

An analysis of Human Wildlife Conflict in the Doro !Nawas Conservancy for the period 2007 to 2010

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c/o Namibia Nature Foundation
for CDSS



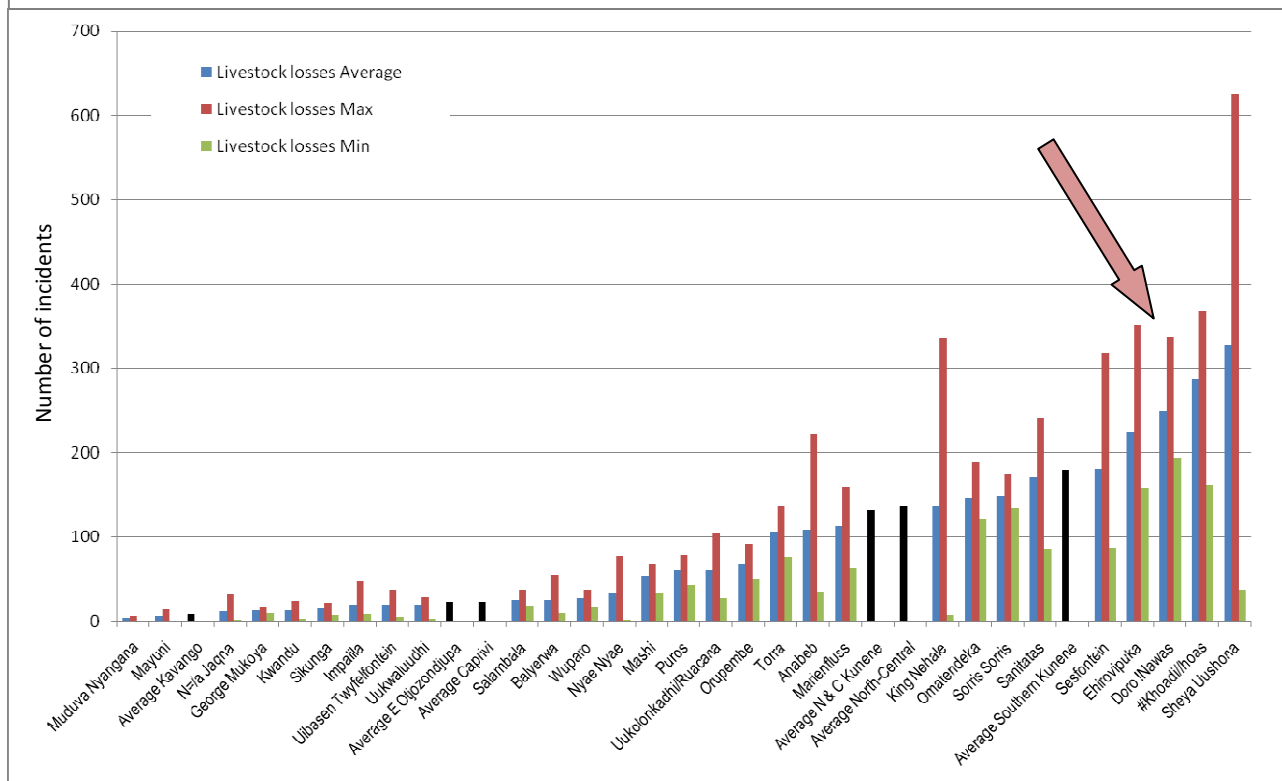
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Introduction

1. This analysis was undertaken to:
 - a. Better understand the extent, characteristics and details of Human-Wildlife Conflict (HWC) in the Doro !Nawas Conservancy; and
 - b. Plan an appropriate response to HWC at the conservancy level, taking into account the various types of conflict, the costs of the different types of conflict, the wildlife species involved, the geographic locations of the conflict and the dynamic nature of the conflict in terms of seasonality, year to year and longer-term trends.

2. The Doro !Nawas Conservancy was prioritized as a pilot conservancy because it is exposed to high incidents of HWC, both from predators killing livestock and from elephants damage to particularly water infrastructure. The position of the Doro !Nawas Conservancy with respect to the incidents of HWC relative to all the MCA-Namibia-supported conservancies is shown in figures 1 & 2 below. It should be kept in mind that the MCA-supported conservancies are likely to experience more HWC than the average for all communal conservancies in Namibia because their selection was influenced by proximity to national parks where elephant and predator numbers are high. Table 1 below summarises the five most severely impacted conservancies per category of HWC. As can be seen the Doro !Nawas conservancy appears in four of the seven columns and is rated as the 7th worst impacted conservancy from HWC.

Figure 1: Number of incidents of livestock loss from HWC in the MCA-supported conservancies for the five-year period 2006-2010. The conservancies are sorted in ascending average number of incidents.



3. The **Vision** of the Doro !Nawas Conservancy as stated in the HWC Management Plan is “To reduce human-wildlife conflict as much as possible and to uplift living standards our community by optimizing benefits from wildlife.”

Figure 2: Average and maximum number of incidents of infrastructure damage from HWC per 1,000 people in the MCA-supported conservancies for the five-year period 2006-2010. The conservancies are sorted in ascending average number of incidents.

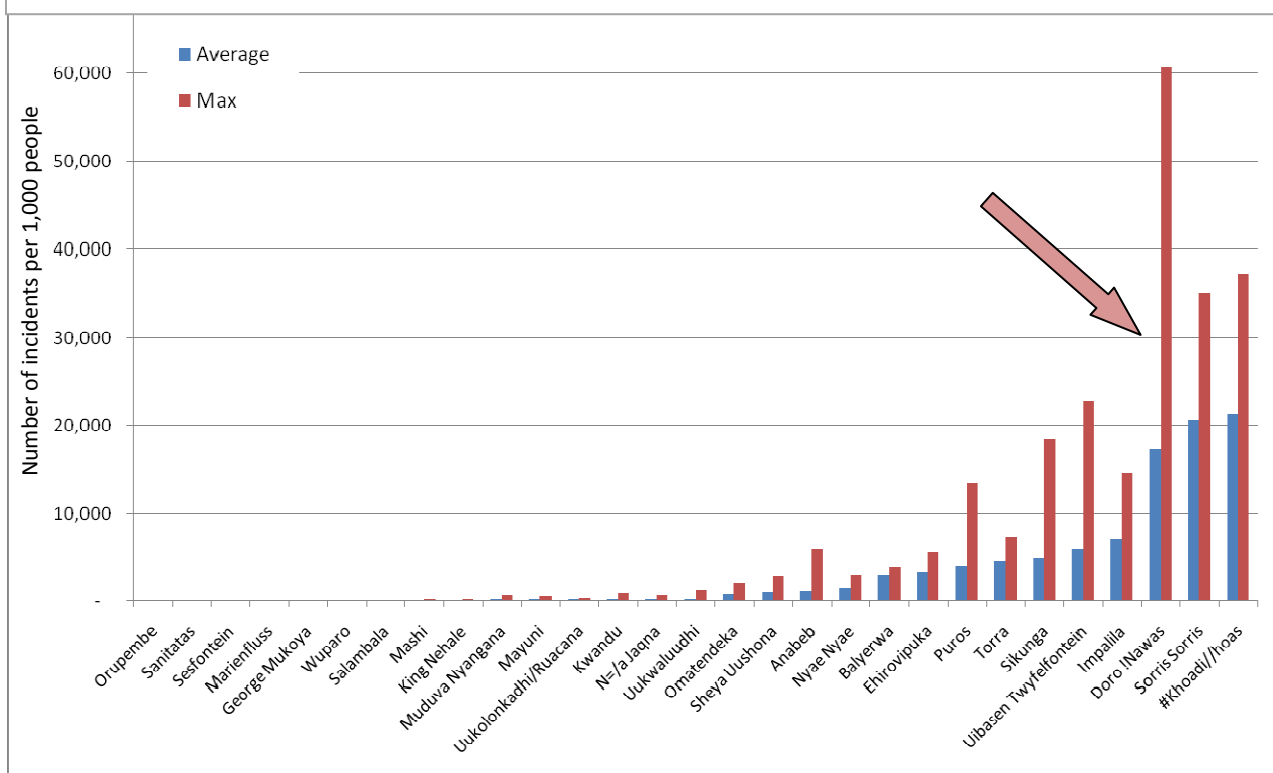


Table 1: The five most seriously impacted conservancies for each of the four HWC categories as well as total HWC, based on per capita costs; the worst benefit to cost ratio and the conservancies with the best potential to improve the cost-benefit ratio by means of project intervention. The conservancies that appear in more than one column are colour coded.

Position (score)	Garden & crop damage	Livestock loss	Infrastructure damage	Human attack	Total HWC damage	Worst benefit to cost ratio	Best intervention for C:B ratio
1 (5)	Kwandu	Sanitatas	#Khoadi //Hoas	Uibasen Twyfelfontein	Sanitatas	Sheya Uushona	Mashi
2 (4)	Balyerwa	Marienfluss	Sorris Sorris	Impalila	Marienfluss	Sorris Sorris	#Khoadi //Hoas
3 (3)	Mashi	Orupembe	Doro !Nawas	Marienfluss	Orupembe	King Nehale	Sesfontein
4 (2)	Impalila	Puros	Impalila	Sikunga	Puros	Sanitatas	Doro !Nawas
5 (1)	Mayuni	Doro !Nawas	Uibasen Twyfelfontein	Kwandu	Doro !Nawas	Ehrovipuka	Marienfluss

The following **Objectives** were developed to help ensure that the Vision is achieved:

- (i) To minimise losses of livestock to cheetahs and jackals while sustaining healthy populations of these species;

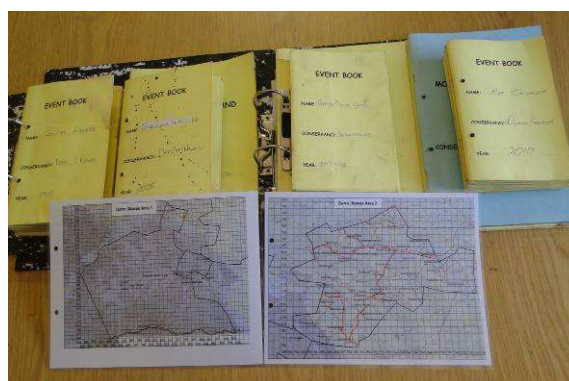
- (ii) To manage the elephant population to minimize conflicts and seek co-existence through benefit;
- (iii) To reduce the hyaena population;
- (iv) To reduce leopard costs to farmers and increase benefits.

4. The data used in this analysis were obtained from the Event Books of the Community Game Guards in the Doro !Nawas Conservancy. The analysis covers the period from January 2007 to December 2010.

5. An important principle of the Event Book system is that the Event Books live in the conservancy and are used for local decision-making and adaptive management. They may never leave the conservancy. For this reason, the relevant pages of the Event Books were photographed in the conservancy office and the data were later transcribed into an excel spreadsheet.

Date	Village	Block Number		Problem animal	Type of Damage	Number	Complainant	Complainant's signature
		South	East					
01/20	INHOEK	540	168	CHEETHA	GOAT	1	C Hoares	[Signature]
01/20	INHOEK	540	168	CHEETHA	GOATS	4	C Hoares	[Signature]
01/20	INHOEK	540	168	JACKAL	GOATS	3	C Hoares	[Signature]
01/20	INHOEK	540	168	JACKAL	GOATS	1	C Hoares	[Signature]
4 22/0	INHOEK HUIS	540	168	JACKAL	GOATS	2	C Hoares	[Signature]
4 22/0	INHOEK HUIS	540	168	JACKAL	GOATS	2	C Hoares	[Signature]
10 22/0	INHOEK HUIS	540	168	JACKAL	GOATS	3	R Uses	[Signature]
10 22/0	INHOEK HUIS	540	168	JACKAL	GOATS	5	H Uses	[Signature]
10 22/0	INHOEK HUIS	540	168	JACKAL	GOATS	4	H Uses	[Signature]
11 02/0	INHOEK HUIS	540	168	JACKAL	SHEEP	1	H Uses	[Signature]
11 02/0	INHOEK HUIS	540	168	CHEETHA	SHEEP	2	H Uses	[Signature]
13 02/0	INHOEK HUIS	540	168	CHEETHA	SHEEP	1	R Uses	[Signature]
13 02/0	NORWAG POST	551	175	JACKAL	GOAT	1	R Soobee	[Signature]
13 02/0	NORWAG POST	551	175	JACKAL	GOAT	1	R Hoages	[Signature]
16 02/0	NORWAG POST	551	175	JACKAL	GOAT	1	E Uses	[Signature]
19 02/0	NORWAG POST	551	175	CHEETHA	FEED VUL	1	A GASEB	[Signature]
21 02/0	LANGBERG POST	551	175	JACKAL	BDR	2	R Soobee	[Signature]
18 01/0	INHOEK	540	168	CHEETHA	GOAT	3	R Uses	[Signature]
18 01/0	NORWAG DX	551	175	JACKAL	GOAT	2	E Hoages	[Signature]
20 04/0	LANGBERG	551	174	JACKAL	GOAT	1	R Grade	[Signature]

Above: Photograph of a HWC page in the Event Book of a Community Game Guard in the Doro !Nawas Conservancy.



Left: Events Books from past years are filed in the Doro !Nawas conservancy office.

Results and Discussion

6. The HWC data for the Doro !Nawas Conservancy are presented in Table 2 (see at end of report) and summarized in Table 3 below. These data were analysed in two ways:

- (i) number of incidents of (a) infrastructure damage (mainly water related, but also fencing, gardens and homesteads), and (b) predation, per species and per year; and
- (ii) cost of incidents from both infrastructure damage and predation, per species and per year.

Total HWC incidents and costs over four years	No. / Value	Average HWC incidents and costs per year	No. / Value
Total number of infrastructure incidents	164	Average no. of infrastructure incidents	41
Total cost (N\$) of infrastructure incidents	N\$402,400	Average cost (N\$) of infrastructure incidents	N\$100,600
Total number of all HWC incidents	903	Average no. of all HWC incidents	226
Total number of livestock lost	1057	Average no. of livestock lost	264
Total cost (N\$) of livestock lost	N\$795,300	Average cost (N\$) of livestock lost	N\$198,825
Total costs (N\$) of all HWC over 4 years	N\$1,197,700	Average cost (N\$) of all HWC per year	N\$299,425

7. Costs of infrastructure damage were based on average replacement costs and cost to people's livelihoods, while predation costs were based on the current average value of livestock in the region. These costs are summarized in table 4 below.



Top left and clockwise: Identifying areas with Conservancy Game Guards in the Doro !Nawas Conservancy that experience significant HWC for planning of site visits; A windmill with a sturdy protective wall against elephants; A water tank and pump with no protection; Goats drinking at a partly protected water point.

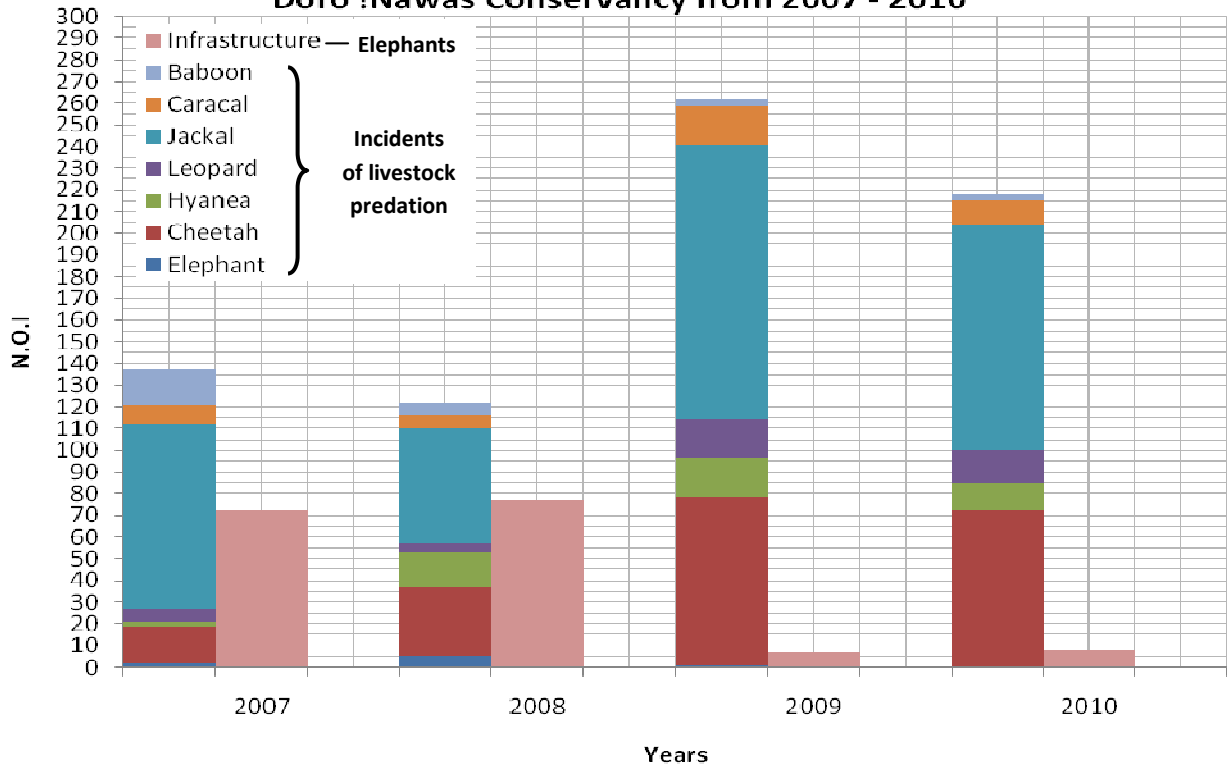
8. There is considerable year-to-year variation in the overall levels of HWC, as measured by the number of incidents and by the costs incurred. The number of incidents ranging from 199 in 2009 and 269 in 2009, a 35% increase; and the cost incurred from these incidents ranged from about N\$209,000 in 2010 to N\$460,000 in 2007, a difference of 120%. These are minimum values because a significant number of HWC goes unreported, particularly when elephants drink from reservoirs where farmers have provided the diesel to pump the water. The overall average minimum figures for HWC in the Doro !Nawas Conservancy is about 226 reported incidents per year costing about N\$198,825 per year.

9. There is also great year-to-year variation in the types of HWC incidents (Figure 3). Damage to infrastructure by elephants was greatest in 2007 and 2008 with 72 and 77 incidents respectively, costing N\$268,000 and N\$116,000 (the difference in cost is related to the type of damage caused), dropping dramatically in 2009 and 2010 to just 7 and 8 incidents respectively. By contrast, livestock predation doubled from 2007/08 to 2009/10 from 137 & 122 incidents to 262 and 218 incidents respectively.

Table 4: Average cost (N\$) of different types of Human-Wildlife Conflict

HWC Impact		Cost (N\$)	Explanatory notes on cost
Human life		5,000	This is not a value on human life but only the cost of funeral benefits provided.
Infrastructure damage	Pipes	1,500	Per incident, being the estimated average cost of new infrastructure / equipment, transport, travel and installation.
	Taps	1,500	Per incident, being the estimated average cost of equipment, transport, travel and installation.
	Tank	4,000	For 5,000 litre tank. Includes purchase, transport and installation.
	Pump	40,000	Includes Lister diesel engine, pump, transport and installation.
	Windmill	90,000	Includes purchase, transport and installation.
	Actual water loss	150	Per tank of 5,000 litres, calculated at pumping rate of 2,000 litres water per hour, 6 litres diesel per hour at N\$10 per litre.
	Cost to livelihood as a result of losing water	6,100	Per 30 days of impact on livestock condition and reproduction, assuming a 5% value loss to stock over this period; and assuming an average livestock holding of 40 goats, 10 sheep, 5 cows and 4 donkeys per household; with an average of 4 households per water point.
	Fence	350	Per incident, being the estimated average for replacement of material, transport and repair time.
	Garden	500	Per incident, being an estimate of average value of vegetables lost and opportunity costs including travel and health impacts.
	Homestead	3,500	Per incident, being an estimate of average cost of replacement of material and rebuilding time and labour.
Local value of domestic stock	Cow	4,000	Cost of replacing lost livestock
	Horse	1,500	
	Goat	600	
	Donkey	500	
	Sheep	450	

Figure 3: Number of HWC incidents (N.O.I.) per year in the Doro !Nawas Conservancy from 2007 - 2010



10. An “incident” of livestock predation may involve the killing of more than one animal. In total there were 739 livestock incidents in the Doro !Nawas Conservancy over the four years resulting in a loss of 1,057 head of livestock, i.e. 1.43 animals per incident. The highest loss per incident ratio was for goats (1.55 animals per incident) followed by sheep (Table 5). The larger livestock species had a loss ratio of about 1:1. When more animals were lost per incident it invariably involved calves and foals.

Stock	No. incidents	No. stock lost	Average no. stock per incident	Range (min-max)
Cow	41	47	1.15	1-3
Donkey	60	61	1.02	1-2
Goat	502	777	1.55	1-13
Horse	13	14	1.08	1-2
Sheep	122	158	1.30	1-4

11. The ratio in incidents to livestock losses also varied between predators (Table 6). Baboons caused the most damage per incident (just over two head of livestock per incident – and these were mostly young animals – followed by Cheetah, Elephant and Jackal.

Predator	No. incidents	No. stock lost	Average no. stock per incident	Range (min-max)
Baboon	28	59	2.11	1 - 13
Caracal	44	54	1.22	1 - 4
Cheetah	198	316	1.60	1 - 9
Elephant	7	11	1.57	1 - 4
Hyaena	49	51	1.04	1 - 2
Jackal	369	515	1.40	1 - 10
Leopard	43	51	1.19	1 - 5

12. Great year-to-year variation emerged between the costs of different types of HWC (Figure 4). In some years (2007) infrastructure damage to water installations by elephants were 48 times greater than in other years (2010). The annual differences in the cost of stock losses were less dramatic, but nonetheless had a 2.5 times difference between the lowest (2007) and the worst (2009) years.

13. The average cost to farmers per year in the Doro !Nawas Conservancy caused by the different wildlife species and calculated over the 4 years is shown in Figure 5. Also shown are the highest and lowest costs for a year. Elephant, Jackal and Cheetah caused the greatest amount of damage (on average about N\$106,500, N\$75,000 and N\$74,000 respectively per year), followed some way behind by Hyaena and Leopard (both about N\$14,000), Baboon (N\$8,000) and Caracal (N\$7,000). The maximum cost caused by most species is about 30 - 50% greater than the average, except for Elephant, where it is almost 160% greater. The difference between the maximum (N\$273,000) and minimum (N\$6,000) annual costs for Elephants is remarkable. (Jo – could this be a result of project interventions – building of elephant protection walls and provision of alternative waters? If yes, then it provides compelling evidence for the effectiveness of this measure. If no, then remarkably variable depending presumably on rainfall & access to veld water???)

Figure 4: Cost (N\$) of HWC per year in the Doro !Nawas Conservancy from 2007 - 2010

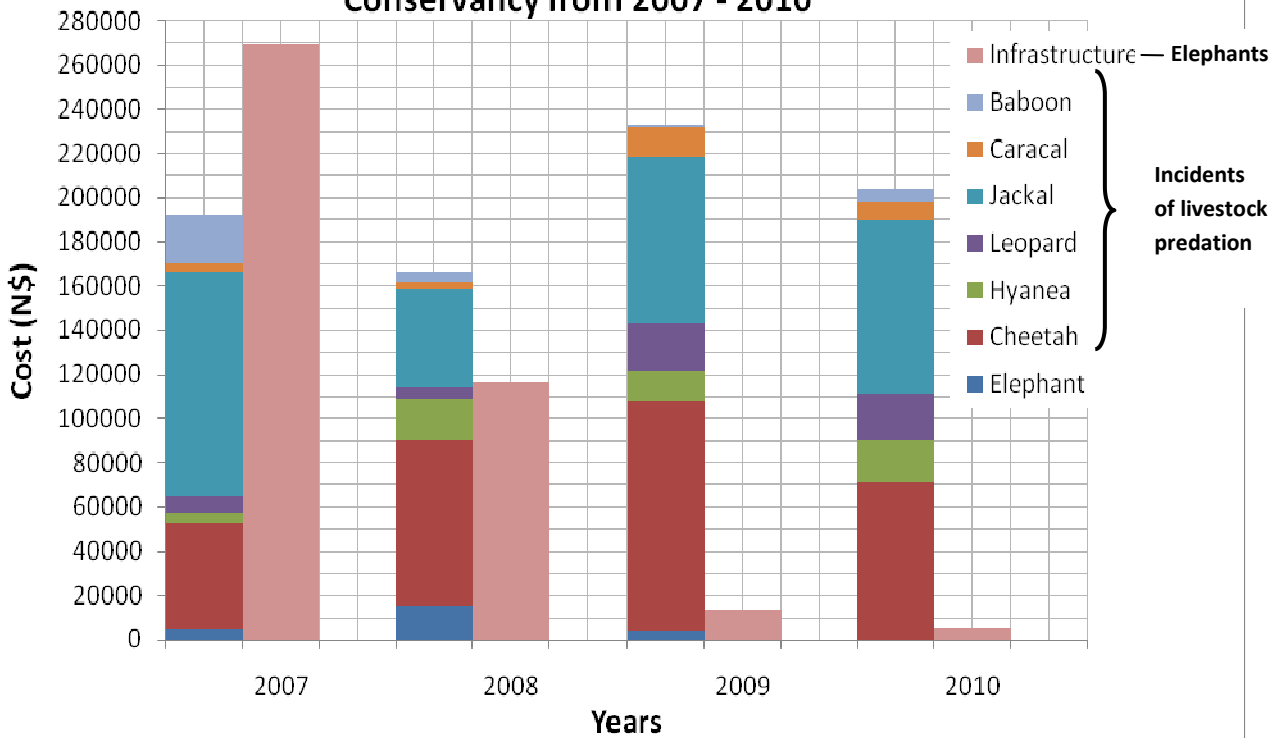
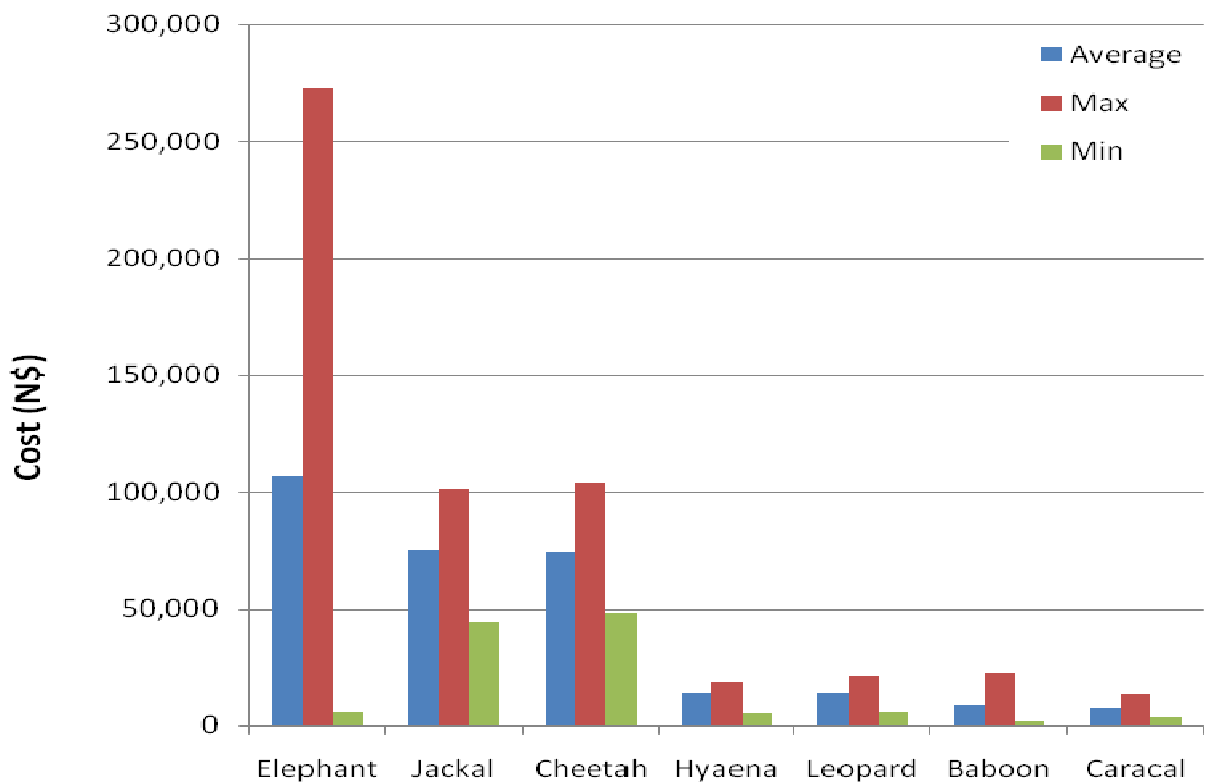
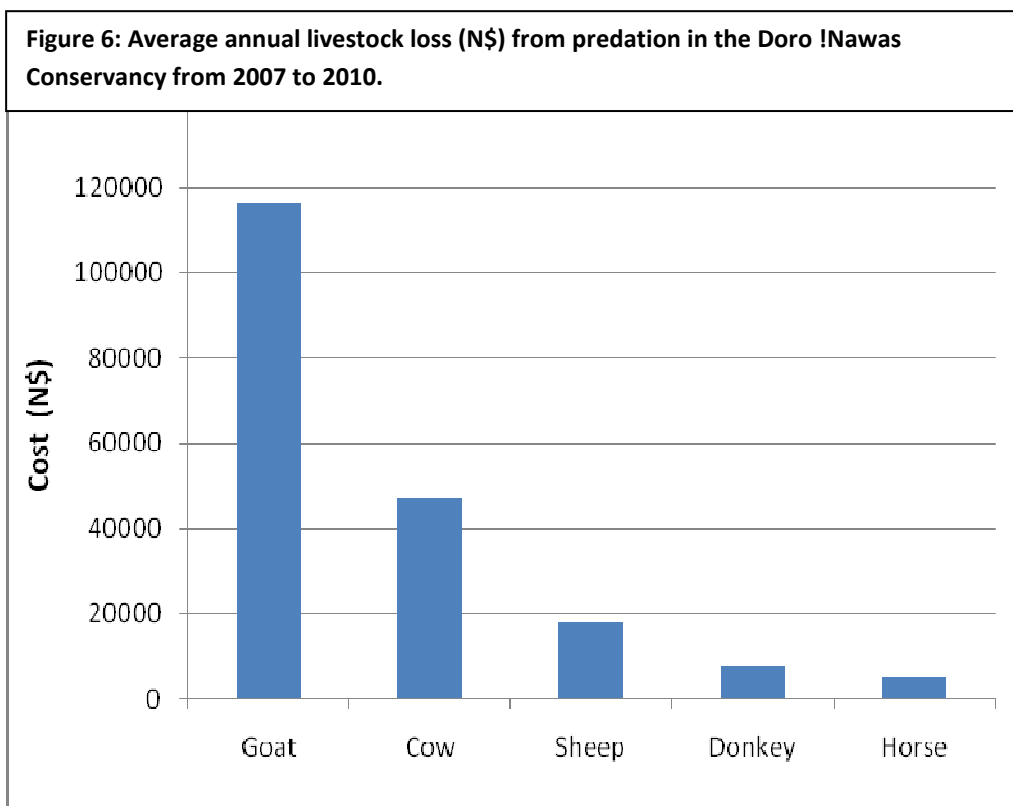


Figure 5: Average HWC cost (N\$) to farmers per year, and the maximum and minimum annual costs, caused by different species of wildlife in the Doro !Nawas Conservancy from 2007 to 2010.



14. The greatest stock loss experienced on average by farmers was that of predation on goats (Figure 6). The average loss was almost N\$120,000 per year. The next greatest loss was predation on cows (less than half the goat loss at just under N\$50,000 per year). Sheep losses were just under N\$20,000 per year while those of donkeys and horses averaged less than N\$10,000 per year.



15. The distribution and frequency of all HWC incidents are mapped in Figure 7. These incidents are broken out by species or category of HWC in Figure 8. The maps show that particular areas and homesteads carry a far greater burden of HWC costs than others. By focusing mitigation measures on these sites, assistance will be provided to those farming members of the conservancy carrying the greatest conservancy costs.

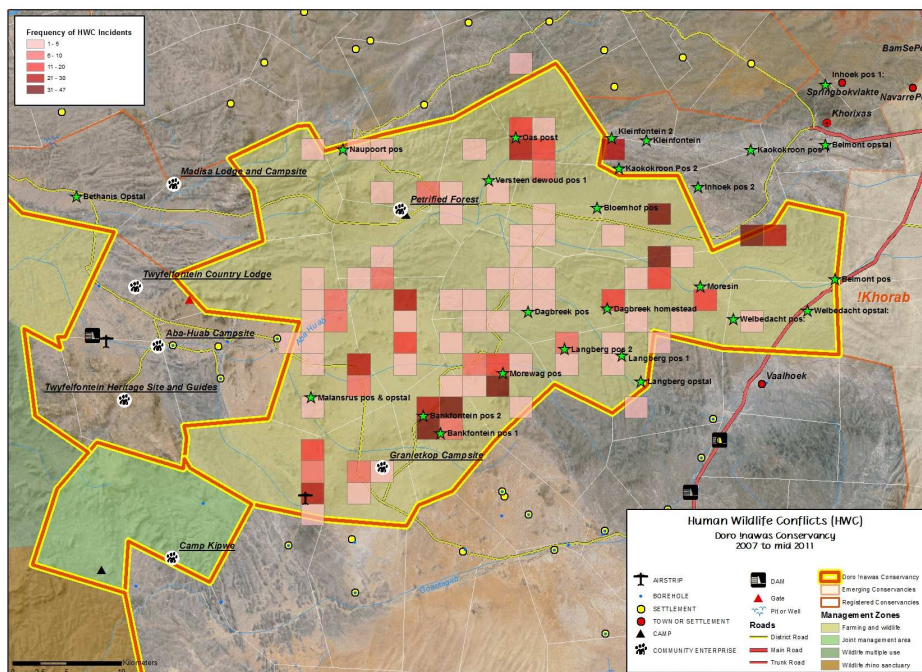


Figure 7: The distribution of all HWC incidents reported in the Doro !Nawas Conservancy from 2007 to 2010

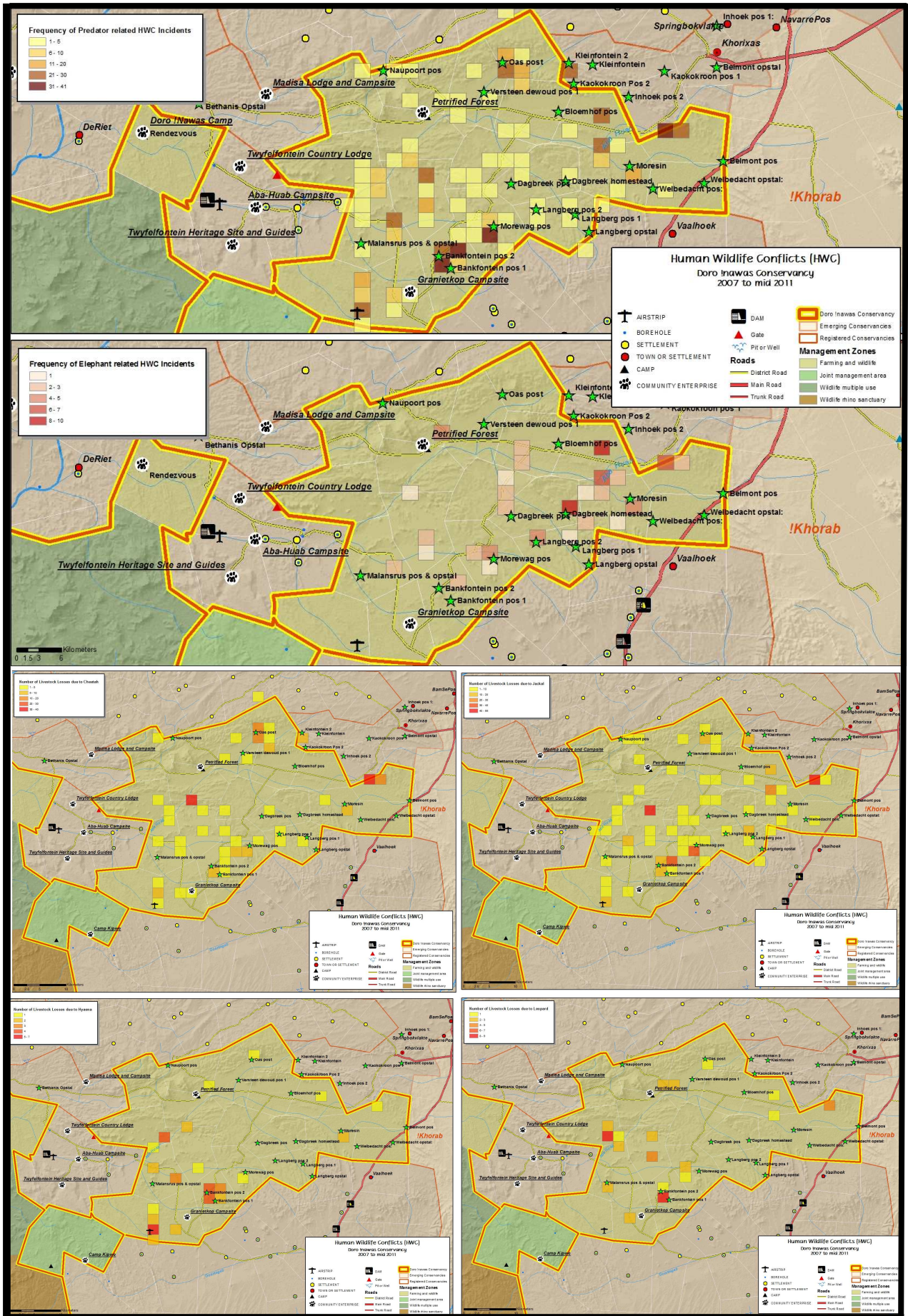


Figure 8: Distribution of predation on livestock and elephant damage in the Doro !Nawas Conservancy from 2007 to 2010 and distribution of livestock losses from the four main predators – cheetah, jackal, hyaena and leopard.

16. Some general observations can be made from these maps: predation occurs throughout the inhabited areas of the conservancy, particularly predation from Cheetah and Jackal. Elephant incidents are restricted more to the eastern parts, in close association with the Aba-Huab River and its tributaries and the Goantagab River. A number of locations experienced particularly high incidents of HWC. The areas around Bankfontein pos 1 & 2, Morewag and an areas some 6 km NE of Moresin reported particularly high livestock losses. The Dagbreek area and area about 4 km E of Bloemhof pos experienced particularly high number of incidents from elephants.

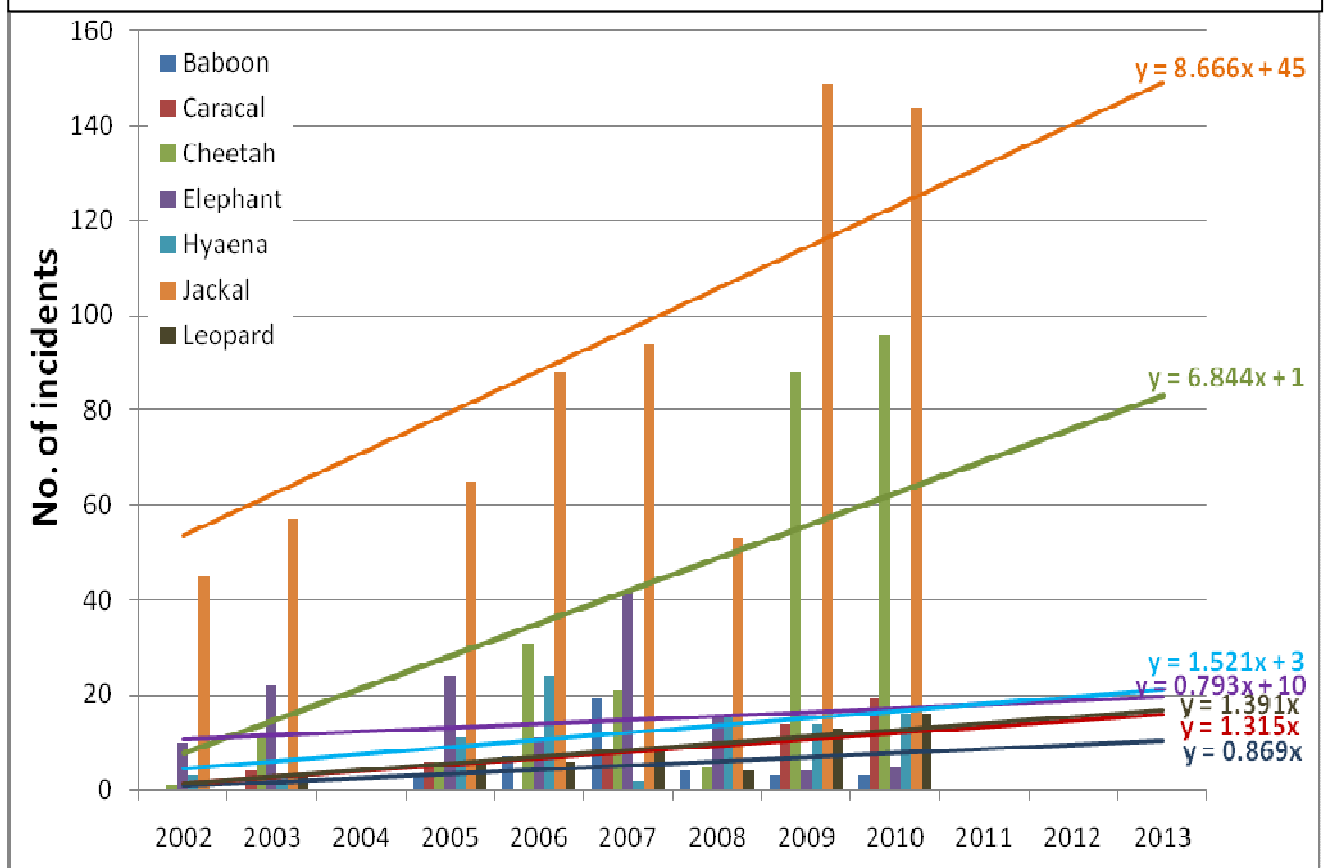
Conclusion and Recommendations

17. The following general observations emerge from this analysis:
- a) The impact of HWC on farmers is highly variable from year to year.
 - b) In some years (e.g. 2007) elephants cause the greatest financial damage, in other years predators do.
 - c) The average overall loss to farmers in the conservancy as a consequence of HWC is at least N\$300,000 per year, but this can go up to at least N\$460,000 in some years. This is a huge burden for poor subsistence farmers to bear.
 - d) Not all farmers share these costs equally. Farmers on migration routes and near favoured feeding grounds of elephants, e.g. the Aba-Huab River and its tributaries, carry a greater burden of infrastructure damage and water loss than do other farmers. There are some locations where the incidents of HWC are particularly high, e.g. Bankfontein pos 1 & 2, Morewag, near Moresin, Dagbreek and near Bloemhof pos .
 - e) Finding solutions to help reduce the incidents of HWC is therefore extremely important from a financial point of view, and specifically from a poverty and livelihoods perspective.
 - f) However, there is also an important intangible component. Farmers manage the land, the water points and are in frequent daily contact with the conservancy's wildlife. It is important for farmers to have a positive attitude towards wildlife and to be actively supporting the conservancy. The large financial losses being experienced by farmers in this conservancy pose a serious risk of farmers turning against the conservancy.
 - g) It is clear that decisive interventions are required to address both infrastructure damage caused mainly by elephants, and domestic stock losses caused mainly by predators. Different project interventions are needed for these two categories.
 - h) In the case of elephants, the main interventions are (a) the protection of key water points used for homesteads and domestic stock in priority conflict areas and (b) the provision of alternative waters for elephants in carefully selected places.
 - i) It is also likely that different interventions will be needed to deal with different types of predation. Currently the two main predators that account for about 77% of the cost of livestock losses to all predators are Jackal and Cheetah. These are both largely diurnal predators that seldom attack animals when kraaled at night. To mitigate livestock loss to these predators requires more intensive protection of stock during the day, such as is provided by the use of livestock guard dogs. This would require the development of a livestock guard dog programme and supportive training and back-stopping. Nocturnal predators such as Hyaena and Leopard, currently accounting for just 14% of the cost of livestock lost to predators, require that domestic stock is kraaled at night in strong, secure kraals. This may require both a change in management practices and the development of appropriate kraal infrastructure together with targeted training. Clearly, the protection of stock from attack by Jackal and Cheetah is a priority for the Doro !Nawas Conservancy.

j) It is important that these interventions are piloted with a number of willing farmers who suffer the greatest losses. The pilot interventions must be carefully monitored, adapted as necessary and then rolled out to other farmers suffering significant HWC losses.

18. And finally, the overall impact of project interventions should be monitored against past HWC trends per species. The focus of the interventions should be to have as great a positive impact against the trends as possible, over a period of at least 2-3 years. The extremely unpredictable and hugely fluctuating incidents of HWC in the Doro !Nawas Conservancy makes it meaningless to set specific targets. However, the use of trends provides an elegant, realistic and pragmatic indicator to monitor the impacts of HWC project interventions. This is illustrated in Figure 9, which also provides the baseline.

Figure 9: Number of incidents of HWC per year caused by different wildlife species in the Doro !Nawas conservancy (bar graph) from 2002 to 2010 and the linear trends per species, using the number of incidents in 2002 as the intercept (i.e. baseline) figure.



Acknowledgement

The conservancy game guards collect and document all the HWC incidents in their Event Books. These are in turn checked by conservancy managers and audited annually by NACSO's Natural Resources Working Group. Without the team of people who developed and fine-tuned the Event Book system, provided the training and back-stopping, provide ongoing support to conservancies in the regions, collect, check, analyse and curate the data, this report would not have been possible. I would take this opportunity to acknowledge the fine ground-breaking work done by the whole team, from community game guards to support organisations to technical support staff. I thank Jo Tagg for discussions on the strategic approach to HWC analysis and management, and Sylvia Thompson for developing the maps.

Table 2: Summary of Human Wildlife Conflict per species and per types of incident in the Doro !Nawas Conservancy from January 2007 to December 2010 (Data from Game Guard Event Books)

Species	Types of HWC incident		2007			2008			2009			2010		
			N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)	N.O.I	Stock loss	Cost (N\$)
Elephant	Human deaths		-	-	-	-	-	-	-	-	-	-	-	-
	Infrastructure	Pipes	25	-	37,500	25	-	37,500	1	-	1,500	3	-	4,500
		Taps	1	-	1,500	4	-	6,000	-	-	-	-	-	-
		Tank	1	-	4,000	4	-	16,000	1	-	4,000	-	-	-
		Pump	-	-	-	-	-	-	-	-	-	-	-	-
		Windmill	2	-	180,000	-	-	-	-	-	-	-	-	-
		Waterloss	26	-	3,900	25	-	3,750	2	-	300	4	-	600
		Livelihood	4	-	24,400	8	-	48,800	1	-	6,100	-	-	-
		Fence/kraal	5	-	1,750	8	-	2,800	-	-	-	-	-	-
		Garden	4	-	1,000	3	-	1,500	2	-	500	1	-	500
		Homestead	4	-	14,000	-	-	-	-	-	-	-	-	-
	Subtotal Infrastructure		72	-	268,050	77	-	116,350	7	-	12,400	8	-	5,600
	Livestock	Goat	1	1	600	2	5	3,000	-	-	-	-	-	-
		Cow	1	1	4,000	3	3	12,000	1	1	4,000	-	-	-
		Sheep	-	-	-	-	-	-	-	-	-	-	-	-
Donkey		-	-	-	-	-	-	-	-	-	-	-	-	
Subtotal Livestock		2	2	4,600	5	8	15,000	1	1	4,000	-	-	-	
Subtotal Elephant			74	2	272,650	82	8	131,350	8	1	16,400	8	-	5,600
Cheetah	Livestock	Goat	7	11	6,600	17	71	42,600	34	57	34,200	52	68	40,800
		Sheep	3	3	1,350	6	11	4,950	18	22	9,900	13	20	9,000
		Cow	4	5	20,000	4	6	24,000	12	12	48,000	3	4	16,000
		Donkey	3	3	20,000	4	4	2,000	8	8	4,000	2	2	1,000
		Horse	-	-	-	1	1	1,500	5	5	7,500	2	3	4,500
Subtotal Cheetah			17	22	47,950	32	93	75,050	77	104	103,600	72	97	71,300
Hyaena	Livestock	Goat	1	2	1,200	1	1	600	2	2	1,200	-	-	-
		Cow	1	1	4,000	3	3	12,000	1	1	4,000	2	3	12,000
		Donkey	-	-	-	12	12	6,000	14	14	7,000	10	10	5,000
		Horse	-	-	-	-	-	-	1	1	1,500	1	1	1,500
Subtotal Hyaena			2	3	5,200	16	16	18,600	18	18	13,700	13	14	18,500

Leopard	Livestock	Goat	-	-	-	-	-	-	10	10	6,000	10	15	9,000
		Sheep	-	-	-	3	4	1,800	2	2	900	1	2	900
		Cow	1	1	4,000	1	1	4,000	3	3	12,000	2	2	8,000
		Donkey	5	6	3,000	-	-	-	2	2	1,000	-	-	-
		Horse	-	-	-	-	-	-	1	1	1,500	2	2	3,000
Subtotal Leopard			6	7	7,000	4	5	5,800	18	18	21,400	15	21	20,900
Jackal	L/stock	Goat	74	156	93,600	51	70	42,000	103	107	64,200	88	118	70,800
		Sheep	11	17	7,650	2	4	1,800	24	25	11,250	16	18	8,100
Subtotal Jackal			85	173	101,250	53	74	43,800	127	132	75,450	104	136	78,900
Caracal	L/stock	Goat	2	2	1,200	4	4	2,400	14	18	10,800	8	11	6,600
		Sheep	7	7	3,150	2	2	900	4	5	2,250	3	5	2,250
Subtotal Caracal			9	9	4,350	6	6	3,300	18	23	13,050	11	16	8,850
Baboon	L/stock	Goat	10	30	18,000	5	6	3,600	3	3	1,800	3	9	5,400
		Sheep	6	9	4,050	1	2	900	-	-	-	-	-	-
Subtotal Baboon			16	39	22,050	6	8	4,500	3	3	1,800	3	9	5,400
Subtotal Infrastructure Damage			72		68,050	77		116,350	7		12,400	8		5,600
Subtotal Livestock Losses			137	255	92,400	122	210	166,050	262	299	233,000	218	293	203,850
TOTAL HWC			209	255	460,450	199	210	282,400	269	299	245,400	226	293	209,450