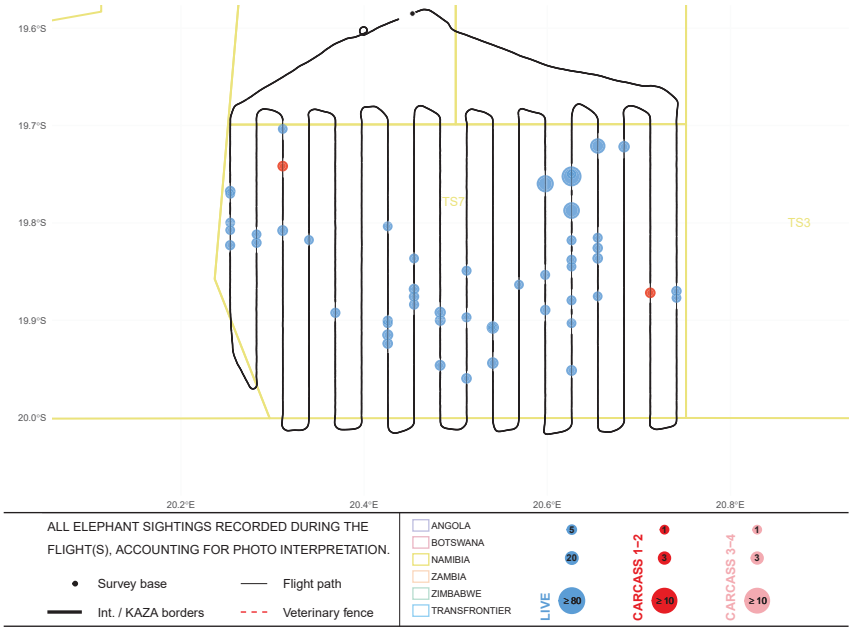
Actual sampling intensity: 10.4 %
Transect flying time: 3.4 h
Transects: 18 – 588 km – 0°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C04	
Side:	L	R
% sightings:	45	55
% individuals:	34	66

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	60	15	11.11
Live elephant (>9):	3	33.33	0
Elephant carcass:	2	0	
Live elephant (<10):	22	31.82	0



LIVE ELEPHANTS



IN SAMPLE:	**129 (25)**
Bulls:	53 (20)
Family:	76 (5)
NOT IN SAMPLE:	**173 (30)**
Outside search strip:	173
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**2 (2)**
Category 1:	0 (0)
Category 2:	2 (2)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	12
Other wildlife count:	195
Domestic count:	2

ELEPHANT DATA ANALYSIS

t = 2.11, N = 175, w = 308

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	1238	1238	19	19
Variance of estimate	$Var\hat{Y}$	232128	232128	159	159
Standard error	$SE\hat{Y}$	482	482	13	13
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1017	± 1017	± 27	± 27
Percentage of relative precision	$PRP\hat{Y}$	82 %	82 %	139 %	139 %
Density per sqkm	$R\hat{Y}$	0.712	0.712	0.011	0.011
Variance between transect counts	s^2_y	153.088	153.088	0.105	0.105
Variance between transect areas	s^2_a	0.847	0.847	0.847	0.847
Covariance between counts & areas	s_{ay}	1.02	1.02	0.022	0.022

CARCASS RATIOS

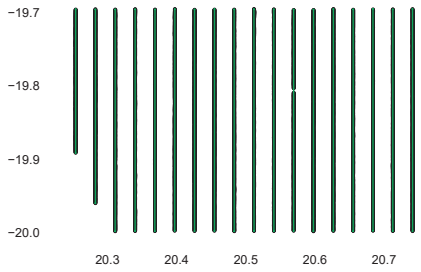
$CR_{1:4}$ = 1.5 %
$CR_{1:2}$ = 1.5 %

TS7 – TS7 NAMIBIA – KHAUDUM NYAE-NYAE

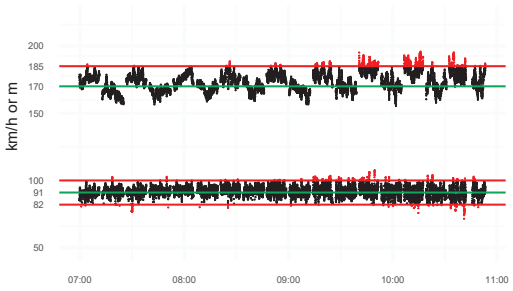
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221013A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 173.7 km/h
Standard dev.: 7 km/h

HEIGHT AGL
Average: 91.8 m (301.1 ft)
Standard dev.: 3.6 m (12 ft)

TS7 – TS7 NAMIBIA – KHAUDUM NYAE–NYAE

STRATUM CODE: TS7 **N:** 175 S_a^2: 0,847
STRATUM NAME: TS7 **w:** 308 **df:** 17

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	7	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	19	27	0,011	158	12,58	0	46	138	0,105	0,043
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	53	87	509	350	0,293	27575	166,06	158	859	69	18,291	0,511
elephant family	Loxodonta africana family	76	86	729	945	0,420	200456	447,72	0	1674	129	131,595	0,510
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	2	0	19	27	0,011	159	12,61	0	46	139	0,105	0,022
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	2	6	19	39	0,011	339	18,41	0	58	202	0,222	0,017
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	20	9	192	150	0,110	5075	71,24	42	342	78	3,399	0,383
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	15	1	144	233	0,083	12209	110,49	0	377	162	8,029	0,225
ostrich	Struthio camelus	13	21	125	143	0,072	4624	68,00	0	268	115	3,036	0,077
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	12	0	115	233	0,066	12171	110,32	0	348	202	8,000	0,233
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	2	0	19	39	0,011	338	18,40	0	58	202	0,222	0,030
tsessebe	Damaliscus lunatus	0	13	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	42	28	403	644	0,232	93165	305,23	0	1047	160	61,294	0,665
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	85	139	816	1008	0,469	228155	477,66	0	1824	124	150,918	1,750
zebra	Equus spp,	0	6	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	129	173	1238	1017	0,712	232128	481,80	222	2255	82	153,088	1,020
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	2	0	19	27	0,011	159	12,61	0	46	139	0,105	0,022
all elephant carcasses	Loxodonta africana carcass all	2	0	19	27	0,011	159	12,61	0	46	139	0,105	0,022
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

TRANSFRONTIER



14H – NG 14 high

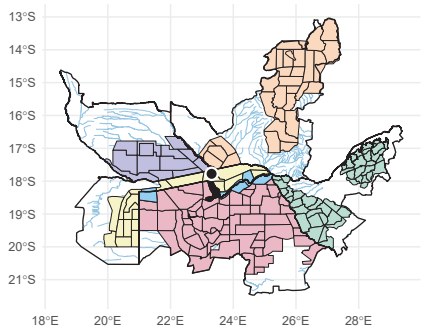
TRANSFRONTIER – NORTHERN BOTSWANA

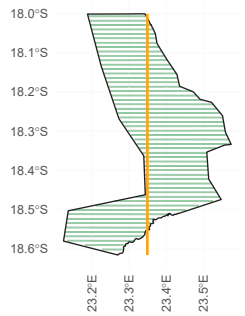
SURVEY DESIGN

COUNTRY: Transfrontier
SUPERSTRATUM: Northern Botswana
STRATUM CODE: 14H
STRATUM NAME: NG 14 high
■ STRATUM AREA: 1480.81 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 62 km

– TRANSECTS: 54 (1173 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 23.8 %

– BASELINE DISTANCE: 68.14 km





SURVEY IMPLEMENTATION

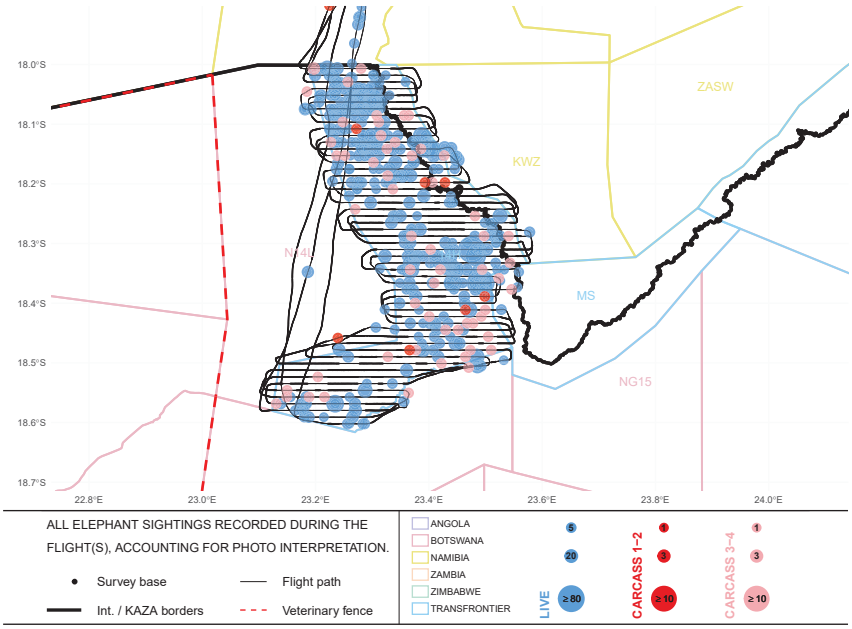
Number of flight(s): 3
Combined flying time: 11.4 h
Crew(s): C01, C02, C04
KES2022_V5IIM20221006A 06:45–10:46
KES2022_V5WOT20221007A 07:19–11:01
KES2022_V5LJB20221007A 06:50–10:30
Actual sampling intensity: 8.5, 8.2, 8.4 %
Transect flying time: 6.8 h
Transects: 54 – 1173 km – 90°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01		C04		C02	
Side:	L	R	L	R	L	R
% sightings:	38	62	46	54	53	47
% individuals:	42	58	45	55	55	45

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	493	19.07	41.49
Live elephant (>9):	59	79.66	40.43
Elephant carcass:	50	14	14.29
Live elephant (<10):	136	5.15	42.86



LIVE ELEPHANTS



IN SAMPLE:	**1543 (193)**
Bulls:	112 (62)
Family:	1431 (131)
NOT IN SAMPLE:	**2173 (222)**
Outside search strip:	1824
Off transect:	349

ELEPHANT CARCASSES



IN SAMPLE:	**51 (50)**
Category 1:	1 (1)
Category 2:	4 (4)
Category 3:	14 (13)
Category 4:	32 (32)
NOT IN SAMPLE:	**16 (16)**
Outside search strip:	9
Off transect:	7

OTHER SPECIES

Other wildlife species:	20
Other wildlife count:	3588
Domestic count:	210

ELEPHANT DATA ANALYSIS

t = 2.016, N = 204, 221, 194, w = 321

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	6005	6174	204	204
Variance of estimate	$Var\hat{Y}$	852842	906808	918	918
Standard error	$SE\hat{Y}$	923	952	30	30
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1861	± 1919	± 61	± 61
Percentage of relative precision	$PRP\hat{Y}$	31 %	31 %	30 %	30 %
Density per sqkm	$R\hat{Y}$	4.056	4.169	0.138	0.138
Variance between transect counts	s^2_y	962.09	1020.249	1.072	1.072
Variance between transect areas	s^2_a	2.582	2.582	2.582	2.582
Covariance between counts & areas	s_{ay}	−4.862	−5.197	−0.039	−0.039

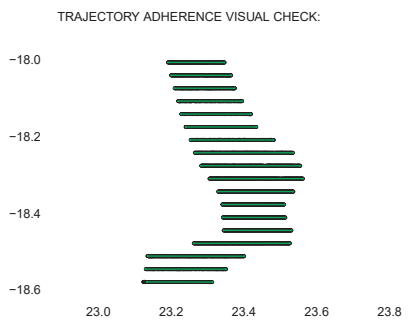
CARCASS RATIOS

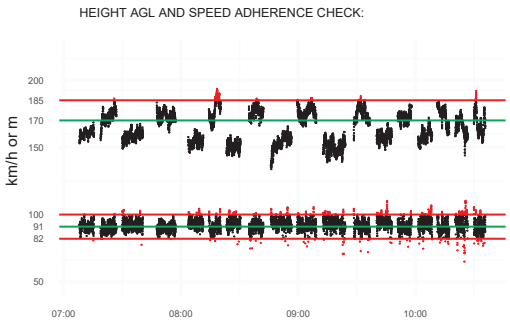
$CR_{1:4} = 3.2$ %
$CR_{1:2} = 0.3$ %

14H – NG 14 high — TRANSFRONTIER – NORTHERN BOTSWANA

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221006A

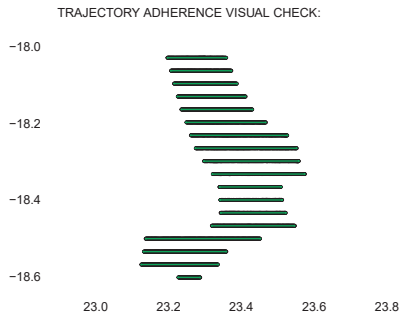


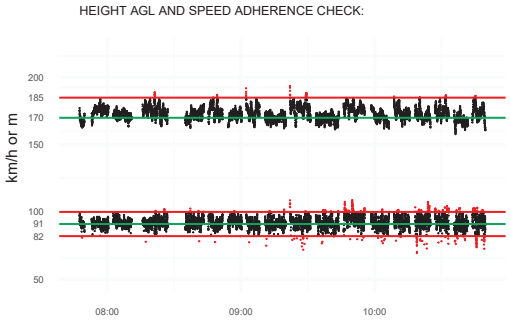


SPEED
Average: 164.5 km/h
Standard dev.: 10.8 km/h

HEIGHT AGL
Average: 92.1 m (302.1 ft)
Standard dev.: 4.2 m (13.9 ft)

KES2022_ V5WOT20221007A

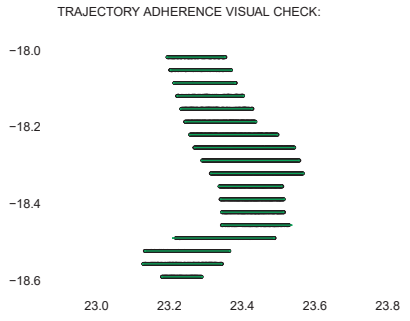


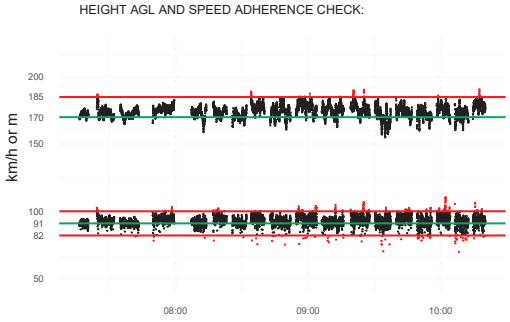


SPEED
Average: 173 km/h
Standard dev.: 4.8 km/h

HEIGHT AGL
Average: 92 m (302 ft)
Standard dev.: 4 m (13.1 ft)

KES2022_ V5LJB20221007A





SPEED
Average: 174.2 km/h
Standard dev.: 4.5 km/h

HEIGHT AGL
Average: 92.8 m (304.4 ft)
Standard dev.: 3.6 m (11.7 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

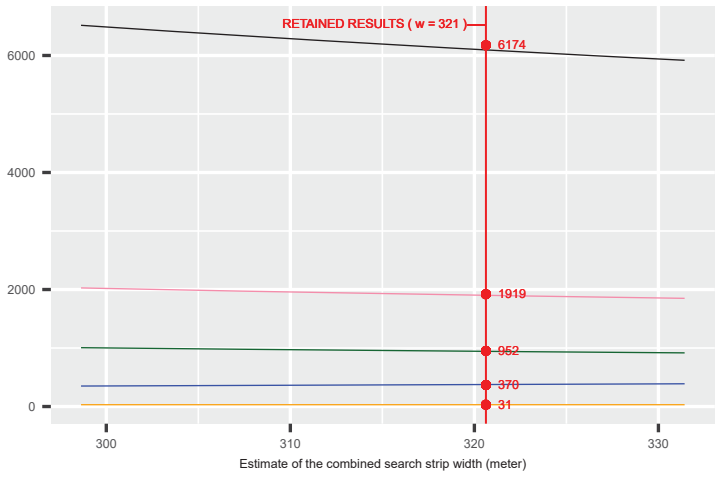
Range of search strip width estimates (m):

C01 – Left: [159 – 191]
C01 – Right: [120 – 161]

C02 – Left: [156 – 178]
C02 – Right: [135 – 187]

C04 – Left: [154 – 154]
C04 – Right: [155 – 155]

LIVE ELEPHANT ESTIMATE: [6516 – 5918]
CONFIDENCE INTERVAL: ± [2027 – 1849]
SAMPLE AREA: [350 – 389] sqkm
SE: [1006 – 917]
PRP: [31 – 31] %



14H – NG 14 high — TRANSFRONTIER – NORTHERN BOTSWANA

STRATUM CODE: 14H **N:** 204, 221, 194 S_a^2: 2,582
STRATUM NAME: NG 14 high **w:** 321 **df:** 53

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	1	0	4	8	0,003	15	3,94	0	12	204	0,019	-0,009
buffalo	Syncerus caffer	1254	420	5009	3425	3,383	2891873	1700,55	1584	8434	68	3478,931	-6,519
bushbuck	Tragelaphus scriptus	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
cattle	Bos taurus	191	31	768	644	0,519	101038	317,87	124	1412	84	123,536	-1,398
donkey	Equus asinus	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
eland	Tragelaphus oryx	6	1	24	33	0,016	252	15,88	0	57	139	0,327	0,172
elephant bulls	Loxodonta africana males	112	157	448	171	0,303	7233	85,04	277	619	38	8,372	-0,339
elephant family	Loxodonta africana family	1431	2016	5726	1880	3,867	870502	933,01	3846	7605	33	986,292	-4,858
elephant carcass one	Loxodonta africana carcass one	1	3	4	8	0,003	14	3,80	0	12	201	0,019	-0,019
elephant carcass two	Loxodonta africana carcass two	4	0	16	19	0,011	90	9,47	0	35	121	0,108	-0,029
elephant carcass three	Loxodonta africana carcass three	14	5	56	28	0,038	191	13,82	28	84	50	0,233	-0,143
elephant carcass four	Loxodonta africana carcass four	32	8	128	51	0,086	653	25,56	76	179	40	0,850	0,152
giraffe	Giraffa giraffa	66	15	264	142	0,178	4951	70,36	122	405	54	6,365	0,989
grysbok	Raphicerus sharpei	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	74	1	295	168	0,199	6939	83,30	127	463	57	8,955	0,903
horse	Equus caballus	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
impala	Aepyceros melampus	242	19	964	493	0,651	58784	242,45	471	1457	51	81,915	2,727
klipspringer	Oreotragus oreotragus	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	35	5	141	104	0,095	2667	51,64	36	245	74	3,289	0,289
oribi	Ourebia ourebi	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
ostrich	Struthio camelus	13	4	52	50	0,035	614	24,78	1	102	97	0,790	0,130
puku	Kobus vardonii	19	0	77	138	0,052	4301	65,58	0	216	179	5,402	0,523
red lechwe	Kobus leche	981	44	3948	2948	2,666	2001939	1414,90	1000	6897	75	2600,745	25,158
reedbuck	Redunca arundinum	14	0	55	84	0,037	1579	39,74	0	139	152	2,120	0,261
roan	Hippotragus equinus	25	8	100	67	0,067	1073	32,75	32	167	68	1,461	0,303
sable	Hippotragus niger	164	44	652	344	0,440	28724	169,48	307	996	53	37,961	0,348
shoat	Capra hircus - Ovis aries	19	0	76	152	0,051	5220	72,25	0	228	201	6,685	-0,348
sitatunga	Tragelaphus spekii	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	NA	0,000	0	0,00	NA	NA	NA	0,000	0,000
tsessebe	Damaliscus lunatus	59	1	236	192	0,160	9090	95,34	44	428	81	11,520	0,360
warthog	Phacochoerus africanus	31	10	123	83	0,083	1662	40,77	40	207	67	2,211	0,721
waterbuck	Kobus ellipsiprymnus	26	0	106	179	0,072	7216	84,94	0	285	169	9,047	0,494
wildebeest	Connochaetes taurinus	78	44	313	196	0,212	9412	97,02	117	509	63	11,874	0,628
zebra	Equus spp,	487	41	1951	766	1,317	144987	380,77	1184	2717	39	170,660	-0,905
all elephants	Loxodonta africana all	1543	2173	6174	1919	4,169	906808	952,26	4255	8093	31	1020,249	-5,197
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	5	3	20	21	0,014	104	10,21	0	41	103	0,123	-0,048
all elephant carcasses	Loxodonta africana carcass all	51	16	204	61	0,138	918	30,31	143	265	30	1,072	-0,039
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	46	13	184	58	0,124	832	28,84	126	242	32	0,997	0,009

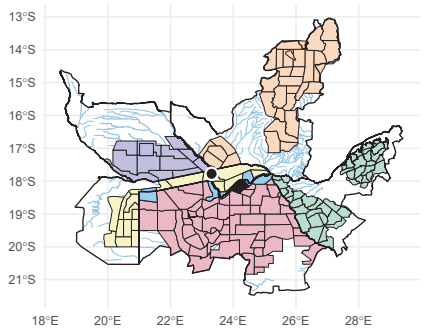
CH1 – CH 1 TRANSFRONTIER – NORTHERN BOTSWANA

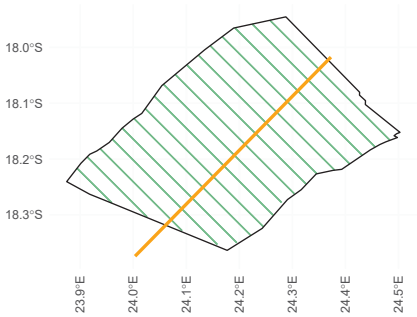
SURVEY DESIGN

COUNTRY: Transfrontier
SUPERSTRATUM: Northern Botswana
STRATUM CODE: CH1
STRATUM NAME: CH 1
■ STRATUM AREA: 1599.7 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 107 km

– TRANSECTS: 17 (521 km)
TRANSECT ORIENTATION: 136°
PLANNED SAMPLING INTENSITY: 9.8 %

– BASELINE DISTANCE: 55.52 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.9 h
Crew(s): C01
KES2022_V5IIM20221004A 06:26–11:20

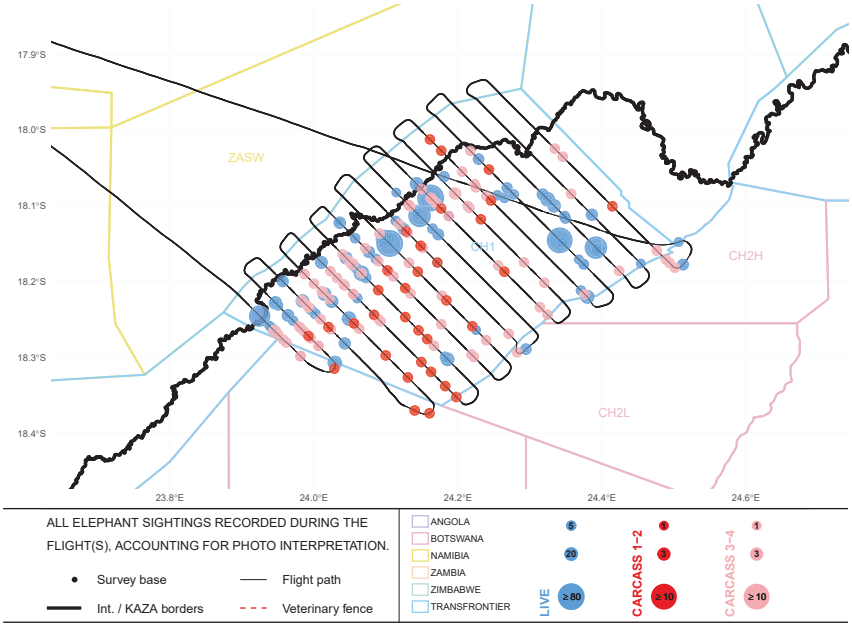
Actual sampling intensity: 10.4 %
Transect flying time: 3.1 h
Transects: 17 – 521 km – 136°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01	
Side:	L	R
% sightings:	38	62
% individuals:	34	66

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	246	44.72	19.09
Live elephant (>9):	11	72.73	25
Elephant carcass:	103	66.02	0
Live elephant (<10):	38	28.95	36.36





LIVE ELEPHANTS

IN SAMPLE:	**400 (49)**
Bulls:	31 (12)
Family:	369 (37)
NOT IN SAMPLE:	**856 (43)**
Outside search strip:	780
Off transect:	76



ELEPHANT CARCASSES

IN SAMPLE:	**106 (103)**
Category 1:	15 (15)
Category 2:	11 (11)
Category 3:	60 (57)
Category 4:	20 (20)
NOT IN SAMPLE:	**18 (18)**
Outside search strip:	6
Off transect:	12

OTHER SPECIES

Other wildlife species:	17
Other wildlife count:	1288
Domestic count:	1510

ELEPHANT DATA ANALYSIS

t = 2.12, N = 173, w = 320

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3703	3837	1017	1017
Variance of estimate	$Var\hat{Y}$	720064	787332	22361	22361
Standard error	$SE\hat{Y}$	849	887	150	150
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 1799	± 1881	± 317	± 317
Percentage of relative precision	$PRP\hat{Y}$	49 %	49 %	31 %	31 %
Density per sqkm	$R\hat{Y}$	2.315	2.399	0.636	0.636
Variance between transect counts	s^2_y	381.596	424.015	10.691	10.691
Variance between transect areas	s^2_a	5.468	5.468	5.468	5.468
Covariance between counts & areas	s_{ay}	−8.477	−7.653	−0.848	−0.848

CARCASS RATIOS

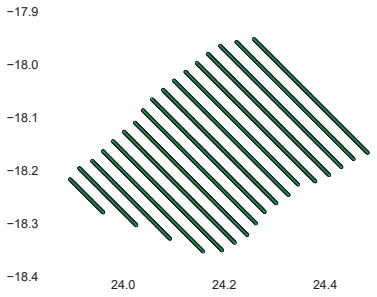
$CR_{1:4} = 20.9$ %
$CR_{1:2} = 6.1$ %

CH1 – CH 1 TRANSFRONTIER – NORTHERN BOTSWANA

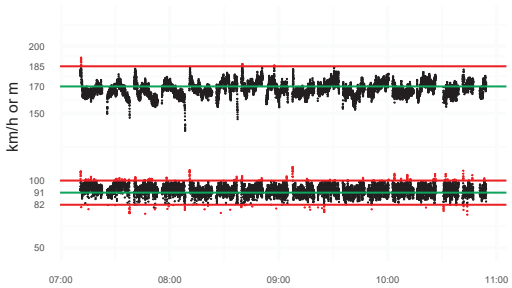
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221004A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



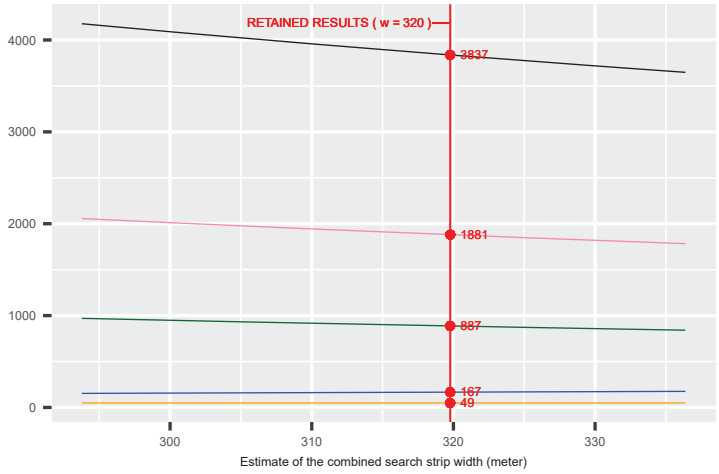
SPEED
Average: 168.1 km/h
Standard dev.: 5.2 km/h

HEIGHT AGL
Average: 92.8 m (304.4 ft)
Standard dev.: 3.7 m (12 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [160 – 193]
C01 – Right: [121 – 162]



LIVE ELEPHANT ESTIMATE: [4177 – 3648]
CONFIDENCE INTERVAL: ± [2057 – 1783]
SAMPLE AREA: [153 – 175] sqkm
SE: [970 – 841]
PRP: [49 – 49] %

CH1 – CH 1 TRANSFRONTIER – NORTHERN BOTSWANA

STRATUM CODE: CH1 **N:** 174 S_a^2: 5,468
STRATUM NAME: CH 1 **w:** 320 **df:** 16

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	225	196	2158	2868	1,349	1830578	1352,99	0	5027	133	1017,816	-43,205
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	1510	250	14485	8525	9,055	16171830	4021,42	5960	23010	59	8836,779	-45,526
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	4	0	38	63	0,024	887	29,78	0	102	165	0,566	0,308
elephant bulls	Loxodonta africana males	31	33	297	232	0,186	12013	109,61	65	530	78	6,904	-1,121
elephant family	Loxodonta africana family	369	823	3540	1857	2,213	767078	875,83	1683	5396	52	423,846	-6,532
elephant carcass one	Loxodonta africana carcass one	15	4	144	78	0,090	1350	36,75	66	222	54	0,860	0,336
elephant carcass two	Loxodonta africana carcass two	11	3	106	65	0,066	951	30,83	40	171	62	0,618	0,358
elephant carcass three	Loxodonta africana carcass three	60	10	576	207	0,360	9531	97,62	369	783	36	4,015	-1,717
elephant carcass four	Loxodonta africana carcass four	20	1	192	97	0,120	2105	45,88	95	289	51	1,279	0,175
giraffe	Giraffa giraffa	11	1	106	131	0,066	3825	61,85	0	237	124	2,493	0,949
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	8	0	77	169	0,048	6384	79,90	0	246	221	3,765	-2,224
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	35	0	336	399	0,210	35438	188,25	0	735	119	23,059	2,731
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	18	11	173	184	0,108	7548	86,88	0	357	107	4,934	1,294
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	19	0	182	376	0,114	31428	177,28	0	558	206	18,985	-2,592
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	32	0	307	376	0,192	31400	177,20	0	683	122	19,860	1,127
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	2	0	19	41	0,012	371	19,27	0	60	213	0,235	0,166
warthog	Phacochoerus africanus	17	0	163	137	0,102	4170	64,57	26	300	84	2,625	0,369
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	47	0	451	546	0,282	66311	257,51	0	997	121	43,191	3,854
zebra	Equus spp,	819	425	7857	5208	4,911	6036028	2456,83	2648	13065	66	4234,404	60,367
all elephants	Loxodonta africana all	400	856	3837	1881	2,399	787332	887,32	1956	5718	49	424,015	-7,653
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	26	7	249	110	0,156	2690	51,86	139	359	44	1,765	0,694
all elephant carcasses	Loxodonta africana carcass all	106	18	1017	317	0,636	22361	149,53	700	1334	31	10,691	-0,848
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	80	11	767	247	0,480	13530	116,32	521	1014	32	5,721	-1,542

CR – Chobe River North–East

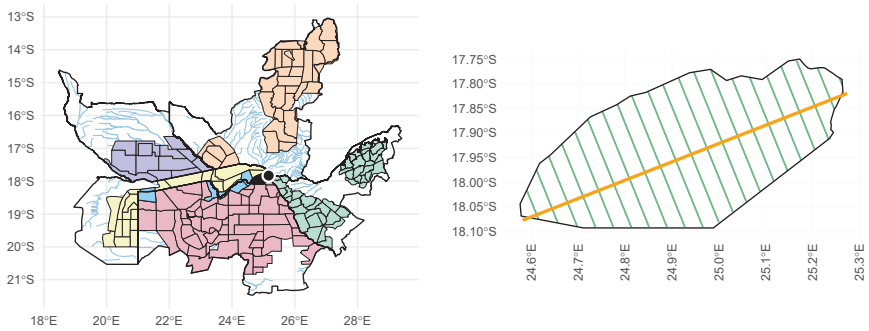
TRANSFRONTIER – NORTHERN BOTSWANA

SURVEY DESIGN

COUNTRY: Transfrontier
SUPERSTRATUM: Northern Botswana
STRATUM CODE: CR
STR. NAME: Chobe River North–East
■ STRATUM AREA: 1794.32 sqkm
• SURVEY BASE: Kasane
DISTANCE TO SURVEY BASE: 25 km

– TRANSECTS: 21 (484 km)
TRANSECT ORIENTATION: 159.6°
PLANNED SAMPLING INTENSITY: 8.1 %

– BASELINE DISTANCE: 78.71 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.2 h
Crew(s): C02
KES2022_V5LJB20221001A 07:09–11:19

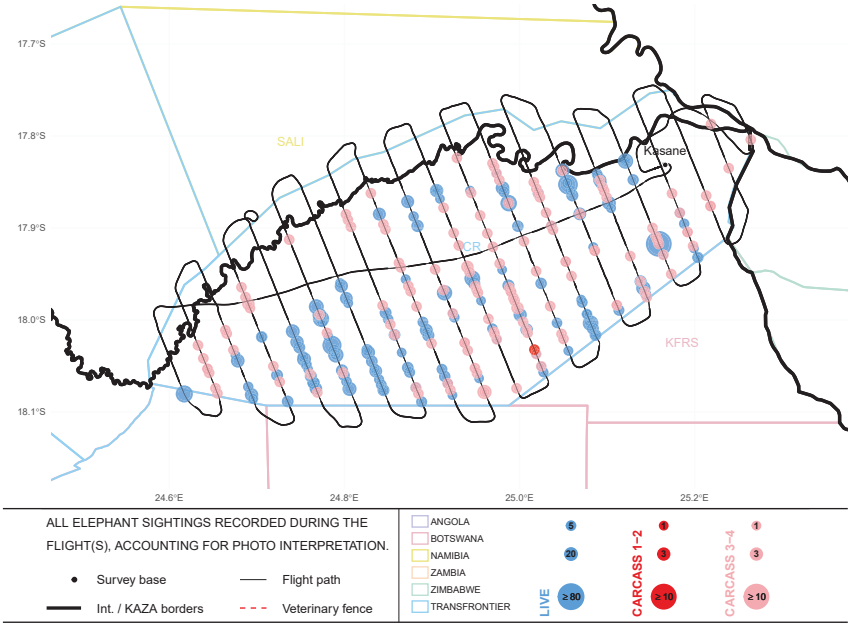
Actual sampling intensity: 8.6 %
Transect flying time: 2.8 h
Transects: 21 – 484 km – 159.6°
Search effort: 1.08 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C02	
Side:	L	R
% sightings:	50	50
% individuals:	63	37

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	325	11.08	22.22
Live elephant (>9):	25	12	33.33
Elephant carcass:	100	15	0
Live elephant (<10):	49	20.41	20





LIVE ELEPHANTS

IN SAMPLE:	**606 (74)**
Bulls:	27 (17)
Family:	579 (57)
NOT IN SAMPLE:	**878 (95)**
Outside search strip:	843
Off transect:	35



ELEPHANT CARCASSES

IN SAMPLE:	**101 (100)**
Category 1:	0 (0)
Category 2:	1 (1)
Category 3:	4 (4)
Category 4:	96 (95)
NOT IN SAMPLE:	**40 (37)**
Outside search strip:	40
Off transect:	0

OTHER SPECIES

Other wildlife species:	16
Other wildlife count:	867
Domestic count:	419

ELEPHANT DATA ANALYSIS

t = 2.086, N = 245, w = 321

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	6983	7007	1168	1168
Variance of estimate	$Var\hat{Y}$	1809109	1873046	28211	28211
Standard error	$SE\hat{Y}$	1345	1369	168	168
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 2806	± 2855	± 350	± 350
Percentage of relative precision	$PRP\hat{Y}$	40 %	41 %	30 %	30 %
Density per sqkm	$R\hat{Y}$	3.892	3.905	0.651	0.651
Variance between transect counts	s^2_y	798.99	826.129	13.262	13.262
Variance between transect areas	s^2_a	8.089	8.089	8.089	8.089
Covariance between counts & areas	s_{ay}	29.867	30.23	4.566	4.566

CARCASS RATIOS

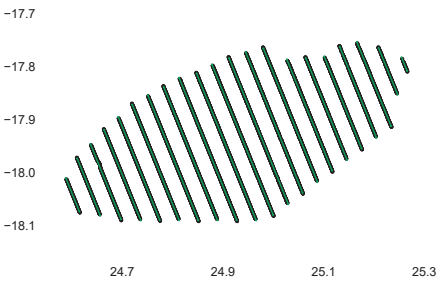
$CR_{1:4} = 14.3$ %
$CR_{1:2} = 0.2$ %

CR – Chobe River North–East TRANSFRONTIER – NORTHERN BOTSWANA

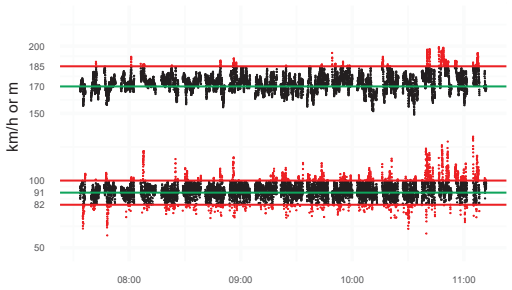
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5LJB20221001A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



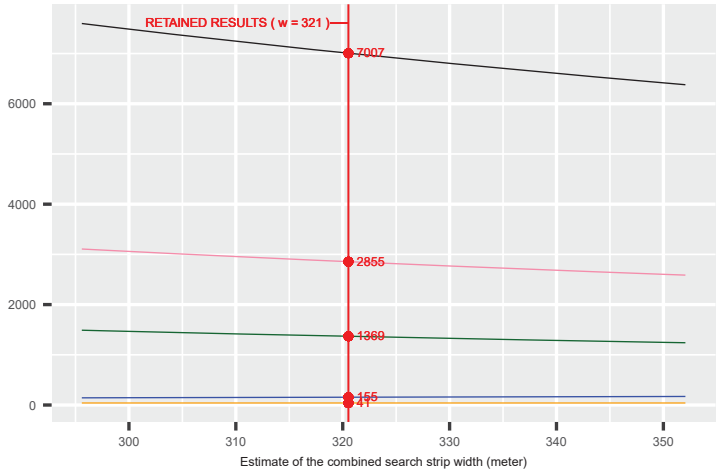
SPEED
Average: 172.9 km/h
Standard dev.: 6.7 km/h

HEIGHT AGL
Average: 92.7 m (304.1 ft)
Standard dev.: 6.5 m (21.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C02 – Left: [156 – 178]
C02 – Right: [135 – 187]



LIVE ELEPHANT ESTIMATE: [7598 – 6379]
CONFIDENCE INTERVAL: ± [3107 – 2587]
SAMPLE AREA: [143 – 170] sqkm
SE: [1489 – 1240]
PRP: [41 – 41] %

CR – Chobe River North–East TRANSFRONTIER – NORTHERN BOTSWANA

STRATUM CODE: CR **N:** 246 S_a^2: 8,089
STRATUM NAME: Chobe River North-East **w:** 321 **df:** 20

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	24	0	277	436	0,155	43689	209,02	0	713	157	17,329	2,852
buffalo	Syncerus caffer	106	300	1226	1377	0,683	435983	660,29	0	2603	112	177,448	11,104
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	397	20	4590	3447	2,558	2730798	1652,51	1143	8037	75	861,290	-24,599
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	17	0	197	398	0,110	36331	190,61	0	594	202	13,762	0,099
elephant bulls	Loxodonta africana males	27	32	312	138	0,174	4391	66,26	174	450	44	2,114	1,974
elephant family	Loxodonta africana family	579	846	6694	2832	3,731	1843452	1357,74	3862	9527	42	800,357	28,256
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	1	0	12	23	0,006	120	10,97	0	34	198	0,048	0,163
elephant carcass three	Loxodonta africana carcass three	4	1	46	41	0,026	383	19,58	5	87	88	0,162	0,413
elephant carcass four	Loxodonta africana carcass four	96	39	1110	319	0,619	23408	153,00	791	1429	29	10,757	3,991
giraffe	Giraffa giraffa	10	2	116	120	0,064	3294	57,40	0	235	104	1,262	0,317
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	18	0	208	297	0,116	20321	142,55	0	505	143	7,129	-2,166
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	318	45	3677	1572	2,049	568000	753,66	2105	5249	43	278,629	23,488
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	3	0	35	69	0,019	1089	32,99	0	104	198	0,429	0,439
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	1	0	12	23	0,006	120	10,97	0	34	198	0,048	0,166
sable	Hippotragus niger	10	0	116	143	0,064	4716	68,67	0	259	124	1,662	-0,782
shoat	Capra hircus - Ovis aries	22	0	254	393	0,142	35477	188,35	0	647	154	12,548	-2,828
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	6	0	69	138	0,039	4363	66,05	0	207	199	1,714	0,835
waterbuck	Kobus ellipsiprymnus	8	0	92	165	0,052	6261	79,13	0	258	178	2,348	-0,151
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	225	92	2601	2314	1,450	1230821	1109,42	287	4916	89	517,414	22,635
all elephants	Loxodonta africana all	606	878	7007	2855	3,905	1873046	1368,59	4152	9861	41	826,129	30,230
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	1	0	12	23	0,006	120	10,97	0	34	198	0,048	0,163
all elephant carcasses	Loxodonta africana carcass all	101	40	1168	350	0,651	28211	167,96	817	1518	30	13,262	4,566
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	100	40	1156	338	0,644	26188	161,83	819	1494	29	12,290	4,404

LIAM – Liambezi

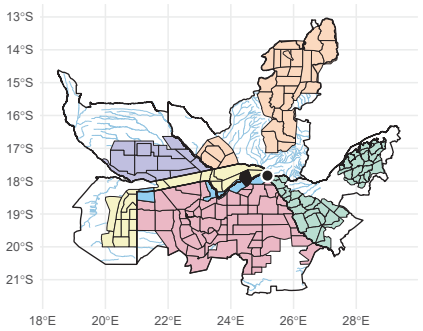
TRANSFRONTIER – KAVANGO ZAMBEZI

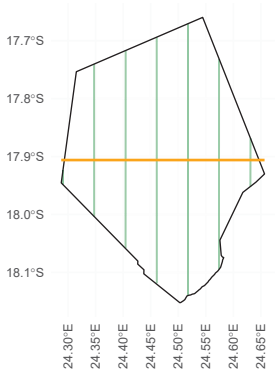
SURVEY DESIGN

COUNTRY: Transfrontier
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: LIAM
STRATUM NAME: Liambezi
■ STRATUM AREA: 1323.34 sqkm
• SURVEY BASE: Kasane
DISTANCE TO SURVEY BASE: 75 km

– TRANSECTS: 7 (222 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 5 %

– BASELINE DISTANCE: 39.09 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.8 h
Crew(s): C03
KES2022_V5WOT20221001A 07:25–11:10

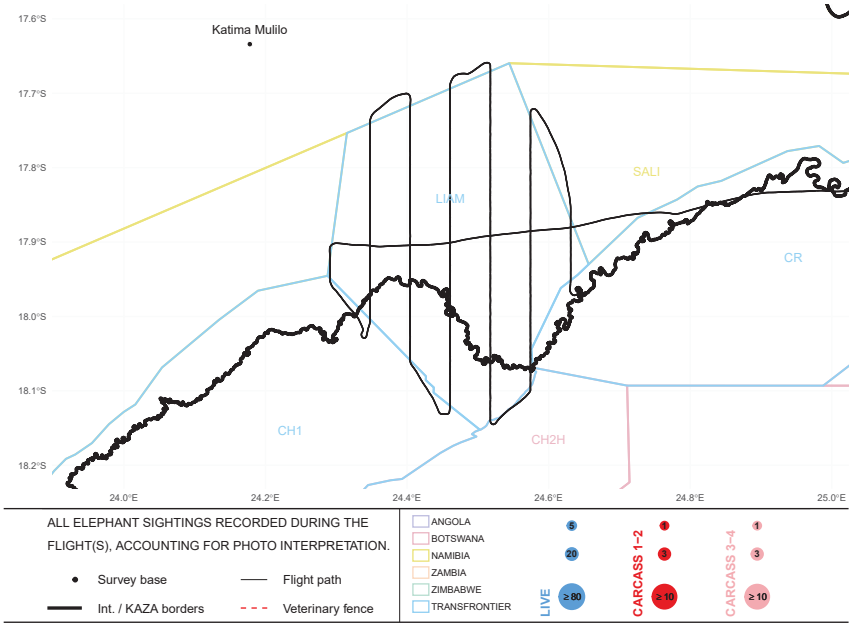
Actual sampling intensity: 5.3 %
Transect flying time: 1.3 h
Transects: 7 – 222 km – 0°
Search effort: 1.11 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C03	
Side:	L	R
% sightings:	35	65
% individuals:	35	65

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	37	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	7
Other wildlife count:	281
Domestic count:	796

ELEPHANT DATA ANALYSIS

t = 2.447, N = 124, w = 315

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

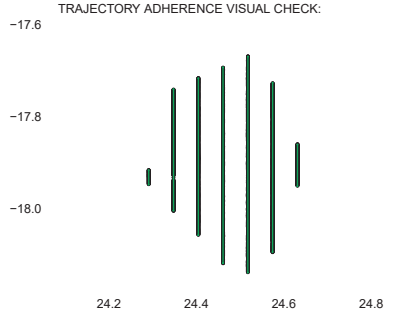
LIAM – Liambezi

TRANSFRONTIER – KAVANGO ZAMBEZI

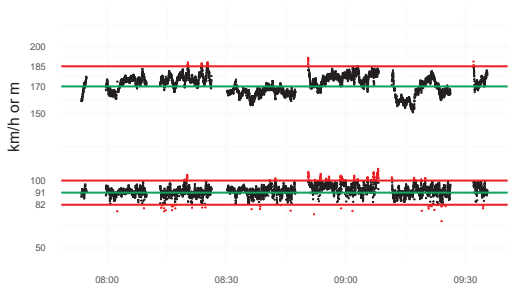
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221001A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED

Average:	171.2 km/h	
Standard dev.:	6.6 km/h	

HEIGHT AGL

Average:	92.6 m	(303.6 ft)
Standard dev.:	3.9 m	(12.8 ft)

LIAM – Liambezi TRANSFRONTIER – KAVANGO ZAMBEZI

STRATUM CODE: LIAM **N:** 124 S_a^2: 34,666
STRATUM NAME: Liambezi **w:** 315 **df:** 6

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	625	0	11862	3155	8,963	1662783	1289,49	8706	15017	27	2519,238	251,340
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	1	0	19	41	0,014	284	16,87	0	60	217	0,143	0,466
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	31	0	588	909	0,445	138072	371,58	0	1498	155	66,619	8,045
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	11	0	209	385	0,158	24800	157,48	0	594	185	13,952	9,202
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	171	0	3245	3996	2,452	2667022	1633,10	0	7241	123	1438,619	74,644
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	3	0	57	114	0,043	2184	46,73	0	171	201	1,286	3,499
waterbuck	Kobus ellipsiprymnus	1	0	19	44	0,014	321	17,91	0	63	231	0,143	-0,140
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	231	231	4384	4477	3,313	3348268	1829,83	0	8862	102	2597,333	206,706
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

MS – Mamili South

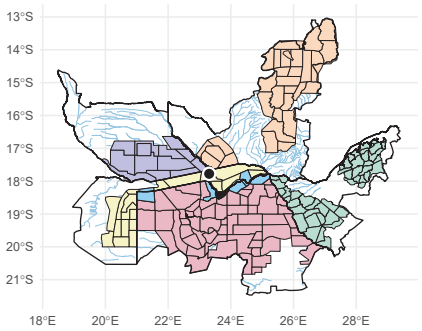
TRANSFRONTIER – KAVANGO ZAMBEZI

SURVEY DESIGN

COUNTRY: Transfrontier
SUPERSTRATUM: Kavango Zambezi
STRATUM CODE: MS
STRATUM NAME: Mamili South
■ STRATUM AREA: 736.28 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 78 km

– TRANSECTS: 30 (492 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 20.1 %

– BASELINE DISTANCE: 46.63 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 5.4 h
Crew(s): C01, C04
KES2022_V5IIM20221004B 15:17–17:55
KES2022_V5WOT20221004B 15:15–18:03

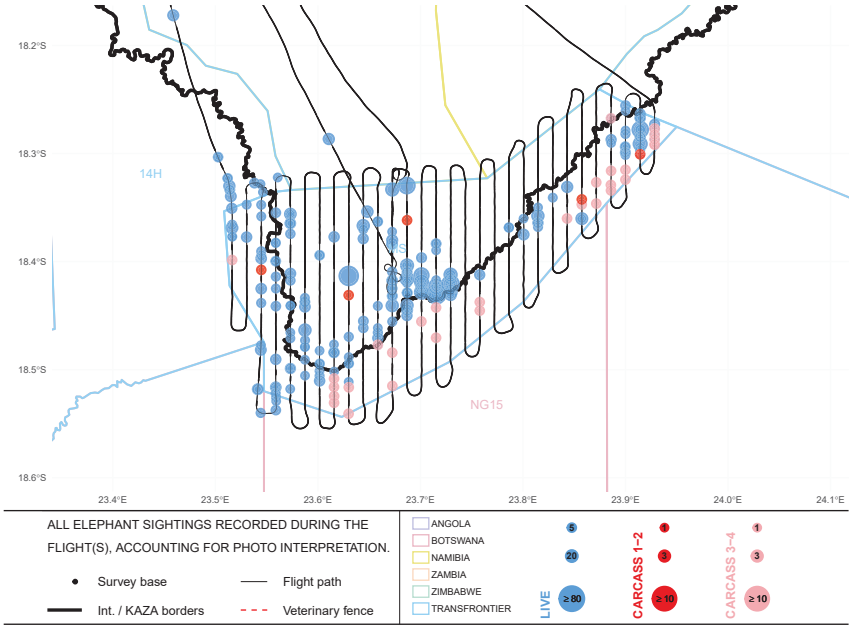
Actual sampling intensity: 21.1 %
Transect flying time: 2.9 h
Transects: 30 – 492 km – 0°
Search effort: 1.1 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C01		C04	
Side:	L	R	L	R
% sightings:	40	60	41	59
% individuals:	43	57	28	72

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	320	15.94	23.53
Live elephant (>9):	21	61.9	30.77
Elephant carcass:	35	80	0
Live elephant (<10):	129	0.78	100





LIVE ELEPHANTS

IN SAMPLE:	**799 (149)**
Bulls:	161 (73)
Family:	638 (76)
NOT IN SAMPLE:	**683 (77)**
Outside search strip:	519
Off transect:	164



ELEPHANT CARCASSES

IN SAMPLE:	**35 (35)**
Category 1:	1 (1)
Category 2:	4 (4)
Category 3:	6 (6)
Category 4:	24 (24)
NOT IN SAMPLE:	**1 (1)**
Outside search strip:	1
Off transect:	0

OTHER SPECIES

Other wildlife species:	23
Other wildlife count:	3875
Domestic count:	169

ELEPHANT DATA ANALYSIS

t = 2.045, N = 147, w = 315

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	3761	3790	166	166
Variance of estimate	$\mathrm{Var}\hat{Y}$	255776	260422	1362	1362
Standard error	$\mathrm{SE}\hat{Y}$	506	510	37	37
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	± 1034	± 1044	± 75	± 75
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	28 %	28 %	45 %	45 %
Density per sqkm	$R\hat{Y}$	5.108	5.147	0.225	0.225
Variance between transect counts	s_y^2	523.151	533.895	1.799	1.799
Variance between transect areas	s_a^2	3.126	3.126	3.126	3.126
Covariance between counts & areas	s_{ay}	16.089	16.356	−0.859	−0.859

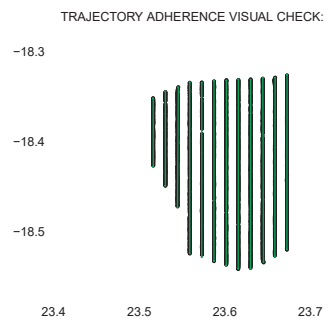
CARCASS RATIOS

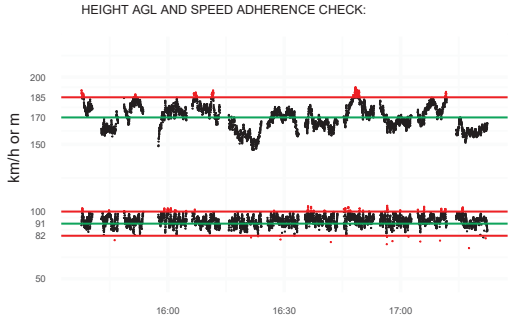
$CR_{1:4} = 4.2\ \%$
$CR_{1:2} = 0.6\ \%$

MS – Mamili South — TRANSFRONTIER – KAVANGO ZAMBEZI

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5IIM20221004B

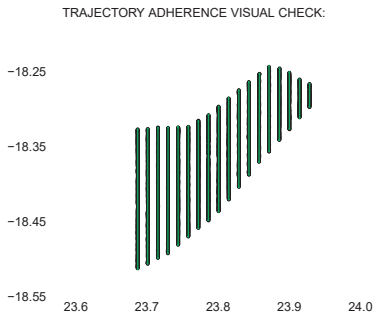


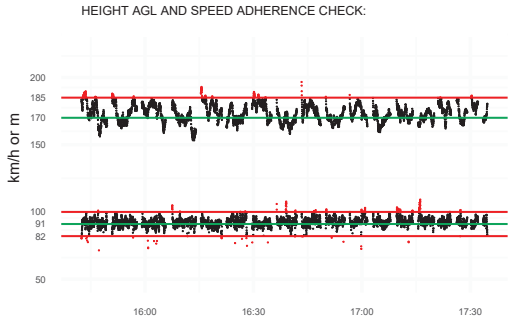


SPEED
Average: 169.6 km/h
Standard dev.: 8.9 km/h

HEIGHT AGL
Average: 93.3 m (306 ft)
Standard dev.: 3.7 m (12.2 ft)

KES2022_ V5WOT20221004B





SPEED
Average: 173.2 km/h
Standard dev.: 6.6 km/h

HEIGHT AGL
Average: 92.3 m (303 ft)
Standard dev.: 3.3 m (10.9 ft)

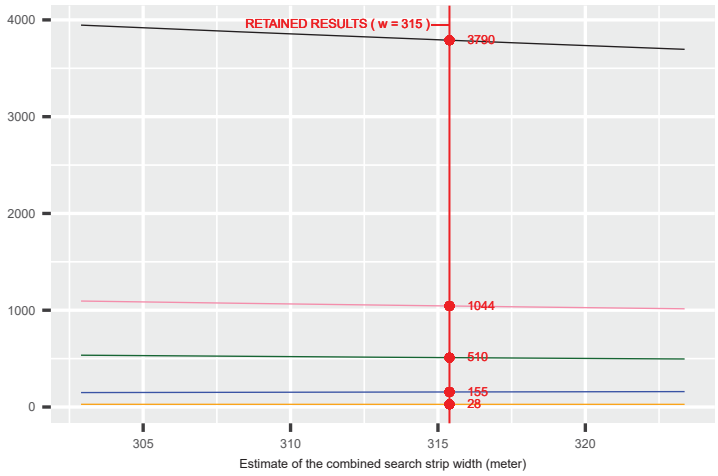
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C01 – Left: [161 – 194]
C01 – Right: [122 – 163]

C04 – Left: [155 – 155]
C04 – Right: [155 – 155]

LIVE ELEPHANT ESTIMATE: [3946 – 3696]
CONFIDENCE INTERVAL: ± [1095 – 1015]
SAMPLE AREA: [149 – 159] sqkm
SE: [535 – 496]
PRP: [28 – 27] %



MS – Mamili South — TRANSFRONTIER – KAVANGO ZAMBEZI

STRATUM CODE: MS **N:** 148 S_a^2: 3,126
STRATUM NAME: Mamili South **w:** 315 **df:** 29

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	8	0	38	47	0,052	525	22,91	0	85	124	0,961	0,634
buffalo	Syncerus caffer	768	748	3643	2539	4,947	1540533	1241,18	1104	6181	70	2783,283	20,984
bushbuck	Tragelaphus scriptus	1	0	5	9	0,006	19	4,35	0	14	187	0,033	0,073
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	169	108	802	756	1,089	136749	369,80	45	1558	94	221,206	-4,829
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	161	104	764	242	1,037	14021	118,41	521	1006	32	31,757	5,294
elephant family	Loxodonta africana family	638	579	3026	1056	4,110	266800	516,53	1970	4082	35	497,444	11,061
elephant carcass one	Loxodonta africana carcass one	1	0	5	9	0,006	19	4,37	0	14	189	0,033	0,041
elephant carcass two	Loxodonta africana carcass two	4	0	19	18	0,026	73	8,56	1	36	92	0,120	-0,087
elephant carcass three	Loxodonta africana carcass three	6	1	28	24	0,039	138	11,77	4	53	85	0,234	0,011
elephant carcass four	Loxodonta africana carcass four	24	0	114	67	0,155	1089	32,99	46	181	59	1,545	-0,823
giraffe	Giraffa giraffa	10	3	47	42	0,064	419	20,48	6	89	88	0,644	-0,507
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	203	27	963	346	1,308	28591	169,09	617	1309	36	59,013	5,787
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	407	19	1930	854	2,622	174304	417,50	1077	2784	44	369,289	17,296
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	4	0	19	21	0,026	108	10,38	0	40	112	0,189	0,096
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	1	0	5	9	0,006	20	4,42	0	14	190	0,033	-0,010
puku	Kobus vardonii	5	0	24	38	0,032	347	18,64	0	62	161	0,557	-0,581
red lechwe	Kobus leche	1823	129	8646	3615	11,743	3124752	1767,70	5031	12262	42	6319,909	58,392
reedbuck	Redunca arundinum	41	1	194	114	0,264	3103	55,70	81	308	59	5,757	1,201
roan	Hippotragus equinus	2	0	9	18	0,013	77	8,76	0	27	189	0,133	0,068
sable	Hippotragus niger	10	24	47	57	0,064	778	27,90	0	104	120	1,333	0,050
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	1	0	5	9	0,006	20	4,43	0	14	191	0,033	-0,023
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	447	10	2120	745	2,879	132607	364,15	1375	2865	35	330,300	22,213
waterbuck	Kobus ellipsiprymnus	3	0	14	27	0,019	171	13,08	0	41	188	0,300	0,171
wildebeest	Connochaetes taurinus	52	44	247	248	0,335	14676	121,14	0	494	100	24,202	-1,063
zebra	Equus spp,	23	11	109	116	0,148	3221	56,75	0	225	106	5,220	-0,868
all elephants	Loxodonta africana all	799	683	3790	1044	5,147	260422	510,32	2746	4833	28	533,895	16,356
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	5	0	24	19	0,032	87	9,33	5	43	80	0,144	-0,046
all elephant carcasses	Loxodonta africana carcass all	35	1	166	75	0,225	1362	36,91	91	241	45	1,799	-0,859
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	30	1	142	72	0,193	1252	35,38	70	215	51	1,724	-0,812

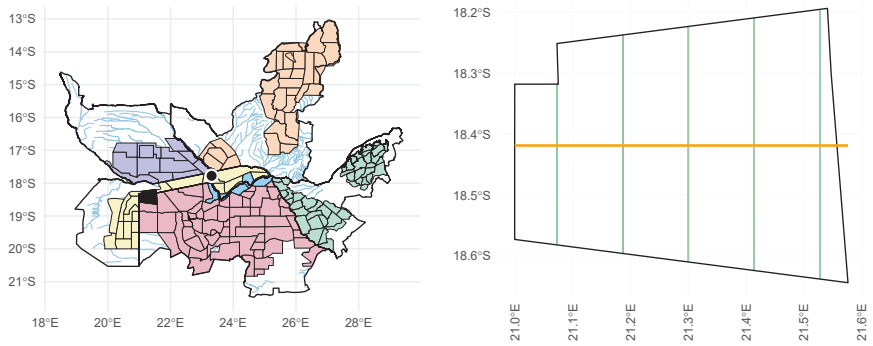
NG1 – NG 1 TRANSFRONTIER – NORTHERN BOTSWANA

SURVEY DESIGN

COUNTRY: Transfrontier
SUPERSTRATUM: Northern Botswana
STRATUM CODE: NG1
STRATUM NAME: NG 1
■ STRATUM AREA: 2438.51 sqkm
• SURVEY BASE: Immelmann
DISTANCE TO SURVEY BASE: 228 km

– TRANSECTS: 5 (210 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 2.6 %

– BASELINE DISTANCE: 61 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 2.8 h
Crew(s): C04
KES2022_V5WOT20221009A 06:29–09:16

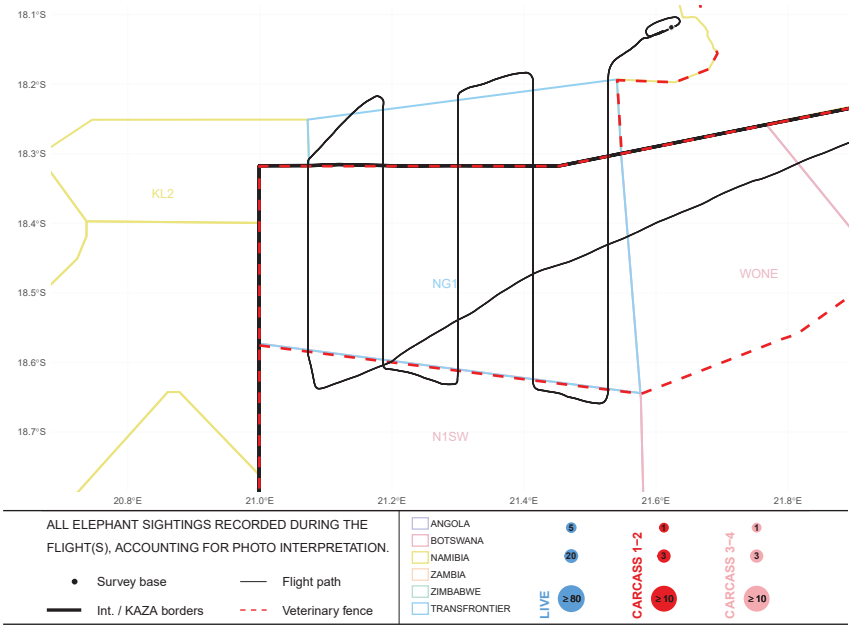
Actual sampling intensity: 2.6 %
Transect flying time: 1.2 h
Transects: 5 – 210 km – 0°
Search effort: 1.12 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C04	
Side:	L	R
% sightings:	48	52
% individuals:	53	47

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	4	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	4
Other wildlife count:	11
Domestic count:	229

ELEPHANT DATA ANALYSIS

t = 2.776, N = 198, w = 307

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

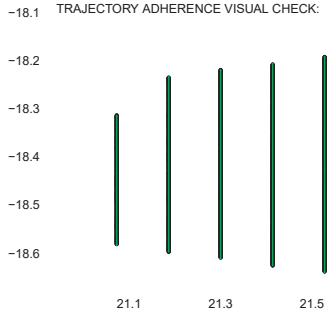
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

NG1 – NG 1 TRANSFRONTIER – NORTHERN BOTSWANA

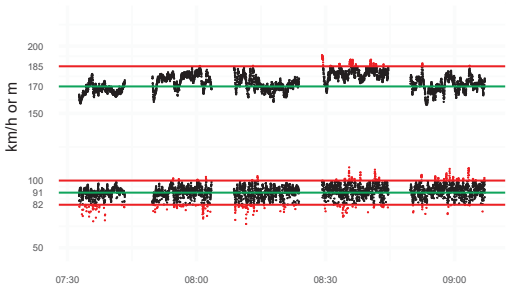
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ V5WOT20221009A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 173.3 km/h
Standard dev.: 6.3 km/h

HEIGHT AGL
Average: 91.5 m (300.3 ft)
Standard dev.: 5.1 m (16.8 ft)

NG1 – NG 1 TRANSFRONTIER – NORTHERN BOTSWANA

STRATUM CODE: NG1 **N:** 199 S_a^2: 6,158
STRATUM NAME: NG 1 **w:** 307 **df:** 4

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	2	0	76	234	0,031	7122	84,39	0	310	310	0,800	-1,940
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	116	24	4391	4073	1,800	2152199	1467,04	317	8464	93	391,700	36,574
donkey	Equus asinus	25	0	946	1177	0,388	179814	424,05	0	2124	124	21,000	-1,885
duiker	Sylvicapra grimmia	3	1	114	244	0,047	7748	88,02	0	358	215	0,800	-2,089
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	18	0	681	1955	0,279	495596	703,99	0	2636	287	64,800	1,456
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	5	0	189	586	0,078	44511	210,98	0	775	310	5,000	-4,850
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	1	0	38	104	0,016	1395	37,35	0	142	274	0,200	0,643
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	70	0	2649	5140	1,087	3427596	1851,38	0	7790	194	380,000	-26,963
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

ZAMBIA



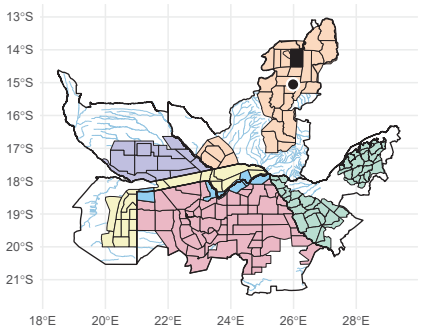
A1 – A1 ZAMBIA – KAFUE

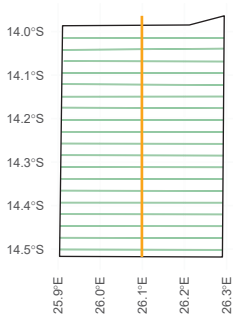
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: A1
STRATUM NAME: A1
■ STRATUM AREA: 2456.55 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 90 km

– TRANSECTS: 19 (790 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 9.6 %

– BASELINE DISTANCE: 61.38 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 8.8 h
Crew(s): C05, C07
KES2022_9JCMA20220829A 07:25–12:03
KES2022_9JMFZ20220829A 07:15–11:23

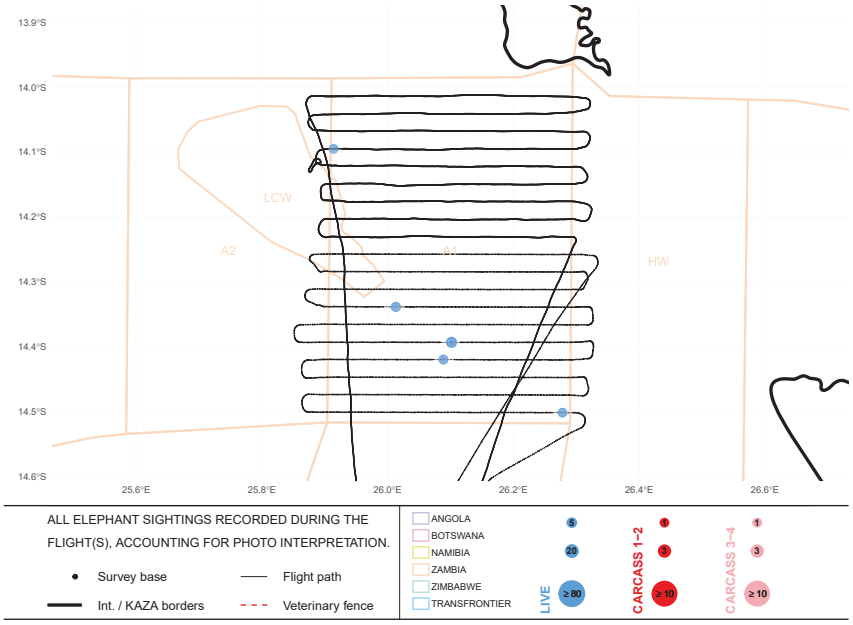
Actual sampling intensity: 10.1 %
Transect flying time: 4.5 h
Transects: 19 – 790 km – 90°
Search effort: 1.09 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	69	31	52	48
% individuals:	37	63	41	59

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	21	33.33	42.86
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	4	25	0



LIVE ELEPHANTS



IN SAMPLE:	**12 (4)**
Bulls:	2 (2)
Family:	10 (2)
NOT IN SAMPLE:	**8 (2)**
Outside search strip:	8
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	21
Other wildlife count:	572
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.101, N = 196, w = 313

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	119	119	–	–
Variance of estimate	$Var\hat{Y}$	6312	6312	–	–
Standard error	$SE\hat{Y}$	79	79	–	–
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 167	± 167	–	–
Percentage of relative precision	$PRP\hat{Y}$	140 %	140 %	–	–
Density per sqkm	$R\hat{Y}$	0.049	0.049	–	–
Variance between transect counts	s_y^2	3.468	3.468	–	–
Variance between transect areas	s_a^2	0.097	0.097	–	–
Covariance between counts & areas	s_{ay}	0.143	0.143	–	–

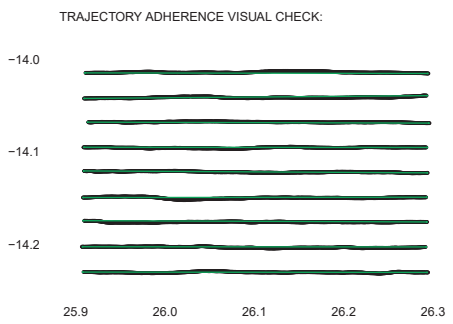
CARCASS RATIOS

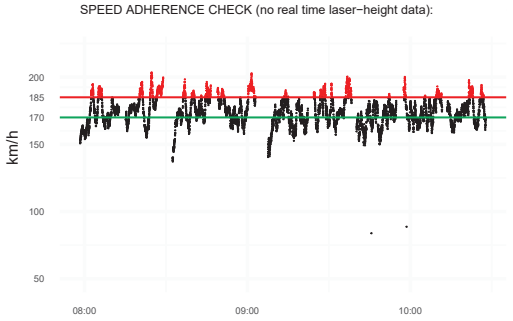
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

A1 – A1 ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220829A



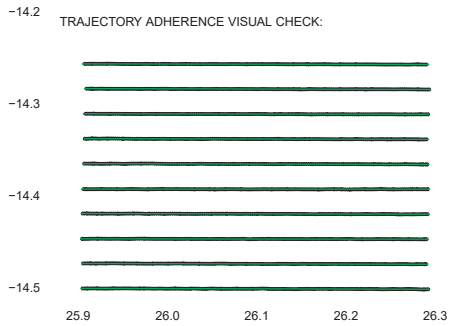


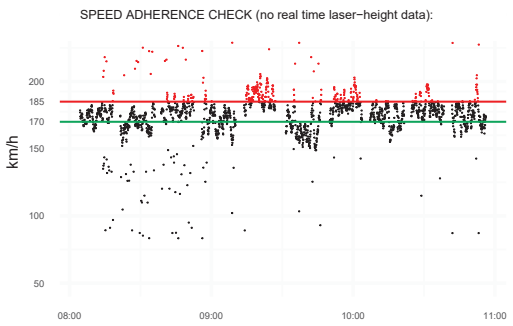
SPEED
Average: 174.3 km/h
Standard dev.: 10.4 km/h

HEIGHT AGL
Average: 92.2 m (302.6 ft)
Standard dev.: 6.2 m (20.5 ft)

Despite the failure of the laser to automatically record continuous height data, the front seat observer manually recorded this information approximately every 30 seconds throughout the flight.

KES2022_ 9JMFZ20220829A





SPEED
Average: 174.9 km/h
Standard dev.: 16.1 km/h

HEIGHT AGL
Average: 93.5 m (306.6 ft)
Standard dev.: 4.9 m (16.1 ft)

Despite the failure of the laser to automatically record continuous height data, the front seat observer manually recorded this information approximately every 30 seconds throughout the flight.

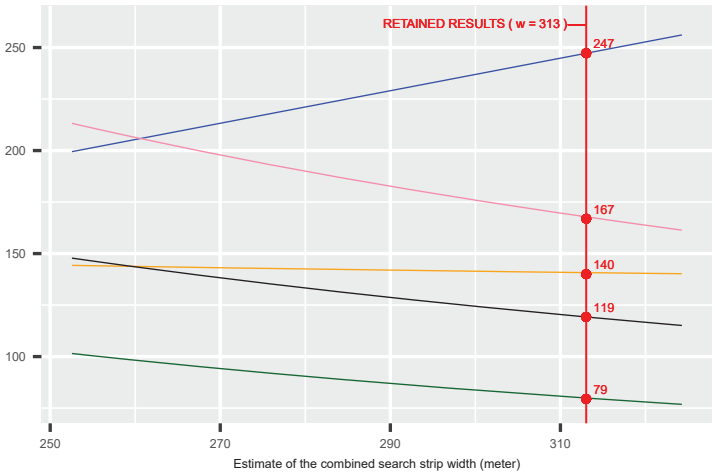
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [147 – 169]
C05 – Right: [142 – 166]

C07 – Left: [112 – 157]
C07 – Right: [98 – 161]

LIVE ELEPHANT ESTIMATE: [148 – 115]
CONFIDENCE INTERVAL: ± [213 – 161]
SAMPLE AREA: [199 – 256] sqkm
SE: [101 – 77]
PRP: [144 – 140] %



A1 – A1 ZAMBIA – KAFUE

STRATUM CODE: A1 **N:** 196 S_a^2: 0,097
STRATUM NAME: A1 **w:** 313 **df:** 18

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	3	7	30	62	0,012	866	29,42	0	92	207	0,474	-0,005
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	4	0	40	38	0,016	320	17,90	2	77	95	0,175	0,005
eland	Tragelaphus oryx	2	67	20	41	0,008	384	19,59	0	61	207	0,211	0,030
elephant bulls	Loxodonta africana males	2	0	20	28	0,008	182	13,48	0	48	142	0,099	0,003
elephant family	Loxodonta africana family	10	8	99	167	0,040	6348	79,67	0	267	168	3,485	0,140
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	76	19	755	647	0,307	94784	307,87	108	1402	86	51,667	-0,322
hippopotamus	Hippopotamus amphibius	23	0	229	395	0,093	35325	187,95	0	623	173	19,398	0,352
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	34	140	338	409	0,138	37828	194,49	0	746	121	20,842	0,514
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	94	55	934	944	0,380	201759	449,18	0	1878	101	111,164	0,997
red lechwe	Kobus leche	65	462	646	841	0,263	160187	400,23	0	1487	130	87,924	0,500
reedbuck	Redunca arundinum	7	0	70	124	0,028	3492	59,09	0	194	178	1,912	0,024
roan	Hippotragus equinus	78	6	775	931	0,315	196454	443,23	0	1706	120	107,655	0,235
sable	Hippotragus niger	80	47	795	1228	0,324	341907	584,73	0	2023	155	186,842	-0,414
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	51	16	507	306	0,206	21267	145,83	200	813	60	11,784	0,360
waterbuck	Kobus ellipsiprymnus	1	11	10	21	0,004	96	9,80	0	31	207	0,053	0,015
wildebeest	Connochaetes taurinus	6	163	60	73	0,024	1219	34,92	0	133	123	0,673	0,111
zebra	Equus spp,	18	72	179	190	0,073	8164	90,36	0	369	106	4,497	0,202
all elephants	Loxodonta africana all	12	8	119	167	0,049	6312	79,45	0	286	140	3,468	0,143
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

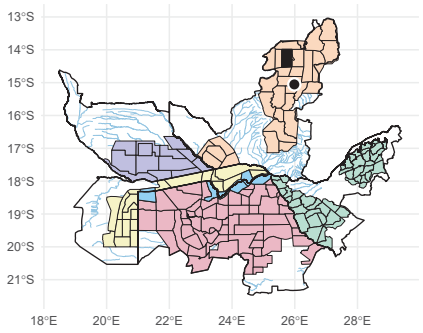
A2 – A2 ZAMBIA – KAFUE

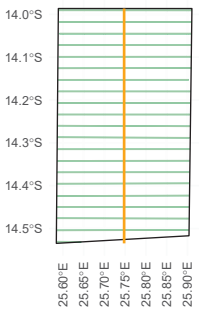
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: A2
STRATUM NAME: A2
■ STRATUM AREA: 2064.55 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 92 km

– TRANSECTS: 21 (699 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10.2 %

– BASELINE DISTANCE: 60.66 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 7.4 h
Crew(s): C05, C07
KES2022_9JCMA20220827A 07:41–11:11
KES2022_9JMFZ20220827A 08:00–11:56

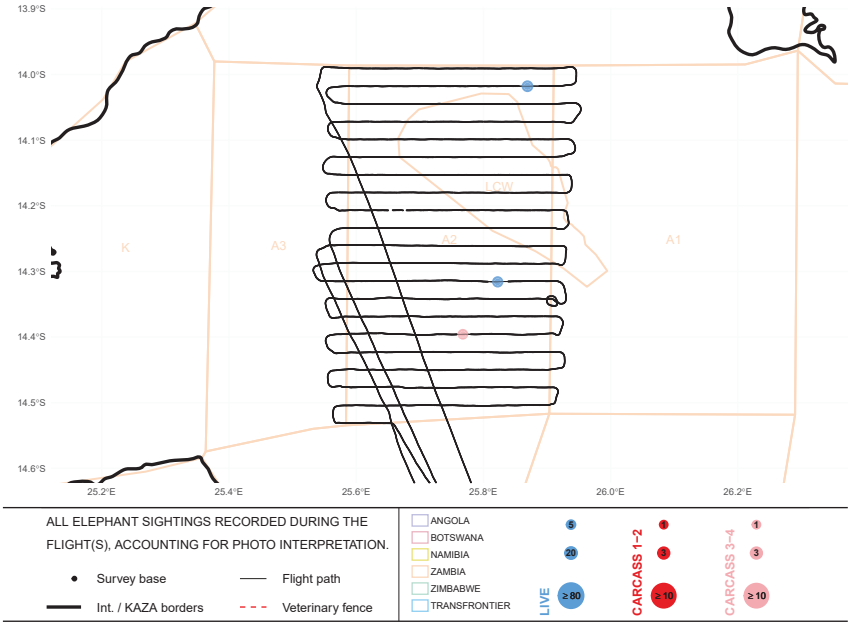
Actual sampling intensity: 10.1 %
Transect flying time: 4 h
Transects: 21 – 699 km – 90°
Search effort: 1.16 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	51	49	58	42
% individuals:	52	48	61	39

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	46	36.96	64.71
Live elephant (>9):	1	100	100
Elephant carcass:	1	100	0
Live elephant (<10):	1	100	100





LIVE ELEPHANTS

IN SAMPLE:	**8 (1)**
Bulls:	0 (0)
Family:	8 (1)
NOT IN SAMPLE:	**10 (1)**
Outside search strip:	10
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	21
Other wildlife count:	1495
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.086, N = 203, w = 298

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	129	79	10	10
Variance of estimate	$Var\hat{Y}$	14210	5381	84	84
Standard error	$SE\hat{Y}$	119	73	9	9
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 249	± 153	± 19	± 19
Percentage of relative precision	$PRP\hat{Y}$	193 %	193 %	193 %	193 %
Density per sqkm	$R\hat{Y}$	0.062	0.038	0.005	0.005
Variance between transect counts	s^2_y	8.048	3.048	0.048	0.048
Variance between transect areas	s^2_a	3.204	3.204	3.204	3.204
Covariance between counts & areas	s_{ay}	0.255	0.157	0.004	0.004

CARCASS RATIOS

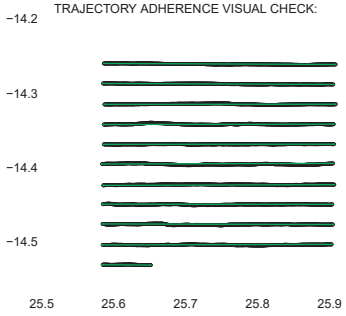
$CR_{1:4} = 11.1$ %
$CR_{1:2} = 0$ %

A2 – A2 ZAMBIA – KAFUE

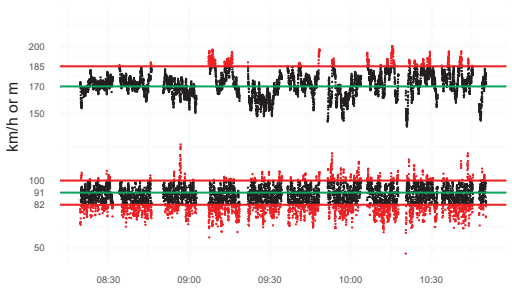
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220827A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:

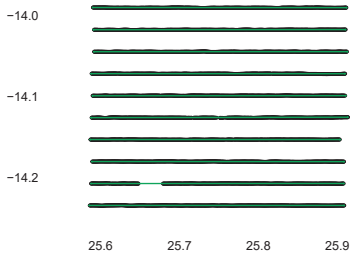


SPEED
Average: 171.8 km/h
Standard dev.: 9.4 km/h

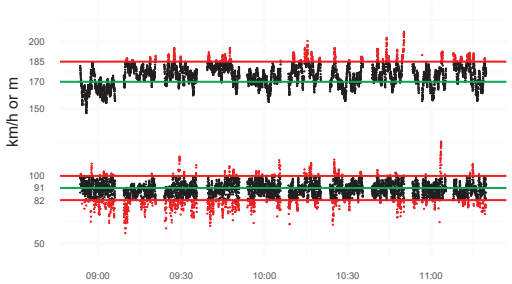
HEIGHT AGL
Average: 87.7 m (287.9 ft)
Standard dev.: 8.6 m (28.1 ft)

KES2022_ 9JMFZ20220827A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 174.8 km/h
Standard dev.: 8.4 km/h

HEIGHT AGL
Average: 89.3 m (292.9 ft)
Standard dev.: 6.9 m (22.5 ft)

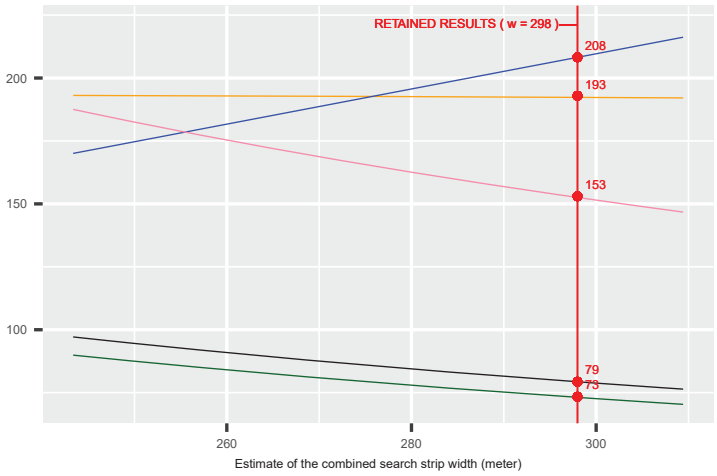
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [140 – 161]
C05 – Right: [135 – 158]

C07 – Left: [107 – 150]
C07 – Right: [94 – 154]

LIVE ELEPHANT ESTIMATE: [97 – 76]
CONFIDENCE INTERVAL: ± [188 – 147]
SAMPLE AREA: [170 – 216] sqkm
SE: [90 – 70]
PRP: [193 – 192] %



A2 – A2 ZAMBIA – KAFUE

STRATUM CODE: A2 **N:** 204 S_a^2: 3,204
STRATUM NAME: A2 **w:** 298 **df:** 20

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	9	250	89	138	0,043	4353	65,98	0	227	154	2,457	0,043
bushbuck	Tragelaphus scriptus	4	0	40	45	0,019	458	21,40	0	84	113	0,262	0,113
bushpig	Potamochoerus larvatus	7	0	69	101	0,034	2358	48,56	0	171	146	1,333	0,067
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	10	19	0,005	84	9,15	0	29	193	0,048	0,037
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	8	10	79	153	0,038	5381	73,36	0	232	193	3,048	0,157
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	10	19	0,005	84	9,18	0	29	193	0,048	0,004
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	70	67	694	713	0,336	116772	341,72	0	1407	103	66,033	0,630
hippopotamus	Hippopotamus amphibius	16	20	159	252	0,077	14563	120,68	0	410	159	8,290	0,532
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	22	32	218	291	0,106	19431	139,39	0	509	133	11,048	0,500
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	6	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	38	79	377	460	0,183	48670	220,61	0	837	122	27,862	1,292
red lechwe	Kobus leche	944	1265	9360	6880	4,534	10876799	3298,00	2481	16240	73	6367,748	31,827
reedbuck	Redunca arundinum	6	3	59	84	0,029	1604	40,05	0	143	140	0,914	0,184
roan	Hippotragus equinus	16	142	159	214	0,077	10548	102,70	0	373	135	5,990	0,328
sable	Hippotragus niger	148	158	1467	1064	0,711	259937	509,84	404	2531	72	148,048	1,977
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	3	0	30	42	0,014	403	20,07	0	72	141	0,229	0,061
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	50	2	496	606	0,240	84522	290,73	0	1102	122	48,148	1,208
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	121	375	1200	1302	0,581	389837	624,37	0	2502	109	223,790	3,982
zebra	Equus spp,	0	24	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	8	10	79	153	0,038	5381	73,36	0	232	193	3,048	0,157
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	0	10	19	0,005	84	9,18	0	29	193	0,048	0,004
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	10	19	0,005	84	9,18	0	29	193	0,048	0,004

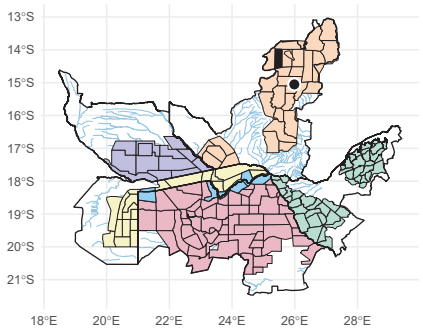
A3 – A3 ZAMBIA – KAFUE

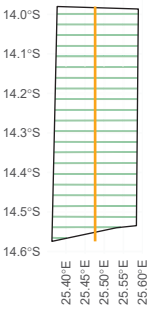
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: A3
STRATUM NAME: A3
■ STRATUM AREA: 1467.64 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 103 km

– TRANSECTS: 22 (491 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10 %

– BASELINE DISTANCE: 65.75 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 7.5 h
Crew(s): C05, C07
KES2022_9JCMA20220901A 06:56–09:28
KES2022_9JMFZ20220901A 07:06–12:03

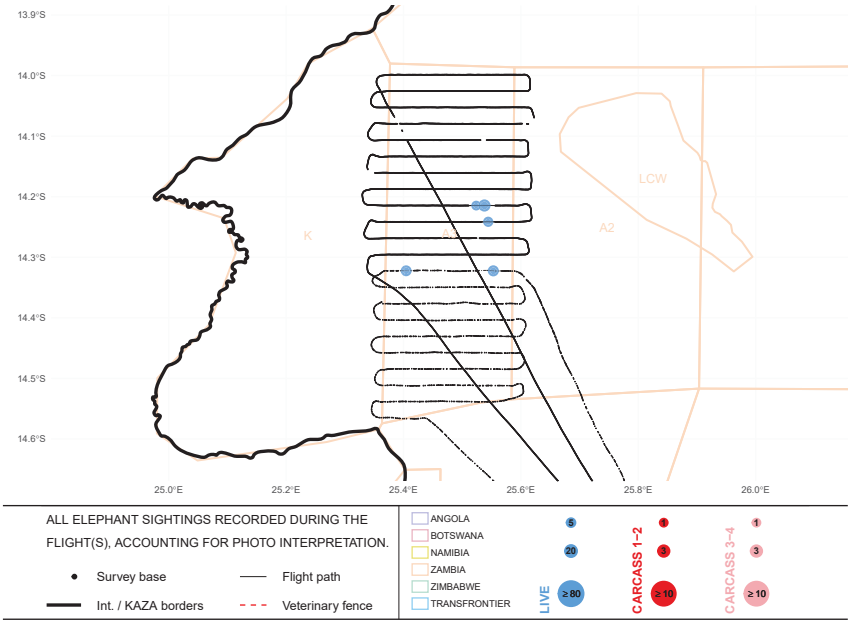
Actual sampling intensity: 9.9 %
Transect flying time: 2.8 h
Transects: 22 – 491 km – 90°
Search effort: 1.14 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	42	58	58	42
% individuals:	50	50	52	48

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	11	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	2	0	



LIVE ELEPHANTS



IN SAMPLE:	**10 (2)**
Bulls:	0 (0)
Family:	10 (2)
NOT IN SAMPLE:	**19 (3)**
Outside search strip:	19
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	14
Other wildlife count:	190
Domestic count:	85

ELEPHANT DATA ANALYSIS

t = 2.08, N = 221, w = 297

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	101	101	–	–
Variance of estimate	$Var\hat{Y}$	5106	5106	–	–
Standard error	$SE\hat{Y}$	71	71	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 149	± 149	–	–
Percentage of relative precision	$PRP\hat{Y}$	147 %	147 %	–	–
Density per sqkm	$R\hat{Y}$	0.069	0.069	–	–
Variance between transect counts	s^2_y	2.545	2.545	–	–
Variance between transect areas	s^2_a	1.492	1.492	–	–
Covariance between counts & areas	s_{ay}	0.106	0.106	–	–

CARCASS RATIOS

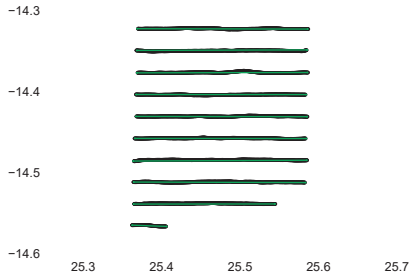
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

A3 – A3 ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220901A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:

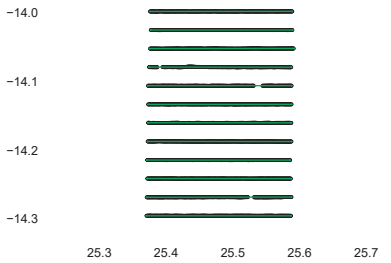


SPEED
Average: 178.2 km/h
Standard dev.: 11.4 km/h

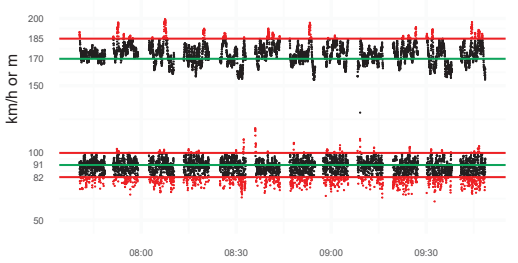
HEIGHT AGL
Average: 87 m (285.5 ft)
Standard dev.: 9.8 m (32.3 ft)

KES2022_ 9JMFZ20220901A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 174 km/h
Standard dev.: 7.4 km/h

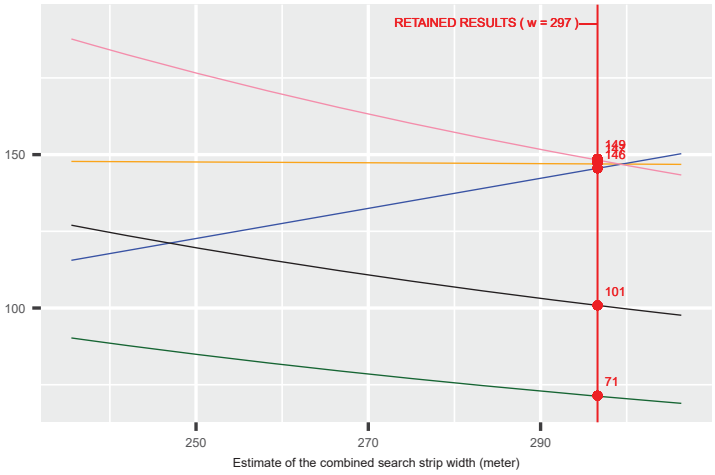
HEIGHT AGL
Average: 88.6 m (290.7 ft)
Standard dev.: 6.4 m (21.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [139 – 159]
C05 – Right: [134 – 157]

C07 – Left: [106 – 149]
C07 – Right: [93 – 152]



LIVE ELEPHANT ESTIMATE: [127 – 98]
CONFIDENCE INTERVAL: ± [188 – 143]
SAMPLE AREA: [116 – 150] sqkm
SE: [90 – 69]
PRP: [148 – 147] %

A3 – A3 ZAMBIA – KAFUE

STRATUM CODE: A3 **N:** 222 S_a^2: 1,492
STRATUM NAME: A3 **w:** 297 **df:** 21

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	7	0	71	139	0,048	4458	66,77	0	209	197	2,227	0,156
cattle	Bos taurus	69	0	696	983	0,474	223217	472,46	0	1678	141	109,361	-1,322
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	3	0	30	33	0,021	247	15,70	0	63	108	0,123	0,036
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	10	18	101	149	0,069	5106	71,46	0	249	147	2,545	0,106
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	31	39	313	356	0,213	29234	170,98	0	668	114	14,729	0,625
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	25	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	6	0	61	119	0,041	3284	57,31	0	180	197	1,636	0,078
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	21	0	212	396	0,144	36329	190,60	0	608	187	18,141	0,397
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	3	0	30	43	0,021	436	20,89	0	74	144	0,219	0,058
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	59	262	595	561	0,405	72683	269,60	34	1156	94	36,703	1,013
shoat	Capra hircus - Ovis aries	16	0	161	224	0,110	11550	107,47	0	385	139	5,636	-0,394
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	24	0	242	203	0,165	9540	97,67	39	445	84	4,848	0,447
waterbuck	Kobus ellipsiprymnus	11	0	111	218	0,076	11001	104,89	0	329	197	5,500	0,268
wildebeest	Connochaetes taurinus	1	0	10	20	0,007	91	9,54	0	30	197	0,045	0,021
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	10	19	101	149	0,069	5106	71,46	0	249	147	2,545	0,106
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

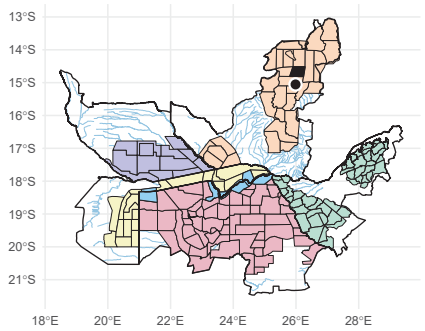
C1 – C1 ZAMBIA – KAFUE

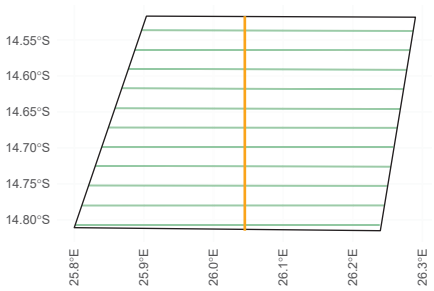
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: C1
STRATUM NAME: C1
■ STRATUM AREA: 1456.12 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 44 km

– TRANSECTS: 11 (492 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10.1 %

– BASELINE DISTANCE: 32.99 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.1 h
Crew(s): C05
KES2022_9JCMA20220908A 06:56–11:03

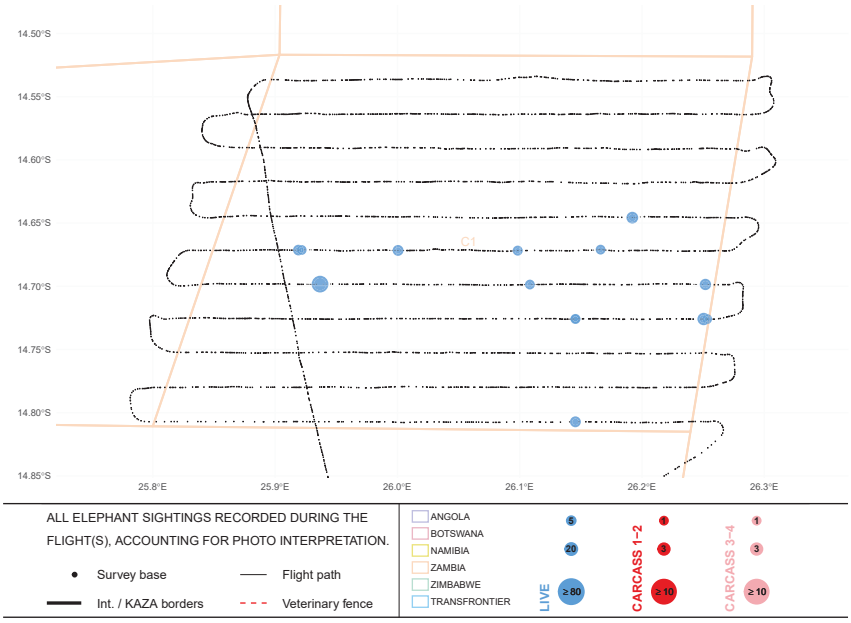
Actual sampling intensity: 10.3 %
Transect flying time: 2.9 h
Transects: 11 – 492 km – 90°
Search effort: 1.16 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	53	47
% individuals:	63	37

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	43	37.21	0
Live elephant (>9):	2	100	0
Elephant carcass:	0		
Live elephant (<10):	9	44.44	0



LIVE ELEPHANTS



IN SAMPLE:	**52 (11)**
Bulls:	7 (5)
Family:	45 (6)
NOT IN SAMPLE:	**38 (4)**
Outside search strip:	38
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	20
Other wildlife count:	823
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.228, N = 108, w = 304

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	507	507	–	–
Variance of estimate	$Var\hat{Y}$	37670	37670	–	–
Standard error	$SE\hat{Y}$	194	194	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 432	± 432	–	–
Percentage of relative precision	$PRP\hat{Y}$	85 %	85 %	–	–
Density per sqkm	$R\hat{Y}$	0.348	0.348	–	–
Variance between transect counts	s^2_y	40.018	40.018	–	–
Variance between transect areas	s^2_a	0.259	0.259	–	–
Covariance between counts & areas	s_{ay}	1.313	1.313	–	–

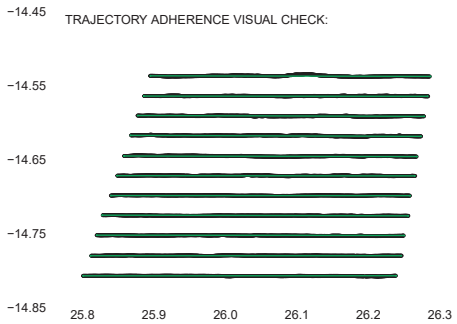
CARCASS RATIOS

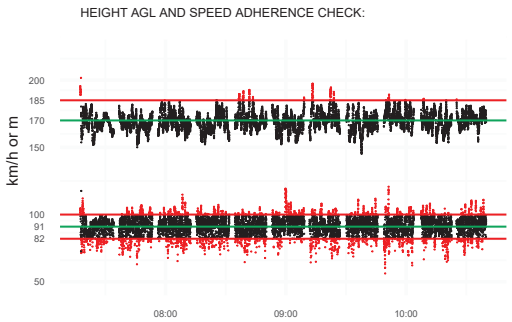
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

C1 – C1 ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220908A





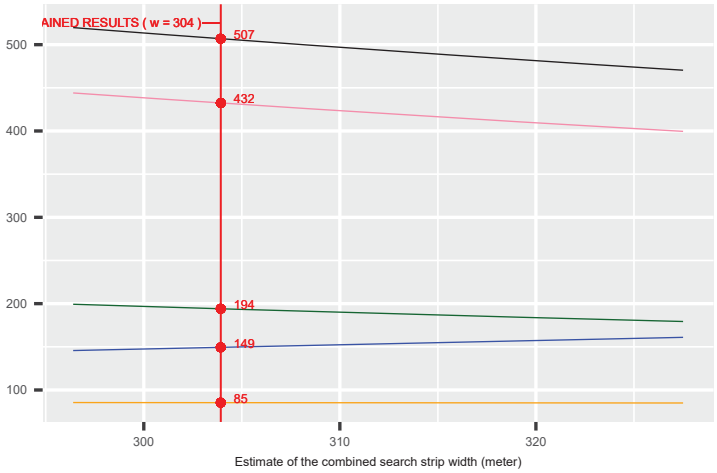
SPEED
Average: 169.5 km/h
Standard dev.: 6.8 km/h

HEIGHT AGL
Average: 91.3 m (299.4 ft)
Standard dev.: 6.8 m (22.5 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [146 – 167]
C05 – Right: [141 – 164]



LIVE ELEPHANT ESTIMATE: [520 – 470]
CONFIDENCE INTERVAL: ± [444 – 400]
SAMPLE AREA: [146 – 161] sqkm
SE: [199 – 179]
PRP: [85 – 85] %

C1 – C1 ZAMBIA – KAFUE

STRATUM CODE: C1 **N:** 109 S_a^2: 0,259
STRATUM NAME: C1 **w:** 304 **df:** 10

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	72	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	2	0	19	28	0,013	158	12,56	0	47	144	0,164	-0,009
bushpig	Potamochoerus larvatus	3	0	29	45	0,020	402	20,05	0	74	153	0,418	0,020
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	19	28	0,013	155	12,44	0	47	142	0,164	0,105
eland	Tragelaphus oryx	15	27	146	193	0,100	7492	86,56	0	339	132	7,855	0,364
elephant bulls	Loxodonta africana males	7	2	68	98	0,047	1950	44,16	0	167	144	2,055	0,306
elephant family	Loxodonta africana family	45	36	439	353	0,301	25130	158,53	85	792	81	26,691	1,006
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	48	36	468	693	0,321	96681	310,94	0	1161	148	101,455	1,615
hippopotamus	Hippopotamus amphibius	21	0	205	196	0,141	7749	88,03	9	401	96	7,891	-0,551
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	218	101	2125	2233	1,459	1004520	1002,26	0	4358	105	1063,764	7,094
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	3	0	29	44	0,020	396	19,91	0	74	152	0,418	0,159
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	312	235	3041	2315	2,089	1079328	1038,91	726	5356	76	1155,055	8,344
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	4	0	39	56	0,027	630	25,10	0	95	143	0,655	0,000
roan	Hippotragus equinus	8	23	78	146	0,054	4297	65,55	0	224	187	4,418	-0,421
sable	Hippotragus niger	31	106	302	313	0,208	19747	140,52	0	615	104	20,964	1,106
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	52	19	507	285	0,348	16362	127,91	222	792	56	16,618	-0,502
waterbuck	Kobus ellipsiprymnus	72	13	702	555	0,482	61972	248,94	147	1257	79	63,873	-0,467
wildebeest	Connochaetes taurinus	12	0	117	191	0,080	7375	85,88	0	308	164	7,691	0,191
zebra	Equus spp,	16	18	156	242	0,107	11752	108,41	0	398	155	12,273	0,311
all elephants	Loxodonta africana all	52	38	507	432	0,348	37670	194,09	74	939	85	40,018	1,313
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

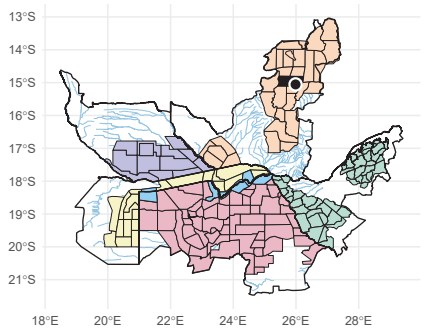
C2 – C2 ZAMBIA – KAFUE

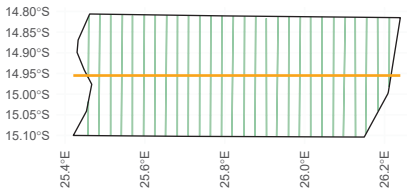
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: C2
STRATUM NAME: C2
■ STRATUM AREA: 2642.74 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 19 km

– TRANSECTS: 28 (881 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 10 %

– BASELINE DISTANCE: 88.08 km





SURVEY IMPLEMENTATION

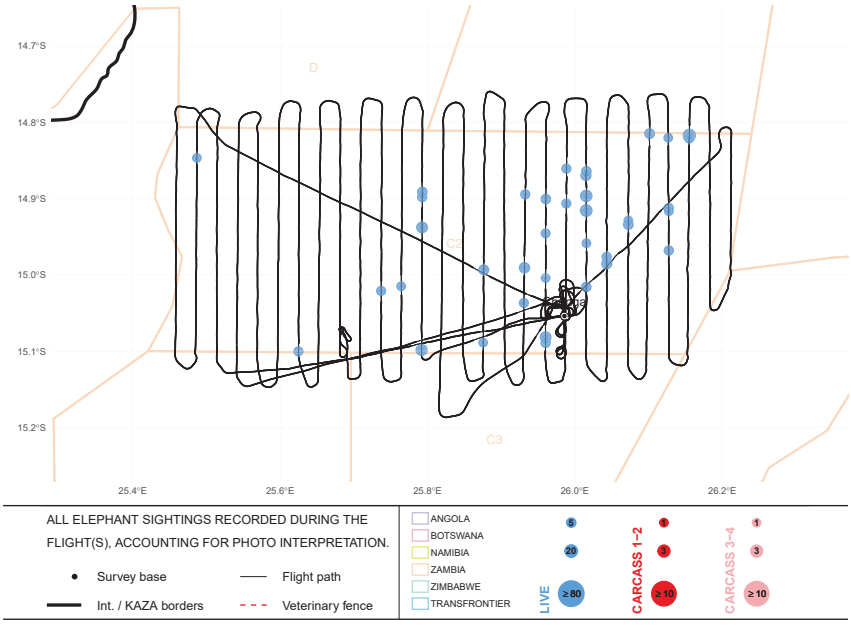
Number of flight(s): 3
Combined flying time: 9.4 h
Crew(s): C05, C07
KES2022_9JCMA20220910A 06:39–08:24
KES2022_9JMFZ20220910A 06:52–11:13
KES2022_9JMFZ20220911A 07:03–10:20
Actual sampling intensity: 10.3 %
Transect flying time: 5.1 h
Transects: 28 – 881 km – 0°
Search effort: 1.13 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	61	39	**56**	**44**
% individuals:	70	30	**65**	**35**

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	57	56.14	31.25
Live elephant (>9):	5	100	20
Elephant carcass:	0		
Live elephant (<10):	17	76.47	7.69





LIVE ELEPHANTS

IN SAMPLE:	**118 (22)**
Bulls:	7 (7)
Family:	111 (15)
NOT IN SAMPLE:	**84 (18)**
Outside search strip:	84
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	21
Other wildlife count:	727
Domestic count:	19

ELEPHANT DATA ANALYSIS

t = 2.052, N = 286, w = 308

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	1150	1150	–	–
Variance of estimate	$Var\hat{Y}$	210060	220548	–	–
Standard error	$SE\hat{Y}$	458	470	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 940	± 964	–	–
Percentage of relative precision	$PRP\hat{Y}$	82 %	84 %	–	–
Density per sqkm	$R\hat{Y}$	0.435	0.435	–	–
Variance between transect counts	s^2_y	80.767	84.767	–	–
Variance between transect areas	s^2_a	1.009	1.009	–	–
Covariance between counts & areas	s_{ay}	1.569	1.599	–	–

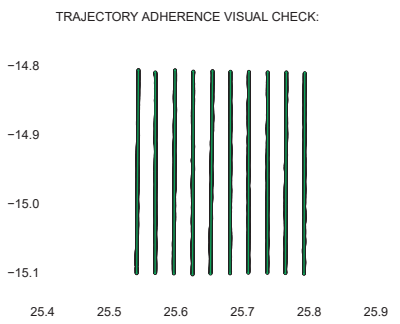
CARCASS RATIOS

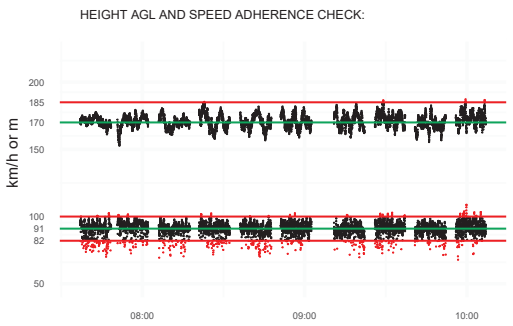
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

C2 – C2 ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JMFZ20220911A

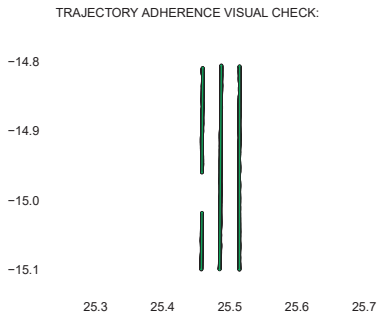


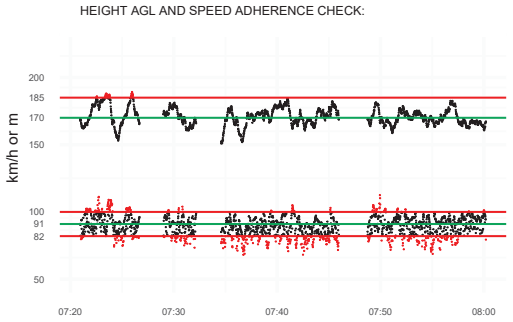


SPEED
Average: 170.9 km/h
Standard dev.: 4.9 km/h

HEIGHT AGL
Average: 90.8 m (298 ft)
Standard dev.: 4.8 m (15.6 ft)

KES2022_ 9JCMA20220910A

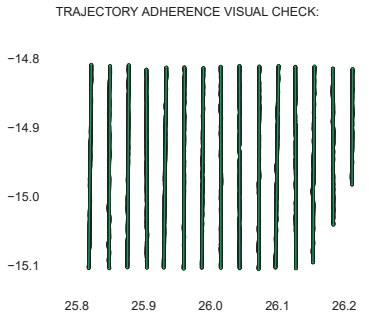


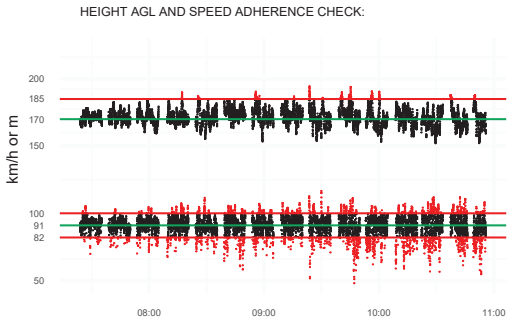


SPEED
Average: 170.8 km/h
Standard dev.: 6.7 km/h

HEIGHT AGL
Average: 89.4 m (293.4 ft)
Standard dev.: 7.5 m (24.7 ft)

KES2022_ 9JMFZ20220910A





SPEED
Average: 171.6 km/h
Standard dev.: 6.1 km/h

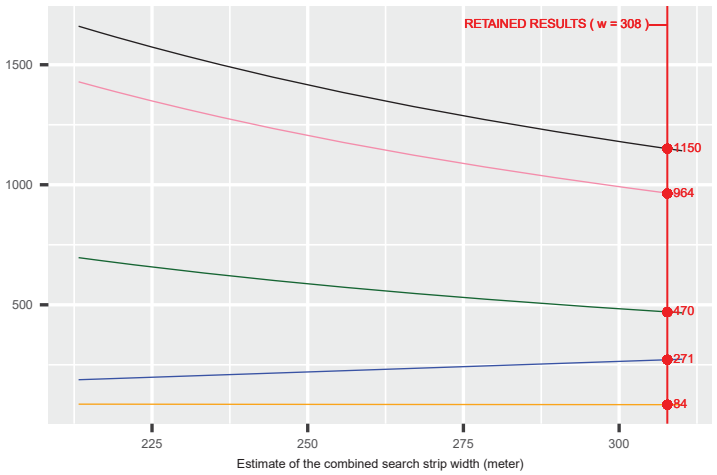
HEIGHT AGL
Average: 90.7 m (297.4 ft)
Standard dev.: 7.4 m (24.4 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [143 – 164]
C05 – Right: [138 – 161]

C07 – Left: [109 – 153]
C07 – Right: [95 – 156]



LIVE ELEPHANT ESTIMATE: [1661 – 1142]
CONFIDENCE INTERVAL: ± [1429 – 957]
SAMPLE AREA: [188 – 273] sqkm
SE: [696 – 467]
PRP: [86 – 84] %

C2 – C2 ZAMBIA – KAFUE

STRATUM CODE: C2 **N:** 286 S_a^2: 1,009
STRATUM NAME: C2 **w:** 308 **df:** 27

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	740	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	7	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	19	7	185	381	0,070	34520	185,79	0	566	206	12,893	-1,297
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	5	0	49	50	0,018	595	24,39	0	99	103	0,226	0,030
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	7	3	68	46	0,026	506	22,50	22	114	68	0,194	0,064
elephant family	Loxodonta africana family	111	81	1082	946	0,410	212464	460,94	136	2028	87	81,591	1,535
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	1	0	10	20	0,004	94	9,70	0	30	204	0,036	0,015
hartebeest	Alcelaphus spp,	109	43	1063	897	0,402	191264	437,34	165	1960	84	73,358	1,307
hippopotamus	Hippopotamus amphibius	105	35	1024	770	0,387	140856	375,31	254	1794	75	54,120	1,163
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	190	231	1852	1399	0,701	465135	682,01	453	3252	76	171,878	-2,758
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	3	2	29	60	0,011	847	29,10	0	89	204	0,321	0,029
oribi	Ourebia ourebi	0	2	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	121	49	1180	832	0,446	164266	405,30	348	2011	70	62,967	1,039
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	16	0	156	141	0,059	4735	68,81	15	297	91	1,810	0,161
roan	Hippotragus equinus	1	45	10	20	0,004	94	9,70	0	30	204	0,036	0,015
sable	Hippotragus niger	36	52	351	440	0,133	45934	214,32	0	791	125	17,397	0,038
shoat	Capra hircus - Ovis aries	0	3	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	73	21	712	315	0,269	23610	153,66	396	1027	44	8,988	0,214
waterbuck	Kobus ellipsiprymnus	17	37	166	244	0,063	14105	118,77	0	409	147	5,358	0,142
wildebeest	Connochaetes taurinus	2	0	19	40	0,007	376	19,40	0	59	204	0,143	0,024
zebra	Equus spp,	22	18	214	190	0,081	8598	92,72	24	405	89	3,286	0,213
all elephants	Loxodonta africana all	118	84	1150	964	0,435	220548	469,63	187	2114	84	84,767	1,599
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

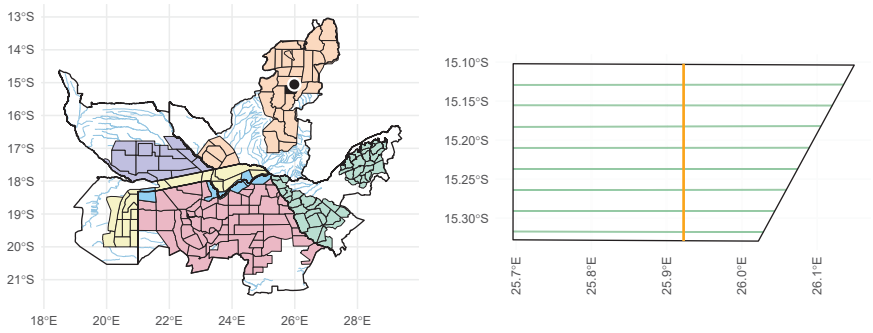
C3 – C3 ZAMBIA – KAFUE

SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: C3
STRATUM NAME: C3
■ STRATUM AREA: 1046.2 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 21 km

– TRANSECTS: 8 (331 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 9.5 %

– BASELINE DISTANCE: 25.16 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.3 h
Crew(s): C05
KES2022_9JCMA20220905A 07:03–10:20

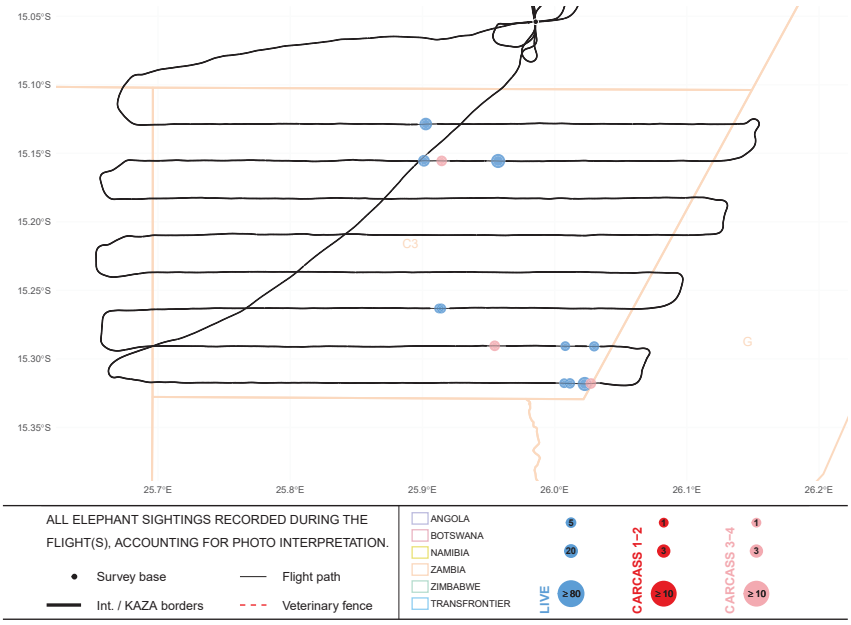
Actual sampling intensity: 9.2 %
Transect flying time: 1.9 h
Transects: 8 – 331 km – 90°
Search effort: 1.21 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	44	56
% individuals:	49	51

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	23	43.48	50
Live elephant (>9):	3	100	66.67
Elephant carcass:	1	100	0
Live elephant (<10):	5	20	0



LIVE ELEPHANTS



IN SAMPLE:	**53 (8)**
Bulls:	5 (4)
Family:	48 (4)
NOT IN SAMPLE:	**25 (2)**
Outside search strip:	25
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	0 (0)
NOT IN SAMPLE:	**2 (2)**
Outside search strip:	2
Off transect:	0

OTHER SPECIES

Other wildlife species:	13
Other wildlife count:	365
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.365, N = 86, w = 291

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	587	576	11	11
Variance of estimate	$Var\hat{Y}$	103561	93286	102	102
Standard error	$SE\hat{Y}$	322	305	10	10
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 761	± 722	± 24	± 24
Percentage of relative precision	$PRP\hat{Y}$	130 %	125 %	220 %	220 %
Density per sqkm	$R\hat{Y}$	0.561	0.55	0.01	0.01
Variance between transect counts	s^2_y	131.357	118.839	0.125	0.125
Variance between transect areas	s^2_a	1.786	1.786	1.786	1.786
Covariance between counts & areas	s_{ay}	9.073	8.827	0.232	0.232

CARCASS RATIOS

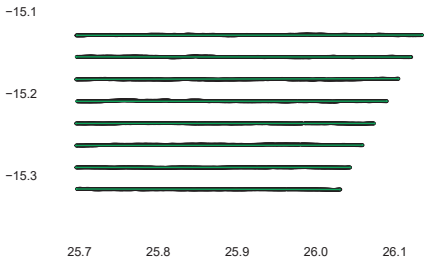
$CR_{1:4}$ = 1.9 %
$CR_{1:2}$ = 0 %

C3 – C3 ZAMBIA – KAFUE

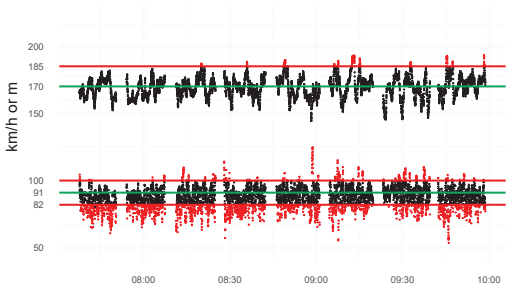
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220905A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



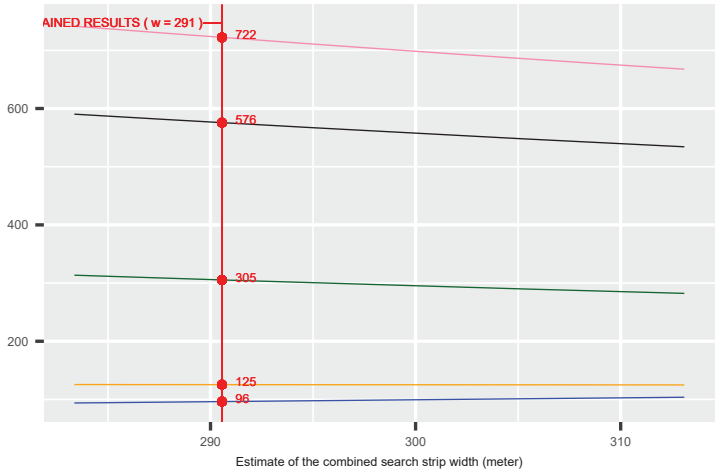
SPEED
Average: 169.3 km/h
Standard dev.: 7.9 km/h

HEIGHT AGL
Average: 87.2 m (286.3 ft)
Standard dev.: 8 m (26.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [139 – 160]
C05 – Right: [135 – 157]



LIVE ELEPHANT ESTIMATE: [590 – 534]
CONFIDENCE INTERVAL: ± [742 – 668]
SAMPLE AREA: [94 – 104] sqkm
SE: [314 – 282]
PRP: [126 – 125] %

C3 – C3 ZAMBIA – KAFUE

STRATUM CODE: C3 **N:** 87 S_a^2: 1,786
STRATUM NAME: C3 **w:** 291 **df:** 7

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	19	0	206	282	0,197	14179	119,08	0	488	136	15,125	-3,738
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	22	32	0,021	185	13,60	0	54	148	0,214	-0,054
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	5	0	54	76	0,052	1033	32,14	0	130	140	1,125	-0,813
elephant family	Loxodonta africana family	48	25	521	744	0,498	98898	314,48	0	1265	143	125,429	9,641
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	2	11	24	0,010	102	10,12	0	35	220	0,125	0,232
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	53	71	576	627	0,550	70386	265,30	0	1203	109	78,839	-3,057
hippopotamus	Hippopotamus amphibius	17	0	185	197	0,177	6975	83,52	0	382	107	8,982	2,375
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	95	62	1032	1505	0,986	405236	636,58	0	2537	146	453,554	-10,695
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	5	3	54	52	0,052	486	22,05	2	106	96	0,554	-0,127
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	36	5	391	502	0,374	45102	212,37	0	893	128	57,143	5,847
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	15	0	163	359	0,156	23098	151,98	0	522	221	28,125	3,259
sable	Hippotragus niger	4	64	43	53	0,042	509	22,57	0	97	123	0,571	-0,292
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	64	4	695	671	0,664	80555	283,82	24	1366	97	92,857	-0,793
waterbuck	Kobus ellipsiprymnus	38	35	413	342	0,395	20921	144,64	71	755	83	27,357	3,854
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	10	2	109	241	0,104	10416	102,06	0	350	222	12,500	1,320
all elephants	Loxodonta africana all	53	25	576	722	0,550	93286	305,43	0	1298	125	118,839	8,827
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	2	11	24	0,010	102	10,12	0	35	220	0,125	0,232
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	2	11	24	0,010	102	10,12	0	35	220	0,125	0,232

D – D

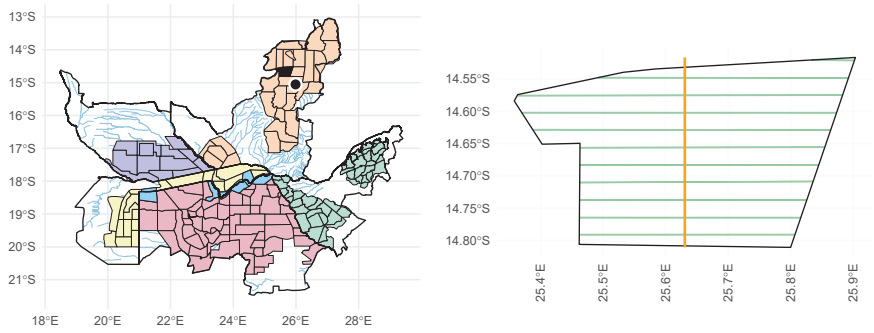
ZAMBIA – KAFUE

SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: D
STRATUM NAME: D
■ STRATUM AREA: 1372.38 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 51 km

– TRANSECTS: 11 (451 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 9.9 %

– BASELINE DISTANCE: 32.52 km



SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.8 h
Crew(s): C05
KES2022_9JCMA20220903A 07:05–10:55

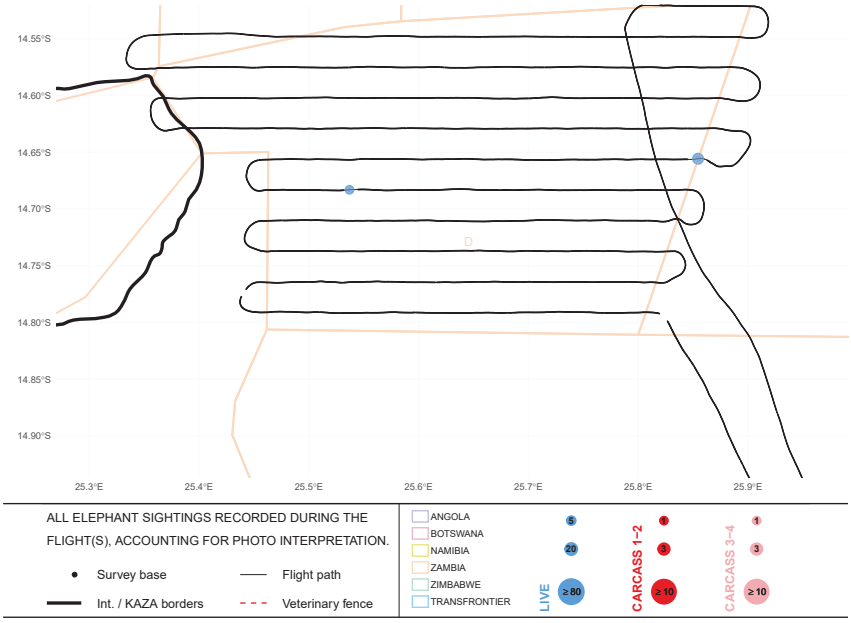
Actual sampling intensity: 9.8 %
Transect flying time: 2.6 h
Transects: 11 – 451 km – 90°
Search effort: 1.16 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	41	59
% individuals:	34	66

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	16	37.5	33.33
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**12 (2)**
Outside search strip:	12
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	11
Other wildlife count:	215
Domestic count:	177

ELEPHANT DATA ANALYSIS

t = 2.228, N = 109, w = 297

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	–	–	–	–
Standard error	$\mathrm{SE}\hat{Y}$	–	–	–	–
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	–	–	–	–
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s_y^2	–	–	–	–
Variance between transect areas	s_a^2	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

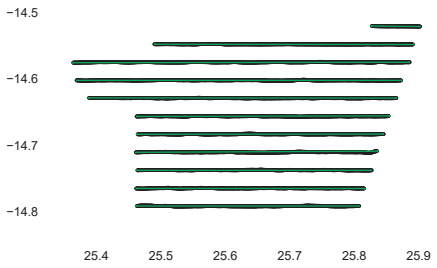
D – D

ZAMBIA – KAFUE

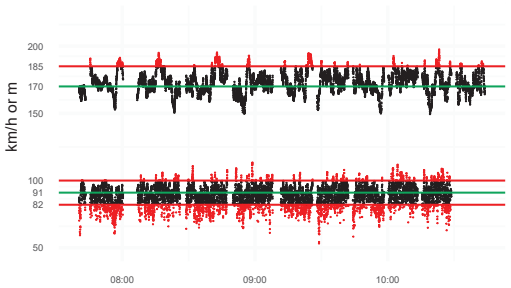
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220903A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED

Average:	173.1 km/h
Standard dev.:	8.1 km/h

HEIGHT AGL

Average:	88.7 m	(290.8 ft)
Standard dev.:	7.7 m	(25.2 ft)

Despite the failure of the laser to automatically record continuous height data throughout transect D−11, the front seat observer manually recorded this information approximately every 30 seconds.

D – D ZAMBIA – KAFUE

STRATUM CODE: D **N:** 109 S_a^2: 14,021
STRATUM NAME: D **w:** 297 **df:** 10

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	42	116	430	598	0,314	71974	268,28	0	1028	139	60,964	-17,752
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	149	21	1526	924	1,112	171930	414,64	602	2450	61	205,273	21,178
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	2	0	20	42	0,015	358	18,92	0	63	206	0,364	0,049
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	11	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	23	77	236	301	0,172	18302	135,28	0	537	128	18,291	0,062
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	3	0	31	63	0,022	805	28,38	0	94	206	0,818	0,073
roan	Hippotragus equinus	4	13	41	38	0,030	293	17,10	3	79	93	0,255	-0,529
sable	Hippotragus niger	104	216	1065	712	0,776	102254	319,77	353	1778	67	113,273	11,168
shoat	Capra hircus - Ovis aries	28	0	287	392	0,209	30982	176,02	0	679	137	32,873	4,445
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	21	17	215	185	0,157	6879	82,94	30	400	86	7,691	3,231
waterbuck	Kobus ellipsiprymnus	2	0	20	42	0,015	362	19,02	0	63	207	0,364	-0,079
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	1	5	10	21	0,007	89	9,46	0	31	206	0,091	0,024
all elephants	Loxodonta africana all	0	12	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

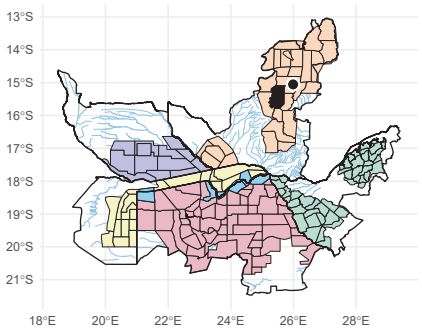
E – E ZAMBIA – KAFUE

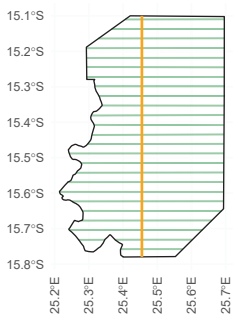
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: E
STRATUM NAME: E
■ STRATUM AREA: 3092.98 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 67 km

– TRANSECTS: 25 (1032 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10 %

– BASELINE DISTANCE: 75.26 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 9.7 h
Crew(s): C05, C07
KES2022_9JCMA20220915A 07:01–11:44
KES2022_9JMFZ20220915A 07:05–12:06

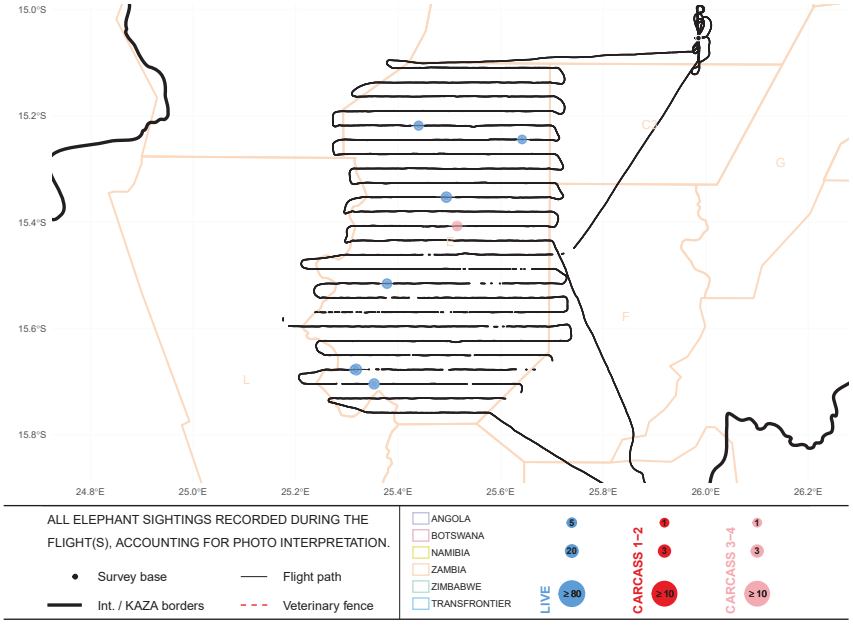
Actual sampling intensity: 10.2 %
Transect flying time: 6 h
Transects: 25 – 1032 km – 90°
Search effort: 1.15 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	51	49	48	52
% individuals:	54	46	40	60

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	25	60	40
Live elephant (>9):	1	100	100
Elephant carcass:	1	100	0
Live elephant (<10):	2	50	0





LIVE ELEPHANTS

IN SAMPLE:	**17 (3)**
Bulls:	1 (1)
Family:	16 (2)
NOT IN SAMPLE:	**21 (4)**
Outside search strip:	21
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**1 (1)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	1 (1)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	18
Other wildlife count:	655
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.064, N = 247, w = 304

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	158	167	10	10
Variance of estimate	$Var\hat{Y}$	12340	14315	88	88
Standard error	$SE\hat{Y}$	111	120	9	9
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	± 229	± 247	± 19	± 19
Percentage of relative precision	$PRP\hat{Y}$	146 %	148 %	197 %	197 %
Density per sqkm	$R\hat{Y}$	0.051	0.054	0.003	0.003
Variance between transect counts	s^2_y	5.657	6.56	0.04	0.04
Variance between transect areas	s^2_a	4.024	4.024	4.024	4.024
Covariance between counts & areas	s_{ay}	0.475	0.496	−0.016	−0.016

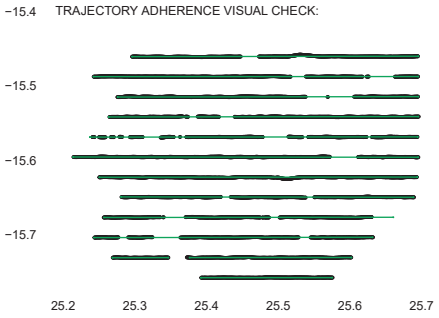
CARCASS RATIOS

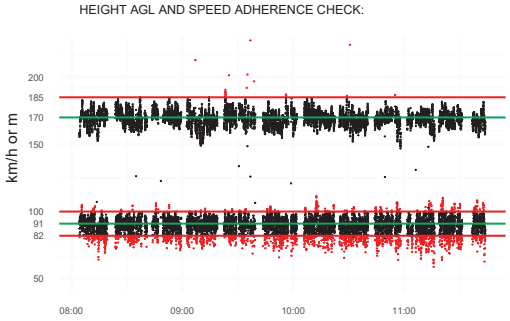
$CR_{1:4}$ = 5.6 %
$CR_{1:2}$ = 0 %

E – E ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JMFZ20220915A

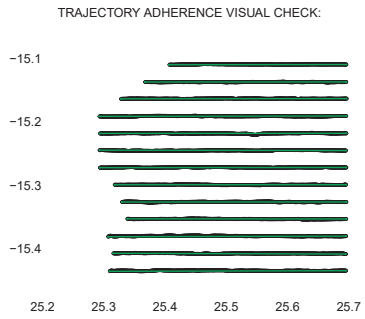


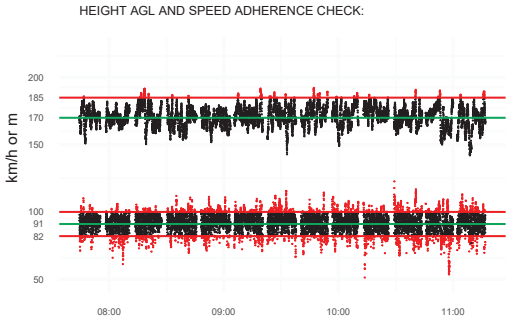


SPEED
Average: 169.1 km/h
Standard dev.: 5.9 km/h

HEIGHT AGL
Average: 89.2 m (292.7 ft)
Standard dev.: 6.4 m (20.9 ft)

KES2022_ 9JCMA20220915A





SPEED
Average: 170.9 km/h
Standard dev.: 7.4 km/h

HEIGHT AGL
Average: 91.7 m (300.8 ft)
Standard dev.: 7.2 m (23.6 ft)

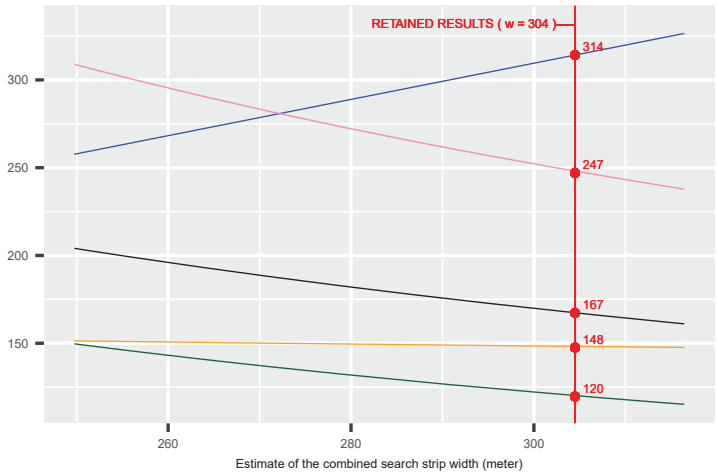
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [146 – 168]
C05 – Right: [141 – 165]

C07 – Left: [107 – 150]
C07 – Right: [94 – 153]

LIVE ELEPHANT ESTIMATE: [204 – 161]
CONFIDENCE INTERVAL: ± [309 – 238]
SAMPLE AREA: [258 – 326] sqkm
SE: [150 – 115]
PRP: [151 – 148] %



E – E ZAMBIA – KAFUE

STRATUM CODE: E **N:** 247 S_a^2: 4,024
STRATUM NAME: E **w:** 304 **df:** 24

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	2	300	20	39	0,006	353	18,79	0	58	197	0,160	-0,042
bushbuck	Tragelaphus scriptus	1	0	10	19	0,003	87	9,35	0	29	196	0,040	0,037
bushpig	Potamochoerus larvatus	1	0	10	19	0,003	87	9,32	0	29	195	0,040	0,080
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	15	0	148	98	0,048	2262	47,56	50	246	66	1,083	0,656
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	1	1	10	19	0,003	88	9,36	0	29	196	0,040	0,022
elephant family	Loxodonta africana family	16	20	158	229	0,051	12340	111,09	0	387	146	5,657	0,475
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	1	0	10	19	0,003	88	9,39	0	29	197	0,040	-0,016
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	101	25	994	810	0,321	154048	392,49	184	1804	81	68,957	-1,195
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	34	63	335	394	0,108	36351	190,66	0	728	118	16,823	1,474
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	25	0	246	212	0,080	10546	102,69	34	458	86	4,917	0,881
oribi	Ourebia ourebi	2	1	20	39	0,006	349	18,68	0	58	196	0,160	0,095
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	14	31	138	187	0,045	8244	90,80	0	325	136	3,757	0,122
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	3	0	30	42	0,010	422	20,54	0	72	144	0,193	0,084
roan	Hippotragus equinus	67	71	660	792	0,213	147165	383,62	0	1451	120	66,477	-0,814
sable	Hippotragus niger	206	294	2028	952	0,656	212831	461,34	1076	2980	47	91,440	-2,848
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	123	50	1211	470	0,392	51818	227,64	741	1681	39	24,577	2,043
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	9	0	89	174	0,029	7084	84,17	0	262	196	3,240	0,309
zebra	Equus spp,	14	7	138	196	0,045	9010	94,92	0	334	142	4,090	-0,051
all elephants	Loxodonta africana all	17	21	167	247	0,054	14315	119,65	0	414	148	6,560	0,496
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	1	0	10	19	0,003	88	9,39	0	29	197	0,040	-0,016
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	1	0	10	19	0,003	88	9,39	0	29	197	0,040	-0,016

F – F

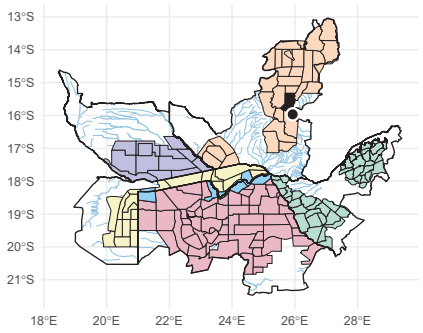
ZAMBIA – KAFUE

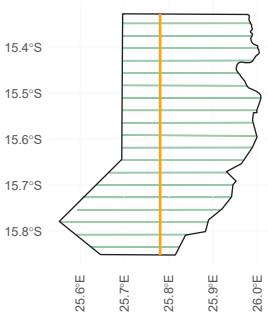
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: F
STRATUM NAME: F
■ STRATUM AREA: 1804.69 sqkm
• SURVEY BASE: Ngoma
DISTANCE TO SURVEY BASE: 44 km

– TRANSECTS: 19 (593 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 9.9 %

– BASELINE DISTANCE: 57.98 km





SURVEY IMPLEMENTATION

Number of flight(s): 2
Combined flying time: 5.8 h
Crew(s): C05, C07
KES2022_9JCMA20220916A 06:47–09:52
KES2022_9JMFZ20220916A 06:39–09:22

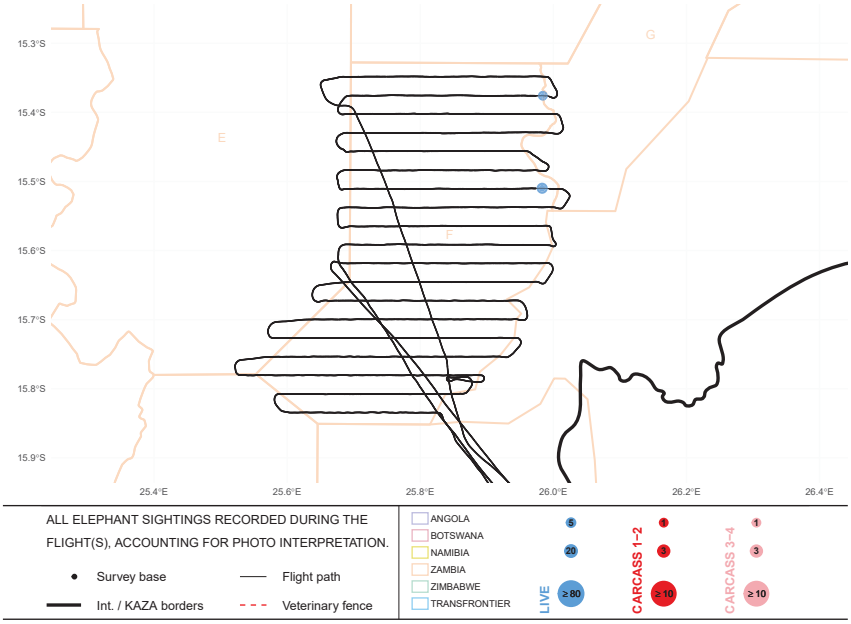
Actual sampling intensity: 10 %
Transect flying time: 3.5 h
Transects: 19 – 593 km – 90°
Search effort: 1.15 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	44	56	67	33
% individuals:	54	46	72	28

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	19	47.37	33.33
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	2	50	0





LIVE ELEPHANTS

IN SAMPLE:	**8 (2)**
Bulls:	1 (1)
Family:	7 (1)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	19
Other wildlife count:	655
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.101, N = 190, w = 305

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	80	80	–	–
Variance of estimate	$Var\hat{Y}$	4403	4403	–	–
Standard error	$SE\hat{Y}$	66	66	–	–
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 139	± 139	–	–
Percentage of relative precision	$PRP\hat{Y}$	174 %	174 %	–	–
Density per sqkm	$R\hat{Y}$	0.044	0.044	–	–
Variance between transect counts	s_y^2	2.591	2.591	–	–
Variance between transect areas	s_a^2	1.037	1.037	–	–
Covariance between counts & areas	s_{ay}	0.323	0.323	–	–

CARCASS RATIOS

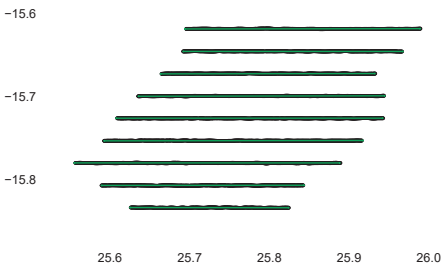
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

F – F ZAMBIA – KAFUE

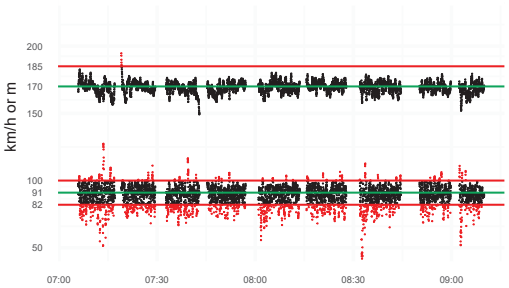
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JMFZ20220916A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:

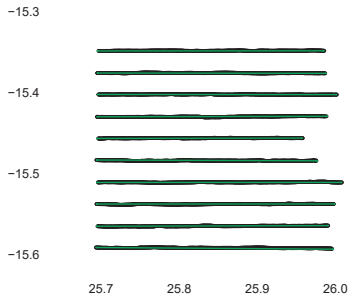


SPEED
Average: 169.2 km/h
Standard dev.: 4.2 km/h

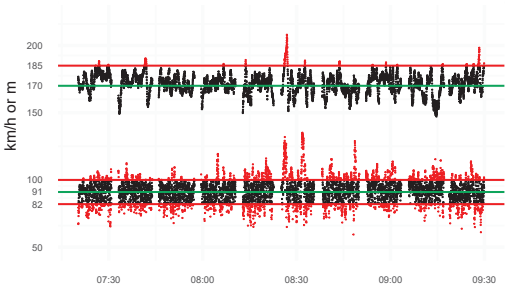
HEIGHT AGL
Average: 88.9 m (291.7 ft)
Standard dev.: 7.7 m (25.4 ft)

KES2022_ 9JCMA20220916A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 171.7 km/h
Standard dev.: 7.4 km/h

HEIGHT AGL
Average: 91.9 m (301.6 ft)
Standard dev.: 9.1 m (29.9 ft)

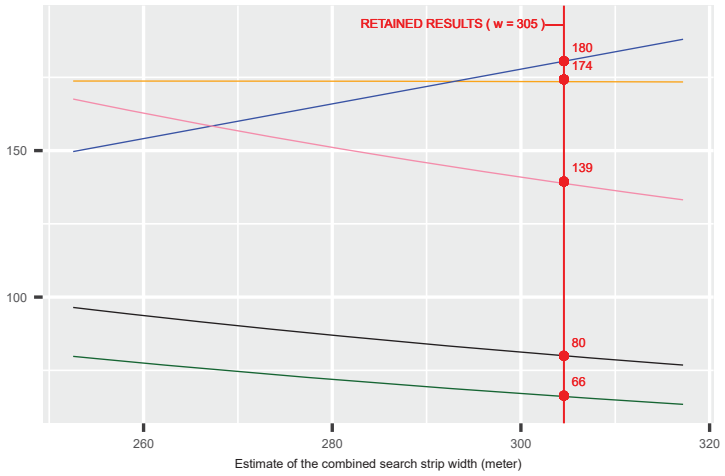
INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [147 – 168]
C05 – Right: [142 – 166]

C07 – Left: [107 – 150]
C07 – Right: [94 – 153]

LIVE ELEPHANT ESTIMATE: [96 – 77]
CONFIDENCE INTERVAL: ± [168 – 133]
SAMPLE AREA: [150 – 188] sqkm
SE: [80 – 63]
PRP: [174 – 173] %



F – F ZAMBIA – KAFUE

STRATUM CODE: F **N:** 190 S_a^2: 1,037
STRATUM NAME: F **w:** 305 **df:** 18

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	77	840	770	1389	0,427	437169	661,19	0	2159	180	256,275	2,219
bushbuck	Tragelaphus scriptus	4	0	40	55	0,022	687	26,20	0	95	138	0,398	-0,036
bushpig	Potamochoerus larvatus	1	0	10	20	0,006	90	9,47	0	30	199	0,053	0,036
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	7	0	70	65	0,039	965	31,06	5	135	93	0,579	0,240
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	1	0	10	20	0,006	90	9,51	0	30	200	0,053	0,001
elephant family	Loxodonta africana family	7	0	70	139	0,039	4389	66,25	0	209	199	2,579	0,322
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	67	150	670	816	0,371	150866	388,42	0	1486	122	89,596	2,542
hippopotamus	Hippopotamus amphibius	15	19	150	300	0,083	20322	142,56	0	449	200	11,842	0,091
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	110	176	1100	935	0,609	198114	445,10	165	2035	85	113,842	-0,934
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	8	7	80	109	0,044	2685	51,82	0	189	136	1,591	0,328
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	25	271	250	253	0,139	14510	120,46	0	503	101	8,339	-0,327
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	4	0	40	79	0,022	1429	37,80	0	119	199	0,842	0,238
roan	Hippotragus equinus	14	0	140	176	0,078	6987	83,59	0	316	125	4,094	0,200
sable	Hippotragus niger	116	290	1160	784	0,643	139323	373,26	376	1944	68	84,544	2,989
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	162	39	1620	527	0,898	63037	251,07	1092	2147	33	38,930	1,703
waterbuck	Kobus ellipsiprymnus	36	2	360	344	0,199	26856	163,88	16	704	96	15,988	0,980
wildebeest	Connochaetes taurinus	1	2	10	20	0,006	90	9,49	0	30	199	0,053	0,020
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	8	0	80	139	0,044	4403	66,36	0	219	174	2,591	0,323
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

G – G

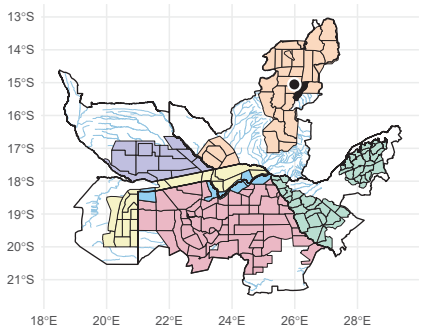
ZAMBIA – KAFUE

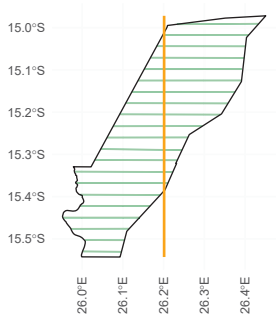
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: G
STRATUM NAME: G
■ STRATUM AREA: 1369.96 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 31 km

– TRANSECTS: 21 (462 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10.1 %

– BASELINE DISTANCE: 63.2 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C05
KES2022_9JCMA20220906A 06:48–11:15

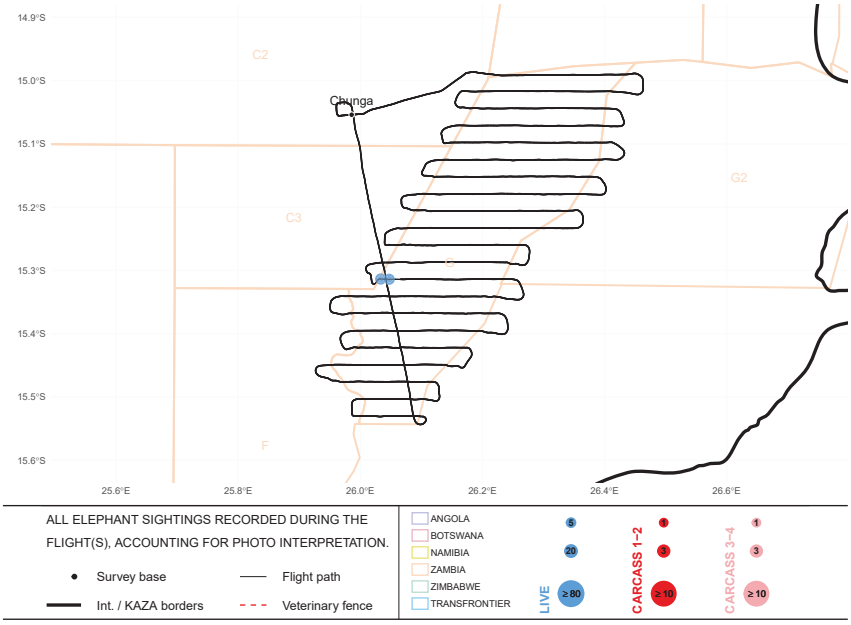
Actual sampling intensity: 9.8 %
Transect flying time: 2.7 h
Transects: 21 – 462 km – 90°
Search effort: 1.21 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	43	57
% individuals:	38	62

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	29	6.9	50
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	1	100	0



LIVE ELEPHANTS



IN SAMPLE:	**7 (1)**
Bulls:	0 (0)
Family:	7 (1)
NOT IN SAMPLE:	**8 (1)**
Outside search strip:	8
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	8
Other wildlife count:	63
Domestic count:	803

ELEPHANT DATA ANALYSIS

t = 2.086, N = 217, w = 291

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	71	71	–	–
Variance of estimate	$\widehat{Var}$	4753	4753	–	–
Standard error	$\widehat{SE}$	69	69	–	–
95% confidence interval	$\widehat{CI}^{95\%}$	± 144	± 144	–	–
Percentage of relative precision	$\widehat{PRP}$	201 %	201 %	–	–
Density per sqkm	$\hat{R}$	0.052	0.052	–	–
Variance between transect counts	s_y^2	2.333	2.333	–	–
Variance between transect areas	s_a^2	1.903	1.903	–	–
Covariance between counts & areas	s_{ay}	−0.028	−0.028	–	–

CARCASS RATIOS

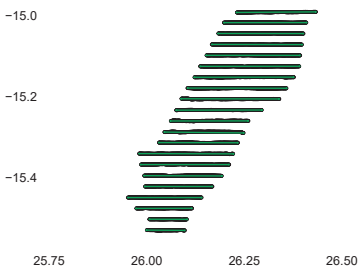
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

G – G ZAMBIA – KAFUE

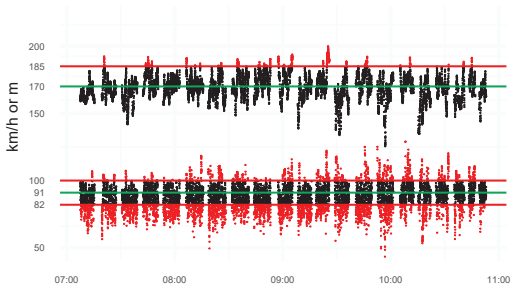
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220906A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



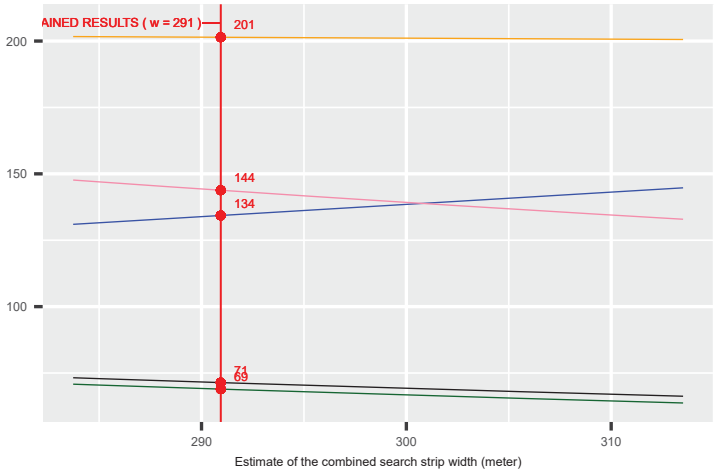
SPEED
Average: 169.3 km/h
Standard dev.: 9.4 km/h

HEIGHT AGL
Average: 87.3 m (286.6 ft)
Standard dev.: 9.6 m (31.5 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C05 – Left: [139 – 160]
C05 – Right: [135 – 157]



LIVE ELEPHANT ESTIMATE: [73 – 66]
CONFIDENCE INTERVAL: ± [148 – 133]
SAMPLE AREA: [131 – 145] sqkm
SE: [71 – 64]
PRP: [202 – 201] %

G – G ZAMBIA – KAFUE

STRATUM CODE: G **N:** 217 S_a^2: 1,903
STRATUM NAME: G **w:** 291 **df:** 20

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	514	0	5243	3134	3,827	2257250	1502,41	2109	8377	60	1016,662	-8,807
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	10	20	0,007	96	9,78	0	31	200	0,048	0,041
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	7	8	71	144	0,052	4753	68,94	0	215	201	2,333	-0,028
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	12	3	122	143	0,089	4722	68,72	0	266	117	2,357	0,258
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	16	0	163	253	0,119	14752	121,46	0	417	155	7,390	0,631
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	9	43	92	163	0,067	6097	78,09	0	255	177	3,057	0,463
shoat	Capra hircus - Ovis aries	289	0	2948	2224	2,152	1136343	1065,99	724	5171	75	503,390	-11,055
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	23	0	235	303	0,171	21049	145,08	0	537	129	10,590	0,810
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	4	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	7	8	71	144	0,052	4753	68,94	0	215	201	2,333	-0,028
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

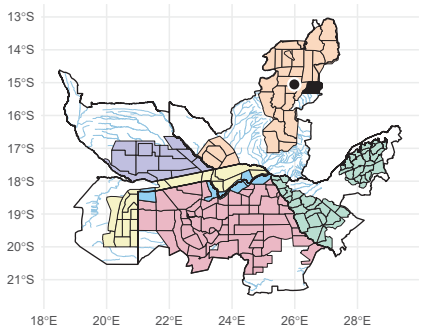
G2 – G2 ZAMBIA – KAFUE

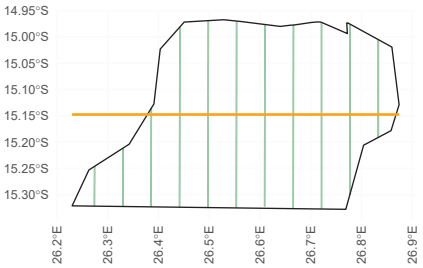
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: G2
STRATUM NAME: G2
■ STRATUM AREA: 1999.18 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 69 km

– TRANSECTS: 11 (333 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 5 %

– BASELINE DISTANCE: 69.22 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 3.8 h
Crew(s): C07
KES2022_9JMFZ20220912A 06:31–10:19

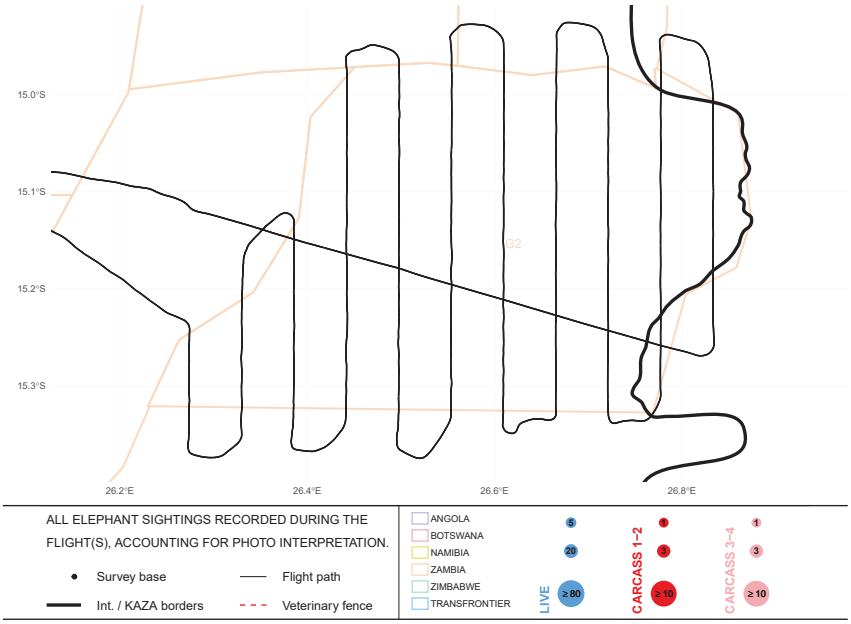
Actual sampling intensity: 5.1 %
Transect flying time: 1.9 h
Transects: 11 – 333 km – 0°
Search effort: 1.14 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C07	
Side:	L	R
% sightings:	49	51
% individuals:	56	44

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	41	21.95	88.89
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	1
Other wildlife count:	1
Domestic count:	1126

ELEPHANT DATA ANALYSIS

t = 2.228, N = 227, w = 304

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$\mathrm{Var}\hat{Y}$	–	–	–	–
Standard error	$\mathrm{SE}\hat{Y}$	–	–	–	–
95% confidence interval	$\mathrm{CI}_{\hat{Y}}^{95\%}$	–	–	–	–
Percentage of relative precision	$\mathrm{PRP}\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s_y^2	–	–	–	–
Variance between transect areas	s_a^2	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

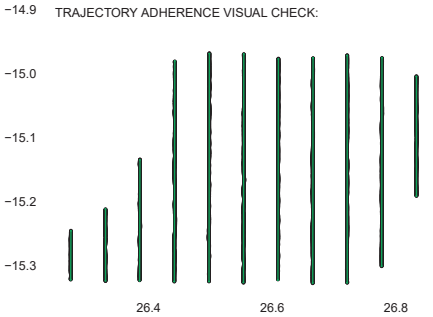
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

G2 – G2 ZAMBIA – KAFUE

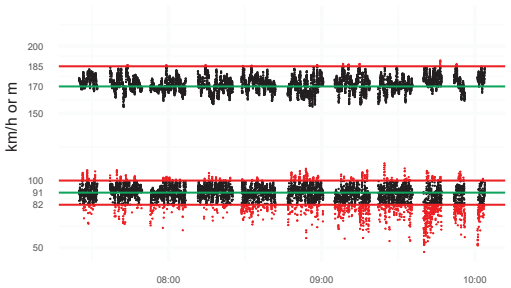
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JMFZ20220912A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 171.8 km/h
Standard dev.: 5.6 km/h

HEIGHT AGL
Average: 89.4 m (293.4 ft)
Standard dev.: 7.7 m (25.2 ft)

G2 – G2 ZAMBIA – KAFUE

STRATUM CODE: G2 **N:** 227 S_a^2: 14,519
STRATUM NAME: G2 **w:** 304 **df:** 10

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	722	593	14218	3682	7,112	2730171	1652,32	10536	17899	26	838,455	67,657
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	404	320	7956	4964	3,979	4962804	2227,74	2992	12919	62	1410,418	66,673
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

HE – HE

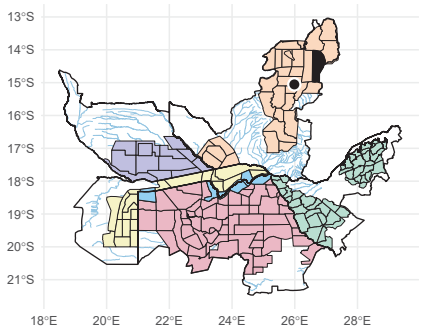
ZAMBIA – KAFUE

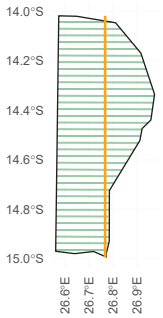
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: HE
STRATUM NAME: HE
■ STRATUM AREA: 3413.26 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 102 km

– TRANSECTS: 35 (1137 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10 %

– BASELINE DISTANCE: 107.83 km





SURVEY IMPLEMENTATION

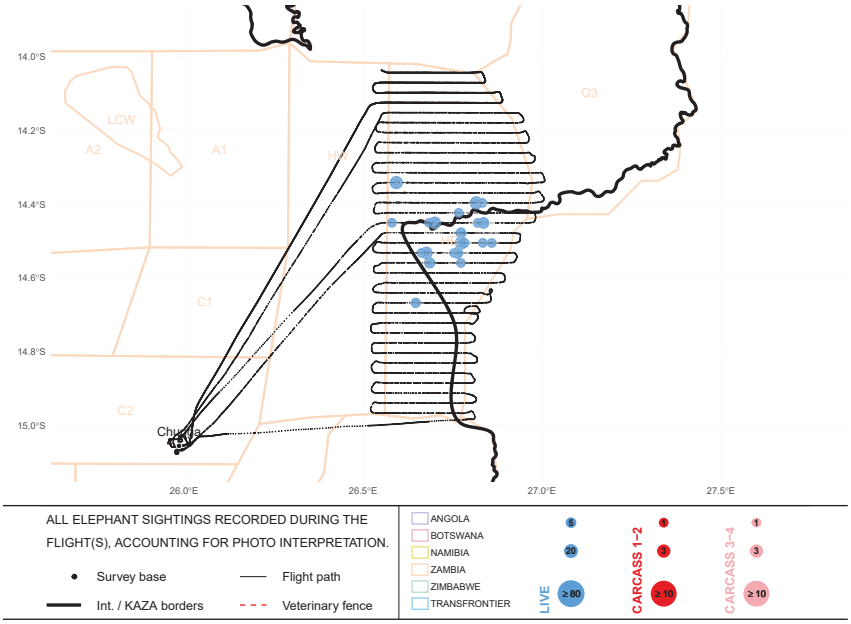
Number of flight(s): 3
Combined flying time: 15.3 h
Crew(s): C07
KES2022_9JMFZ20220903A 06:58–12:13
KES2022_9JMFZ20220904A 06:48–11:33
KES2022_9JMFZ20220905A 06:52–12:09
Actual sampling intensity: 10 %
Transect flying time: 6.4 h
Transects: 35 – 1137 km – 90°
Search effort: 1.13 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C07
Side:	L R
% sightings:	**61 39**
% individuals:	**57 43**

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	51	17.65	55.56
Live elephant (>9):	2	100	50
Elephant carcass:	0		
Live elephant (<10):	7	0	



LIVE ELEPHANTS



IN SAMPLE:	**44 (9)**
Bulls:	3 (3)
Family:	41 (6)
NOT IN SAMPLE:	**95 (15)**
Outside search strip:	95
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	20
Other wildlife count:	843
Domestic count:	131

ELEPHANT DATA ANALYSIS

t = 2.032, N = 358, w = 301

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	430	440	–	–
Variance of estimate	$Var\hat{Y}$	37431	40335	–	–
Standard error	$SE\hat{Y}$	193	201	–	–
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 393	± 408	–	–
Percentage of relative precision	$PRP\hat{Y}$	92 %	93 %	–	–
Density per sqkm	$R\hat{Y}$	0.126	0.129	–	–
Variance between transect counts	s_y^2	11.77	12.667	–	–
Variance between transect areas	s_a^2	5.074	5.074	–	–
Covariance between counts & areas	s_{ay}	2.252	2.301	–	–

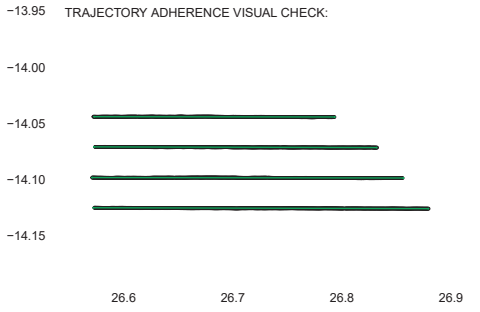
CARCASS RATIOS

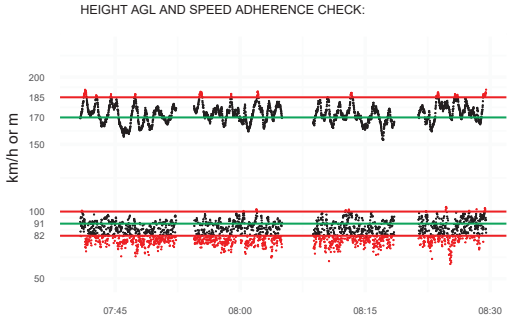
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

HE – HE ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JMFZ20220905A

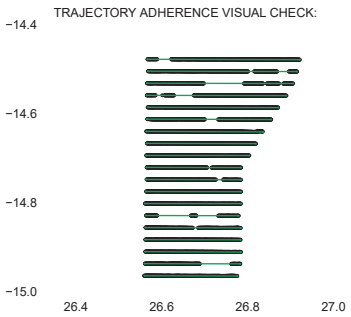


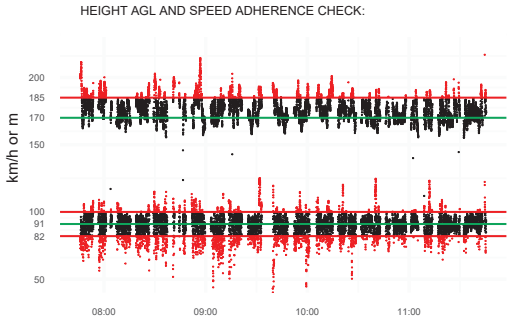


SPEED
Average: 172.8 km/h
Standard dev.: 7.1 km/h

HEIGHT AGL
Average: 84.6 m (277.4 ft)
Standard dev.: 7.4 m (24.2 ft)

KES2022_ 9JMFZ20220903A

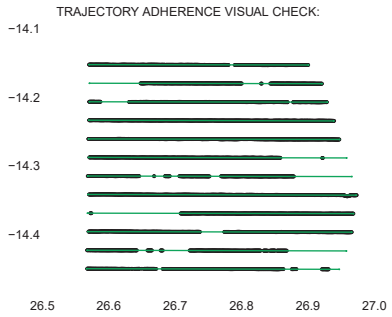


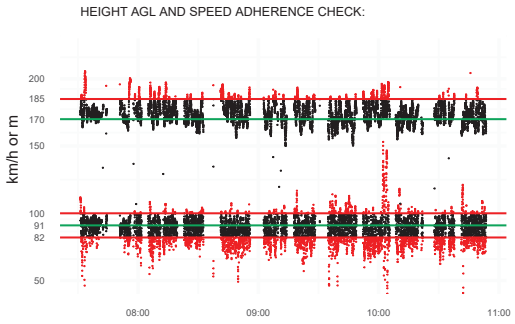


SPEED
Average: 176.2 km/h
Standard dev.: 8.8 km/h

HEIGHT AGL
Average: 89.5 m (293.7 ft)
Standard dev.: 8.6 m (28.1 ft)

KES2022_ 9JMFZ20220904A





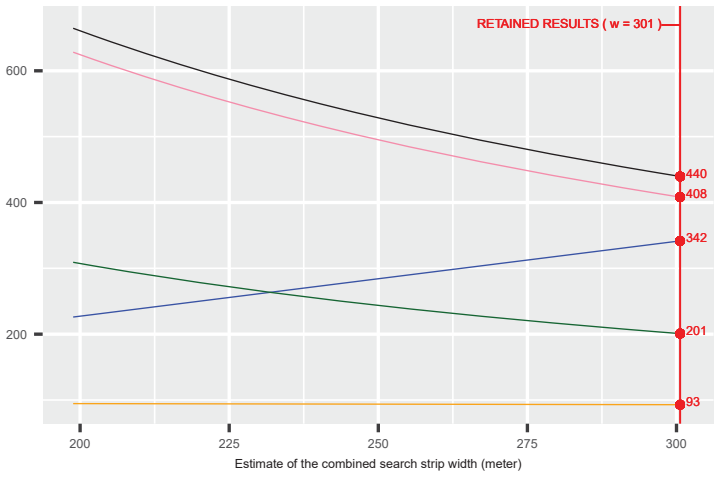
SPEED
Average: 174.6 km/h
Standard dev.: 8.4 km/h

HEIGHT AGL
Average: 87.8 m (288 ft)
Standard dev.: 9.8 m (32.3 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C07 – Left: [106 – 149]
C07 – Right: [93 – 152]



LIVE ELEPHANT ESTIMATE: [665 – 440]
CONFIDENCE INTERVAL: ± [628 – 408]
SAMPLE AREA: [226 – 342] sqkm
SE: [309 – 201]
PRP: [95 – 93] %

HE – HE ZAMBIA – KAFUE

STRATUM CODE: HE **N:** 359 S_a^2: 5,074
STRATUM NAME: HE **w:** 301 **df:** 34

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	67	133	669	833	0,196	167864	409,71	0	1502	124	51,139	1,868
bushbuck	Tragelaphus scriptus	10	0	100	105	0,029	2651	51,49	0	205	105	0,798	0,059
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	66	30	659	563	0,193	76880	277,27	96	1223	85	22,516	-1,216
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	11	0	110	71	0,032	1231	35,08	39	181	65	0,398	0,505
eland	Tragelaphus oryx	62	0	619	1030	0,181	257096	507,05	0	1650	166	77,770	1,202
elephant bulls	Loxodonta africana males	3	8	30	32	0,009	254	15,94	0	62	108	0,081	0,254
elephant family	Loxodonta africana family	41	87	410	402	0,120	39102	197,74	8	811	98	12,205	2,046
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	38	47	380	264	0,111	16849	129,81	116	643	69	5,022	0,024
hippopotamus	Hippopotamus amphibius	40	15	400	561	0,117	76125	275,91	0	960	140	23,655	3,320
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	55	240	549	482	0,161	56299	237,28	67	1032	88	17,546	2,194
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	9	0	90	129	0,026	4058	63,70	0	219	144	1,255	0,679
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	344	262	3437	3720	1,007	3351294	1830,65	0	7157	108	1059,852	27,196
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	13	2	130	157	0,038	5997	77,44	0	287	121	1,770	-0,404
roan	Hippotragus equinus	7	12	70	103	0,020	2547	50,46	0	172	147	0,753	-0,308
sable	Hippotragus niger	59	150	589	454	0,173	49820	223,20	136	1043	77	14,104	-2,208
shoat	Capra hircus - Ovis aries	65	0	649	669	0,190	108340	329,15	0	1318	103	30,597	-4,936
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	56	26	559	393	0,164	37340	193,24	167	952	70	12,071	2,901
waterbuck	Kobus ellipsiprymnus	45	6	450	567	0,132	77854	279,02	0	1017	126	23,798	1,586
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	9	0	90	124	0,026	3700	60,83	0	214	137	1,138	0,492
all elephants	Loxodonta africana all	44	95	440	408	0,129	40335	200,84	31	848	93	12,667	2,301
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

HW – HW

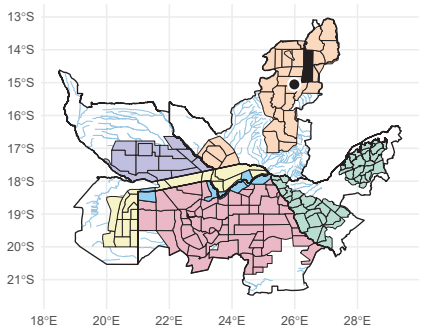
ZAMBIA – KAFUE

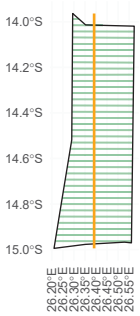
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: HW
STRATUM NAME: HW
■ STRATUM AREA: 3394.4 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 99 km

– TRANSECTS: 37 (1133 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10 %

– BASELINE DISTANCE: 114.08 km





SURVEY IMPLEMENTATION

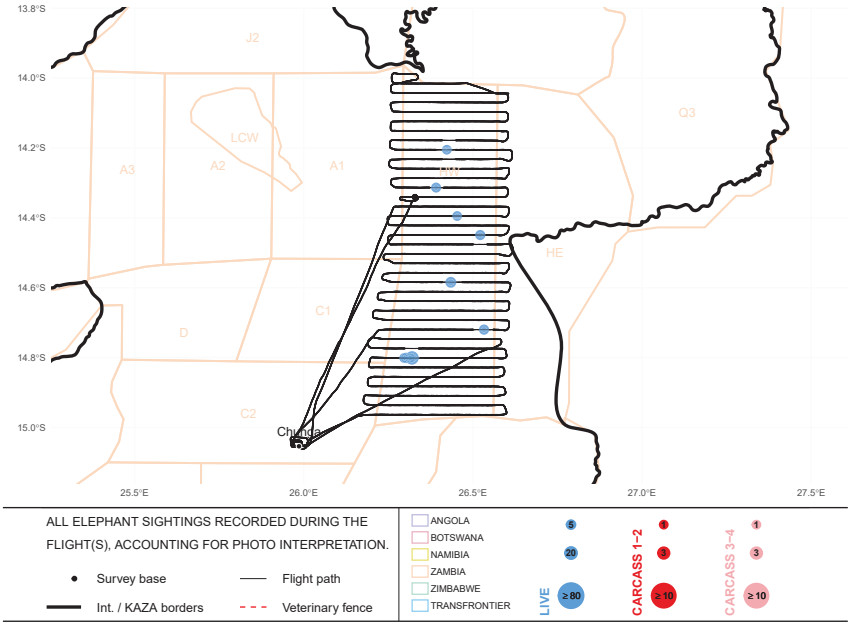
Number of flight(s): 3
Combined flying time: 12.8 h
Crew(s): C07
KES2022_9JMFZ20220905A 06:52–12:09
KES2022_9JMFZ20220906A 06:44–11:02
KES2022_9JMFZ20220908A 06:55–10:06
Actual sampling intensity: 10.1 %
Transect flying time: 6.6 h
Transects: 37 – 1133 km – 90°
Search effort: 1.15 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C07	
Side:	L	R
% sightings:	52	48
% individuals:	63	37

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	38	18.42	28.57
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	7	28.57	0



LIVE ELEPHANTS



IN SAMPLE:	**20 (7)**
Bulls:	5 (3)
Family:	15 (4)
NOT IN SAMPLE:	**20 (3)**
Outside search strip:	20
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	22
Other wildlife count:	933
Domestic count:	0

ELEPHANT DATA ANALYSIS

t = 2.028, N = 376, w = 303

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	197	197	–	–
Variance of estimate	$Var\hat{Y}$	6939	6939	–	–
Standard error	$SE\hat{Y}$	83	83	–	–
95% confidence interval	$CI_{\hat{Y}}^{95\%}$	± 169	± 169	–	–
Percentage of relative precision	$PRP\hat{Y}$	86 %	86 %	–	–
Density per sqkm	$R\hat{Y}$	0.058	0.058	–	–
Variance between transect counts	s_y^2	2.033	2.033	–	–
Variance between transect areas	s_a^2	3.257	3.257	–	–
Covariance between counts & areas	s_{ay}	0.259	0.259	–	–

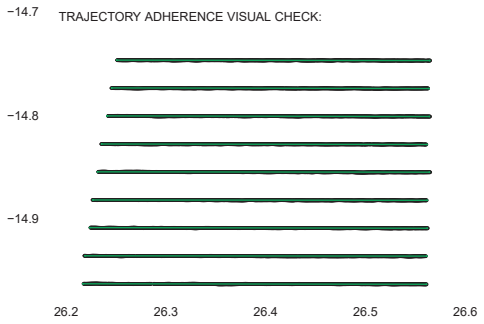
CARCASS RATIOS

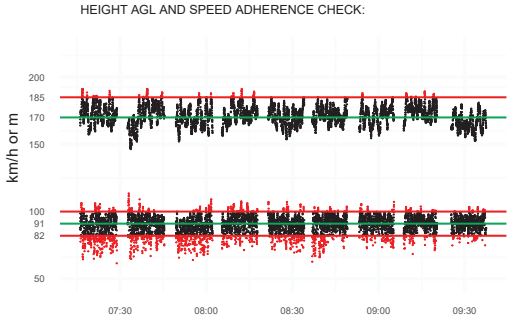
$CR_{1:4} = 0$ %
$CR_{1:2} = 0$ %

HW – HW ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JMFZ20220908A

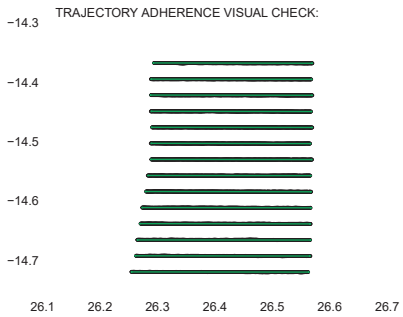


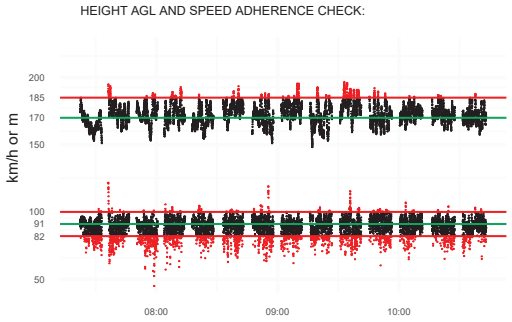


SPEED
Average: 171.3 km/h
Standard dev.: 7.5 km/h

HEIGHT AGL
Average: 90 m (295.1 ft)
Standard dev.: 7.2 m (23.7 ft)

KES2022_ 9JMFZ20220906A

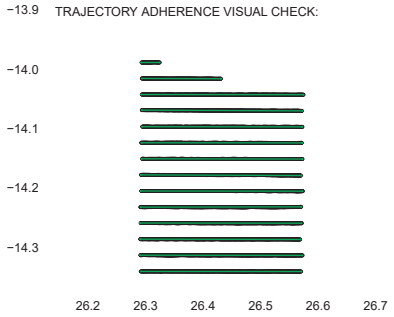


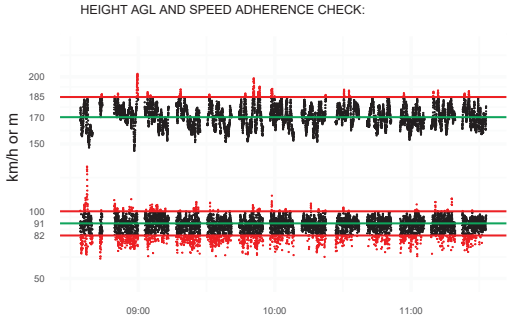


SPEED
Average: 172.7 km/h
Standard dev.: 7.7 km/h

HEIGHT AGL
Average: 88.5 m (290.4 ft)
Standard dev.: 6.9 m (22.5 ft)

KES2022_ 9JMFZ20220905A





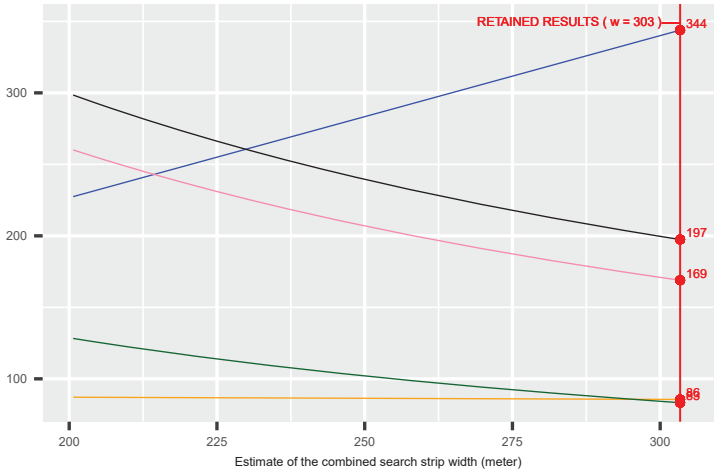
SPEED
Average: 171.8 km/h
Standard dev.: 7.8 km/h

HEIGHT AGL
Average: 89.1 m (292.3 ft)
Standard dev.: 6.7 m (22.1 ft)

INFLUENCE OF
SEARCH STRIP WIDTH ESTIMATES
ON THE ESTIMATED NUMBER OF ELEPHANTS
AND OTHER STATISTICS

Range of search strip width estimates (m):

C07 – Left: [107 – 150]
C07 – Right: [94 – 153]



LIVE ELEPHANT ESTIMATE: [298 – 197]
CONFIDENCE INTERVAL: ± [260 – 169]
SAMPLE AREA: [227 – 344] sqkm
SE: [128 – 83]
PRP: [87 – 86] %

HW – HW ZAMBIA – KAFUE

STRATUM CODE: HW **N:** 376 S_a^2: 3,257
STRATUM NAME: HW **w:** 303 **df:** 36

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	59	153	582	1036	0,172	260873	510,76	0	1618	178	76,414	2,333
bushbuck	Tragelaphus scriptus	3	0	30	43	0,009	455	21,34	0	73	146	0,132	0,012
bushpig	Potamochoerus larvatus	0	3	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	7	0	69	47	0,020	537	23,17	22	116	68	0,158	0,080
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	5	2	49	64	0,015	980	31,31	0	113	129	0,287	0,101
elephant family	Loxodonta africana family	15	18	148	152	0,044	5613	74,92	0	300	103	1,637	0,158
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	26	67	257	318	0,076	24603	156,85	0	575	124	7,270	0,984
hippopotamus	Hippopotamus amphibius	73	39	721	633	0,212	97274	311,89	88	1353	88	28,249	0,390
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	189	253	1866	1066	0,550	276098	525,45	800	2931	57	79,488	0,313
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	10	19	99	140	0,029	4742	68,86	0	238	141	1,369	-0,070
oribi	Ourebia ourebi	3	1	30	59	0,009	841	29,00	0	88	199	0,243	-0,029
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	280	198	2764	1774	0,814	765305	874,82	990	4538	64	218,808	-0,698
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	5	2	49	80	0,015	1541	39,26	0	129	161	0,453	0,237
roan	Hippotragus equinus	3	5	30	59	0,009	833	28,87	0	88	198	0,243	0,095
sable	Hippotragus niger	51	60	503	612	0,148	91069	301,78	0	1115	122	26,408	0,170
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	168	64	1658	781	0,489	148413	385,24	877	2440	47	42,033	-0,267
waterbuck	Kobus ellipsiprymnus	31	0	306	309	0,090	23261	152,52	0	615	101	6,751	0,147
wildebeest	Connochaetes taurinus	0	9	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	10	14	99	160	0,029	6192	78,69	0	258	162	1,814	0,334
all elephants	Loxodonta africana all	20	20	197	169	0,058	6939	83,30	28	366	86	2,033	0,259
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

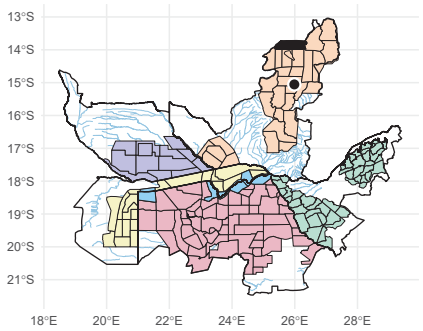
J2 – J2 ZAMBIA – KAFUE

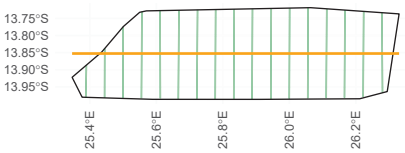
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: J2
STRATUM NAME: J2
■ STRATUM AREA: 2723.89 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 130 km

– TRANSECTS: 17 (451 km)
TRANSECT ORIENTATION: 0°
PLANNED SAMPLING INTENSITY: 5 %

– BASELINE DISTANCE: 106.28 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.9 h
Crew(s): C05
KES2022_9JCMA20220831A 06:43–11:36

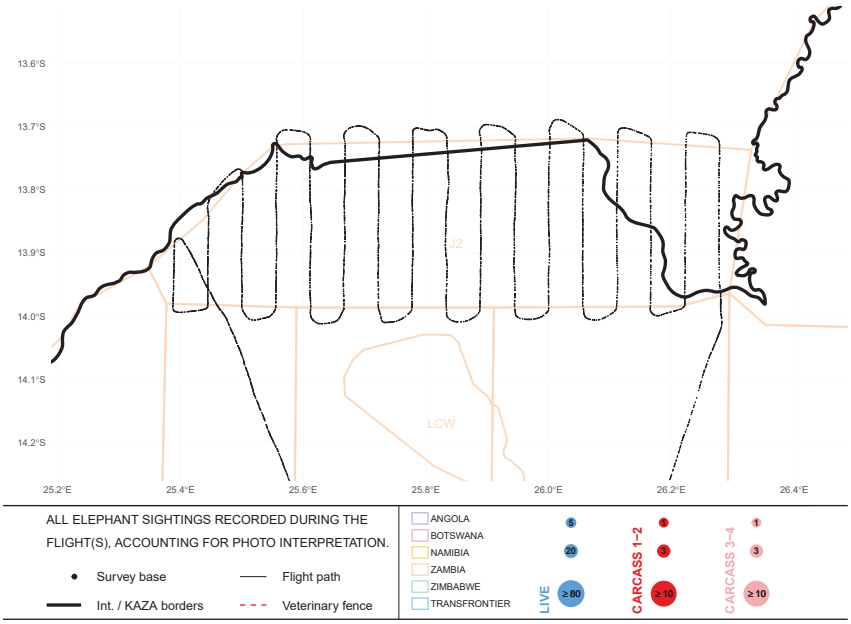
Actual sampling intensity: 4.8 %
Transect flying time: 2.6 h
Transects: 17 – 451 km – 0°
Search effort: 1.19 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	44	56
% individuals:	57	43

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	6	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	4
Other wildlife count:	16
Domestic count:	115

ELEPHANT DATA ANALYSIS

t = 2.12, N = 367, w = 289

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

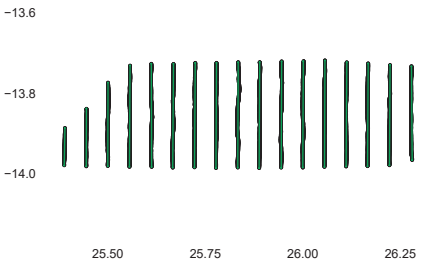
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

J2 – J2 ZAMBIA – KAFUE

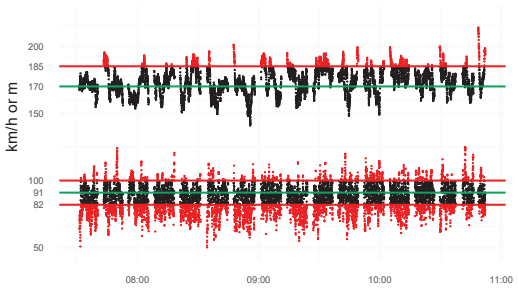
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220831A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 173.9 km/h
Standard dev.: 9.5 km/h

HEIGHT AGL
Average: 86.7 m (284.5 ft)
Standard dev.: 10.2 m (33.5 ft)

J2 – J2 ZAMBIA – KAFUE

STRATUM CODE: J2 **N:** 368 S_a^2: 2,233
STRATUM NAME: J2 **w:** 289 **df:** 16

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	1	0	21	45	0,008	454	21,32	0	66	216	0,059	-0,058
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	77	44	1609	1473	0,591	482897	694,91	136	3082	92	66,765	3,340
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	1	0	21	45	0,008	444	21,07	0	66	214	0,059	0,032
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	3	0	63	97	0,023	2115	45,99	0	160	155	0,279	0,045
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	38	0	794	832	0,292	153943	392,36	0	1626	105	21,066	1,683
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

K – K

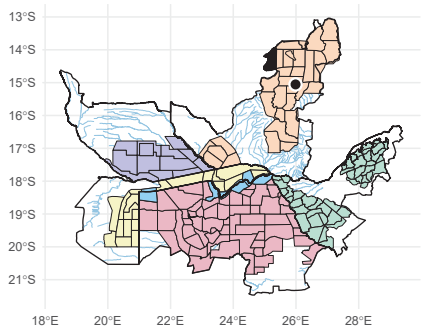
ZAMBIA – KAFUE

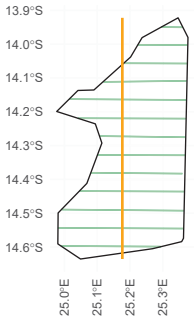
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: K
STRATUM NAME: K
■ STRATUM AREA: 2295.55 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 119 km

– TRANSECTS: 13 (384 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 5 %

– BASELINE DISTANCE: 78.95 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.4 h
Crew(s): C05
KES2022_9JCMA20220826A 07:40–12:03

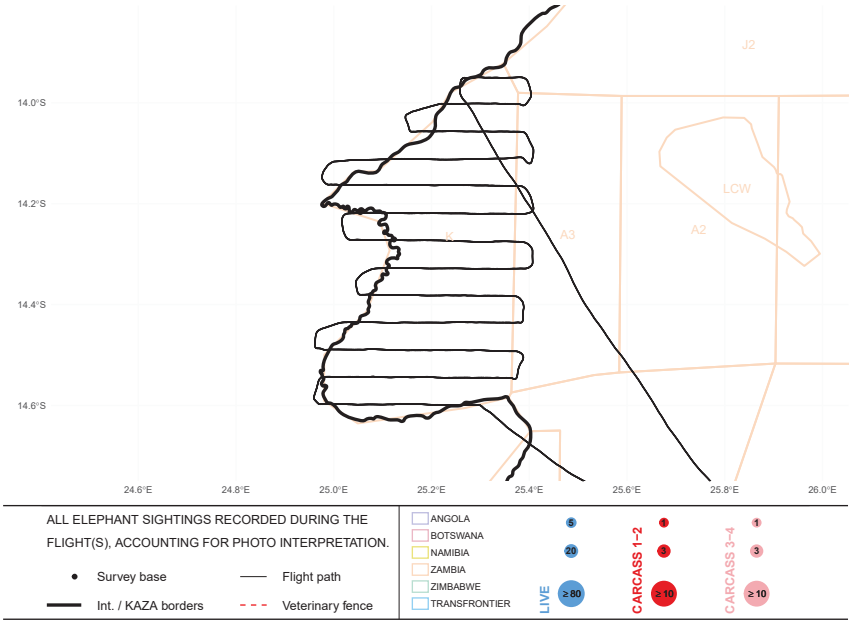
Actual sampling intensity: 4.9 %
Transect flying time: 2.2 h
Transects: 13 – 384 km – 90°
Search effort: 1.17 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	54	46
% individuals:	59	41

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	11	45.45	80
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	6
Other wildlife count:	70
Domestic count:	208

ELEPHANT DATA ANALYSIS

t = 2.179, N = 268, w = 295

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

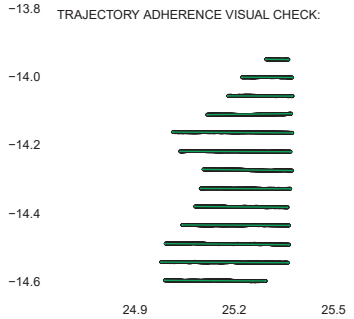
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

K – K ZAMBIA – KAFUE

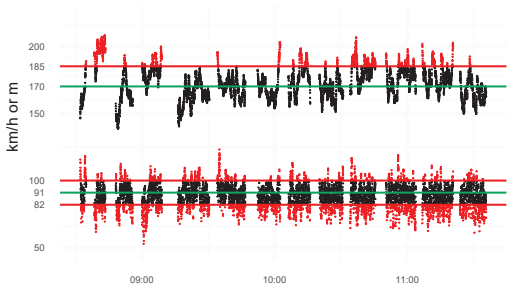
ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220826A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED

Average:	173 km/h
Standard dev.:	12.1 km/h

HEIGHT AGL

Average:	88.5 m	(290.3 ft)
Standard dev.:	8.9 m	(29.2 ft)

K – K ZAMBIA – KAFUE

STRATUM CODE: K **N:** 268 S_a^2: 8,506
STRATUM NAME: K **w:** 295 **df:** 12

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	208	60	4219	3452	1,838	2510101	1584,33	767	7671	82	547,333	26,842
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	3	1	61	71	0,027	1048	32,37	0	131	116	0,192	-0,018
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	22	7	446	643	0,194	86976	294,92	0	1089	144	15,731	-1,261
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	9	0	183	395	0,080	32945	181,51	0	578	217	6,231	0,117
sable	Hippotragus niger	22	1	446	828	0,194	144570	380,22	0	1275	186	27,231	0,144
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	4	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

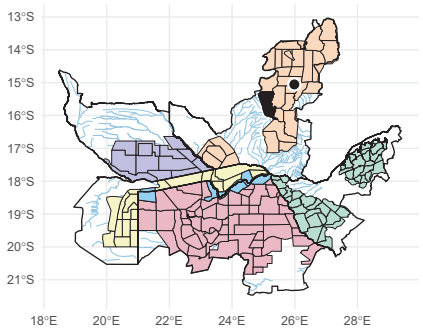
L – L ZAMBIA – KAFUE

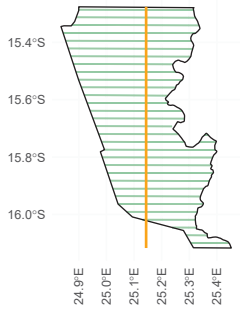
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: L
STRATUM NAME: L
■ STRATUM AREA: 3331.35 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 118 km

– TRANSECTS: 31 (1114 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 10 %

– BASELINE DISTANCE: 93.01 km





SURVEY IMPLEMENTATION

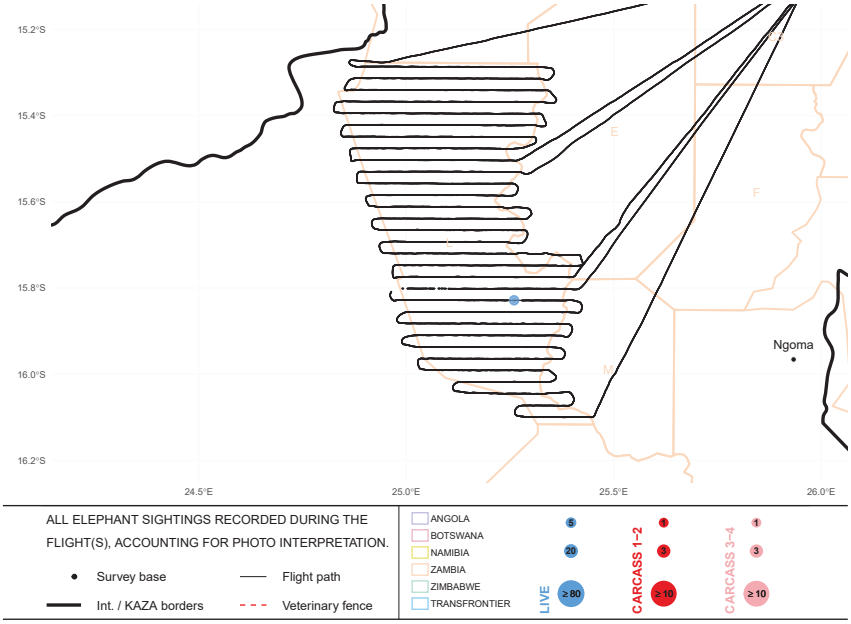
Number of flight(s): 3
Combined flying time: 12.4 h
Crew(s): C05, C07
KES2022_9JCMA20220912A 06:41–10:54
KES2022_9JCMA20220913A 06:42–10:38
KES2022_9JMFZ20220913A 06:40–10:58
Actual sampling intensity: 9.9 %
Transect flying time: 6.5 h
Transects: 31 – 1114 km – 90°
Search effort: 1.18 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05		C07	
Side:	L	R	L	R
% sightings:	58	42	47	53
% individuals:	82	18	37	63

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	9	22.22	100
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		



LIVE ELEPHANTS



IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**4 (1)**
Outside search strip:	4
Off transect:	0

ELEPHANT CARCASSES



IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	13
Other wildlife count:	277
Domestic count:	72

ELEPHANT DATA ANALYSIS

t = 2.042, N = 312, w = 298

		LIVE OBS	LIVE FINAL	ALL CARCASSES OBS	ALL CARCASSES FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

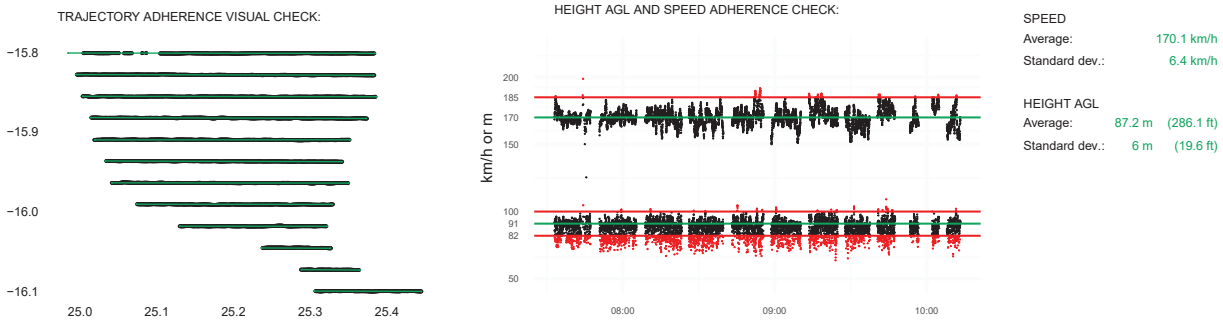
CARCASS RATIOS

$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

L – L ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

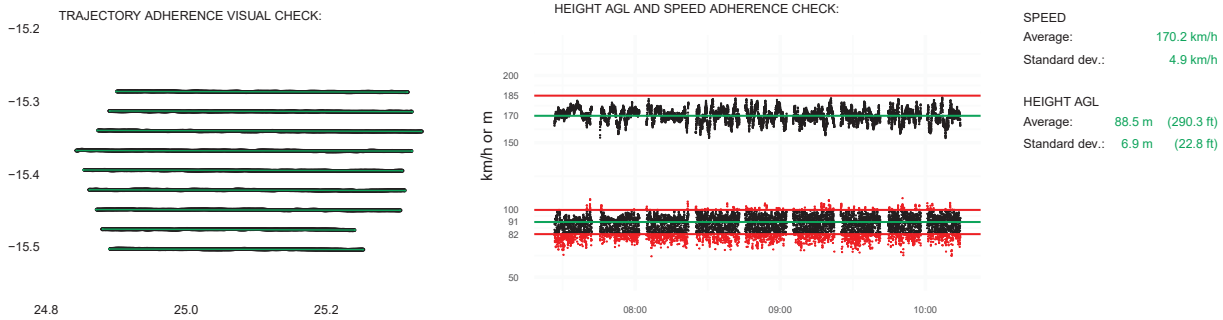
KES2022_ 9JMFZ20220913A



SPEED
Average: 170.1 km/h
Standard dev.: 6.4 km/h

HEIGHT AGL
Average: 87.2 m (286.1 ft)
Standard dev.: 6 m (19.6 ft)

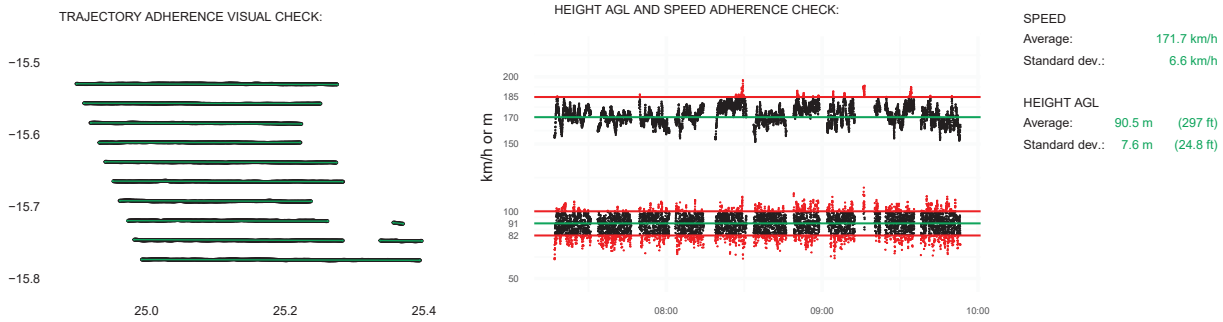
KES2022_ 9JCMA20220912A



SPEED
Average: 170.2 km/h
Standard dev.: 4.9 km/h

HEIGHT AGL
Average: 88.5 m (290.3 ft)
Standard dev.: 6.9 m (22.8 ft)

KES2022_ 9JCMA20220913A



SPEED
Average: 171.7 km/h
Standard dev.: 6.6 km/h

HEIGHT AGL
Average: 90.5 m (297 ft)
Standard dev.: 7.6 m (24.8 ft)

L – L ZAMBIA – KAFUE

STRATUM CODE: L **N:** 313 S_a^2: 10,281
STRATUM NAME: L **w:** 298 **df:** 30

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	4	0	40	61	0,012	884	29,74	0	101	151	0,316	0,258
cattle	Bos taurus	72	41	724	724	0,217	125529	354,30	0	1447	100	43,492	-0,530
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	40	1	402	190	0,121	8642	92,96	212	592	47	2,813	-0,334
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	4	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	67	22	674	600	0,202	86414	293,96	73	1274	89	29,206	-1,994
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	1	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	7	0	70	104	0,021	2578	50,77	0	174	147	0,914	0,255
oribi	Ourebia ourebi	2	0	20	39	0,006	363	19,05	0	59	193	0,129	0,137
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	3	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	16	62	161	220	0,048	11654	107,95	0	381	137	3,991	-0,919
sable	Hippotragus niger	89	160	895	947	0,269	214854	463,52	0	1841	106	75,649	1,348
shoat	Capra hircus - Ovis aries	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	23	6	231	177	0,069	7528	86,76	54	408	77	2,598	-0,027
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	4	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	4	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000

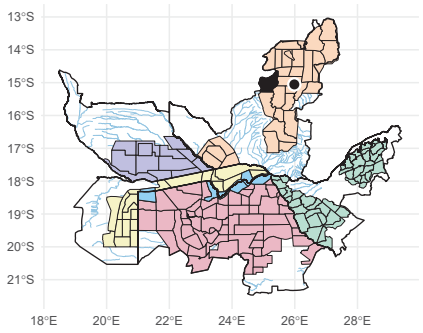
L2 – L2 ZAMBIA – KAFUE

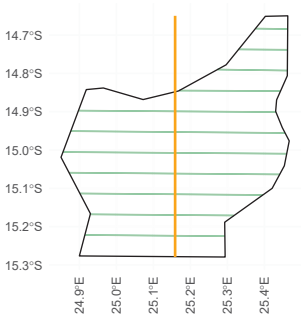
SURVEY DESIGN

COUNTRY: Zambia
SUPERSTRATUM: Kafue
STRATUM CODE: L2
STRATUM NAME: L2
■ STRATUM AREA: 2913.74 sqkm
• SURVEY BASE: Chunga
DISTANCE TO SURVEY BASE: 89 km

– TRANSECTS: 11 (455 km)
TRANSECT ORIENTATION: 90°
PLANNED SAMPLING INTENSITY: 4.7 %

– BASELINE DISTANCE: 69.65 km





SURVEY IMPLEMENTATION

Number of flight(s): 1
Combined flying time: 4.7 h
Crew(s): C05
KES2022_9JCMA20220904A 06:55–11:39

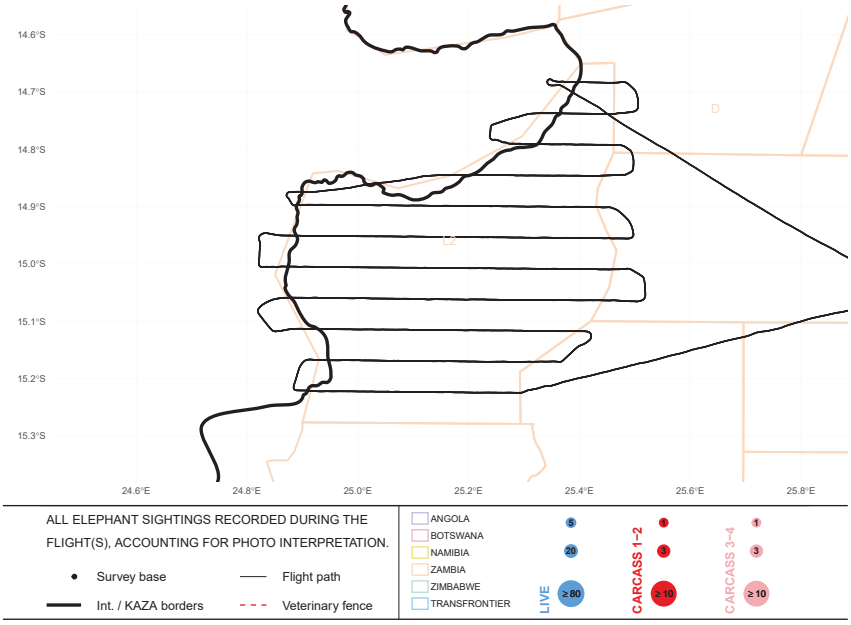
Actual sampling intensity: 4.6 %
Transect flying time: 2.7 h
Transects: 11 – 455 km – 90°
Search effort: 1.21 min/sqkm

OBSERVER CONTRIBUTION

Crew(s):	C05	
Side:	L	R
% sightings:	48	52
% individuals:	37	63

PHOTO INTERPRETATION

	Photo	Match (%)	Corr. (%)
All species (>9):	28	0	
Live elephant (>9):	0		
Elephant carcass:	0		
Live elephant (<10):	0		





LIVE ELEPHANTS

IN SAMPLE:	**0 (0)**
Bulls:	0 (0)
Family:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0



ELEPHANT CARCASSES

IN SAMPLE:	**0 (0)**
Category 1:	0 (0)
Category 2:	0 (0)
Category 3:	0 (0)
Category 4:	0 (0)
NOT IN SAMPLE:	**0 (0)**
Outside search strip:	0
Off transect:	0

OTHER SPECIES

Other wildlife species:	1
Other wildlife count:	4
Domestic count:	822

ELEPHANT DATA ANALYSIS

t = 2.228, N = 238, w = 293

		LIVE		ALL CARCASSES	
		OBS	FINAL	OBS	FINAL
Population estimate	$\hat{Y}$	–	–	–	–
Variance of estimate	$Var\hat{Y}$	–	–	–	–
Standard error	$SE\hat{Y}$	–	–	–	–
95% confidence interval	$CI^{95\%}_{\hat{Y}}$	–	–	–	–
Percentage of relative precision	$PRP\hat{Y}$	–	–	–	–
Density per sqkm	$R\hat{Y}$	–	–	–	–
Variance between transect counts	s^2_y	–	–	–	–
Variance between transect areas	s^2_a	–	–	–	–
Covariance between counts & areas	s_{ay}	–	–	–	–

CARCASS RATIOS

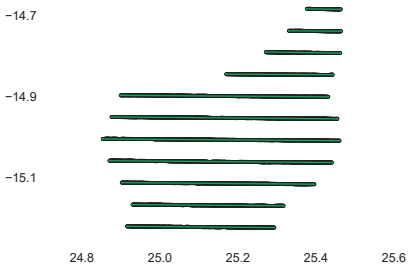
$CR_{1:4}$ = n/a
$CR_{1:2}$ = n/a

L2 – L2 ZAMBIA – KAFUE

ADHERENCE TO FLIGHT PARAMETERS

KES2022_ 9JCMA20220904A

TRAJECTORY ADHERENCE VISUAL CHECK:



HEIGHT AGL AND SPEED ADHERENCE CHECK:



SPEED
Average: 168.6 km/h
Standard dev.: 6.4 km/h

HEIGHT AGL
Average: 87.8 m (288.2 ft)
Standard dev.: 6.5 m (21.3 ft)

L2 – L2 ZAMBIA – KAFUE

STRATUM CODE: L2 **N:** 238 S_a^2: 35,743
STRATUM NAME: L2 **w:** 293 **df:** 10

COMMON NAME	LATIN NAME	IN COUNT	OUT COUNT	ESTIMATE	CI	DENSITY	VARIANCE	SE	LOWER CL	UPPER CL	PRP (%)	S_y^2	S_{ay}
baboon	Papio spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
buffalo	Syncerus caffer	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushbuck	Tragelaphus scriptus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
bushpig	Potamochoerus larvatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
cattle	Bos taurus	522	118	11431	6055	3,923	7384272	2717,40	5376	17486	53	2685,873	221,005
donkey	Equus asinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
duiker	Sylvicapra grimmia	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
eland	Tragelaphus oryx	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant bulls	Loxodonta africana males	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant family	Loxodonta africana family	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass one	Loxodonta africana carcass one	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass two	Loxodonta africana carcass two	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass three	Loxodonta africana carcass three	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
elephant carcass four	Loxodonta africana carcass four	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
giraffe	Giraffa giraffa	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
grysbok	Raphicerus sharpei	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hartebeest	Alcelaphus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
hippopotamus	Hippopotamus amphibius	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
horse	Equus caballus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
impala	Aepyceros melampus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
klipspringer	Oreotragus oreotragus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
kudu	Tragelaphus strepsiceros	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oribi	Ourebia ourebi	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
oryx	Oryx gazella	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
ostrich	Struthio camelus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
puku	Kobus vardonii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
red lechwe	Kobus leche	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
reedbuck	Redunca arundinum	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
roan	Hippotragus equinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
sable	Hippotragus niger	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
shoat	Capra hircus - Ovis aries	300	0	6569	5063	2,255	5162994	2272,22	1507	11632	77	946,018	17,205
sitatunga	Tragelaphus spekii	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
springbok	Antidorcas marsupialis	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
tsessebe	Damaliscus lunatus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
warthog	Phacochoerus africanus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
waterbuck	Kobus ellipsiprymnus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
wildebeest	Connochaetes taurinus	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
zebra	Equus spp,	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephants	Loxodonta africana all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C1-2 elephant carcasses	Loxodonta africana carcass 1-2	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
all elephant carcasses	Loxodonta africana carcass all	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000
C3-4 elephant carcasses	Loxodonta africana carcass 3-4	0	0	0	0	0,000	0	0,00	0	0	NA	0,000	0,000