African wild dog Conservation Research Project - Mozambique

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Conservation status and ecology of the endangered African wild dog (*Lycaon pictus)* in Mozambique

Fieldwork session 2003-2004: the northern Sofala province (incl. Gorongosa NP & Marromeu Complex)

1- INTRODUCTION

The African wild dog (*Lycaon pictus*) is one of the carnivores the most threatened with extinction in the world (listed as "Endangered", with criteria C2a(i), in the IUCN Red Data Book, 2008), the second most endangered (after the Ethiopian wolf, *Canis simensis*) of the only continent it inhabits and the first in sub-Saharan Africa. The species has now been completely extirpated from 25 of the 39 countries it once occupied (Woodroffe et al., 2004) although it is habitat generalist, able to persist

in a wide array of environmental conditions as long as preys are available (IUCN/SSC, 2007), but apparently limited by negative interactions with larger carnivores (Creel & Creel, 1996; Mills & Gorman, 1997) and primarily by human activities (Woodroffe et al., 2004).
Wild dogs indeed suffer from direct and indirect persecution (e.g. shooting, snaring, poisoning, road kills), infectious diseases (possibly transmitted by domestic dogs), habitat fragmentation and loss of prey under continuous human population expansion and encroachment.

By 2003, detailed information on distribution or status was absent in Mozambique where the species benefits from legal protection since 1978. No data had been published since a short account in the 1970's (Smithers & Lobao Tello, 1976) while the country's African wild dog population is potentially a key one since it would link the Tanzanian specimens to those occurring in Zimbabwe and NE South Africa.

When published, the Status Survey and Conservation Action Plan for the African wild dog (Woodroffe et al. *eds.*, 1997) of the IUCN/SSC (Species Survival Commission) attempted to summarize last observations in the country (Fanshawe et al., 1997) and concluded that the outlook for the species in Mozambique was not hopeful, recommending a field survey to assess its status at least in the North of the country (Woodroffe & Ginsberg, 1997b). The more recent IUCN/SSC Canids Action Plan (Sillero-Zubiri et al. *eds.*, 2004) reiterated such recommendations together with additional awareness work in the country (Woodroffe et al., 2004; Sillero-Zubiri et al., 2004)

2- OBJECTIVES

- To determine African wild dog distribution and abundance in the 9 northern districts of the Sofala province (Dondo, Nhamatanda, Muanza, Gorongosa, Cheringoma, Maringué, Marromeu, Caia & Chemba), including the Gorongosa National Park and the Marromeu Complex.
- To assess the availability in the preferred habitats of the African wild dog across the area.
- To analyse the role of extrinsic ecological factors (predation, competition, diseases) on African wild dog population dynamics in the area.
- To study the interactions of African wild dogs, as of other large carnivores (lion & spotted hyena) and potential prey species, with the people (attitudes & land uses) living in the area.
- To deduce the various anthropogenic pressures faced by African wild dog local populations and predict their long-term impacts on the survival of the species.

3- METHODS

Data were collected in the field according to 3 distinct surveys.
The "Field interviews Survey" aimed primarily at obtaining a first distribution description of the African wild dog in the area and an assessment of its abundance and habitat preference through the detailed report by local inhabitants of their most recent direct sightings of the species. The same process of local interviews was also expected to bring relevant information on local communities' socio-economic activities and associated land use patterns, on people's attitudes towards African wild dogs in particular and wildlife in general including other large carnivores and medium-sized ungulates (respectively potential competitors and preys of the species in focus), such as on the relative abundance of these species in the surrounds of the settlements and of the sighting points.
The "Distance sampling Survey" was to estimate population density of African wild dog potential prey species within smaller ranges offering the highest probability of resident packs and the "Call-in stations Survey" had a similar purpose towards potential competitor species of *Lycaon pictus*, in particular lions (*Panthera leo*) and spotted hyenas (*Crocuta crocuta*),

3.1- Field interviews Survey

- Any single human settlement located within the area to be surveyed must first be recorded together with the vegetation type it falls in. Larger areas can be divided into blocks (e.g. according to main land uses) that will be treated separately and, within each block, a same number of human settlements is randomly selected in each represented vegetation type (stratified semi-random sampling). Knowledge of the species in focus and wildlife in general of potential respondents to be interviewed within the selected local communities is preliminarily tested with pictures, aided when relevant by a translator in the spoken local language.

- A standard questionnaire especially set up for the purpose is then used together with a special pictures-book showing African wild dogs of both sex, with various fur patterns and postures, of the different age classes ("pup" less than 1 year old, "yearling" of 1 to 2 years old, "adult" older than 2 years) and in various numbers (pack size), the other large carnivores (potential competitors) susceptible to occur in the area, all the relevant ungulate species (potential preys) also possibly present and the broad vegetation types known or supposed to be found in the area.

Respondents are asked to report all African wild dog sightings they remember sufficiently including details such as date, hour, exact location (GPS fix whenever possible), observed vegetation type, pack size and age/sex composition (discriminating pups less than half adult-size, more than half adult-size, here called "yearlings" by convenience, and actual yearlings and adults that do not show effective differences in body size), activity in course (incl. prey species when sighted while hunting/feeding) etc. When the area offers a large enough sightings-to-area ratio, adding up all non-redundant reported African wild dog sightings and dividing by the area of the concerned region provides a first estimation of the density of the species (Gros et al., 1996; Gros, 1998; Gros & Rejmanek, 1999; Gros, 2002). A distribution map can be obtained by plotting down on the GIS all reliable sightings coordinates that can be assessed. Preference Index (PI) of any used vegetation type can be determined in dividing its rates of use by the proportion of its cover in the entire area or specific sectors looked at (Mills & Gorman, 1997; Creel & Creel, 2002).

They are also requested to comment on the long-term trends in sightings and to assess the relative abundance (on a scale from 0, "absent", to 4, "abundant", through "very rare", "rare" and "common") of other known wildlife species, whether at African wild dog sighting points (best) or around the village of residence (when no sighting or not remembered for sighting place). In the first case, this enables the identification of the ungulate species represented the most times in the potential prey-base of the African wild dog where it was sighted (as the frequency of presence of lion, spotted hyena & leopard), and the respective mean relative abundances when present, such as the determination of the pattern of relative abundance of possible available preys (present competitors) averaged in overall for the entire area or for specific sectors looked at (block, vegetation type, home range…).
In the second case, this simply increases the characterization of the interviewed settlements and gives punctual assessments of wildlife abundance across the entire area.

- A specific set of questions investigate people's attitudes towards African wild dogs and wildlife in general to identify the local perception of the origins of eventual conflicts (problematic species) and contributes to the socio-economic description of each communities visited in the field (incl. inhabitants and trends in number, whether increasing, stable or decreasing, area of settlement and of influence, main activities, traditionally hunted wildlife species…).

3.2- Distance sampling Survey

Transects are drawn a priori within smaller ranges offering the highest probability of resident African wild dog populations as revealed by the Field interviews Survey and driven (in the early morning and late afternoon) at very low speed (15 km/h) with 1 or 2 assistants (for sampling 1 or both 2 sides of the vehicle). Any direct observation of African wild dog potential prey species is geo-referenced by GPS (what enables the determination of vegetation type on GIS), species are identified, groups are counted and detailed in terms of sex/age, observed habitat type is recorded and perpendicular distance to the transect-line is assessed (range-finder) while the total distance of each transect is noted down as well. Whenever possible, a same transect is maintained in a same vegetation type in order to describe it more specifically.

For each species, direct estimates of the density are obtained through a model of the way in which detectability drops off with increasing distance to assess the number of animals that have been missed (Buckland et al., 2001).

3.3- Call-in stations Survey

Transects are drawn a priori within smaller ranges offering the highest probability of resident African wild dog populations as revealed by the Field interviews Survey (eventually the same ones than for Distance sampling Survey) and driven at night (21h00-04h00), stopping at successive points for the calling exercise that can last up to 1 hour. At each station, recorded sounds known to attract (call-in) large carnivores (especially lion and spotted hyena) are amplified and played back through horn-speakers according to a well defined protocol (Ogutu & Dublin, 1998; Mills et al., 2001).
The distance from each station within which sounds are supposedly audible to the target species (the radius of the circle area actually surveyed around each point) must be assessed depending on field conditions (vegetation density, slopes, wind…). Two consecutive call-in points must be separated (straight-line) by at least the sum of these two respective estimated distances (confirmed through GPS) to avoid double-counting of a same animal during the same night.
At each station, dividing the total number of attracted individuals of each species by the respective circle area actually surveyed around the point gives punctual densities.

4- RESULTS

4.1- Field interviews Survey

- A total of 188 local communities were recorded within the entire area (47,118 km²) that was divided into 4 blocks, namely **Block A** (8,389 km²) representing the Gorongosa National Park (3,770 km²) and its periphery (15 km buffer = 4,619 km²), **Block B** (10,212 km²) which is the Marromeu Complex made of 4 contiguous safari concessions (Coutadas 10, 11, 12 & 14 = 8,053 km²), 1 national reserve (Marromeu NR = 1,561 km²), 1 game farm (Mozunaf Safari = 176 km²) and 1 timber concession (Catapú = 422 km²), **Block C** that corresponds to the adjoined Coutadas 6 and 15 (4,563 km²) and **Block D** covering the remaining area (23,954 km²) occupied by other land uses (Fig. 1).

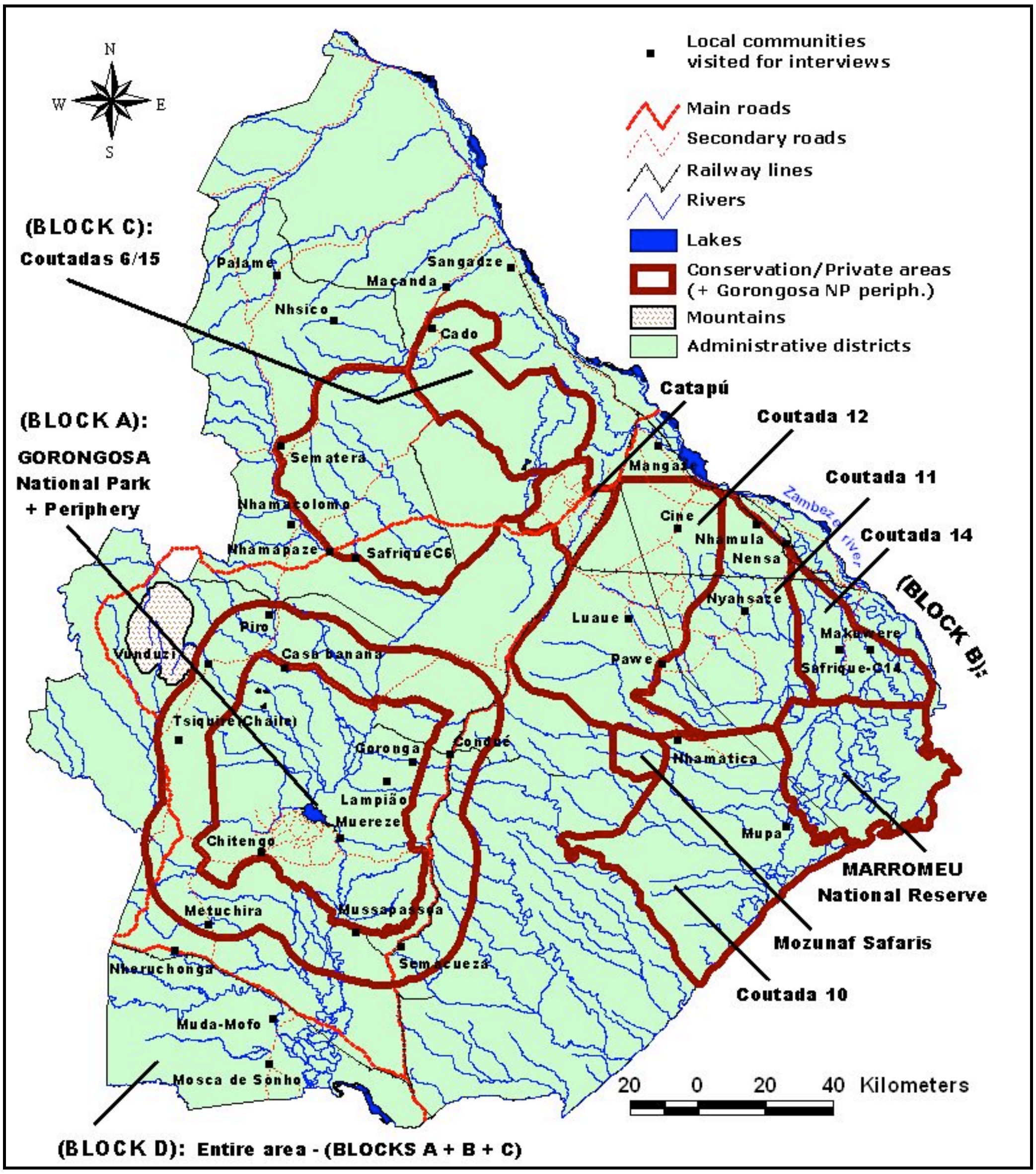


Fig. 1: **Geographical representation of the entire study area, of the blocks it was divided into (and the conservation/private areas within), and of the 35 local communities visited for interview purposes.**

Plotting the respective 188 exact coordinates on the habitat layer (Land Use/Land Cover, IGN-France & DINAGECA-Mozambique, 1997) of the Geographical Information System (GIS, ArcView software) especially developed for this research brought the main vegetation type which each community fell within (Annex 1 and Annex 2 for vegetation type codes and other codes used further in this report).

In each study block, a same number of local communities were randomly selected in each represented vegetation type, what gave 11 locations (+ Chitengo) in Block A (6 vegetation types), 11 in Block B (6 vegetation types), 6 in Block C (3 vegetation types) and 6 in Block D (6 vegetation types), for a total of 35 local communities (19% of 188) selected and thereafter visited for interview purposes (Table 1 and Fig. 1).

ID	Name	Long. E	Lat. S	GIS Hab. 1 (Code 1)	Hab. 1 %	GIS Hab. 2 (Code 1)	Inh. Nr.	Hum. pop.	Time to cross	Main activity within com.	2nd main act. within com.	Trad. Hunted sp. (Code 6)	Dom. dogs	Problem sp. (Code 9)	Ung. ab.	Car. ab.
BLOCK A																
Bushland - 50 to 70% - Meadow																
1	Mussapassoa	34,60	19,19	205	70	102	250	Stable	40'	Agriculture	Fishing	13,18	50	1,2,3	Y	Y
44	Casa banana	34,41	18,49	205	50	102	1200	Dec.	1h20'	Agriculture	Tradi. Hunting	9,10,14,18,17,11	201		Y	Y
Open woodland - 40 to 70% - Woodland																
2	Semacueza	34,72	19,23	209	70	210	180	Inc.	30'	Charcoal	Agriculture	1,2,13	75	4,7	N	Y
23	Condue	34,85	18,72	210	60	209	275	Inc.	1h40'	Agriculture	Charcoal	1,2		1,4,3,2	Y	Y
Shrubland - 50% - Bushland																
4	Tsiquire (Chaile)	34,13	18,68	202	50	205	720	Inc.	2h30'	Agriculture	Gold extraction		240	1,8	N	Y
5	Vunduzi	34,21	18,48	202	50	205	4400	Dec.	1h30'	Agriculture	Fishing		733	7,1	N	Y
Wooded grassland - 50 to 60% - Open woodland																
20	Lampiao	34,68	18,79	206	60	209	750	Inc.	2h	Agriculture	Stone extraction	9,14,13,10	125	1,4,9,	Y	Y
45	Piro	34,37	18,35	209	50	206	1560	Inc.	45'	Agriculture	Cotton	13,9,10	346	1	Y	Y
Wooded grassland - 80%																
21	Goronga	34,75	18,74	206	80	209	264	Inc.	1h30'	Agriculture	Fishing		88	4,3,10,2,11	Y	N
22	Muereze	34,56	18,94	206	80	205	300	Inc.	1h	Agriculture	Fishing	1,9,10,14,20	216	4,12,1,10,	Y	Y
Grassland - 75%																
3	Metuchira	34,21	19,17	201	75	206	2200	Stable	1h	Agriculture	Services	17,7,6	843	4,1	Y	Y
Gorongosa NP main camp																
#	Chitengo	34,35	18,98	206	60	205	120	Inc.	1h	Tourism					N	N
BLOCK B																
Grassland - 50 to 70%																
8	Safrique-C14	35,88	18,44	201	70	206	1300	Stable	45'	Agriculture	Sugar company	1,13,17,9,10,15	217	6,5,1	Y	Y
46	Nensa	35,74	18,16	201	50	205	950	Inc.	1h30'	Agriculture			150		Y	Y
Open woodland - 60% - Woodland																
9	Cine	35,45	18,12	209	60	210	30	Inc.	20'	Agriculture	Trad. Hunting	1,2	9	4,1,2	Y	Y
47	Nhamula	35,66	18,11	209	60	210	170	Stable	30'	Agriculture	Trad. Hunting	2,14,9,13,		4,1	Y	Y
0pen woodland - 70%																
19	Mangaze	35,40	17,90	209	70	206	1100	Stable	1h40'	Fishing	Agriculture	2,13	244	4,5,6	Y	Y
27	Nhamatica	35,45	18,68	209	70	102	72	Dec.	15'	Agriculture	C10 staff memb.		12	14,15,1,4,3,2,10	Y	Y
Open woodland - 100%																
24	Luaue	35,32	18,36	209	100	#	12	Dec.	15'	Agriculture	C12 staff memb.		0	4,1,3,9	Y	Y
25	Pawe	35,41	18,48	209	100	#	222	Inc.	2h30'	Agriculture	Antiga serraçao	1,9,13,16	0		Y	Y
Aquatic meadow - 50 to 80%																
33	Makuwere	35,96	18,44	103	50	205	170	Stable	20'	Agriculture	Fishing, C14	13,17,10,9,15			Y	Y
28	Mupa	35,74	18,91	103	80	209	220	Stable	40'	Fishing	Agriculture		50	4,1	Y	Y
Woodland - 100%																
30	Nyansaze	35,63	18,34	210	100	#	48	Dec.	30min	Agriculture	C11 staff member		0	2,16,10,1	Y	Y
BLOCK C																
Open woodland - 50% - Wooded grassland																
12	Nhamacolomo	34,43	18,11	209	50	206	460	Stable	45'	Agriculture	Fishing		230	1,4	N	Y
37	Cado	34,80	17,59	209	50	206	1140	Inc.	3h	Cotton	Agriculture		253	15	Y	Y
Wooded grassland - 70 to 80% - Open woodland																
10	Sematera	34,40	17,90	206	80	209	1500	Stable	40'	Agriculture	Fishing	2,1,13	250	1,4,2	Y	Y
11	Safrique-C6	34,60	18,20	206	70	209	330	Dec.	1h20'	Agriculture	C6 staff member	1,6,17	120	4,5	Y	Y
Open woodland - 70 to 95%																
13	Nhamapaze	34,53	18,18	209	70	102	1200	Inc.	45'	Agriculture	National road		300	1	N	Y
40	Macanda	34,84	17,48	209	95	1	180	Stable	1h45'	Agriculture	Cotton	2,11,13	45	1,17,19	Y	Y
BLOCK D																
Meadow - 60% - Open woodland																
36	Sangadze	35,01	17,43	102	60	209	402	Inc.	2h	Agriculture	Cotton		156		Y	Y
Wooded grassland - 100%																
34	Palame	34,39	17,45	206	100	#	420	Inc.	30'	Agriculture	Cotton	15,11,7,6,2	70	15	Y	Y
Aquatic meadow - 100%																
48	Muda-Mofo	34,38	19,42	103	100	#	630	Stable	1h10'	Cattle farming	Agriculture			4	Y	N
Open woodland - 55% - Wooded grassland																

4.1.1- African wild dog distribution, density and ecology

- The process yielded a total of 134 field interviews (56, 43, 13 & 22, respectively in Block A, B, C & D) of which 46 (34%) contained the report of an African wild dog direct observation (13, 24, 03 & 06, respectively) including the date, exact location, pack size, sex/age composition and additional details (Table 2). Two more sightings were reported as personal communications.
- A distribution map was obtained by plotting down sightings coordinates on the GIS (Fig. 2).

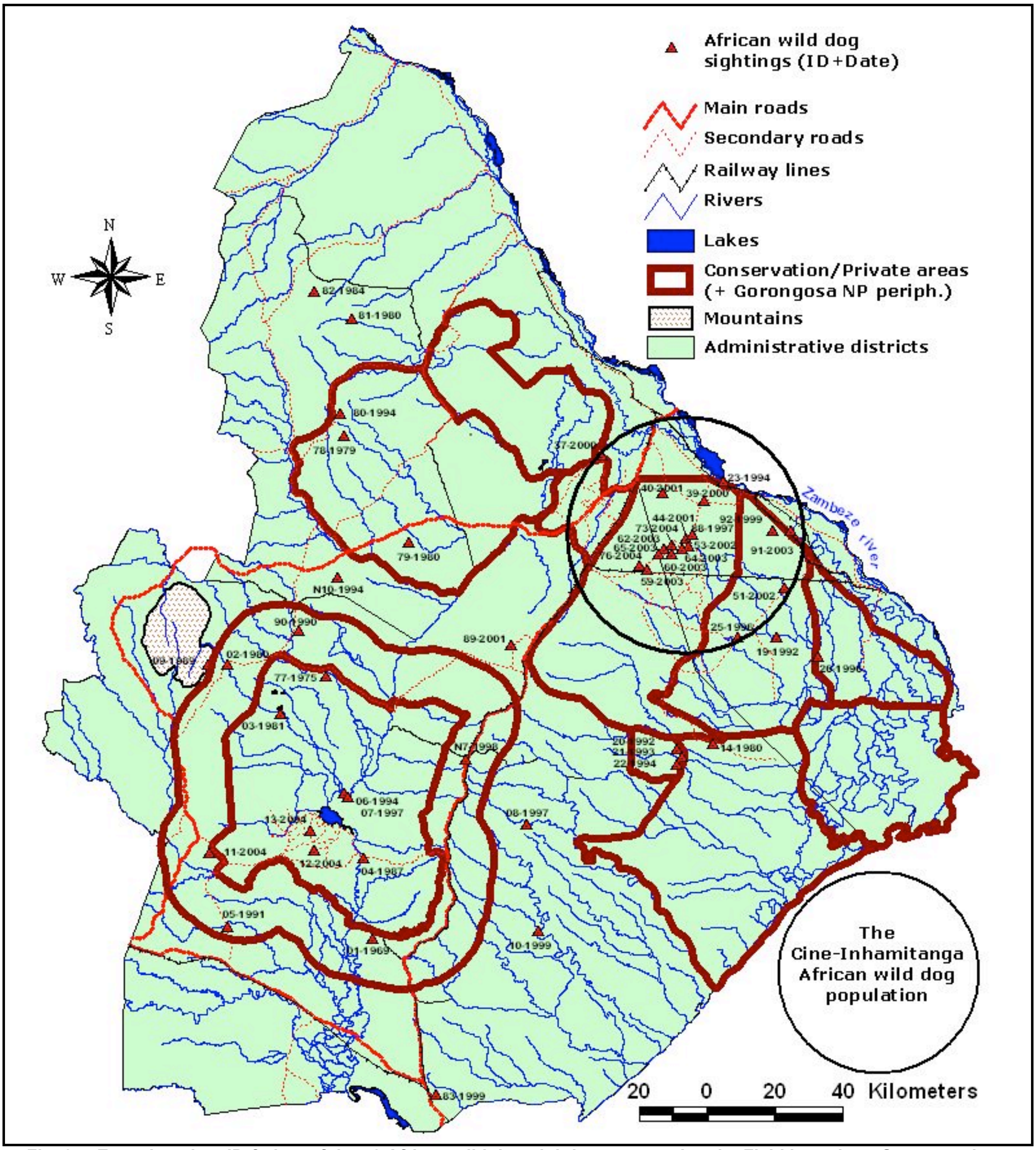


Fig. 2: Exact location, ID & date of the 48 African wild dog sightings reported to the Field interviews Survey and a circular representation around the ones of the previously unknown Cine-Inhamitanga population.

- Adding-up non-redundant and most recent sightings revealed the existence of a population of African wild dogs resident in the north-western Block B (marked with a 31.5 km radius circle on Fig. 2). This population had never been described before (Woodroffe et al., 2004) and was assessed to be made of up to 32 individuals into 2 packs (p. 65 in Annex 3) over around 3,117 km² (1.03 ind./100km²) when the information was first brought to the international conservation community (André, 2005). Note that if the area of the minimum convex polygon containing all sightings is rather considered (1,161 km²), density consequently grows up to 2.76 ind./100 km².

ID	Date	From interview in … (+Block)	Time	Long. E	Lat. S	Nb.	ad.	yearl.	pups	male	fem.	unk.	Habitat (Code 5)	GIS Hab. 1 (Code 1)	Hab. 1 %	GIS Hab. 2 (Code 1)	Activity	Prey sp. (Code 6)	Ung. ab.	Car. ab.
BLOCK A																				
WD01	1969	Mussapassoa (A)		34,60	19,19	?							2	205	70	102	Not hunting/feeding		Y	Y
WD77	1975	Nhamapaze (C)		34,47	18,51	20						20	2	209	60	206	Not hunting/feeding		N	N
WD02	1980	Goronga (A)		34,21	18,48	2	2	0	0			2	2	202	50	205	Not hunting/feeding		N	N
WD03	1981	Vunduzi (A)		34,35	18,61	8						8	4	206	100	#	Resting		N	Y
WD04	1987	Mussapassoa (A)	17h	34,57	18,99	?	?	?	0				3	102	80	205	Drinking		N	N
WD09	1989	Muereze (A)		34,16	18,48	1	1	0	0	1	0	0	1	211	80	201	Snared & Released		Y	Y
WD90	1990	Piro (A)		34,40	18,39	15						15	2	206	60	205	Hunting	13	Y	Y
WD05	1991	Metuchira (A)		34,21	19,17	12	?	?	0			12	4	201	75	206	Trotting		Y	Y
WD06	1994	Mussapassoa (A)	09h	34,52	18,82	10	6	0	4			10	4	105	100	#	Playing		Y	Y
WD07	1997	Mussapassoa (A)		34,53	18,83	6	6	0	0			6	3	102	100	#	Drinking		N	N
N7	1998	Pers. Com.		34,84	18,73	4	4	0	0			4	1	210	60	209	Not hunting/feeding		N	N
WD11	01/2004	Muereze (A)		34,17	18,97	6	6	0	0			6	2	205	60	209	Walking		N	N
WD12	04/2004	Muereze (A)		34,44	18,97	5	5	0	0			5	2	209	70	205	Walking		N	N
WD13	05/2004	Goronga (A)		34,43	18,92	1	1	0	0			1	4	105	60	205	Not hunting/feeding		N	N
BLOCK B																				
WD14	1980	Nhamatica (B)		35,49	18,68	10	?	?	0			10	?	209	80	206	Walking		N	N
WD19	1992	Nyansaze (B)		35,66	18,41	6	6	0	0			6	2	209	100	#	Not hunting/feeding		Y	N
WD20	02/1992	Mupa (B)		35,41	18,72	8	8	0	0			8	2	209	70	102	Not hunting/feeding		Y	Y
WD21	10/1993	Mupa (B)		35,41	18,72	8	6	2	0			8	3	209	70	102	Not hunting/feeding		Y	Y
WD22	03/1994	Mupa (B)		35,41	18,72	8	8	0	0			8	2	209	70	102	Not hunting/feeding		Y	Y
WD23	09/1994	Cine (B)		35,52	18,00	>15	>15	0	0			>15	4	102	80	103	Drinking by drought		Y	Y
WD25	1996	Pawe (B)		35,56	18,41	>10						>10	1	210	100	#	Not hunting/feeding		N	N
WD26	1996	Safrique-C14 (B)	07h	35,77	18,46	13	9	4	0			13	2	102	60	206	Not hunting/feeding		Y	Y
WD88	06/1997	Chitengo (A)		35,44	18,14	20	15	5	0			20	1	209	60	205	Resting on road		N	Y
WD92	1999	Nhamula (B)		35,65	18,13	15	15	0	0			15	1	209	60	210	Not hunting/feeding		Y	N
WD37	2000	Cine (B)		35,20	17,93	>10	>10	0	0			>10	1	210	100	#	Not hunting/feeding		Y	N
WD39	03/2000	Makuere (B)		35,47	18,05	20	?	?	0			20	1	210	100	#	On the road		N	N
WD40	2001	Mangaze (B)	12h	35,36	18,03	15	10	?	?			15	2	209	100	#	Drinking		Y	Y
WD44	11/2001	Makuere (B)		35,43	18,15	10						10	2	209	60	205	Not hunting/feeding		N	N
WD51	2002	Nyansaze (B)	07h	35,68	18,28	2	2	0	0			2	2	210	100	#	Resting		N	Y
WD53	12/2002	Safrique-C14 (B)	13h	35,43	18,16	12	12	0	0			12	2	209	60	205	Resting		Y	Y
WD91	2003	Nensa (B)		35,70	18,13	20	?	?	0			20	1	210	100	#	Walking		N	Y
WD59	04/2003	Luaue (B)		35,32	18,23	7	4	3	0			7	1	209	100	#	Not hunting/feeding		N	N
WD60	08/2003	Cine (B)	09h	35,37	18,18	14	14	0	0			14	1	209	60	210	Drinking		Y	Y
WD62	09/2003	Cine (B)	10h	35,37	18,18	23	23	0	0			23	1	209	60	210	Drinking		Y	Y
WD64	10/2003	Nhamatica (B)		35,40	18,17	5	5	0	0			5	1	209	60	210	Resting		Y	Y
WD65	10/2003	Cine (B)	09h	35,35	18,19	13	?	0	?			13	1	210	80	211	Walking		N	Y
WD73	02/2004	Cine (B)		35,37	18,18	1	1	0	0			1	1	209	60	210	Road kill		Y	Y
WD76	20/05/04	Cine (B)	10h	35,30	18,22	>20	?	?	0			>20	2	209	100	#	Feeding	2	N	N
BLOCK C																				
WD78	1979	Sematera (C)		34,52	17,88	13	?	0	?			13	2	209	60	206	Not hunting/feeding		Y	Y
WD79	1980	Safrique-C6 (C)		34,69	18,16	12	6	?	?			12	1	210	100	#	Not hunting/eating		Y	Y
WD80	1994	Sematera (C)	11h	34,51	17,82	3	3	0	0			3	2	205	60	206	Walking		Y	Y
BLOCK D																				
WD81	1980	Nhsico (D)		34,54	17,57	6	6	0	0			6	3	209	55	206	Hunting	11	Y	Y

- Out of the 48 sighting reports, 21 came with an estimation by the interview respondent of the relative abundance both of known ungulate and of other large carnivore species at sighting place and time (Table 2 and Annex 4a), 03 with this estimation for ungulates only (24 in total, respectively 05 in Block A, 14 in Block B, 03 in Block C and 02 in Block D) and 06 with it for carnivores only (27 in total, respectively 06 in Block A, 15 in Block B, 03 in Block C and 03 in Block D). Whenever possible the respondent assessed such abundance both at sighting time and nowadays, and an abundance of 0.05 (on a scale up to 4) was given for better visualization (histogram) when a species was at least recognized, but taken as 0.00 in the calculations.

Ungulate species

Within the 24 times it has been possible for the interview respondent to assess wild ungulates relative abundance at a reported African wild dog sighting place & time from the entire study area, red duiker (*Cephalophus natalensis*) was represented the highest number of times, being present at 16 occasions (67% of 24), with a mean relative abundance of 3.19 (the 2nd most abundant) when present (n=16) and of 2.13 (1st most abundant) in the possible available preys pattern (Fig. 3a) averaged in overall for the entire area (n=24). Second was bushbuck (*Tragelaphus scriptus*), present at 14 occasions (58%), with a mean relative abundance of 2.86 (4th most abundant) when present (n=14) and of 1.67 (2nd most abundant) in overall (n=24), followed by suni (*Neotragus moschatus*) and greater kudu (*Tragelaphus strespciseros*), both present at 13 occasions (54%), respectively with a mean relative abundance of 2.92 (3rd most abundant) and 2.23 (8th most abundant) when present (n=13), and of 1.58 (3rd most abundant) and 1.21 (6th most abundant) in overall (n=24). Bushpig (*Potamochoerus larvatus*) was present at only 11 occasions (46%), in 6th position after southern reedbuck (*Redunca arundinum*) in 5th (50%), but its mean relative abundance when present (n=11) of 3.36 was the highest, the fourth with 1.54 in overall (n=24).

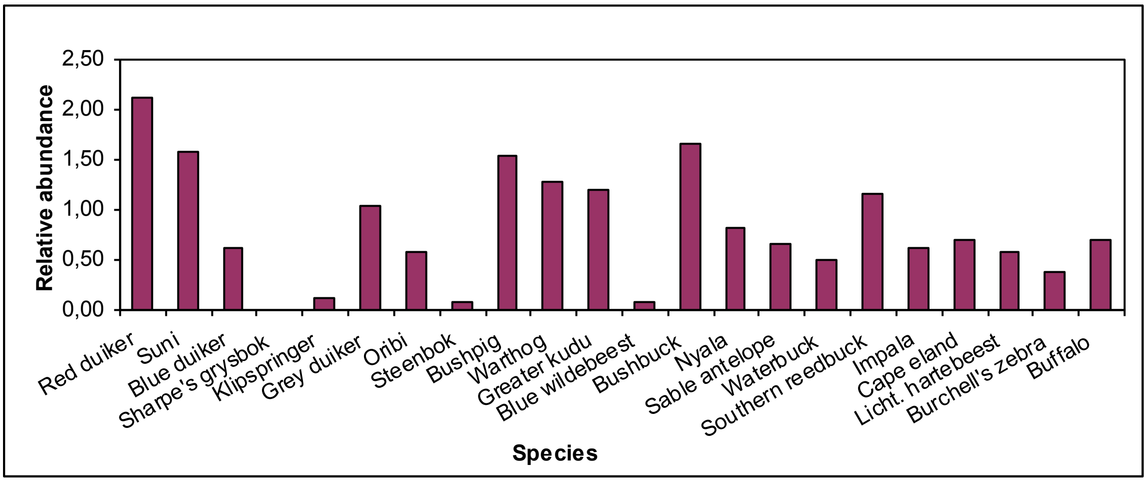


Fig. 3a: Pattern of relative abundance of possible available preys averaged in overall for the entire study area (n=24).

In Block B only (n=14), the situation is sensibly the same than in the entire area, with red duiker being represented the most times, 13 in total (93% of 14) with a mean relative abundance of 3.15 (2nd most abundant) when present (n=13) and of 2.93 (1st most abundant) in the possible available preys pattern (Fig. 3b) averaged in overall for Block B only (n=14). Second came suni, present at 11 occasions (79%), with a mean relative abundance of 2.91 (3rd most abundant) when present (n=11) and of

2.29 (2nd most abundant) in overall (n=14), bushbuck in third, present at 10 occasions (71%), with a mean relative abundance of 2.90 (4th most abundant) when present (n=10) and of 2.07 (3rd most abundant) in overall (n=14), and greater kudu in fourth, present at 9 occasions (64%), with a mean relative abundance of 1.89 (6th most abundant) when present (n=9) and of 1.21 (6th most abundant) in overall (n=14). Bushpig is fifth, being present at 8 occasions (57%) but once again with the highest mean relative abundance of 3.38 when present (n=8), and only the fourth with 1.93 in overall (n=14).

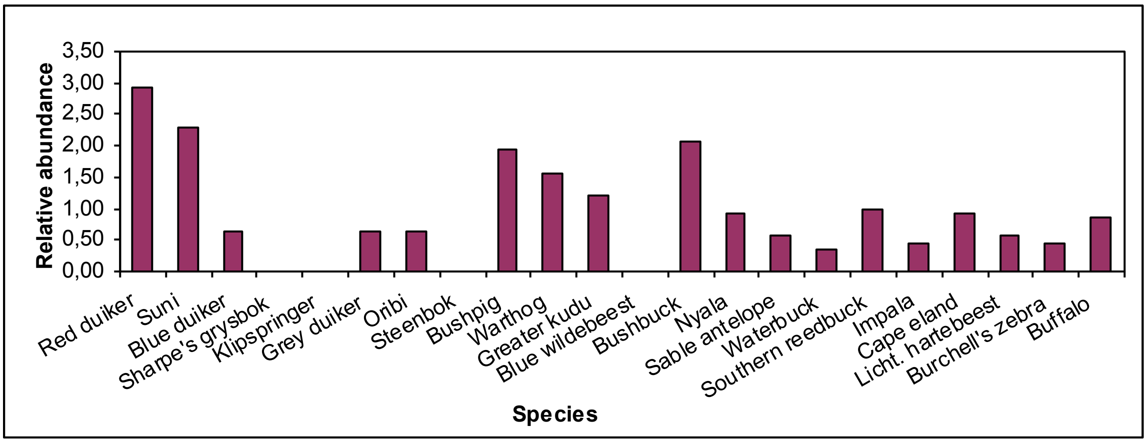


Fig. 3b: Pattern of relative abundance of possible available preys averaged in overall for Block B only (n=14).

Comparatively in Block A only (Gorongosa NP & periphery), the wild ungulate species represented the most times of the only 5 in total for which data were available is grey duiker (*Sylvicarpa grimmia*) first, present at 3 occasions (60% of 5) but with a mean relative abundance of 2.33 in these cases (n=3) that made it only the 7th most abundant, while being the first (together with bushpig) with 1.40 in the possible available preys pattern (Fig. 3c) averaged in overall for Block A only (n=5). There were then 6 species present at 2 occasions (40%), namely, in decreasing order of mean relative abundance when present, bushpig with 3.50 (n=2), also 1st most abundant with 1.40 in overall (n=5), blue duiker (*Cephalophus monticola*) and greater kudu with 3.00 (n=2), respectively 3rd or 4th most abundant (ex-aequo) with 1.20 in overall (n=5), and finally bushbuck, southern reedbuck and impala (*Aepyceros melampus*) with 2.50 (n=2), respectively 5th, 6th or 7th most abundant (ex-aequo) with 1.00 in overall (n=5).

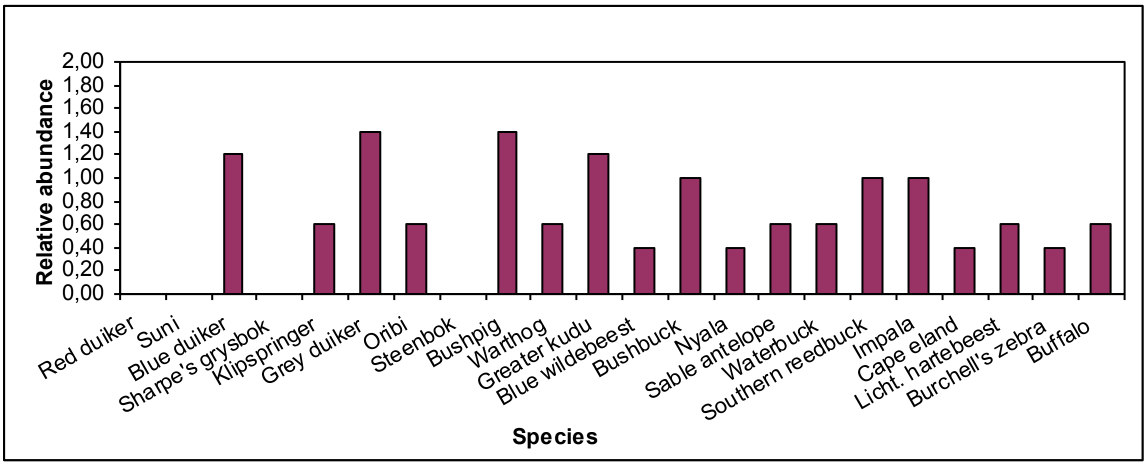
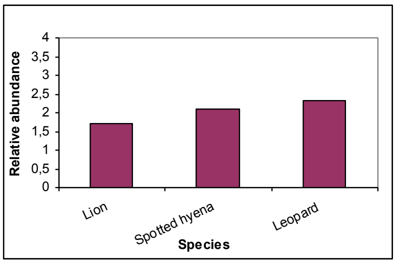
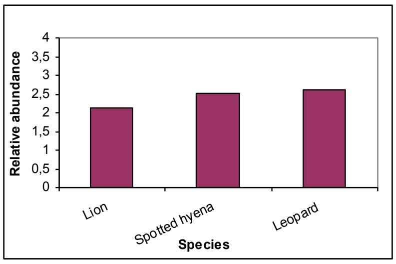


Fig. 3c: Pattern of relative abundance of possible available preys averaged in overall for Block A only (n=5).

Carnivore species

Among the 27 occasions at which the interviewee has been able to provide an assessment of the relative abundance of other large carnivore species at a reported African wild dog sighting place & time from the entire study area (Annex 4a), lion (*Panthera leo*) was present 25 times (93%) and its overall relative abundance averaged in the pattern of possible present competitors (Fig. 4a) was 1.70 (n=27). Spotted hyena (*Crocuta crocuta*) was present at all but 1 occasions (96%) with an overall relative abundance of 2.11 (n=27), and leopard (*Panthera pardus*) at 26 occasions as well (96%) but with the highest relative abundance of 2.33 (n=27).
For Block B only (n=15), the averaged pattern of relative abundance of other large carnivores (Fig. 4b) is very similar, with both three species being present in all occasions (100%) and overall relative abundances (n=15) respectively of 2.13 for lion, 2.53 for spotted hyena and 2.60 for leopard.
Finally in the Gorongosa NP and periphery (Block A) only (n=6), the same situation was observed at the only difference that the mean relative abundance of each species averaged in overall in the respective possible pattern (Fig. 4c) are all smaller than in Block B or in the entire study area. Indeed, lion and spotted hyena were present at all occasions but 1 (83% of 6) with overall relative abundance respectively of 1.50 (n=6) and 1.67 (n=6), while leopard was present all the times (100% of 6) with an overall relative abundance of 2.00 (n=6).





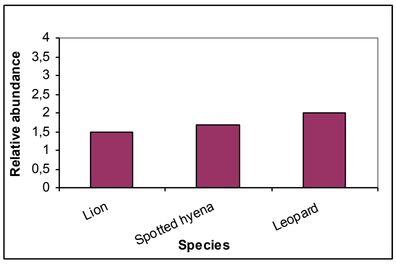


Fig. 4a: Pattern of possible present competitors averaged for the entire study area (n=27) .

Fig. 4b: Pattern of possible present competitors averaged for Block B only (n=15) .

Fig. 4c: Pattern of possible present competitors averaged for Block A only (n=6).

4.1.2- Habitat analysis

A Preference Index (PI) of 1 for a given habitat means that the African wild dogs were using it in proportion of its availability and more the PI is superior to 1, more the habitat was preferred. The lower was a PI inferior to 1 (min=0), the more the referred habitat was avoided.
PI's of all vegetation types in which fell African wild dog sightings (Table 2) reported by interview respondents along the 2003-2004 Field interviews Survey (n=48) according to their exact location on GIS (Land Use/Land Cover) were determined

(Table 3), not only at the level of the entire study area, but also at the level of each block individually, respectively, Block A (n=14), Block B (n=24), Block C (n=3) and Block D (n=7). This of course implied that the cover of each represented vegetation type was first determined in each block and in the entire area.
Note that the vegetation type actually observed at sighting place was also recorded from the respondents (Table 2) but simplified to the only 4 broader vegetation types (grassland, wooded grassland, open woodland & woodland).

Vegetation type (Code 1)	**102**	**105**	**201**	**202**	**205**	**206**	**209**	**210**	**211**	**13**	**n**
BLOCK A											
Habitat use (nr. of sightings) out of 14	2	2	1	1	2	2	2	1	1	0	14
Habitat use (proportion)	14.29	14.29	7.14	7.14	14.29	14.29	14.29	7.14	7.14	-	100
Habitat availability (km²) in 8,389 km²	1,739	893	282	128	382	1,627	2,559	336	391	-	
Habitat availability (proportion)	20.73	10.65	3.36	1.52	4.55	19.39	30.50	4.00	4.66	-	
PI (=Use/Availability)	**0.69**	**1.34**	**2.13**	**4.70**	**3.14**	**0.74**	**0.47**	**1.79**	**1.53**	**-**	
BLOCK B											
Habitat use (nr. of sightings) out of 24	2	0	0	0	0	0	16	6	0	0	24
Habitat use (proportion)	8.33	-	-	-	-	-	66.67	25.00	-	-	100
Habitat availability (km²) in 10,212 km²	2,394	-	-	-	-	-	4,147	1,435	-	-	
Habitat availability (proportion)	23.44	-	-	-	-	-	40.61	14.05	-	-	
PI (=Use/Availability)	**0.36**	**-**	**-**	**-**	**-**	**-**	**1.64**	**1.78**	**-**	**-**	
BLOCK C											
Habitat use (nr. of sightings) out of 3	0	0	0	0	1	0	1	1	0	0	3
Habitat use (proportion)	-	-	-	-	33.33	-	33.33	33.33	-		100
Habitat availability (km²) in 4,563 km²	-	-	-	-	559	-	1,321	455	-	-	
Habitat availability (proportion)	-	-	-	-	12.25	-	28.96	9.98	-	-	
PI (=Use/Availability)	**-**	**-**	**-**	**-**	**2.72**	**-**	**1.15**	**3.34**	**-**	**-**	
BLOCK D											
Habitat use (nr. of sightings) out of 7	0	0	0	0	1	1	2	2	0	1	7
Habitat use (proportion)	-	-	-	-	14.29	14.29	28.57	28.57	-	14.3	100
Habitat availability (km²) in 23,954 km²	-	-	-	-	2,017	6,597	8,904	898	-	2	
Habitat availability (proportion)	-	-	-	-	8.42	27.54	37.17	3.75	-	0.01	
PI (=Use/Availability)	**-**	**-**	**-**	**-**	**1.70**	**0.52**	**0.77**	**7.62**	**-**	**x**	
ENTIRE STUDY AREA											
Habitat use (nr. of sightings) out of 48	4	2	1	1	4	3	21	10	1	1	48
Habitat use (proportion)	8.33	4.17	2.08	2.08	8.33	6.25	43.75	20.83	2.08	2.08	100
Habitat availability (km²) in 47,118 km²	6,370	547	1,027	773	3,434	10,649	17,175	2,874	155	5	
Habitat availability (proportion)	13.52	1.16	2.18	1.64	7.29	22.60	36.45	06.10	0.33	0.01	
PI (=Use/Availability)	**0.62**	**3.59**	**0.95**	**1.27**	**1.14**	**0.28**	**1.20**	**3.41**	**6.30**	**x**	

Table 3: Habitat use, availability & preference of African wild dogs (in each study block & in the entire area) based on the 48 sightings reported to the Field interviews Survey.

Once the most preferred vegetation types were determined, it was interesting to produce for each of these the respective possible available preys/present competitors patterns of relative abundance averaged in overall from all the ones (n=24 and n=27) provided by interviewees (Annex 4a) as practiced at the level of the study blocks in the previous section.

In decreasing order of preference for a specific vegetation type at the level of the entire area, this was practiced (Annex 4b) respectively for Evergreen forest (n=1 for ungulates and n=1 for carnivores), Sparse grassland (n=1 and n=1), Woodland (n=2 and n=4), Open woodland (n=13 and n=13) and Bushland (n=3 and n=3). Note that Shrubland was the fourth most preferred habitat type (PI=1.27) but there was no data on wildlife abundance in it from interviews.

4.1.3- Local people's attitudes and land uses

Out of the 35 local communities visited for interview purposes, 27 came with an estimation by the interview respondents of the relative abundance both of known ungulate and other large carnivore species around the village of residence (Table 1 and Annex 4c), 02 with this estimation for ungulates only (29 in total, respectively 08 in Block A, 11 in Block B, 04 in Block C and 06 in Block D) and 05 with it for carnivores only (32 in total, respectively 10 in Block A, 11 in Block B, 06 in Block C and 05 in Block D).
At the level of a single community, the final abundance index for each wildlife species was the simple mean of all the indices given by respondents who at least recognized it. Once again, respondents were asked to attempt such assessment not only at that time (2004) but also a medium-to-long term (5 to 15 years) before.

Problematic wildlife species mentioned by respondents from a same human settlement were simply cumulated to describe wildlife perception within the respective local community and traditionally hunted species were determined through interviews of people practicing locally the related activity. Number of inhabitants and trends were given by the local authority and/or assessed by houses counts and mean size of a household, the extent of each settlement was estimated by the time taken to cross it by foot, first and second main activities were directly deduced from respondents' answers to the interview about their own current occupation(s) and the assessment of the domestic dogs number (relevant to assess the risk of transmission of infectious diseases to the African wild dog) was based on the average number of dogs in randomly sampled houses, then multiplied by the total number of households within the community (Table 1).

4.2- Distance sampling Survey

Fieldwork soon revealed that distance sampling methods were pertinent only on the tourist tracks of the Urema plains in the Gorongosa NP and not elsewhere because whether roads scarcity/off-road poor conditions, dense vegetation cover, low wildlife abundance, or a combination of these factors, turned them meaningless due to the insufficiency in direct observations of wild ungulate species actually experienced.

The survey was thus turned into a simple record of any opportunistic sighting that occurred along other fieldwork (n=104), including the data from the first attempts of distance sampling.
The respective field dataset (Annex 5) described in details the direct observations of (most sighted species first) warthog (*Phacochoerus africanus*) on 22 occasions, red duiker (*Cephalophus natalensis*) on 14, southern reedbuck (*Redunca arundinum*) on 13, waterbuck (*Kobus ellipsiprymnus*) on 10, oribi (*Ourebia ourebi*) on 09, bushbuck (*Tragelaphus scriptus*) on 07, sable antelope (*Hippotragus niger*) on 06, nyala (*Tragelaphus angasii*) on 05, suni (*Neotragus moschatus*) & greater kudu (*Tragelaphus strepsiceros*) on 04, impala (*Aepyceros melampus*) on 03, grey duiker (*Silvicarpa grimmia*) & Burchell's zebra (*Equus quagga crawshayii*) on 02, bushpig

(*Potamochoerus larvatus*), Lichtenstein's hartebeest (*Alcelaphus buselaphus lichtensteinii*) and buffalo (*Syncerus caffer*) on 01 occasion only.

The same 104 direct sightings of wild ungulate species were also summarized (Table 4) in function of the study Block and vegetation type in which they occurred.

Species (Code 6) **Veg. type (Code 1)**	**1**	**2**	**6**	**7**	**9**	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**	**20**	**21**	**22**	**n**
						Block A											
101				1		5					3	6					15
102				2		6	1	1	1		6	3					20
105				2		1											3
205				1			1										2
206	1			1		5		1				2	1				11
209						2		2									4
Total Block A	**1**			**7**		**19**	**2**	**4**	**1**		**9**	**11**	**1**				**55**
						Block B											
101																	
102						1				1		1		1			4
105																	
205													2				2
206																	
209	10	2	2	2	1	1	2	2	2	5	1	1			2	1	34
210	3	2				1		1	2								9
Total Block B	**13**	**4**	**2**	**2**	**1**	**3**	**2**	**3**	**4**	**6**	**1**	**2**	**2**	**1**	**2**	**1**	**49**
						Block A + Block B											
101				1		5					3	6					15
102				2		7	1	1	1	1	6	4		1			25
105				2		1											3
205				1			1						2				4
206	1			1		5		1				2	1				10
209	10	2	2	2	1	3	2	4	2	5	1	1			2	1	38
210	3	2				1		1	2								9
Total Block A + B	**14**	**4**	**2**	**9**	**1**	**22**	**4**	**7**	**5**	**6**	**10**	**13**	**3**	**1**	**2**	**1**	**104**

Table 4: Opportunistic direct observations of wild ungulates along fieldwork (n=104) summarized in function of the study Block and vegetation type.

4.3- Call-in stations Survey

Lions and spotted hyenas were called-in at night with specific recorded playbacks at 35 exact locations (Fig. 5) within the entire area (15 in Block A, 19 in Block B and 01 in Block D).
The mean distance from a station within which sounds were supposedly audible to the target species was assessed to 2.71 km, giving therefore a circle area actually surveyed around each point of 23.07 km².
Target species actually responded to the attracting sounds and approached at a visible distance from the call-in station on 2 occasions only (both in Block B), a single (1) spotted hyena (*Crocuta crocuta*) on the first (LH041), and three (3) on the second (LH043). This corresponded to punctual densities of 4.33 ind./100km² in the first case and of 13.00 ind./100km² in the second.
Additional details on the call-in sessions such as exact location, block, date, time, habitat type etc. (Annex 6) revealed that habitat types where spotted hyenas responded were the same and dominated by open woodland (70%) and meadow in the eastern sector of the safari concession nr. 10. Of the 35 calling exercises practiced in total, 14 were in Open woodland (40.0%), 07 in Meadow (20.0%), 05 in Woodland (14.3%), and 03 in Sparse grassland (8.6%), Bushland (8.6%) and Wooded grassland (8.6%).

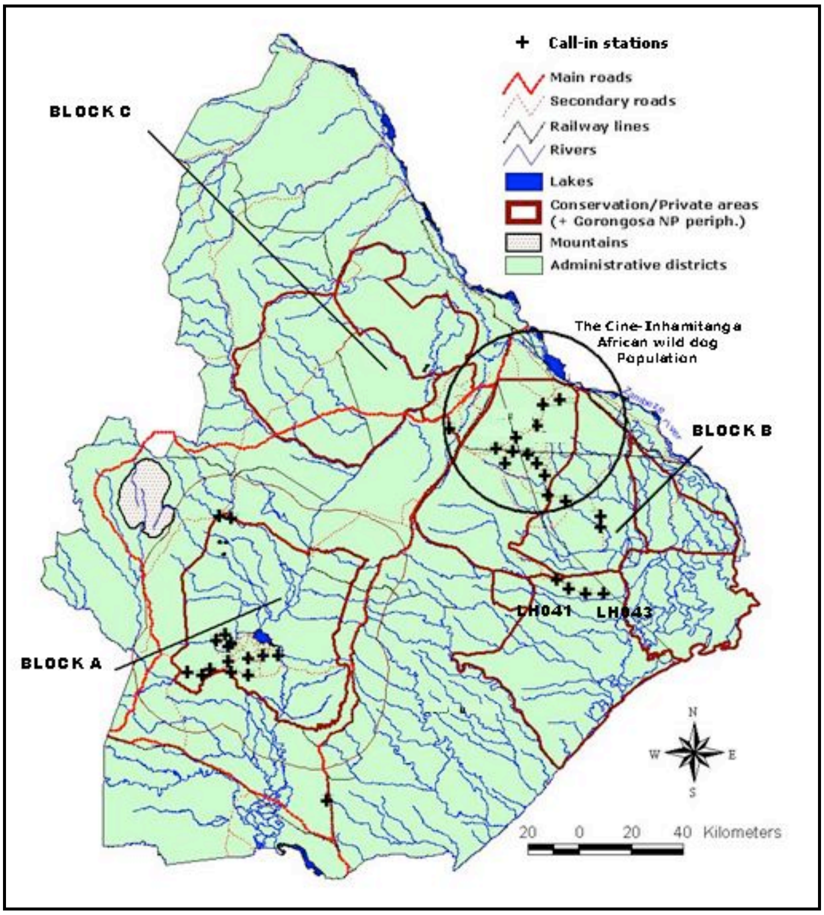


Fig. 5: Exact location of the 35 call-in stations practiced during fieldwork 2003-2004 to attract lions & spotted hyenas and assess punctual densities.

4- DISCUSSION

Density

With an estimated size (up to 32) well inferior to the Minimum Viable Population (Shaffer, 1987; Ramade, 1991; Primack, 1993) set to 50-100 for the species in its Population Viability Analysis (Vucetich & Creel, 1999), the Cine-Inhamitanga population of African wild dog described here in Block B for the first time ever appeared to be small. Even considering the 537.0 km² (range: 258.2–918.8) mean home range of a pack, calculated from the most exhaustive possible review of the relevant scientific literature (Reich, 1981; Childes, 1988, Fuller & Kat, 1990; Fuller et al., 1992; Gorman et al., 1992; Creel & Creel, 1995; Mills & Gorman, 1997; Woodroffe & Ginsberg, 1997a; Rasmussen, 1999; Creel & Creel, 2002; Woodroffe et al., 2004), coupled to the average pack composition made of 6.1 adults, 3.6 yearlings and 7.3 pups (17.0 individuals in total), derived from the same complete review of the existing bibliographic references (+ Fanshawe & Fitzgibbon, 1993; Maddock & Mills, 1994; Courchamp & Macdonald, 2001), the area this population possibly inhabits (1,161 km²) could not theoretically accommodate more than 2.2 packs in total, what means not more than 37.4 individuals (3.22 ind./100 km²) that are still much less than the MVP and thus put the viability of the referred population in question.
However, the density of 2.76 ind./100 km² at which these African wild dogs actually occur is comparable to the one recorded in other populations where it ranged from 0.5 adults/100 km² in North-central Botswana (Woodroffe et al., 2004; Creel et al.,

2004) to 2.6–4.6 ind. (>6 months old)/100 km² in Aitong, near Maasai-Mara in Kenya (Fuller & Kat, 1990), through 0.67 ad./100 km² in Serengeti NP, Tanzania, in 1985-1991 (Scott, 1991; Burrows et al., 1994), 1.5 ad./100 km² in Hwange NP, Zimbabwe (Creel & Creel, 1996), 1.67 ad./100 km² in Kruger NP, South Africa (Mills & Gorman, 1997), 3.3 ad./100 km² in Hluhluwe-Umfolozi Park, South Africa (Maddock, 1993), 3.8 adults & yearlings/100 km² in Selous GR, Tanzania (Creel & Creel, 2002; Creel et al., 2004) and 1.9–3.9 ind./100 km² in Kruger NP more recently (Creel et al., 2004).

Because there were only 3 recent (since 2000) African wild dog sightings reported for Block A (Gorongosa NP and periphery) out of 14 (21%), in comparison to the 14 out of 24 (58%) in Block B (Marromeu Complex), it is difficult to conclude to the present occurrence of a resident population of the species within the limits of this first study block. The numerous sightings from 1969 however let no doubt that its ecological requirements were met there until the late 1990's, and still might be once its disappearance could have been driven by human factors mainly.

With much fewer sightings (respectively 3 and 7) and no recent ones but close to study Block A and/or B, the present occurrence of *Lycaon pictus* in Block C and Block D is unlikely.

Habitat

Interestingly, the 5 most preferred vegetation types of African wild dogs in Block A at the time of their presence, namely Shrubland (PI=4.70), Bushland (PI=3.14) and Grassland (PI=2.13) of the central Rift valley dry savanna-thicket-dry forest mosaic (Tinley, 1977), Woodland (PI=1.79) mainly found at the foot slopes of the Cheringoma plateau and Evergreen forest (PI=1.53) of the Gorongosa mountains, are all marginal, each covering less than 5.00% of the total extent. In contrast, the two most widespread habitat, Meadow (20.73% of the area) corresponding mainly to the *Digitaria spp.* dominated floodplains grassland of the Urema system, and Open woodland (30.50%) mostly of the moist miombo (*Brachystegia spp.*) type found in the dissected midlands making the link with the mountains on the West and on the Cheringoma cuesta on the East, were the 2 most avoided (respectively PI=0.69 and PI=0.47).
A similar pattern of preference for less extended habitats was also the case in the Kruger NP (Mills & Gorman, 1997) where the African wild dogs preferred (PI=0.54 on a log-transformed PI scale where a value of 0.3 indicates the utilization of a particular habitat in proportion of its availability) the habitat type ("Lebombo hills": undulating terrain with a heterogeneous dense to moderate bush vegetation) covering the smaller extent (3.41%) of the entire study area and clearly avoided (PI=0.22) the one ("*Acacia* thickets": dense woody vegetation, particularly along the perennial rivers) with the largest cover (38.77%). The 2nd or 3rd (both with PI=0.39) most preferred habitats ("Lowland sour bushveld": open tree savanna with a dense and tall grass layer & "Malelane mountain bushveld": broken country with heterogeneous vegetation varying from dense to moderate bush savanna) also counted among the less extended (respectively 9.54% & 13.03%) of that whole study area. As it was concluded for the Kruger NP that "African wild dogs were avoiding those habitats chosen by lion regardless of the fact that they may contain high densities of their own prey" and the same avoidance behaviour of potential competitors (predator in the case of lion) might be a plausible mechanism having also driven vegetation type selection by the species within the Gorongosa NP and periphery at the time of its occurrence in the area.

With only 3 vegetation types in Block B which African wild dog sightings were reported in, the preference pattern is much more simple. The most preferred is Woodland (PI=1.78) that covers 14.05% of the area and could be seen as the densest type away from the Zambeze river alluviums of the semi-moist deciduous miombo typical of the better drained zones while moist grasslands ("tando") occupy the low-lying drained areas (Wild & Barbosa, 1967; White, 1986), but also including a specific patch of atypical lowland (sand) dense scrub forest in northern Coutada 12 and Coutada 11 (in the Cine-Inhamitanga region) that grew on the former alluvial plains of the Zambeze river after its course had shifted northwards.
Then comes Open woodland (PI=1.64) with an extent of 40.61% of the area and that corresponds to the more open types of the miombo woodland just referred to (semi-moist deciduous), including in transition towards the also just described patch of dense scrub forest it is surrounding. As such, 5 of the 14 recent (from 2000) sightings that served for the identification of the Cine-Inhamitanga African wild dog population were treated in the habitat analysis as having occurred in Open woodland, because informed like so by GIS on the basis of their exact coordinates, but the observed habitat type reported by the respective interview respondents was actually Woodland (Table 2). In addition to the 5 sightings already falling into Woodland on GIS (10 in total out of 14 that described the Cine-Inhamitanga population), this would not necessarily increase the PI of the habitat type, as it is likely that its availability should be uplifted as well, but would definitely make the referred population to occur almost exclusively in the most densely wooded vegetation type.
Accordingly, the third and last habitat in Block B where sightings were reported was Meadow, constituted by the already evoked "tandos" and the floodplain grassland of the Zambeze delta extending across the Marromeu NR into Coutada 11 & Coutada 10, that covers 23.44% of the total extent but that was frankly avoided (PI=0.36) by the species here in focus.

Because this tendency of particular affection for dense woody habitat is also expressed in Block C and Block D (Woodland being the most preferred habitat in both, respectively with PI=3.34 and PI=7.62), it becomes inevitably detectable as well when analysing habitat preference at the scale of the whole study area.
After the 2 most preferred vegetation types, namely Evergreen forest (PI=6.30) and Sparse grassland (PI=3.59), that are only marginally represented (respectively 0.33% and 1.16% of the total extent), the third (PI=3.41) is Woodland with a total cover of 6.10%.
Then the African wild dogs of the northern Sofala province use, among the non-marginal habitats, Open woodland (PI=1.20) and Bushland (PI=1.14) a bit more than in proportion of their availability (respectively 36.45% and 7.29% of the entire area) and clearly avoid the more open habitats dominated by grass such as Meadow (PI=0.62) and Wooded grassland (PI=0.28), although these are relatively well extended (respectively 13.52% and 22.60%).
Such avoidance for vegetation types featuring a characteristic grass layer, that can become tall and thick at the end of the wet season and let think that the mobility and/or visibility or a medium-sized carnivore such as *Lycaon pictus* could thus be affected, was already documented. But in the Selous GR (Creel & Creel, 2002), while the species indeed preferred Miombo, chipya and *Combretum-Termialia-Pterocarpus* woodlands (PI=1.30) and Thorn (*Terminalia spinosa – Acacia drepanolobium*) woodlands (PI=1.20) to grass-dominated habitats, the most avoided one was the Short grass type (PI=0.94) supported year round by smaller areas of alkaline hardpan soil, usually with scattered palms, rather than the Tall grass (PI=1.07) of the seasonally flooded plains and made of species growing to more than 2 meters high (*Sporobolus pyramidalis, Setaria sphacelata, Andropogon gayanus*).
On the other hand, African wild dogs were also described upon a comprehensive study of their movements and prey activity in south-western Kenya (Fuller & Kat,

1990) as showing “a clear preference for grassland”, with PI assessed to 1.49 for the referred habitat type, and in the abovementioned study of habitat preference in the Kruger NP, one of the two 2nd most preferred habitat (“Lowland sour bushveld”) is “an open tree savanna with a dense and tall grass layer”.

Prey species

Out of the 48 direct observations of African wild dogs reported to this study through field interviews, the species was hunting/feeding on only 4 occasions (8.3%) for which the prey animal was also identified by the interviewee (Table 2).

Once it was bushbuck (*Tragelaphus scriptus*) in Block A (near Piro) at a location (WD90) for which the interview respondent was also able to assess the relative abundance of other ungulates known to be present at sighting place and time (Annex 4a). Among these, bushpig was the only species more abundant than bushbuck that was as much abundant as grey duiker and greater kudu and more abundant than southern reedbuck and impala, among the known possible preys of the African wild dog. This pattern of abundance was similar to the one at the level of the whole Block A (5 sightings in total with assessment of ungulates relative abundance) where bushbuck was as much present as these other species (2 sightings out of 5) but the grey duiker (3 sightings out of 5), as much abundant as southern reedbuck and impala and less than greater kudu, bushpig and grey duiker (*Sylvicarpa grimmia*), the last 2 being equally the most abundant (Fig. 3c). As the later (grey duiker) was also reported as being hunted by African wild dogs in Block D, but near Mazamba and Block A (WD89), these 2 species (**bushbuck** & **grey duiker**) would emerge as having been the 2 most important preys of the carnivore species here in focus in the Block A at the time of its presence in the area. Indeed, they were also recorded as such in other regions of Africa offering, at least in part, similar habitats such as the Kruger NP (Mills & Gorman, 1997), the miombo woodlands of the Ngorongoro ecosystem (Estes & Goddard, 1967) and all over Zimbabwe (Childes, 1988) for both species, and additionally in the Selous GR (Creel & Creel, 2002), in northern Botswana (Creel et al., 2004) and in Namibia (Woodroffe & Ginsberg, 1997a) for the grey duiker only.
Among the 104 opportunistic sightings of wild ungulates experienced along the 2003-2004 fieldwork, bushbuck was seen 7 times in total, 4 times in Block A and 3 times in Block B, 4 times in overall in Open woodland and once in Woodland (Table 4).

Bushpig was as much (as grey duiker) or more (than bushbuck) abundant in Block A than those 2 species but was never recorded in other studies as part of the alimentary diet of *Lycaon pictus*, at the contrary of southern reedbuck (*Redunca arundinum*), recorded in all the just mentioned areas (but the Selous GR) and also in Zambia (Woodroffe & Ginsberg, 1997a), and particularly of impala (*Aepyceros melampus*), that was not only recorded from all the regions reviewed so far (but Namibia) but also from south-western Kenya (Fuller & Kat, 1990), the Hwange NP (Woodroffe & Ginsberg, 1997a), the Hluhluwe-Umfolozi Park (Krueger et al., 1999) and in the Savé Valley Conservancy (Pole et al., 2004), moreover always first or second most important prey species, representing from 17% (south-western Kenya) up to 85% (northern Botswana) of the total kills by the African wild dog, in any of the referred regions.
Once these 2 last species (**southern reedbuck** & **impala**) were, as already said, as much frequent and abundant (both when present only and in overall) in Block A (Fig. 3c) as bushbuck, they should obviously be considered as equally important possible preys of the African wild dogs at the time these were inhabiting the Gorongosa NP and periphery. Although impala was opportunistically sighted only once in Block A

(and twice in Block B) during 2003-2004, southern reedbuck was the third most seen species (13 times in total of which 11 in Block A, always on bare soils or open grass-dominated habitat in the later) along the same time period (Table 4).

More interesting either with bushbuck is that it maintained a similar position (2nd most frequent, 4th most abundant when present, 2nd most abundant in overall) in the possible available prey pattern averaged for the entire study area (24 sightings with assessment of ungulates relative abundance) than in the one for the Block A only (2nd most frequent, 4th most abundant when present, 5th most abundant in overall), while all the other species mentioned so far did not count anymore among the most frequent/abundant at this level, maybe at the exception of southern reedbuck (Fig. 3a). Indeed, the species the most frequently reported (16 times) by the 24 respondents and also the most abundant in overall (n=24) was red duiker (*Cephalophus natalensis*), with suni (*Neotragus moschatus*) being the 3rd most frequent (present on 13 occasions) and 3rd most abundant in overall (n=24). The quite surprising high-ranked positions of these 2 species, never recorded as African wild dog's preys in the case of suni and once only for red duiker (Krueger et al., 1999), were dictated by similar ones in the Block B (respectively 2nd most frequent, 3rd most abundant when present, 2nd most abundant in overall and 1st most frequent, 2nd most abundant when present, 1st most abundant in overall) where there were 14 sightings in total accompanied by an assessment from the interviewee of relative abundance of wild ungulates (Fig. 3b). Less expected either was that, at one of those 14 sighting occasions in Block B (near Inhamitanga in this case), the canid species here studied was seen while hunting suni (WD76) which abundance was assessed at the closest place and time (WD60) as identical to the one of the red duiker (Annex 4a). This made inevitable to consider these 2 species (**red duiker** & **suni**), and suni in particular, as possibly important preys of the African wild dog, apparently at the level of the entire study area and much more certainly in the Block B only, what means at the level of the newly described Cine-Inhamitanga population.
Red duiker was moreover the second most directly sighted species along fieldwork in 2003-2004 (Table 4), seen on 14 occasions in the entire study area of which 13 in Block B (10 in Open woodland) while suni was never seen in Block A and 4 times in Block B, as much in Open woodland (2 times) than in Woodland.

The last case of reported ungulate preyed on by *Lycaon pictus* in northern Sofala province was greater kudu (WD81) in Block D (Nhsico). It was a long time ago (1980) and the density of this species (*Tragelaphus strepsiceros*) is known to have drastically dropped down since then but, looking at it well, it was reported as being present at 13 occasions (2/5 in Block A, 9/14 in Block B, 1/3 in Block C and 1/2 in Block D) out of the 24 for the entire study area (3rd most frequent together with suni) and, although its assessed relative abundance never got high, it was the second most abundant when present (n=2) in Block A. Conjointly considering the numerous mentions in the literature of this species (**greater kudu**) as an important prey of the African wild dog, representing 30% of all the kills in Hwange NP (Woodroffe & Ginsberg, 1997a), 25.8% in whole Zimbabwe (Childes, 1988), 22% in the Savé Valley Conservancy (Pole et al., 2004), 15% in the Kruger NP (Woodroffe et al., 2004), less than 15% in northern Botswana (Creel et al., 2004) and even less but still taken in the Ngorongoro ecosystem (Estes & Goddard, 1967), it should also be seen as such across the entire study area.
The species was seen 4 times only along 2003-2004, twice in the Open woodland of Block B and twice in the more open habitats (Meadow & Bushland) of Block A.

Competitors

The assessment of other large carnivore species relative abundance at African wild dog sighting points by interview respondents was made available numerous times in any of the study blocks (Annex 4a) but unfortunately with a notable uniformity within the values making that local variation was difficult to detect.
Lion (*Panthera leo*) was cited as present on 25 occasions out of 27 in the entire study area but with the lowest relative abundance as much in Block A (Fig. 4c), than in Block B (Fig. 4b) and in all blocks taken together (Fig. 4a). In comparison, spotted hyena (*Crocuta crocuta*) was present 96% of the times (n=27), most often as the second most abundant, and the leopard (*Panthera pardus*) was as much frequent (96% of 27 occasions) and generally the most abundant.

Such high frequencies of other large carnivores reported at African wild dog sighting place and time was a bit surprising as much the later species was documented in other studies to be limited by the first ones, especially when more abundant.
Indeed, its diet overlaps heavily with the ones of lions and spotted hyenas (Creel, 2001), although more extensively with the second (Creel & Creel, 1996), suggesting that exploitation competition is intense with both, as a consequence of the dependence on same resources. **Lion**, for instance, is known to limit African wild dog through competitive exclusion from areas of high prey density (Mills & Biggs, 1993; Mills & Gorman, 1997; Creel et al., 2001; Creel & Creel, 2002).
In terms of interference competition, lion is also unanimously recognized as commonly killing African wild dogs (Mills & Biggs, 1993; McNutt, 1995; van Heerden et al., 1995; Creel & Creel, 1998; Creel & Creel, 2002; Woodroffe et al., 2004) while **spotted hyena**, although rarely been observed to kill the species here studied, is much well-known to affect it in many ecosystems through kleptoparasitism at the carcasses it killed, especially when spotted hyena densities are high and African wild dog pack size is small (Estes & Goddard, 1967; Fanshawe & Fitzgibbon, 1993; Creel & Creel, 1996; Carbone et al., 1997; Gorman et al., 1998; Creel, 2001; Carbone et al., 2005).
Interactions of African wild dog with **leopard** were much less studied and interference competition should be rare given the distinct ecological niche the second occupied (nocturnal and off the ground) but the inevitable dietary overlaps between the two, especially within the typically wooded habitat of the Cine-Inhamitanga region, is most probably evolving into significant exploitation competition.

So maybe the explanation for such an apparent coexistence between these carnivore species and the African wild dog across the entire study area should be found on the side of the relative abundance at which the first ones where reported by the interview respondents to be present. None ever happened to be “common”, not even leopard that was the most abundant (max. 2.60 of relative abundance in overall in Block B when 3.00 is necessary to be considered as “common”), with spotted hyena being only a bit more than “rare” (2.11) at the level of the entire study area (max. 2.53 in Block B) and attracted only on two occasions (5.7%), moreover in very small numbers, along the Calling-stations Survey that was performed at 35 distinct locations in total, and finally lion, that was the less abundant with a relative abundance down to 1.50 (between “rare” and “very rare”) in Block A and that did never show up at any of the call-in stations.
It could thus be acceptably summarized that, although present, the densities at which the potential competitors of the African wild dog occur wherever in the entire study area would never be sufficient to turn effective the expected, because usually observed, interspecific competition when simultaneously present.

Anthropogenic threats

Not only because the case of one African wild dog killed by a collision with a vehicle was directly reported to the Field interviews Survey (WD73) but also due to the numerous sightings of the species whatever resting, playing or simply walking on the roads of the entire study area (Table 2) and to the fact that such a cause of death counts among the most frequent in general (Woodroffe et al., 2004), **road kill** would emerge as the most immediate threats to the population of the northern Sofala province.
Also directly reported through interviews (WD09), and well-known cause of African wild dog deaths in other populations due to its peripatetic habits (Woodroffe *ed.*, 2005), the **by-catch of snares** and other unselective traditional hunting techniques used to catch medium-sized wild ungulates would appear to be an as much important threat to the species in the northern Sofala province. Indeed, “traditional hunting” was mentioned various times as a second main activity within the local communities selected in the region (Table 1) and it was possible to identify the wild ungulate species like so taken in not less than 19 cases out of 35 in total. This problem also includes possible conflicts, and consequent direct persecution of the African wild dog (shooting, spearing, poisoning…), ensuing from the **interferences with** their activity that would be perceived by the **traditional hunters**. Ultimately, a result of the activity here referred to could also be the **loss of prey species** available to the carnivore in focus.
Similar interferences, and prejudicial consequences to the African wild dog, could also exist with the intense **professional hunting** in course across the area comprising not less than 6 safari concessions and 1 game farm, but no evidence of this was collected along the survey and collaboration of the respective safari operators was generally obtained and looked like sincere.
The transmission to the African wild dog of **fatal infectious diseases harboured by domestic dogs** would be of much higher concern as up to 18 local communities were revealed to count more than 100 of these animals (Table 1), generally in disastrous sanitary conditions.
People’s unfounded fear of less known wildlife species is also a factor that must be considered as there was a reported case (WD83) of an African wild dog shot by ignorance while the pack it belonged to was, the most likely by mistake, approximating an urbanized dwelling area (Dondo) whereas there is no report of **attack to people** by the species in the entire area.
Fortunately, cattle farming is rare in the region (2 mentions only among local community main activities) and **conflicts ensuing from livestock depredation** should not be much intense.
In contrast, subsistence agriculture (referred to at 34 occasions, the most often as main socio-economic activity of the interviewed local communities), commercial agriculture (cotton in particular, mentioned 6 times) and charcoal production (2 times) are quite intensively practiced with the known consequences (shifting agriculture occupies a land for an average of 2 to 3 years only before it is abandoned in deep conditions of degradation in comparison to the primary vegetation that was present before) on **natural habitats fragmentation/destruction** that thus should be seen as another actual threat to the African wild dog population of the region.

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Supplementary information

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       * * *           * * *      *        *        *   *     *  **  *   *      **  **
A1  HFLNVAKSECYFTNGTERVRFVDRYIYNREEFVRFDSDVGEFRAVTELGRPDAEYLNRQKEILEQERAAVDTYCRHNYGVGESFTVQRR
A2  --------------------------------------------------------------------------------I--------
A3  -------------------------------------------------------W------------------------I--------
A4  -------------------------------------------------------W---------------------------------
A5  -------------------------------------------------------W----------------V----------------
A6  -----------------------------------------Y-------------W------------------------I--------
A7  -------------------------------------------------------W-----L---R--E---V----------------
A8  -------------------------------------------------------W----------------V-------I--------
-------------------------------------------------------------------------------------------
B1  --VYQF-G-------------LA-S------------------------------W-----L---R--E---V----------------
B2  --VYQF-G-------------LA-S----------------Y-------------W-----L---R--E--------------------
B3  --VYQF-G-------------LA-S----------------Y-------------R-----L---R--E--------------------
B4  --VYQF-G------------LLA-S------------------------------W-----L---R--E---V-------I--------
B5  --VYQF-G------------LLA-S------------------------------W-----L---R--E---V----------------
B6  --VYQF-G------------LLA-S------------------------------R-----L---R-----------------------
B7  --VYQF-G------------LLA-S----------------------------------------------------------------
B8  --VYQF-G------------LLA-S-----------------------------------------------V-------I--------
B9  --VYQF-G------------LLA-S------------------------------------L---R--E--------------------
B10 --VYQF-G-------------LA-S------------------------------W-----L---R--E---V-------I--------
B11 --VYQF-G------------LLA-S----------------Y-------------R-----L---R--E--------------------
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Figure S1: Wild dog DLA-DRB1 alleles aligned to allele A1. Matching amino acids are indicated with a dash, varying amino acids are indicated by single letter amino acid codes. Alleles are grouped into two phylogenetically divergent allelic lineages, A (above the line) and B (below the line). Amino acids of the putative peptide binding regions (Bondinas *et al.* 2007) are indicated by *. Amongst alleles, 16/89 codons and 30/267 nucleotide sites, were variable.

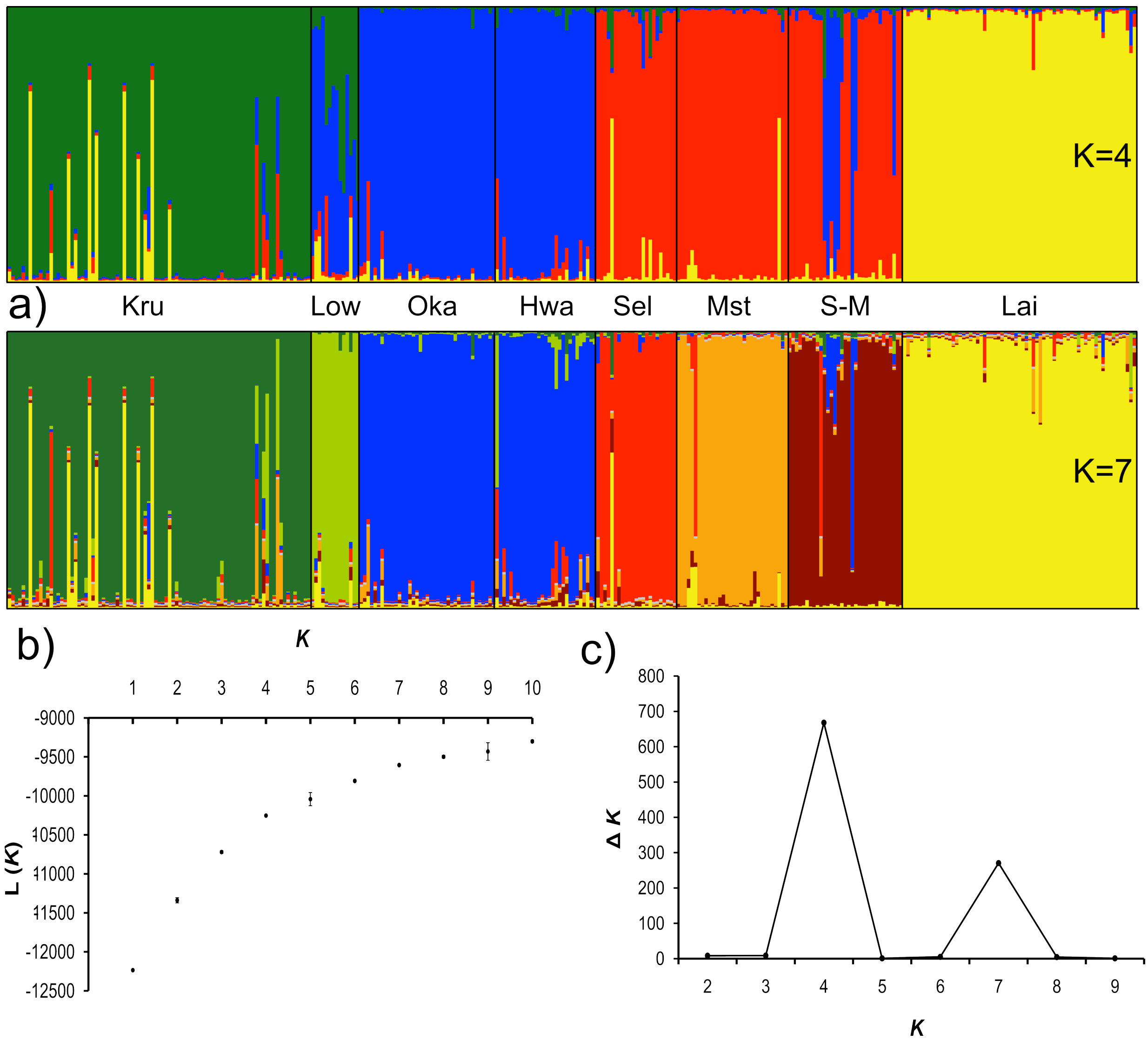


Figure S2: a) Genetic structure of wild dog populations based on Bayesian clustering analyses (STRUCTURE) of samples at 10 microsatellite loci. Shown is the uppermost level of structuring (K=4) and finer scale population structuring (K=7) as indicated by the ΔK statistic (panel c). Columns are individuals, with the proportion of an individual's genotype assigned to each cluster (K) denoted by different colours. Colours correspond with location map in Error! Reference source not found. **and population three letter codes with**

Table S1. b) Likelihood probability profile estimated from STRUCTURE 2.2 at K1-10 showing the mean and variance at each K. c) ΔK at each value of K, averaged across 10 replicates.

Table S1: Details of the origin of the wild dog samples used in this study including the name and country of the monitoring area, the sampling years, number of animals and packs sampled, and monitoring area three letter abbreviations.

Monitoring area	Country	Sampling years	n	Npop	packs	Abbreviation	Collector
Kruger	SE South Africa	Old:1990-95 Recent: 2007-08	67 24	400 100	≥9 6	Kru	G.Mills H.Mostert-Davies, J.Edwards, P.Bloomer
Lowveld	SE Zimbabwe	2008-2009	15	130	6	Low	R.Groom, B.Fivaz
Okavango	N Botswana	Old: ? Recent: 2000-06	19 42	200 200	? ≥15	Oka	J.W.McNutt
Hwange	NW Zimbabwe	~1990-2007	19	250	~	Hwa	G.Rasmussen, J.Ginsberg
Selous	S Tanzania	1991-1995	23	100	8	Sel	S.Creel
Serengeti-Mara	Tanzania-Kenya border	Old:1981-90 Recent: 2005-07	20 14	50 160	≥5 5	S-M	S.Cleaveland, P.Kat E.Masenga
Masai-Steppe	NE Tanzania	1995	32	UNK	3	Mst	A.Visée
Laikipia	Central Kenya	2003-2008	67	300	14	Lai	R.Woodroffe
Monitoring areas where n≤5							
Ghanzi	W Botswana	2006	1		1		M.Swarner
NE Namibia	NE Namibia	1980-2007	5		4		F.Stander, R.Lines
Sofala	Central Mozambique	2004	3		1		J-M.André
Niassa	N Mozambique	2008	1		1		C. & K. Begg
Kajiado	S. Kenya	2008	1		1		R.Woodroffe

Table S2: Details about the source of samples

Kruger	The Kruger samples were derived from a monitoring area in the Southern section of Kruger National Park in North Eastern South Africa [31º6'E, -25º1'N]. Samples were collected at two different time periods, 1990-1995 (Gus Mills) and 2007 (Janet Edwards, Paulette Bloomer, Harriet Mostert-Davies).
Lowveld	The Lowveld is located in South Eastern Zimbabwe [32º1'E, -20º8'N], and the monitoring area encompassed both the Savé Valley Conservancy monitoring population (3487km^2) and Malilangwe Wildlife Reserve (384 km^2), which is an adjacent, virtually contiguous protected area. The Lowveld samples were collected in 2008-2009 (Rosemary Groom).
Hwange	The Hwange monitoring area includes Hwange National Park and Nyamandlovu (an area of land that is contiguous with Hwange national Park and part of the Hwange ecosystem) in North Western Zimbabwe [26º9'E, -18º8'N]. Hwange has been influenced by

	artificial translocations of wild dogs from South Africa and other areas of Zimbabwe. Therefore, we only classified animals as Hwange when we were confident they were of pure Hwange origin. We collected 19 samples from Hwange; 10 samples from Hwange National Park (n=5, unknown packs, sampled prior to 1993 and n=5 from 3 packs, sampled 2006-7), and 9 samples from Nyamandlovu (n=9, unknown packs, 1995-96) (Joshua Ginsberg, Greg Rasmussen). Sample sizes were too small for a temporal comparison; therefore, these samples were pooled into a single data set.
Okavango	The Okavango encompasses the Okavango delta area, which includes the Moremi Game Reserve in Northern Botswana [23º4'E, -19º3'N]. Samples were collected at two different time periods, 1991-1993 and 2000-2007 (Tico McNutt). The five migrant animals with the new S5 (T1) haplotype had the following local ID's; Mank [(T)06-197], Warne [(T)04-188], Nino [(T)02-169; [(T)03-176] Lyra [(T)02-152], Cygnus [(T)01-149].
Selous	The Selous sampling area encompassed the Northern parts of the Selous game reserve (43,600 km^2) [38º1'E, -7º6'N]. Samples were collected between 1991-1995 (Scott Creel). The three migrant animals with the new S4 (C3) haplotype had the following local ID's: Pluto, Thor and Neptune.
Masai Steppe	The Masai Steppe samples were derived from a group of three litters of wild-born pups that were taken from three dens in the Masai Steppe area in the 1980's [37º0'E, -4º5'N] and subsequently moved to a captive facility at the Mkomazai Game Reserve. Specifically, we were provided with DNA from 18 wild-born pups, and 15 samples from the descendents of a further 5 wild born pups for which DNA samples were not available (Aart Visee).
Serengeti-Mara	The Serengeti-Mara is located on the border of Southern Kenya and Northern Tanzania. Samples were collected from wild dog packs residing in or near the Serengeti National Park (SNP), Masai Mara Nature Reserve (MMNR), Ngorongoro Conservation Area and Loliondo Game Controlled Area [35º1'E, -2º3'N]. Samples were collected at two time periods: Old, n = 20, 1981-1990 (Sarah Cleaveland, Pieter Kat); Recent,n = 14, 2005 and 2007 (Emmanuel Masenga). For more details of Serengeti-Mara see Marsden et al 2011 submitted.
Laikipa	The Laikipia samples were derived from a monitoring area in the Laikipia district and parts of the Samburu, Isiolo and Baringo Districts in Kenya [37º2'E, 0º6'N]. Samples were collected between 2003-2008 (Rosie Woodroffe).
Monitoring areas with ≤5 samples	Monitoring areas with ≤5 samples were collected in the following years: Kajiado district in 2001 (Rosie Woodroffe); NE-Namibia pre-1990 (Flip Stander) and in 2006-2007 (Robin Lines); Niassa National Reserve in 2008 (Colleen Begg; 35º3'E, -18º2'N); Northern Sofala Province in 2004 (35º4'E, -18º1'N; Jean-Marc André); and Ghanzi district, Western Botswana in 2006 (Mark

	Swarner).

Table S3: Information on microsatellite primers used in this study.

Primer Name	Sequence (5'---3')	Chromosome	Approx # alleles	Label and primer mix
FH2611F	GAAGCCTATGAGCCAGATCA	36	20	Ned Multiplex 1
FH2611R	TGTTAGATGATGCCTTCCTTCT	36		
PEZ12F	GTAGATTAGATCTCAGGCAG	3	7	Ned Multiplex 1
PEZ12R	TAGGTCCTGGTAGGGTGTGG	3		
PEZ08F	TATCGACTTTATCACTGTGG	17	10	6-Fam Multiplex 2
PEZ08R	ATGGAGCCTCATGTCTCATC	17		
FH2785F	ATGGCAGGTCAAGAGTATGG	28	12	6-Fam Multiplex 2
FH2785R	GATAGATCCAAGCCAACACC	28		
FH3965F	GTCGCTCAGCAGTTAAGCTC	02	20	6-FAM Multiplex 1
FH3965R	GAATCCTGGCTCTGCTACTTAC	02		
FH2054F	GCCTTATTCATTGCAGTTAGGG	12	7	Hex Multiplex 1
FH2054R	ATGCTGAGTTTTGAACTTTCC	12		
FH2658F	TCTTAGAAATTGCTGGTGGG	14	11	Hex Multiplex 1
FH2658R	TAAGAAACTGCCAGTCTGTGG	14		
FH3399F	TCTCTATGCCTGCAGTTTCC	38	32	Hex Multiplex 1
FH3399R	TTCTGATGCCCTCATAAAGC	38		
FH2010F	AAATGGAACAGTTGAGCATGC	24	5	Ned Multiplex 2
FH2010R	CCCCTTACAGCTTCATTTTCC	24		
PEZ15F	CTGGGGCTTAACTCCAAGTTC	05	9	Hex Multiplex 2
PEZ15R	CAGTACAGAGTCTGCTTATC	05		

Table S4: Sample sizes (n) and distribution of mtDNA haplotypes across wild dog populations. Private haplotypes are underlined. Okavango and Serengeti-Mara represent frequencies based on both Old and Recent samples.

	n	S1	S2	S3	S4	S5	Z1	Z2	E1	E2	E3
Kruger Old	94	<u>35</u>	59								
Lowveld	15		15								
NE Namibia*	10		10								
Okavango	90		13			<u>5</u>	4	6	59	3	
Ghanzi	1		1								
Hwange	47		16				11	17	1	2	
Sofala	3									3	
Niassa	1			1							
Selous	37			26	<u>3</u>					8	
Serengeti-Mara	41								32		9
Masai-Steppe	32								14		18
Laikipia	54								15		39
Total	**425**	**35**	**123**	**27**	**3**	**5**	**15**	**23**	**121**	**16**	**66**

*Four samples from this study were combined with data from six samples from (Girman *et al.* 2001).

Table S5: Original (as submitted by Girman *et al.* 2001), corrected and new mtDNA haplotype sequences detected in African wild dogs

Haplotype	Sequence
mtDNA haplotypes submitted by Girman et al. 2001	
>E1-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGGCTTGCCCCATGCATATA AGCATGTACATGATATTATATTCTTACATAGGACATATCTACTTAATCTCACAATCTCA TTGACCTACAGCAGCAATGAAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA CCAATGTGGGGG
>E3-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGGCTTGCCCCATGCATATA AGCATGTACATGATATTATATTCTTACATAGGACATACCTGCTTAACCTCACAATCTCA TTGACCTACAACAGCAATGAAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA CCAATGTGGGGG
>E2-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGGCTTGCCCCATGCATATA AGCATGTACATGATATTATATTCTTACATAGGACATACCTACTTAACCTCACAATCTCA TTGACCTACAACAGCAATGAAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA CCAATGTGGGGG
>Z2-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAGTGACTTGCCCCATGCATATA AGCATGTACATAGTATTATACTCTTACATAGGACATACCTACTTAGTCTCACAATCTCA TTAACCTACAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA TTAATGTGGGGG
>Z1-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATA AGCATGTACATAGTATTATACTCTTACATAGGACATACCTACTTAGTCTCACAATCTCA TTAACCTACAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA TTAATGTGGGGG
>S2-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATA AGCATGTACATAGTATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCA TTAACCTATAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA TTAATGTGGGGG
>S1-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATA AGCATGTACATAATATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCA TTAACCTATAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA TTAATGTGGGGG
>S3-Girman	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTACCCCATGCATATA AGCATGTACATAATATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCA TTAACCTATAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCA TGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATA TTAATGTGGGGG
Corrected mtDNA haplotype sequences and two new haplotypes.	

>E2-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTCACTATGCCACGCCGGC ACCCCATCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGGCTTGCCCCATGCATAT AAGCATGTACATGATATTATATTCTTACATAGGACATACCTACTTAACCTCACAATCTC ATTGACCTACAACAGCAATGAAATGCATATCACCTAGTCCAATAAGGGATTAATCACC ATGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCAT ACCAATGTGGGGGTCGCTATAATGGAACTATAC
>E3-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTCACTATGCCACGTCGGC ACCCCATCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGGCTTGCCCCATGCATAT AAGCATGTACATGATATTATATTCTTACATAGGACATACCTGCTTAACCTCACAATCTC ATTGACCTACAACAGCAATGAAATGCATATCACCTAGTCCAATAAGGGATTAATCACC ATGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCAT ACCAATGTGGGGGTCGCTATAATGGAACTATAC
>E1-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCCCATCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGGCTTGCCCCATGCATAT AAGCATGTACATGATATTATATTCTTACATAGGACATATCTACTTAATCTCACAATCTC ATTGACCTACAGCAGCAATGAAATGCATATCACCTAGTCCAATAAGGGATTAATCACC ATGCCTCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCAT ACCAATGTGGGGGTCGCTATAACGGAACTATAC
>Z2-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC- ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAGTGACTTGCCCCATGCATATAAGCA TGTACATAGTATTATACTCTTACATAGGACATACCTACTTAGTCTCACAATCTCATTAA CCTACAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGGAACTATAC
>Z1-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC- ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATAAGCA TGTACATAGTATTATACTCTTACATAGGACATACCTACTTAGTCTCACAATCTCATTAA CCTACAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGGAACTATAC
>S2-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC- ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATAAGCA TGTACATAGTATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCATTAA CCTATAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGAAACTATAC
>S1-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC- ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATAAGCA TGTACATAATATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCATTAA CCTATAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGAAACTATAC
>S3-Marsden	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC- ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTACCCCATGCATATAAGCA TGTACATAATATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCATTAA CCTATAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGAAACTATAC
>S4-Marsden NEW	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC-

	ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTACCCCATGCATATAAGCA TGTACATAATATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCATTAA CCTACAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGAAACTATAC
>S5-Marsden NEW	CTATTCCCTGATCTCCCCCATATTCACATATTGAGTCAACCTTACTATGCCACGTCGGC ACCC- ACCCTCTTTTCTCCCCTATGTACGTCGTGCATTAATGACTTGCCCCATGCATATAAGCA TGTACATAGTATTATACTCTTACATAGGACATATCTACTTAGTCTCACAATCTCATTAA CCTACAACAGCAATGGAATGCATATCACCTAGTCCAATAAGGGATTAATCACCATGCC TCGAGAAACCATCAATCCTTGCTCGTAATGTCCCTCTTCTCGCTCCGGGCCCATATTAA TGTGGGGGTCGCTACAATGAAACTATAC

Table S6: Official DLA-DRB1 names alleles given in the paper. Also listed are local names which were used in original files.

Manuscript Name	Official name	Local name	Reference
A1	DRB1*90101	awd01	Marsden et al 2009
A2	DRB1*90102	awd02	Marsden et al 2009
A3	DRB1*90201	awd04	Marsden et al 2009
A4	DRB1*90202	awd09	Marsden et al 2009
A5	DRB1*90203	at04	Marsden et al 2009
A6	DRB1*90204	awd04v	Marsden et al 2009
A7	DRB1*90301	GPB1	Marsden et al 2009
A8	DRB1*90205	STAR	Marsden et al 2011
B1	DRB1*90401	T5819/at09v	Marsden et al 2009
B2	DRB1*90402	m038	Marsden et al 2009
B3	DRB1*90501	awd34	Marsden et al 2009
B4	DRB1*90601	awd08	Marsden et al 2009
B5	DRB1*90602	at09	Marsden et al 2009
B6	DRB1*907011	T5920/bru40	Marsden et al 2009
B7	DRB1*90801	5960	Marsden et al 2009
B8	DRB1*91101	K2MozNa	Marsden et al 2011
B9	DRB1*91001	R504	New
B10	DRB1*90403	DISH	Marsden et al 2011
B11	DRB1*90901	R331	New

Table S7: Results from hierarchical analysis of molecular variance (AMOVA) computed in Arlequin v 3.11 (Excoffier 2006). Alternative a priori hypotheses of population groupings were tested to identify groupings that explain more variation (%var) between groupings (symbol $_{CT}$) than within, as is indicative of population structure. Significance was assessed using 1,000 permutations and is indicated by bold type. Populations are described by three letter codes (

Table S1).

		mtDNA			*Msats*			*MHC*	
Grouping tested	df	%var	p	df	%var	p	df	%var	p
Southern-Eastern									
[Kru,Low,Oka,Hwa] [Sel,S-M,Mst,Lai]									
Among Groups [Φ_{ct}]	1	26.88	0.059	1	1.99	**0.019**	1	1.84	0.213
Among Populations [Φ_{sc}]	6	43.65	**<0.001**	6	13.54	**<0.001**	6	18.31	**<0.001**
Within Populations [Φ_{st}]	395	29.47	**<0.001**	640	84.47	**<0.001**	632	79.85	**<0.001**
Southern-Central-Eastern									
[Kru,Low,Oka,Hwa] [Sel] [S-M,Mst,Lai]									
Among Groups [Φ_{ct}]	2	40.97	0.053	2	2.35	0.052	2	0.40	0.47
Among Populations [Φ_{sc}]	5	30.71	**<0.001**	5	13.38	**<0.001**	5	19.26	**<0.001**
Within Populations [Φ_{st}]	395	28.32	**<0.001**	640	84.26	**<0.001**	632	80.34	**<0.001**
SouthEast-SouthWestCentral-Eastern									
[Kru,Low] [Oka,Hwa] [Sel] [S-M, Mst, Lai]									
Among Groups [Φ_{ct}]	3	46.34	**0.048**	3	2.72	**0.028**	3	2.87	0.182
Among Populations [Φ_{sc}]	4	22.62	**<0.001**	4	12.75	**<0.001**	4	17.02	**<0.001**
Within Populations [Φ_{st}]	395	31.03	**<0.001**	640	84.53	**<0.001**	632	80.12	**<0.001**
SouthEast-SouthWest-EasternNorth-East									
[Kru,Low] [Oka,Hwa] [Sel,S-M, Mst] [Lai]									
Among Groups [Φ_{ct}]	3	17.87	0.282	3	2.05	0.068	3	10.41	**0.010**
Among Populations [Φ_{sc}]	4	49.57	**<0.001**	4	13.21	**<0.001**	4	9.96	**<0.001**
Within Populations [Φ_{st}]	395	32.56	**<0.001**	640	84.73	**<0.001**	632	79.63	**<0.001**
SouthEast-SouthWest-Central-Eastern-North East									
[Kru,Low] [Oka,Hwa] [Sel] [S-M, Mst] [Lai]									
Among Groups [Φ_{ct}]	4	38.82	0.133	4	3.81	**0.008**	3	10.13	**0.005**
Among Populations [Φ_{sc}]	3	29.09	**<0.001**	3	11.50	**<0.001**	4	10.02	**<0.001**
Within Populations [Φ_{st}]	395	32.09	**<0.001**	640	84.69	**<0.001**	632	79.86	**<0.001**

Table S8: Pairwise bootstrapped D_{est} (Jost 2008) estimates of genetic differentiation between wild dog populations. DRB data above the diagonal, mtDNA below the diagonal. Values <0.2 are underlined. O and R depict Old and Recent samples for each population for which two sets of samples were considered.

	KruO	*KruR*	*OkaO*	*OkaR*	*Hwa*	*Low*	*Sel*	*MaSt*	*SerO*	*SerR*	*Lai*
KrugerO		<u>0.06</u>	0.88	0.82	0.85	0.46	0.48	0.83	0.99	0.85	0.59
KrugerR	<u>0.03</u>		0.93	0.89	0.91	0.26	0.47	0.78	0.99	0.91	0.74
OkavangoO	0.36	0.27		<u>0.07</u>	0.42	0.63	0.83	0.75	0.78	0.95	0.85
OkavangoR	0.32	0.26	<u>0.02</u>		0.54	0.90	0.78	0.54	0.61	0.88	0.72
Hwange	0.27	0.26	<u>0.09</u>	<u>0.06</u>		0.60	0.82	0.44	0.64	0.65	0.69
Loweld	0.37	0.28	0.46	0.39	0.35		0.61	0.82	1.00	1.00	1.00
Selous	0.37	0.33	0.51	0.45	0.36	0.45		0.51	0.77	0.44	0.67
Masai	0.32	0.36	0.32	0.30	0.36	0.55	0.43		0.28	0.53	0.72
SerengetiO	0.30	0.36	0.37	0.28	0.27	0.35	0.23	0.28		0.63	0.76
SerengetiR	0.24	0.23	0.21	0.25	0.20	0.46	0.47	0.27	<u>0.14</u>		0.75
Laikipia	0.39	0.46	0.37	0.30	0.48	0.50	0.33	0.36	0.25	0.28	

Bondinas GP, Moustakas AK, Papadopoulos GK (2007) The spectrum of HLA-DQ and HLA-DR alleles, 2006: a listing correlating sequence and structure with function. *Immunogenetics* **59**, 539-553.

Excoffier L, Laval, G., Schneider, S. (2006) Arlequin 3.11; An Integrated Software Package for Population Genetics Data Analysis, Geneva, Switzerland: Genetics and Biometry Laborator, University of Geneva.

Girman DJ, Vila C, Geffen E*, et al.* (2001) Patterns of population subdivision, gene flow and genetic variability in the African wild dog (*Lycaon pictus*). *Molecular Ecology* **10**, 1703-1723.

Jost L (2008) Gst and its relatives do not measure differentiation. *Molecular Ecology* **17**, 4015-4026.

ANNEX 1

Selection of local communities in the 9 northern districts of the Sofala province for the 2003-2004 Field interviews Survey on African wild dog (semi-random sampling stratified per block & vegetation type)

(*) = selected   (**) = Gorongosa NP main camp   Vegetation type codes: see Annex 2

Name	xx E	yy S	Veget	Block	Name	xx E	yy S	Veget	Block
Dondo District					Pataias	35,40	-18,50	210	B
Chibuabuabua	34,61	-19,37	205	D	Sanga	35,33	-18,62	209	B
Chinamaconda	35,04	-19,46	209	D	A"	34,68	-18,62	209	B
Macuacua	34,95	-19,42	102	D	B"	34,80	-18,61	206	B
Mutua	34,58	-19,49	102	D	Luawe(*)	35,32	-18,36	209	B
Nhamacungwere	34,58	-19,27	209	A	Pawe(*)	35,41	-18,48	209	B
Savane	34,71	-19,43	209	D	Mupa(*)	35,74	-18,91	103	B
Savane praia	35,16	-19,62	104	D	Nhacomba	35,43	-18,67	209	B
Mafambisse	34,62	-19,55	1	D	Nyago	35,51	-18,67	209	B
Dondo	34,75	-19,61	1	D	Chironde	35,36	-18,33	209	B
Nhamatanda District					Katapú	35,16	-18,18	209	B
Jasse	34,18	-19,25	202	D	Nhamatica(*)	35,45	-18,68	209	B
Lamego	34,38	-19,38	1	D	Makuwere(*)	35,96	-18,44	103	B
Macaraure	34,36	-19,53	201	D	Inhaminga	35,02	-18,42	14	B
Macorococho	34,17	-19,62	206	D	Inhamitanga	35,16	-18,22	1	B
Mecheu	34,34	-19,02	1	A	**Maringué District**				
Mecuze	34,21	-19,34	205	D	Uanchite	34,32	-17,27	206	D
Metuchira(*)	34,21	-19,17	201	A	Senga-Senga	34,28	-17,31	1	D
Mucumbeze	34,12	-19,03	210	A	Palame(*)	34,39	-17,45	206	D
Muda	33,95	-19,35	209	D	Masaite	34,38	-17,49	209	D
Muda-Mofo(*)	34,38	-19,42	103	D	Bucha	34,64	-17,52	206	D
Mosca de Sonho(*)	34,37	-19,54	201	D	Nhsico(*)	34,56	-17,57	209	D
Ndedja	34,42	-19,30	202	D	Suare	34,60	-17,58	209	C
Nhampoca	34,41	-19,38	1	D	Canze	34,31	-17,64	206	D
Nheruchonga(*)	34,12	-19,24	202	D	Tabua	34,31	-17,66	206	D
Ntondo	34,18	-19,03	1	A	Chigombe	34,44	-17,68	209	C
Pita	34,27	-19,18	1	A	Gombalanþai	34,58	-17,69	206	C
Xiluvo	34,04	-19,24	202	D	M'Sunza	34,38	-17,74	209	C
Nhamatanda	34,21	-19,27	14	D	Tocuta	34,37	-17,77	206	C
Tica	34,44	-19,41	1	D	Tubo	34,35	-17,79	209	D
Muanza District					Chachau	34,35	-17,79	206	C
Derunde	34,80	-19,11	209	A	Diua	34,32	-17,82	206	C
Galinha serração	35,02	-19,18	209	D	Sematera(*)	34,40	-17,90	206	C
Goronga(*)	34,75	-18,74	206	A	Sando	34,65	-17,96	209	C
Lampião(*)	34,68	-18,79	206	A	Nhamaclomo(*)	34,43	-18,11	209	C
João Koa	34,60	-18,88	209	A	Nhamapaze(*)	34,53	-18,18	209	C
Augusto Cadeado	34,64	-18,90	209	A	Nhamacala	34,65	-18,21	206	C
Muanza baixo	34,74	-18,85	209	A	Safrique-(C6)(*)	34,60	-18,20	206	C
Muereze(*)	34,56	-18,94	206	A	Maringué	34,39	-17,97	206	C
Mussapassoa(*)	34,60	-19,19	205	A	Subwé	34,43	-18,13	206	C
N'Guezane	35,22	-19,21	209	B	Canxixe	34,31	-17,58	206	D
Nhamassenzira	35,29	-18,94	209	B	**Marromeu District**				
Nhamissembe	35,58	-19,23	104	B	Banze	35,74	-18,10	205	B
Pedreira	34,75	-18,87	209	A	Bauaze	35,84	-18,15	205	B
Samacueza(*)	34,72	-19,23	209	A	Cine(*)	35,45	-18,12	209	B
Sambanzo	35,35	-19,49	209	B	Chupanga t.	35,50	-18,05	209	B
N'Siticulo	35,05	-19,02	209	D	Gombe-Gombe	35,47	-18,01	209	B
Tewe-Tewe	35,60	-19,06	205	B	Gorra	35,50	-18,02	210	B
Wirquize	35,46	-19,14	102	B	Jaze	35,43	-18,39	209	B
Wirquize praia	35,50	-19,33	104	D	Sakas-Muluko	36,09	-18,73	103	B
A'	34,67	-19,04	210	A	Mungari	35,60	-18,39	210	B
Winha	34,58	-18,78	102	A	N'zou	35,42	-18,00	209	B
Cruzado	34,64	-18,74	102	A	Nhamula(*)	35,66	-18,11	209	B

Chiniziua	35,15	-18,93	209	B	Nensa(*)	35,74	-18,16	201	B
Muanza District (continued)					**Marromeu District (continued)**				
Maçiambose	35,25	-18,81	209	B	Nhiane	35,89	-18,26	102	B
Derunde	34,80	-19,11	209	A	N'Ponda	35,34	-17,86	210	B
Galinha	34,95	-19,31	209	D	Nhatole	35,46	-18,39	209	B
Muanza	34,79	-18,90	209	A	Mangaze(*)	35,40	-17,90	209	B
Gorongosa District					Chupanga	35,56	-18,02	209	B
Anora	34,43	-18,51	102	A	Safrique-C14(*)	35,88	-18,44	201	B
Botho	34,20	-18,70	209	A	Kunguma	35,89	-18,50	102	B
Bunga	34,35	-18,61	105	A	Nyansaze(*)	35,63	-18,34	210	B
Caravira serra	34,19	-18,36	202	A	**Caia District**				
Casa banana(*)	34,41	-18,49	205	A	Machesse	34,73	-17,69	206	C
Chitengo(**)	34,35	-18,98	206	A	Bruire	34,74	-17,64	209	C
Cudzo	33,88	-18,63	206	D	Gombe-Gombe2	34,94	-17,65	205	C
Domba	34,07	-18,26	206	D	Jaze	34,86	-17,63	209	C
Maruro	33,92	-18,52	206	D	Ubar	34,88	-17,63	209	C
Massara	34,22	-18,32	206	D	Ganunga	34,82	-17,61	209	C
Morombeza	34,02	-18,57	209	D	Lidoma (Cado)(*)	34,80	-17,59	209	C
Mucodza	34,16	-18,58	209	A	Cadeado	34,95	-17,54	205	C
Mucuacua	33,84	-18,57	206	D	Sangadze(*)	35,01	-17,43	1	D
Nhambilira	33,97	-18,32	206	D	Semente	34,73	-17,89	1	C
Nhandara	34,04	-18,61	209	D	Jezane	35,07	-17,54	1	C
Pavua	34,08	-18,85	205	A	Nhacuecha	35,13	-17,63	205	C
Piro(*)	34,37	-18,35	209	A	Camba	35,28	-17,74	1	C
Pungue	34,07	-18,96	205	A	Caia	35,34	17,89	14	C
Sofrinho	34,00	-18,62	205	D	Sena	35,03	17,44	1	C
Tambarara	34,10	-18,64	1	A	Murraça	35,24	17,71	1	C
Tazaronda	34,18	-18,54	202	A	**Chemba District**				
Tsiquire (Chaile)(*)	34,13	-18,68	202	A	Cavambiri	34,93	-17,24	102	D
Nhambita	34,23	-19,03	205	A	Macanda(*)	34,84	-17,48	209	C
Nhahemba	34,17	-18,64	209	A	Muananhunga	34,92	-17,39	209	D
A	34,26	-18,67	209	A	Chena	34,88	-17,44	206	D
B	34,26	-18,62	209	A	Cordar	34,69	-17,48	209	D
C	34,39	-18,58	105	A	Sussoto	34,71	-17,46	209	D
D	34,32	-18,54	209	A	Nhambata	34,79	-17,40	206	D
E	34,42	-19,02	206	A	Molima	34,63	-17,35	209	D
F	34,52	-19,11	102	A	Aricete	34,50	-17,37	206	D
G	34,63	-18,62	206	A	Cassume	34,58	-17,37	206	D
Cusinurera	34,56	-18,64	206	A	Punzane	34,62	-17,40	209	D
Nhamadze	33,95	-18,47	202	D	Tomecena	34,69	-17,31	206	D
Vunduzi(*)	34,21	-18,48	202	A	Calamo	34,83	-17,22	206	D
Gorongosa	34,07	-18,68	14	A	Anjeje	34,86	-17,12	102	D
Cheringoma District					Goba	34,84	-17,09	206	D
Condué(*)	34,85	-18,72	210	A	Pachombe	34,81	-17,01	206	D
Dota	35,41	-18,39	209	B	Chineue	34,65	-17,14	206	D
Matondo	35,04	-18,16	209	C	Catumene	34,73	-17,08	206	D
Mazamba	34,77	-18,50	209	A	Nhaussopo	34,60	-17,02	209	D
Sanga(2)	35,30	18,48	102	B	Nhamatope	34,46	-17,12	206	D
Muchana	34,74	-18,47	102	C	Machesse	34,42	-17,17	206	C
Naungo	35,32	-18,36	209	B	Mangudo	34,32	17,20	102	D
Nessona	35,74	-18,82	103	B	Colofite	34,24	-17,16	206	D

Block A = Gorongosa NP + periph.
Block B = Marromeu Complex
Block C = Safari concessions 6/15
Block D = other land uses

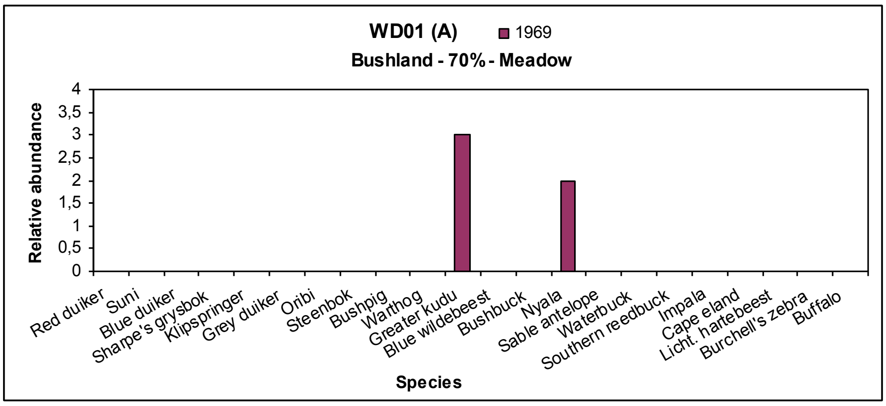
ANNEX 2 – Code Sheet

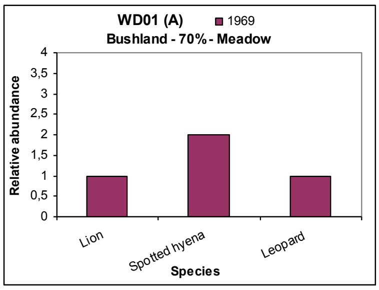
Code 1			
1	Rainfed cultivation	10	*Phacochoerus africanus* (warthog)
2	Irrigated cultivation	11	*Tragelaphus strepsiceros* (greater kudu)
11	Plantations	12	*Connochaetes taurinus ssp.*(blue wildebeest)
12	Recreational area	13	*Tragelaphus scriptus* (bushbuck)
13	Urbanized dwelling area	14	*Tragelaphus angasii* (nyala)
14	Semi-urbanized dwelling area	15	*Hippotragus niger* (sable antelope)
15	Non-urbanized dwelling area	16	*Kobus ellipsiprymnus* (waterbuck)
16	Industrial area	17	*Redunca arundinum* (southern reedbuck)
17	Salt Pans	18	*Aepyceros melampus* (impala)
101	Bare soils	19	*Taurotragus oryx* (Cape eland)
102	Meadow	20	*Alcelaphus b. lichtensteinii* (Lichtenstein's hartebeest)
103	Aquatic meadow	21	*Equus quagga crawshayii* (Burchell's zebra)
104	Mangrove	22	*Syncerus caffer* (buffalo)
105	Sparse grasslands		
201	Grassland	**Code 9**	
202	Shrubland	1	*Papio ursinus* (baboon)
205	Bushland	2	*Hystrix africaeaustralis* (porcupine)
206	Wooded grassland	3	*Thryonomys swinderianus* (greater cane rat)
209	Open woodland	4	*Potamochoerus larvatus* (bushpig)
210	Woodland	5	*Hippopotamus amphibius* (hippo)
211	Evergreen forest	6	*Crocodilus niloticus* (crocodile)
		7	*Phacochoerus africanus* (warthog)
Code 5	(vc = wooded vegetation cover)	8	? (snakes)
1	Forest/Woodland (vc>70%)	9	? (cropfield raiding birds)
2	Open woodland/Bushland (70>vc>40%)	10	*Tragelaphus scriptus* (bushbuck)
3	Wooded grassland (40>vc>10%)	11	*Ourebia ourebi* (oribi)
4	Grassland (vc<10%)	12	*Loxodonta africana* (elephant)
		13	*Redunca arundinum* (southern reedbuck)
Code 6		14	*Crocuta crocuta* (spotted hyena)
1	*Cephalophus natalensis* (red duiker)	15	*Panthera leo* (lion)
2	*Neotragus moschatus* (suni)	16	*Cephalophus natalensis* (red duiker)
3	*Cephalophus monticola* (blue duiker)	17	? (crop raiding rodents)
4	*Raphicerus sharpei* (Sharpe's grysbok)	18	*Syncerus caffer* (buffalo)
5	*Oreotragus oreotragus* (klipspringer)	19	*"galinha-do-mato"* (Guinea fowl)
6	*Sylvicarpa grimmia* (grey duiker)	20	? (rabbits)
7	*Ourebia ourebi* (oribi)	21	*Cercopithecus aethiops* (vervet monkey)
8	*Raphicerus campestris* (steenbok)	22	*Diceros bicornis* (black rhino)
9	*Potamochoerus larvatus* (bushpig)	23	*Felis lybica* (wild cat)

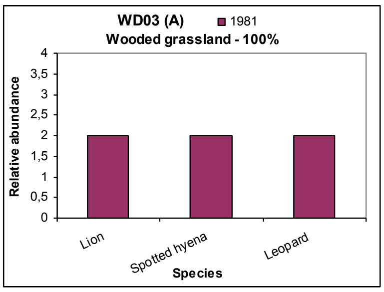
ANNEX 4a

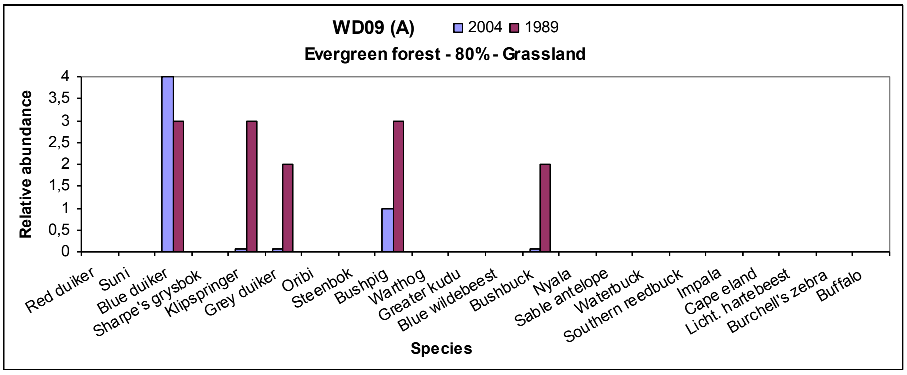
Relative abundance of wild ungulate & large carnivore species at African wild dog sighting points in the 9 northern districts of the Sofala province as revealed by the Field interviews Survey (2003-2004)

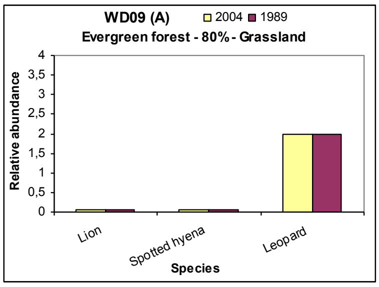
Block A

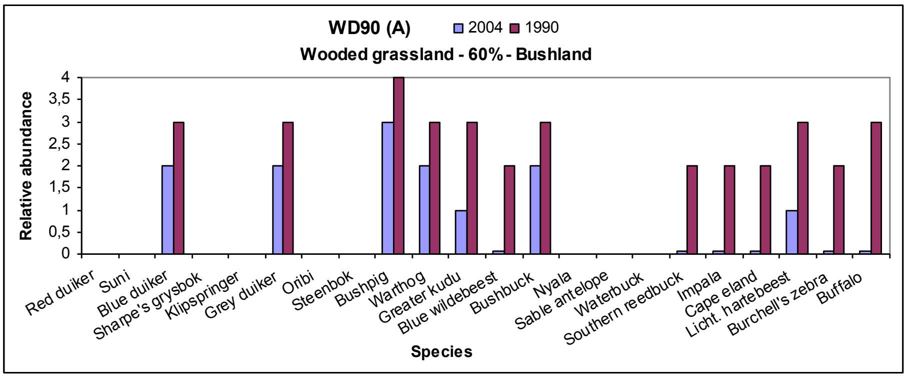


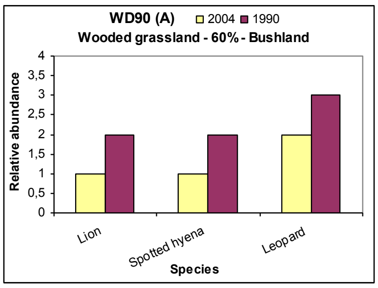


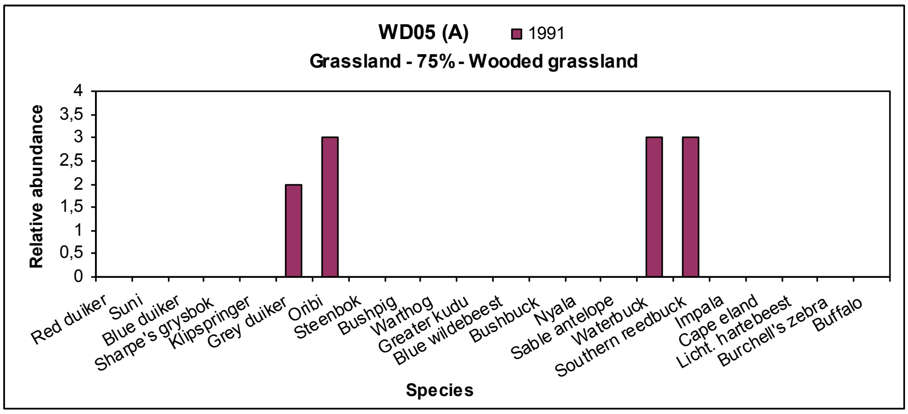


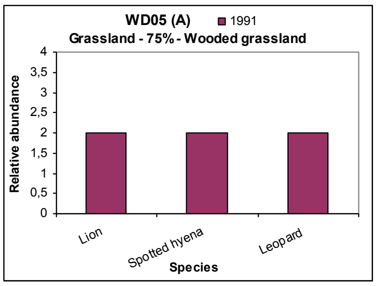

WD09 (A)
2004
1989
Evergreen forest - 80% - Grassland
Relative abundance
0
0,5
1
1,5
2
2,5
3
3,5
4
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

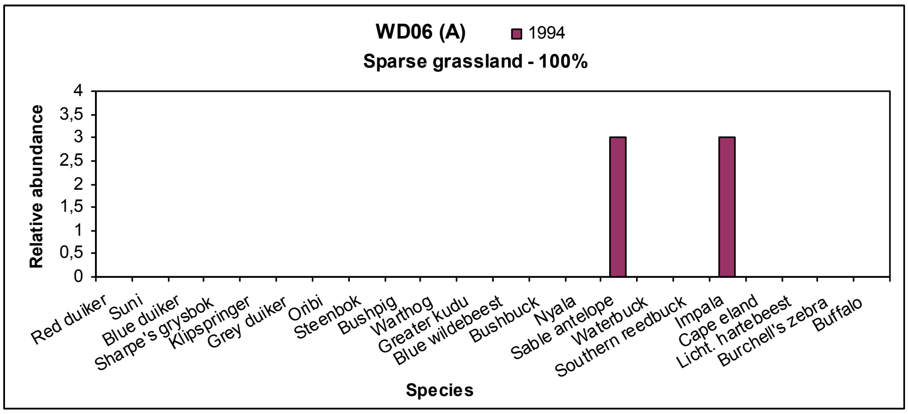

WD09 (A)
2004
1989
Evergreen forest - 80% - Grassland
Relative abundance
0
0,5
1
1,5
2
2,5
3
3,5
4
Lion
Spotted hyena
Leopard
Species

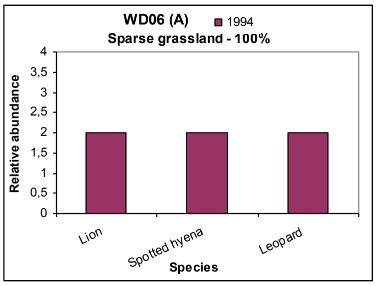

WD90 (A)
2004
1990
Wooded grassland - 60% - Bushland
Relative abundance
0
0,5
1
1,5
2
2,5
3
3,5
4
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


WD90 (A)
2004
1990
Wooded grassland - 60% - Bushland
Relative abundance
0
0,5
1
1,5
2
2,5
3
3,5
4
Lion
Spotted hyena
Leopard
Species

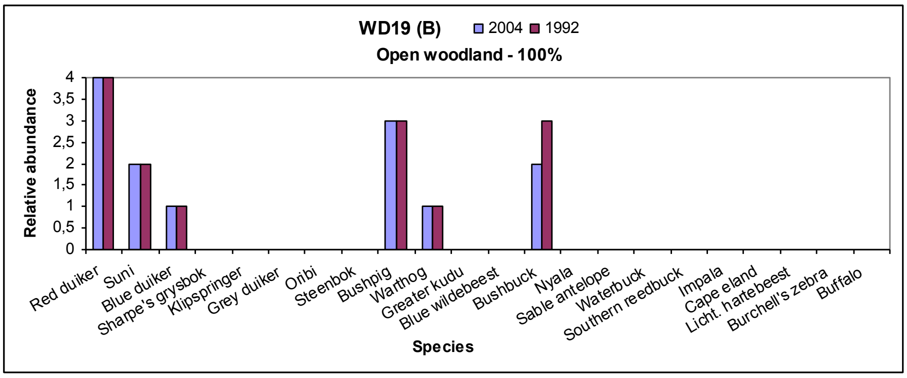

WD05 (A)
1991
Grassland - 75% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


WD05 (A)
1991
Grassland - 75% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

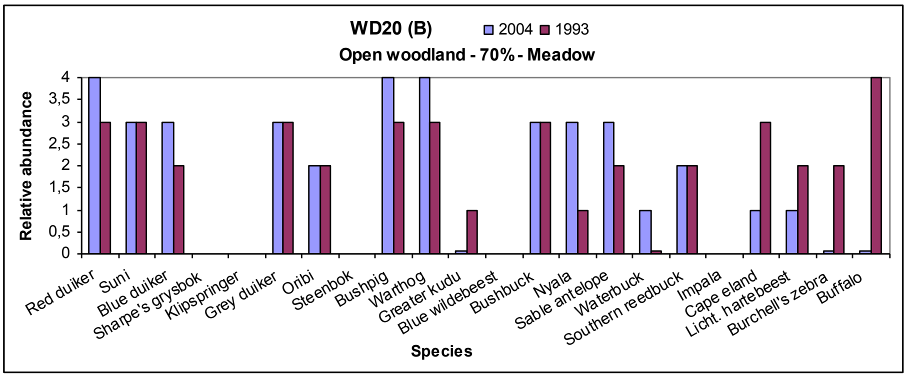

WD06 (A)
1994
Sparse grassland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


WD06 (A)
1994
Sparse grassland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

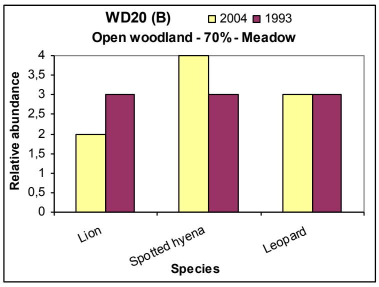
Block B



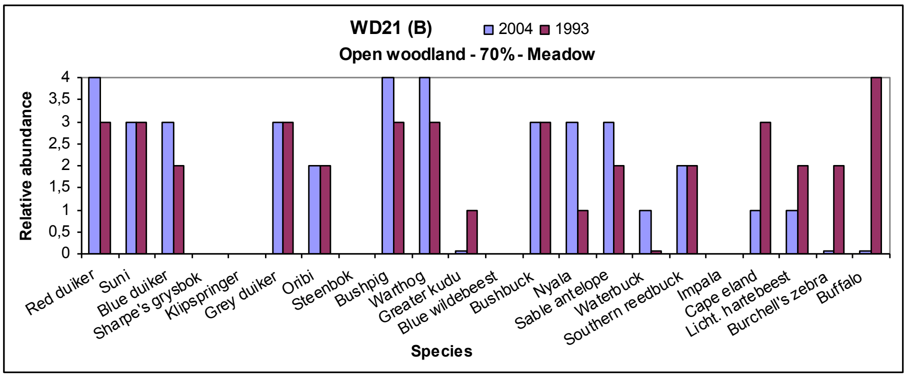
WD19 (B)
2004
1992
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species



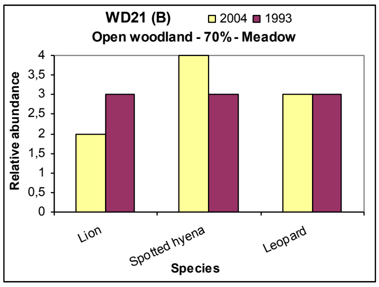
WD20 (B)
2004
1993
Open woodland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species



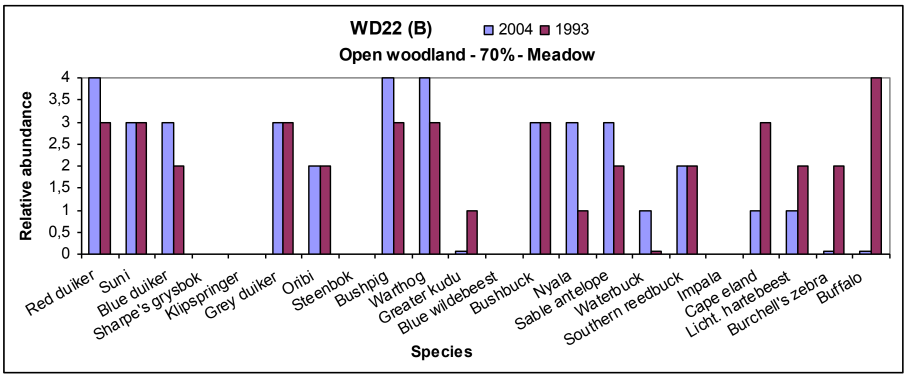
WD20 (B)
2004
1993
Open woodland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

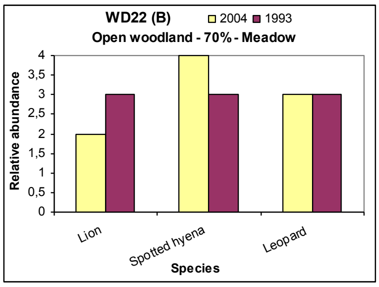


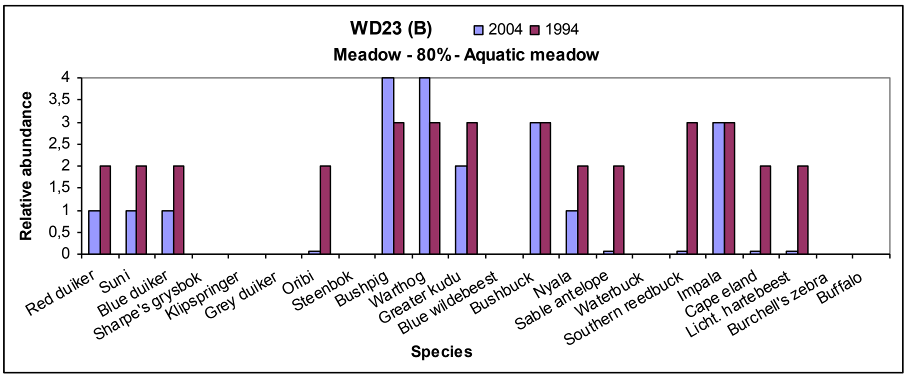
WD21 (B)
2004
1993
Open woodland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

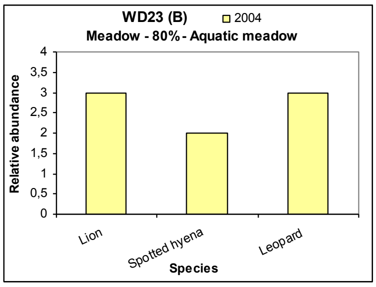


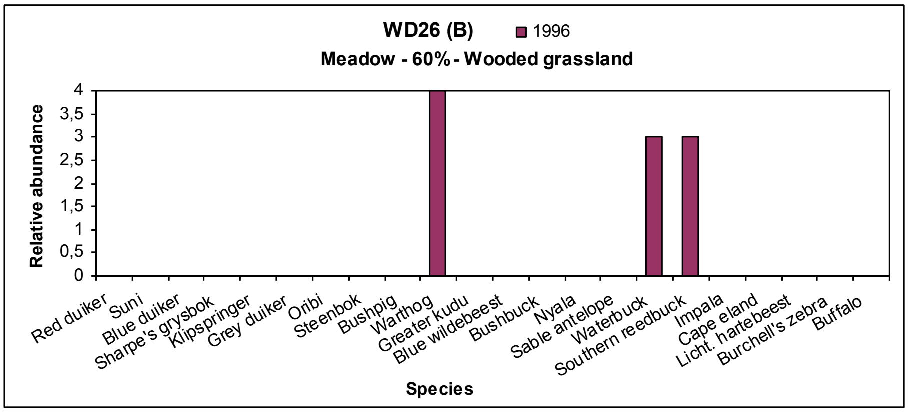
WD21 (B)
2004
1993
Open woodland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

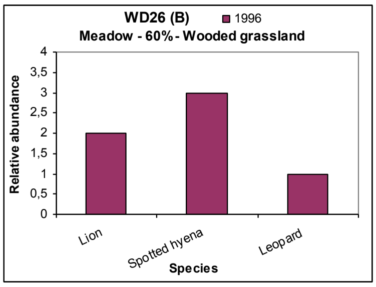

WD22 (B)
2004
1993
Open woodland - 70% - Meadow
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo

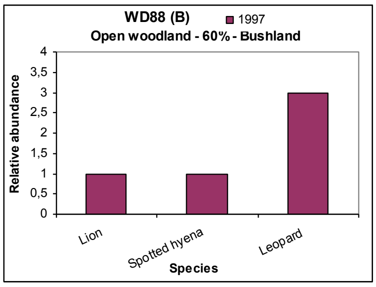

WD22 (B)
2004
1993
Open woodland - 70% - Meadow
Relative abundance
Species
Lion
Spotted hyena
Leopard

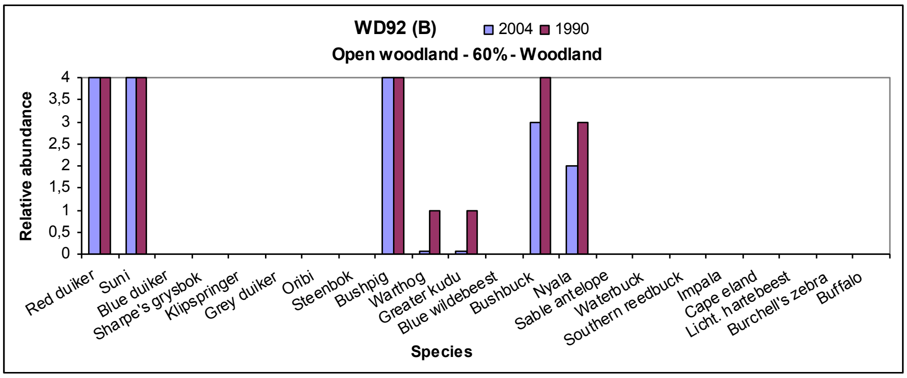

WD23 (B)
2004
1994
Meadow - 80% - Aquatic meadow
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo

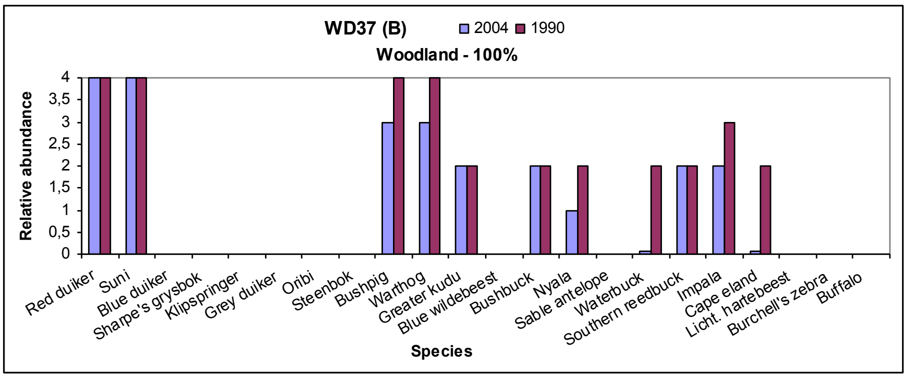

WD23 (B)
2004
Meadow - 80% - Aquatic meadow
Relative abundance
Species
Lion
Spotted hyena
Leopard

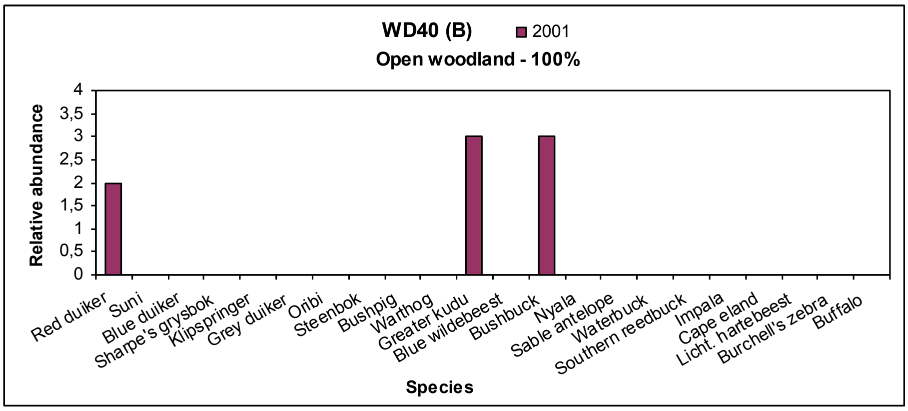

WD26 (B)
1996
Meadow - 60% - Wooded grassland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


WD26 (B)
1996
Meadow - 60% - Wooded grassland
Relative abundance
Lion
Spotted hyena
Leopard
Species

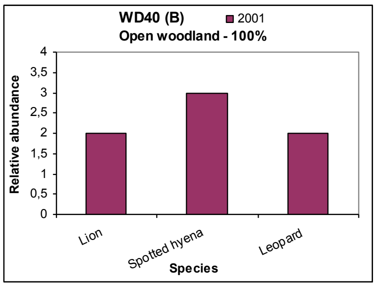

WD88 (B)
1997
Open woodland - 60% - Bushland
Relative abundance
Lion
Spotted hyena
Leopard
Species


WD92 (B)
2004
1990
Open woodland - 60% - Woodland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

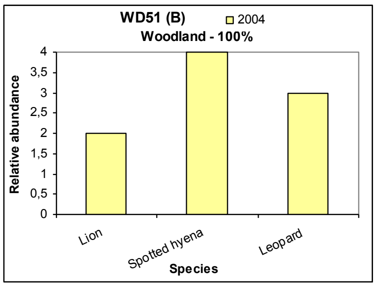

WD37 (B)
2004
1990
Woodland - 100%
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species



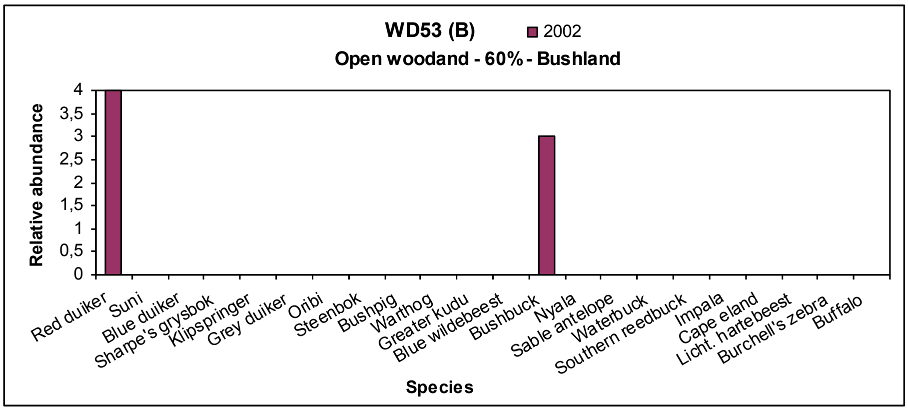
WD40 (B)
2001
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species



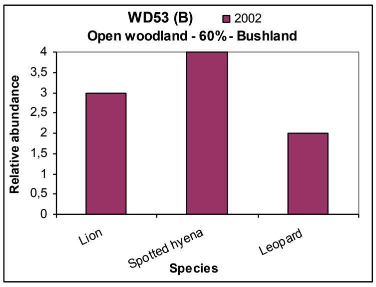
WD40 (B)
2001
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species



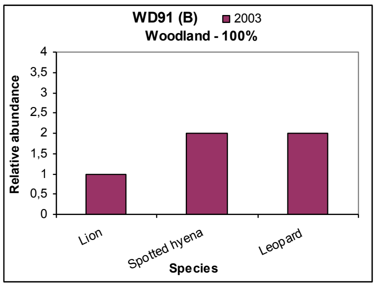
WD51 (B)
2004
Woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

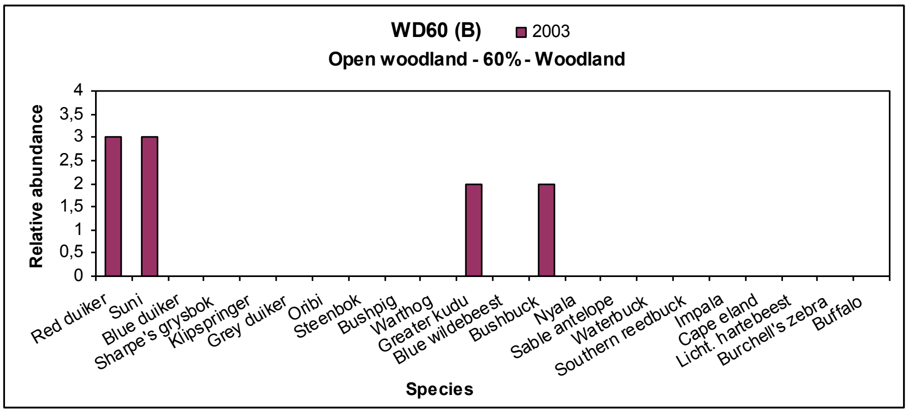


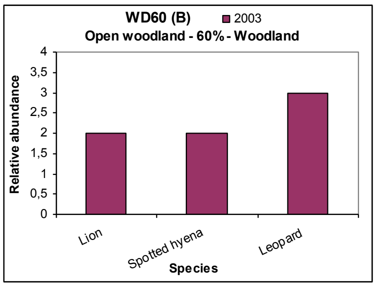
WD53 (B)
2002
Open woodand - 60% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

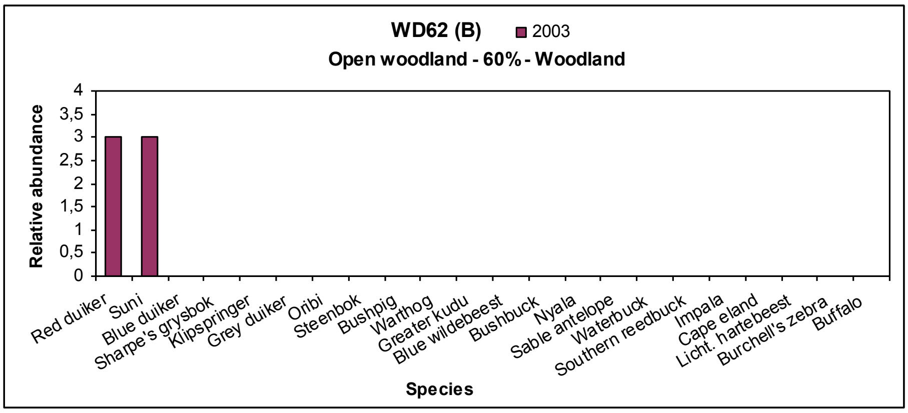


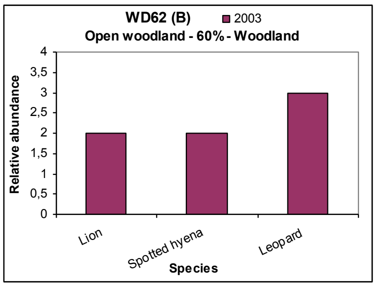
WD53 (B)
2002
Open woodland - 60% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

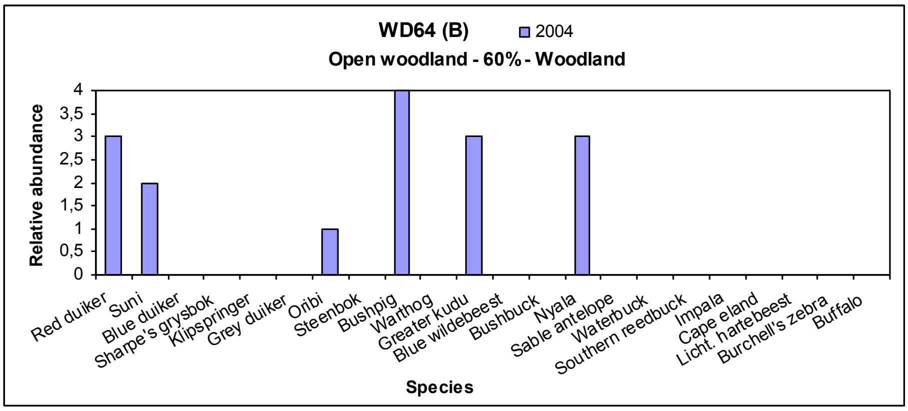

WD91 (B)
2003
Woodland - 100%
Relative abundance
Lion
Spotted hyena
Leopard
Species


WD60 (B)
2003
Open woodland - 60% - Woodland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

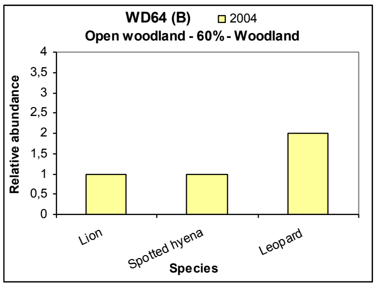

WD60 (B)
2003
Open woodland - 60% - Woodland
Relative abundance
Lion
Spotted hyena
Leopard
Species


WD62 (B)
2003
Open woodland - 60% - Woodland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

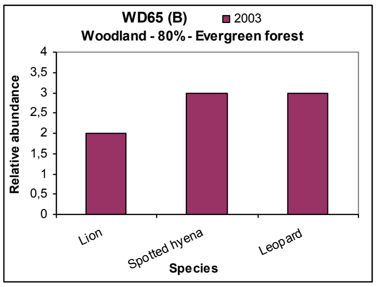

WD62 (B)
2003
Open woodland - 60% - Woodland
Relative abundance
Lion
Spotted hyena
Leopard
Species



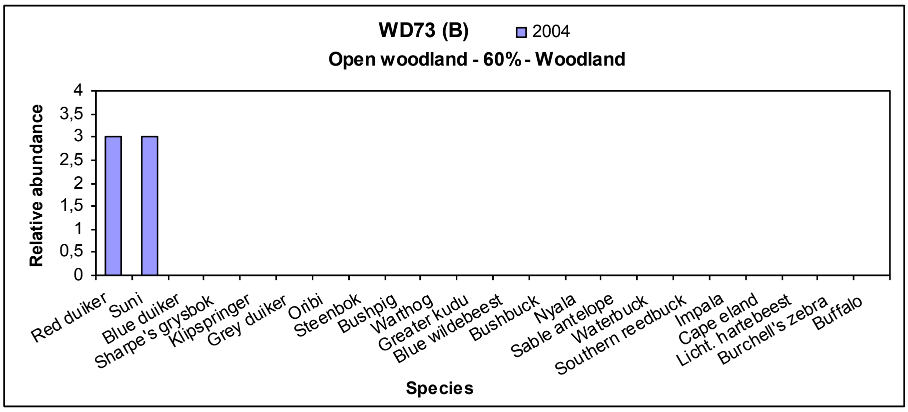
WD64 (B)
2004
Open woodland - 60% - Woodland
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo



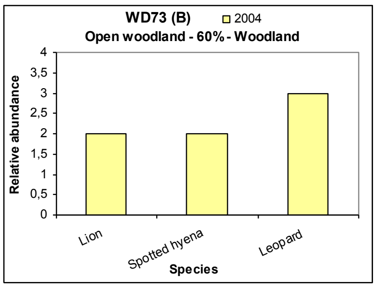
WD64 (B)
2004
Open woodland - 60% - Woodland
Relative abundance
Species
Lion
Spotted hyena
Leopard



WD65 (B)
2003
Woodland - 80% - Evergreen forest
Relative abundance
Species
Lion
Spotted hyena
Leopard

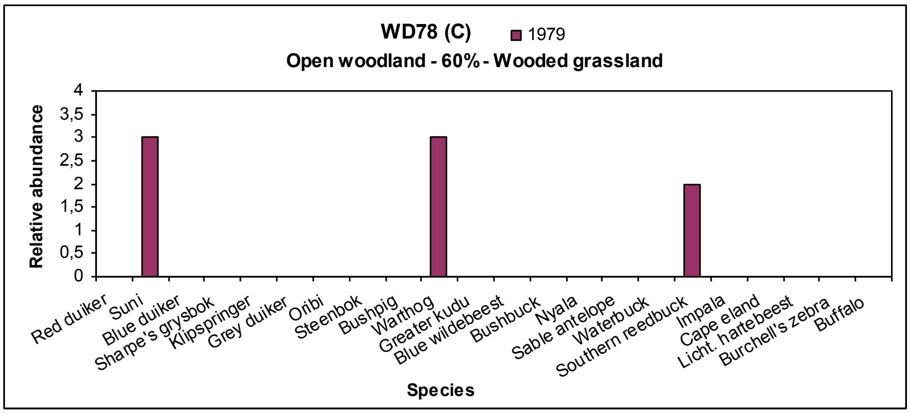


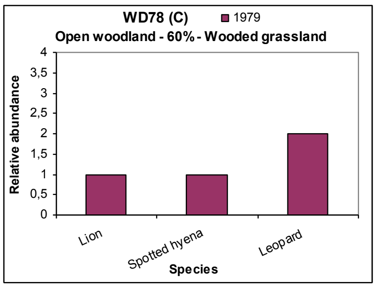
WD73 (B)
2004
Open woodland - 60% - Woodland
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo



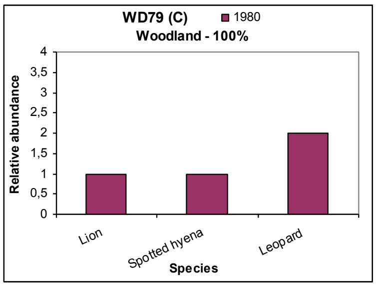
WD73 (B)
2004
Open woodland - 60% - Woodland
Relative abundance
Species
Lion
Spotted hyena
Leopard

Block C

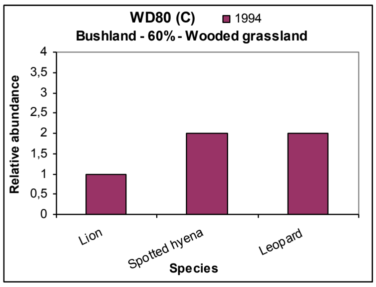

WD78 (C)
1979
Open woodland - 60% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


WD78 (C)
1979
Open woodland - 60% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

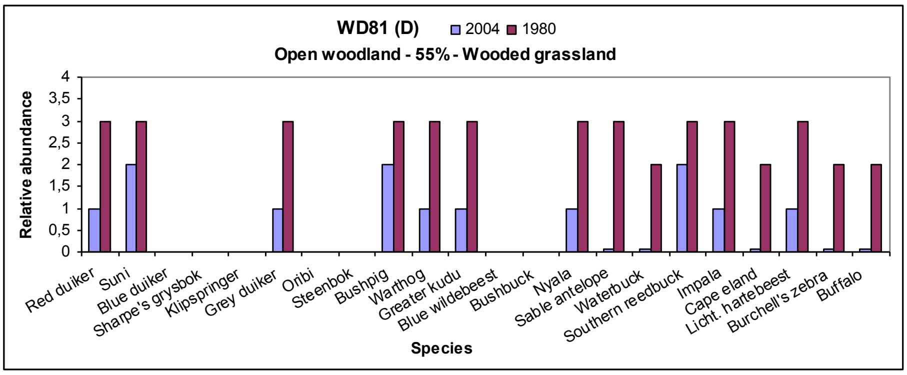

WD79 (C)
1980
Woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

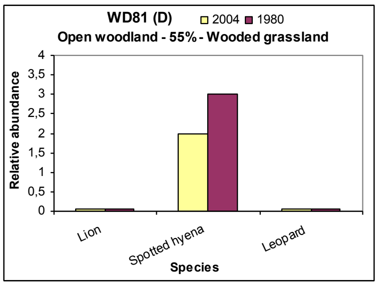

WD79 (C)
1980
Woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

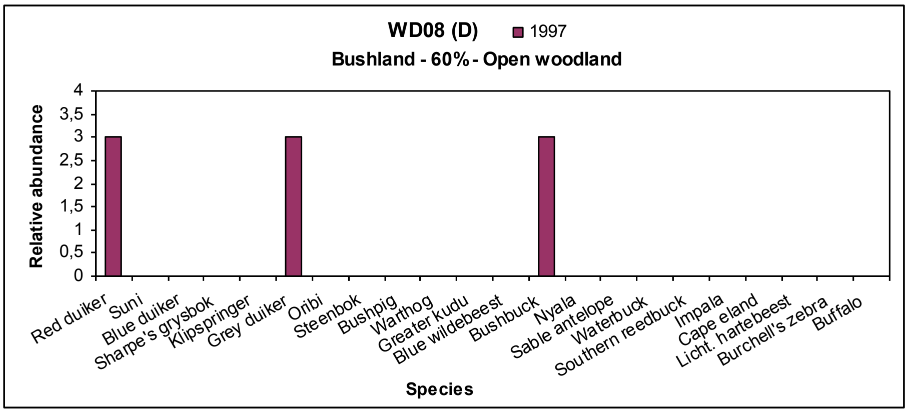

WD80 (C)
1994
Bushland - 60% - Wooded grassland
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo

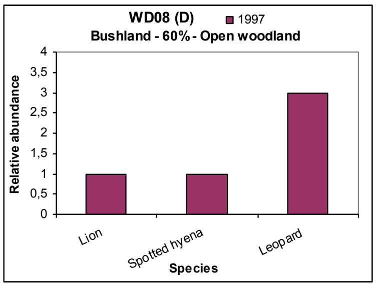

WD80 (C)
1994
Bushland - 60% - Wooded grassland
Relative abundance
Species
Lion
Spotted hyena
Leopard

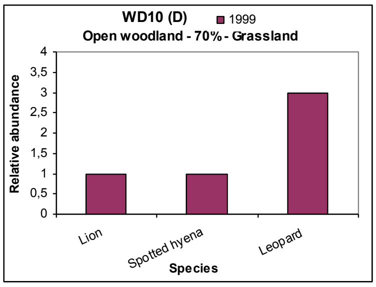
Block D


WD81 (D)
2004
1980
Open woodland - 55% - Wooded grassland
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo


WD81 (D)
2004
1980
Open woodland - 55% - Wooded grassland
Relative abundance
Species
Lion
Spotted hyena
Leopard

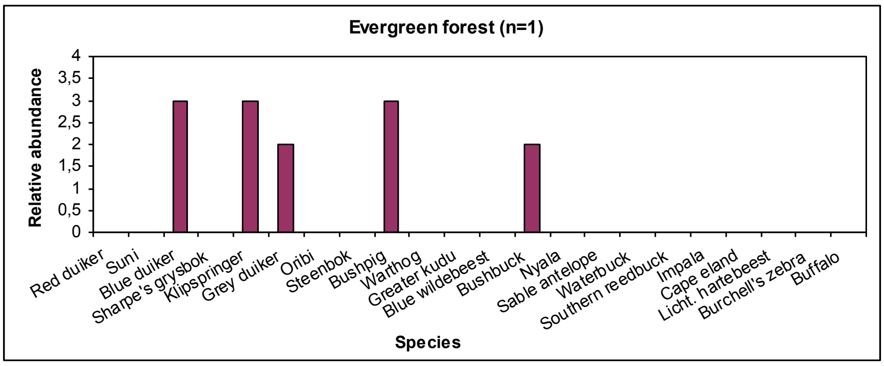

WD08 (D)
1997
Bushland - 60% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

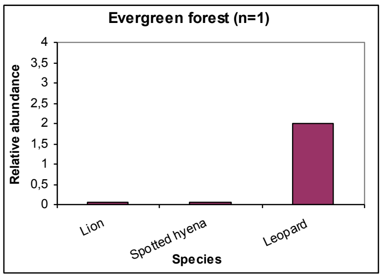

WD08 (D)
1997
Bushland - 60% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

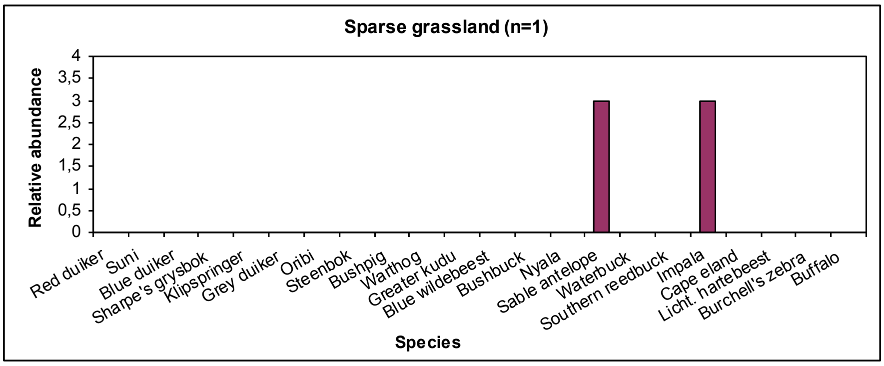

WD10 (D)
1999
Open woodland - 70% - Grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

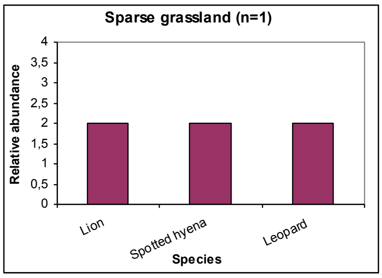
ANNEX 4b

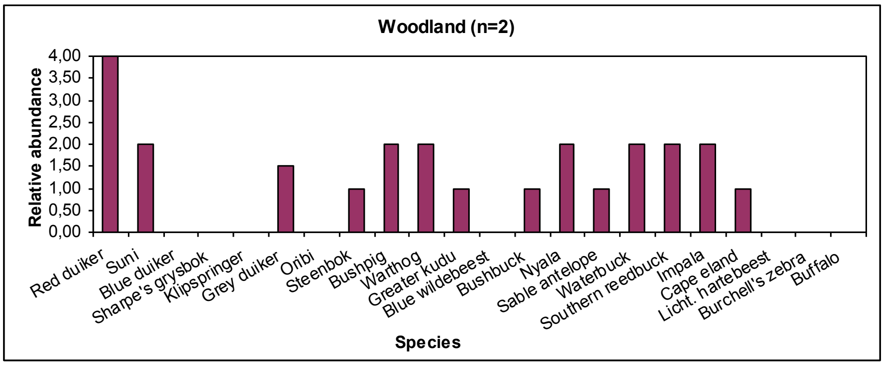
Possible available preys/present competitors patterns of relative abundance averaged in overall for the most preferred vegetation types of the African wild dog in northern Sofala as revealed by the Field interviews Survey (2003-2004)

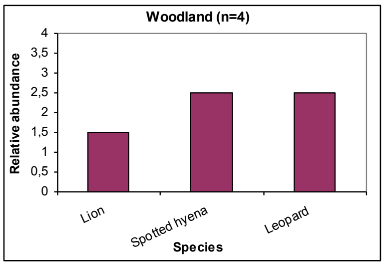


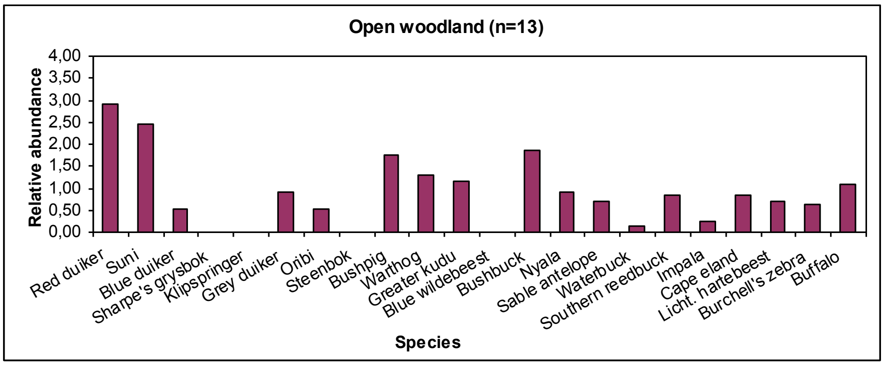


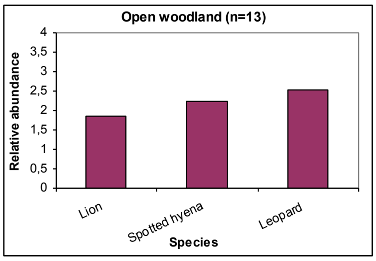





Woodland (n=2)
Relative abundance
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


Woodland (n=4)
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

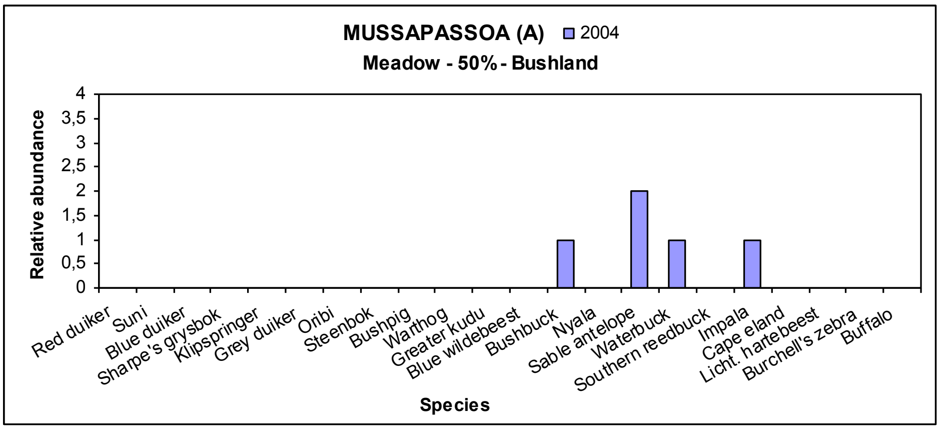

Open woodland (n=13)
Relative abundance
4,00
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


Open woodland (n=13)
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

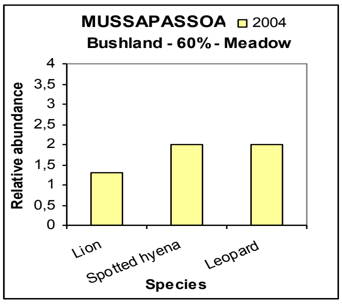
ANNEX 4c

Possible available preys/present competitors patterns of relative abundance averaged in overall around selected human settlements in the northern districts of the Sofala province as revealed by the Field interviews Survey (2003-2004)

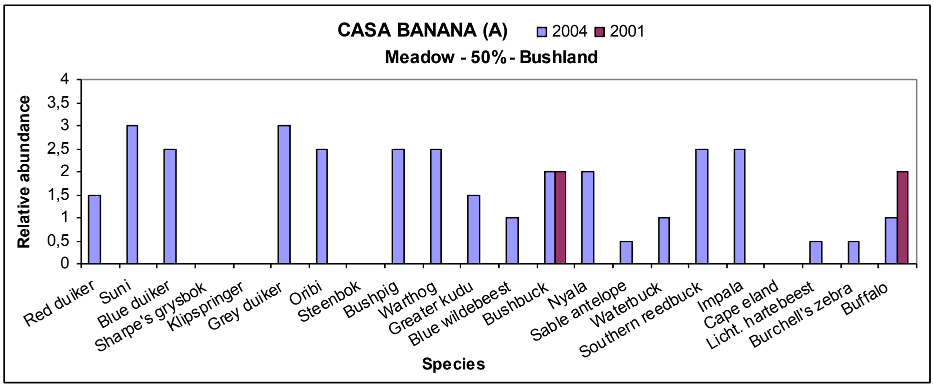
Block A



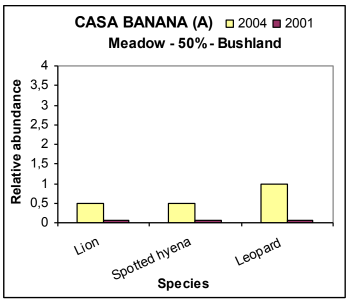
MUSSAPASSOA (A) 2004
Meadow - 50% - Bushland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species



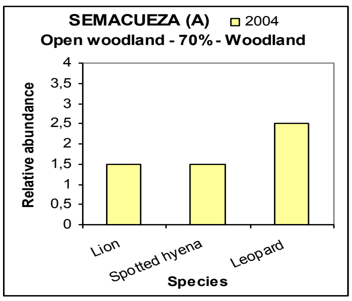
MUSSAPASSOA 2004
Bushland - 60% - Meadow
Relative abundance
Lion
Spotted hyena
Leopard
Species



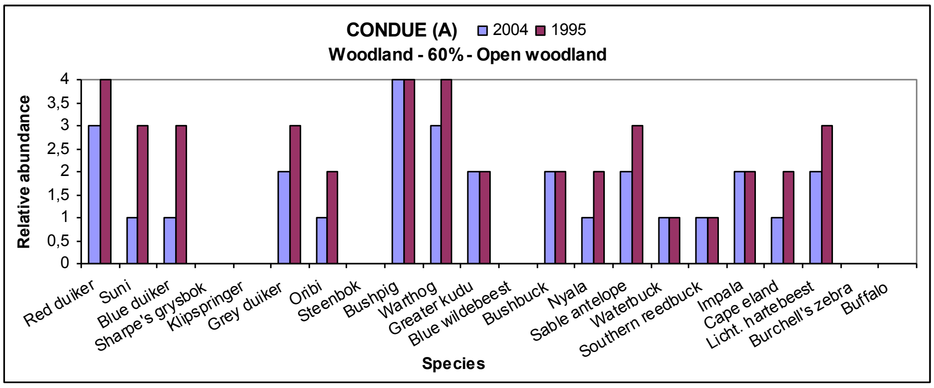
CASA BANANA (A) 2004 2001
Meadow - 50% - Bushland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

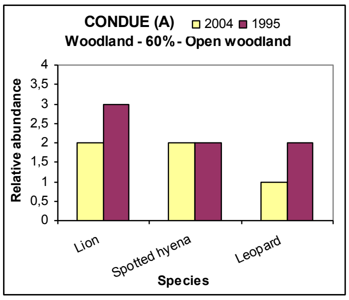


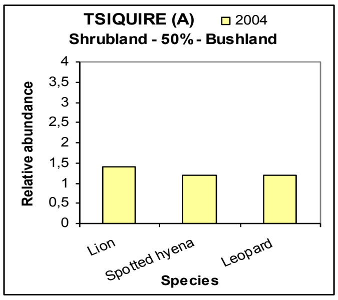
CASA BANANA (A) 2004 2001
Meadow - 50% - Bushland
Relative abundance
Lion
Spotted hyena
Leopard
Species

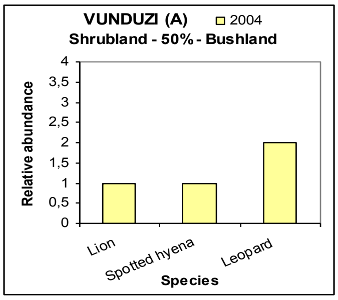


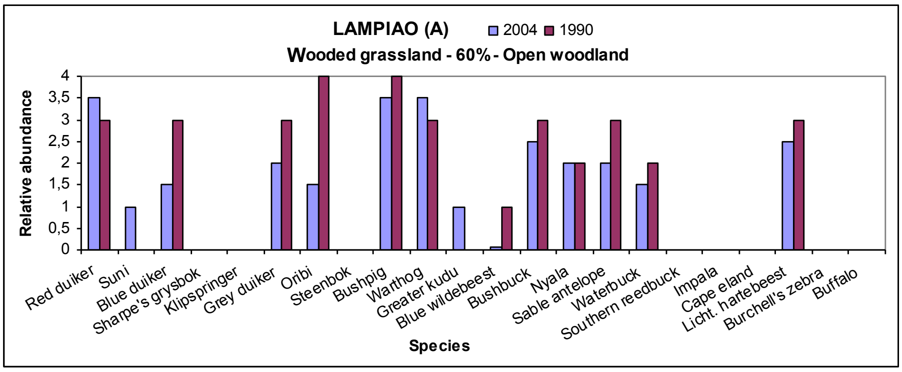
SEMACUEZA (A) 2004
Open woodland - 70% - Woodland
Relative abundance
Lion
Spotted hyena
Leopard
Species

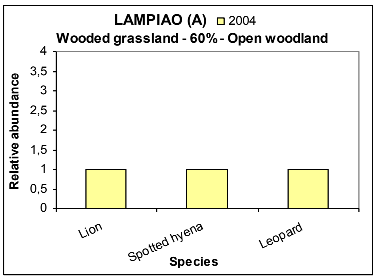

CONDUE (A) 2004 1995
Woodland - 60% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

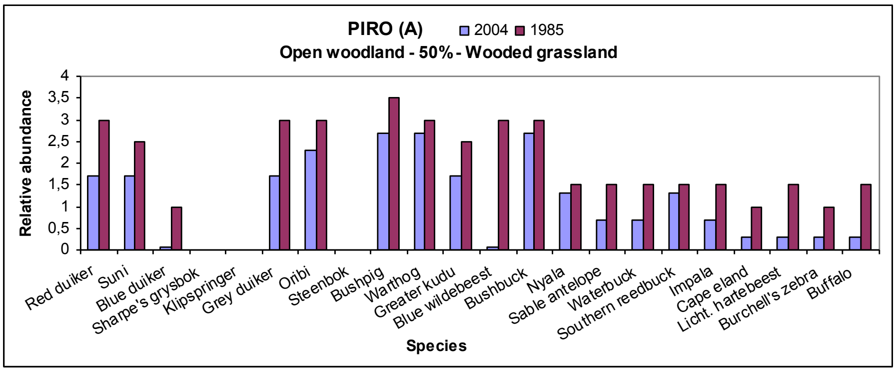

CONDUE (A) 2004 1995
Woodland - 60% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

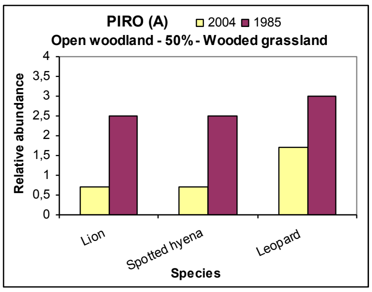

TSIQUIRE (A) 2004
Shrubland - 50% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

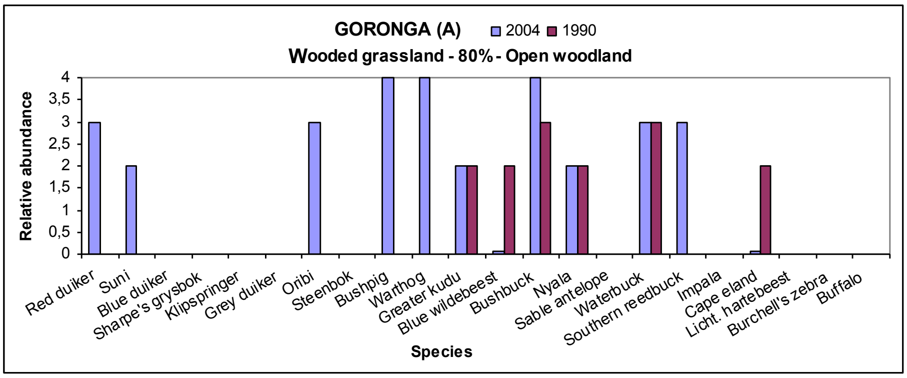

VUNDUZI (A) 2004
Shrubland - 50% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

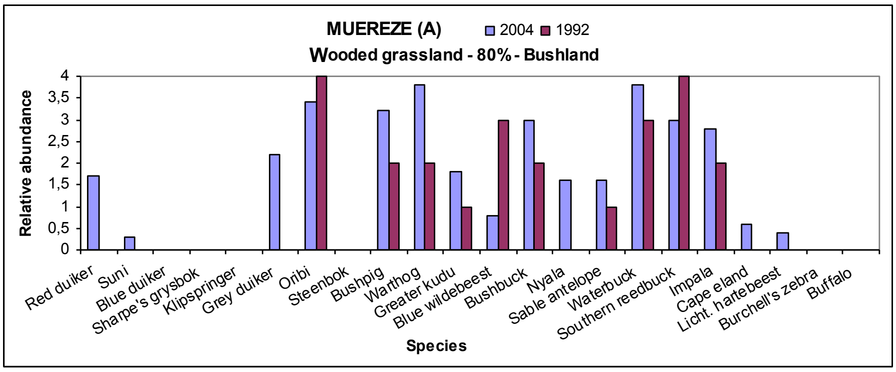

LAMPIAO (A)
2004
1990
Wooded grassland - 60% - Open woodland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

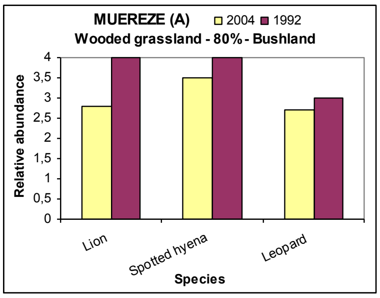

LAMPIAO (A)
2004
Wooded grassland - 60% - Open woodland
Relative abundance
Lion
Spotted hyena
Leopard
Species

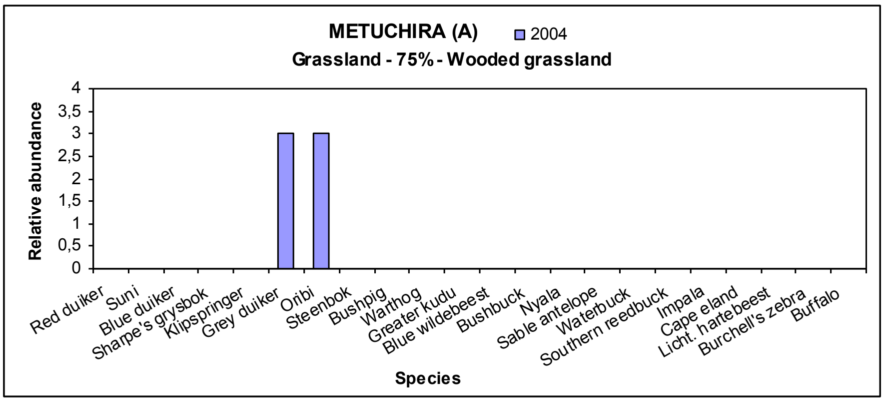

PIRO (A)
2004
1985
Open woodland - 50% - Wooded grassland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

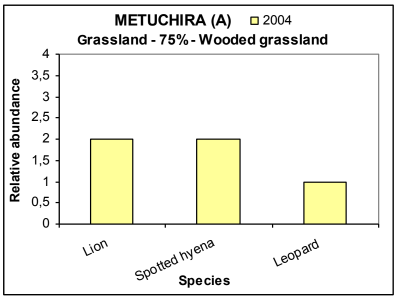

PIRO (A)
2004
1985
Open woodland - 50% - Wooded grassland
Relative abundance
Lion
Spotted hyena
Leopard
Species


GORONGA (A)
2004
1990
Wooded grassland - 80% - Open woodland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

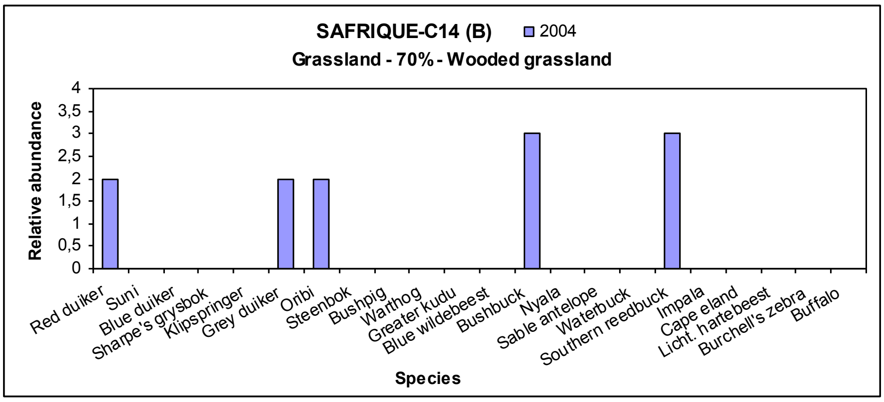

MUEREZE (A)
2004
1992
Wooded grassland - 80% - Bushland
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo

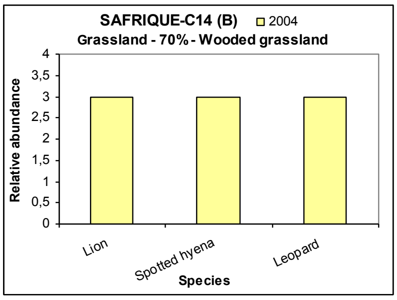

MUEREZE (A)
2004
1992
Wooded grassland - 80% - Bushland
Relative abundance
Species
Lion
Spotted hyena
Leopard

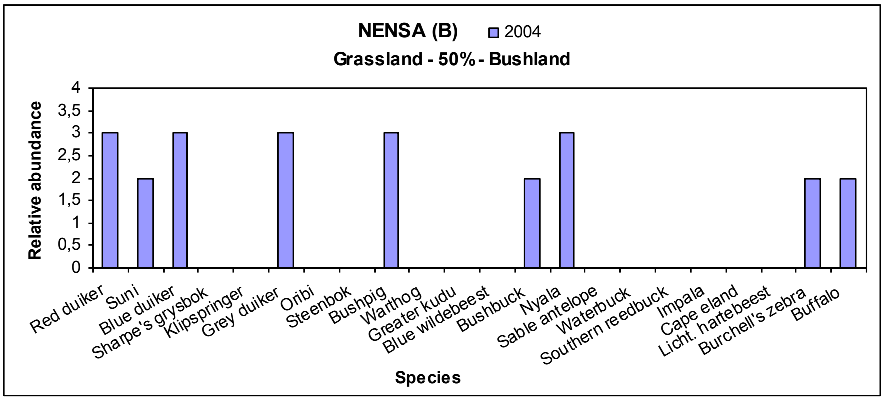

METUCHIRA (A)
2004
Grassland - 75% - Wooded grassland
Relative abundance
Species
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo

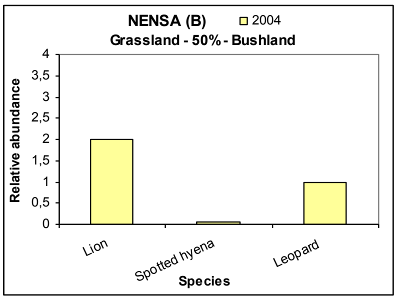

METUCHIRA (A)
2004
Grassland - 75% - Wooded grassland
Relative abundance
Species
Lion
Spotted hyena
Leopard

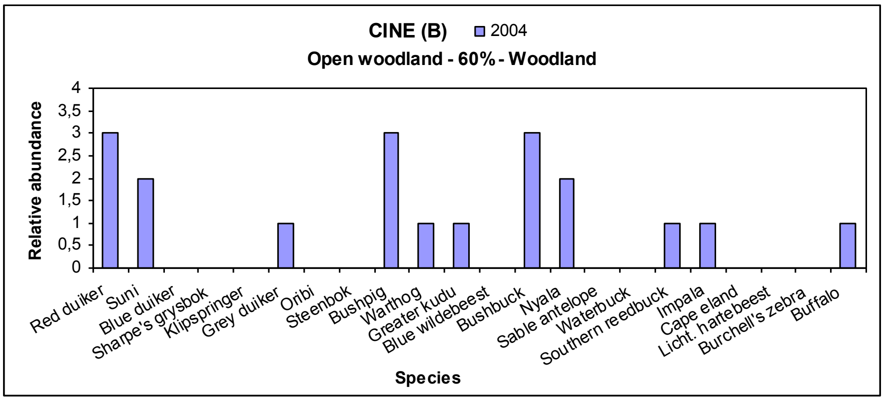
Block B

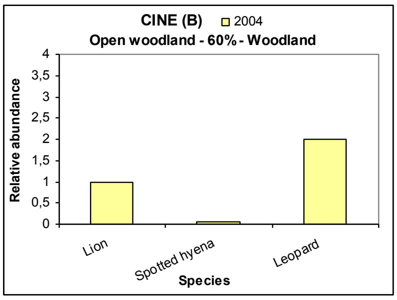

SAFRIQUE-C14 (B)
2004
Grassland - 70% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

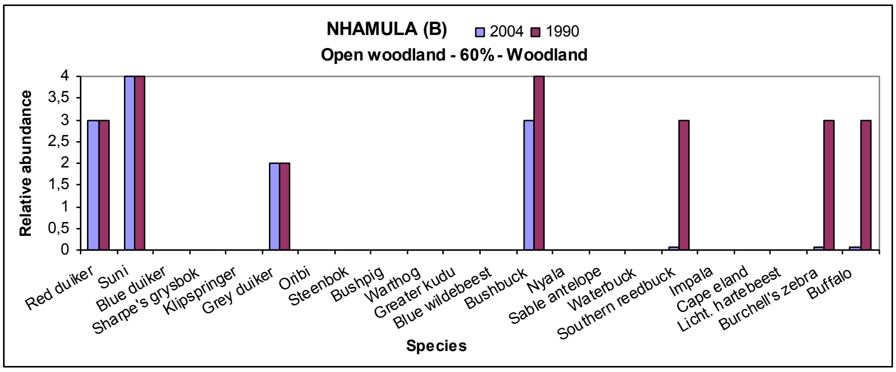

SAFRIQUE-C14 (B)
2004
Grassland - 70% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

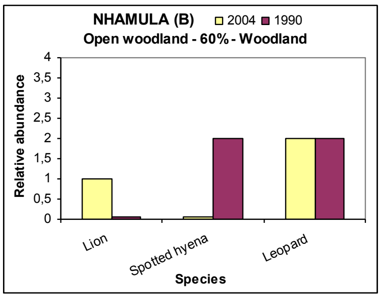

NENSA (B)
2004
Grassland - 50% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

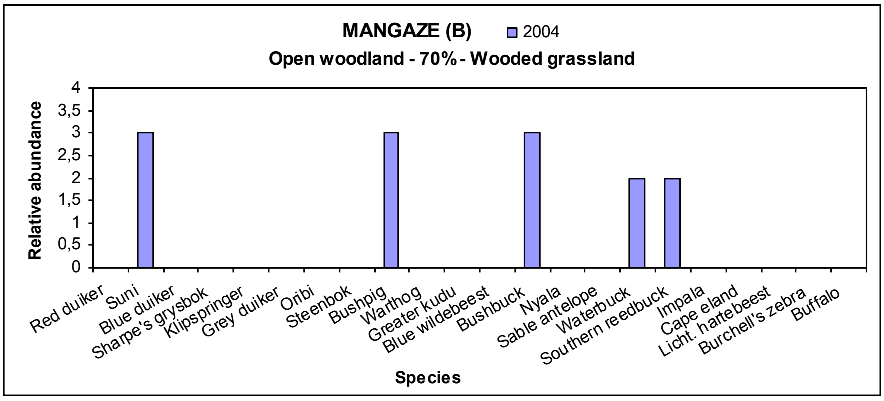

NENSA (B)
2004
Grassland - 50% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

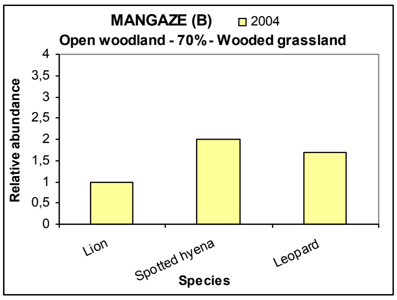

CINE (B)
2004
Open woodland - 60% - Woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

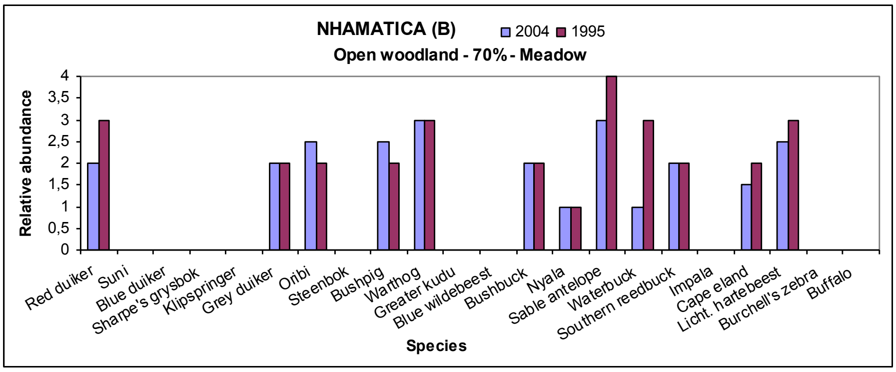

CINE (B)
2004
Open woodland - 60% - Woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

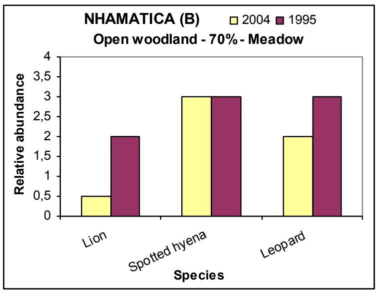

NHAMULA (B)
2004
1990
Open woodland - 60% - Woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

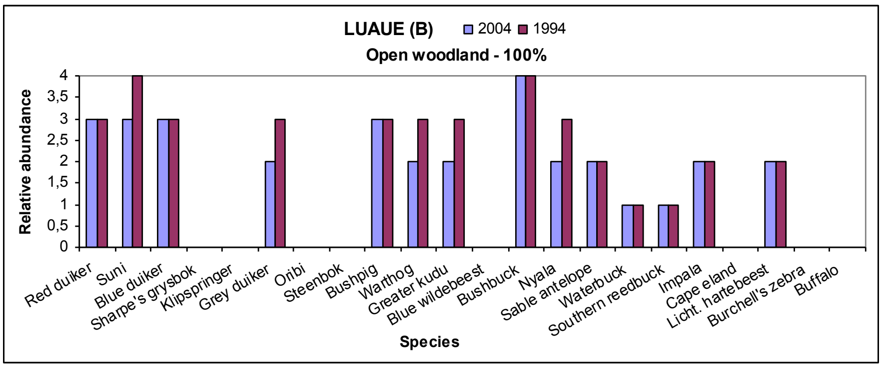

NHAMULA (B)
2004
1990
Open woodland - 60% - Woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

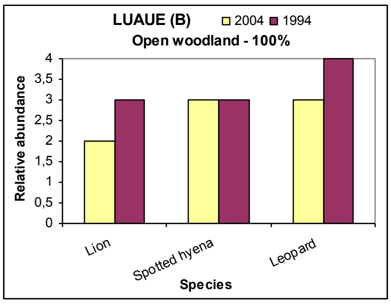

MANGAZE (B)
2004
Open woodland - 70% - Wooded grassland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

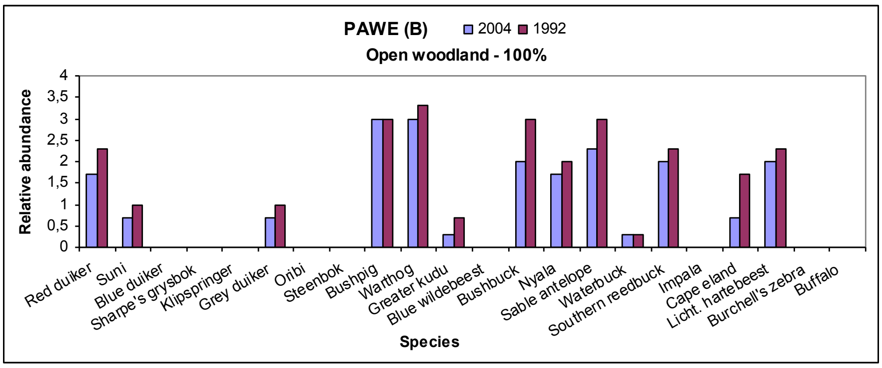

MANGAZE (B)
2004
Open woodland - 70% - Wooded grassland
Relative abundance
Lion
Spotted hyena
Leopard
Species

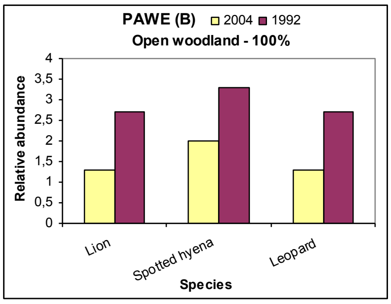

NHAMATICA (B)
2004
1995
Open woodland - 70% - Meadow
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

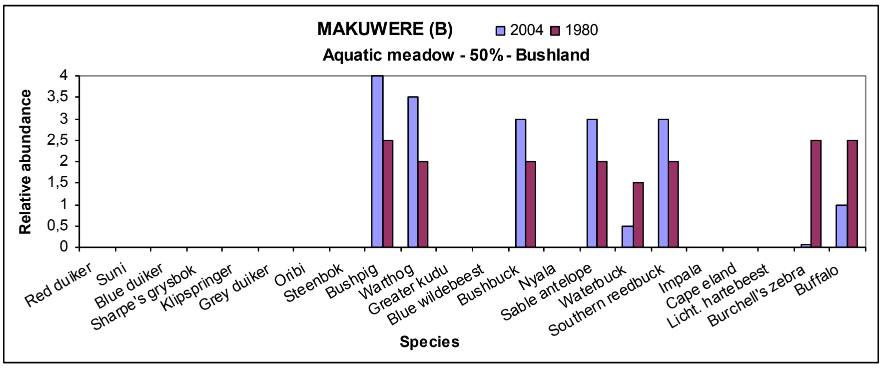

NHAMATICA (B)
2004
1995
Open woodland - 70% - Meadow
Relative abundance
Lion
Spotted hyena
Leopard
Species

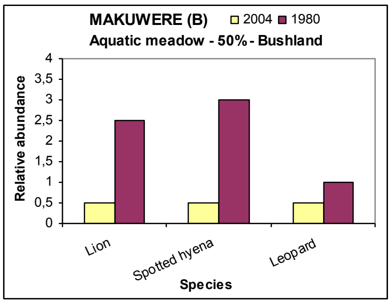

LUAUE (B)
2004
1994
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

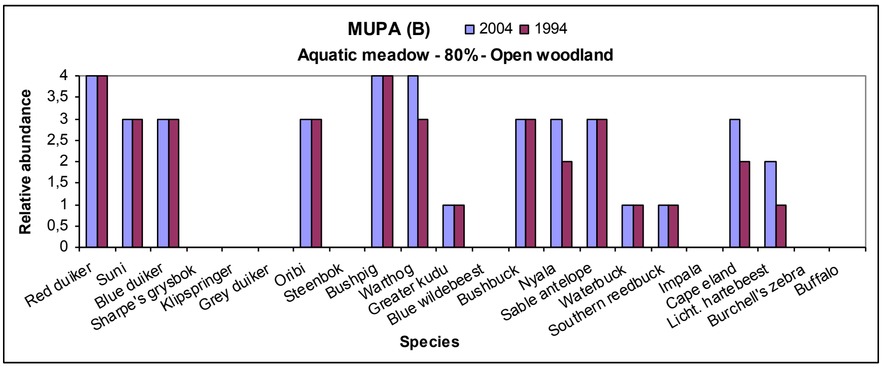

LUAUE (B)
2004
1994
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

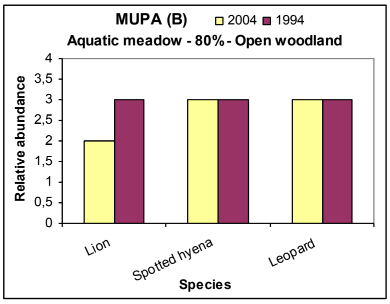

PAWE (B)
2004
1992
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

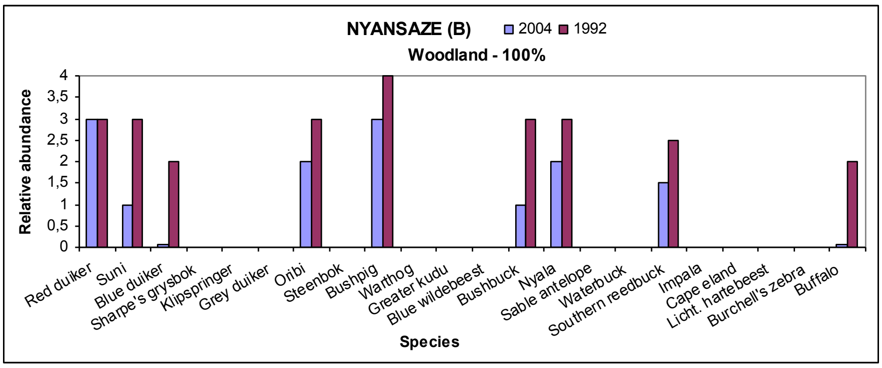

PAWE (B)
2004
1992
Open woodland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

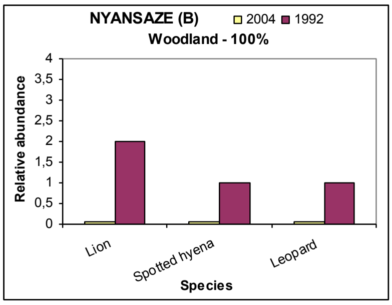

MAKUWERE (B)
2004
1980
Aquatic meadow - 50% - Bushland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


MAKUWERE (B)
2004
1980
Aquatic meadow - 50% - Bushland
Relative abundance
Lion
Spotted hyena
Leopard
Species

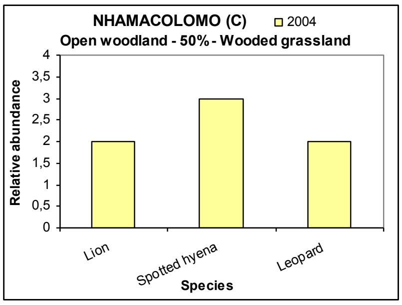

MUPA (B)
2004
1994
Aquatic meadow - 80% - Open woodland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

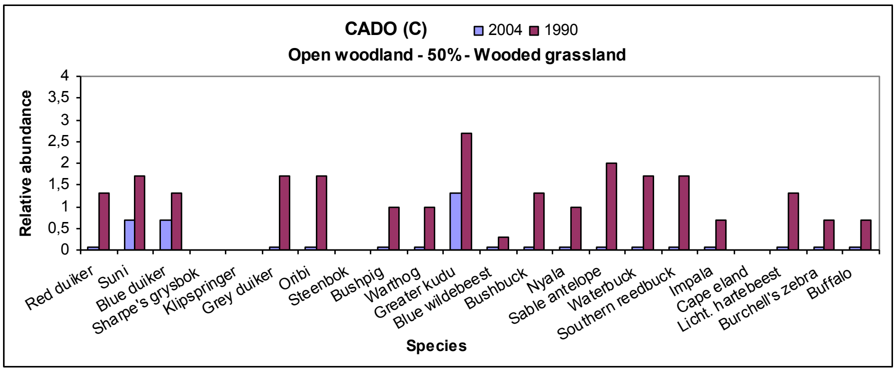

MUPA (B)
2004
1994
Aquatic meadow - 80% - Open woodland
Relative abundance
Lion
Spotted hyena
Leopard
Species

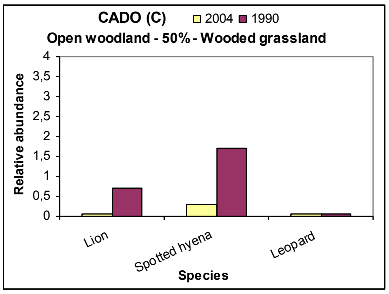

NYANSAZE (B)
2004
1992
Woodland - 100%
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

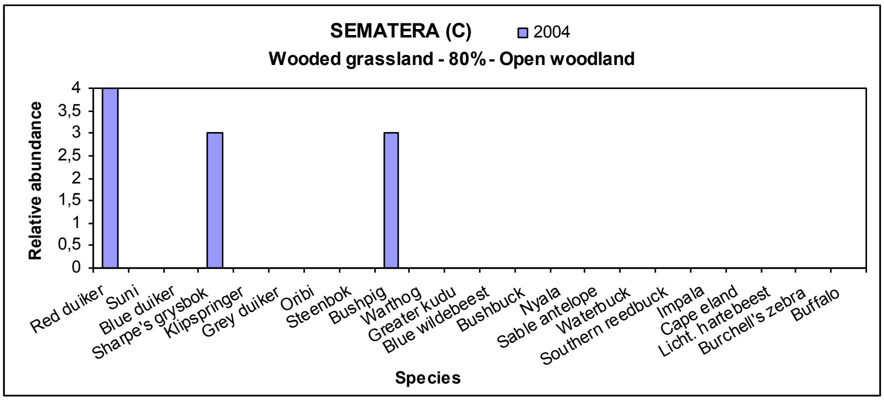

NYANSAZE (B)
2004
1992
Woodland - 100%
Relative abundance
Lion
Spotted hyena
Leopard
Species

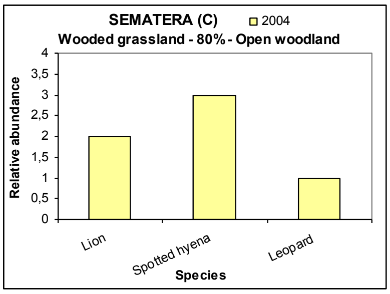
Block C

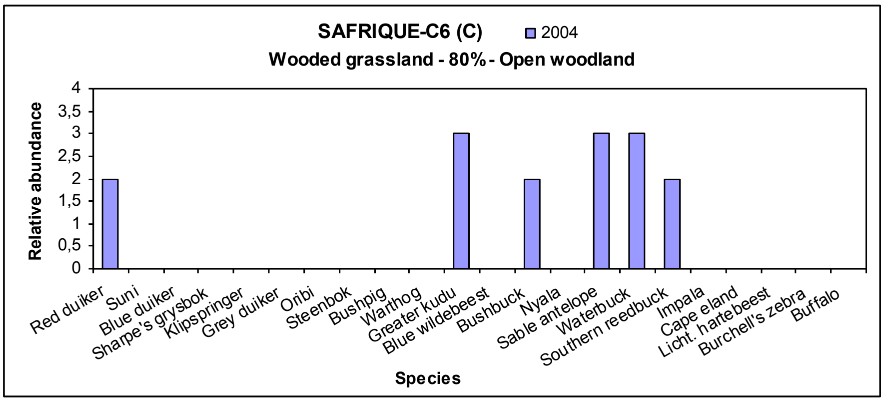

NHAMACOLOMO (C)
2004
Open woodland - 50% - Wooded grassland
Relative abundance
Lion
Spotted hyena
Leopard
Species

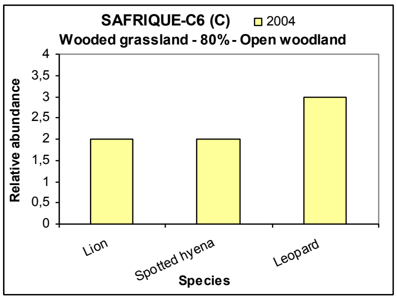

CADO (C)
2004
1990
Open woodland - 50% - Wooded grassland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

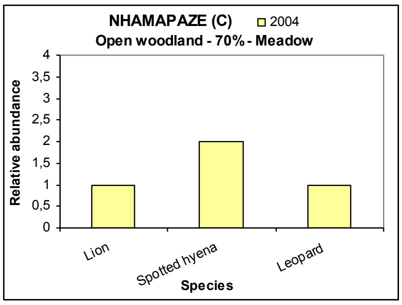

CADO (C)
2004
1990
Open woodland - 50% - Wooded grassland
Relative abundance
Lion
Spotted hyena
Leopard
Species

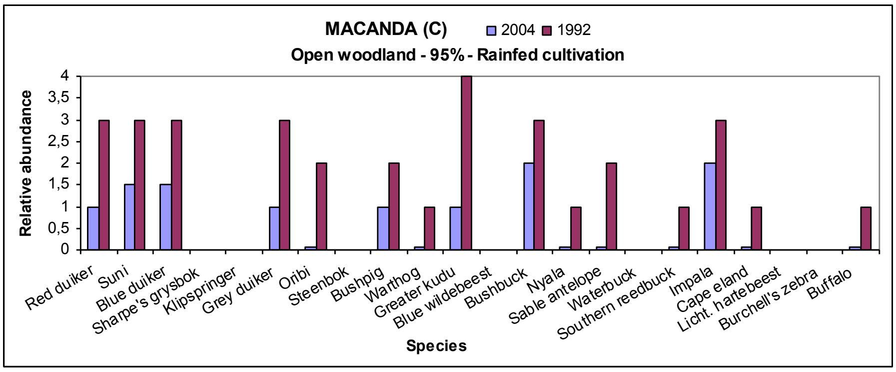

SEMATERA (C)
2004
Wooded grassland - 80% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

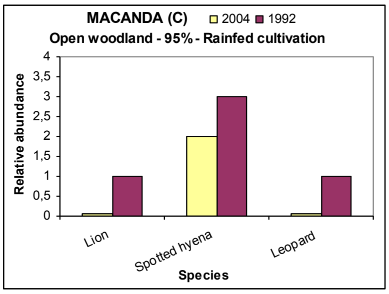

SEMATERA (C)
2004
Wooded grassland - 80% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species


SAFRIQUE-C6 (C)
2004
Wooded grassland - 80% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

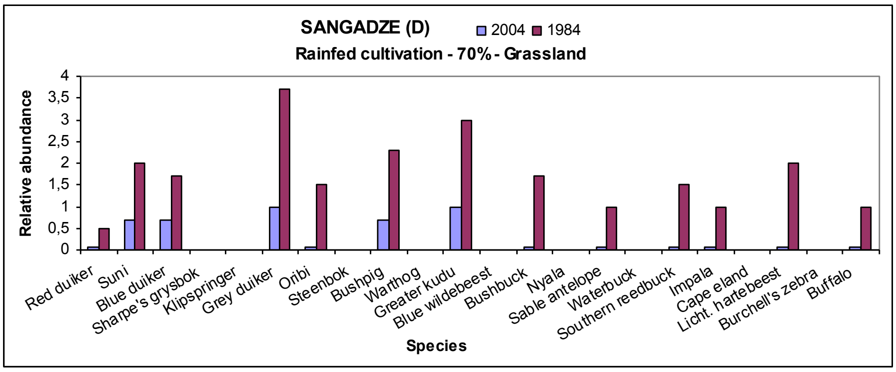

SAFRIQUE-C6 (C)
2004
Wooded grassland - 80% - Open woodland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

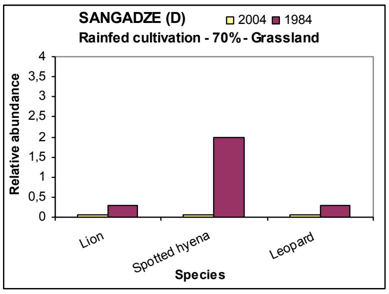

NHAMAPAZE (C)
2004
Open woodland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

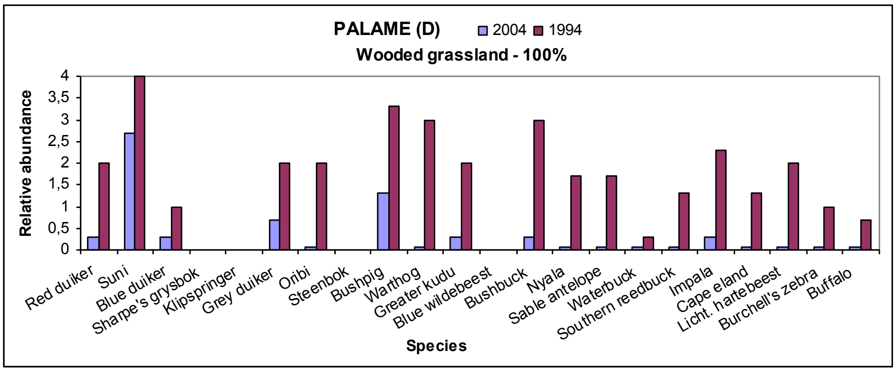

MACANDA (C)
2004
1992
Open woodland - 95% - Rainfed cultivation
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

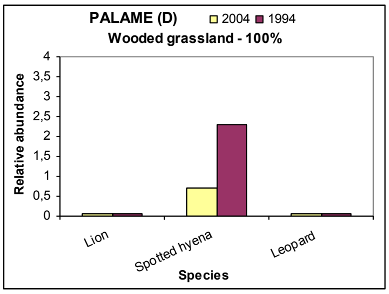

MACANDA (C)
2004
1992
Open woodland - 95% - Rainfed cultivation
Relative abundance
Lion
Spotted hyena
Leopard
Species

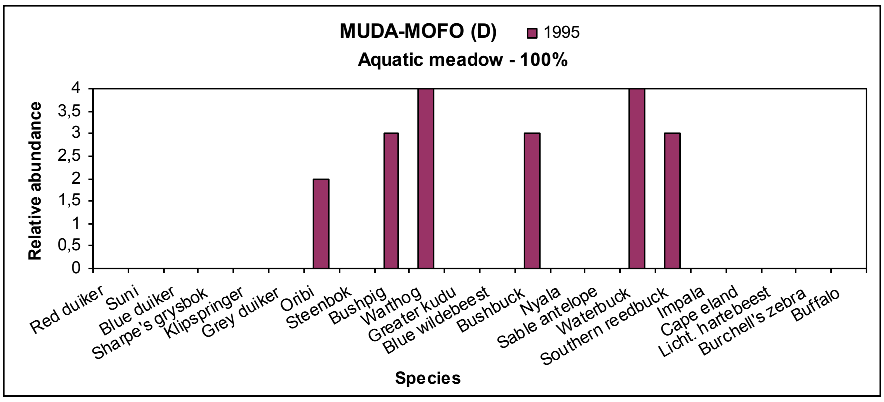
Block D

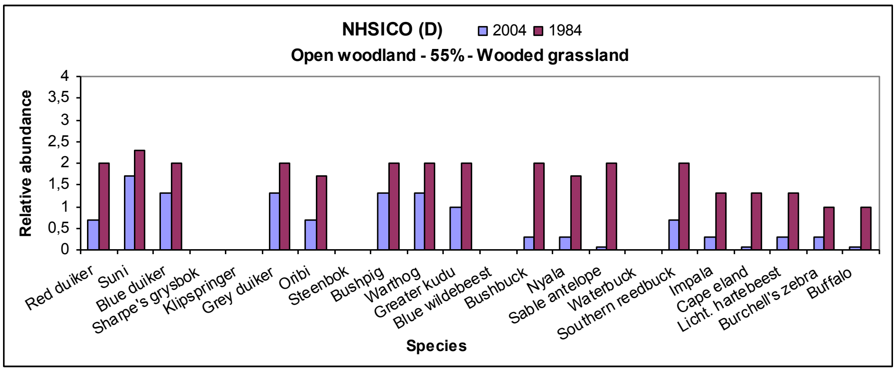

SANGADZE (D)
2004
1984
Rainfed cultivation - 70% - Grassland
Relative abundance
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

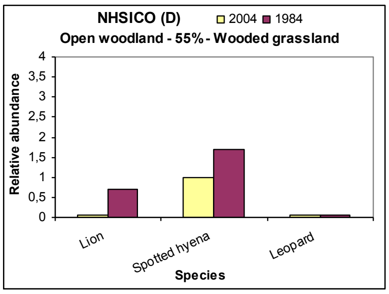

SANGADZE (D)
2004
1984
Rainfed cultivation - 70% - Grassland
Relative abundance
Lion
Spotted hyena
Leopard
Species

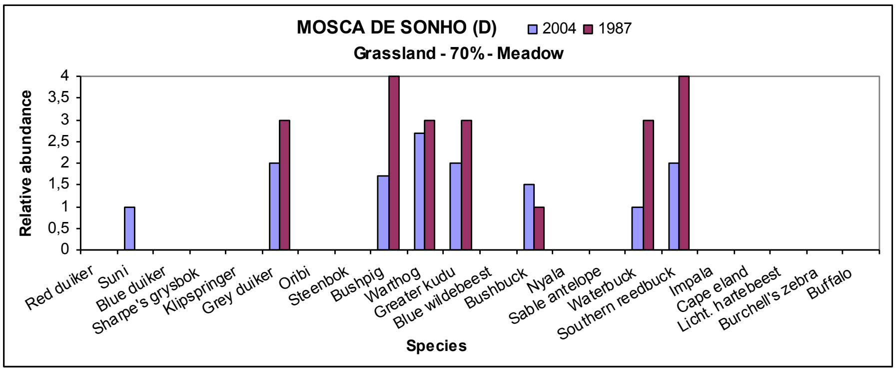

PALAME (D)
2004
1994
Wooded grassland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

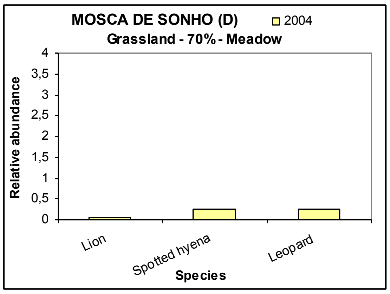

PALAME (D)
2004
1994
Wooded grassland - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

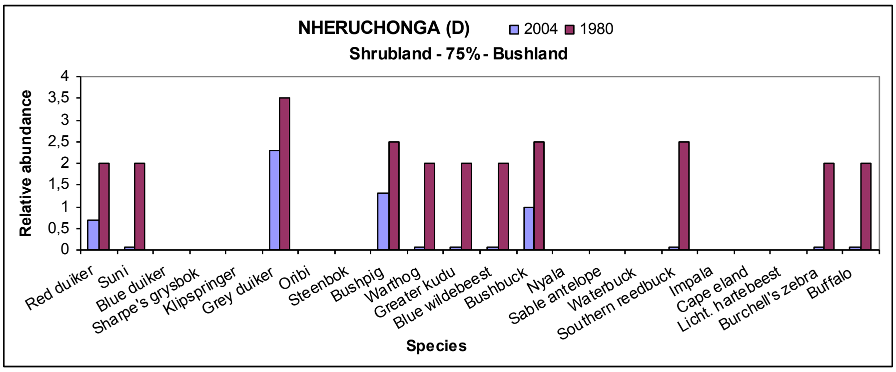

MUDA-MOFO (D)
1995
Aquatic meadow - 100%
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species

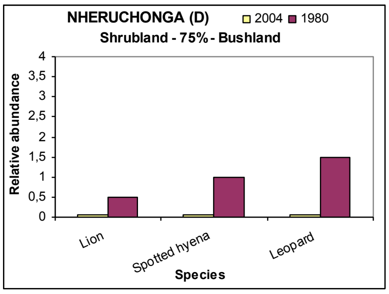

NHSICO (D)
2004
1984
Open woodland - 55% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


NHSICO (D)
2004
1984
Open woodland - 55% - Wooded grassland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species


MOSCA DE SONHO (D)
2004
1987
Grassland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


MOSCA DE SONHO (D)
2004
Grassland - 70% - Meadow
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species


NHERUCHONGA (D)
2004
1980
Shrubland - 75% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Red duiker
Suni
Blue duiker
Sharpe's grysbok
Klipspringer
Grey duiker
Oribi
Steenbok
Bushpig
Warthog
Greater kudu
Blue wildebeest
Bushbuck
Nyala
Sable antelope
Waterbuck
Southern reedbuck
Impala
Cape eland
Licht. hartebeest
Burchell's zebra
Buffalo
Species


NHERUCHONGA (D)
2004
1980
Shrubland - 75% - Bushland
Relative abundance
4
3,5
3
2,5
2
1,5
1
0,5
0
Lion
Spotted hyena
Leopard
Species

ANNEX 5

Ungulate Sightung

ID	DATE	HOUR	XX.E	YY.S	Bck	Obs.	GIS		GIS	SPECIES	Nbr.	M	F	Unk.	Age	Dist.	Left /
						Hab.	H. 1	%	H. 2								Right
14	10/02/04	15h07	34.48	-19.02	A	Tando	206	100		Warthog	1	1	0	0		0	
16	10/02/04	15h14	34.46	-19.02	A	W	209	70	205	Warthog	2	1	1	0		0	
17	10/02/04	15h25	34.43	-19.01	A	W	209	70	205	Bushbuck	1	0	1	0		0	
18	10/02/04	15h29	34.42	-19.01	A	W	209	70	205	Bushbuck	1	1	0	0	8Y	0	
20	10/02/04	15h36	34.41	-19.00	A	Tando	209	70	205	Warthog	1			1		28	R
22	10/02/04	15h43	34.39	-18.99	A	B	102	60	205	Warthog	2	1	1	0		12	R
23	10/02/04	15h47	34.38	-18.99	A	OW	102	60	205	Warthog	4		1	3	3Y	36	L
26	10/02/04	15h59	34.37	-18.99	A	Tando	206	60	205	Warthog	2			2	1x1Y	15	L
27	10/02/04	16h06	34.36	-18.98	A	W	206	60	205	Warthog	3			3		0	
29	10/02/04	17h44	34.37	-18.95	A	Tando	206	60	205	Impala	4	4	0	0		15	L
30	10/02/04	17h56	34.38	-18.93	A	B	105	60	205	Warthog	1	1	0	0		42	R
31	10/02/04	18h15	34.38	-18.90	A	G	102	100		Waterbuck	1	1	0	0	3Y	360	R
32	10/02/04	18h15	34.38	-18.90	A	G	102	100		S. Reedbuck	4	2	2	0	1x5Y(M), 3x2Y	250	R
33	10/02/04	18h16	34.38	-18.91	A	G	102	100		Waterbuck	1	1	0	0	8Y	300	R
34	10/02/04	18h17	34.39	-18.91	A	G	101	100		Waterbuck	7	2	5	0	1x7Y(M), 2x2Y(F)	125	L
77	02/10/04		34.38	-18.90	A		102	100		Oribi	2			2		35	L
77	02/10/04		34.38	-18.90	A		102	100		Oribi	1			1		50	L
77	02/10/04		34.38	-18.90	A		102	100		Waterbuck	5	0	3	2	3F & juv.	60	R
77	02/10/04		34.38	-18.90	A		102	100		Waterbuck	3	3	0	0	1x8Y	150	R
77	02/10/04		34.38	-18.90	A		102	100		Warthog	5	1		4	1x5Y(M)	200	L
78	02/10/04		34.38	-18.90	A		102	100		S. Reedbuck	3	1	2	0		160	L
78	02/10/04		34.38	-18.90	A		102	100		S. Reedbuck	7	2	3	2	2 juv.	300	L
78	02/10/04		34.38	-18.90	A		102	100		Waterbuck	1	0	1	0	15Y	400	R
79	02/10/04		34.38	-18.90	A		102	100		Warthog	1			1		75	L
80	02/10/04		34.38	-18.91	A		101	100		S. Reedbuck	3	0	3	0		50	L
81	02/10/04		34.38	-18.91	A		101	100		S. Reedbuck	1	1	0	0	young male	400	R

81	02/10/04		34.38	-18.91	A		101	100		Waterbuck	1	1	0	0		125	R
81	02/10/04		34.38	-18.91	A		101	100		S. Reedbuck	1	0	1	0		175	R
83	03/10/04	08h00	34.38	-18.92	A		102	100		Warthog	3			3		15	L
84	03/10/04	08h07	34.39	-18.92	A		206	60	205	Oribi	1			1		57	R
84	03/10/04	08h07	34.39	-18.92	A		206	60	205	Warthog	9	2	2	5	5 juv.	600	L
84	03/10/04	08h07	34.39	-18.92	A		206	60	205	Warthog	2			2		85	L
85	03/10/04	08h14	34.39	-18.91	A		101	100		Warthog	2			2		250	L
86	03/10/04	08H17	34.39	-18.91	A		101	100		Warthog	3	1		2		80	L
86	03/10/04	(+15m)	34.39	-18.91	A		101	100		Waterbuck	2	2	0	0	2x5Y	400	R
86	03/10/04	(+30m)	34.39	-18.91	A		101	100		S. Reedbuck	1	1	0	0	not 5Y	400	R
86	03/10/04	(+45m)	34.39	-18.91	A		101	100		Warthog	4			4		300	L
86	03/10/04	(+60m)	34.39	-18.91	A		101	100		Warthog	1			1		400	L
86	03/10/04	(+75m)	34.39	-18.91	A		101	100		S. Reedbuck	2	0	2	0		150	R
86	03/10/04	(+90m)	34.39	-18.91	A		101	100		S. Reedbuck	4		1	3		400	R
86	03/10/04	(+105m)	34.39	-18.91	A		101	100		Warthog	11			11		400	L
1010	03/10/04	?	34.37	-18.92	A		206	60	205	Bushbuck	1	1	0	0	10Y	0	
1000	03/10/04		34.26	-19.01	A		205	60	206	Kudu	1	0	1	0		0	
1001	01/10/04		34.26	-19.01	A		205	60	206	Oribi	2	1		1		0	
1003	01/10/04		34.31	-18.99	A		102	60	205	Kudu	1	0	1	0		0	
1003	01/10/04		34.31	-18.99	A		102	60	205	Bushbuck	2	1	1	0	1x5Y(M)	0	
CASALI	02/10/04		34.38	-18.90	A		102	100		Waterbuck	8	2	6	8	1x12Y(M)	0	
CASALI	02/10/04		34.38	-18.90	A		102	100		Nyala	1	0	1	0		0	
CASALI	02/10/04		34.38	-18.90	A		102	100		Warthog	2			2		0	
1005	02/10/04		34.35	-18.91	A		206	100		S. Reedbuck	1	0	1	0		0	
1005	02/10/04		34.35	-18.91	A		206	100		Red duiker	1			1		0	
1006	02/10/04		34.34	-18.90	A		105	70	205	Oribi	1			1		0	
1007	02/10/04		34.33	-18.87	A		105	70	205	Oribi	1			1		0	
1008	02/10/04		34.37	-18.87	A		206	100		S. Reedbuck	1	1	0	1		0	
1009	02/10/04		34.38	-18.89	A		101	100		Oribi	1	1	0	0		0	
LH029	18/10/04	03h30	35.46	-18.3	B	Tando	210	100		Suni	1			1		0	

				2													
1020	18/10/04	06h30	35.47	-18.28	B		209	100		Suni	1			1		0	
1021	18/10/04	06h32	35.47	-18.28	B		209	100		Red duiker	1			1		0	
1022	18/10/04	06h37	35.47	-18.26	B		209	60	205	Red duiker	1			1		0	
1023	18/10/04	06h43	35.46	-18.25	B	Tando	209	60	210	Sable antel.	10	3	7	0	1x8Y(M), 1x6Y(M, 3x5Y(F)	800	R
1024	18/10/04	06h47	35.46	-18.23	B		209	60	205	Red duiker	1			1		0	
1025	18/10/04	07h05	35.45	-18.18	B		209	60	210	S. Reedbuck	2	1	1	0	1x3Y(M)	380	R
1026	18/10/04	07h11	35.44	-18.17	B		209	60	210	Red duiker	1			1		0	
1027	18/10/04	07h17	35.43	-18.16	B		209	60	205	Bushbuck	1	0	1	0		0	
1029	18/10/04		35.32	-18.24	B		209	70	205	Red duiker	1			1			R
1029	18/10/04		35.32	-18.24	B		209	70	205	Grey duiker	1			1			R
1029	18/10/04		35.32	-18.24	B		209	70	205	Nyala	3	0	3	0		0	
1030	18/10/04		35.32	-18.24	B		209	70	205	Red duiker	1			1			L
1031	18/10/04		35.32	-18.24	B		209	70	205	Red duiker	2	1	1	0			L
1032	18/10/04		35.32	-18.27	B		209	100		Red duiker	1			1		0	
1033	18/10/04		35.32	-18.28	B		209	100		Suni	3			3			L
1034	18/10/04		35.33	-18.31	B		209	100		Bushbuck	2	1	1	0	1x7Y(M)	0	
1035	19/10/04	17h33	35.38	-18.62	B		209	70	102	Oribi	1			1		0	
1036	19/10/04	17h41	35.41	-18.62	B		209	70	102	Bushpig	6			6		0	
1037	20/10/04	06h18	35.40	-18.62	B		209	70	102	Oribi	3			3		0	
1038	20/10/04	06h23	35.39	-18.61	B		209	70	102	Sable antel.	2	2	0	0		0	
1039	20/10/04	16h16	35.45	-18.44	B		209	100		Red duiker	1			1		0	
1040	20/10/04	17h20	35.41	-18.38	B		209	100		Red duiker	2	1	1	0		0	
1041	20/10/04	17h27	35.40	-18.38	B		102	100		S. Reedbuck	6	2	4	0		400	L
NHAMU	22/10/04	07h13	35.66	-18.09	B		210	100		Bushbuck	2	1	1	0			
FLOC12 (1)	22/10/04	16h38	35.35	-18.20	B		210	80	211	Red duiker	2			2		0	
FLOC12 (2)	22/10/04	16h41	35.34	-18.20	B		210	80	211	Suni	1			1		0	
FLOC12 (3)	22/10/04	16h42	35.34	-18.20	B		210	80	211	Red duiker	1			1		0	
FLOC12 (4)	22/10/04	16h44	35.34	-18.21	B		210	60	209	Nyala	9	2	4	3	1x13Y(M)	0	
FLOC12 (5)	22/10/04	16h47	35.33	-18.21	B		210	60	209	Red duiker	1			1		0	

LacWiSa		15h45	35.57	-18.03	B		205	60	209	Impala	5	5	0	0	2x2Y, 3X3Y	0	
Lac2aCur			35.56	-18.05	B		205	60	209	Impala	9	2	3	4	1x9Y(M)	0	
AntCine			35.45	-18.09	B		209	60	205	Kudu	1	0	1	0		0	
DepCine			35.43	-18.15	B		209	60	205	Kudu	3			3		0	
DepCine			35.43	-18.15	B		209	60	205	Buffalo	3	1		2			
LtoC(1)			35.44	-18.38	B		209	100		Zebra	3			3		800	
LtoC(2)			35.43	-18.38	B		209	100		Sable antel.	2	2	0	0		0	
LtoC(3)			35.41	-18.38	B		209	100		Waterbuck	3	1	2	0		0	
PAtoLI			35.45	-18.44	B		209	80	102	Zebra	10			10		0	
Sable(1)			35.46	-18.42	B	Tando	102	80	209	Sable antel.	11	2	5	4	1x7Y(M), 1x5Y(M), 3x	0	
Gondong			35.47	-18.48	B		102	80	209	Licht. Harteb.	3			3		0	
Sable(2)			35.40	-18.49	B		209	100		Sable antel.	17	5	6	6	1x9Y(M)	0	
NyalaC12			35.45	-18.32	B		210	100		Nyala	1	1	0	1	1x15Y	0	
NyalaCat			35.17	-18.07	B		209	70	206	Nyala	1	1	0	1	1x10Y	0	
Sable(3)			35.30	-18.23	B		209	70	205	Sable antel.	3	1	2	0		0	
GreyC12			35.22	-18.26	B		209	70	205	Grey duiker	1			1		0	
JavC12(1)			35.43	-18.16	B	Tando	209	60	205	Warthog	3			3		0	
JavC12(2)			35.46	-18.32	B	Tando	210	100		Warthog	1			1		0	
JavC12(3)			35.40	-18.38	B	Tando	102	100		Warthog	5	1	1	3		0	

ANNEX 6

Carnivore Calls

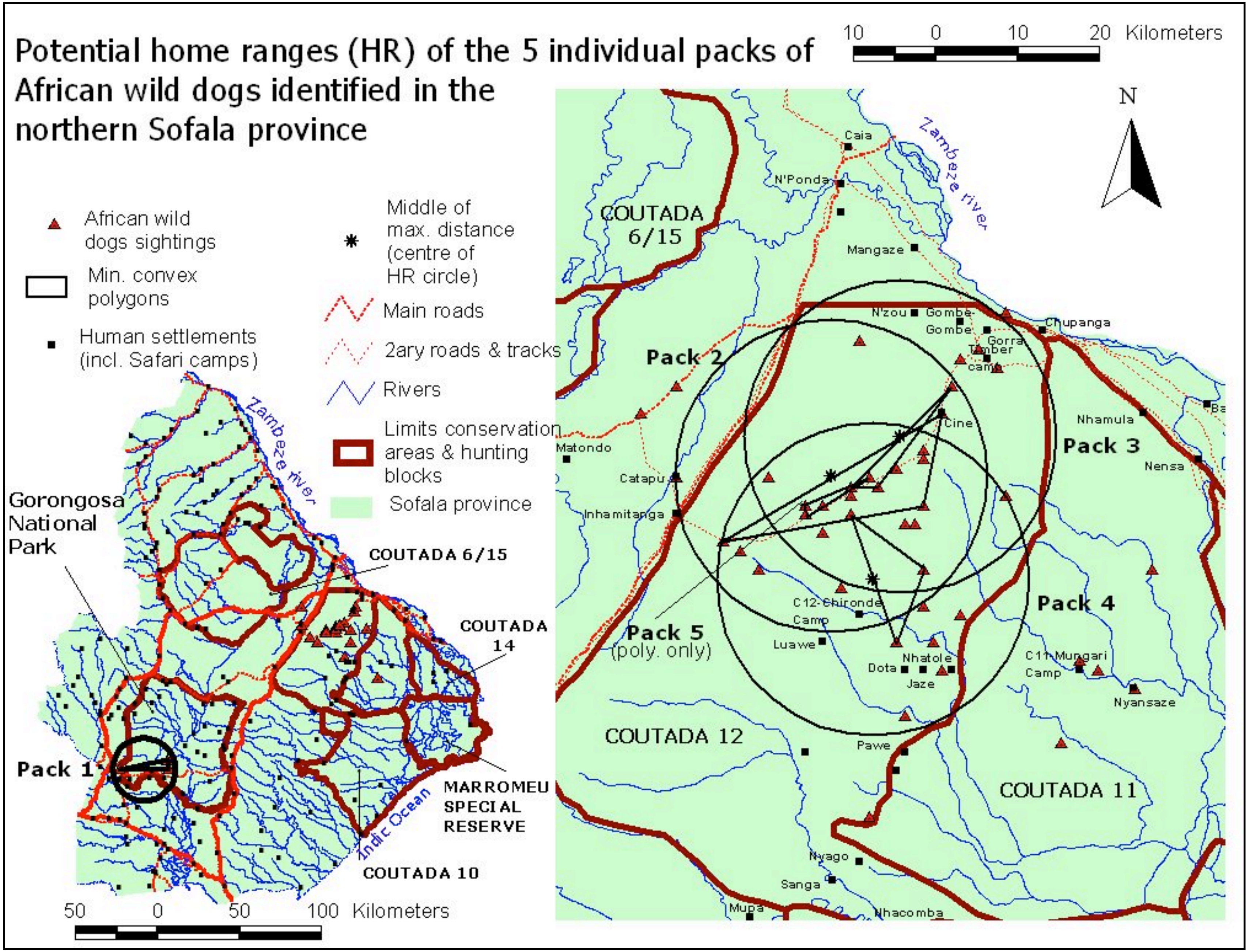
NAME	DATE	HOUR	XX. E	YY. S	Block	Hab 1	%	Hab 2	Hyena	Lion
LH001	30/09/2004	23h00	34.31	-18.99	A	102	60	205	0	0
LH002	01/10/2004	01h00	34.28	-19.01	A	105	100		0	0
LH003	01/10/2004	02h30	34.23	-19.00	A	205	60	206	0	0
LH004	01/10/2004	23h15	34.37	-18.96	A	206	60	205	0	0
LH005	02/10/2004	04h22	34.37	-18.91	A	206	100		0	0
LH006	02/10/2004	20h30	34.33	-18.89	A	210	100		0	0
LH007	02/10/2004	22h38	34.36	-18.87	A	105	70	205	0	0
LH008	03/10/2004	01h30	34.38	-18.90	A	102	100		0	0
LH009	03/10/2004	22h40	34.54	-18.94	A	102	80	205	0	0
LH010	04/10/2004	00h20	34.49	-18.94	A	206	80	205	0	0
LH011	04/10/2004	02H01	34.44	-18.95	A	105	60	205	0	0
LH012	04/10/2004	03h50	34.38	-19.00	A	102	60	205	0	0
LION2	04/10/2004	05h03	34.44	-19.01	A	209	70	205	0	0
LH020	15/10/2004	03h17	34.71	-19.44	D	209	70	205	0	0
LH021	16/10/2004	02h35	34.34	-18.46	A	205	60	206	0	0
LH022	16/10/2004	04h20	34.38	-18.47	A	102	50	205	0	0
LH023	16/10/2004	22h29	35.13	-18.16	B	209	70	206	0	0
LH024	17/10/2004	01h40	35.29	-18.23	B	209	70	205	0	0
LH025	17/10/2004	03h01	35.36	-18.19	B	210	80	211	0	0
LH026	17/10/2004	22h10	35.32	-18.28	B	209	100		0	0
LH027	17/10/2004	23h22	35.35	-18.24	B	209	60	210	0	0
LH028	18/10/2004	01h07	35.40	-18.25	B	205	60	209	0	0
NSUYU	18/10/2004	02h34	35.43	-18.28	B	209	60	210	0	0
LH029	18/10/2004	03h20	35.46	-18.32	B	210	100		0	0
LH040	19/10/2004	21h00	35.50	-18.68	B	209	80	206	0	0
LH041	19/10/2004	23h12	35.54	-18.71	B	209	70	102	1	0
LH042	20/10/2004	02h15	35.60	-18.73	B	209	70	102	0	0
LH043	20/10/2004	03h25	35.66	-18.73	B	209	70	102	3	0
LH050	20/10/2004	21h20	35.47	18.39	B	102	80	209	0	0
LH50SU	20/10/2004	23h56	35.53	-18.41	B	102	100		0	0
LH051	21/10/2004	01h18	35.65	-18.46	B	210	100		0	0
LH053	21/10/2004	02h18	35.65	-18.50	B	209	70	102	0	0
LH060	21/10/2004	23h37	35.51	-18.06	B	209	60	210	0	0

LH061	22/10/2004	00h36	35.45	-18.08	B	210	100		0	0
LH062	22/10/2004	01h32	35.43	-18.15	B	209	60	205	0	0

Findings summary for the northern sofala province – December 2007

Sightings description for the 5 individual packs of African wild dogs identified within the northern Sofala province

ID	Date		Location		Size	Age comp.			Habitat	Habitat (GIS)			Activity
WD	ddmmm	yy	EE	SS	S	A	Y	P	(Reported)	1	%	2	
PACK 1 (discarded because doubtful)													
11	JAN	04	34.17	-18.97	6	6			Open wood.	205	60	209	?
12	APR	04	34.44	-18.97	5	5			Open wood	209	70	205	?
13	MAY	04	34.43	-18.92	1	1			Grassland	105	60	205	?
PACK 2													
57	JAN	03	35.40	-18.17	20	10	10		Woodland	209	60	210	Walking
60	AUG	03	35.37	-18.18	15	15			Woodland	210	80	211	Drinking in river
61	SEP	03	35.43	-18.21	14	14			Woodland	209	60	210	?
67	OCT	03	35.45	-18.11	10	10			Open wood.	209	60	205	Walking
68	NOV	03	35.35	-18.20	9	9			Open wood.	210	80	211	Playing
72	JAN	04	35.40	-18.17	8	8			Open wood.	209	60	210	Resting
74	MAR	04	35.21	-18.25	10	7	-	3	Woodland	210	-	-	Drinking in small lake
PACK 3													
63	OCT	03	35.38	-18.19	15	5	4	6	Woodland	209	60	210	?
65	OCT	03	35.35	-18.19	13	6	-	7	Open wood.	210	80	211	Walking
66	OCT	03	35.46	-18.08	12	4	8		Open wood.	209	60	205	?
PACK 4													
N3	APR	03	35.43	-18.28	5	5			Woodland	209	70	210	Drinking
59	APR	03	35.35	-18.22	7	4	-	3	Woodland	209	60	210	?
56	?	03	35.40	-18.36	4	4			Open wood.	209	-	-	Walking on road
PACK 5													
62	SEP	03	35.37	-18.18	23	23			Woodland	210	80	211	Drinking in river
71	JAN	04	35.30	-18.21	20	20			Woodland	210	80	211	Crossing road
76	20MAY	04	35.30	-18.22	20	12	8		Open wood.	209	-	-	Hunting suni
Population size & age composition considering last sighting of each of the 4 packs (October 2004)													
					46	27	16	3					


Potential home ranges (HR) of the 5 individual packs of African wild dogs identified in the northern Sofala province
African wild dogs sightings
Min. convex polygons
Human settlements (incl. Safari camps)
Middle of max. distance (centre of HR circle)
Main roads
2ary roads & tracks
Rivers
Limits conservation areas & hunting blocks
Sofala province
Gorongosa National Park
Pack 1
Zambeze river
COUTADA 6/15
COUTADA 14
MARROMEU SPECIAL RESERVE
Indic Ocean
COUTADA 10
50 0 50 100 Kilometers
10 0 10 20 Kilometers
N
Caia
N'Ponda
Mangaze
COUTADA 6/15
N'zou
Gombe-Gombe
Gorra
Chupanga
Pack 2
Pack 3
Pack 4
Pack 5 (poly. only)
Nhamula
Nensa
Cine
Matondo
Catapu
Inhamitanga
C12-Chironde Camp
Luawe
Nhatole
Dota
Jaze
C11-Mungari Camp
Nyansaze
COUTADA 12
COUTADA 11
Pawe
Nyago
Sanga
Mupa
Nhacomba

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March 2010

"Conservation reinforcement through advanced research on a highly vulnerable population of African wild dog (*Lycaon pictus*) in the northern Sofala province, central Mozambique."

Preliminary scientific report on the 2008-2009 fieldwork session

1- DATA COLLECTION AND SPECIFIC METHODS

The present section will pass in review the various data sets that were collected during the effective presence in the field from October 2008 to October 2009, and the respective methods that were used to do so.

1.1- African wild dog direct observations

As the requirements for using acoustic simulations of the African wild dog "Hoo" (long distance) call (Call-in station method) are that the pack is active and present nearby (within audible distance, 2.2 km in this case), the road sections known to be more frequented by the species from the 2004 study were intensively cruised in search for recent signs of presence (faeces, footprints, hairs, dead bodies…). The entire total distance (37 km) was scanned in one single trip at least once a month to get an overall vision of the situation in the all region at the same time. The safari concessions tracks were not used because footprints are very difficult to spot on these access ways much less clean from natural vegetation than the main sandy road that crosses the study area, where the African wild dog seem, moreover, to have developed the habit of systematically defecating when jumping onto it from the very dense forest apart.
When very fresh signs were found, the audio equipment was brought into the location and call-in stations were performed during the early morning (from dawn up to 10h30 at the latest) of the next 1 to 3 days at a number of points comprised between 3 and 5, situated 1,000 to 2,000m apart one from another and from the central one where the fresh signs were.

Such practice resulted in 8 direct observations of African wild dogs as detailed in **Annex 1** (together with photographs) between the 02nd May 2009 and the 03rd October 2010 (ID0 being pictures taken in March 2008 and provided by a third part).
The exact location of these successive direct observations is represented on the figure below (**Figure 1**) together with their ID displayed in Annex 1 and chosen in a chronological order.

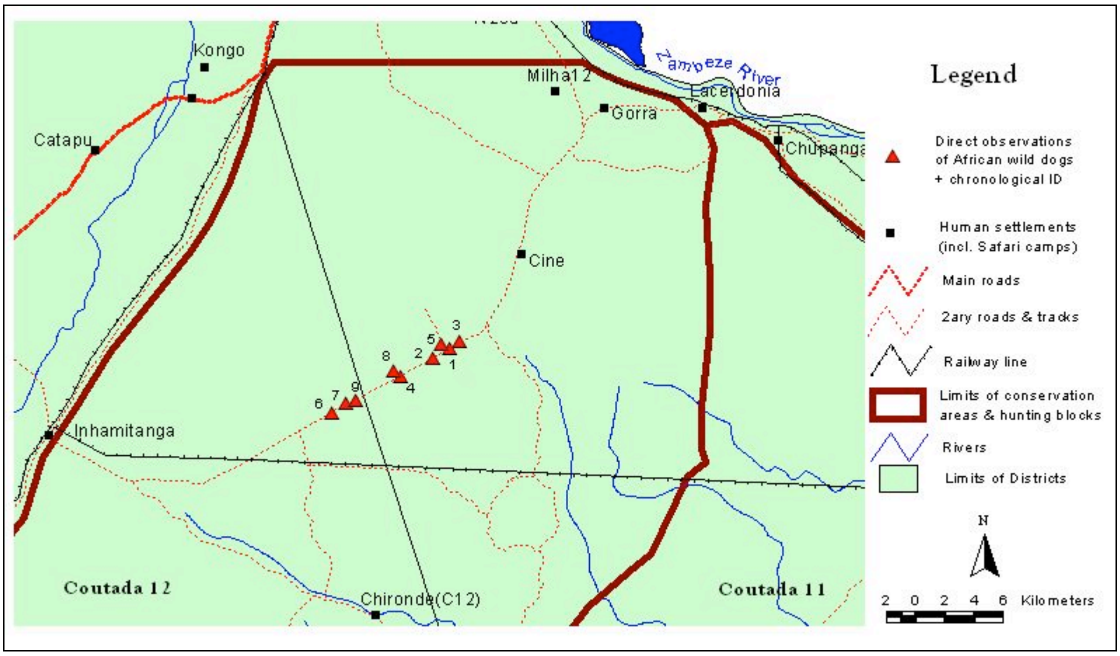


Figure1: Exact location of African wild dog direct observations along fieldwork 2008-2009 + ID

A call-in station is made of arrival at the point, fitting the equipment, camouflaging the vehicle, short silence (5 min.), 27 min. of playback according to the methodology, followed by a resting period of 5 min. initially, brought up to 30 min. once African wild dogs were progressively discovered to be capable of appearing at a calling point as a long time after the proper emission of calls was over.

1.2- Report of African wild dog direct sightings through interviews

Continuing the record started during the 2004 study of African wild dog direct sightings reported by respondents to a standardized interview, an additional 45 reports from 2008-2009 were joined to the already existing table made of 39 lines. The 84 direct sighting reports in total are displayed with details at **Annex 2** and the plotting of their location on the map is presented at **Figure 2**, with a clear distinction between the ones collected 5 years ago and the 2nd set of more recent ones.

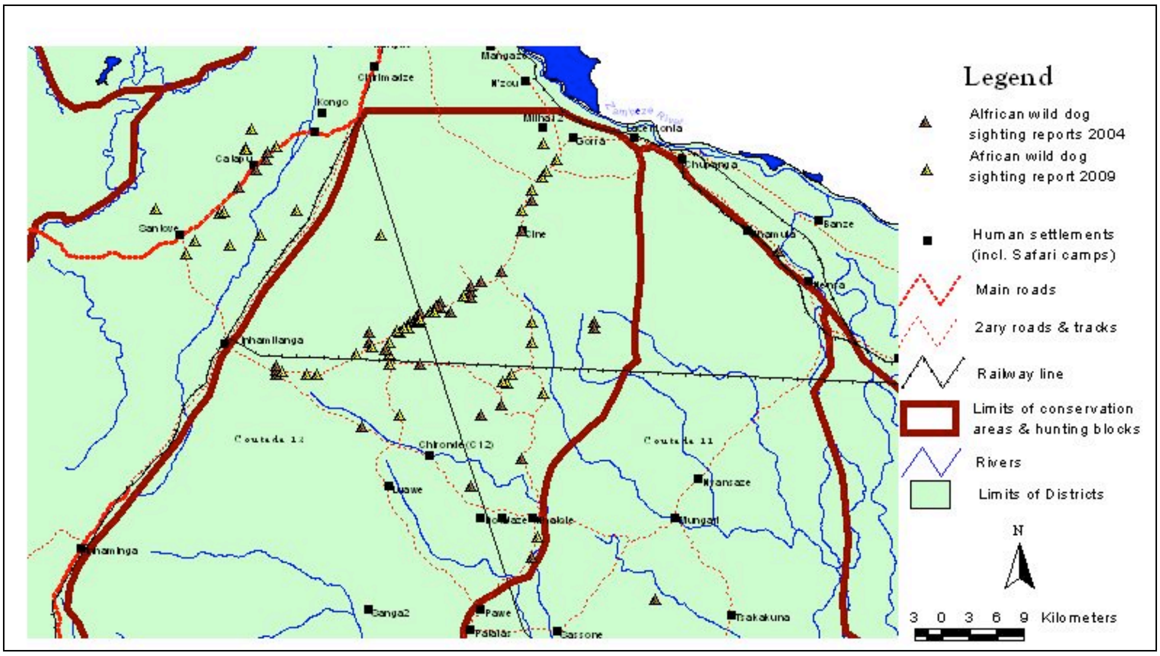


Figure 2: African wild dogs sighting reports collated respectively in 2004 and 2009

The respondents to the interviews were mainly safari/timber concession operators and their specialized staff, local people with subsistence activities in the bush, transport drivers, road maintenance staff…

1.3- Survey of African wild dog signs of presence

While scanning the specific road sections already referred to, not only the very fresh signs of presence of African wild dogs were noted down to orient posterior call-in work, but also the other footprints, faeces and other signs of the same species whatever the actual levels of decay. These provided additional locations where the animals definitively passed through, together with possible additional information on pack size and age composition, habitat type, alimentary diet through faeces composition, movements etc...

A table detailing the 63 signs of presence which were encountered, and information collated on, is presented in **Annex 3** and the figure below (**Figure 3**) gives a geographical representation of the location of the same.

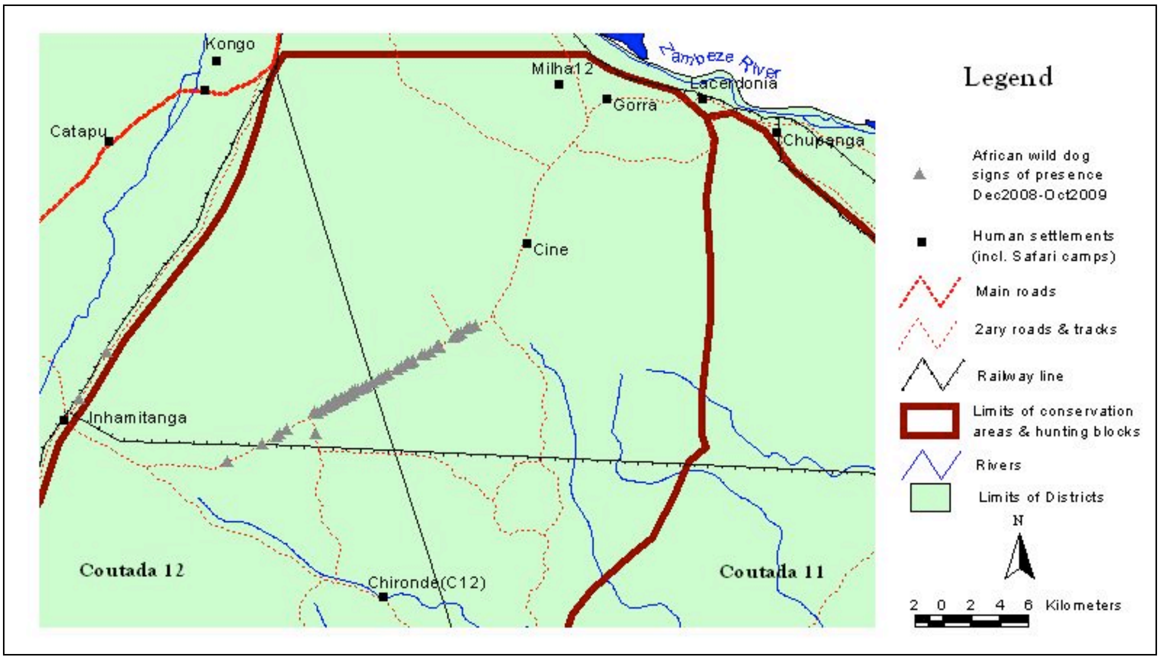


Figure 3: Exact location of the signs of presence of African wild dogs encountered in 2008-2009

The assistance of a local traditional tracker was crucial during the early days in the field to become familiar with the recognition of the various signs of wildlife presence encountered and to the determination of the species having produced them such as for depicting additional information on the animal presence that could be read from such signs (group size, activity, last feeding nature…)

1.4- Collection of data on habitat types

The 3 annexes introduced so far present detailed information on special research events (direct observations, direct sightings being reported, encounter of signs of presence) including in all cases a description of the habitat type where the event occurred made by the individual having personally experienced it.

The other method of data collection on habitat types relies on the exact location of the same research events just evoked and presented in the three abovementioned annexes as well and on the digital mapping of the vegetation supported by the Geographical Information System built for this research that is presented hereafter (**Figure 4**). The first (points) being plotted on the second to reveal the habitat type (polygon) in which they fall.

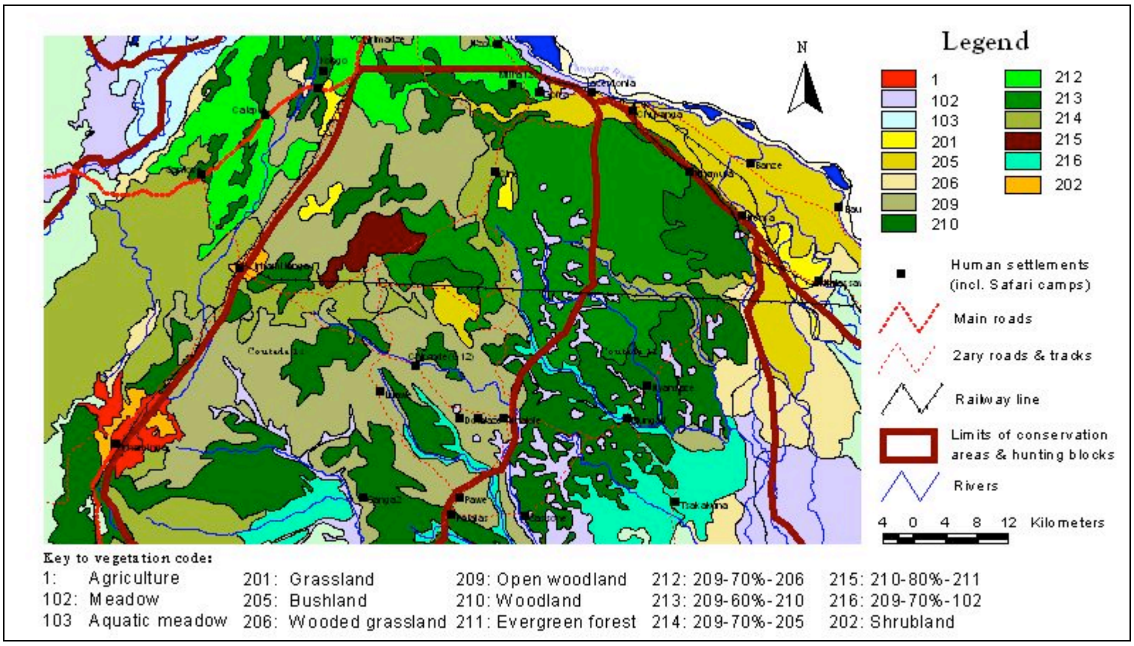


Figure 4: Habitat types in the study area according to the GIS-supported digital map

1.5- Survey of other carnivore & herbivore species

Signs of presence of other large carnivores in the study area (namely, in decreasing order of abundance, leopard - *Panthera pardus*, lion - *Panthera leo* & spotted hyena - *Crocuta crocuta*) were surveyed along the same road sections together with recorded details on date, exact location, habitat type etc. but the preliminary treatment of such data has not been brought sufficiently far yet to propose any concise display or geographical representation.

Herbivores of the area were surveyed through their signs of presence as well, but also by direct count along the same road sections. Including, in decreasing order of abundance, suni - *Neotragus moshatus*, red duiker - *Cephalophus natalensis*, nyala - *Tragelaphus angasii*, bushbuck - *Tragelaphus scriptus*, bushpig - *Potamocherus larvatus*, greater kudu - *Tragelaphus strepsiceros* & sable - *Hippotragus niger*, the degree of preliminary treatment of the data on the relative abundance and density of these wildlife species is still insufficient to propose any condensed visualization at this step.

2- DATA TREATMENT AND RESPECTIVE RESULTS

2.1- Basic demography

2.1.1- DISTRIBUTION

Two of the 3 existing datasets on African wild dogs presented above can not be considered as relevant for determining the edge distribution of the entire subpopulation resident in the study area, namely the direct observations and the signs of presence record. Indeed the methods for these limited the potential research events referred to here to be located exclusively on the only road sections travelled for fieldwork. In other words, the linearity of such events (see Figures 1 & 3) makes them pretty much useless for the drawing of an African wild dog population ranging area.

Fortunately the information contained in the third dataset (reports of African wild dog direct sighting, see Figure 2) does not suffer from such a geographical restriction and remains anyhow the only available source of information about the most distant sightings of what could be a single population. Furthermore, trends in time can be observed thanks to the identical dataset from 2004.

On the next figure below (**Figure 5**), 2 minimum perimeter convex polygons including all other fixes were drawn on the locations of the African wild dog sightings reported respectively in 2004 and 2009. To be remembered here is that the detailed data of these sighting reports are in Annex 2.

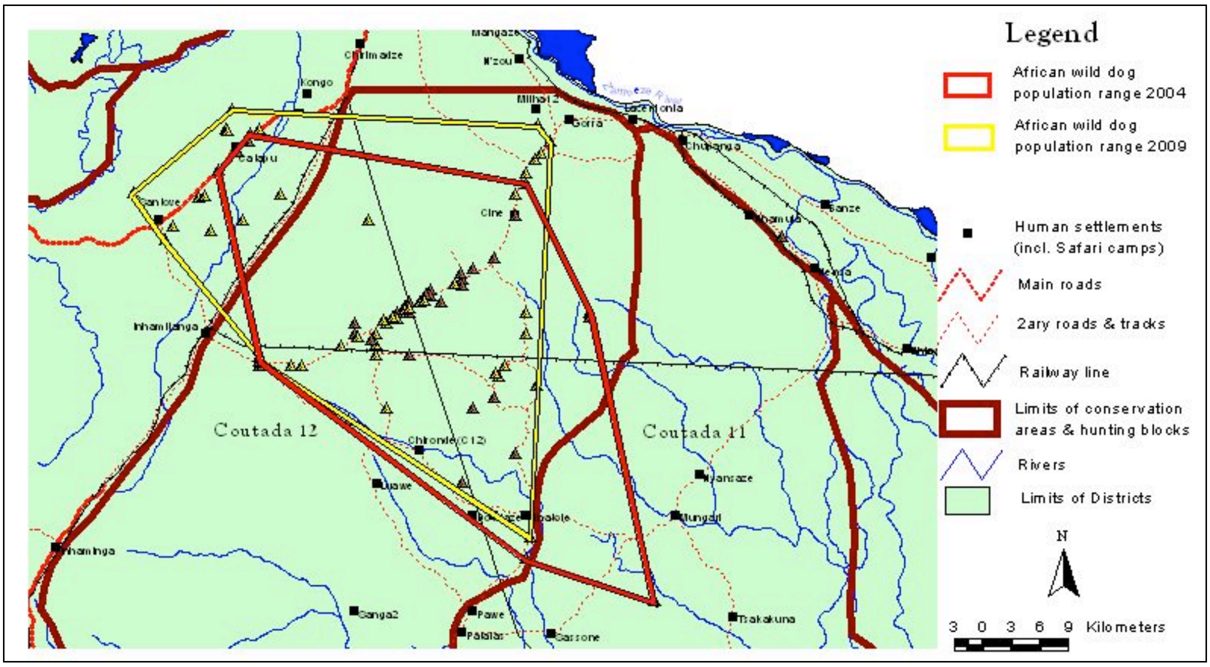


Figure 5: African wild dog population range, respectively in 2004 and in 2009

The area of the population range calculated by GIS is respectively 1,161.328 km^2 in 2004 and 1,123.659 km^2 in 2009.

Results & Discussion

The area of the population range remained sensibly unchanged between 2004 and 2009 (3.2% reduction) but its shifting to the Northwest is more characteristic. Indeed, recent sightings to the West of the EN1 in the Catapú timber concession and to the North between the sandy road crossing to Caia and to Milha 12 have made the population range to extend in these directions. At the same time, no recent sighting from the Coutada 11 made it to stench from the Southeast.

2.1.2- Population size, Number of packs, Packs size & Age structure

Of course the methodology set up in the past by the present research project to analyse the redundancy between direct sightings reported by interview respondents and already driven on the 2004 data (with results produced thereafter) could have been applied. This provides indeed good estimation of basic demographics like pack size and sex/age composition such as it enables the assessment of the home range of each identified pack.

But due to the concentration of this study population on a rather small area the 2004 results of such “Redundancy Analysis” were made quite arduous to interpret with polygon representation of home range of one pack entirely comprised within the one of another pack, other home ranges extremely tiny and more aberrations of the same nature. Moreover, it was clearly mentioned in the terms of reference of this most recent study that one of the guidelines to be followed in it was to not rely anymore on direct/indirect observations experienced and reported by another party than the research team itself. This mainly for turning into secure assessment what had finally never been more than guesses in the past.

So the details provided at Annex 1 and Figure 1 for all the direct observations of the African wild dog during the 2008-2009 fieldwork must be analysed further.

Thanks to the unique fur pattern that characterizes any single African wild dog it appears through looking at the available pictures that the lone animal of ID4 was counting among the 12 dogs of ID0 and not within the pack of ID3.
The quality of the pictures of ID1 enables the description of only 2 morphological units (tail and left profile), out of 6 (+ right profile, head, front legs & rear legs), for 1 individual only out of 6 as well in total, what gives it a very low description rate of 5.6% (2 morphological units available out of 36 possible in total).
ID3 has a good description rate (77.8%) but none of the animal appearing at that occasion is clearly identified at any other one.
Although pictures of ID5 do exist, the description rate is 0.0% because these were taken from much too far to make any of the 24 (6x4) morphological units distinguishable.
The exact number of dogs of ID9 is unknown but comparing the number of faeces let on the road at that occasion (5) with the 4 faeces found from the 9 dogs of ID6, the pack size should sensibly be the same although no yearling was at ID6 while some were present at ID9.

Results & Discussion

The most conservative reading of such data might thus be that the pack of ID6 and ID9 is the same according to the similar number of pack members and to the geographical proximity of the two direct observations. Being moreover the only large pack of the population, ID0 would be a sighting of the same pack the year before, with an additional few members that died in the between times and it is proven that the single dog of ID4 is also part of the same pack.
Due to their proximity in time and space, ID1, ID2 & ID3 could be 3 successive sightings of another pack.
ID5 would be the only direct observation of a third pack and ID7, which was made of 1 adult and 2 yearlings that must be considered as not viable on their own, would be the sighting of a temporarily isolated subgroup and not of a proper pack.
Finally, ID8 could be the observation of whether the pack of ID1, ID2 & ID3 or of the pack of ID5 after they breed (presence of yearlings and similar number of adults).
Although never directly sighted (and thus not presented in Annex 1) and no sign of presence ever found, all staff members of the Catapú timber concession claimed all along the 12 months of fieldwork that a pack of 4 adults was residing in their area and reported numerous observations.

According to such an analysis, the northern Sofala province African wild dog population would be constituted of one **9** adults pack lastly seen with at least **1** yearling, one pack of **6** adults and another of **4**, one of the two lastly seen after they bred (**2** yearlings) as well, additionally to the Catapú pack of **4** adults.
This represents a total of **23 adults** and **3 yearlings**, say 26 individuals, divided into **4 packs**.

Now the most optimistic interpretation of the same data could be that there are 2 large packs of around **9** adults (ID6 & ID9, ID4 being the sighting of one dog belonging to one of the 2 because seen in ID0 the year before) in the region, one of the 2 lastly seen with at least **1** yearling, 2 packs of **6** adults (ID1 & ID3, ID2 being a second observation of one of the 2), 1 pack of **4** adults (ID5), one more pack of **5** adults lastly seen (ID8) after it bred (**2** yearlings), additionally to the **4** adults Catapú pack.
In such case, the total number of individuals in the population would be 46, made of **43 adults** and **3 yearlings**, entering into **7 packs**.

2.1.3- Home ranges size, shape, core area & overlaps

Unfortunately none of the pack just referred to was observed with certainty more than once so that the drawing of their respective home ranges has been made impossible so far as this requires a minimum of three successive fixes for the simplest polygon representation (triangle).
Following a pack during a sufficient time period could have also provided useful information, at least to draw its route during a given time period, but such process was never successfully conducted mainly due to the very high density of the vegetation (see below).

2.1.4- Movements & Ranging mechanism

At the opposite of direct observations (only experienced between May and October 2009), the record of encountered signs of presence of the African wild dog (Figure 3) was undertaken all along the 12 months of presence in the field and was marked by only a few interruptions that suggest a repartition in 4 successive time period namely December 2008 to February 2009, April to June 2009, July-August 2009 & September-October 2010. The geographical representation of such a repartition is proposed hereafter (**Figures 6a to 6d**) and could be useful for depicting some aspects of the annual movements of the African wild dogs in the study area.

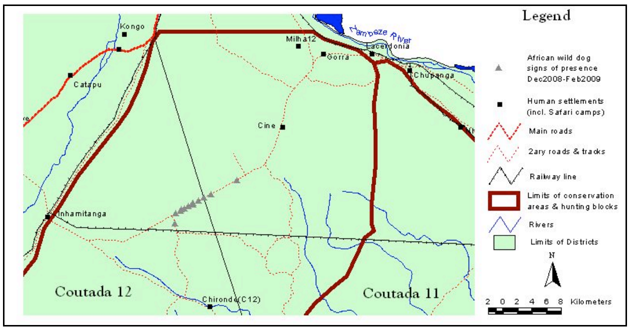


Figure 6a

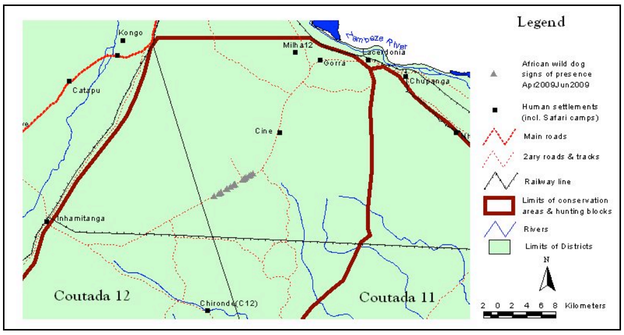


Figure 6b

Figure 6c

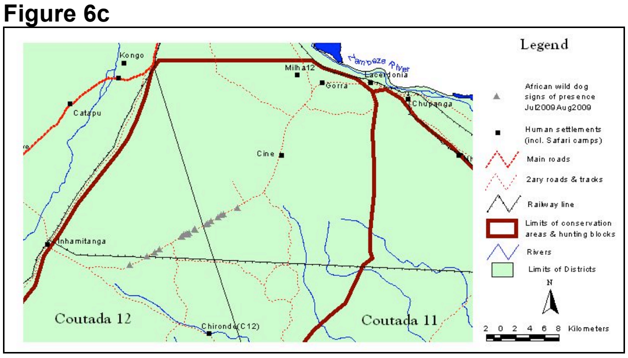
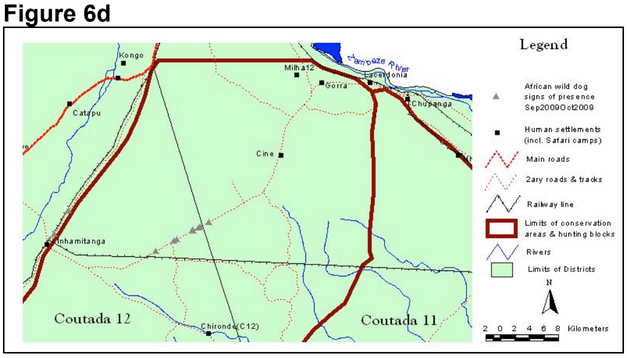


Figure 6d



Figures 6a to 6d: exact location of encountered African wild dog signs of presence respectively between December 08 & February 09, between April & June 09, in July-August 09 and in September-October 09

<u>Results & Discussion</u>

In case ID1, ID2 and ID3 would actually be 3 observations of the same pack, their details provided in Annex 1 can give some information on daily or short-term movements as ID1 and ID2 occurred during the same day and ID3 only 4 days after. It would appear indeed that a pack can remain in a smaller area for up to 4 days, that the movements of a same pack are surely comprised between 06h55 (ID1) and 11h30 (ID2) on a single day, that, apart from ID2, the African wild dog always responded to the call before 09h00 and that a same pack can be seen twice on the road on the same day at locations distant of up to 2km (distance between AWDEX1, where the dogs seen on ID1 exited the forest onto the road, and the second point where they were seen that day).
If the same pack (member) was seen in ID4, ID6 & ID9, the same distance is known over a 4 months ½ time period and is around 5.5km.

An other interesting aspect to be deduced from the details of the same all direct observations is that in all cases but one (ID2) and 2 other unknown (ID0 & ID9), the African wild dogs jumped onto the road from its southern side (6 cases) and jumped out of the same road to its southern side again on 3 occasions and to its North on the other 3. The referred southern side of the road was quite surely the one where the packs actually passed the night before responding to the call-in exercise performed the next early morning, and they continued foraging on that same side in 50% of the cases. The area at the South could thus be regarded as more suitable to the dogs.

Finally, there is a clear shift in global localization of encountered signs of presence from West to East along the Inhamitanga-Chupanga road, with much of the signs concentrated between the second (when coming from Inhamitanga) entrance of the Coutada 12 & the districts limit during December 2008 to February 2009, and between the districts limit and the third entrance of the same Coutada during April to June 2009. In July and August the signs have a quite regular dispersion over the entire distance (14.4km) between the 2 entrances of the Coutada already referred to, and by Septemer-October 2009 the concentration was once again more evident between the second entrance and the districts limit.
A possible explanation of such an annual movements pattern could come from the yearly evolution of the vegetation under the effect of rainfall, and more precisely of the grass layer. As shown by the following figures (**Figures 7a to 7c**) the grasses under the open woodland type grow explosively with the first rains (late-November, early-December), and continue as long as it rains (to April or even May), from a quite flat physiognomy (Figure 7a) to a thick and high layer of which density could make it completely non-penetrable for an African wild dog pack (Figure 7b).


Figure 7a


Figure 7b


Figure 7c

But there is a possible escape coming from the fact that as soon as the woody layer get denser there is no more grass at all on the ground (Figure 7c) what makes that habitat much more suitable for the movements and especially hunting practices of a medium-sized carnivore like this one. This could explained the movements depicted at Figure 6 by a migration of the dogs caused by the growing of a dense layer grass with increasing rainfall in the areas where the cover of woody plants is not enough for not having such grasses existing at all. Areas of this last type (no grass) could then easily be found in the places where the signs of presence were recorded between April and June (in the densest scrub forest), while the drying and falling grasses during July and August would explain that the packs little by little re-colonize the entire distance on the road. Finally, by September-October, the African wild dogs are back to their initial location where some elements should increase the suitability of the habitat once grass layer height and density have dropped.

2.2- Habitat selection

But there is absolutely no doubt, in overall, that the packs of African wild dogs of this study population do frequent in general much more the dense woody habitat than the open woodlands or savannas, as shown by the data presented on the following table (**Table 1**) of habitat types where the 3 main kinds of recorded research events did actually occur along fieldwork. The density of their habitat of predilection is illustrated by the next images (**Figure 8a to 8d**).
Note that this is very unusual for a species that normally prefers open to semi-open habitats. However, it is true that although the penetrability of this typical forest is very low for a 1.80m standing human being, the practicability of the first 80cm from the ground is much higher.

Figure 8a (5m)

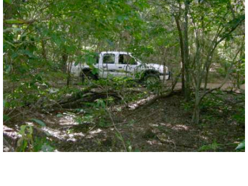

Figure 8b (15m)


Figure 8c (30m)


Figure 8d (by foot)


Table 1: Habitat types where the various research events did occur along the 2008-2009 fieldwork session

Habitat	Direct Observations (n=10)	Sighting reports (n=45)	Signs of presence (n=62)
As reported by the individual having experienced the event			
Dense woodland	10 (100%)	-	-
Woodland	0	7 (64% of n=11)	-
Open woodland	0	3 (27% of n=11)	-
Wooded grassland	0	1 (09% of n=11)	-
Grassland	0	0	-
As informed by the GIS vegetation map on the basis of the exact location of the event			
210-80%-211	2 (22% of n=9)	4 (09%)	12 (19%)
210-100%	0	11 (24%)	0
209-60%-210	5 (56% of n=9)	8 (18%)	31 (50%)
209-100%	2 (22% of n=9)	8 (18%)	11 (17%)
209-60%-205	0	3 (07%)	1 (02%)
209-70%-205	0	4 (09%)	5 (08%)
209-70%-206	0	6 (13%)	1 (02%)
209-70%-102	0	1 (02%)	0
202-50%-209	0	0	1 (02%)

GIS vegetation code: 211=Evergreen forest, 210=Woodland, 209=Open woodland, 206=Wooded grassland, 205=Bushland, 202=Shrubland, 102=Meadow

2.3- Advanced demographics

- Sex ratio:
Only the sex of the single African wild dog having shown up for ID4 was determined through the position it takes to urinate when it jumped onto the road, it was a female.

- Whelping time and Birth rate
First yearlings walking with a pack were observed by 03rd August (ID7), what places whelping time in early May (the pups of African wild dogs remaining at the den for about 3 months after birth), and reproduction around 70 days before (gestation), in late February or early March.
Two yearlings were seen with 5 adults in the case of ID8, what puts birth rate to 40% at the level of that particular pack.

- Age-specific fecundity, Litter size & Pup survival
No pregnant female was observed and a fortiori not its litter thereafter, which are the necessary data to calculate age-specific fecundity as an indicator of reproduction.
No active den was observed either so that there is no data on litter size in general.
Only the 2 yearlings observed on two occasions can be compared to the average size of a litter displayed by the species, equivalent to 10-11, to possibly deduce that pup survival might be around 18-20% only during the 3 first months of life.

- Yearling & Adult survival
The yearlings observed twice were always at the number of two what would have prevented any calculation of mortality (no decrease in number) even if the certainty had been acquired that the animal(s) were the same.
By comparing ID0 and ID6 where the same pack was potentially observed, a decrease from 12 adults to 9 is revealed along a 15 months time period what corresponds to a survival rate of 75%.

- Immigration, Emigration and Dispersal
Intense research efforts on the edge of the population distribution presented at Figure 4 has revealed no migration corridors or possible passage points for the species in or out of the study area, so that the referred population must continue to be considered as particularly isolated with the closest known stable population not less than 420km away to the Southwest in the Save Valley Conservancy (Zimbabwe). Migrations should thus be inexistent and no dispersal was observed.

- Actual causes of death & Den site requirements

No death event was directly observed by the research team along the fieldwork period and 4 road kills count among the new sighting reports. No African wild dog den was located.

2.4- Ecology & Behaviour

2.4.1- PREY SELECTION AND ALIMENTARY DIET

No hunting scene was actually observed by the research during the all presence in the field but the traditional tracker assisting with faeces recognition stipulated only two times out of 62 (03%) that the dejections found and attributed to the African wild dog were composed of other ungulate species than suni (*Neotragus moshatus*), being red duiker (*Cephalophus natalensis*) in those two only cases.
New sighting reports mentioned only two observed hunting/feeding scenes with prey species being identified and it was a suni in the first case and a nyala (*Tragelaphus angasii*) in the second.

On the basis of such information, it could be suggested that the suni (**Figure 9a**) constitutes the large majority of the African wild dog alimentary diet in the study area, followed from very far by the nyala (**Figure 9b**), and further either by the red duiker (**Figure 9c**) and possibly the bushpig (*Potamocherus larvatus*) but these two last taken only opportunistically.
A bit surprisingly, the red duiker seems to be as much abundant as the suni but almost absent from the African wild dog diet.


Figure 9a: suni

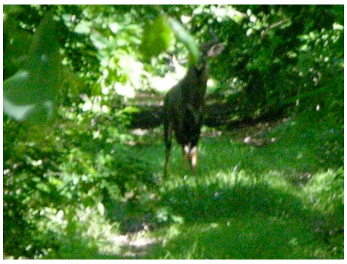


Figure 9b: nyala


Figure 9c: red duiker

2.4.2- COMPETITION WITH OTHER CARNIVORE SPECIES AND BETWEEN PACKS

Because the leopard (*Panthera pardus*) is not occupying the same ecological niche than the African wild dog, the latest being essentially diurnal and unable of climbing trees on the contrary of the first, the competition between the two species should not be so intense although the leopard is present in very appreciable numbers (thus eventually competing by “exploitation” if common preys become scarce, but never competing by “interference”) .
The densities of spotted hyena (*Crocuta crocuta*) are so low that it would be surprising that the referred species plays an actual role of competitor to the species in focus in the study area.
The only possible effective natural competitor (incl. by “interference”) might thus be the lion (*Panthera leo*) which signs of presence were encountered second in abundance after the African wild dogs and sometimes at same or very close locations but in the much denser woodland.
No direct intra-specific competition between African wild dog packs was directly observed, but seen how these are concentrated (1,124 km^2 for 4-7 packs when the average home range for 1 pack deduced from literature is around 567 km^2), it would be surprising that they do not encounter quite frequently and it is known that encounters between packs most often evolve into clashes.

2.4.3- INTERACTIONS WITH HUMANS

Poaching with unselective techniques is intense in the study area (target species being the suni) and the African wild dog seems to pay a heavy tribute to by-catch with snares and jaw-traps. Secondly comes the collision with vehicles on the existing road network, even on the more sandy section of the secondary road from Inhamitanga to Chupanga where speed can not be that much.

Domestic dogs, representing a reservoir of infectious diseases transmittable to the African wild dogs, continue numerous in the local communities surrounding the study area and located within its limits. Some poachers also bring their dogs with when they go to hunt.

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December 2010

"Conservation reinforcement through advanced research on a highly vulnerable population of African wild dog (*Lycaon pictus*) in the northern Sofala province, central Mozambique."

Preliminary scientific report on the 2010 fieldwork session

1- DATA COLLECTION AND SPECIFIC METHODS

The present section will pass in review the various data sets that were collected during the effective presence in the field in May-June 2010, as from September 2010 until now, and the respective methods that were used to do so.

1.1- African wild dog direct observations

The scientific techniques and methods to perform and record such direct observations are the same than described in the previous report from the project and titled “Preliminary scientific report on the 2008-2009 fieldwork session”, prepared in March 2010. The only difference is that a 28 km section of track, from Inhamitanga to the North, along the railway line up to the tar road (see map), was also cruised this year in addition to the 37 km of sandy road between Inhamitanga and Ciné in search for recent signs of presence of the species which locations would become possible stations for a call-in session thereafter. But this has unfortunately not happened yet along that new section.

Such practice on the other section (Inhamitanga-Ciné sandy road) however resulted in 1 direct observation of African wild dogs upon call-in as detailed in **Annex 1** (together with photographs) by 04th December 2010. Two additional lines appear in the same annex. The first to describe an opportunistic sighting made from a vehicle in movement between Cine and Inhamitanga on 21st October (no photograph) and the second to detail the direct observation of the dead body of a male yearling killed by collision with a vehicle on the National Road Nr. 1 (EN1) by 27th November 2010, which is coming together with photographs again.
The exact location of these successive direct observations is represented on the figure below (**Figure 1**) together with their ID displayed in Annex 1 and chosen in a chronological order.

1.2- Report of African wild dog direct sightings through interviews

Continuing the record of African wild dog direct sightings reported by respondents to a standardized interview, as started during the 2004 study and repeated in 2008-2009, an additional 10 reports collected along 2010 were joined to the existing table made of 84 lines already. Only these last 10 reported sightings of the 94 in total are displayed with details at **Annex 2** and the plotting of their location on the map is presented at **Figure 1** as well, together with their respective ID in Annex 2 and the 1,123.659 km^2 polygon representing the population range assessed from the 2008-2009 data as presented in the last scientific report from the project (March 2010).

1.3- Survey of African wild dog signs of presence

While scanning the specific road sections already referred to, not only the very fresh signs of presence of African wild dogs were noted down to orient posterior call-in work, but also the other footprints, faeces and other signs of the same species whatever the actual levels of decay. These provided additional locations where the animals definitively passed through, together with possible additional information on pack size and age composition, habitat type, alimentary diet through faeces composition, movements etc...

A table detailing the 17 signs of presence which were encountered during this year 2010, and information collated on, is presented in **Annex 3** and the figure below (**Figure 1**) gives a geographical representation of the location of the same.

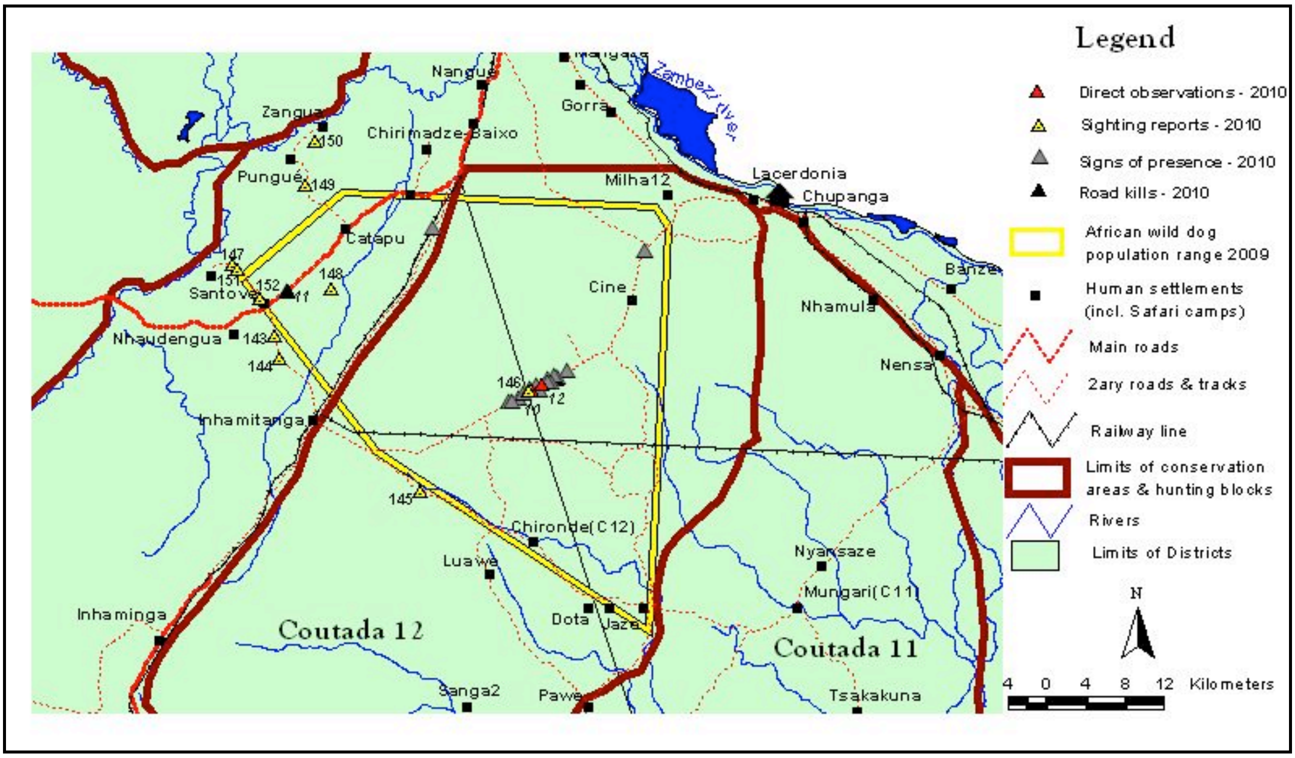

Figure 1: Exact location of 2010 direct observations, sighting reports and signs of presence of African wild dogs

1.4- Collection of data on habitat types

The 3 annexes introduced so far present detailed information on special research events (direct observations, direct sightings being reported, encounter of signs of presence) including in two cases out of three (direct observations and sighting reports) a description of the habitat type where the event occurred made by the individual having personally experienced it.

The other method of data collection on habitat types relies on the exact location of the same research events just evoked and presented in the three abovementioned annexes as well and on the digital mapping of the vegetation supported by the Geographical Information System built for this research. The first (points) being plotted on the second (polygons) to reveal the habitat type in which they occurred.

1.5- Survey of other carnivore & herbivore species

Signs of presence of other large carnivores in the study area (namely, in decreasing order of abundance, leopard - *Panthera pardus*, lion - *Panthera leo* & spotted hyena - *Crocuta crocuta*) are continuously surveyed along the same road sections and recorded with details such date, exact location, habitat type etc.
Once a sufficient amount of such data will have been acquired, it will possible through its treatment to analyse further the role of an extrinsic ecological factor like competition on the population dynamics of the African wild dog in the study area.

Herbivores of the area permanently surveyed through their signs of presence as well, reinforced by direct sightings along the same road sections scanned for African wild dog fresh signs of presence, evolving into a continuous assessment of their relative abundance. The species include, in decreasing order of abundance, suni - *Neotragus moshatus*, red duiker - *Cephalophus natalensis*, nyala - *Tragelaphus angasii*, bushbuck - *Tragelaphus scriptus*, bushpig - *Potamocherus larvatus*, greater kudu - *Tragelaphus strepsiceros* & sable - *Hippotragus niger*, oribi - *Ourebia ourebi*, Lichtenstein's hartebeest - *Alcelaphus b. lichtensteinii* and buffalo - *Syncerus caffer.*

For getting more quantitative, a proper data collection based on signs of presence is currently in course. Twice already for the Inhamitanga-Cine section (late July 2009 and late November 2010), and once only for the 28 km along the railway line northwards of Inhamitanga (late November 2010), 100m of road are systematically sampled every 1km so that the number of individual animal of each species having recently crossed the quadrat is determined through signs of presence and recorded, just missing the calibration of every sign of presence/species to produce actual densities. Once a sufficient amount of such data will have been acquired, it will possible through its treatment and complementary information on alimentary diet and hunting habits, to analyse further the role of an extrinsic ecological factor like predation on the population dynamics of the African wild dog in the study area.

1.6- Biological samples of African wild dogs

As recent technological evolutions made that fresh faeces preserved in 95% ethyl alcohol are now a suitable material for molecular genetics analysis, sample of such nature are collected when encountered by the research team, described in details (date, location etc.), properly labelled and conserved. A list of such material collected both along the 2008-2009 fieldwork session and so far along the current one is proposed here below and samples (15 in total, 10 from 2009-2009 and 5 from 2010) are available from the project.

- 02/05/2009: 3 samples (3 different animals out of a pack of 6 called-in and pictured)
- 06/05/2009: 1 sample (1 animal out of another pack of 6 called-in and pictured)
- 28/06/2009: 1 sample (1 animal out of a non-observed pack)
- 29/06/2009: 1 sample (1 animal out of a pack of 4 called-in but not pictured)
- 31/07/2009: 3 samples (3 different animals out of a non-observed pack of 7-10)
- 03/08/2009: 1 sample (1 animal out of non-observed pack)
- 27/09/2010: 2 samples (2 animals out of a non-observed pack of 4)
- 27/09/2010: 2 samples (2 animals out of a non-observed pack of 4)
- 04/12/2010: 1 sample (1 animal likely out of a pack of 10 called-in and pictured)

Formerly, the samples required for the abovementioned molecular genetics study were pieces of fresh body tissues also preserved in 95% ethanol such as the tip of the tongue, the tip of the ear and a piece of skin taken at the left armpit.
Because the male yearling encountered dead in the afternoon of 27th November 2010 was killed by collision with a vehicle from less than 24 hours, according to the mainly known signs of decomposition, these samples where taken out of it together with 2 blood smears for haematology. Body measurements were performed as well (making 4 individuals in total measured so far, together with the three animals dead in once from the same cause in October 2004) such as other observations but it has been made impossible to collect any brain sample for rabies scanning.

2- DATA TREATMENT AND RESPECTIVE RESULTS

2.1- Basic demography

2.1.1- Distribution

For the same reasons than presented in the previous report, the most appropriate dataset to be looked at for getting information about the most distant sightings one with each other of what could be a single population are the reports through local interviews of African wild dog direct sightings in the area (yellow triangles on Figure 1). Comparison with the last assessment of population range produced on the basis of 2008-2009 fieldwork data (yellow minimum perimeter convex polygon on Figure 1 as well) allows to describe the last evolutions of the distribution of the entire population

<u>Results & Discussion</u>

The numerous new reports of direct sightings to the West of the former population range assessment and beyond (especially to the Northwest) could let think about an extension of the distribution area towards these directions, and will be serve for such adjustment the next time actual drawing will be carried out. However, the referred extension is not necessarily recent in time but mainly due to the practice this year only of local interviews in the communities of that same sector (West) which had never been visited before for that purpose (Santove-Alto, Santove-Baixo, Pungué e Zangua). Interview respondents are asked to describe African wild dog direct sightings having occurred in an area "around" their place of residence, and this could easily explain the concentration of new sightings having recently been experienced over there.
Two additional sightings were also reported by the staff of the Catapú timber concession who remains most of the time at work within the forest, what increases the rate of possible direct observations.
Finally, reports of people having spotted the species within the densest section of the forest between Inhamitanga and Cine are still numerous but not recorded anymore unless the interviewee is able to locate precisely the event. As it is not easy for who does not frequent it very often to make distinctions along the 15 km of a continuous and quite unchanging dense scrub vegetation, the number of sightings reported from such section has dropped consistently.

2.1.2- POPULATION SIZE, NUMBER OF PACKS, PACKS SIZE & AGE STRUCTURE

The details provided at Annex 1 and Figure 1 of the previous scientific report on this research (March 2010) about the direct observations of the African wild dog during the 2008-2009 fieldwork must of course be kept in mind in order to properly analyse the ones experienced along 2010.

Thanks to the unique fur pattern that characterizes any single African wild dog it appears through looking at the available pictures that none of the sufficiently described animals of ID12 (around 30 morphological units available out of 60 possible in total, giving a description rate of about 50%) seems to have ever been seen before, more certainly not among the animals of ID0 an ID3 that are described the best so far (description rate of respectively 55.6% and 77.8%).
ID11 confirms the existence of at least one pack ranging, at least in part, across the Catapú area.

Results & Discussion

To remain on the most conservative side of the reading of such additional data, the former assessment of population size brought to 26 (23 adults and 3 yearlings) entering into 4 packs, respectively one of 9 adults and 1 yearling (ID0, ID4, ID6 & ID9), one of 6 (ID1, ID2 & ID3) and one of 4 (ID5), one of the two lastly seen with 2 yearlings after it bred (ID8), together with one pack on the Catapú concession, should be the one to start from.
ID12 have been compared to ID0 for concluding that different packs were actually observed on the two occasions while the lack of correspondence with ID3 makes it unlikely that the pack of 6 animals observed on that occasion would have grown to 10 even if it was lastly seen with 2 yearlings. It is as much unlikely that the pack of 4 considered last year (ID5) could have grown to 10, this time because this would imply annual growth rate well beyond the one known nowadays for the species (would require exceptionally high fecundity and survival).
The only possible deduction is thus that ID12 was the direct observation of a new pack not described so far, although it might correspond to ID6 or ID9 but that should then be differentiated from ID0, of which 10 members should be cumulated to the 26 considered so far.

According to such an analysis, the northern Sofala province African wild dog population would be constituted of one **10** adults pack lastly seen last year as 9 adults and 1 yearling (ID0 and ID4, maybe ID6 or ID9), another **10** adults pack observed for the first time ever this year (ID12, maybe ID6 or ID9), one pack of **3** adults (ID10) that counted 6 last year (ID1, ID2 & ID3 or ID5 & ID8) but that lost 3 animals, one remaining pack of **6** from last year (ID1, ID2 & ID3 or ID5 & ID8), in addition to the Catapú pack of **4** adults.
This represents a total of **33 adults**, divided into **5 packs**.

Now the most optimistic interpretation of the same data could be that there were already 3 larger packs last years, one of **12** individuals (ID0 & ID4), another of **9** (ID6) and a last one of **9** as well (ID9), to which the new one of **10** seen for the first time this year must be added (ID12), then a pack of **6** adults (ID1 & ID2) a second one of **6** adults (ID3), one pack of **3** adults (ID10) that has 4 last year (ID5) but lost one, one more pack of **7** adults (ID8), additionally to the **4** adults Catapú pack.
In such case, the total number of individuals in the population would be **66 adults**, entering into **9 packs**.

2.1.3- HOME RANGES SIZE, SHAPE, CORE AREA & OVERLAPS

Unfortunately none of the pack just referred to was observed with certainty more than once yet so that the drawing of their respective home ranges has been made impossible so far as this requires a minimum of three successive fixes for the simplest polygon representation (triangle).
Following a pack during a sufficient time period could have also provided useful information, at least to draw its route during a given time period, but such process was never successfully conducted mainly due to the very high density of the vegetation.

2.1.4- MOVEMENTS & RANGING MECHANISM

As it was the case along the 2008-2009 field data collection, the record of encountered signs of presence of the African wild dog was the research effort the most intensively undertaken during 2010 and the geographical representation of their repartition appears as the most appropriate for depicting some aspects of the annual movements of the African wild dogs in the study area.

Results & Discussion

The theory proposed in the former report and according to which the African wild dogs would change their point of crossing the Inhamitanga-Cine road in function the period of the year to avoid the grass layer that grows tall and thick during the rainy season and then pushes the packs in the areas with the densest tree overlay below which no grass can develop was completely invalidated this year. Indeed, the signs of presence encountered during May-June 2010 (between the so-called “second” entrance of the Coutada 12 and the districts limit) were at the opposite of their location last year at the same time (between the district limits and the “third” entrance of the Coutada 12, and the ones recorded between September and December 2010 (between the districts limit and the “third entrance of the Coutada 12) at the opposite of their location last year during the same months (between the “second” entrance of the Coutada 12 and the districts limit).

Such growth of the grass layer during the rainy season being the only consistent modification of the habitat along the year, the just exposed invalidation can only highlight that habitat changes and the search of maximum suitability is not the leading force behind annual movements and ranging of the African wild dog in the northern Sofala province.
These forces should then most probably be looked for on the side of prey availability and hunting efforts optimization or of competition avoidance.

2.2- Habitat selection

The general trend continues to be that the packs of African wild dogs of this study population do frequent in general much more the dense woody habitat than the open woodlands or savannas, as shown by the data presented on the following tables of habitat types where the 3 main kinds of recorded research events did actually occur along fieldwork, whether during 2010 only (**Table 1**) or cumulated to the data from the 2008-2009 fieldwork session (**Table 2**).

Table 1: Habitat types where the various research events did occur along the 2010 fieldwork session

Habitat	Direct Observations (n=3)	Sighting reports (n=10)	Signs of presence (n=17)
As reported by the individual having experienced the event			
Dense woodland	3 (100%)	-	-
Woodland	0	1 (100% of n=1)	-
Open woodland	0		-
Wooded grassland	0		-
Grassland	0		-
As informed by the GIS vegetation map on the basis of the exact location of the event			
210-80%-211	2 (67%)	1 (10%)	5 (29%)
210-100%	0	3 (30%)	1 (06%)
209-60%-210	0	0	9 (53%)
209-100%	0	0	0
209-60%-205	0	0	0
209-70%-205	0	2 (20%)	0
209-70%-206	1 (33%)	4 (40%)	1 (06%)
209-70%-102	0	0	0
202-50%-209	0	0	0
201-70%-209	0	0	1 (06%)

GIS vegetation code: 211=Evergreen forest
210=Woodland
209=Open woodland
206=Wooded grassland
205=Bushland
202=Shrubland
102=Meadow

Table 2: Habitat types where the various research events did occur along the 2010 & 2008-2009 fieldwork sessions

Habitat	Direct Observations (n=13)	Sighting reports (n=55)	Signs of presence (n=79)
As reported by the individual having experienced the event			
Dense woodland	13 (100%)	-	-
Woodland	0	8 (67% of n=12)	-
Open woodland	0	3 (25% of n=12)	-
Wooded grassland	0	1 (08% of n=12)	-
Grassland	0	0	-
As informed by the GIS vegetation map on the basis of the exact location of the event			
210-80%-211	4 (33% of n=12)	5 (09%)	17 (22%)
210-100%	0	14 (24%)	1 (01%)
209-60%-210	5 (42% of n=12)	8 (15%)	40 (51%)
209-100%	2 (17% of n=12)	8 (15%)	11 (14%)
209-60%-205	0	3 (05%)	1 (01%)
209-70%-205	0	6 (11%)	5 (06%)
209-70%-206	1 (08% of n=12)	10 (18%)	2 (03%)
209-70%-102	0	1 (02%)	0
202-50%-209	0	0	1 (01%)
201-70%-209	0	0	1 (01%)

2.3- Advanced demographics

- Sex ratio:
The sex of animals from the studied population has been determined so far with certainty only at 4 occasions, always from dead specimens killed by collision with vehicle. In October 2004, 2 of the 3 were females and in November this year it was a male. Under the assumption that sex does not influence the sensibility to the referred threat (road kills), and in the case the sample like so created would be large enough to represent the entire population (most unlikely), the sex ratio of this one could be assessed as being 1:1

- Whelping time and Birth rate
An African wild dog is fully grown 1 year after birth and is half adult size by 6 months.
The size of the dead yearlings killed by collision with vehicle can thus help in determining the time of their respective birth and thus better assess the whelping time of *Lycaon pictus* in the area.

The 3 animals found on 18th October 2004 were quite exactly half the size of an adult and their age consequently estimated around 6 months old, what puts birth date around **mid-April**. The one recently found on 27th November 2010 was lightly smaller and could have been 4 months ½ or so, and thus could have been born by **mid-July**.
Note that the assessment made in the previous report from the earlier date a pack was seen with yearlings, giving early May as possible whelping time, fits into the just determined interval. Reproduction would in this case take place between mid-February and mid-May.

- Age-specific fecundity, Litter size & Pup survival
No pregnant female was observed and a fortiori not its litter thereafter, which are the necessary data to calculate age-specific fecundity as an indicator of reproduction.
No active den was observed either so that there is no data on litter size in general.

- Yearling & Adult survival
Should the supposition made for the most conservative assessment of population size that the 3 adults pack directly observed this year in October is the same than one of the 6 adults packs encountered and registered by May 2009 be correct, this would translate a survival rate of 50% over 18 months or 33% annually.

- Immigration, Emigration and Dispersal
No migration corridors or possible passage points for the species into or out of the study area has been found yet, so that the referred population must continue to be considered as particularly isolated with the closest known stable population not less than 420km away to the Southwest in the Save Valley Conservancy (Zimbabwe). Migrations should thus be inexistent and no dispersal was observed.

- Actual causes of death & Den site requirements
Only one death event was directly observed by the research team along the fieldwork period and it was caused by a collision with vehicle. No African wild dog den was located.

2.4- Ecology & Behaviour

2.4.1- PREY SELECTION AND ALIMENTARY DIET

At the occasion of AWD12, the research team directly observed its first hunting scene ever.
The pack responded to the call-in in two times. A first group made of 2 dogs only surged from the South onto the road at 80m in front of the vehicle while the six and then eight others came a bit later 150m behind the vehicle and started crossing as well. When this was happening, a suni crossed the road at full speed in front of the vehicle again, from North to South, exactly where the two first African wild dogs had just entered back from the road into the forest but that time to the North. Immediately after the suni, one of these two “first” dogs crossed back the road (southwards this time), clearly chasing the suni.
Within the next 30 minutes, that dog was back on the road from the South again and looking to enter into the northern side of the road where it had crossed it a first time already, together with its mate a few time before.

Two other reliable sighting reports recently recorded (145 & 147) in April and June this year mention a group of only 2 African wild dogs chasing suni again while in November 2009 a group of 15 animals was reported to hunt nyala.
From 2003-2004, this gives a total of 8 directly observed or reported hunting scenes together with identification of the chased species, this one being suni in 5 cases out of 8 (62.5%) and nyala in 3. When hunting suni, the African wild dogs were in group of 2 or less in 4 cases out of 5 (80%) and a minimum of 6 animals, up to 15 (28?) when hunting nyala.

The hunting for suni seems to be particularly flexible in terms of pack cohesion with lone or paired individuals detaching from the pack and starting a chase upon opportunity, quickly bringing it to the end, feeding and reintegrating as soon as possible the group tracked the most probably through scent and smells.