AERIAL SURVEY OF WILDLIFE IN THE NIASSA GAME RESERVE

Mozambique, October 2011

DRAFT REPORT
January 2012

Prepared for
Sociedade para a Gestão e Desenvolvimento
da Reserva do Niassa
Moçambique

By

G C Craig
DG Ecological Consulting c

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1. INTRODUCTION

The 2011 aerial survey of wildlife in the Niassa Reserve in northern Mozambique was undertaken from 1 to 19 October. This was the seventh survey of the area promoted and organised by the Sociedade para a Gestão e Desenvolvimento da Reserva do Niassa (SGDRN).

A survey of Chipanje-Chetu community-based natural resource management project area, on the western boundary of Niassa, was also carried out during this period, and is reporteded in Annex 1. Adjacent areas to the East of Niassa were surveyed immediately after and the results are reported in Annex 2.

Descriptions of methods are provided in Appendix I. Stratified systematic transect sampling was used (Norton Griffiths, 1978) in a light aircraft (a Cessna 206) flying at a nominal height of 300 feet above the ground. The nominal sampling intensity was 10%. Strata were management units (Fig. 1).

This interim report covers wildlife populations and human activities. The results section describes estimates and distribution for all attributes. Full results by stratum are given in Appendix II.

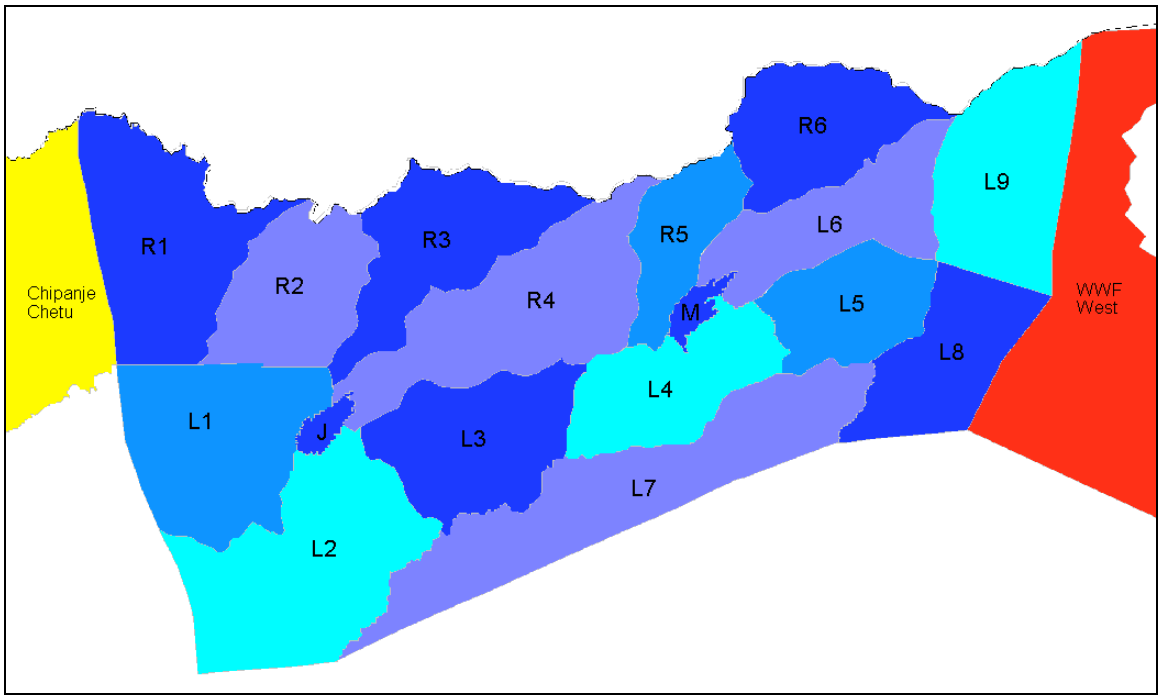

Figure 1: Niassa Survey Strata 2011

RESULTS FOR WILDLIFE

For each wildlife species in this section a sighting map is provided along with a table of estimates for each management unit. In the table the "range" refers to the range within which there is a 95% probability that the true number falls (i.e. it is the 95% confidence interval). Strictly, for most species this is actually the range within which 95% of independent *estimates* made by the same method would fall. The true value is likely to be higher on average because of undercounting bias.

"No. seen" is the number of animals seen within sampling strips and "No. out" is the number seen outside of the sampling strips. Where animals were seen only outside of the sampling strips no estimate can be made by this method although the record shows that the species occurs.

Wildlife species in this section are arranged in alphabetical order of their common names with the exception of: Elephant and buffalo, which are placed first and second respectively; monkeys, which are put next to baboons; crocodiles, which are placed with hippos; and carnivores, which are put together after Zebra. At the end other carcasses seen are reported.

Under elephants, elephant carcasses are tabulated and carcass ratios are given in the table.

Full original results by stratum are given in Appendix II.

Elephant Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	392	167 - 617	41	5	0.0934
L3	1284	385 - 2183	133	16	0.4823
L4	590	85 - 1144	61	24	0.2626
L5	470	100 - 887	48	52	0.2584
L6	736	289 - 1183	76	21	0.3208
L7	1864	622 - 3106	192	73	0.4267
L8	1993	992 - 2994	209	14	0.9339
L9	86	63 - 202	9	54	0.0298
Mecula	182	27 - 551	27	0	0.7889
R1	97	10 - 264	10	0	0.0281
R2	346	51 - 736	36	15	0.1535
R3	697	321 - 1073	72	84	0.2581
R4	1509	722 - 2296	155	45	0.4068
R5	837	116 - 1980	87	29	0.5711
R6	886	309 - 1463	91	26	0.3791
Total	**11971**	**9440 - 14502**	**1247**	**458**	**0.283**

Elephant Family Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	335	114 - 557	35	5	0.0797
L3	1178	254 - 2102	122	12	0.4424
L4	561	79 - 1132	58	21	0.2497
L5	470	99 - 904	48	51	0.2584
L6	707	252 - 1163	73	20	0.3081
L7	1641	393 - 2890	169	67	0.3756
L8	1898	855 - 2941	199	14	0.8892
L9	86	63 - 203	9	54	0.0298
Mecula	182	27 - 552	27	0	0.7889
R1	87	9 - 258	9	0	0.0253
R2	288	30 - 683	30	0	0.1279
R3	687	302 - 1072	71	82	0.2545
R4	1392	595 - 2190	143	44	0.3753
R5	750	104 - 1938	78	26	0.512
R6	886	288 - 1484	91	24	0.3791
Total	**11150**	**8629 - 13671**	**1162**	**420**	**0.2636**

ElephantBull Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	57	6 - 122	6	0	0.0137
L3	106	15 - 203	11	4	0.0399
L4	29	6 - 69	3	3	0.0129
L5	0	1 - 0	0	1	0
L6	29	4 - 85	3	1	0.0127
L7	223	73 - 374	23	6	0.0511
L8	95	10 - 202	10	0	0.0447
R1	10	1 - 29	1	0	0.0028
R2	58	21 - 155	6	15	0.0256
R3	10	3 - 28	1	2	0.0036
R4	117	32 - 202	12	1	0.0315
R5	87	12 - 235	9	3	0.0591
R6	0	2 - 0	0	2	0
Total	**821**	**535 - 1106**	**85**	**38**	**0.0194**

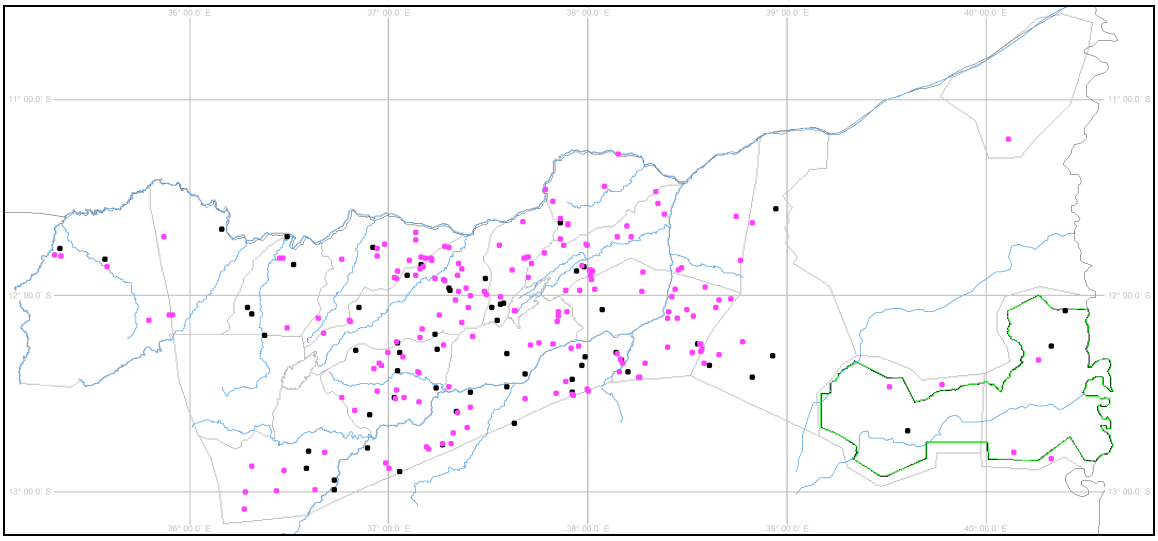

Figure 2: Elephant sightings: bulls black; family groups pink

Elephant Carcass Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²	C. Ratio%
L2	19	2 - 46	2	0	0.0046	4.6
L3	10	1 - 29	1	0	0.0036	0.8
L4	145	16 - 298	15	1	0.0646	19.7
L5	363	217 - 509	37	0	0.1992	43.6
L6	620	449 - 791	64	8	0.2701	45.7
L7	117	41 - 193	12	1	0.0266	5.9
L8	144	71 - 217	15	0	0.0671	6.7
L9	221	91 - 351	23	1	0.0761	72
Mecula	0	0 - 0	0	1	0	0
R1	10	1 - 29	1	0	0.0028	9.3
R2	30	3 - 62	3	0	0.0129	8
R3	106	27 - 185	11	2	0.0395	13.2
R4	156	57 - 255	16	2	0.042	9.4
R5	221	144 - 298	23	6	0.1509	20.9
R6	468	331 - 605	48	12	0.2	34.6
Total	**2627**	**2272 - 2982**	**271**	**34**	**0.0621**	**18**

Carcass ratio is 100*carcasses/(carcasses + live)

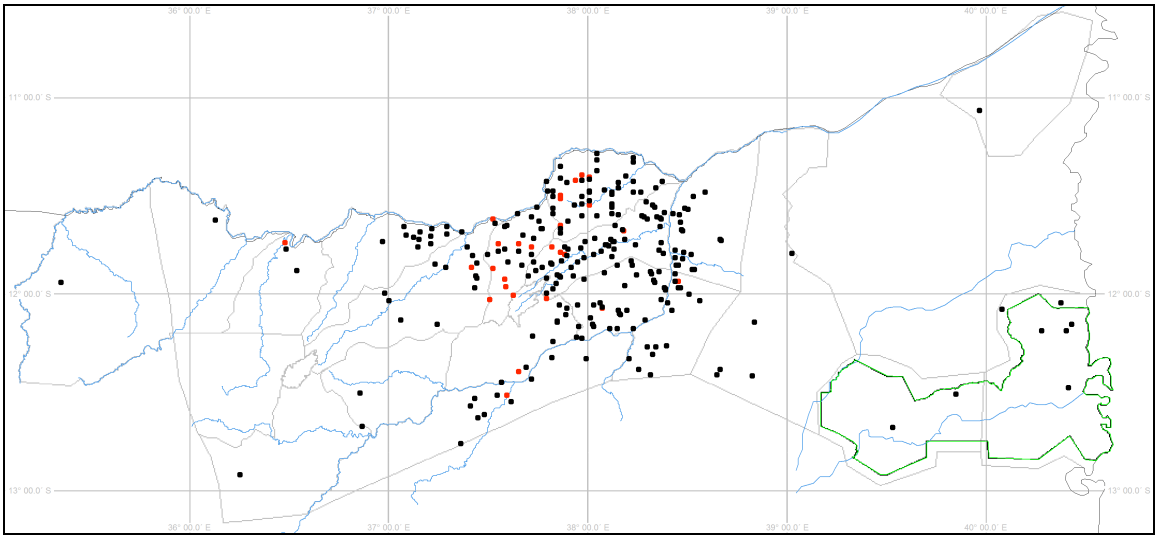

Figure 3: Carcass sightings: Fresh-recent (1+2) red; old-very old (3+4) black

Elephant Carcass 1 Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
R2	10	1 - 30	1	0	0.0043
R4	0	1 - 0	0	1	0
R6	0	4 - 0	0	4	0
Total	10	6 - 28	1	5	0.0002

Elephant Carcass 2 Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L4	19	2 - 45	2	0	0.0086
L5	10	1 - 29	1	0	0.0054
L6	48	6 - 108	5	1	0.0211
L7	10	1 - 28	1	0	0.0022
L8	10	1 - 30	1	0	0.0045
R4	10	1 - 28	1	0	0.0026
R5	67	27 - 108	7	1	0.0459
R6	78	16 - 140	8	0	0.0333
Total	**252**	**152 - 351**	**26**	**2**	**0.006**

Elephant Carcass 3 Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L4	29	3 - 73	3	0	0.0129
L5	20	2 - 47	2	0	0.0108
L6	68	10 - 126	7	0	0.0295
L7	10	1 - 28	1	0	0.0022
L8	10	1 - 30	1	0	0.0045
R2	10	1 - 29	1	0	0.0043
R3	19	2 - 56	2	0	0.0072
R5	77	35 - 119	8	0	0.0525
R6	39	4 - 75	4	0	0.0167
Total	**281**	**179 - 382**	**29**	**0**	**0.0066**

EleCarcass 4 Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	19	2 - 46	2	0	0.0046
L3	10	1 - 29	1	0	0.0036
L4	97	11 - 188	10	1	0.0431
L5	333	182 - 483	34	0	0.183
L6	504	347 - 661	52	7	0.2195
L7	97	24 - 170	10	1	0.0222
L8	124	51 - 197	13	0	0.0581
L9	221	91 - 351	23	1	0.0761
Mecula	0	1 - 0	0	1	0
R1	10	1 - 29	1	0	0.0028
R2	10	1 - 29	1	0	0.0043
R3	87	15 - 159	9	2	0.0323
R4	146	46 - 246	15	1	0.0394
R5	77	20 - 134	8	5	0.0525
R6	351	226 - 475	36	8	0.15
Total	2084	1758 - 2410	215	27	0.0493

Buffalo Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²

L2	575	60	-	1387	60	0	0.1366
L3	1448	227	-	2856	150	77	0.5439
L4	1402	188	-	2615	145	35	0.6243
L5	147	35	-	438	15	20	0.0807
L6	155	16	-	313	16	0	0.0675
L7	29	3	-	84	3	0	0.0067
L8	878	94	-	2106	92	2	0.4111
R3	68	7	-	160	7	0	0.0251
R4	78	58	-	177	8	50	0.021
R5	548	64	-	1571	57	7	0.3741
R6	759	117	-	2111	78	39	0.3249
Total	**6214**	**3462**	**-**	**8967**	**644**	**230**	**0.1469**

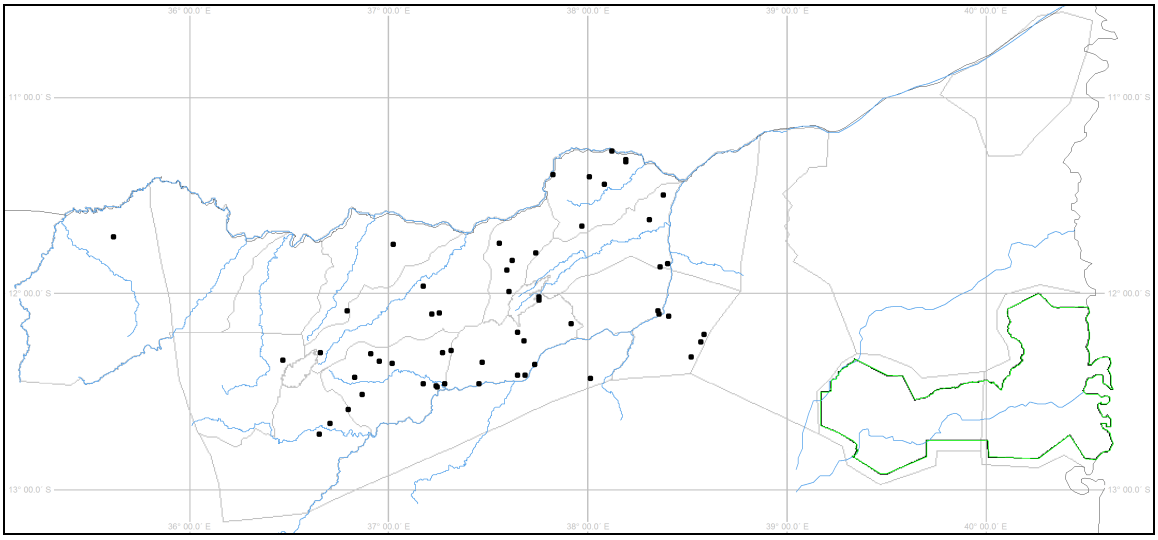

Figure 4: Buffalo

Baboon Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	39	4 - 116	4	0	0.0119
L2	240	25 - 502	25	0	0.0569
L3	135	14 - 403	14	0	0.0508
L5	137	14 - 291	14	0	0.0754
L6	242	25 - 482	25	0	0.1055
L7	524	151 - 898	54	0	0.12
L9	86	9 - 209	9	0	0.0298
R1	146	15 - 305	15	0	0.0422
R3	39	4 - 114	4	0	0.0143
R4	107	11 - 317	11	0	0.0289
R6	68	7 - 204	7	0	0.0292
Total	**1764**	**1103 - 2425**	**182**	**0**	**0.0417**

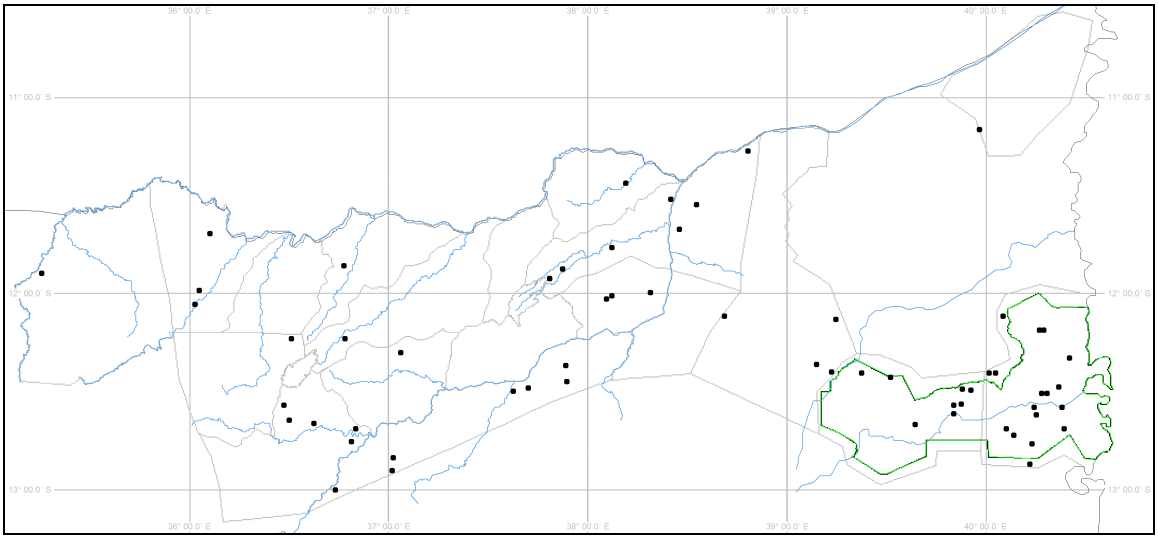

Figure 5: Baboons

Monkey Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L6	87	9 - 208	9	0	0.038
L8	19	2 - 57	2	0	0.0089
L9	96	10 - 226	10	0	0.0331
R4	0	6 - 0	0	6	0
R6	29	3 - 88	3	0	0.0125
Total	**232**	**51 - 412**	**24**	**6**	**0.0055**

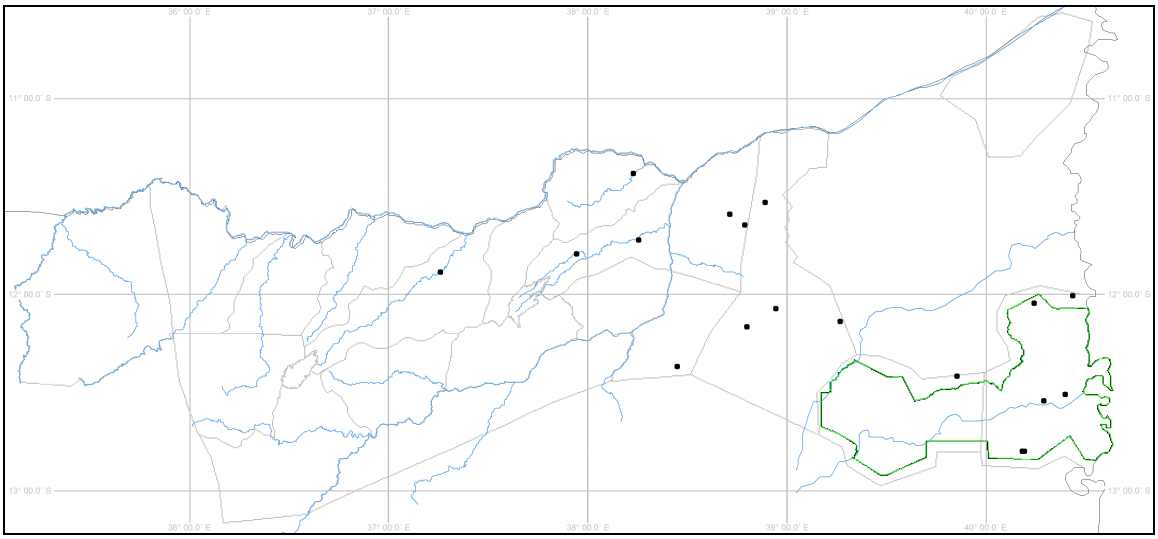

Figure 6: Monkeys

Bushbuck Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	10	1 - 28	1	0	0.0023
L3	10	1 - 28	1	0	0.0036
L4	19	2 - 57	2	0	0.0086
L6	68	7 - 135	7	0	0.0295
L7	29	3 - 70	3	0	0.0067
L8	19	2 - 45	2	0	0.0089
R1	19	2 - 45	2	0	0.0056
R4	68	7 - 136	7	0	0.0184
Total	**242**	**128 - 356**	**25**	**0**	**0.0057**

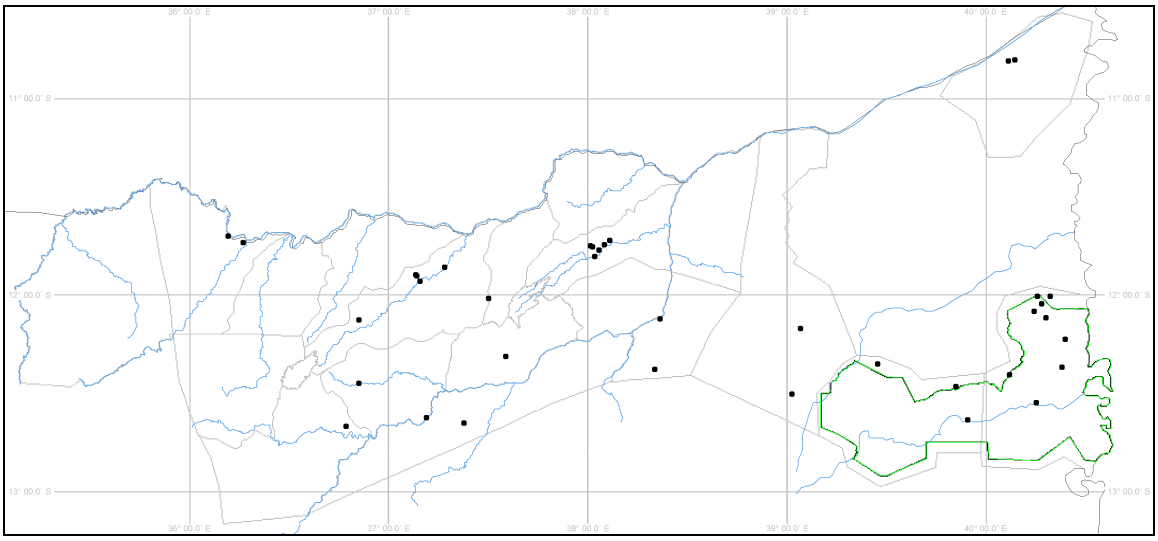

Figure 7: Bushbuck

Bushpig Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	105	11 - 219	11	0	0.0251
L7	58	6 - 140	6	0	0.0133
R4	49	5 - 142	5	0	0.0131
R5	10	1 - 28	1	0	0.0066
R6	29	3 - 86	3	0	0.0125
Total	**251**	**80 - 423**	**26**	**0**	**0.0059**

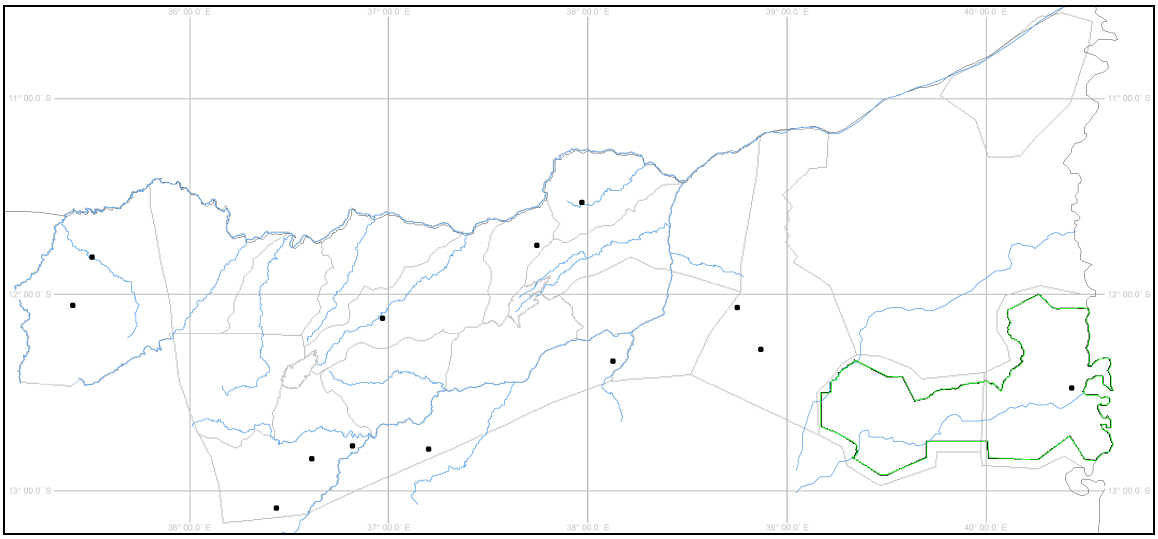

Figure 8: Bushpig

Duiker Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	344	198 - 489	35	0	0.1038
L2	546	404 - 688	57	0	0.1298
L3	560	423 - 696	58	0	0.2103
L4	251	117 - 385	26	0	0.1119
L5	675	561 - 790	69	0	0.3714
L6	1056	700 - 1412	109	0	0.4601
L7	1000	747 - 1254	103	0	0.2289
L8	610	482 - 739	64	0	0.286
L9	979	727 - 1232	102	1	0.3375
R1	621	374 - 868	64	0	0.18
R2	451	295 - 606	47	0	0.2003
R3	842	585 - 1099	87	0	0.3119
R4	1081	786 - 1375	111	1	0.2913
R5	654	393 - 916	68	0	0.4463
R6	886	601 - 1171	91	0	0.3791
Total	**10557**	**9736 - 11378**	**1091**	**2**	**0.2496**

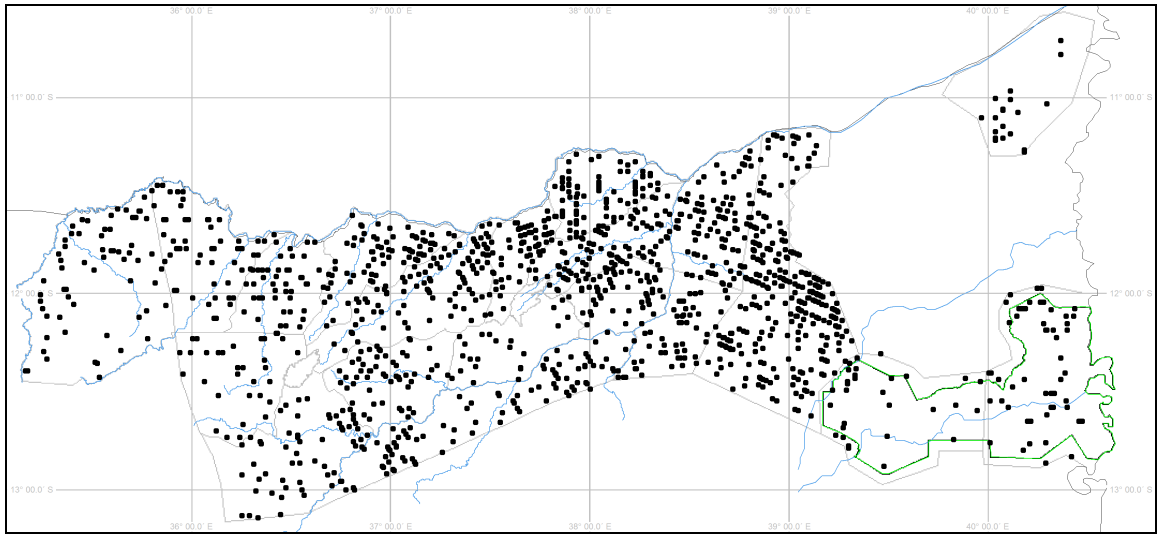

Figure 9: Duiker

Eland Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	177	18 - 484	18	0	0.0534
L2	987	106 - 2002	103	3	0.2346
L3	328	34 - 858	34	0	0.1233
L4	39	4 - 84	4	0	0.0172
L5	20	2 - 46	2	0	0.0108
L6	174	18 - 454	18	0	0.076
L7	573	59 - 1249	59	0	0.1311
L9	19	2 - 57	2	0	0.0066
Jao	25	3 - 79	3	0	0.1217
R1	19	2 - 57	2	0	0.0056
R2	77	8 - 180	8	0	0.0341
R3	281	29 - 836	29	0	0.104
R4	146	18 - 323	15	3	0.0394
R5	154	16 - 420	16	0	0.105
R6	243	25 - 566	25	0	0.1041
Total	**3262**	**1761 - 4763**	**338**	**6**	**0.0771**

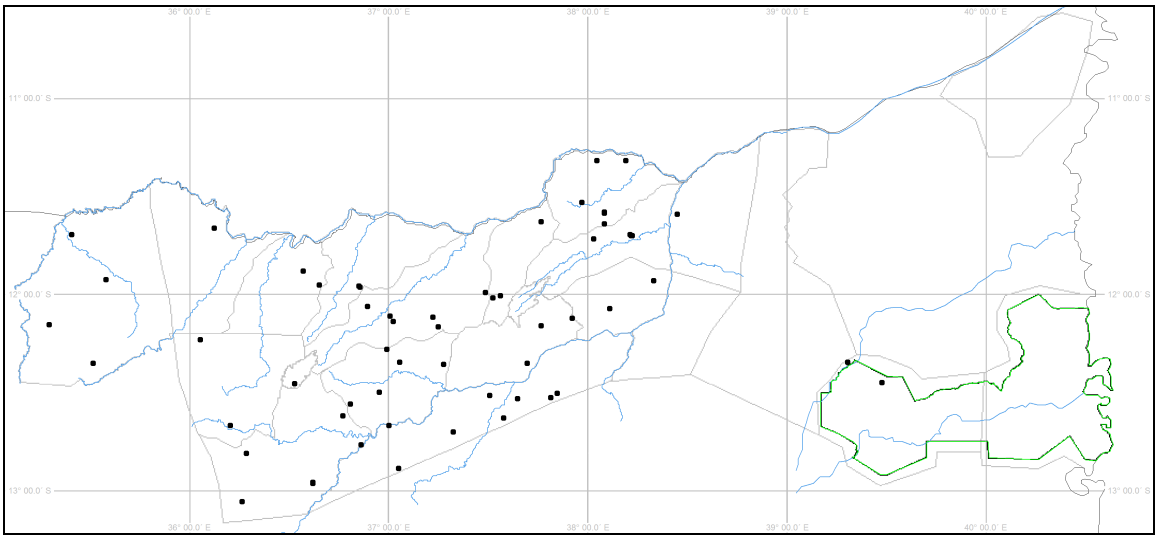

Figure 10: Eland

Ground Hornbill Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	79	8 - 167	8	0	0.0237
L2	259	77 - 440	27	0	0.0615
L3	68	7 - 156	7	0	0.0254
L4	48	5 - 114	5	0	0.0215
L5	215	60 - 371	22	0	0.1184
L6	678	336 - 1021	70	5	0.2955
L7	272	89 - 455	28	1	0.0622
L8	353	168 - 538	37	0	0.1653
L9	346	149 - 543	36	3	0.1191
R1	155	19 - 301	16	3	0.045
R2	19	2 - 57	2	0	0.0085
R3	126	14 - 243	13	1	0.0466
R4	185	58 - 312	19	1	0.0499
R5	173	20 - 374	18	2	0.1181
R6	234	106 - 361	24	0	0.1
Total	**3209**	**2603 - 3816**	**332**	**16**	**0.0759**

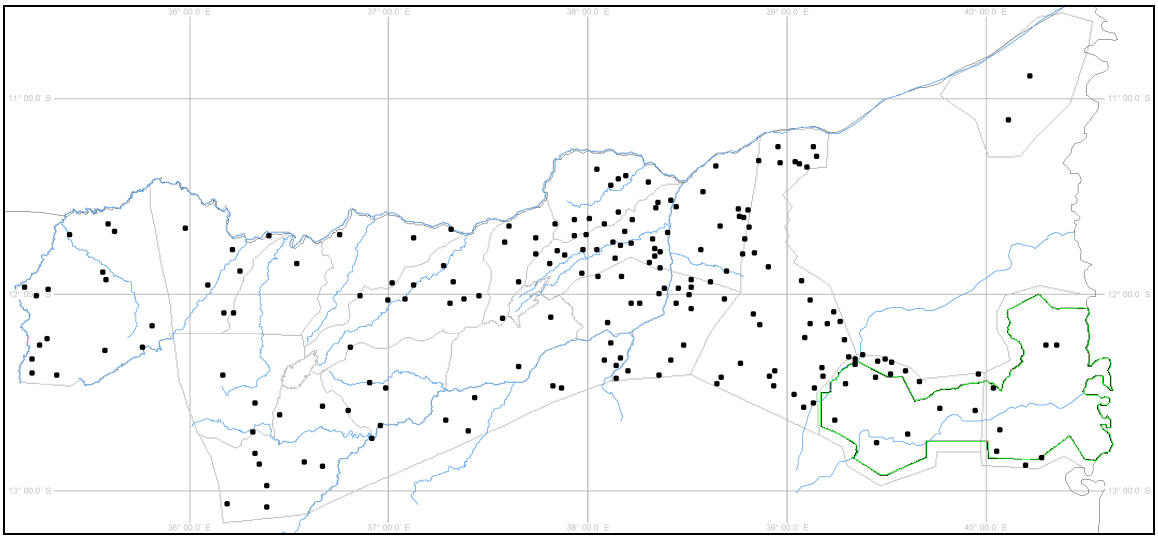

Figure 11: Ground Hornbill

Hartebeest Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	285	29 - 694	29	0	0.086
L2	153	16 - 345	16	0	0.0364
L3	483	52 - 948	50	2	0.1813
L4	145	15 - 283	15	0	0.0646
L5	137	14 - 339	14	0	0.0754
L6	39	4 - 117	4	0	0.0169
L7	418	92 - 744	43	10	0.0956
L8	29	3 - 86	3	0	0.0134
R1	417	44 - 799	43	1	0.1209
R2	422	112 - 732	44	0	0.1875
R3	310	32 - 610	32	0	0.1147
R4	545	174 - 916	56	0	0.147
R5	106	17 - 209	11	6	0.0722
R6	175	24 - 326	18	0	0.075
Total	**3663**	**2670 - 4655**	**378**	**19**	**0.0866**

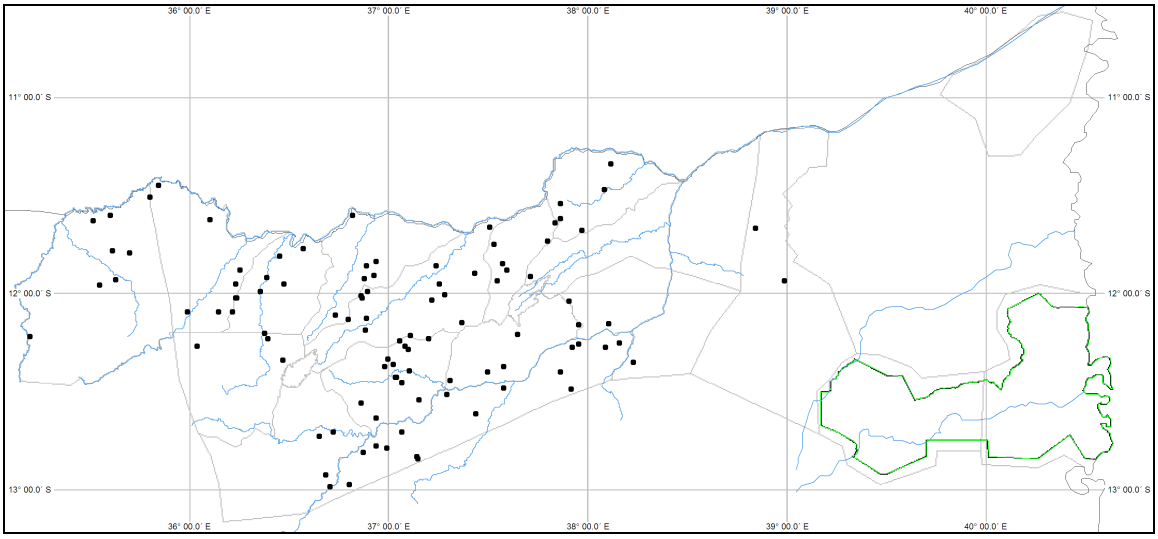

Figure 12: Hartebeest

Hippopotamus Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	29	3 - 72	3	0	0.0068
L3	251	26 - 499	26	0	0.0943
L4	116	12 - 294	12	0	0.0517
L5	206	21 - 613	21	0	0.113
L7	223	23 - 462	23	0	0.0511
L8	10	1 - 29	1	0	0.0045
R1	0	7 - 0	0	7	0
R6	0	7 - 0	0	7	0
Total	**834**	**304 - 1365**	**86**	**14**	**0.0197**

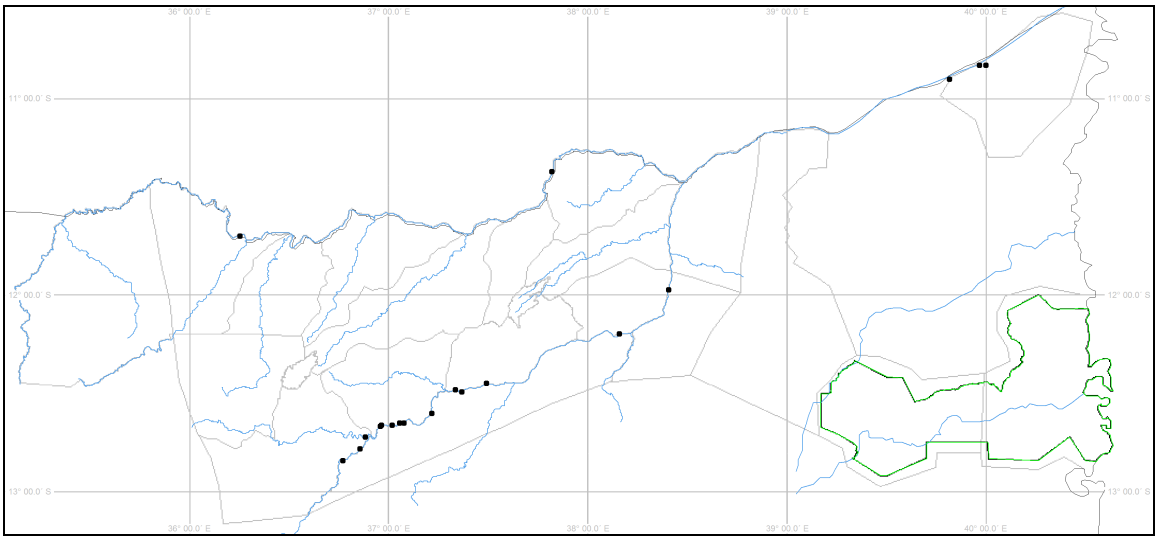

Figure 13: Hippopotamus

Crocodile Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	29	3 - 60	3	0	0.0068
L3	10	1 - 30	1	0	0.0036
L4	10	1 - 29	1	0	0.0043
L6	10	1 - 28	1	0	0.0042
L7	19	2 - 56	2	0	0.0044
L8	76	8 - 217	8	0	0.0357
L9	10	1 - 28	1	0	0.0033
R4	10	1 - 29	1	0	0.0026
Total	**173**	**30 - 316**	**18**	**0**	**0.0041**

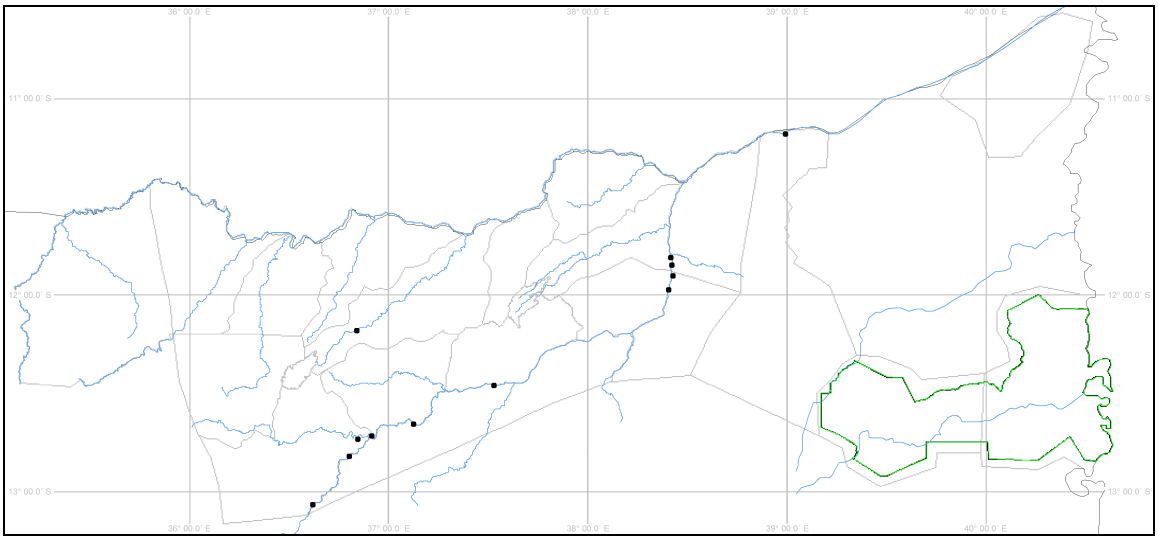

Figure 14: Crocodile

Impala Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L3	58	6 - 172	6	0	0.0218
L5	78	12 - 144	8	0	0.0431
L6	116	12 - 299	12	0	0.0507
L7	495	122 - 869	51	0	0.1133
L8	29	3 - 90	3	0	0.0134
L9	67	7 - 181	7	0	0.0232
R6	175	18 - 402	18	0	0.075
Total	**1019**	**530 - 1508**	**105**	**0**	**0.0241**

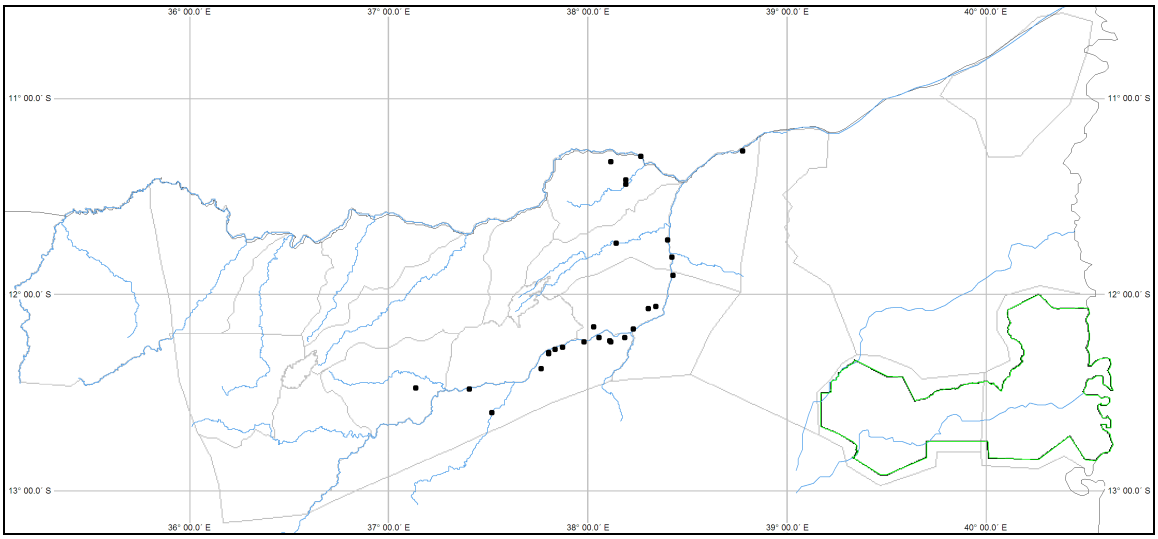

Figure 15: Impala

Kudu Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	88	9 - 207	9	0	0.0267
L3	10	1 - 28	1	0	0.0036
L5	166	57 - 276	17	0	0.0915
L6	426	219 - 634	44	0	0.1857
L7	58	6 - 126	6	0	0.0133
L8	29	3 - 87	3	0	0.0134
L9	29	3 - 85	3	0	0.0099
R1	58	10 - 125	6	4	0.0169
R2	48	5 - 125	5	0	0.0213
R4	78	8 - 232	8	0	0.021
R5	154	16 - 310	16	0	0.105
R6	224	23 - 473	23	0	0.0958
Total	**1368**	**946 - 1791**	**141**	**4**	**0.0324**

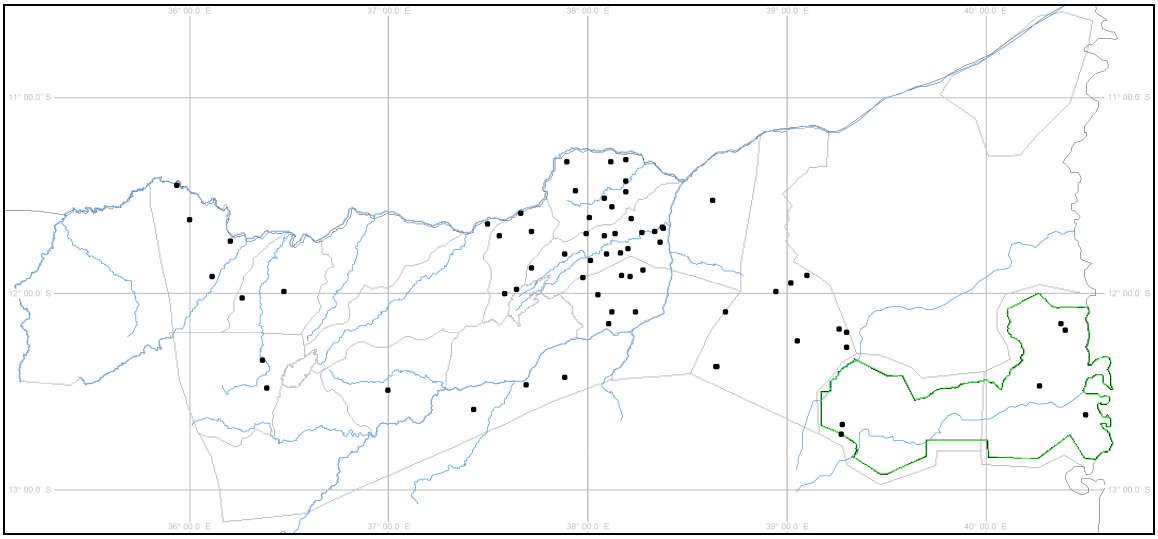

Figure 16: kudu

Reedbuck Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	39	4 - 81	4	0	0.0119
L2	48	5 - 103	5	0	0.0114
L3	19	2 - 58	2	0	0.0073
L5	29	3 - 88	3	0	0.0161
L7	68	7 - 165	7	0	0.0156
L8	10	1 - 29	1	0	0.0045
R1	369	184 - 554	38	0	0.1069
R2	125	13 - 258	13	0	0.0554
R3	39	4 - 83	4	0	0.0143
R4	19	2 - 56	2	0	0.0052
Total	**765**	**506 - 1024**	**79**	**0**	**0.0181**

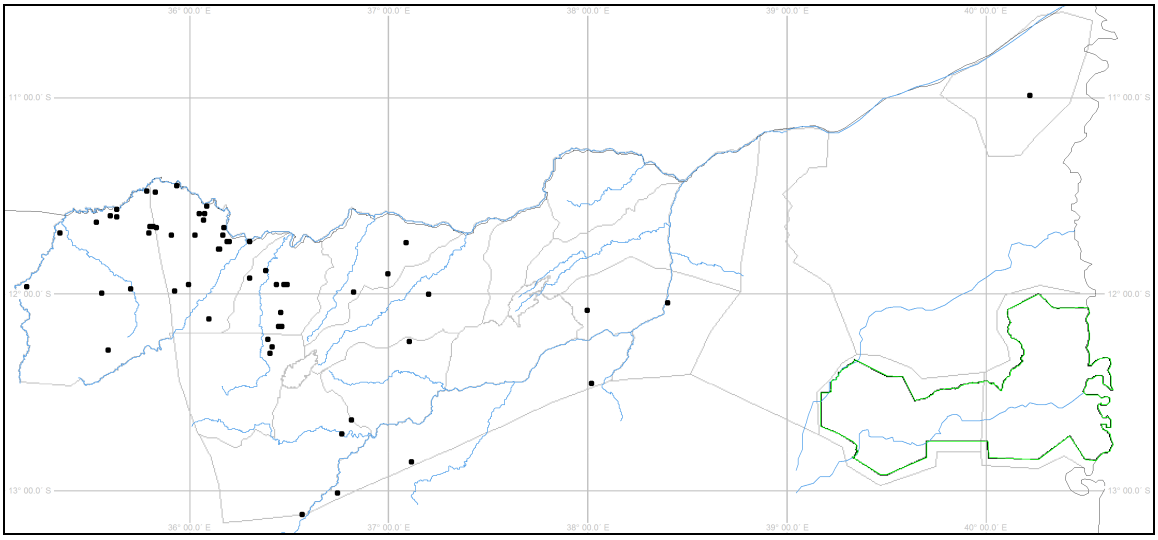

Figure 17: Reedbuck

Sable Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	658	70 - 1317	67	3	0.1988
L2	786	287 - 1284	82	2	0.1867
L3	627	205 - 1050	65	46	0.2357
L4	367	137 - 598	38	1	0.1636
L5	274	30 - 524	28	2	0.1507
L6	649	83 - 1215	67	1	0.2828
L7	1768	782 - 2753	182	67	0.4044
L8	48	5 - 95	5	0	0.0223
L9	38	9 - 72	4	5	0.0132
R1	1155	580 - 1729	119	11	0.3347
R2	767	363 - 1171	80	6	0.3409
R3	590	141 - 1040	61	12	0.2187
R4	925	339 - 1511	95	2	0.2493
R5	241	39 - 488	25	14	0.1641
R6	779	160 - 1398	80	48	0.3333
Total	**9671**	**7822 - 11520**	**998**	**220**	**0.2287**

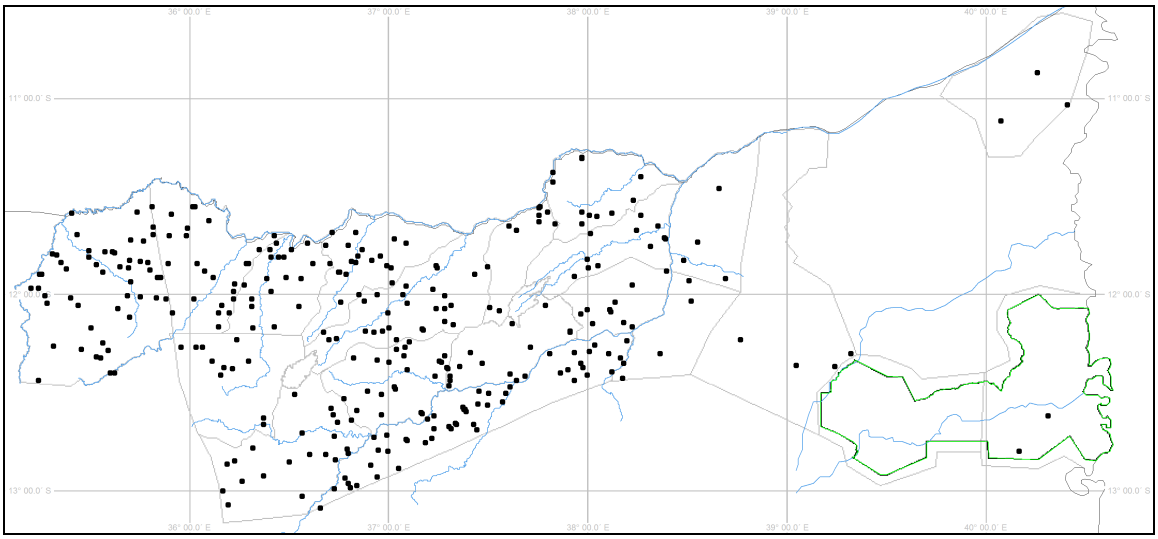

Figure 18: Sable

Warthog Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	49	5 - 145	5	0	0.0148
L2	594	247 - 941	62	0	0.1412
L3	415	194 - 636	43	0	0.1559
L4	106	11 - 293	11	0	0.0474
L5	186	60 - 312	19	0	0.1023
L6	678	253 - 1104	70	0	0.2955
L7	466	67 - 865	48	5	0.1067
L8	143	15 - 334	15	0	0.067
L9	480	217 - 744	50	0	0.1654
R1	359	127 - 591	37	0	0.1041
R2	230	92 - 368	24	5	0.1023
R3	77	8 - 192	8	0	0.0287
R4	399	147 - 651	41	3	0.1076
R5	144	39 - 249	15	0	0.0985
R6	175	52 - 299	18	0	0.075
Total	**4503**	**3623 - 5384**	**466**	**13**	**0.1065**

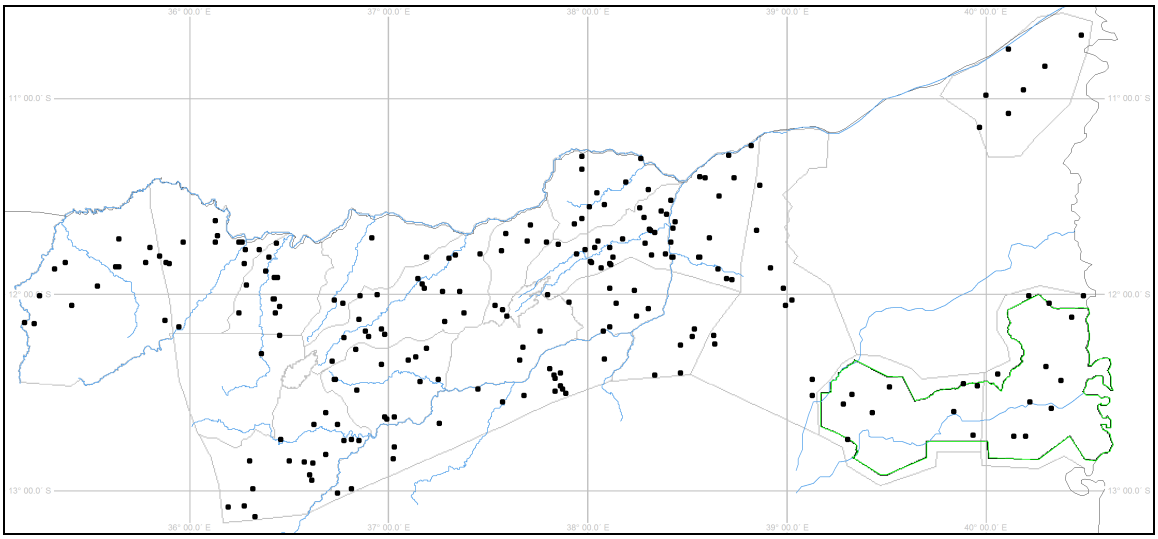

Figure 19: Warthog

Waterbuck Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	59	6 - 125	6	0	0.0178
L2	412	134 - 690	43	0	0.0979
L3	87	9 - 206	9	0	0.0326
L4	77	8 - 190	8	0	0.0344
L5	69	7 - 193	7	0	0.0377
L6	300	38 - 584	31	7	0.1309
L7	262	66 - 458	27	0	0.06
L8	19	2 - 47	2	0	0.0089
L9	154	16 - 417	16	0	0.0529
R1	97	10 - 202	10	0	0.0281
R4	39	4 - 113	4	0	0.0105
R5	48	5 - 148	5	0	0.0328
R6	39	4 - 101	4	0	0.0167
Total	**1662**	**1104 - 2220**	**172**	**7**	**0.0393**

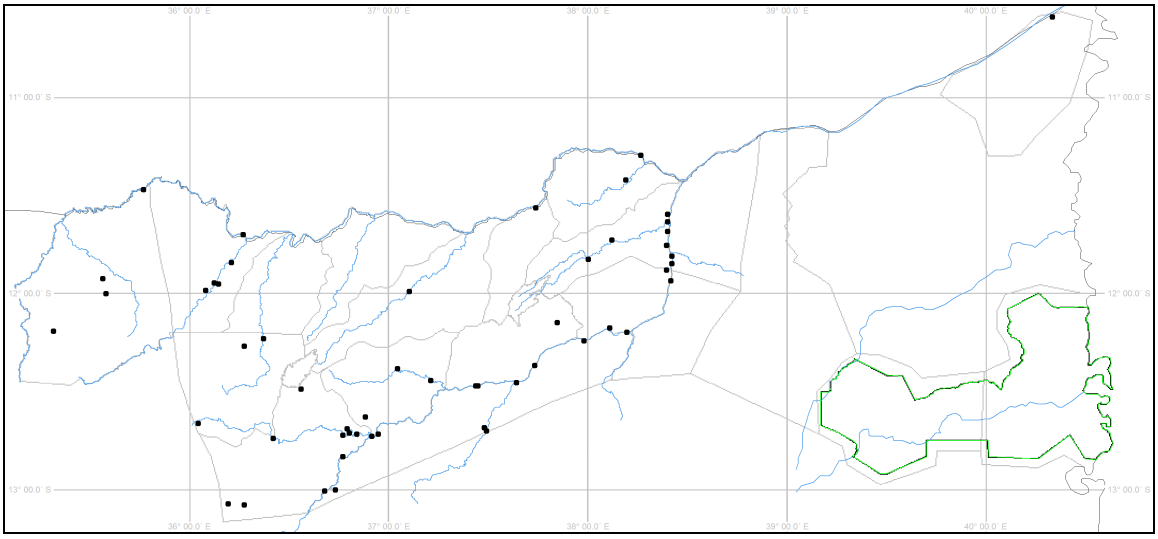

Figure 20: Waterbuck

Wildebeest Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L3	10	1 - 29	1	0	0.0036
L4	58	6 - 173	6	0	0.0258
L6	19	2 - 58	2	0	0.0084
L7	0	15 - 0	0	15	0
L8	334	35 - 786	35	0	0.1564
L9	48	5 - 142	5	0	0.0165
R4	127	13 - 367	13	0	0.0341
R5	10	1 - 28	1	0	0.0066
R6	156	16 - 384	16	0	0.0667
Total	**761**	**219 - 1302**	**79**	**15**	**0.018**

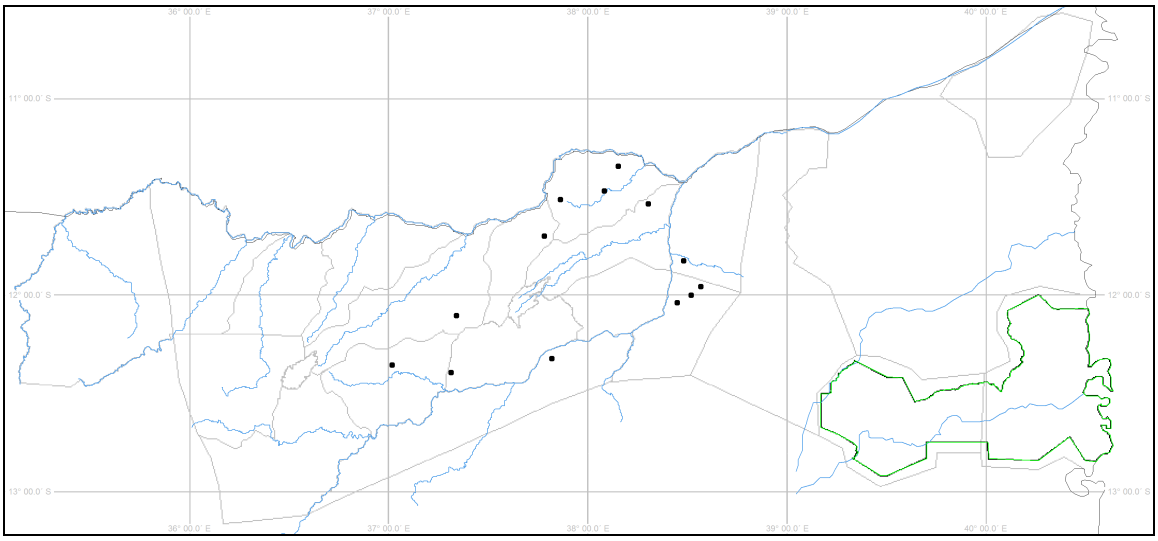

Figure 21: Wildebeest

Zebra Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	48	5 - 141	5	0	0.0114
L3	434	129 - 740	45	0	0.1632
L4	290	39 - 664	30	9	0.1292
L5	528	231 - 826	54	4	0.2907
L6	378	99 - 657	39	0	0.1646
L7	282	122 - 441	29	0	0.0644
L8	315	85 - 545	33	0	0.1475
L9	96	10 - 227	10	0	0.0331
R1	291	88 - 494	30	2	0.0844
R2	221	23 - 463	23	0	0.098
R3	213	22 - 404	22	0	0.0789
R4	282	60 - 504	29	0	0.0761
R5	144	15 - 281	15	0	0.0985
R6	282	37 - 528	29	2	0.1208
Total	**3805**	**2980 - 4630**	**393**	**17**	**0.09**

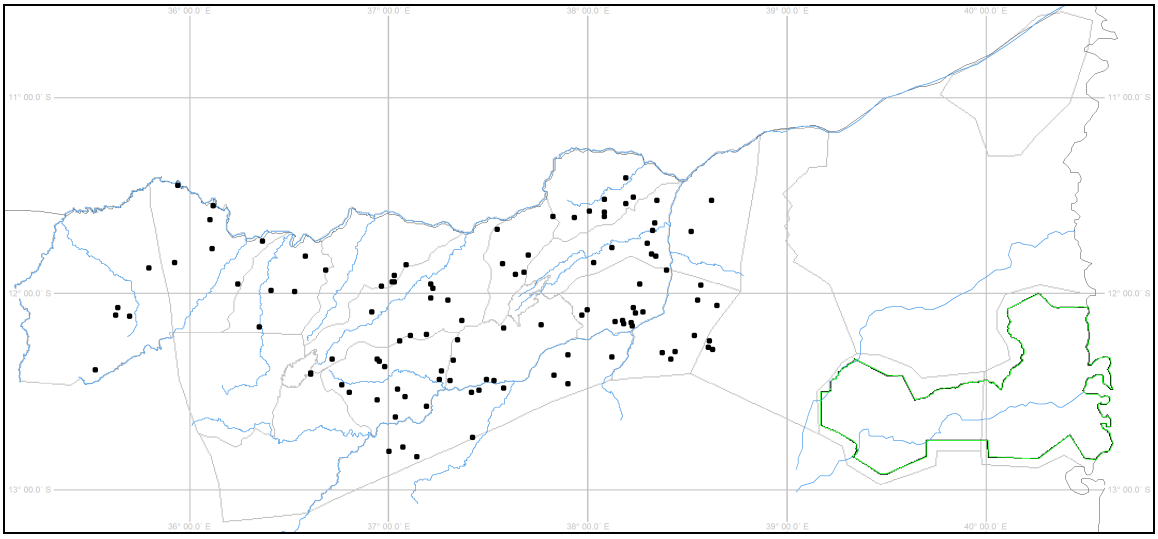

Figure 22: Zebra

Leopard Estimates

Stratum	Pop. Est.	Range	No. seen	No. out	Dens/km²
L7	10	1 - 28	1	0	0.0022
Total	**10**	**1 - 28**	**1**	**0**	**0.0002**

Lion Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	20	2 - 59	2	0	0.0059
L3	19	2 - 57	2	0	0.0073
L7	0	2 - 0	0	2	0
Total	**39**	**6 - 90**	**4**	**2**	**0.0009**

Hyaena Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	10	1 - 28	1	0	0.0023
R4	10	1 - 28	1	0	0.0026
R5	10	1 - 28	1	0	0.0066
R6	10	1 - 29	1	0	0.0042
Total	**39**	**4 - 74**	**4**	**0**	**0.0009**

Honey Badger Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
R6	0	1 - 0	0	1	0
Total	**0**	**1 - 0**	**0**	**1**	**0**

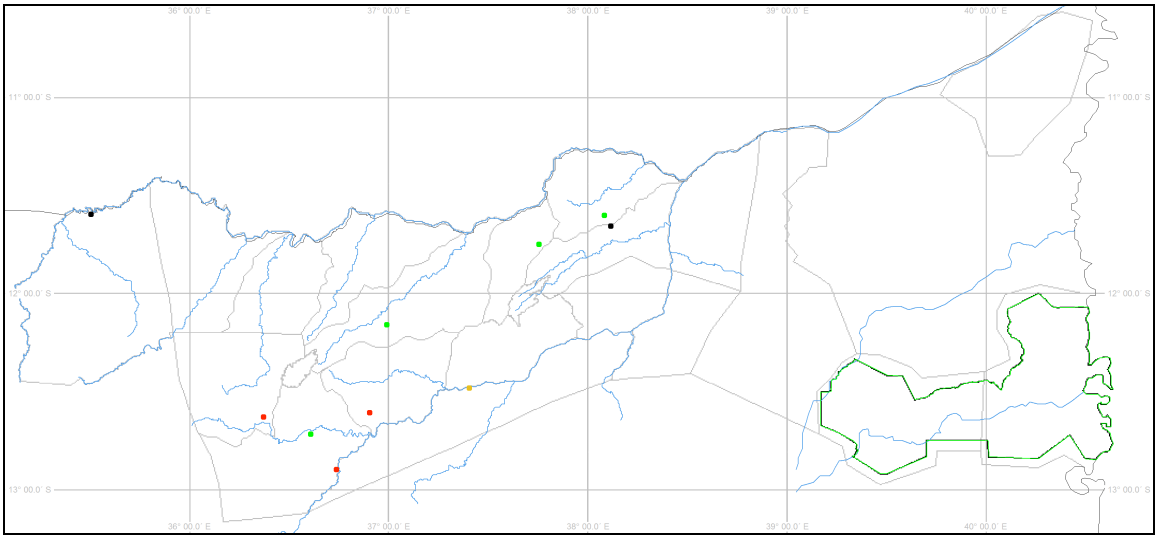

Figure 23: Canivores: Lion red; Leorpard yellow; Hyaena green; Honey badger black

Other Carcass Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
Carc1					
L2	10	1 - 29	1	0	0.0023
Total	10	1 - 28	1	0	0.0002
Carc2					
R4	10	1 - 28	1	0	0.0026
Total	10	1 - 28	1	0	0.0002
Carc3					
L6	19	2 - 45	2	0	0.0084
R6	10	1 - 29	1	0	0.0042
Total	29	3 - 59	3	0	0.0007
Carc4					
L6	10	1 - 28	1	0	0.0042
L7	10	1 - 28	1	0	0.0022
R2	10	1 - 30	1	0	0.0043
R3	10	1 - 28	1	0	0.0036
R4	29	3 - 60	3	0	0.0079
R6	10	1 - 29	1	0	0.0042
Total	78	28 - 128	8	0	0.0018
Overall	**127**	**63 - 191**	**13**	**0**	**0.0029**

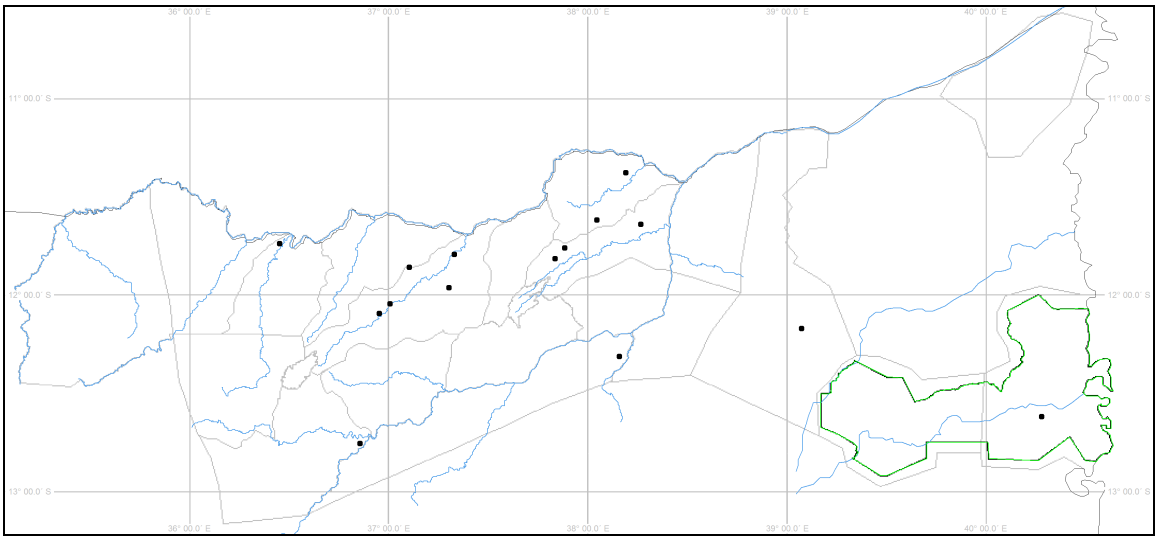

Figure 24: Other wildlife carcasses including unknown species

OTHER OBSERVATIONS

This section describes attributes other than wildlife recorded during the survey. "Estimates" are tabulated for several attributes, including density estimates. This has not been done in previous reports because such estimates only refer to observable instances and are not necessarily related to the true number of anything. For example: "villages" does not relate to the number of dwellings or people therein; fields extend beyond the sampling transect and the count does not reflect area; and snare lines also extend beyond the transect but are counted if only part is in. The counts may nevertheless serve as useful indices of occurrence and the estimates are given for so that comparisons can be made between areas and years. Livestock and logging represent discrete occurrences and these are true estimates. As for wildlife, data for surveys adjacent to Niassa are included on the maps.

Sheep or goats Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	294	30 - 607	30	0	0.089
L4	222	23 - 540	23	0	0.099
Total	**517**	**101 - 933**	**53**	**0**	**0.0122**

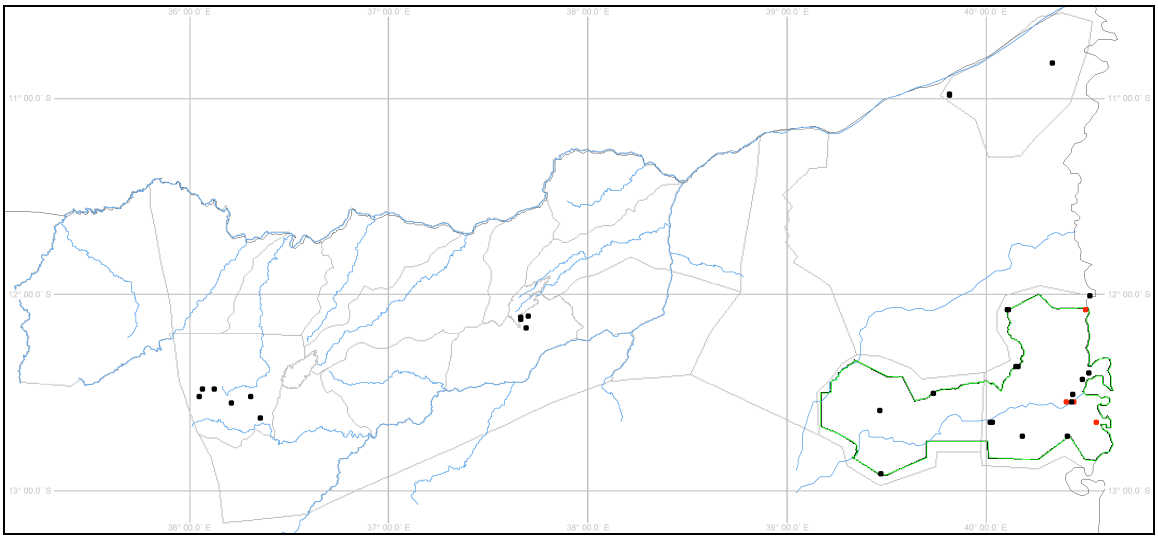

Figure 25: Livestock: Cattle red; Small stock black

Fishing camp Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	10	1 - 28	1	0	0.0023
L3	19	2 - 45	2	0	0.0073
L4	29	3 - 60	3	0	0.0129
L5	10	1 - 30	1	0	0.0054
L7	117	32 - 202	12	0	0.0267
L9	48	5 - 94	5	0	0.0165
R3	10	1 - 29	1	0	0.0036
R6	29	3 - 64	3	0	0.0125
Total	**271**	**160 - 382**	**28**	**0**	**0.0064**

Fishtrap/net Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	49	5 - 121	5	0	0.0148
L2	57	6 - 112	6	0	0.0137
L3	58	6 - 110	6	0	0.0218
L4	10	1 - 29	1	0	0.0043
L5	166	94 - 239	17	0	0.0915
L6	126	13 - 255	13	0	0.0549
L7	262	160 - 365	27	2	0.06
L8	48	5 - 100	5	0	0.0223
L9	250	40 - 459	26	0	0.086
R1	10	1 - 29	1	0	0.0028
R2	29	3 - 62	3	0	0.0128
R3	232	24 - 535	24	0	0.086
R4	29	3 - 62	3	0	0.0079
R6	68	9 - 127	7	0	0.0292
Total	**1394**	**982 - 1807**	**144**	**2**	**0.033**

Canoe Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L2	29	3 - 72	3	0	0.0068
L3	39	4 - 87	4	0	0.0145
L4	29	3 - 86	3	0	0.0129
L5	20	2 - 46	2	0	0.0108
L6	10	1 - 29	1	0	0.0042
L7	165	17 - 322	17	0	0.0378
L8	10	1 - 29	1	0	0.0045
L9	29	3 - 72	3	0	0.0099
R3	68	7 - 185	7	0	0.0251
R4	19	2 - 47	2	0	0.0052
R6	10	1 - 30	1	0	0.0042
Total	**426**	**210 - 642**	**44**	**0**	**0.0101**

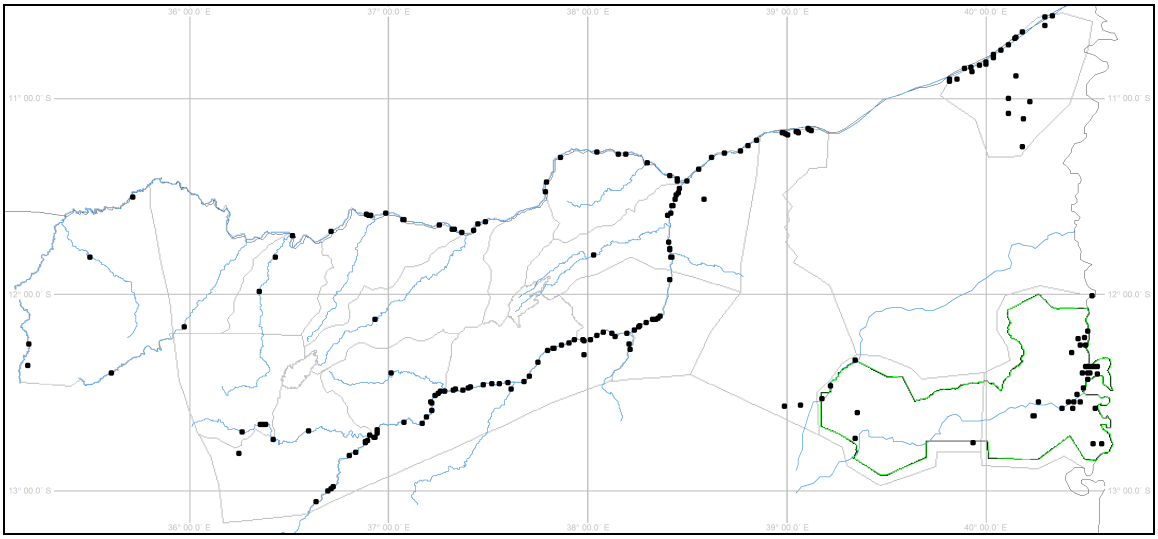

Figure 26: Fishing instances: camps, canoes, nets, traps

Snareline Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	206	96 - 316	21	0	0.0623
L2	86	13 - 159	9	1	0.0205
L4	48	5 - 93	5	0	0.0215
L5	39	4 - 83	4	0	0.0215
L6	58	16 - 100	6	0	0.0253
L7	107	18 - 195	11	0	0.0244
L8	10	1 - 29	1	0	0.0045
L9	307	114 - 500	32	2	0.1059
R1	29	3 - 62	3	0	0.0084
R2	307	104 - 509	32	2	0.1364
R3	435	251 - 620	45	2	0.1613
R4	49	5 - 97	5	0	0.0131
R5	29	3 - 71	3	0	0.0197
R6	351	113 - 588	36	1	0.15
Total	**2061**	**1635 - 2487**	**213**	**8**	**0.0487**

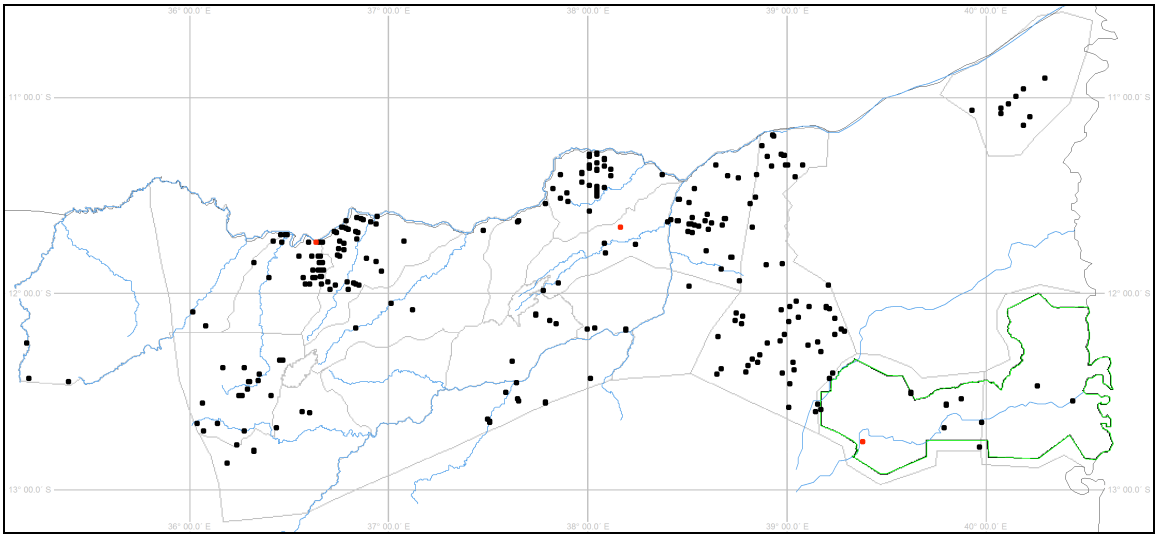

Figure 27: Illegal hunting: Snarelines black, Camps red

Gold panning Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
R6	10	1 - 29	1	0	0.0042
Total	**10**	**1 - 28**	**1**	**0**	**0.0002**

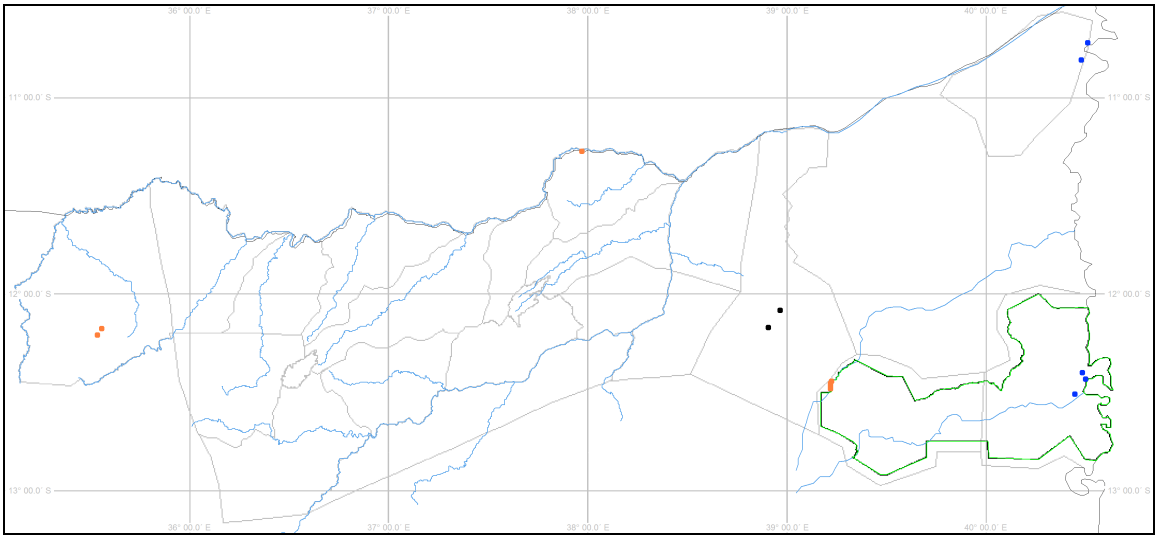

Figure 28: Mineral extraction: Gold panning orange; Prospecting black; Salt extraction blue

Logging Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	10	1 - 30	1	0	0.003
L6	107	11 - 257	11	0	0.0464
L9	1978	1421 - 2535	206	0	0.6816
R4	10	1 - 29	1	0	0.0026
R6	127	31 - 222	13	1	0.0542
Total	**2231**	**1676 - 2785**	**232**	**1**	**0.0527**

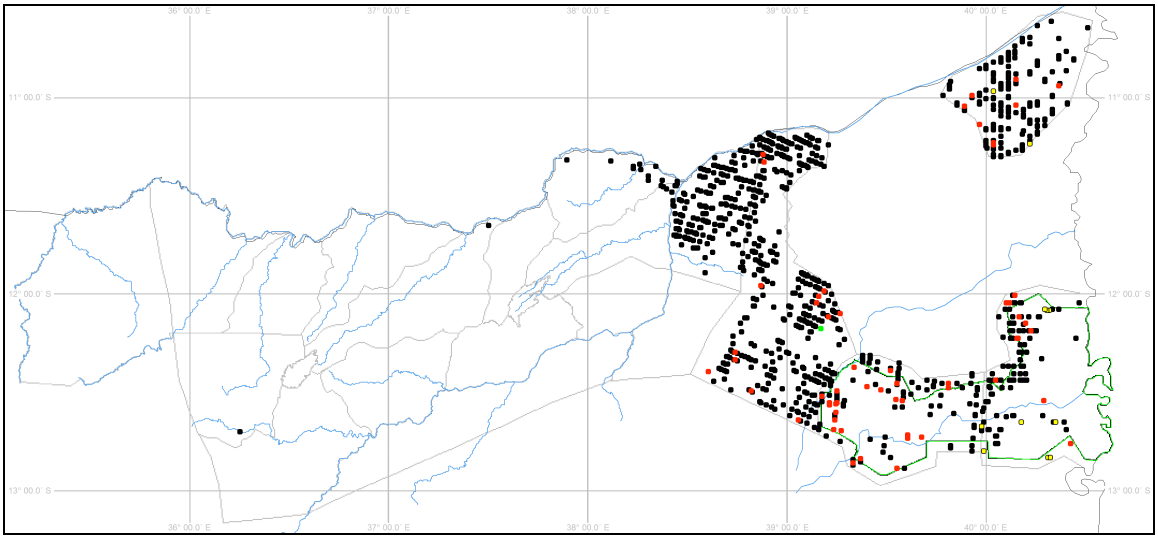

Figure 29: Wood extraction: Logging black; Timber stores red; Timber truck green; Bamboo cutting yellow

Cultivation Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	1404	585 - 2223	143	2	0.4242
L2	316	33 - 616	33	0	0.0752
L4	0	2 - 0	0	2	0
L5	59	6 - 157	6	0	0.0323
L6	29	3 - 69	3	0	0.0127
L7	136	14 - 264	14	0	0.0311
L9	250	98 - 401	26	1	0.086
R1	39	4 - 91	4	0	0.0113
R3	10	1 - 28	1	0	0.0036
R4	78	8 - 154	8	0	0.021
R6	29	3 - 89	3	0	0.0125
Total	**2349**	**1502 - 3195**	**241**	**5**	**0.0555**

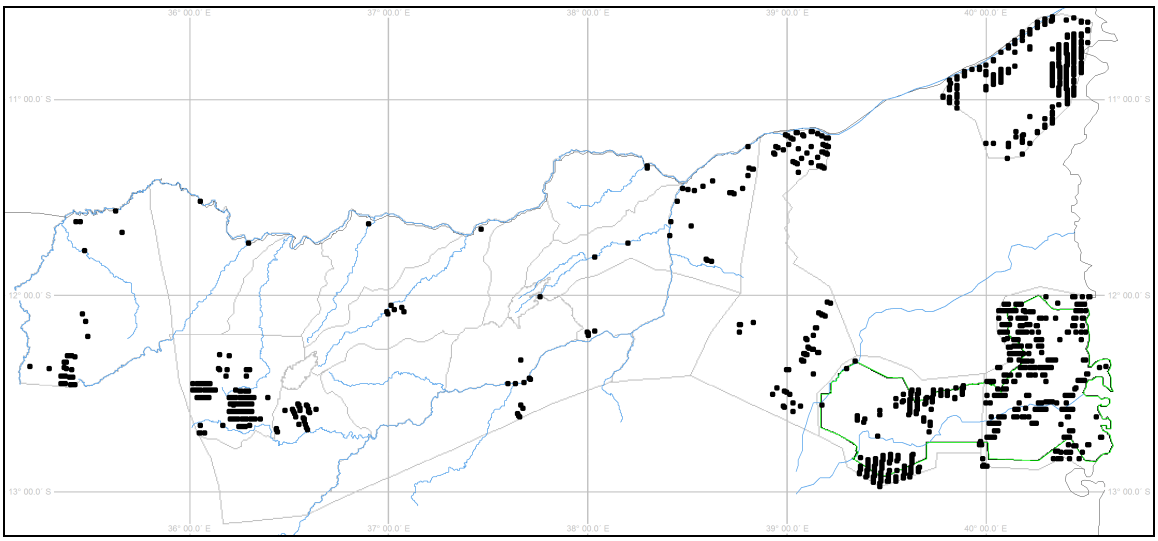

Figure 30: Cultivation

Village Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	854	306 - 1402	87	2	0.2581
L2	115	16 - 242	12	4	0.0273
L4	97	11 - 223	10	1	0.0431
L5	10	1 - 29	1	0	0.0054
L6	10	1 - 28	1	0	0.0042
L7	87	18 - 157	9	0	0.02
L9	115	42 - 189	12	2	0.0397
R1	39	4 - 82	4	0	0.0113
R3	10	1 - 28	1	0	0.0036
R4	49	5 - 97	5	0	0.0131
R6	19	2 - 59	2	0	0.0083
Total	**1404**	**854 - 1955**	**144**	**9**	**0.0332**

Big village Estimates

Stratum	Pop. est.	Range	No. seen	No. out	Dens/km²
L1	0	1 - 0	0	1	0
L2	0	1 - 0	0	1	0
L5	0	1 - 0	0	1	0
L6	0	1 - 0	0	1	0
L7	0	1 - 0	0	1	0
L9	10	2 - 28	1	1	0.0033
Total	**10**	**7 - 27**	**1**	**6**	**0.0002**

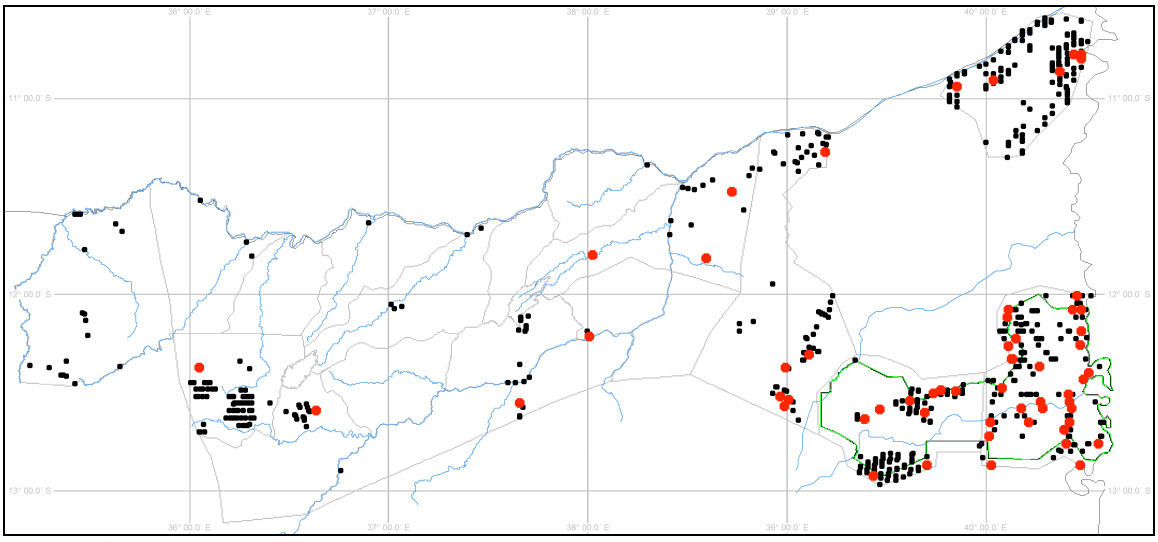

Figure 31: Habitation: Small settlements black; Major settlements and towns red

DISCUSSION

Observer Bias

The 2009 results showed a great increase in elephants since 2006 and most species continued a modest upward trend from earlier surveys. It can not be ruled out that some of this effect was due to the pairing of the two best observers of the series for the first time. The 2011 survey used the observer team from 200-2004 of whom only the right hand observer was present in 2009. This was an attempt to make a later survey comparable with earlier ones.

While the two observers obtained comparable results for elephant and buffalo, the left observer detected fewer groups of most species and very significantly fewer of some of the more cryptic species (Appendix II), showing that observer bias is present. For consistency across surveys, no correction has been made for this in the reported estimates. To place the apparent declines in perspective, however, the following table shows the results of the right observer, who alone was present on both surveys

Comparison of estimates by the right hand observer

	2009	2011
Baboon	4125	3188
Buffalo	4258	6265
Bushbuck	504	398
Bushpig	403	544
Crocodile	80	146
Duiker	22113	15942
Eland	3983	4312
ElephantBull	1619	773
ElephantFamily	14351	13463
EleCarcass 2	102	335
EleCarcass 3	244	210
EleCarcass 4	488	2935
GroundHornbill	3415	3634
Hartebeest	3364	4381
Hippopotamus	396	1303
Impala	1459	1679
Klipspringer	81	0
Kudu	2223	1973
Leopard	20	21
Lion	324	0
Monkey	867	500
Reedbuck	1116	1152
Sable	12290	10936
Hyaena	0	84
Warthog	7155	6918
Waterbuck	2337	2196
Wildebeest	689	859
Zebra	4825	4724

Elephant mortality

In this survey 2627 carcasses were estimated, compared to 896 in 2009, an increase of 1731. The additional cacasses have accumulated since 2009 and therefore represent an estimate of animals that have died since then. No more than around 200 of these could have been due to natural mortality during the two years from 2009 to 2011, so the bulk of the deaths is likely to be the result of illegal hunting. This is still possibly an underestimate because: carcasses are difficult to see so are always somewhat underestimated; and some pre-2009 carcasses will have deteriorated to become undetectable since then(although this must be a small proportion as carcasses remain detectable for five years or more and most of those in 2009 were recent then, the illegal hunting upsurge having just begun).

The undercounting issue is underlined by the measure of observer bias reported in Appendix II, although no overall estimate of detectability is possible – there is no measure of how many the best observer is missing. Nevertheless, to eliminate the bias we know about it is important to compare like with like, using only the data from the observer present on both surveys (the right hand observer).

Comparison of right observer's carcass estimates in 2009 and 2011

2009	2011	Difference	Range of difference
834	3480	2646	1960 - 3332

The probability that the observed difference is due to chance is less than one in a billion, so there is little doubt that the losses are real, and, reflecting on the unmeasured efficiency of the right observer, are probably still underestimated. Over the period reproduction may have replaced only around 1200 animals, so the losses are clearly unsustainable.

Comparing the population estimates of the right observer gives:

Comparison of right observer's elephant estimates in 2009 and 2011

2009	2011	Difference	Range of difference
15970	14236	1734	-3553 - 7022

That is, the population could have declined by 7000 or increased by 3500. Although the balance of evidence favours a decline, the result is not statistically significant. This is expected: with a widespread population of this size, sampled at this intensity, one is unlikely to obtain a confidence interval as good as $\pm$ 20% of the estimate, which makes a change of several thousand undetectable over two surveys. Carcasses, however, are a direct measure of mortality and will increase by a large *factor* (fourfold in this case) when the population declines by only a *proportion*. Therefore, although they tend towards an underestimate, they are a very sensitive indicator of population change, hence the importance of counting them.

It is noticeable that the estimated number of bulls in bachelor groups has declined since 2009 (the estimate has more than halved). Again, for consistency, analysing only the right observer's results reveals:

Comparison of right observer's bull elephant estimates in 2009 and 2011

2009	2011	Difference	Range of difference

Despite the small numbers in the comparison, the difference is marginally significant at the 5% level (p = 4.8%). The range of the possible change is wide but there is statistically significant evidence of a decline, suggesting mature male elephants have been disproportionately removed by illegal hunting.

APPENDIX I: METHODS

Methods were the same as in previous Niassa Surveys. Stratification was according to management units. Transect selection is shown in Fig. 32. Nominal sampling intensity was 10%.

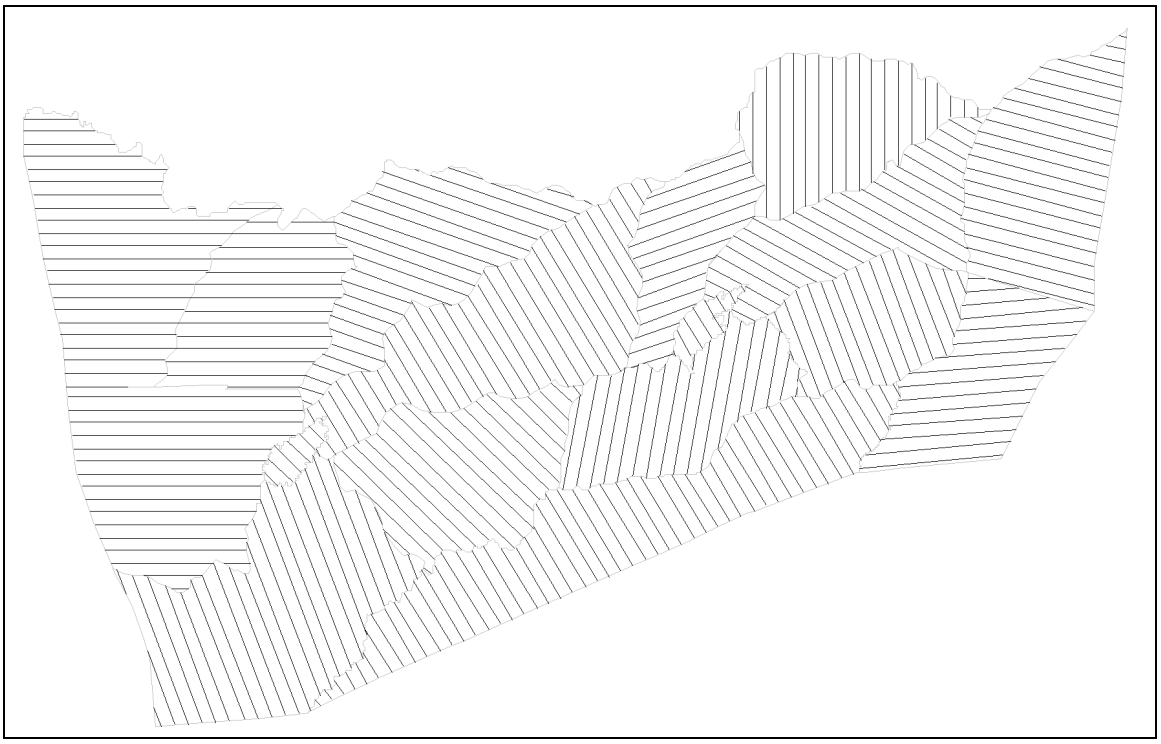

Figure 32: Niassa 2011 Transects

Survey crew comprised D. le Poidevin and C. Hertzler (Pilots), C. Craig (coordinator and front-seat observer), F. Muroki (left hand observer) and D Chipesi(right hand observer).

APPENDIX II: RESULTS

Supporting data indicating survey quality are given below.

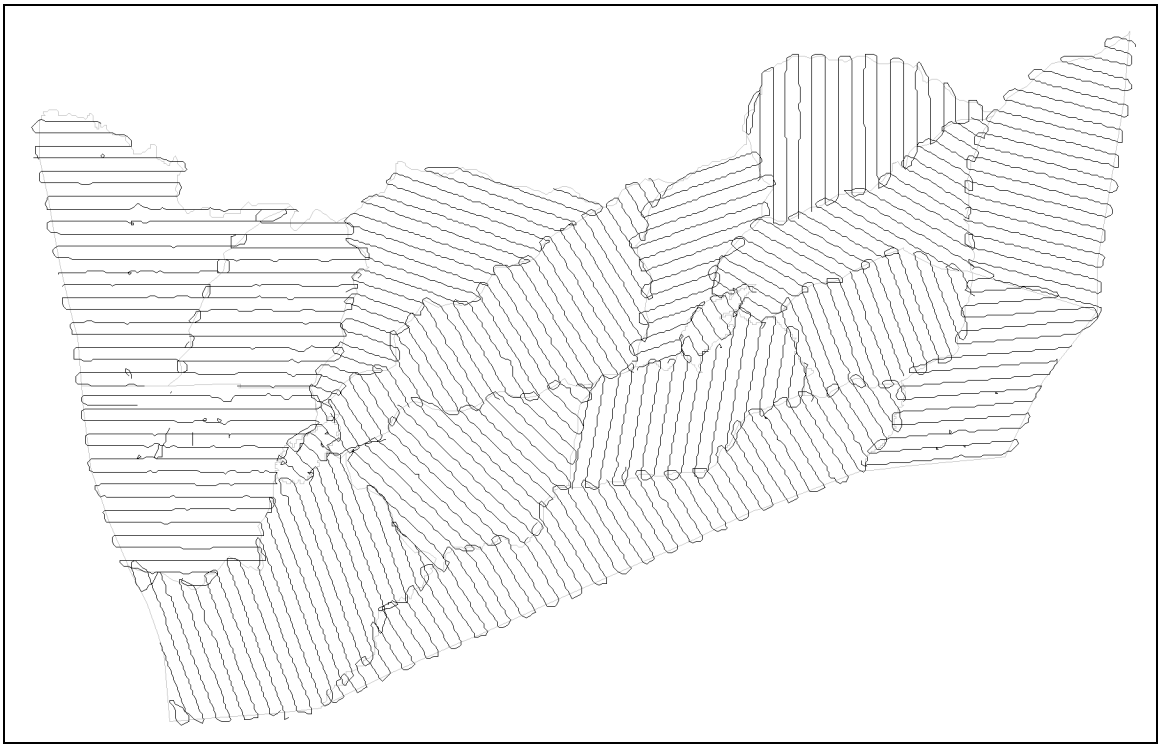

Figure 33: Tracks flown on Niassa survey

Stratum Statistics

Stratum	Area	SArea	SI	NSU	V(Knots)	Srate
L1	3308.56	337.09	10.19	17	92.43	1.2
L2	4206.75	439.12	10.44	25	94.09	1.2
L3	2662.24	275.77	10.36	20	94.19	1.2
L4	2245.28	232.27	10.34	20	95.45	1.22
L5	1818.26	185.79	10.22	17	96.55	1.22
L6	2295.52	236.9	10.32	26	92.77	1.18
L7	4370.51	450.01	10.3	51	91.22	1.16
L8	2134.69	223.79	10.48	15	94.14	1.2
L9	2902.19	302.25	10.41	22	94.38	1.2
J	209	24.66	11.8	7	80.47	1.17
M	231.31	34.23	14.8	9	86.66	1.63
R1	3450.13	355.54	10.31	24	95.86	1.21
R2	2249.77	234.65	10.43	16	92.48	1.19
R3	2699.44	278.94	10.33	26	93.15	1.18
R4	3709.15	381	10.27	34	93.16	1.18
R5	1465.79	152.35	10.39	15	90.21	1.15
R6	2337.24	240.04	10.27	19	91.92	1.17
All	42295.83	4384.39	10.37	363	93.32	1.19

SArea = Sample area; SI = Sampling intensity; NSU = No. of sampling units; V = groundspeed; Srate = Search rate in km^2 per minute. The target search rate was 1.1 km^2 per minute.

Calibration of Strip Widths

The results of the strip width calibration are given below. Messrs Muroki and Chipese were left and right observers respectively.

		L		R		Width		Corrected		Tot W
#	H	in	out	in	out	L	R	L	R	
1	280	9	28	7	22	200	160	214.2857	171.4286	385.7143
2	220	6	22	7	20	170	140	231.8182	190.9091	422.7273
3	240	1	19	13	27	190	150	237.5	187.5	425
4	250	9	27	5	19	190	150	228	180	408
5	250	5	23	8	23	190	160	228	192	420
6	250	10	26	4	19	170	160	204	192	396
7	220	11	28	2	14	180	130	245.4545	177.2727	422.7273
8	260	19	29	1	15	110	150	126.9231	173.0769	300
9	220	10	26	2	16	170	150	231.8182	204.5455	436.3636
10	250	10	27	4	17	180	140	216	168	384
11	250	11	29	2	14	190	130	228	156	384
12	220	10	29	3	16	200	140	272.7273	190.9091	463.6364
13	220	8	25	4	17	180	140	245.4545	190.9091	436.3636
14	240	9	25	4	20	170	170	212.5	212.5	425
15	250	9	24	5	20	160	160	192	192	384
16	250	12	28	2	17	170	160	204	192	396
17	250	8	24	7	23	170	170	204	204	408
18	250	9	25	5	22	170	180	204	216	420
19	260	8	25	6	21	180	160	207.6923	184.6154	392.3077
20	250	9	25	5	19	170	150	204	180	384
21	260	5	23	9	23	190	150	219.2308	173.0769	392.3077
22	240	10	29	4	19	200	160	250	200	450
								218.5184	187.6701	
									Mn	406.1885
									Var	1092.435
									SE Mn	7.582651
									%CL	3.733562

Maintenance of height

The target height was 300 feet above ground. The mean height flown was 305 feet. 95% of recorded heights were within 47.5 feet of this value.

Observer Bias

Species	No.of groups seen in + out Left	Right	Chi^2	P%	
Baboon	5	56	42.639	6.58E-09	****
Buffalo	37	25	2.323	12.75084	
Bushbuck	6	31	16.892	0.00396	****
Bushpig	0	13	13	0.03115	***
Crocodile	5	7	0.333	56.37029	
Duiker	421	1012	243.741	6.01E-53	****
Eland	23	37	3.267	7.07012	
EleCarcass 1	2	2	0	100	
EleCarcass 2	9	15	1.5	22.06715	
EleCarcass 3	20	11	2.613	10.59976	
EleCarcass 4	86	141	13.326	0.02618	***
All Carc	117	169	9.455	0.21063	**
ElephantBull	39	39	0	100	
ElephantFamily	92	113	2.151	14.24567	
All Eles	131	152	1.558	21.19138	
GroundHornbill	93	110	1.424	23.28045	
Hartebeest	46	58	1.385	23.93167	
Hippopotamus	8	12	0.8	37.10934	
Honey Badger	1	1	0	100	
Hyaena	0	4	4	4.55003	*
Impala	8	18	3.846	4.98602	*
Kudu	24	43	5.388	2.0275	*
Lion	2	1	0.333	56.37029	
Leopard	0	1	1	31.73108	
Monkey	1	18	15.211	0.00962	**
Reedbuck	20	39	6.119	1.33763	*
Sable	150	195	5.87	1.54049	*
Warthog	73	153	28.319	1.03E-05	****
Waterbuck	23	34	2.123	14.51204	
Wildebeest	4	9	1.923	16.55179	
Zebra	46	65	3.252	7.13254	

The above shows that the left observer made significantly fewer sightings than the right when dealing with the more difficult-to-see species. These will be underestimated by the survey. There is no measure of the number of groups the right observer misses. All data from Niassa, Chipanje-Chetu and the WWF survey are included. **** indicates a probability of <1/10000, *** of <1/1000, ** of <1/100 and * of <1/20.

Estimates of numbers, densities and confidence limits

The following tables give the results for each stratum based on the numbers seen in the sample. Results for all species and attributes counted are given. Column 6 is the 95% confidence limit expressed as a percentage of the estimate.

Niassa Reserve overall		Area:	42295.82	km²	Mean sampling intensity	10.4%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	1764	182	0	112842.88	37.5	1103 <> 2425	0.0417
Buffalo	6214	644	230	1956382.8	44.3	3462 <> 8967	0.1469
Bushbuck	242	25	0	3367.75	47.2	128 <> 356	0.0057
Bushpig	251	26	0	7587.93	68.3	80 <> 423	0.0059
Crocodile	173	18	0	5277.93	82.7	30 <> 316	0.0041
Duiker	10557	1091	2	174190.28	7.8	9736 <> 11378	0.2496
Eland	3262	338	6	581990.76	46	1761 <> 4763	0.0771
ElephantBull	821	85	38	21058.1	34.8	535 <> 1106	0.0194
EleCarcass 1	10	1	5	91.58	196.4	6 <> 28	0.0002
EleCarcass 2	252	26	2	2548.53	39.5	152 <> 351	0.006
EleCarcass 3	281	29	0	2644.94	36.1	179 <> 382	0.0066
EleCarcass 4	2084	215	27	27419.18	15.6	1758 <> 2410	0.0493
ElephantFamily	11150	1162	420	1640988.5	22.6	8629 <> 13671	0.2636
GroundHornbill	3209	332	16	95017.32	18.9	2603 <> 3816	0.0759
Hartebeest	3663	378	19	254379.13	27.1	2670 <> 4655	0.0866
Hippopotamus	834	86	14	72694.24	63.6	304 <> 1365	0.0197
Honey Badger	0	0	1	0	0	1 <> 0	0
Impala	1019	105	0	61765.83	48	530 <> 1508	0.0241
Kudu	1368	141	4	46091.96	30.9	946 <> 1791	0.0324
Leopard	10	1	0	83.96	185.7	1 <> 28	0.0002
Lion	39	4	2	680.92	131.9	6 <> 90	0.0009
Monkey	232	24	6	8449.57	78.1	51 <> 412	0.0055
Reedbuck	765	79	0	17350.85	33.9	506 <> 1024	0.0181
Sable	9671	998	220	882777.92	19.1	7822 <> 11520	0.2287
Hyaena	39	4	0	322.96	91.4	4 <> 74	0.0009
Warthog	4503	466	13	200248.82	19.6	3623 <> 5384	0.1065
Waterbuck	1662	172	7	80372.16	33.6	1104 <> 2220	0.0393
Wildebeest	761	79	15	75728.9	71.2	219 <> 1302	0.018
Zebra	3805	393	17	175832.31	21.7	2980 <> 4630	0.09
Sheep/goats	517	53	0	44719.5	80.5	101 <> 933	0.0122
OtherCarcass 1	10	1	0	86.52	191.1	1 <> 28	0.0002
OtherCarcass 2	10	1	0	83.87	185.1	1 <> 28	0.0002
OtherCarcass 3	29	3	0	237.29	104.1	3 <> 59	0.0007
OtherCarcass 4	78	8	0	647.4	64.5	28 <> 128	0.0018
Fishing camp	271	28	0	3183.03	41	160 <> 382	0.0064
Fishtrap/net	1394	144	2	43937.81	29.6	982 <> 1807	0.033
Canoe	426	44	0	12067.4	50.7	210 <> 642	0.0101
Snareline	2061	213	8	46943.79	20.7	1635 <> 2487	0.0487
Gold panning	10	1	0	81.5	182.5	1 <> 28	0.0002
Logging	2231	232	1	79345.58	24.8	1676 <> 2785	0.0527
Village	1404	144	9	78283.12	39.2	854 <> 1955	0.0332
Cultivation	2349	241	5	185140.37	36.1	1502 <> 3195	0.0555
Big Village	10	1	6	81.56	185.1	7 <> 27	0.0002

Stratum L1 Area: 3309 km² Sampling intensity: 10.20%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	39	4	0	1318	196	4 <> 116	0.0119
Buffalo	128	13	0	14035.83	196.8	13 <> 379	0.0386
Duiker	344	35	0	4711.93	42.4	198 <> 489	0.1038
Eland	177	18	0	21045.13	174.1	18 <> 484	0.0534
GroundHornbill	79	8	0	1745.82	112.8	8 <> 167	0.0237
Hartebeest	285	29	0	37216.54	143.7	29 <> 694	0.086
Kudu	88	9	0	3153	134.8	9 <> 207	0.0267
Lion	20	2	0	352.47	202.7	2 <> 59	0.0059
Reedbuck	39	4	0	396.47	107.5	4 <> 81	0.0119
Sable	658	67	3	96872.51	100.3	70 <> 1317	0.1988
Warthog	49	5	0	2066.08	196.3	5 <> 145	0.0148
Waterbuck	59	6	0	967.89	112	6 <> 125	0.0178
Sheep/goats	294	30	0	21693.02	106	30 <> 607	0.089
Fishtrap/net	49	5	0	1144.19	146.1	5 <> 121	0.0148
Snareline	206	21	0	2689.11	53.3	96 <> 316	0.0623
Logging	10	1	0	91.22	206.3	1 <> 30	0.003
Village	854	87	2	66826.12	64.2	306 <> 1402	0.2581
Cultivation	1404	143	2	149252.69	58.4	585 <> 2223	0.4242
Big Village	0	0	1	0	0	1 <> 0	0

Stratum L2 Area: 4207 km² Sampling intensity: 10.40%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	240	25	0	16187.48	109.6	25 <> 502	0.0569
Buffalo	575	60	0	155025.16	141.4	60 <> 1387	0.1366
Bushbuck	10	1	0	83.79	197.2	1 <> 28	0.0023
Bushpig	105	11	0	3012.7	107.5	11 <> 219	0.0251
Crocodile	29	3	0	231.11	109.2	3 <> 60	0.0068
Duiker	546	57	0	4712.46	25.9	404 <> 688	0.1298
Eland	987	103	3	241992.18	102.9	106 <> 2002	0.2346
ElephantBull	57	6	0	986.57	112.8	6 <> 122	0.0137
EleCarcass 4	19	2	0	169.82	140.4	2 <> 46	0.0046
ElephantFamily	335	35	5	11509.67	66	114 <> 557	0.0797
GroundHornbill	259	27	0	7745.47	70.2	77 <> 440	0.0615
Hartebeest	153	16	0	8662	125.3	16 <> 345	0.0364
Hippopotamus	29	3	0	431.9	149.2	3 <> 72	0.0068
Reedbuck	48	5	0	720.65	115.7	5 <> 103	0.0114
Sable	786	82	2	58390.26	63.5	287 <> 1284	0.1867
Hyaena	10	1	0	79.63	192.3	1 <> 28	0.0023
Warthog	594	62	0	28334.19	58.5	247 <> 941	0.1412
Waterbuck	412	43	0	18188.5	67.6	134 <> 690	0.0979
Zebra	48	5	0	2035	194.4	5 <> 141	0.0114
OtherCarcass 1	10	1	0	86.52	200.4	1 <> 29	0.0023
Fishing camp	10	1	0	81.92	195	1 <> 28	0.0023
Fishtrap/net	57	6	0	697.32	94.8	6 <> 112	0.0137
Canoe	29	3	0	439.07	150.5	3 <> 72	0.0068
Snareline	86	9	1	1253.56	84.8	13 <> 159	0.0205
Village	115	12	4	3778.26	110.4	16 <> 242	0.0273
Cultivation	316	33	0	21097.05	94.8	33 <> 616	0.0752
Big Village	0	0	1	0	0	1 <> 0	0

Stratum L3 Area: 2662 km² Sampling intensity: 10.40%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	135	14	0	16408.94	198.4	14 <> 403	0.0508
Buffalo	1448	150	77	452604.42	97.2	227 <> 2856	0.5439
Bushbuck	10	1	0	81.04	195.2	1 <> 28	0.0036
Crocodile	10	1	0	92.87	208.9	1 <> 30	0.0036
Duiker	560	58	0	4255.68	24.4	423 <> 696	0.2103
Eland	328	34	0	64149.92	161.5	34 <> 858	0.1233
ElephantBull	106	11	4	2119.9	90.7	15 <> 203	0.0399
EleCarcass 4	10	1	0	81.48	195.7	1 <> 29	0.0036
ElephantFamily	1178	122	12	194899.9	78.5	254 <> 2102	0.4424
GroundHornbill	68	7	0	1804.69	131.6	7 <> 156	0.0254
Hartebeest	483	50	2	49480.36	96.5	52 <> 948	0.1813
Hippopotamus	251	26	0	13994.54	98.6	26 <> 499	0.0943
Impala	58	6	0	2948.13	196.2	6 <> 172	0.0218
Kudu	10	1	0	78.39	192	1 <> 28	0.0036
Lion	19	2	0	328.45	196.5	2 <> 57	0.0073
Reedbuck	19	2	0	340.88	200.1	2 <> 58	0.0073
Sable	627	65	46	40766.37	67.3	205 <> 1050	0.2357
Warthog	415	43	0	11184	53.3	194 <> 636	0.1559
Waterbuck	87	9	0	3219.4	136.7	9 <> 206	0.0326
Wildebeest	10	1	0	81.89	196.2	1 <> 29	0.0036
Zebra	434	45	0	21304.79	70.3	129 <> 740	0.1632
Fishing camp	19	2	0	155.34	135.1	2 <> 45	0.0073
Fishtrap/net	58	6	0	620.94	90	6 <> 110	0.0218
Canoe	39	4	0	524.07	124.1	4 <> 87	0.0145

Stratum L4 Area: 2245 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Buffalo	1402	145	35	335969.45	86.6	188 <> 2615	0.6243
Bushbuck	19	2	0	328.99	196.4	2 <> 57	0.0086
Crocodile	10	1	0	82.25	196.4	1 <> 29	0.0043
Duiker	251	26	0	4102.81	53.3	117 <> 385	0.1119
Eland	39	4	0	469.62	117.3	4 <> 84	0.0172
ElephantBull	29	3	3	368.49	138.5	6 <> 69	0.0129
EleCarcass 2	19	2	0	145.66	130.7	2 <> 45	0.0086
EleCarcass 3	29	3	0	438.31	151.1	3 <> 73	0.0129
EleCarcass 4	97	10	1	1904.96	94.5	11 <> 188	0.0431
ElephantFamily	561	58	21	74533.15	101.9	79 <> 1132	0.2497
GroundHornbill	48	5	0	975.16	135.2	5 <> 114	0.0215
Hartebeest	145	15	0	4323.22	94.9	15 <> 283	0.0646
Hippopotamus	116	12	0	7218.1	153.3	12 <> 294	0.0517
Sable	367	38	1	12144.13	62.8	137 <> 598	0.1636
Warthog	106	11	0	7936.93	175.4	11 <> 293	0.0474
Waterbuck	77	8	0	2922.22	146.3	8 <> 190	0.0344
Wildebeest	58	6	0	3030.35	198.7	6 <> 173	0.0258
Zebra	290	30	9	31857.12	128.8	39 <> 664	0.1292
Sheep/goats	222	23	0	23026.48	142.9	23 <> 540	0.099
Fishing camp	29	3	0	220.75	107.2	3 <> 60	0.0129
Fishtrap/net	10	1	0	82.11	196.2	1 <> 29	0.0043
Canoe	29	3	0	748.77	197.5	3 <> 86	0.0129
Snareline	48	5	0	459.2	92.8	5 <> 93	0.0215
Village	97	10	1	3639.05	130.6	11 <> 223	0.0431
Cultivation	0	0	2	0	0	2 <> 0	0

Stratum L5 Area: 1818 km² Sampling intensity: 10.20%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	137	14	0	5244.89	112.1	14 <> 291	0.0754
Buffalo	147	15	20	18906.99	198.6	35 <> 438	0.0807
Duiker	675	69	0	2931.72	17	561 <> 790	0.3714
Eland	20	2	0	160.59	137.2	2 <> 46	0.0108
ElephantBull	0	0	1	0	0	1 <> 0	0
EleCarcass 2	10	1	0	84.35	198.9	1 <> 29	0.0054
EleCarcass 3	20	2	0	164.88	139.1	2 <> 47	0.0108
EleCarcass 4	333	34	0	5038.77	45.2	182 <> 483	0.183
ElephantFamily	470	48	51	41963.57	92.4	99 <> 904	0.2584
GroundHornbill	215	22	0	5368.09	72.1	60 <> 371	0.1184
Hartebeest	137	14	0	9057.64	147.3	14 <> 339	0.0754
Hippopotamus	206	21	0	36856.9	198	21 <> 613	0.113
Impala	78	8	0	968.11	84.2	12 <> 144	0.0431
Kudu	166	17	0	2650.39	65.6	57 <> 276	0.0915
Reedbuck	29	3	0	767.55	200	3 <> 88	0.0161
Sable	274	28	2	13953.6	91.4	30 <> 524	0.1507
Warthog	186	19	0	3552.37	67.9	60 <> 312	0.1023
Waterbuck	69	7	0	3474.07	182.4	7 <> 193	0.0377
Zebra	528	54	4	19717.96	56.3	231 <> 826	0.2907
Fishing camp	10	1	0	94.76	210.9	1 <> 30	0.0054
Fishtrap/net	166	17	0	1173.75	43.7	94 <> 239	0.0915
Canoe	20	2	0	152.15	133.6	2 <> 46	0.0108
Snareline	39	4	0	432.35	112.6	4 <> 83	0.0215
Village	10	1	0	84.77	199.4	1 <> 29	0.0054
Cultivation	59	6	0	2141.03	167	6 <> 157	0.0323
Big Village	0	0	1	0	0	1 <> 0	0

Stratum L6 Area: 2296 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	242	25	0	13507.99	98.8	25 <> 482	0.1055
Buffalo	155	16	0	5858.95	101.7	16 <> 313	0.0675
Bushbuck	68	7	0	1065.37	99.1	7 <> 135	0.0295
Crocodile	10	1	0	80.55	190.8	1 <> 28	0.0042
Duiker	1056	109	0	29924.95	33.7	700 <> 1412	0.4601
Eland	174	18	0	18365.4	160	18 <> 454	0.076
ElephantBull	29	3	1	739.65	192.7	4 <> 85	0.0127
EleCarcass 2	48	5	1	826.07	122.2	6 <> 108	0.0211
EleCarcass 3	68	7	0	788.87	85.3	10 <> 126	0.0295
EleCarcass 4	504	52	7	5795.72	31.1	347 <> 661	0.2195
ElephantFamily	707	73	20	48848.76	64.3	252 <> 1163	0.3081
GroundHornbill	678	70	5	27688.56	50.5	336 <> 1021	0.2955
Hartebeest	39	4	0	1430.87	201	4 <> 117	0.0169
Impala	116	12	0	7855.95	157	12 <> 299	0.0507
Kudu	426	44	0	10179.38	48.7	219 <> 634	0.1857
Monkey	87	9	0	3425.46	138.2	9 <> 208	0.038
Sable	649	67	1	75474.46	87.1	83 <> 1215	0.2828
Warthog	678	70	0	42729.05	62.8	253 <> 1104	0.2955
Waterbuck	300	31	7	18955.18	94.4	38 <> 584	0.1309
Wildebeest	19	2	0	345.74	197.6	2 <> 58	0.0084
Zebra	378	39	0	18394.26	73.9	99 <> 657	0.1646
OtherCarcass 3	19	2	0	154.54	132.1	2 <> 45	0.0084
OtherCarcass 4	10	1	0	82.86	193.5	1 <> 28	0.0042
Fishtrap/net	126	13	0	3912.07	102.3	13 <> 255	0.0549
Canoe	10	1	0	88.74	200.2	1 <> 29	0.0042
Snareline	58	6	0	421.54	72.7	16 <> 100	0.0253
Logging	107	11	0	5365.19	141.5	11 <> 257	0.0464
Village	10	1	0	83.28	194	1 <> 28	0.0042
Cultivation	29	3	0	385.2	139	3 <> 69	0.0127
Big Village	0	0	1	0	0	1 <> 0	0

Stratum L7 Area: 4371 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	524	54	0	34581.13	71.2	151 <> 898	0.12
Buffalo	29	3	0	752.49	189.1	3 <> 84	0.0067
Bushbuck	29	3	0	413.29	140.1	3 <> 70	0.0067
Bushpig	58	6	0	1668.06	140.8	6 <> 140	0.0133
Crocodile	19	2	0	338.99	190.4	2 <> 56	0.0044
Duiker	1000	103	0	15901.06	25.3	747 <> 1254	0.2289
Eland	573	59	0	113140.08	117.9	59 <> 1249	0.1311
ElephantBull	223	23	6	5594.87	67.3	73 <> 374	0.0511
EleCarcass 2	10	1	0	84.64	190.3	1 <> 28	0.0022
EleCarcass 3	10	1	0	84.64	190.3	1 <> 28	0.0022
EleCarcass 4	97	10	1	1322.96	75.2	24 <> 170	0.0222
ElephantFamily	1641	169	67	386532.63	76.1	393 <> 2890	0.3756
GroundHornbill	272	28	1	8313.95	67.3	89 <> 455	0.0622
Hartebeest	418	43	10	26343.93	78.1	92 <> 744	0.0956
Hippopotamus	223	23	0	14107.66	106.8	23 <> 462	0.0511
Impala	495	51	0	34527.13	75.4	122 <> 869	0.1133
Kudu	58	6	0	1127.26	115.7	6 <> 126	0.0133
Leopard	10	1	0	83.96	189.5	1 <> 28	0.0022
Lion	0	0	2	0	0	2 <> 0	0
Reedbuck	68	7	0	2319.97	142.3	7 <> 165	0.0156
Sable	1768	182	67	240535.26	55.7	782 <> 2753	0.4044
Warthog	466	48	5	39433.05	85.6	67 <> 865	0.1067
Waterbuck	262	27	0	9495.83	74.6	66 <> 458	0.06
Wildebeest	0	0	15	0	0	15 <> 0	0
Zebra	282	29	0	6284.1	56.5	122 <> 441	0.0644
OtherCarcass 4	10	1	0	84.83	190.5	1 <> 28	0.0022
Fishing camp	117	12	0	1792.31	73	32 <> 202	0.0267
Fishtrap/net	262	27	2	2600.61	39.1	160 <> 365	0.06
Canoe	165	17	0	6068.66	94.8	17 <> 322	0.0378
Snareline	107	11	0	1946.86	83	18 <> 195	0.0244
Village	87	9	0	1195.07	79.4	18 <> 157	0.02
Cultivation	136	14	0	4042.53	93.9	14 <> 264	0.0311
Big Village	0	0	1	0	0	1 <> 0	0

Stratum L8 Area: 2135 km² Sampling intensity: 10.50%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Buffalo	878	92	2	327841.85	139.9	94 <> 2106	0.4111
Bushbuck	19	2	0	146.73	136.2	2 <> 45	0.0089
Crocodile	76	8	0	4282.59	183.9	8 <> 217	0.0357
Duiker	610	64	0	3572.61	21	482 <> 739	0.286
ElephantBull	95	10	0	2453.47	111.4	10 <> 202	0.0447
EleCarcass 2	10	1	0	88.62	211.7	1 <> 30	0.0045
EleCarcass 3	10	1	0	88.62	211.7	1 <> 30	0.0045
EleCarcass 4	124	13	0	1147.34	58.6	51 <> 197	0.0581
ElephantFamily	1898	199	14	236578.73	55	855 <> 2941	0.8892
GroundHornbill	353	37	0	7463.22	52.5	168 <> 538	0.1653
Hartebeest	29	3	0	719.56	201.1	3 <> 86	0.0134
Hippopotamus	10	1	0	85.14	207.5	1 <> 29	0.0045
Impala	29	3	0	828.53	215.7	3 <> 90	0.0134
Kudu	29	3	0	728.88	202.3	3 <> 87	0.0134
Monkey	19	2	0	318.58	200.7	2 <> 57	0.0089
Reedbuck	10	1	0	81.26	202.7	1 <> 29	0.0045
Sable	48	5	0	484.26	99	5 <> 95	0.0223
Warthog	143	15	0	7923.19	133.4	15 <> 334	0.067
Waterbuck	19	2	0	164.68	144.3	2 <> 47	0.0089
Wildebeest	334	35	0	44351.14	135.3	35 <> 786	0.1564
Zebra	315	33	0	11505.82	73.1	85 <> 545	0.1475
Fishtrap/net	48	5	0	605.69	110.7	5 <> 100	0.0223
Canoe	10	1	0	80.99	202.3	1 <> 29	0.0045
Snareline	10	1	0	85.14	207.5	1 <> 29	0.0045

Stratum L9 Area: 2902 km² Sampling intensity: 10.40%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	86	9	0	3473.9	141.8	9 <> 209	0.0298
Crocodile	10	1	0	81.77	195.8	1 <> 28	0.0033
Duiker	979	102	1	14743.15	25.8	727 <> 1232	0.3375
Eland	19	2	0	323.65	194.8	2 <> 57	0.0066
EleCarcass 4	221	23	1	3906.38	58.9	91 <> 351	0.0761
ElephantFamily	86	9	54	3130.71	134.6	63 <> 203	0.0298
GroundHornbill	346	36	3	8968.28	57	149 <> 543	0.1191
Impala	67	7	0	3002.42	169.5	7 <> 181	0.0232
Kudu	29	3	0	731.58	195.3	3 <> 85	0.0099
Monkey	96	10	0	3932.88	135.8	10 <> 226	0.0331
Sable	38	4	5	267.95	88.6	9 <> 72	0.0132
Warthog	480	50	0	16060.42	54.9	217 <> 744	0.1654
Waterbuck	154	16	0	16037.15	171.4	16 <> 417	0.0529
Wildebeest	48	5	0	2038.63	195.6	5 <> 142	0.0165
Zebra	96	10	0	3951.61	136.1	10 <> 227	0.0331
Fishing camp	48	5	0	478.65	94.8	5 <> 94	0.0165
Fishtrap/net	250	26	0	10156.88	84	40 <> 459	0.086
Canoe	29	3	0	434.32	150.5	3 <> 72	0.0099
Snareline	307	32	2	8592.01	62.7	114 <> 500	0.1059
Logging	1978	206	0	71746.47	28.2	1421 <> 2535	0.6816
Village	115	12	2	1246.74	63.7	42 <> 189	0.0397
Cultivation	250	26	1	5289.49	60.6	98 <> 401	0.086
Big Village	10	1	1	81.56	195.6	2 <> 28	0.0033

Stratum J Area: 209 km² Sampling intensity: 11.80%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Eland	25	3	0	481.96	211.2	3 <> 79	0.1217

Stratum M Area: 231 km² Sampling intensity: 14.80%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
EleCarcass 4	0	0	1	0	0	1 <> 0	0
ElephantFamily	182	27	0	25632.02	202.3	27 <> 552	0.7889

Stratum R1 Area: 3450 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	146	15	0	5970.28	109.8	15 <> 305	0.0422
Bushbuck	19	2	0	151.5	131.2	2 <> 45	0.0056
Duiker	621	64	0	14245.45	39.8	374 <> 868	0.18
Eland	19	2	0	337.67	195.9	2 <> 57	0.0056
ElephantBull	10	1	0	84.42	195.9	1 <> 29	0.0028
EleCarcass 4	10	1	0	84	195.4	1 <> 29	0.0028
ElephantFamily	87	9	0	6827.56	195.7	9 <> 258	0.0253
GroundHornbill	155	16	3	4966.3	93.9	19 <> 301	0.045
Hartebeest	417	43	1	33976.78	91.4	44 <> 799	0.1209
Hippopotamus	0	0	7	0	0	7 <> 0	0
Kudu	58	6	4	1030.77	114.1	10 <> 125	0.0169
Reedbuck	369	38	0	8000.28	50.2	184 <> 554	0.1069
Sable	1155	119	11	77157.11	49.8	580 <> 1729	0.3347
Warthog	359	37	0	12605.05	64.7	127 <> 591	0.1041
Waterbuck	97	10	0	2580.7	108.3	10 <> 202	0.0281
Zebra	291	30	2	9625.24	69.7	88 <> 494	0.0844
Fishtrap/net	10	1	0	85.94	197.6	1 <> 29	0.0028
Snareline	29	3	0	253.81	113.2	3 <> 62	0.0084
Village	39	4	0	429.01	110.4	4 <> 82	0.0113
Cultivation	39	4	0	628.3	133.6	4 <> 91	0.0113

Stratum R2 Area: 2250 km² Sampling intensity: 10.40%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Duiker	451	47	0	5310.21	34.5	295 <> 606	0.2003
Eland	77	8	0	2367.6	135.2	8 <> 180	0.0341
ElephantBull	58	6	15	2098.71	169.7	21 <> 155	0.0256
EleCarcass 1	10	1	0	91.58	212.7	1 <> 30	0.0043
EleCarcass 3	10	1	0	84.03	203.8	1 <> 29	0.0043
EleCarcass 4	10	1	0	81.58	200.8	1 <> 29	0.0043
ElephantFamily	288	30	0	34351.86	137.3	30 <> 683	0.1279
GroundHornbill	19	2	0	322.46	199.6	2 <> 57	0.0085
Hartebeest	422	44	0	21177.32	73.5	112 <> 732	0.1875
Kudu	48	5	0	1300.2	160.3	5 <> 125	0.0213
Reedbuck	125	13	0	3929.64	107.2	13 <> 258	0.0554
Sable	767	80	6	35915.89	52.7	363 <> 1171	0.3409
Warthog	230	24	5	4178.41	59.9	92 <> 368	0.1023
Zebra	221	23	0	12975.17	110.1	23 <> 463	0.098
OtherCarcass 4	10	1	0	91.58	212.7	1 <> 30	0.0043
Fishtrap/net	29	3	0	240.04	114.8	3 <> 62	0.0128
Snareline	307	32	2	9042.95	66.1	104 <> 509	0.1364

Stratum R3 Area: 2699 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	39	4	0	1323.49	193.6	4 <> 114	0.0143
Buffalo	68	7	0	2009.15	136.3	7 <> 160	0.0251
Duiker	842	87	0	15565.2	30.5	585 <> 1099	0.3119
Eland	281	29	0	72722.93	197.9	29 <> 836	0.104
ElephantBull	10	1	2	78.46	188.5	3 <> 28	0.0036
EleCarcass 3	19	2	0	313.48	188.4	2 <> 56	0.0072
EleCarcass 4	87	9	2	1226.32	82.8	15 <> 159	0.0323
ElephantFamily	687	71	82	34967.31	56.1	302 <> 1072	0.2545
GroundHornbill	126	13	1	3261.91	93.5	14 <> 243	0.0466
Hartebeest	310	32	0	21269.61	97	32 <> 610	0.1147
Reedbuck	39	4	0	463.31	114.5	4 <> 83	0.0143
Sable	590	61	12	47667.16	76.2	141 <> 1040	0.2187
Warthog	77	8	0	3075.68	147.5	8 <> 192	0.0287
Zebra	213	22	0	8579.51	89.6	22 <> 404	0.0789
OtherCarcass 4	10	1	0	79.32	189.5	1 <> 28	0.0036
Fishing camp	10	1	0	90.12	202	1 <> 29	0.0036
Fishtrap/net	232	24	0	21573.22	130.2	24 <> 535	0.086
Canoe	68	7	0	3255.12	173.5	7 <> 185	0.0251
Snareline	435	45	2	8048.1	42.4	251 <> 620	0.1613
Village	10	1	0	78.37	188.4	1 <> 28	0.0036
Cultivation	10	1	0	78.37	188.4	1 <> 28	0.0036

Stratum R4 Area: 3709 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	107	11	0	10639.27	196	11 <> 317	0.0289
Buffalo	78	8	50	2375.55	127.3	58 <> 177	0.021
Bushbuck	68	7	0	1097.05	98.9	7 <> 136	0.0184
Bushpig	49	5	0	2096.82	191.4	5 <> 142	0.0131
Crocodile	10	1	0	87.8	195.8	1 <> 29	0.0026
Duiker	1081	111	1	20988.67	27.3	786 <> 1375	0.2913
Eland	146	15	3	7566.23	121.2	18 <> 323	0.0394
ElephantBull	117	12	1	1749.14	72.8	32 <> 202	0.0315
EleCarcass 1	0	0	1	0	0	1 <> 0	0
EleCarcass 2	10	1	0	83.48	190.9	1 <> 28	0.0026
EleCarcass 4	146	15	1	2418.9	68.5	46 <> 246	0.0394
ElephantFamily	1392	143	44	153661.44	57.3	595 <> 2190	0.3753
GroundHornbill	185	19	1	3903.94	68.7	58 <> 312	0.0499
Hartebeest	545	56	0	33226.14	68	174 <> 916	0.147
Kudu	78	8	0	5725.21	197.7	8 <> 232	0.021
Monkey	0	0	6	0	0	6 <> 0	0
Reedbuck	19	2	0	330.84	190.1	2 <> 56	0.0052
Sable	925	95	2	82965.48	63.4	339 <> 1511	0.2493
Hyaena	10	1	0	83.87	191.4	1 <> 28	0.0026
Warthog	399	41	3	15316.62	63.1	147 <> 651	0.1076
Waterbuck	39	4	0	1339.53	191.2	4 <> 113	0.0105
Wildebeest	127	13	0	13992.85	190.2	13 <> 367	0.0341
Zebra	282	29	0	11892.32	78.6	60 <> 504	0.0761
OtherCarcass 2	10	1	0	83.87	191.4	1 <> 28	0.0026
OtherCarcass 4	29	3	0	223.35	104.1	3 <> 60	0.0079
Fishtrap/net	29	3	0	257.67	111.8	3 <> 62	0.0079
Canoe	19	2	0	180.61	140.4	2 <> 47	0.0052
Snareline	49	5	0	566.03	99.4	5 <> 97	0.0131
Logging	10	1	0	89.46	197.7	1 <> 29	0.0026
Village	49	5	0	562.61	99.1	5 <> 97	0.0131
Cultivation	78	8	0	1416.06	98.3	8 <> 154	0.021

Stratum R5 Area: 1466 km² Sampling intensity: 10.40%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Buffalo	548	57	7	227455.04	186.5	64 <> 1571	0.3741
Bushpig	10	1	0	76.84	195.4	1 <> 28	0.0066
Duiker	654	68	0	14864.51	40	393 <> 916	0.4463
Eland	154	16	0	15361.25	172.7	16 <> 420	0.105
ElephantBull	87	9	3	4784.42	171.3	12 <> 235	0.0591
EleCarcass 2	67	7	1	354.85	60	27 <> 108	0.0459
EleCarcass 3	77	8	0	387.67	54.9	35 <> 119	0.0525
EleCarcass 4	77	8	5	705.86	74	20 <> 134	0.0525
ElephantFamily	750	78	26	306522.51	158.2	104 <> 1938	0.512
GroundHornbill	173	18	2	8790.64	116.1	20 <> 374	0.1181
Hartebeest	106	11	6	2315.27	97.5	17 <> 209	0.0722
Kudu	154	16	0	5307.9	101.5	16 <> 310	0.105
Sable	241	25	14	13282.73	102.8	39 <> 488	0.1641
Hyaena	10	1	0	76.84	195.4	1 <> 28	0.0066
Warthog	144	15	0	2396.04	72.7	39 <> 249	0.0985
Waterbuck	48	5	0	2167.69	207.6	5 <> 148	0.0328
Wildebeest	10	1	0	76.3	194.7	1 <> 28	0.0066
Zebra	144	15	0	4084.96	95	15 <> 281	0.0985
Snareline	29	3	0	385.42	145.9	3 <> 71	0.0197

Stratum R6 Area: 2337 km² Sampling intensity: 10.30%

SPECIES	Pop. est.	No. seen	No. Out	Variance	95%cl %est.	95%Range	Dens /km²
Baboon	68	7	0	4187.51	199.5	7 <> 204	0.0292
Buffalo	759	78	39	413547.96	177.9	117 <> 2111	0.3249
Bushpig	29	3	0	733.52	194.8	3 <> 86	0.0125
Duiker	886	91	0	18359.86	32.1	601 <> 1171	0.3791
Eland	243	25	0	23506.53	132.3	25 <> 566	0.1041
ElephantBull	0	0	2	0	0	2 <> 0	0
EleCarcass 1	0	0	4	0	0	4 <> 0	0
EleCarcass 2	78	8	0	880.85	80	16 <> 140	0.0333
EleCarcass 3	39	4	0	294.43	92.6	4 <> 75	0.0167
EleCarcass 4	351	36	8	3535.07	35.6	226 <> 475	0.15
ElephantFamily	886	91	24	81028.65	67.5	288 <> 1484	0.3791
GroundHornbill	234	24	0	3698.84	54.7	106 <> 361	0.1
Hartebeest	175	18	0	5179.89	86.3	24 <> 326	0.075
Hippopotamus	0	0	7	0	0	7 <> 0	0
Honey Badger	0	0	1	0	0	1 <> 0	0
Impala	175	18	0	11635.57	129.3	18 <> 402	0.075
Kudu	224	23	0	14079	111.3	23 <> 473	0.0958
Monkey	29	3	0	772.64	199.9	3 <> 88	0.0125
Sable	779	80	48	86900.71	79.5	160 <> 1398	0.3333
Hyaena	10	1	0	82.61	196.1	1 <> 29	0.0042
Warthog	175	18	0	3457.76	70.5	52 <> 299	0.075
Waterbuck	39	4	0	859.3	158.1	4 <> 101	0.0167
Wildebeest	156	16	0	11811.99	146.6	16 <> 384	0.0667
Zebra	282	29	2	13624.45	86.8	37 <> 528	0.1208
OtherCarcass 3	10	1	0	82.75	196.3	1 <> 29	0.0042
OtherCarcass 4	10	1	0	85.46	199.5	1 <> 29	0.0042
Fishing camp	29	3	0	269.18	118	3 <> 64	0.0125
Fishtrap/net	68	7	0	787.37	86.5	9 <> 127	0.0292
Canoe	10	1	0	94.88	210.2	1 <> 30	0.0042
Snareline	351	36	1	12767.71	67.7	113 <> 588	0.15
Gold panning	10	1	0	81.5	194.8	1 <> 29	0.0042
Logging	127	13	1	2053.24	75.2	31 <> 222	0.0542
Village	19	2	0	359.84	204.6	2 <> 59	0.0083
Cultivation	29	3	0	809.65	204.6	3 <> 89	0.0125