THE IMPACTS OF MINERAL EXPLOITATION AND ASSOCIATED TRADE ON WILDLIFE IN THE DJA-BOUMBA MINING AREA EAST CAMEROON: RSG I.D: 13305-B

Fig.1. Awareness campaign on non-sustainable hunting and kids preparing bushmeat

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1. Participatory collection and analysis of community based ecological monitoring data

The community based ecological monitoring team participatorily collected data on bushmeat hunting, consumption and trade levels in the hunting camps, along snare lines and on paths that lead to hunting sites and agricultural fields. The project coordinator and the field biologists triangulated the data to have a deeper analysis and have more concrete and realistic description of the findings, so that a whistle blowing program could be developed. The data on hunting, consumption and trade levels was analysis over three year's period using SPSS 16.0. The statistical methods used for analyzing the data were mainly simple descriptive methods, one-way ANOVA, non-parametric test, histogram, Pearson correlations, curves and a few significance tests have been performed.

Table: 1. Monthly data collected on bushmeat hunting and trade

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
PRIMATA	PRIMATES								
Gorilla gorilla	Western lowland gorilla	July	3	180	3	0	2	EN, I	A
		August	3	180	3	0	2		
		October	3	180	3	0	2		
Total			9	540	9	0	6		
Pan troglodytes	Chimpanzee	August	3	150	3	0	2	EN, I	A
		October	5	250	5	0	4		
		November	2	100	2	0	2		
Total			10	500	10	0	8		
Cercocebus agilis	Crested mangabey	July	40	180	18	22	12	II	C
		August	45	202.5	17	28	16		
		September	5	22.5	2	3	2		
		October	44	198	13	31	16		
		November	27	121.5	8	19	9		
		December	18	81	8	10	5		
Total			179	805.5	66	113	60		
Cercopithecus cephus	Moustached monkey	July	34	241	12	22	11	nt	C
		August	52	364	20	32	19		
		September	27	147	4	23	8		
		October	47	329	15	31	15		
		November	25	175	10	15	9		
		December	5	35	4	1	4		
Total			190	1337	65	125	65		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
Lophocebus albigena	Grey cheeked mangabey	July	24	136.8	9	15	6	II	C
		August	15	85.5	6	9	3		
		September	8	17.1	1	7	1		
		October	24	136.8	12	12	8		
		November	14	79.8	6	8	4		
Total			85	456	34	51	22		
Cercopithecus nictitans	putty nose monkey	July	34	187	11	23	10	II	C
		August	71	390.5	13	58	18		
		September	31	165	3	28	8		
		October	72	390.5	16	56	21		
		November	64	352	19	45	15		
		December	16	33	10	6	5		
Total			288	1529	72	216	78		
Colobus polykomos	Black and white colobus	August	5	75	2	3	3	VU, II	A
		September	8	120	2	6	1	Threat rating of 3	
		October	5	75	2	3	2	IUCN	
Total			18	270	6	12	6		
Cercopithecus neglectus	De Brazza 's monkey	August	2	12	0	2	1	II	A
		September	6	36	1	5	1		
		November	5	30	5	0	3		
Total			13	78	6	7	5		
Cercopithecus pogonias	Crowned monkey	August	6	24	2	4	3	EN,II	A
		September	3	12	0	3	1		
Total			9	36	2	7	4		
Galago elegantulus	Needle crawled galago	August	2	2	0	2	1	nt	

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass (Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
		September	1	2	1	0	1		
Total			3	2	1	2	2		
Galago alleni	Allen's galago	August	3	6	1	2	1	nt	
Total			3	6	1	2	1		
Perodicticus potto	Potto	August	5	8	5	0	4	II	A
Total			5	8	5	0	4		
Miopithecus ogouensis	Talapoin monkey	August	1	2	1	0	1	nt	
		November	1	2	0	1	1		
Total			2	4	1	1	2		
ELEPHANTIDAE									
Loxodonta africana	African forest elephant	August	2	10.000	15 pieces	25pieces	1	EN, I	A
Total			2	10.000	15 pieces	25 pieces	1		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker	July	53	927.5	18	35	14	LRnt	C
		August	56	945	16	37	21		
		September	14	245	1	13	7		
		October	54	945	17	44	18		
		November	79	1382.5	31	48	18		
		December	36	630	13	23	15		
Total			292	5109	96	196	93		
Cephalophus dorsalis	Bay duiker	July	30	450	9	21	13	LRnt	C
		August	47	705	12	35	23		
		September	6	270	0	6	4		
		October	24	360	8	16	16		
		November	41	615	16	25	15		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
		December	5	75	2	3	3		
Total			153	2475	47	1O6	74		
Cephalophus sylvicultor	Yellow -backed duiker	July	4	180	1	3	3	LRnt, II	A
		August	5	225	2	3	5		
		October	2	90	0	2	2		
		November	4	180	2	2	4		
Total			15	495	5	10	14		
Cephalophus callipygus	Peter's duiker	July	3	60	0	3	1	LRnt	C
		August	5	100	1	4	2		
		September	3	60	0	3	2		
		October	3	60	0	3	2		
		November	2	20	0	2	2		
Total			15	320	1	14	8		
Cephalophus nigrifons	Black-fronted duiker	July	1	16	0	1	1	LRnt	C
		October	1	16	0	1	1		
Total			2	32	0	2	2		
Cephalophus monticola	Blue duiker	August	22	110	1	21	3		C
		September	2	10	1	1	2		
		December	2	10	0	2	1		
Total			26	130	2	24	6		
Cephalophus niger	Black duiker	July	1	22	0	1	1	EN	A
		August	2	44	0	2	1		
Total			3	66	0	3	2		
Tragelaphus spekei	Sitatunga	July	2	200	1	1	2	VU	B
		August	6	600	2	4	3		
		September	5	500	0	5	5		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
		October	4	800	1	3	3		
		November	1	200	0	1	1		
Total			14	1800	3	14	14		
Neotragus pygmaeus	Royal antelope	July	2	6		2	2	LRnt	C
		August	3	9	1	2	1		
		September	1	3	0	1	1		
		October	9	32	8	1	5		
Total			15	50	9	6	9		
SUIDAE									
Potamocherous porous	Red river hog	July	11	490	2	9	5	II	C
		August	16	1120	4	12	9		
		September	3	210	0	3	2		
		October	9	490	2	7	5		
		November	6	420	2	4	3		
Total			44	3010	10	33	24		
PHOLIDOTA	PANGOLINS								
Smutsia gigantea	Giant pangolin	July	2	70	1	1	2	LRnt, II	A
		August	2	70	0	2	2		
		September	1	35	0	1	1		
		October	4	280	1	3	4		
		November	2	70	2	0	2		
Total			11	595	4	7	11		
Uromanis tetradactyla	Long-tailed pangolin	July	22	66	7	15	6	LRnt, II	C
		August	32	96	5	27	11		
		October	21	63	8	13	6		
		November	20	60	8	12	5		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
		December	11	33	4	7	4		
Total			106	318	32	74	28		
Phataginus tricupis	Tree pangolin	July	8	24	3	5	5	LRnt, II	C
		August	14	42	3	11	6		
		September	19	57	5	14	5		
		October	29	87	5	24	9		
		November	23	69	5	18	6		
		December	3	9	1	2	2		
Total			96	288	22	74	33		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine	July	67	240	36	31	16	nt	C
		August	116	464	26	90	34		
		September	63	252	24	39	11		
		October	52	208	13	39	21		
		November	57	228	19	38	15		
		December	15	60	6	9	7		
Total			370	1452	124	246	104		
Thrynomys swinderianus	Cane rat	July	2	16	2	0	1	nt	
		August	53	424	23	30	20		
		September	12	88	5	7	4		
		October	16	120	5	11	9		
		November	8	64	2	6	2		
Total			91	712	37	54	36		
Cricetomys gambianus	Emin's giant rat	July	16	19.6	12	4	9	nt	
		August	62	86.8	48	14	28		
		September	17	23.8	7	10	7		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
		October	51	71.4	38	13	20		
		November	27	37.8	21	6	3		
Total			173	242.2	126	47	67		
CARNIVORA									
Felis aurata	Golden cat	July	14	98	6	8	6	VU	A
		August	20	140	9	11	12		
		September	4	28	0	4	1		
		October	8	56	3	5	4		
		November	16	112	10	6	6		
		December	7	49	4	3	4		
Total			69	483	32	37	33		
Civettictis civetta	African civet	August	5	60	3	2	5	nt	B
		September	6	72	3	3	3		
		October	7	84	2	5	4		
		November	6	48	2	4	4		
Total			24	288	10	14	16		
Genetta servalina	Servaline genet	July	5	10	5	0	3		
		August	2	4	1	1	1		
		December	1	2	0	1	1		
Total			8	16	6	2	5		
Herpestes naso	Long-snouted mangoose	July	3	9	3	0	3	nt	C
		August	1	3	1	0	1		
		October	8	72	8	0	5		
Total			12	84	12	0	9		
Atilax paludinosus	Marsh mangoose	July	1	2.5	1	0	1	nt	C
		August	1	2.5	0	1	1		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
		September	1	2.5	1	0	1		
		October	1	2.5	1	0	1		
		November	2	5	0	2	1		
Total			6	15	3	3	5		
REPTILIA									
Bitis gabonica	Gabon viper	August	7	30	2	5	5	nt	
		September	1	6	1	0	1		
		October	2	12	2	0	2		
		November	1	6	0	1	1		
Total			9	66	5	6	9		
Naja melanoleuca	Forest cobra	August	1	5	1	0	1	nt	
Total			1	5	1	0	1		
Veranus nilotinus	Monitor lizard	July	1	4	1	0	1	nt	
		August	3	12	2	1	2		
		September	1	4	0	1	1		
		October	6	24	4	2	4		
		November	1	4	1	0	1		
Total			12	48	7	4	9		
Demochely sp.	Land turtle	August	3	6	3	0	3	nt	
		October	4	8	4	0	4		
Total			7	14	7	0	7		
TRAGULIDAE									
Hyemoschus aquaticus	Water chevrotain	September	1	10	0	1	1	III	A
		October	1	10	0	1	1		
Total			2	20	0	2	2		

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
HYRCOIDEA									
Dendrohyrax dorsalis	Tree hyrax	July	9	28	9	0	5	nt	A
		August	14	56	9	5	5		
		September	3	12	1	2	2		
		October	11	44	11	0	8		
		November	4	16	4	0	3		
Total			41	156	33	7	23		

Table 2: Summary of monthly analysis of hunting, consumption and trade levels

Month	Quantity of wildlife Hunted	Total biomass/month	Quantity of bushmeat consumed	Quantity of bushmeat sold	Average Effective hunting days
July	784	5554	340	444	8
August	1424	12186	496	918	4
September	504	4688	126	378	42
October	1054	9786	414	652	4
November	888	6392	354	534	9.3
December	238	2034	104	134	3.1
Total	4892	40640	1834	3060	60.4

Table 3: Analysis of wildlife species hunted, consumed and traded in the month of July

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
PRIMATA	PRIMATES								
Gorilla gorilla	Western lowland gorilla		3	180	3	0	2	EN, I	A
Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation

Cercocebus agilis	Crested mangabey		40	180	18	22	12	II	C
Cercopithecus cephus	Moustached monkey		34	241	12	22	11	nt	C
Lophocebus albigena	Grey cheeked mangabey		24	136.8	9	15	6	II	C
Cercopithecus nictitans	putty nose monkey		34	187	11	23	10	II	C
Total			135	788	53	82	41		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker		53	927.5	18	35	14	LRnt	C
Cephalophus dorsalis	Bay duiker		30	450	9	21	13	LRnt	C
Cephalophus sylvicultor	Yellow -backed duiker		4	180	1	3	3	LRnt, II	A
Cephalophus callipygus	Peter's duiker		3	60	0	3	1	LRnt	C
Cephalophus nigrifons	Black-fronted duiker		1	16	0	1	1	LRnt	C
Cephalophus niger	Black duiker		1	22	0	1	1	EN	A
Tragelaphus spekei	Sitatunga		2	200	1	1	2	VU	B
Neotragus pygmaeus	Royal antelope		2	6	0	2	2	LRnt	C
Total			96	934	29	67	37		
SUIDAE									
Potamocherous porous	Red river hog		11	490	2	9	5	II	C
Total			11	490	2	9	5		
PHOLIDOTA	PANGOLINS								
Smutsia gigantea	Giant pangolin		2	70	1	1	2	LRnt, II	A
Uromanis tetradactyla	Long-tailed pangolin		22	66	7	15	6	LRnt, II	C
Phataginus tricupis	Tree pangolin		8	24	3	5	5	LRnt, II	C
Total			32	160	11	21	13		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine		67	240	36	31	16	nt	C

Family / Scientific name	Common name	Month	Quantity harvested	Total biomass(Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN/CITES	Cameroon legislation
Thrynomys swinderianus	Cane rat		2	16	2	0	1	nt	
Cricetomys gambianus	Emin's giant rat		16	19.6	12	4	9	nt	
Total			85	256	50	35	26		
CARNIVORA									
Felis aurata	Golden cat		14	98	6	8	6	VU	A
Genetta servalina	Servaline genet		5	10	5	0	3		
Herpestes naso	Long-snouted mangoose		3	9	3	0	3	nt	C
Atilax paludinosus	Marsh mangoose		1	2.5	1	0	1	nt	C
Total			23	117	15	8	13		
REPTILIA									
Veranus nilotinus	Monitor lizard		1	4	1	0	1	nt	
Total			1	4	1	0	1		
HYRCOIDEA									
Dendrohyrax dorsalis	Tree hyrax		9	28	9	0	5	nt	A
Total			9	28	9	0	5		
Grand Total			784	5554	340	444	282		

Table. 4. Analysis of wildlife hunted, consumed and traded in August

Family / Scientific name	Common name	Month August	Quantity Harvested	Total Biomass/Kg	Quantity consumed	Quantity sold	Effective Hunting days	Status IUCN/CITES	Cameroon legislation
PRIMATA	PRIMATES								
Gorilla	Western lowland gorilla		3	180	3	0	2	EN, I	A
Pan troglodytes	Chimpanzee		3	150	3	0	2	EN, I	A
Cercocebus agilis	Crested mangabey		45	202.5	17	28	16	II	C
Cercopithecus cephus	Moustached monkey		52	364	20	32	19	nt	C
Lophocebus albigena	Grey cheeked		15	85.5	6	9	3	II	C

	mangabey								
Cercopithecus nictitans	putty nose monkey		71	390.5	13	58	18	II	C
Colobus polykomos	Black and white colobus		5	75	2	3	3	VU, II	B
Cercopithecus neglectus	De Brazza 's monkey		2	12	0	2	1	nt	
Cercopithecus pogonias	Crowned monkey		6	24	2	4	3		
Galago elegantulus	Needle-clawed galago		2	2	0	2	1		
Galago alleni	Allen's galago		3	6	1	2	1		
Perodicticus potto	Potto		5	8	5	0	4	II	A
Miopithecus ogouensis	Talapoin monkey		1	2	1	0	1		
Total			213	823	73	140	74		
ELEPHANTIDAE									
Loxodonta africna	African forest elephant		2	10	15 pieces	25 pieces	1	EN, I	A
Total			2	10	15 pieces	25 pieces	1		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker		56	945	16	37	21	LRnt	C
Cephalophus dorsalis	Bay duiker		47	705	12	35	23	LRnt	C
Cephalophus sylvicultor	Yellow-backed duiker		5	225	2	3	5	LRnt, II	B
Cephalophus callipygus	Peter's duiker		5	100	1	4	2	LRnt	C
Cephalophus monticola	Blue duiker		22	110	1	21	3	LRnt	C
Cephalophus niger	Black duiker		2	44	0	2	1	EN	A
Tragelaphus spekei	Sitatunga		6	600	2	4	3	VU	B
Neotragus pygmaeus	Royal antelope		3	9	1	2	1	LRnt	C
Total			146	2738	35	108	59		
SUIDAE									
Potaocherous porous	Red river hog		16	1120	4	12	9	II	C
Total			16	1120	4	12	9		
PHOLIDOTA	PANGOLINS								
Smutsia gigantea	Giant pangolin		2	70	0	2	2	LRnt, II	A
Uromanis tetradactyla	Long-tailed pangolin		32	96	5	27	11	LRnt, II	C

Phataginus tricupis	Tree pangolin		14	42	3	11	6	LRnt, II	C
Total			48	208	8	40	19		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine		116	464	26	90	34		
Thrynomys swinderianus	Cane rat		53	424	23	30	20		
Cricetomys gambianus	Emin's giant rat		62	86.8	48	14	28		
Total			231	888	97	134	82		
CARNIVORA									
Felis aurata	Golden cat		20	140	9	11	12	VU	A
Civettictis civetta	African civet		5	60	3	2	5		
Genetta servalina	Servaline genet		2	4	1	1	1	nt	C
Herpestes naso	Long-snouted mangoose		1	3	1	0	1	nt	C
Total			28	207	14	14	19		
REPTILIA									
Bitis gabonica	Gabon viper		7	30	2	5	5	nt	
Naja melanoleuca	Forest cobra		1	5	1	0	1	nt	
Veranus nilotinus	Monitor lizard		3	12	2	1	2		
Demochely sp.	Land turtle		3	6	3	0	3	nt	
Total			14	53	8	6	11		
HYRCOIDEA									
Dendrohyrax dorsalis	Tree hyrax		14	56	9	5	5		
Total			14	56	9	5	5		
Grand Total			1424	12186	496	918	558		

Table.5. Analysis of wildlife hunted, consumed and traded in September

Family / Scientific name	Common name	Month September	Quantity harvested	Total biomass (Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN / CITES	Cameroon legislation
PRIMATA	PRIMATES							II	C
Cercocebus agilis	Crested mangabey		5	22.5	2	3	2	nt	C

Cercopithecus cephus	Moustached monkey		27	147	4	23	8	II	C
Lophocebus albigena	Grey cheeked mangabey		8	17.1	1	7	1	II	C
Cercopithecus nictitans	putty nose monkey		31	165	3	28	8	II	C
Colobus polykomos	Black and white colobus		8	120	2	6	1	Threat rating of 3	
Cercopithecus neglectus	De Brazza 's monkey		6	36	1	5	1	nt	
Cercopithecus pogonias	Crowned monkey		3	12	0	3	1		
Galago elegantulus	Needle-clawed galago		1	2	1	0	1		
Total			89	482	14	75	23		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker		14	245	1	13	7	LRnt	C
Cephalophus dorsalis	Bay duiker		6	270	0	6	4	LRnt	C
Cephalophus callipygus	Peter's duiker		3	60	0	3	2	LRnt, II	C
Cephalophus monticola	Blue duiker		2	10	1	1	2	LRnt	C
Tragelaphus spekei	Sitatunga		5	500	0	5	5	LRnt	B
Neotragus pygmaeus	Royal antelope		1	3	0	1	1	LRnt	C
Total			31	1088	2	29	21		
SUIDAE									
Potamocherous porous	Red river hog		3	210	0	3	2	II	C
Total			3	210	0	3	2		
PHOLIDOTA	PANGOLINS								
Smutsia gigantea	Giant pangolin		1	35	0	1	1	LRnt, II	A
Phataginus tricupis	Tree pangolin		19	57	5	14	5	LRnt, II	C
Total			20	92	5	15	6		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine		63	252	24	39	11	nt	C
Thrynomys swinderianus	Cane rat		12	88	5	7	4		

Cricetomys gambianus	Emin's giant rat		17	23.8	7	10	7		
Total			92	340	36	56	22	nt	C
CARNIVORA									
Felis aurata	Golden cat		4	28	0	4	1	VU	A
Civettictis civetta	African civet		6	72	3	3	3	nt	C
Atilax paludinosus	Marsh mangoose		1	2.5	1	0	1	nt	C
Total			11	100	4	7	5		
REPTILIA									
Bitis gabonica	Gabon viper		1	6	1	0	1		
Veranus nilotinus	Monitor lizard		1	4	0	1	1		
Total			2	10	1	1	2		
TRAGULIDAE									
Hyemoschus aquatcus	Water chevrotain		1	10	0	1	1	III	A
Total			1	10	0	1	1		
HYRCOIDEA									
Dendrohyrax dorsalis	Tree hyrax		3	12	1	2	2		
Total			3	12	1	2	2		
Grand Total			504	4688	126	378	168		

Table. 6. Analysis of wildlife hunted, consumed and traded in October

Family / Scientific name	Common name	Month October	Quantity harvested	Total biomass (kg)	Quantity consumed	Quantity sold	Effective Hunting days	Status IUCN/CITES	Cameroon legislation
PRIMATA	PRIMATES								
Gorilla gorilla	Western lowland gorila		3	180	3	0	2	EN, I	A
Pan troglodytes	Chimpanzee		5	250	5	0	4	EN, I	A
Cercocebus agilis	Crested mangabey		44	198	13	31	16	II	C
Cercopithecus cephus	Moustached monkey		47	329	15	31	15	nt	C
Lophocebus albigena	Grey cheeked mangabey		24	136.8	12	12	8	II	C

Cercopithecus nictitans	putty nose monkey		72	390.5	16	56	21	II	C
Colobus polykomos	Black and white colobus		5	75	2	3	2	IUCN 3	
Total			200	1032	66	133	68		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker		54	945	17	44	18		
Cephalophus dorsalis	Bay duiker		24	360	8	16	16	LRnt	C
Cephalophus sylvicultor	Yellow-backed duiker		2	90	0	2	2	LRnt	C
Cephalophus callipygus	Peter's duiker		3	60	0	3	2	LRnt, II	C
Cephalophus nigrifons	Black-fronted duiker		1	16	0	1	1	LRnt	C
Tragelaphus spekei	Sitatunga		4	800	1	3	3	LRnt	B
Neotragus pygmaeus	Royal antelope		9	32	8	1	5	LRnt	C
Total			97	2303	34	70	47		
SUIDAE									
Potamocherous porous	Red river hog		9	490	2	7	5	II	C
Total			9	490	2	7	5		
PHOLIDOTA	PANGOLINS								
Smutsia gigantea	Giant pangolin		4	280	1	3	4	LRnt	A
Uromanis tetradactyla	Long-tailed pangolin		21	63	8	13	6	LRnt	C
Phataginus tricupis	Tree pangolin		29	87	5	24	9	LRnt	C
Total			54	430	14	40	19		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine		52	208	13	39	21		
Thrynomys swinderianus	Cane rat		16	120	5	11	9		
Cricetomys gambianus	Emin's giant rat		51	71.4	38	13	20		
Total			119	328	56	63	50		
CARNIVORA									

Felis aurata	Golden cat		8	56	3	5	4	VU	A
Civettictis civetta	African civet		7	84	2	5	4		
Herpestes naso	Long-snouted mangoose		8	72	8	0	5	LRnt	C
Atilax paludinosus	Marsh mangoose		1	2.5	1	0	1	LRnt	C
Total			24	212	14	10	14		
REPTILIA									
Bitis gabonica	Gabon viper		2	12	2	0	2		
Veranus nilotinus	Monitor lizard		6	24	4	2	4		
Demochely sp.	Land turtle		4	8	4	0	4		
Total			12	44	10	2	10		
TRAGULIDAE									
Hyemoschus aquatcus	Water chevrotain		1	10	0	1	1	EN	A
Total			1	10	0	1	1		
HYRCOIDEA									
Dendrohyrax dorsalis	Tree hyrax		11	44	11	0	8		
Total			11	44	11	0	8		
Grand Total			1054	9786	414	652	444		

Table 7. Analysis of wildlife hunted, consumed and traded in November

Family / Scientific name	Common name	Month November	Quantity harvested	Total biomass (Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN / CITES	Cameroon legislation
PRIMATA	PRIMATES								
Pan troglodytes	Chimpanzee		2	100	2	0	2	EN, I	A
Cercocebus agilis	Crested mangabey		27	121.5	8	19	9	II	C
Cercopithecus cephus	Moustached monkey		25	175	10	15	9	nt	C
Lophocebus albigena	Grey cheeked mangabey		14	79.8	6	8	4	II	C

Cercopithecus nictitans	putty nose monkey		64	352	19	45	15	II	C
Cercopithecus neglectus	De Brazza 's monkey		5	30	5	0	3	VU, II	B
Miopithecus ogouensis	Talapoin monkey		1	2	0	1	1		
Total			138	659	50	88	43		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker		79	1382.5	31	48	18	LRnt	C
Cephalophus dorsalis	Bay duiker		41	615	16	25	15	LRnt	C
Cephalophus sylvicultor	Yellow -backed duker		4	180	2	2	4	LRnt, II	B
Cephalophus callipygus	Peter's duiker		2	20	0	2	2	LRnt	C
Tragelaphus spekei	Sitatunga		1	200	0	1	1	LRnt	B
Total			133	1435	51	82	43		
SUIDAE									
Potaocherous porous	Red river hog		6	420	2	4	3	II	C
Total			6	420	2	4	3		
PHOLIDOTA	PANGOLINS								
Smutsia gigantea	Giant pangolin		2	70	2	0	2	LRnt	A
Uromanis tetradactyla	Long-tailed pangolin		20	60	8	12	5	LRnt	C
Phataginus tricupis	Tree pangolin		23	69	5	18	6	LRnt	C
Total			45	199	15	30	13		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine		57	228	19	38	15		
Thrynomys swinderianus	Cane rat		8	64	2	6	2		
Cricetomys gambianus	Emin's giant rat		27	37.8	21	6	3		
Total			92	292	42	50	20		
CARNIVORA									

Felis aurata	Golden cat		16	112	10	6	6	VU	A
Civettictis civetta	African civet		6	48	2	4	4		
Atilax paludinosus	Marsh mangoose		2	5	0	2	1	LRnt	C
Total			24	165	12	12	11		
REPTILIA									
Bitis gabonica	Gabon viper		1	6	0	1	1		
Veranus nilotinus	Monitor lizard		1	4	1	0	1		
Total			2	10	1	1	2		
HYRCOIDEA									
Dendrohyrax dorsalis	Tree hyrax		4	16	4	0	3		
Total			4	16	4	0	3		
Grand Total			888	6392	354	534	276		

Table 8. Analysis of wildlife species hunted, consumed and traded in the month of December

Family / Scientific name	Common name	Month December	Quantity harvested	Total biomass (Kg)	Quantity consumed	Quantity sold	Effective hunting days	Status IUCN / CITES	Cameroon legislation
PRIMATA	PRIMATES								
Cercocebus agilis	Crested mangabey		18	81	8	10	5	II	C
Cercopithecus cephus	Moustached monkey		5	35	4	1	4	nt	C
Cercopithecus nictitans	putty nose monkey		16	33	10	6	5	II	C
Total			39	149	22	17	14		
ARTIODATYLA									
CAPHALOPHINAE	DUIKERS								
Cephalophus leucogaster	Gabon duiker		36	630	13	23	15	LRnt	C
Cephalophus dorsalis	Bay duiker		5	75	2	3	3	LRnt	C
Cephalophus monticola	Blue duiker		2	10	0	2	1		
Total			43	715	15	28	19		

PHOLIDOTA	PANGOLINS								
Uromanis tetradactyla	Long-tailed pangolin		11	33	4	7	4		
Phataginus tricupis	Tree pangolin		3	9	1	2	2		
Total			14	42	5	9	6		
RODENTIA	RODENTS								
Atherurus africanus	Brush-tailed porcupine		15	60	6	9	7		
Total			15	60	6	9	7		
CARNIVORA									
Felis aurata	Golden cat		7	49	4	3	4	VU	A
Genetta servalina	Servaline genet		1	2	0	1	1	LRnt	C
Total			8	51	4	4	5		
Grand Total			238	2034	104	134	102		

Table: 9. Descriptive statistics

	Mean	Std. Deviation	N
Y1	14.79310	8.809002	29
Wildlife killed	250.96552	355.287558	29
Wildlife consumed	104.20690	132.894528	29
Wildlife traded	146.82759	226.189407	29

Model summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.453[a]	.205	.144	8.151072	.205	3.351	2	26	.030	.393

a. Predictors: (Constant), Wildlife traded, Wildlife consumed
b. Dependent Variable: Y1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	445.319	2	222.660	3.351	.030[a]
	Residual	1727.439	26	66.440		
	Total	2172.759	28			

a. Predictors: (Constant), Wildlife traded, Wildlife consumed
b. Dependent Variable: Y1

Correlations

		Y1	Wildlife killed	Wildlife consumed	Wildlife traded
Y1	Pearson Correlation	1	-.439**	-.452**	-.424*
	Sig. (1-tailed)		.009	.007	.011
	N	29	29	29	29
Wildlife killed	Pearson Correlation	-.439**	1	.981**	.994**
	Sig. (1-tailed)	.009		.000	.000
	N	29	29	29	29
Wildlife consumed	Pearson Correlation	-.452**	.981**	1	.953**
	Sig. (1-tailed)	.007	.000		,000
	N	29	29	29	29
Wildlife traded	Pearson Correlation	-.424*	.994**	.953**	1
	Sig. (1-tailed)	.011	.000	.000	
	N	29	29	29	29

**. Correlation is significant at the 0.01 level (1-tailed).
*. Correlation is significant at the 0.05 level (1-tailed).

One-Sample Test

	Test Value = 0					
U					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Y1	9.043	28	.000	14.793103	11.44234	18.14387
Wildlife killed	3.804	28	.001	250.965517	115.82136	386.10968
Wildlife consumed	4.223	28	.000	104.206897	53.65652	154.75727
Wildlife traded	3.496	28	.002	146.827586	60.78974	232.86544

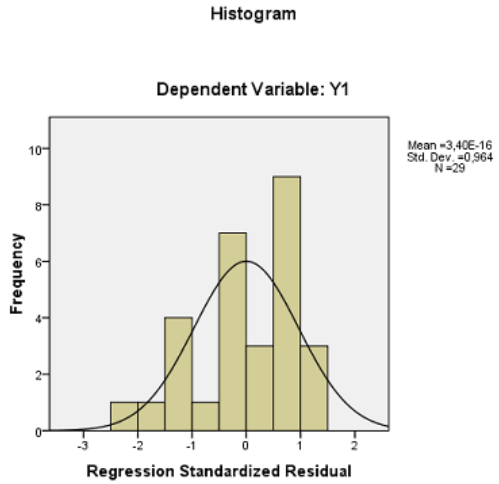

Fig.2. Histogram for descriptive statistics

1.1. Ecological monitoring of forest carrying capacity

Table 10: surveys of small, medium and large-sized in the project area

Wildlife species	Number of males	Number of females	Number of weaned	Number of babies	Number of group	Indices of presence					
						N	VO	FT	F	M	R
Gorilla	5	10	2	1	3	1	5	2	1		
Chimpanzee	11	12	6		3	2	20		1	1	
Panthera pardus	1						17			1	1
Cercopithecus cephus	58	70	72	19	57		53		9	4	2
Cercopithecus nictitans	69	115	144	37	22		88	3	7	4	
Neotragus pygmaeus	1						7				
Dendrohyrax dorsalis	7				2		98		4		
Herpestes naso	8	14	4	6	3					2	
Cephalophus leucogaster	1										
Veranus nilotinus	1										1
Cercocebus agilis	18	42	46	13	4		29		3		
Cercopithecus neglectus	1	2	5	2	1		1				
Potamocherous porous	2	7	5		1		9		1		
Dendrohyrax dorsalis	26						1388		2	6	2
Tragelaphus spekei	3								3		
Galago alleni	4						313		4		
Neotragus pygmaeus	1								1		
Cephalophus monticola	1								1		

Animals indices of presence: N = Nest, V0 = Vocalization, FT= Foot print, F = Feeding, M = Movement, R = Resting

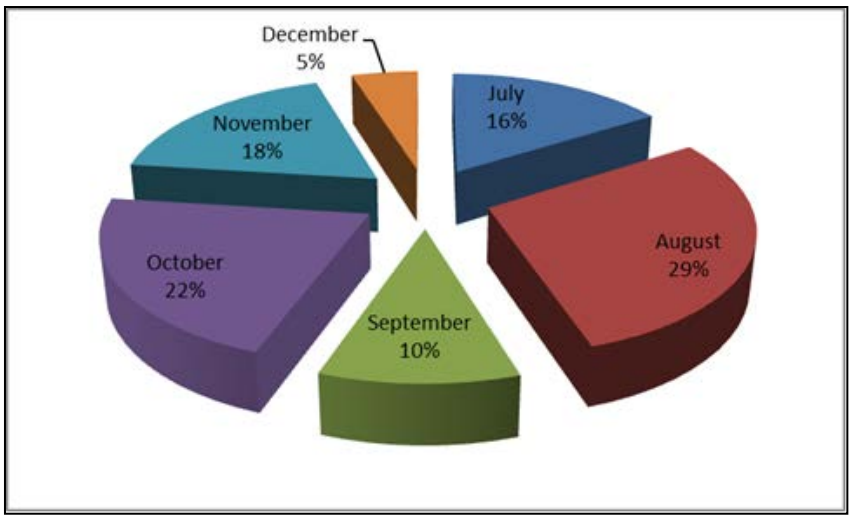

Fig.3. Percentage of wildlife captured in six months

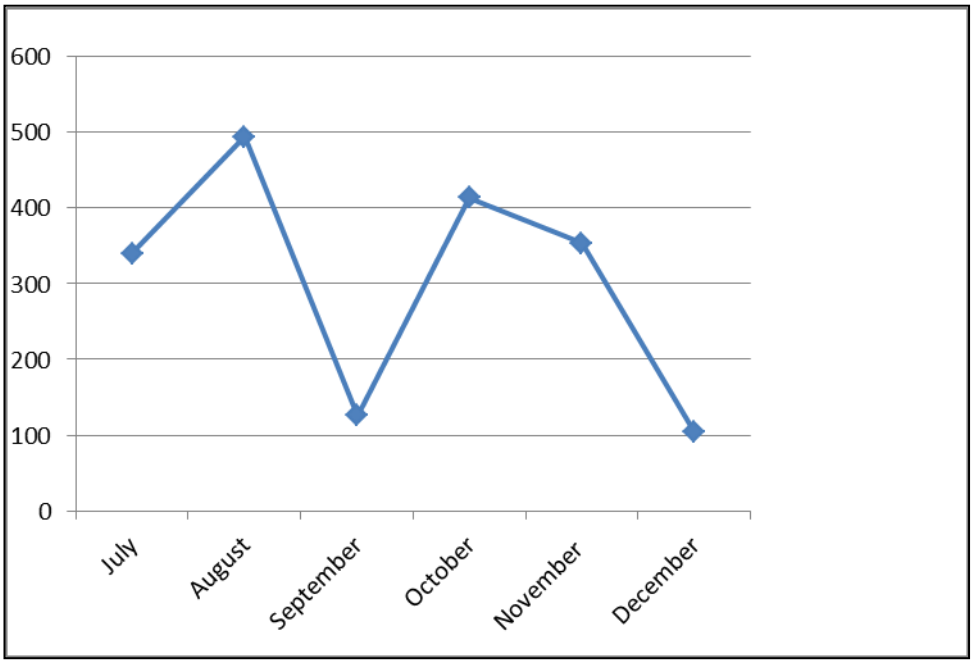

Fig.4. Household consumption in six months

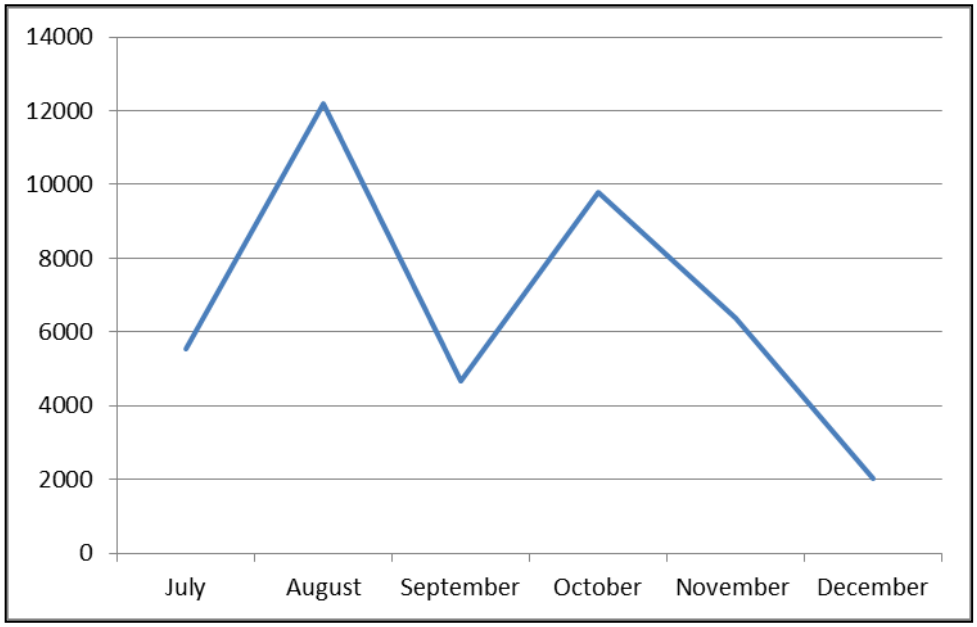

Fig.5. Quantity of bushmeat commercialized in six months

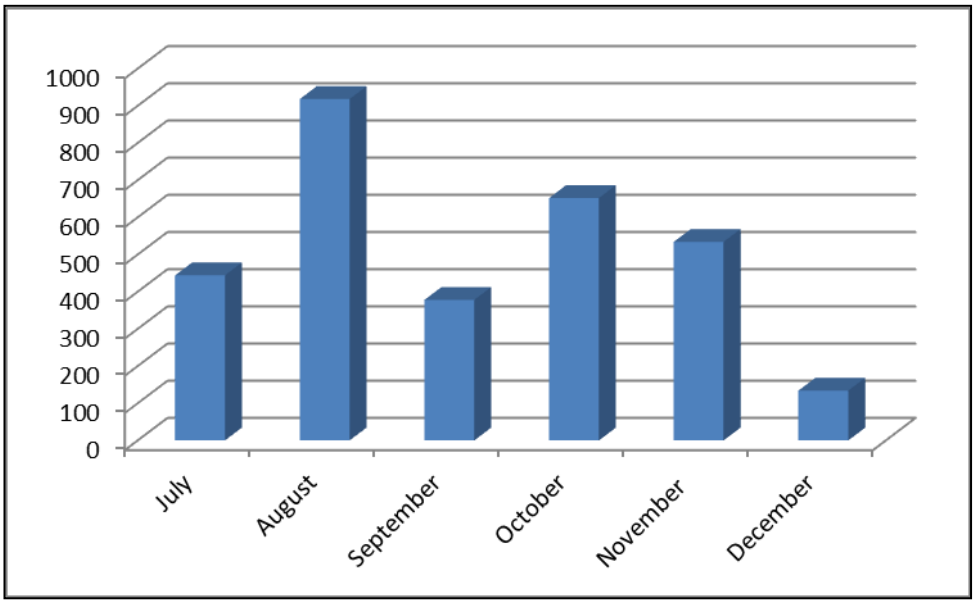

Fig.6. Biomass (Kg) of bushmeat captured in six months

2. Evaluation of vegetable gardening

- The purpose of evaluating the project short term activities was to:
- Monitor the activities to demonstrate project's success;
- Document the lessons learned;
- Provide recommendations for project development and improvement;
- Examine the changes that resulted from doing the activity.

- The community based ecological monitoring team selected three individuals to accompany the project coordinator during the evaluation.

Combinations of formal and informal methods were used to gather information on the vegetable gardening. The team accompanied the farmers at the sites of vegetable cultivations and information were collected on the field by listening, observation and documenting what were seen and heard. Through asking questions to the farmers, which sought to seek information on plant survival rates, crops diversity, quality of the crops, transplanting of seedlings, wedding, pesticides application, watering process and timing, identification of indicators of infections, external factors that are crucial for the success of the project and difficulties encountered. At the end of the sites visits of the vegetable gardening there were focus group discussions and knowledge tests on each farm and other related issues. The farmers and other members of the project asked questions, make suggestions and recommendations about the project activities. So far, results of the evaluation revealed that 85% of the vegetable farmers have knowledge on the level of success, failure, achievements, modifications, and movements of the project toward its objectives.

2.1. Marketing of the vegetable products in the villages

The community based ecological monitoring team organised the marketing of the vegetable products during the festivities period to sell the vegetables at reasonable cost to generate revenue for the local communities. The marketing of the vegetable products were done in the close village markets, village squares and directly in the farms. Vegetable products as tomato, pepper, okra, carrot, green beans, maize, cabbage, green condiments were sold on the stands, tables, in buckets and on the floor. The local communities gained substantial cash income during this period which helps as an economic fall-back to purchase clothes and other essentials for their families. With the city and the village markets being so close, vegetable gardening is an attractive source of proteins and income. The community based team ecological monitoring gave advice to the public how the improvement in the quality and widen range of their gardening products could increase their financial returns. The local communities are gradually transforming from the consummation of animal proteins to vegetable proteins.

2.2. Introduction of poultry farms to rear chickens as alternative sources of nutrients and income.

One of the objectives of the project was to develop small scale livelihood alternative sources of nutrients and income as the rearing of rabbits/ guinea pigs. High demand for rabbits and guinea pigs in Cameroon and other central Africa countries created scarcity in these domestic animals. The local communities participatorily accepted to replace the rabbits and guinea pigs with chickens and ducks. The project created three poultry farms in the three villages (Melene, Kongo and Achip). The three poultry farms contain 120 chickens to be managed by 12 individuals, 5 households and 2 associations or common initiative groups in the project area. The local communities were trained on the techniques of poultry rearing, identification of signs and symptoms of chicken diseases and treatment by the delegate of agriculture and rural development for Lomie sub division.

3. Awareness campaign activities in the project area

The Catholic sisters in collaboration with the community based ecological monitoring team sensitised the local communities on: Artificial colonization and preservation of bee colonies, how to feed bees, planting of bee pollinated flowers, hive pests, diseases and treatment. The school wildlife clubs did the planting of bee pollinate flowers as part of the environmental education program. The pupils of primary school Kongo, Melene and Achip produced sketches on the risk of unsustainable hunting and the impact of mining on wildlife in the area (see cover page). The Christian women groups use theatre and songs to encourage the wives of immigrants and the military officers to be involved in vegetable gardening which is an attractive source of income and proteins than bushmeat harvest and trade. The Christian women groups concluded that this vegetable gardening will occupy households and bushmeat harvest and trade will be reduced in the project area.

4. Results and Discussions

4.1. Ecological monitoring of bushmeat

Data on hunting, consumption and trade levels were collected in the project area from July to December, 2013. A total of 4892 wildlife consisting of 10 families and 41 species were killed in the project area. Bushmeat traded (3060 species sold) were twice more than household consumption (1832 species eaten). The month of August has the highest impact of hunting on wildlife species than any other month (1424, 30%) in the study area. This is followed in the descending order by October (1054, 21%), November (888, 18%), July (784, 15%), September (504, 12%) and December (238, 4%) months. (See tables 3, 4, 5, 6, 7, 8 and figure1). Forty one different animal species were captured during an average of 64.2 effective hunting days. Table 2 and figures 1, 2 and 3 summarizes the total number of wildlife captured, total biomass in kg, total consumed and traded within July to December. Artiodactyla (ungulates) were trapped most often (591 animals captures), yielding 10943 kg of total captured biomass (Figure 4). By comparison, African forest elephants and primates contribution to the harvest biomass was significant (2 animals = 10.000Kg and 814 animals =3933Kg) respectively. Most of the local population still hunt endangered and vulnerable species with their variables or reasons that the meat has quantity, provide trophies and maintain their cultural integrity. It is of interest to note that endangered species as apes are also killed for traditional medicine, rituals and for political purposes. Seven endangered or vulnerable wildlife species hunted within the study area include gorilla, chimpanzee, elephant, golden cat, *Cephalous Niger*, *Tragelaphus spekei* and *C. pogonias*. Hunting activities in the region are increasing due to a growing number of non-indigenous peoples migrating to the area in search of employment with the mining companies and to hunt wild meat illegally for urban commercial markets. Apes have fallen prey to professional hunters due to the political atmosphere of Cameroon. Politicians are regular using apes' parts for rituals to gain political posts in the government. Another reason for over exploitation of wildlife species is due to ghost promises from the mining administrators that they will provide job to the

desperate population to no avail. These mining companies has brought many changes to the region, including (a) increased access to the forest interior through the creation of mining roads; (b) the introduction of a non-indigenous labour force mostly relatives and in-laws; and (c) a mechanism for transporting wild meat to external markets. All of these factors translate to increased activity in the wild meat hunting, consumption and trade (table1), with heavier pressure on large ungulates, primates and rodents. Therefore, it is evident that pressures on wildlife have been increasing in the recent past, and sustainability into the future could only be observed through the implementation of a variety of potential nutrients and income alternatives and awareness campaigns which is ongoing in the project area.

4.2. Testing a series of assumptions in the bushmeat hunting, consumption and trade levels (2011-2013)

Table 9 presents the descriptive statistics for wildlife captured, household consumption and wildlife traded and their corresponding standard deviations. The ANOVA table is presented to verify if these means are significantly different from each other. The mean wildlife captured within the six months period is highest while that from wildlife consumed is the lowest. Hence, the number of wildlife killed depends on the immediate cash need of the hunters and not necessary source of animal protein for those hunters living close to the forest. This findings does not agree with that of Mogaka, (1992), who reported that it is the poorer households who have little alternative source of food that do most of the harvesting.

Table 10 presents the relationship between wildlife captured, consumed and traded in the study area (R^2 = 0.205, Adjusted R^2 = 0.144; standard error = 8.151072; F cal. = 3.351; α-sign = 0.030 at $p < 0.05$ significant level). The results of the findings suggest that there is a positive relationship (20.5%) between wildlife captured, consumed and traded in the study area. This implies that hunting activities in the study area is highly related to wildlife species killed, consumed and traded. They accounted for 20.5 percent of wildlife species killed, consumed and traded in the study area.

The Pearson correlations table show that there is a strong, positive and significant relationship between the number of wildlife killed, consumed and traded in the project area($r=0.981$, $r=0.994$, $p=0.01$). This suggests that there may be population influx into the mining area to search for job opportunities which have increase pressure on bushmeat. The results of the one-sample test show that there is wildlife captured for bushmeat differs highly significantly ($p < 0.001$) from either wildlife consumed or traded, but the latter two differ significantly from each ($p<0.000$, $p<0.002$).

The frequency curve is normally distributed with the values dropping off in a particular fashion as they increase up to the value of 6 and decrease from the mean. The results contain 68.26% of the data within ±1 standard deviation from the mean.

5. Ecological monitoring of the forest capacity

We estimated the relative abundance of key mammal species using observation per square kilometre (Buckland et al., 2001). IKA = ND, where N is the total number of observations recorded along the reconnaissance paths and D is the distance covered in kilometres. Conditional abundance of species were determined for the key wildlife species and expressed as a percentage of species presence (Cark et al., 2009).

5.1. Gorilla

Three groups of gorillas were observed in the project area, consisting of 5 males, 10 females, 1 weaned individual and a baby (66%). Considering the fact that each gorilla in a group, with the exception of infants which sleep with their mothers, makes a nest each night in which to sleep, only a single nest was recorded during this period. Gorillas' signs (feedings trails, footprints and vocalisations) were recorded 1, 2 and 5 times respectively (29.6%). The relative abundance of gorillas signs were observed towards the eastern part of the project area. The observation of a single nest over a period of six months suggests that the gorillas might have slept on the ground, on tree branches or remains awake throughout the nights to avoid being detected by night professional hunters. The regular observation of gorillas in the eastern part of the project area may also be due to the dense layers of *Zingiberaceae* and *Marantaceae* which provides an ideal habitat for gorillas. In the study area gorillas avoided regions subjected to habitat alteration by mining, logging and high level of poaching due to easy accessibility by roads. Clark et al., (2009) reported that gorilla conditional abundance (effect= -0.62:95% CI = -0.93 to -0.32) decreased in logged forest.

5.2. Chimpanzee

A total of 3 Chimpanzee groups were recorded in the study area. Amongst which were 11 males, 12 females, 2 weaned individuals and a baby (46.4%). Chimpanzee fresh nest and other signs as vocalisation, feeding trails and movement were recorded throughout the study area. Vocalisation signs were registered more than other signs (20, 37.7%), feeding trails (2, 4%) and movement (1, 2%) in descending order.

More gorillas and chimpanzees activity signs were observed as compared to the previous years which show that the great apes have regained the Nkamouna forest. Human perpetuation does not seem to influence ape presence in the area due to continuous sensitisation of the local communities by the project.

5.3. Diurnal primates

Four species of arboreal primates were observed in the study area; *Cercopithecus nictitans, Cercopithecus cephus, cercocebus agilis* and *Cercopithecus neglectus.* Of the 84 groups of arboreal primates observed, 22 (26%) were the *Cercopithecus nictitans*, 57, (68%) were Cercopithecus cephus, 4(4.8%) were *cercocebus agilis* and 1(1.2%) were *Cercopithecus neglectus.*

Wilkie and Carpenter, (2000) reported that primates and large-bodied species were most severely affected by hunters, Grey-cheeked mangabey (*Cercocebus albigena*) densities were reduced from over 51 individuals per km to under 3 ind/km^2, a reduction in species biomass of over 280 kg/km^2. The working assumption is that primates are adequate indicators for other species (at least those that are hunted), and that variations in species densities are determined by habitat specific carrying capacities and local hunting pressure.

5.4. Ungulates

Five species of ungulates, *Potamocherous porous, Tragelaphus spekei, Neotragus pygmaeus, Cephalophus leucogaster and Cephalophus monticola* were recorded in the study area. A relatively low and descending order of frequency ($57 \leq FQ \leq 2$) of activity signs were observed in the study area. The most commonly hunted groups of animals were the ungulates because hunters will only take a given species when the ratio of benefits (measured for instance in kilograms or calories) to costs (measured for instance by the time and energy spent hunting and processing meat) equals or exceeds the average returns for all hunted species.

5.5. Other mammals

Panthera pardus, Herpestes naso, Veranus nilotinus, Dendrohyrax dorsalis and Galago alleni activity signs were frequently heard and observed in the area.

5.6. Lessons learned

1. The evaluation of the vegetable farms enables the local communities to determine their level of engagement and success in the project activities.
2. The local communities are gradually adapting to the consummation of vegetable as sources of nutrients and income.
3. The project has advice the local communities to improve on the quality, widen the range of their products and improve on their financial returns by direct marketing of vegetable products through common initiative groups and associations.
4. The introduction of the poultry farms has motivated the local communities to become increasingly self-reliant and less dependent on wildlife as an economic fall back to meet their needs.
5. Awareness campaigns amongst the forest dwelling indigenous communities and the local immigrant has provided eye witness accounts that they are the key actors in the sustainable management of wildlife.
6. There is a strong correlation between population increase and the number of wildlife captured in the project area. With media announcement of the coming back of some of the mining companies, youths and the local immigrants are trooping the area in search of jobs thus exerting more pressure on wildlife species.

5.7. Difficulties encountered

Climate change is raising its ugly head in Cameroon and this has an impact on the vegetable and other crops products yields in the project area.

Local immigrants and central Africa refuges are the key actors in the depletion of wildlife species. Awareness campaigns have to be reinforced with new strategies put in place.

6. Conclusions

The project has poses a significant potential improvement in the livelihoods of the indigenous forest dwellers of the Dja-Boumba mining area. The activities of the project have given room for conservation and development to work together.

The development of databases information on wildlife management and the proper awareness campaigns in the project area have provided a sense of responsibility for the local communities and other stakeholders.

All the local communities were enthusiastic about the evaluation of vegetable products and the introduction of the poultry farms. The populations are convinced that these approaches have positive impact on the communities and in their livelihoods.

The mixture of songs, dances, mimes, recitals and dramatic sketches by the wildlife clubs, youths, Christian women association and the hunters association encouraged the local immigrants to integrate themselves into the project and take off vegetable gardening as an attractive source of proteins and income. The increased in bushmeat trade is linked to the uncontrolled entry of visitors and immigrants into the project area. It seems that a certain level of human activities does not necessarily drive wildlife away, as mine workers admitted seeing groups of wildlife species during working hours. But the intense increased in wildlife population due to sensitisation of local communities has given an upper hand to the non-indigenous people to exert pressure on wildlife.

7. References

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Fig.7. Pangolin scales for sale in the project area

Fig.8. Evaluation of the vegetable farms