Darwin Initiative – Final Report

Darwin project information

Project Reference	DAR17-031
Project Title	**Ecological sustainability of leopard trophy hunting in Zimbabwe**
Host country(ies)	UK, Zimbabwe
UK Contract Holder Institution	WildCRU, Zoology Department, Oxford University
UK Partner Institution(s)	
Host Country Partner Institution(s)	Zambezi Society Zimbabwe Parks And Wildlife Management Authority
Darwin Grant Value	£XXX
Start/End dates of Project	December 2009 To November 2012
Project Leader Name	Dr Andrew J Loveridge
Project Website	http://wildcru.org/research http://zamsoc.david.co.zw/
Report Author(s) and date	Dr Andrew J Loveridge (WildCRU) Mrs Roseline L Chikerema-Mandisodza (Zamsoc/ ZPWMA) Mr Peter Musto (Zamsoc)
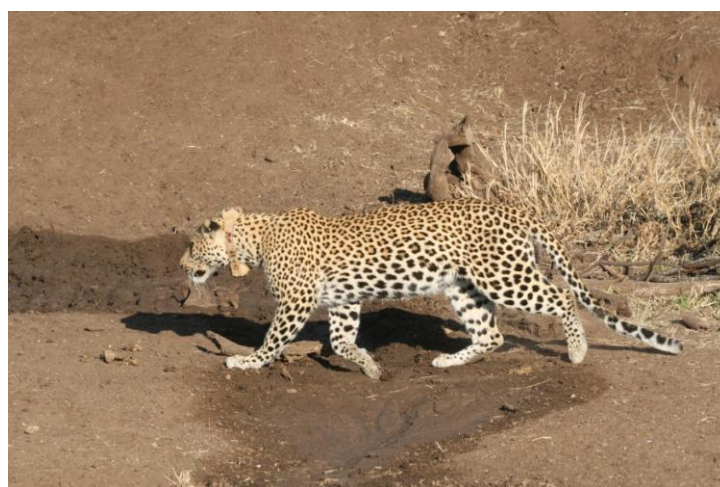
1   Project Background

This project aimed to address the need for improved management and sustainable conservation of African leopard (*Panthera pardus*) and the leopard habitat in Zimbabwe. The project collected ecological and management data to support a sustainable management of the species. The project was a three way partnership between the Wildlife Conservation Research Unit, Oxford University (WildCRU, lead UK institution), Zambezi Society (ZAMSOC) and the Zimbabwe Parks and Wildlife Management Authority (ZPWMA, project partner).

Zimbabwe have had a CITES allocated sport hunting quota of 500 leopards since 1992. However, this quota has never been fulfilled, which raises the question as to whether the leopard population can sustain the off take or whether the quota of 500 is allocated against a leopard population estimate that may no longer be realistic after several decades of land degradation and land use change.

This project sought to formulate the baseline data on which the impact of hunting on the leopard population could be assessed. There was little or no data to assess the impact of hunting on leopard populations or carry out a non-detrimental findings assessment. This project helped in the formulation of a CITES non-detriment determination for Zimbabwe through collecting baseline ecological and distribution data, establishing contacts with research experts and providing training.

2   Project support to the Convention on Biological Diversity (CBD)

Worldwide, leopards range from Critically Endangered (Amur, Javan and Arabian sub-species) to Near Threatened (Sub Saharan Africa). Sub –Saharan leopards (*P.pardus pardus*) were uplisted on the IUCN 'Red List' from a species of 'least concern' to 'near-threatened' in 2007 based largely on concerns over habitat loss. Leopards are on CITES Appendix 1. Trade in the species is strictly controlled. However CITES quotas are given to 12 African Countries on the basis of non-detriment reports to the CITES secretariat from the country concerned. Zimbabwe has the highest CITES quota of any African country. There is concern within the Wildlife Management Authority of Zimbabwe that this quota may no longer be appropriate given land use change and degradation within the country since the early 1990s when the quota was first implemented. This project has contributed information (with the first ever country wide survey for leopards) and capacity to addressing this question. Data collected by this project also contributes to the ongoing CITES 'Non-detriment finding' (NDF) determination for Zimbabwe.

Furthermore, leopards, being a large predator, are a crucial component of natural ecosystems in African Savannah ecosystems. Recent research suggests that ecosystems with intact predator guilds are more likely to be complex and biologically diverse. Finally large predators function as flagship species to motivate wide-scale conservation of natural ecosystems. Thus conserving large predators in their natural ecosystems contributes to the aims of the Convention on Biodiversity.

3   Project Partnerships

This project is a partnership of three institutions.

The WildCRU, Department of Zoology, Oxford University based research group is the UK partner in the project. Dr Andrew Loveridge is the project leader for this Darwin project. Mr Byron du Preez is a D.Phil. student registered at Oxford. Mr du Preez is working on a detailed study of leopard spatial ecology and social behavior in Bubye Valley Conservancy. His D.Phil study investigates the impact of trophy hunting on a closed/fenced population.

The Zambezi Society (ZAMSOC**),** an established conservation NGO that has previously undertaken assessments of the sustainability of leopard trophy hunting, has initiated the National Strategy for leopard conservation and brought together the partners for the project. ZAMSOC liaises closely with the Zimbabwe Parks and Wildlife Management Authority research staff, local stakeholders, will organise and run technical and management workshops, coordinate permissions and logistics for surveys, maintain the project website and disseminate results and information. ZAMSOC is the recipient of all host country DI funding.

Roseline Chikerema-Mandisodza, a Senior Ecologist in ZPWMA Scientific Services was seconded to ZAMSOC for the duration of the project and fulfilled a coordination and liaison role. Mr Peter Musto (Zamsoc Projects Officer) has been responsible for facilitating, co-ordination and running field surveys.

Zimbabwe Parks and Wildlife Management Authority (ZPWMA), is the government wildlife management authority responsible for management of protected areas and biodiversity, sustainable use of wildlife, population monitoring, and evaluation of CITES allocated quotas and other wildlife quotas. ZPWMA has commissioned this project and assigned a staff member to the research to facilitate and co-ordinate research, permission and compilation of data. ZPWMA are the management authority responsible for formulation of policy and implementation of CITES legislation. Thus, recommendations of this project can be translated into changes to policy and management. ZPWMA will provide access to official government records and databases. Staff time will be made available in CITES office, hunting and administration offices, permits office, scientific services, regional offices and national parks. ZPWMA will not receive direct funding. Roseline Chikerema-Mandisodza (ZPWMA, Senior Ecologist-Scientific Services), has been assigned to work on the project and has office space in the ZAMSOC office. The project has contact with and liaises with other projects working on leopards and other large carnivores. We anticipate collaborations arising from these contacts.

The organogram below sets out the operational structure of the project.
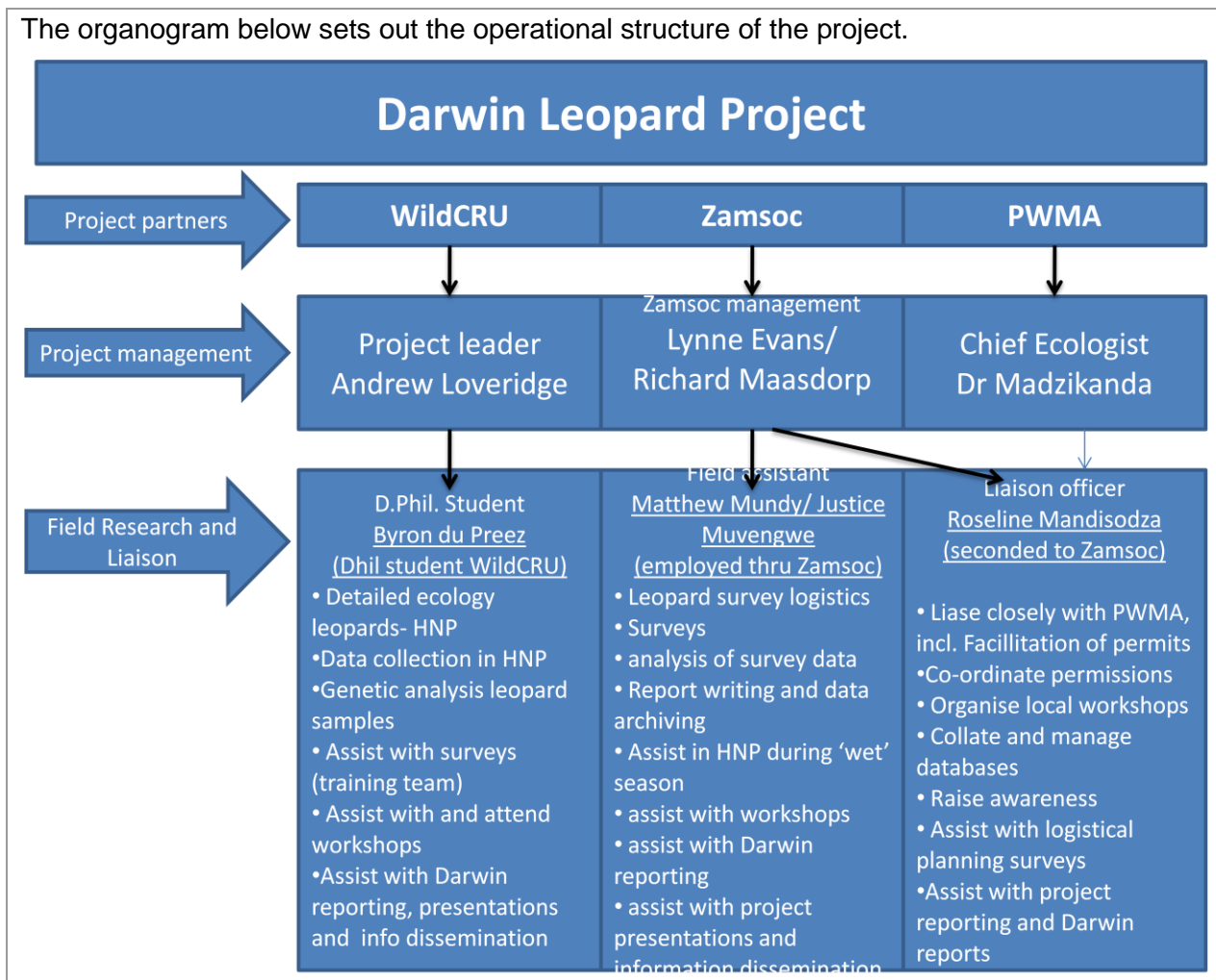
4 Project Achievements

4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The goal of this project was to promote leopards as ecological flagships to reduce loss of biodiversity in whole ecosystems and as components of biodiversity to be sustainably used to generate revenue to benefit people. The project was able to highlight to wildlife authorities, professional hunters, photographic safari operators and other stakeholders within the country the need to monitor leopard population trends to ensure that levels of utilisation remain sustainable in relation to population size and the importance of future monitoring of population trends. Project staff (particularly R. Chikerema-Mandisodza) have also been integral in facilitating workshops and meetings, in particular a CITES facilitated Non-detriment finding workshop aimed at assessing the conservation needs and status of the species as a preamble to forming an NDF determination by the Parks and Wildlife Management Authority. This project's results, along with other stakeholder input, helped to inform this process and highlight management needs and gaps in knowledge.

4.2 Outcomes: achievement of the project purpose and outcomes

Project purpose

The project purpose was 'to collect ecological and management data to support a National Leopard Management Strategy and to build local and regional consensus to create and implement a conservation strategy to manage leopards and their habitats on a sustainable basis'. The project has made significant strides in gaining a detailed understanding of the distribution and size of leopard populations in Zimbabwe as well as of the factors that may determine population size and viability. A key output has been a series of baseline surveys of leopard populations that will inform current management and serve as a foundation for future assessment of population trends.

At the policy level this project did not achieve as much as had been hoped for, and in retrospect these aims may have been overly ambitious. However, significant strides were made in drawing attention to the need for sustainable management for leopards in Zimbabwe. This is likely to lead to further progress in implementing a more sustainable approach to setting quotas for leopard, based upon rigorous population data.

Furthermore, as part of improving and designing management strategies for leopards, the project has been engaged in the CITES non-detriment finding (NDF) process for this species. This is a crucial step in putting in place sustainable hunting practices in the country. The general consensus is that the current CITES quota of 500 leopard exports per year should be revisited to verify whether this is in fact sustainable for the species.

Project outcomes

Leopard population surveys

This project provided the first ever baseline leopard population data for many of the most important protected areas within Zimbabwe. This provides important information for wildlife managers to set hunting quotas sustainably on the basis of population size. In addition these surveys provide a starting point for future surveys designed to detect population trends over time. Population trend rather than finite population size is critical information on which wildlife managers should base their decisions. Survey sites were chosen based on areas identified as being important for leopard conservation in the county and covered a range of land-use areas ranging from fully protected National Parks, Safari Area, Communal Lands (Campfire Areas) and conservancies where leopards are trophy hunted

The survey method used by this project (spoor surveys) was chosen because it is relatively cheap and simple to implement and requires little training and expertise (aside from traditional tracking skills) and can thus be used to provide indices of population size over time. The project has provided the necessary training to wildlife managers to independently implement these surveys in the future. It is likely that ongoing engagement by the project PI (Loveridge), Zamsoc and research staff within PWMA will facilitate future survey work.

Surveys were undertaken at the following sites, largely by the Darwin Leopard Project survey teams, except for those sites marked '*' which were undertaken in collaboration with research teams based in these areas.

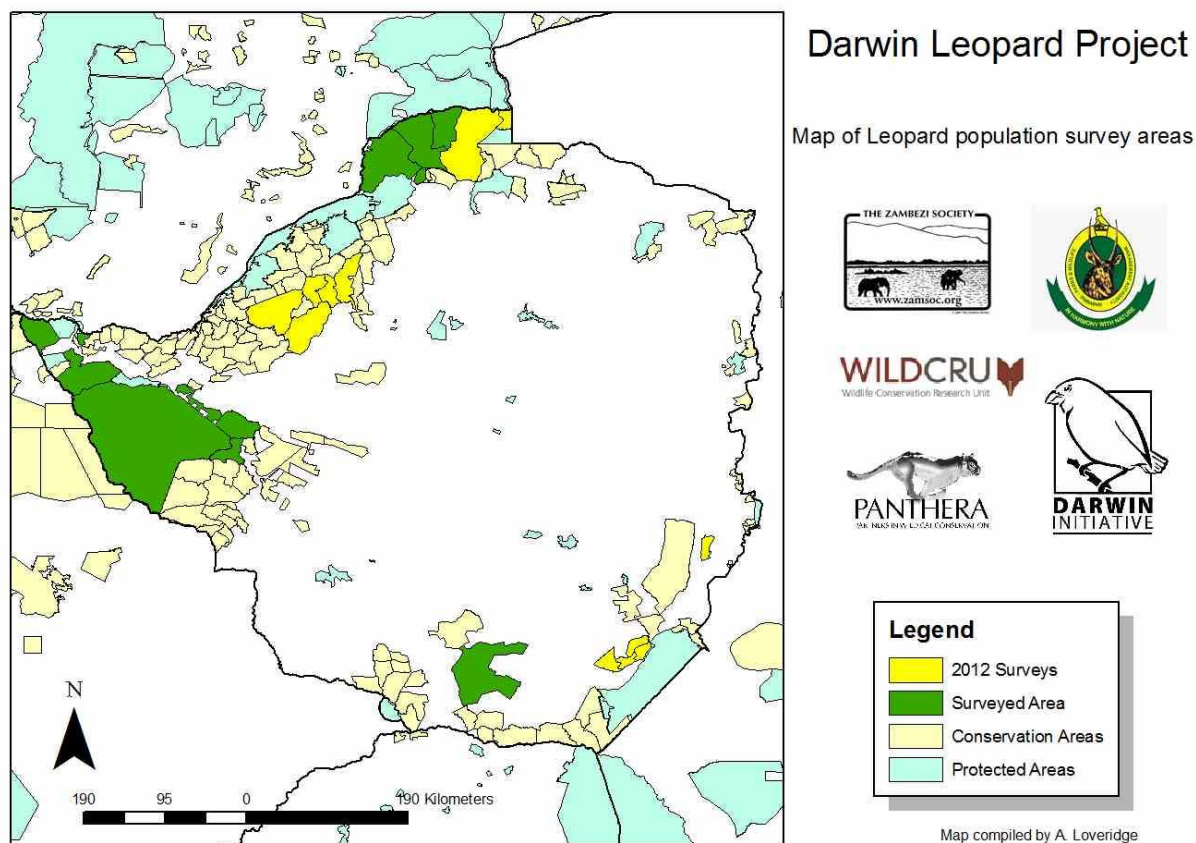The map below shows the survey areas covered between 2010 and 2012.

Figure 1: Map showing 2012 Leopard spoor survey areas

Western Region

Matetsi Safari Area

Hwange National Park (4 sites in 15 000km^2 Park)

Gwaai Intensive Conservation Area

Sikumi and Gwaai Forest

Tsholotsho Communal Land (Campfire Area)

Hwange Communal Land (Campfire Area, Chief Mvuthu's area)

Northern Region

Mana Pools National Park

Rifa and Urungwe Safari Areas

Chewore North Safari Area

Urungwe-Mukwichi Communal Land (Campfire Area)

Dande North and South Safari Areas

South-East Lowveld

Bubye Valley Conservancy

Save Valley Conservancy*

Malilangwe Conservancy*

Chipinge Safari Area

Gonarezhou National Park*

Baseline surveys to estimate leopard population size were undertaken at 18 sites, identified by PWMA and project staff as being important for conservation and management of leopards. These areas included three National Parks, seven Safari Areas, four Conservancies and three community areas. These surveys provide a starting point for future monitoring programmes for the species as survey routes are mapped and repeatable and repeat surveys can be undertaken relatively cheaply in the future to provide comparably data. The survey data provides the opportunity to assess key factors determining the presence of leopards. A pilot analysis (described in the output section) suggests that factors most influencing leopard presence are broad regional abiotic factors, human population size and the presence of competing carnivores (largely lions).

Detailed Study of Leopard Ecology

Detailed studies of leopards are rare because leopards are a cryptic and elusive species that are logistically difficult and time consuming to study. To address this paucity of ecological information a three year study of leopards was undertaken on the Bubye Valley Conservancy (BVC), led by WildCRU D.Phil. Student, Byron duPreez. BVC is a private conservancy of 3 600km^2, used primarily for high end trophy hunting safaris. Leopards are a key species in marketing safaris in this area. This study employed GPS collars to determine leopard (and lion) movements within the study site in relation to both competing carnivores and trophy hunting offtake. Intensive camera trapping (both baited and passive methods) was used to provide population estimates and provide information on leopard population demography. Population estimates derived from camera trapping were also intended to verify simultaneous estimates derived from spoor transects at this site. In addition data were collected on diet, habitat use and interactions with other species in the sympatric large predator guild were obtained and contribute to knowledge of leopard habitat requirements which is an important factor in population management.

BVC is a medium to high nutrient ecosystem that is primarily dominated by basalt soils and mopane woodland habitat. The area has a low mean annual rainfall of approximately 300mm. Research was conducted between May 2010 and September 2012 by a team consisting of a D.Phil. research student, at least one assistant, and one full-time local tracker. Additional help was sought from time to time as the situation demanded.

Between 2010 and 2012 18 leopards and 11 lions were captured and fitted with GPS/Satellite radio-telemetry collars that were programmed to record GPS fixes every hour on the hour – providing high resolution simultaneous spatiotemporal data on the movements and habits of both species in relation to one another.

75 camera-traps were deployed in 6 capture-recapture surveys in 2 different study sites between the years of 2011 and 2012 during which there was a major change to the conservation and management of one of the sites, when lions were introduced for the first time. The leopard population in this site was monitored before and after this introduction to assess

the effect that the introduction on lions would have on their behavioural ecology. Another, neighbouring, population of leopards coexisting with a stable lion population was monitored simultaneously to provide a level of control.

Between the surveys of 2011 and 2012 whilst the cameras were not being used for the core research in the Bubye Valley Conservancy, they were loaned to Wild Horizons in Victoria Falls to conduct a camera-trapping survey on their leopard population.

Spoor transects were conducted annually in BVC from 2009 – 2012, providing baseline data on the leopard and lion populations in the study sites. Several local Zimbabwean researchers and ecologists were trained by the DI Leopard Team on how to plan, conduct and analyse the results of these surveys, with the goal that they would conduct autonomous research. Indeed, several of the researchers trained went on to conduct the national spoor transect surveys as part of the Darwin Initiative Leopard Project research.

Compilation of leopard management data

Harvest and hunting quota data have been compiled for the key leopard populations for the project period to provide an overall assessment of sustainably of utilisation. These data are also being used in the analysis of the factors that affects the size and viability of leopard populations, in particular the harvest in relation to population size is potentially an important factor in determining population viability of many long lived species. In addition we have compiled quota and harvest data for lions and spotted hyaenas which are key competitors within the carnivore guild and could potentially also have an impact on leopard populations.

Management meetings, workshops and regional collaboration

A number of stakeholder meetings were held to bring together research and management expertise from within Zimbabwe. The first meetings took place in Oxford. Mrs Chikerema-Mandisodza was flown over to begin the planning process and also to familiarise herself with WildCRU. Meetings to plan the initial stages of the project took place between Mrs Chikerema-Mandisodza, Mr duPreez and Dr Loveridge over the period of a week. The first workshop was held in August 2011 in Marula at Stone Hills Lodge. This meeting comprised of 10 research scientists . The second meeting was held in Bulawayo on the 17 August 2011 (see workshop meeting report, attached), this was hosted by the Parks and Wildlife Authority and facilitated by Dr A. Loveridge and attended by 18 researchers, ZPWMA ecologists and managers. A key recommendation of this meeting was to hold a non-detriment finding workshop facilitated by a CITES approved facilitator. This took place in November 2012, facilitated by the Head of TRAFFIC, Southern Africa (Dr David Newton) and provided the preliminary stages of the CITES NDF process for leopards (see attached report).

Wider collaboration has been achieved with other researchers working in Zimbabwe as follows:-

- Mr Dusty Joubert (undertaking leopard monitoring in Save Valley Conservancy)

- Dr Rosemary Groom (carnivore research in Gonarezhou National Park and Save Valley Conservancy)

- Ms Tanith Grant (leopard study in Marula District, Matabeleland South

- Roger and Jess Parry (Victoria Falls Wildlife Trust)

- Dr Guy Balme and Dr Peter Lindsay (Panthera and Leopard research in KwaZulu Natal).

Extensive collaboration has been achieved with hunting operators in the various safari areas and conservancies surveyed by the project, with logistical assistance and support provided by staff on the ground. Support and assistance was also provided to survey staff undertaking leopard surveys by PWMA field stations and staff.

Training and capacity building

Training in survey methods (primarily spoor transects) has been provided for 21 field staff from field stations around Zimbabwe. Much of the training occurred when survey teams worked with field staff. In addition a training workshop to provide in depth training on population surveys was help from 9th-13th of May at Hwange Main Camp. This workshop trained twenty-one PWMA, Forestry and Rural District council field staff as well as a number of staff from local NGOs.

The twenty one participants were trainee ecologists and rangers from Zimbabwe's National Parks, Safari Areas and Forestry Commission Areas, CAMPFIRE representatives from Rural District Councils, and staff from the Zambezi Society itself. A combination of classroom lectures (pictured left) and field work (pictured right) were used.

The following areas were covered:-

- Overview of leopard population biology
- Distribution of leopards in Africa and Zimbabwe
- Overview of techniques used in monitoring carnivores
- Why study/monitor leopards?
- Discussion on use of spoor as a technique to monitor animals including leopards
- Differences between leopard spoor and other cat spoor
- Leopard identification and aging - in the field
- Aging and sex determination from spoor
- Trophy size estimates using spoor
- Spoor data collection
- Spoor data analysis

A key area where training was facilitated by the project was by arranging for two senior ecologists from PWMA (Mr Godfrey Mtare and Mr Edwin Makuwe), to attend the Postgraduate diploma course in International Wildlife Conservation Practice at the Recanati-Kaplan Centre at Oxford (see www.wildcru.org/courses/diploma). Both men passed the course (Mr Mtare has since gone on to complete a Masters degree) which focuses extensively on conservation and management of large felids. Both Mr Mtare and Mr Makuwe have returned to Zimbabwe and both are based in the field and in a strong position to utilise their new skills.

In addition to training and capacity building the project undertook a public outreach campaign. Leopards are frequently confused with other predator species (serval, cheetah and sometime spotted hyaena) and this leads to over-estimation of numbers and also incorrect identification of problem causing animals. The project produced and printed posters in English, Shona and Ndebele. These were distributed to schools, provincial and ZPWMA offices across the country. Samples of these posters accompany this report.

4.3   Outputs (and activities)

Leopard population surveys

Table 1 presents details of the leopard surveys undertaken by the project and project partners. Sites marked (*) are those undertaken by project partners outside the remit of the main project, but where data were provided for the purpose of analysis. In total 48123km^2 of important leopard habitat were surveyed. This constitutes 12.3 % of the land area within Zimbabwe and the most important leopard areas. Surveys were undertaken on transects totalling 14400km in length (with each transect being run on two or more occasions). These survey routes have been logged for use in any ongoing survey work. These are measures of the significant amount of effort that was put into leopard surveys for this project.

Table 1: Leopard survey sites

Survey Area	Year	Region	Area (km^2)	Land Use	Transect km
Chirisa&Sengwa	2012	Central	1713	Hunting	453.4
Chizarira	2012	Central	1948	Protected	534.9
Omay	2012	Central	1865	communal	466.16
Chewore North	2012	Northern	1648	Hunting	399.8
Dande	2012	Northern	1155	communal	443.1
Hurungwe (Nyakasanga+Rifa)	2011	Northern	1709	Hunting	732.8
Mana pools	2011	Northern	1287	Protected	469.4
Mukwichi	2011	Northern	1853	communal	386.6
Bubye Kwalusi	2010	South East	480	Hunting	165.8
Bubye North	2010	South East	1071	Hunting	307.8
Bubye South	2010	South East	1394	Hunting	432.8
Chipinge	2012	South East	261	Hunting	126.9
Gonarezhou*	2009	South East	4965.9	Protected	490.4
Save North*	2006	South East	1753	Hunting	565.1
Save South*	2006	South East	834	Hunting	387.1
Malilangwe*	2010	South East	476.5	Hunting	120.6
Gwaai Valley	2007	Western	927	Hunting	841.4
Hwange MC	2009	Western	1737	Protected	486
Hwange Robbins	2008	Western	1699	Protected	436
Hwange Wilderness	2008	Western	1817	Protected	430
Hwange Central	2012	Western	5676	Protected	674
Hwange Southern	2012	Western	2513	Protected	500.8
Matetsi	2008	Western	1934	Hunting	1095
Ngamo forest land	2008	Western	1386	Protected	488
Tsholotsho	2010/2011	Western	1397	communal	1275
Hwange- Vic Falls	2011	Western	392	communal	269.9
Marula*	2010	South East	2674	communal	610
			48 123.4		**14 400**

The map below (Figure 2) presents the results of population surveys across all study sites and shows leopards per 100km2. In general, as indicated in the figure, high densities were found in the North and South East of the country corresponding to high nutrient soils and well protected wildlife areas. Populations in the West of the country tended to be lower density, likely because of low nutrient, dystrophic soil systems. Overall leopard populations were higher in protected areas and low in human dominated systems (Communal Lands).
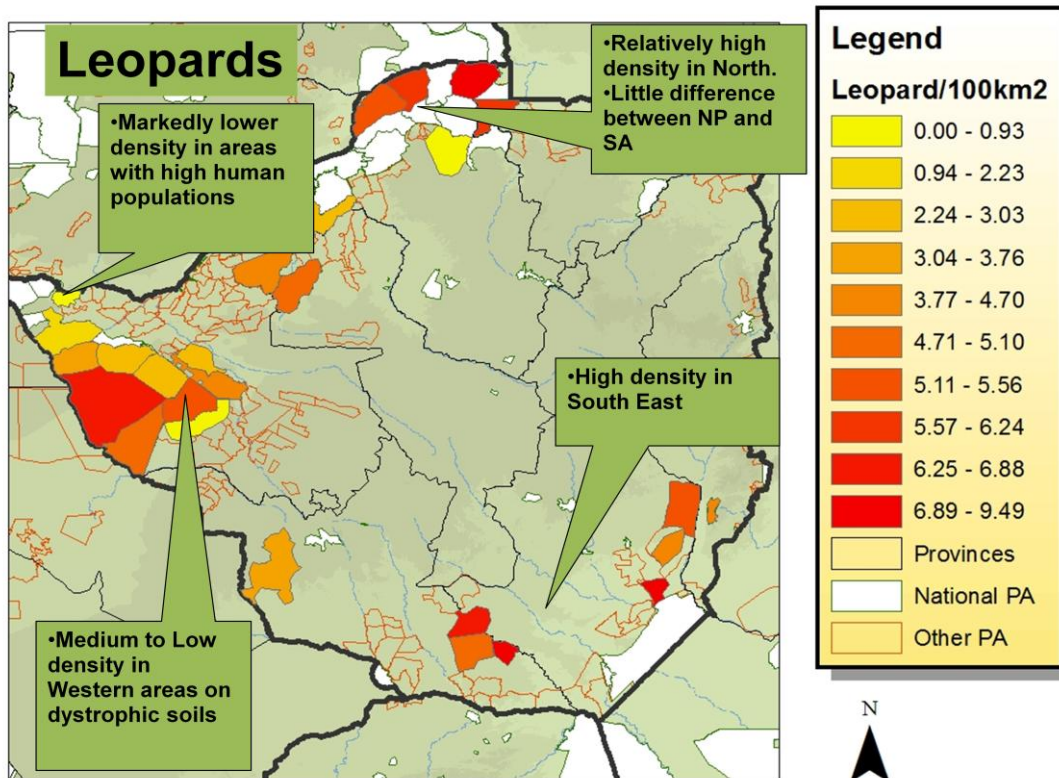
Figure 2: Map showing leopard population density in surveyed areas

Using the Akaike Criterion approach we examined factors that could potentially influence leopard distribution and population viability. Key factors were considered to be Human Appropriation of Net Primary productivity (HANPP), competing carnivores, Regional ecology, hunting pressure, Soil nutrient status and Rainfall. HANPP was closely correlated with human population density so that later was excluded from models to limit confounding correlation. The most highly weighted model (Table 2; 3 and 4) included the effects of HANPP, potential competitors within the carnivore guild and regional variation. Surprisingly the effects of trophy hunting were not included in any of the top weighted models. It is possible that use of quota rather than harvest data in the models may have limited the importance of this effect in the model, however harvest data were not available at the time of analysis. These models will be re-run with harvest data substituted for quota data. Nevertheless, human impact (HANPP/ human density) appears to have the most profound effects. The effect of competitors also appears to have a strong effect on leopard population density, suggesting that there may be an intriguing situation were in areas where lions are heavily hunted (and populations are therefore depressed) may improve the viability of leopard populations (Figure 3). Further data would help to disentangle these issues and steps are being taken to source data from extra sites. In particular sites where human impacts are high would be valuable (Figure 4). The project largely focused on survey sites that were important for leopards and these are in general well protected conservation areas with low human presence. These data are currently being written up for publication.

Model	Deviance	AICc	Delta	Weight
HANPP + Hyaena + Lion + Region	77.14	131.42	0.00	0.28
HANPP + Hyaena + Region	95.34	133.37	1.95	0.10
Hyaena + Region	109.91	133.75	2.33	0.09
Lion + Hyaena + Region	97.93	134.12	2.70	0.07
HANPP + Region	111.76	134.22	2.80	0.07
Hunting + Hyaena + Region	102.82	135.48	4.06	0.04

(+ 28 further models weighted < 0.04)

Table 2. Top weighted AIC models

Factor	Coefficient	SE	z value	Pr(>|z|)	P
Region (intercept)	4.587516	1.692628	2.606	0.00916	0.001
Human impact	-1.345634	0.623206	2.064	0.03897	0.01
Trophy hunting	-0.406534	0.541359	0.715	0.47488	n/s
Hyaena density	1.615015	0.649844	2.381	0.01727	0.01
Lion density	-0.960855	0.501222	1.813	0.06983	0.05
Soil nutrient	-0.069419	0.460697	0.143	0.88640	n/s
Rainfall	-0.048322	0.636411	0.072	0.94260	n/s

Table 3. Results of model averaging, showing that region, human impact and competitors remain the most important factors determining leopard density.

Variable	Relative importance
Region	1.00
Hyaena Density	0.83
Human Impact	0.70
Lion Density	0.56
Trophy hunting impact	0.17
Soil Nutrient	0.12
Rainfall	0.12

Multiple R-squared: 0.7036,   Adjusted R-squared: 0.6189 F-statistic: 8.308 on 6 and 21 DF, p-value: 0.0001091

Table 4: showing the relative importance of variables in the model in determining leopard population size, Region, Competitors and human impact were all relatively important. Trophy hunting and abiotic factors contributed less weight to AIC models
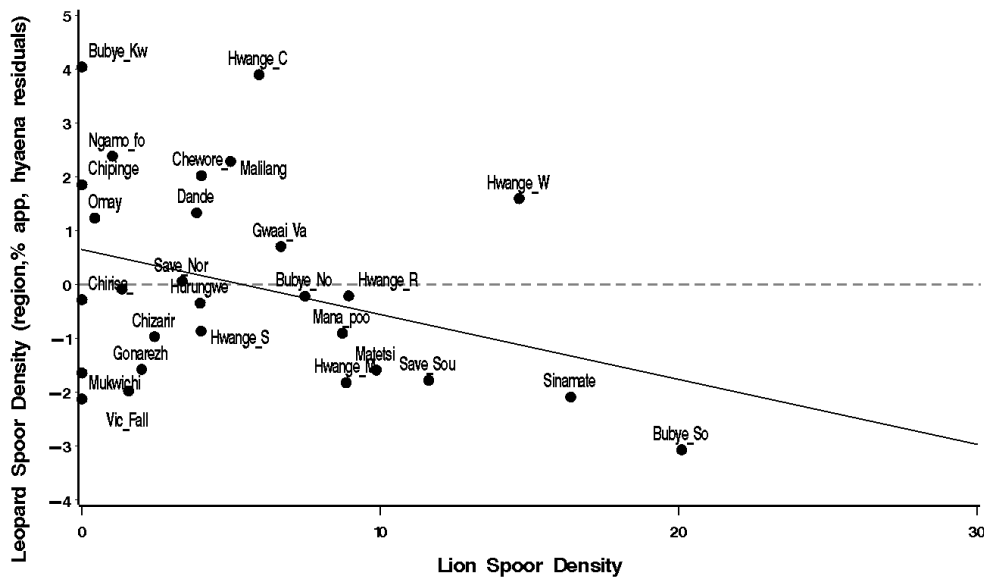
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Figure 3: The relationship between Lion spoor density (a surrogate for population density) and variation in leopard spoor density.
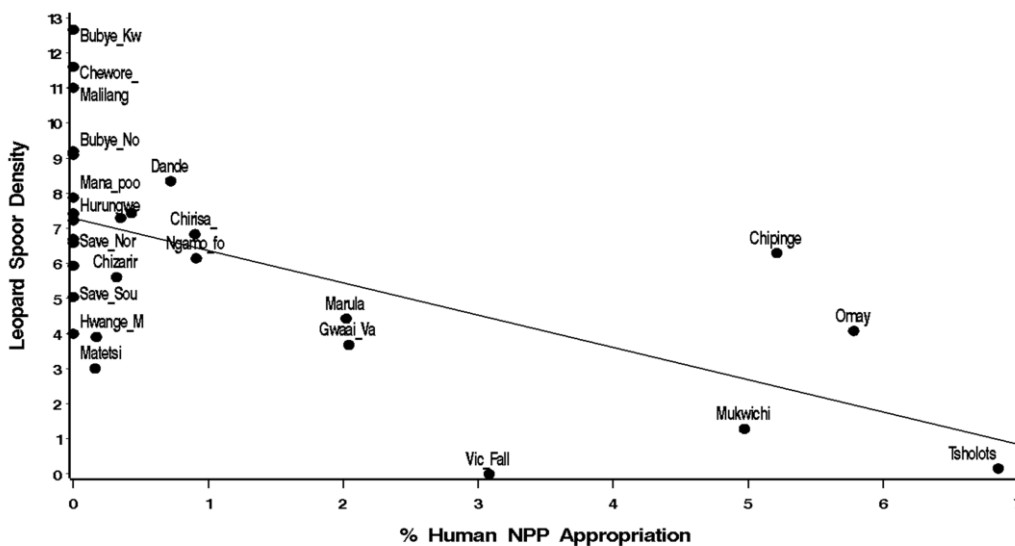

Figure 4: The relationship between leopard population density and human impact. Lower leopard densities were found when human impact was high.

Detailed field study of leopard population ecology

In total, over 150,000 GPS fixes from the radio-telemetry collars on both leopards and lions were recorded. These will be investigated for interaction between and within the species, and the outcome of these interactions. The GIS data also provides accurate details on species' home-ranges and territories, and the seasonality of these, as well as habitat preference and utilisation, survival rates, and habitat mediated behaviours.

Over 40,000 images of leopards were recorded in the 6 camera-trapping surveys carried out between 2011 and 2012. The cats in each of these photographs were individually identified and named, based on their unique pelage patterns. The results were then analysed using capture-recapture models that take the ratio of known ('marked') leopards to previously unmarked individuals, and repeat this over many occasions in order to estimate population abundance for

a given area. The more individuals that can be captured at each occasion, resulting in fewer unknown animals on subsequent occasions, the more accurate the results. We implemented a novel method of camera-trapping leopards using baits in order to attract them to the cameras so as to increase both capture probability and capture frequency. We tested this method against the traditional method that uses paired cameras carefully sited to capture both sides of the leopards as they naturally wander around their territory. This 'passive' method requires as much skill as luck, and whilst it has proven valuable in the past, we saw an opportunity for improvement. A comparison of these camera-trapping methods carried out on the same population of leopards in the same season shows that several resident leopards that were captured in the baited cameras are missed using the traditional passive set-up, and none of the cubs in the population are captured. Several cubs were captured on many different occasions at the baited camera-trap sites. This is an important demographic, and therefore result, as it indicates the health and stability of the leopard population, and may reflect and be affected by management decisions.

One collared male leopard was shot by trophy hunters during the course of the field work, and this provides important information on the effect of trophy hunting on leopard population demographics and behaviour, as the reactions from the leopards in nearby territories were monitored. An additional 2 collared leopards were killed by lions, and another by a leopard, indicating the importance and prevalence of intra-guild competition, and the need for solid data on this interaction so that management is able to make well informed decisions.

The data collected during the Darwin Initiative Leopard Project field work will be published as scientific papers in peer reviewed journals.

These will include papers on:

- A comparison between baited and passive camera-trapping methods
- Leopard ecology in the Bubye Valley Conservancy
- The effect of intra-guild competition on leopard behavioural ecology
- The effect of trophy hunting on leopard behavioural ecology
- Population management model

The leopard is a flagship species, but more importantly, it is an umbrella species. Leopards therefore have the ability to conserve other species by proxy. Researching relevant data on leopard behavioural ecology accurately is vital to sustainable management of the population, but also ensures conservation of a host of non-target species, as long as land and habitats are protected for trophy hunting of leopard. A reasonable regional hunting quota, based not only on abundance, but on the overall effect of removal at a population level, will ensure the long-term availability of leopards as a trophy species, and secure their future conservation status.

Results of the annual spoor transects and camera-trapping surveys were used to inform BVC management when setting trophy hunting quotas for lions and leopards. The lion quota was increased sustainably, and the leopard quota reduced based on the results of this research.

The results of this research were presented in Harare 2012, at a CITES Non-Detriment Finding workshop on leopard trophy hunting in Zimbabwe, during which a draft management plan for the future hunting off-take of leopards in Zimbabwe was formulated.

This study helped inform and shape several other local leopard research projects. We also planned and coordinated the National Leopard surveys, which is the first rigorous attempt to census Zimbabwe's leopard population.

Workshop and meetings

The project has organised several workshops involving key stakeholder groups and these have functioned to raise awareness of the need for improved management of the species and also provided opportunities for information exchange. Meetings undertaken are outlined in the section above and copies of workshop reports are provided.

Training and public outreach activities

Training was undertaken throughout the project, much of it as on the job practical training of ecological staff at ZPWMA stations in protected areas. In addition a formal training workshop was held and attended by ZPWMA research ecologists from across the country. Over the course of the project two Zimbabwean ZPWMA ecologists received post-graduate diplomas from Oxford University and one Zimbabwean is currently completing a DPhil. This training was all directly facilitated by the Darwin Initiative project. Posters aimed at increasing public awareness of leopards were widely distributed in the country as part of a public awareness campaign.

4.4   Project standard measures and publications

See table in Annex 4

4.5   Technical and Scientific achievements and co-operation

CITES Preliminary Non-detriment Finding (NDF) workshop

A key technical outcome of this work, largely resulting from attention to the issue of leopard sustainable use highlighted by ZPWMA, this project and other stakeholders (for instance Panthera Foundation), was a preliminary Non-detriment Finding workshop, held under the auspices of the CITES authority within Zimbabwe. The full report for this workshop accompanies this report and provides full details of the NDF process and workshop. This workshop was convened by PWMA and Panthera to bring together all stakeholders in leopard conservation and utilisation. The workshop, facilitated by Dr David Newton (head of TRAFFIC, southern Africa) brought together expertise from throughout the country. The radar chart (Figure 5) below summarises the findings of the workshop. Interpretation of the diagram suggests that points of information that fall far from the centre represent areas of uncertainty (and/or low confidence in the sustainability of harvest) that could result in a detriment finding by the CITES authority of the country. There was significant debate as to the real state of knowledge and consensus of the workshop was that a qualified or precautionary non-detriment finding be made, contingent on further management actions and research being carried out. The current CITES quota was to be continued for a further three years.
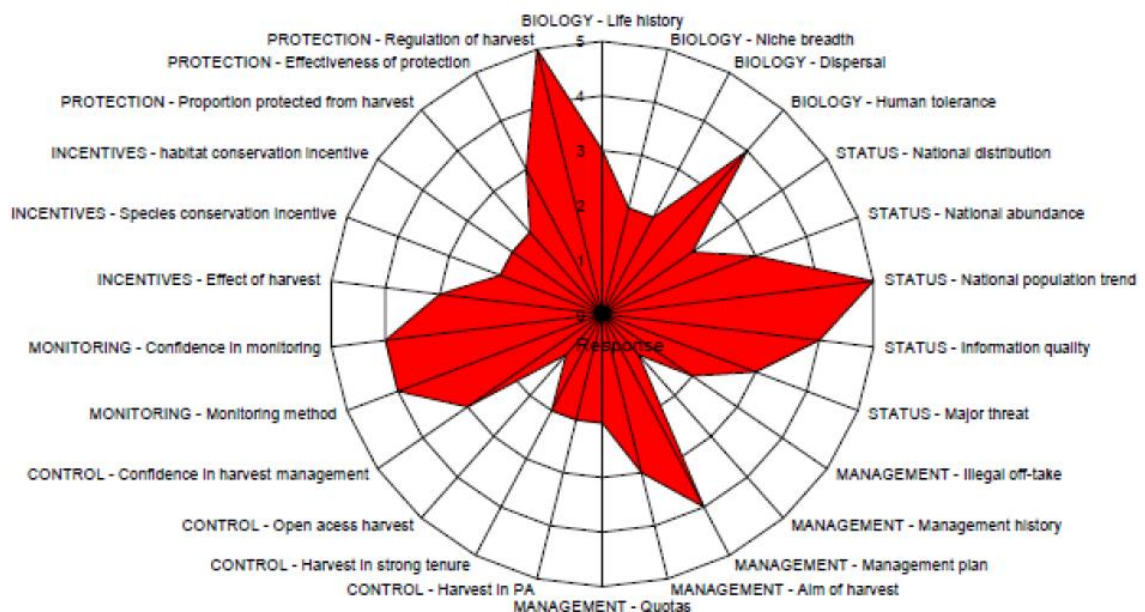

Figure 5: Radar chart showing the results of the NDF determination workshop (taken from NDF workshop report).

4.6   Capacity building

As outlined above the project undertook the following training activities

- Formal training of 21 ZPWMA / Forestry / Rural district council staff in survey methods. This was to enable local ecologists to undertake surveys in their areas of responsibility as part of the DI survey team and to continue with monitoring in future

- Practical on-the-job training provided to ZPWMA staff participating in surveys. Provision of this training ensures that staff on the ground are familiar with survey methods and are able to repeat baseline surveys in future

- Two ZPWMA ecologists (G. Mtare and E. Makuwe) received training at WildCRU, Oxford and qualified with Post-graduate diplomas (see www.wildcru.org/courses/diploma). Both ecologists have returned to Zimbabwe and are still employed within ZPWMA and are active in conservation management.

- A DPhil student (B. duPreez) is currently writing up a DPhil. Thesis at Oxford, having competed all the field data collection under the auspices of the project. Mr duPreez intends to return to Zimbabwe and contribute to Zimbabwean wildlife management and conservation

4.7   Sustainability and Legacy

In terms of legacy one of the key achievements of this DI project has been the baseline surveys for leopards and other carnivores in all the most important protected areas in Zimbabwe. This is the first wide-scale systematic survey of its kind. The surveys covered around 12% of the total area of the country and have provided baseline information for managers going forward. Should these surveys be repeated periodically by wildlife managers they will provide crucial trend data for many of the carnivore species in the country providing a basis for population trend assessment in future management. This will contribute to sustainability of wildlife resources in the country and be an outstanding legacy to the DI project. Further surveys, involving all the current project partners are planned for 2013, suggesting that project partners are likely to stay in touch and continue to work together. Project resources will continue to be used for their original purposes as part of ongoing research undertaken by WildCRU and continue to contribute to assessment of and research into sustainability and conservation of natural resources in Zimbabwe

Meetings and workshops organised and attended by the project have been important in bringing stakeholders together to discuss conservation and sustainable use of leopards in the country. Workshops (particularly the NDF process) have highlights gaps in knowledge and areas where the precautionary principle should be applied. It is hoped that attention drawn to the need for sustainable management of the species will have an influence on future management policy implemented by decision makers within the country's wildlife management authority.

5   Lessons learned, dissemination and communication

Throughout the project we have involved as many stakeholder groups as possible in dissemination of information. There has been a very enthusiastic response from other researchers in the country and many have contributed data to the project which has boosted the data available for analysis of factors influencing leopard distribution. ZPWMA ecologists have been included in training, planning and implementation of surveys and in all workshops. There is thus wide awareness of the DI leopard project in Zimbabwe. In addition project news has been posted on the Zambezi Society website (www.zamsoc.org). Talks on the project to stakeholder groups (such as professional hunting groups) have been given at suitable occasions and project partners are planning a final seminar presentation for mid 2013 to feedback the key results of the survey to Zambezi Society members and other stakeholders.

Scientific outputs of the project are in the process of being prepared. Data analysis from the detailed study and surveys is currently being undertaken and papers will be submitted for peer review during 2013.

Possibly the key lesson learned by the project is that changing management policy is a very slow process and three years is not enough to fully achieve this. However the project has highlighted the need for revision and reassessment of leopard management with Zimbabwe and this has been communicated to stakeholders and there is wide commitment within ZPWMA to achieving this.

5.1 Darwin identity

The Darwin project formed a distinct project (The Darwin Leopard Project) with a clear identity recognised by project partners and by other stakeholders within Zimbabwe. The Darwin Initiative for Biodiversity Logo was used on all project outputs and reports wherever possible. Logos were also used on project websites. There was recognition within the host country that the Darwin Initiative for Biodiversity funded much of the Darwin Leopard Project research and activities.

6 Monitoring and evaluation

Annex 1 has been completed and activities against project outputs and appropriateness of project indicators noted.

Output 1 was to undertake population surveys across Zimbabwe to ascertain leopard population distribution and abundance. Indicators of success were to complete surveys for leopards in at least 17 sites and to compile these data for analysis. 18 survey sites were completed and data compiled and presented to managers and ZPWMA decision makers at a workshop at the end of 2012.

Output 2 was to set up a detailed behavioural study of leopards to assess potential impacts of hunting and other important factors on leopard population dynamics. The study was undertaken at Bubye Valley conservancy from 2010 to 2012. As described above, this study successfully collared 18 leopards and undertook three camera trap surveys (providing demographic and population data). These data, once analysed, will contribute a better understanding of leopard population dynamics and the factors (including hunting) that affect leopard populations in protected areas. The data collected for this component of the project meet with the expected indicator of success put forward in the original log frame.

Output 3 was to compile data on past management from historical records, with the indicator success being a database of past management available to managers and policy makers to inform management of the species. We have compiled the hunting quota data for all out survey sites, but much information appears to be missing or unavailable from the official records and this highlights the need to overhaul record keeping within ZPWMA.

Output 4 was for a National management workshop. At the end of 2012 a National Non-detriment finding workshop was help for leopards. This workshop highlighted management needs for the species and came up with necessary activities to ensure sustainable management and better understanding of changing conservation needs of the species. This meeting was attended as far as possible by all identified stakeholders in leopard conservation (ZPWMA managers and ecologists, Conservation NGOs, independent research scientists and the hunting industry). It was originally envisaged that a more formal Management Strategy meeting would be held, however a stakeholder workshop held in 2011 identified that a CITES driven non-detriment finding workshop was crucial for ongoing leopard management and this largely subsumed and superseded the need for the management strategy meeting.

Output 5 was to organise workshops and meetings to facilitate regional collaboration of stakeholders and research scientists. These workshops were held and resulted in the wide and ongoing collaboration amongst stakeholders as well as identification of management needs such as the requirement for a non-detriment finding process to take place.

Output 6 aimed to provide opportunities for training of local field staff in survey techniques and to provide training to local ecologists and conservationists to facilitate ongoing management and conservation work in the country. Indicators were training provided for 25 field staff ,

opportunities sought for enrolment of local students in the WildCRU diploma course and training for a Zimbabwean DPhil. student and other field staff from partner institutions. A training course was held for field staff, two ZPWMA ecologists were enrolled, attended and passed the postgraduate diploma course and one Zimbabwean graduate student is currently completing a D.Phil. at Oxford. These appear to be suitable indicators of the success of the outputs for this component of the project.

The six monthly Darwin reporting schedule provided the project with the opportunity to evaluate progress as part of ongoing reporting. It was not felt that additional monitoring and evaluation was required in addition to this. There has been no external evaluation of this project.

6.1 Actions taken in response to annual report reviews

The last reviewer recommendation (May 2010) was that the Darwin project should be more fully reported on the host institution website, this recommendation was implemented. This was discussed with project partners. It was also suggested that a stakeholder analysis be undertaken. The project has considered carefully who may constitute stakeholder groups and attempts have been made to include all such in meetings and workshops.

7 Finance and administration

7.1 Project expenditure

Expenditure Category	Year 1 and 2*		Year 3		Year 4		Total Grant		
	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	Budget	Expenditure	%
Salaries	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	-12**
Overhead costs	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	+5
Travel and subsistence	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	-4
Operating costs	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	+18***
Capital items/equipment	£XXX	£XXX				£XXX	£XXX	£XXX	-8
Other									
FEC	*£XXX*	*£XXX*	*£XXX*	*£XXX*	*£XXX*	*£XXX*			
Printing	*£XXX*	*£XXX*	*£XXX*	*£XXX*	*£XXX*	*£XXX*			
Total Other	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	£XXX	+6
TOTALS	**£XXX**	**£XXX**	**£XXX**	**£XXX**	**£XXX**	**£XXX**	**£v**	**£XXX**	**-0.5**

* Year 1 and 2 were accounted for together in annual report 2. This was because the project was only finally approved by the DI committee at the end of 2009, almost all of the host country budget was carried forward to year 2.

** & ***Overall, there was a 12% under spend on salaries and 18% overspend on operating costs in the host country. This discrepancy was because some survey fieldwork (spoor surveys) was contracted out to local experts. Staff costs related to these surveys and included in survey budgets have therefore inflated the operating costs and reduced core salary costs, although ultimately approximately the same staff time was invested in the project by contracted field staff as would have been invested by host institution staff.

7.2   Additional funds or in-kind contributions secured

- Toyota Zimbabwe provided a 4x4 vehicle for use on survey sites in the northern region of Zimbabwe

- Funds from the Recanati-Kaplan Trust were made available through WildCRU to purchase 30 additional camera traps for use in the field at the Bubye Valley Conservancy field site. This allowed the introduction of in depth passive camera trapping at the site and a comparison between baited and passive methods of camera trapping for leopards.

- Panthera (via PWMA and Roseline Chikerema-Mandisodza) funded and facilitated the CITES NDF workshop held in Harare in November 2012.

7.3   Value of DI funding

There is very little resourcing available for biodiversity conservation, field survey work or field studies and conservation work within Zimbabwe. Darwin funding was absolutely critical in making this project possible. It is inconceivable that this work could have been carried out to the extent that it has without the crucial support of DI funding. In addition, by covering core costs, the DI grant allowed the project to leverage additional funding and in kind assistance (outlined above) over the life of the project.

Annex 1   Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	Actions required/planned for next period
Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.			
Sub-Goal: Promote leopards as ecological flagships to reduce loss of biodiversity in whole ecosystems and as components of biodiversity to be sustainably used to generate revenue to benefit people.	Leopard populations are stabilised and increase, leopard habitats are conserved, providing protection for other components of biodiversity. Use of species is managed within sustainable limits.	• Non-detriment findings by National CITES Technical Committee submitted to CITES for the species • Future surveys show leopard habitats are better protected and leopard populations healthy	
Purpose To collect ecological and management data to support a National Leopard Management Strategy and to build local and regional consensus to create and implement a conservation strategy to manage leopards and their habitats on a sustainable basis.	Increased understanding of the distribution, viability and previous management of leopard populations and improved motivation, capacity and tools to monitor and manage them.	This project collected both detailed behavioural (through GPS collars and camera trapping), abundance and distribution data (through population surveys) and compiled management information (from historical management records) on African leopards in Zimbabwe. This information has been used to inform reassessment of the management of the species. Training and capacity building has been undertaken to support future monitoring and research work.	
Output 1. National leopard survey provides knowledge of distribution, population viability and wider ecosystem that will inform national management.	Surveys of distribution and abundance of leopards and other mammals undertaken in 12 protected areas, 2 conservancies and 2-3 rural districts councils (years 1 and 2)	Population surveys were carried out in protected areas, safari areas, conservancies, forest land and communal land identified as key areas for leopard conservation. The indicator for this output was appropriate and suggests that the output was achieved by the project	
Activity 1.1 National leopard survey to determine leopard population size and distribution at ~17 sites across the country		Activity was undertaken and completed: 18 surveys were undertaken by the leopard project survey team.	
Activity 1.2, 1 Baseline survey data compiled. Results disseminated, reports to decision makers in management institutions, data inform quota allocation, CITES non-detriment findings		Activity was undertaken and completed and results of the surveys were compiled and presented to managers and decision makers at the workshop in December 2012. These results contribute to the CITES NDF	

		process.
Output 2. Impacts of trophy hunting on behavioural ecology and population viability recognised and incorporated into management during the life of the project and ultimately into policy through a National Management Strategy	Technical knowledge gained in years 1-3 by project scientists on the impacts of trophy hunting on behavioural ecology and viability of leopard populations, and put forward for inclusion in national planning, changes in management and policy	A detailed study of leopard behavioural ecology was undertaken over 3 years by DPhil. Student and project PI. The completion of this study is an indicator of the achievement of output 2. Valuable insights have been gained on behaviour of the species within a hunting area, including interactions with other competitors within the carnivore guild (which may have profound effects on leopard social and population dynamics).
Activity 2.1 Detailed ecological study to measure the demographic impacts of trophy hunting, undertaken at hunted and un-hunted study sites, results inform management strategy		Detailed study undertaken with 18 leopards radio-collared and 3 camera surveys completed (>150 000 photos of leopards taken). Results inform management at the conservancy and more widely.
Activity 2.2 Results disseminated, published in relevant peer reviewed journals, lessons inform management of leopards and setting of hunting quotas		The data collected by this study are currently being analysed as part of a DPhil. Thesis write-up. Data will be written up as 3-4 scientific papers and submitted for peer review.
Output 3. Trends in past management and utilisation identified and used to inform management during the life of the project and incorporated into the National Management Strategy	Database of historical leopard management and utilisation compiled by project staff by year two	Historical records of management leopard management were accessed and compiled where possible. Activity highlighted possible shortcomings in the current record system.
Activity 3.1 To inform future management, data on historical leopard hunting and management trends complied, database analysed for trends in quota allocation, trophy size, off-take		Where possible hunting quotas and off-takes have been compiled from historical management records. Quota data were compiled for all the survey sites in order to carry out analysis factors influencing leopard population size and distribution. Harvest data were unavailable, but are now being compiled.
Activity 3.2 Identify shortcomings of system and future management requirements. Propose solutions as part of National Strategy based on field/ historical data		A complete analysis of historical management data was not feasible as many records are missing or unavailable. Regional or locational analysis may however be possible and this is being explored.
Output 4. Sustainable management of leopard populations and leopard habitats implemented through National Leopard	National Leopard Management Strategy workshop held to devise strategy, in consultation with and attended by all stakeholders in year	Workshops were organised and attended by project staff, local conservationists, ZPWMA ecologists and managers and other stakeholders (eg hunting industry, local councils and conservation organisations). The final workshop contributed to a preliminary CITES non-detriment finding for leopards as well making significant management

Management Strategy	three	and conservation recommendations for future action. Given the urgent need (identified at a stakeholder and research workshop in 2011) for an NDF assessment a NDF meeting superseded the planned Management Strategy meeting.
Activity 4.1 Design a stakeholder driven National Leopard Management Strategy through participatory workshop		A participatory workshop (CITES NDF) organised and run by Roseline Chikerema-Mandisodza.
Activity 4.2 Approval sought by project partners from Minister for Environment & Tourism for National management strategy. Strategy endorsed		This activity has not been undertaken and it may have been over-ambitious to expect to achieve this within a three year project period as major policy change is relatively slow
Output 5. Improved regional collaboration and technical exchange between conservation managers and scientists in southern Africa	i) Regional technical and management meetings organised by the project (years 1 and 2). ii) Potential regional collaborations set up to enhance project impact	A number of meetings and workshops were held to facilitate exchange of information and technical knowledge between managers and research scientists. Significant collaboration between research scientists working on large carnivores was achieved and this has resulted in additional data being acquired for analysis (indicator i and ii). While some experts and scientists from beyond Zimbabwe attended workshops the project did not manage to include all experts from the wider region and this may have, in practice, been beyond the scope of what could be achieved (indicator ii).
Activity 5.1 Two Regional technical workshops, attended by regional and local scientists, conservationists and managers, organised. Knowledge transferred and collaborations established		Two meetings/ workshops organised and attended by stakeholders and scientists. Significant collaborations established and network of experts created that will have long lasting effects.
Activity 5.2 Workshops reports (2) complied, published and distributed to all stakeholders and workshop participants		Workshop reports compiled (see accompanying reports)
Output 6. Local conservationists monitor important components of biodiversity, using skills acquired during project, leading to improved monitoring of leopard trophy hunting off-takes and management of leopard populations and their habitats	i) 25 PWMA (field and administration staff), 5 RDC, 3 Forestry and hunting staff trained in monitoring of leopard populations, trophy hunting and survey methods ii) 2-4 Zimbabweans gain valuable training and experience on project, iii) 2-3 Zimbabwean graduates receive diplomas	Training was provided to ZPWMA, Forestry and RDC staff in survey techniques and followed up with field training where appropriate. Feild staff from WildCRU, Zamsoc and ZPWMA acquired experience of field survey techniques. Zimbabwean ecologists and conservationists receive training through a DPhil. Degree and Diploma courses. This training has increased the skills base within the ecology and conservation sector. Indicators of the success of Output 6 were appropriate.
Activity 6.1 Identify training needs, conduct field training exercises (surveys, radio-tracking, analysis of data), conduct in-house training programmes for administration staff		Training in survey techniques was identified as a key need. A training workshop was organised at Hwange Main Camp for 21 ZPWMA and Forestry ecologists. On the job training was provided by the survey team to local ecologists, managers and game scouts where ever possible.

Activity 6.2 Develop training manuals where needed (e.g., survey manual; quota allocation; trophy measurement protocols). Manuals used in conjunction with training sessions	A spoor survey manual was written and distributed as part of survey training provided by the DI project (see manual accompanying this report)
Activity 6.3 Identify host country personnel for Diploma training course	Two host country ZPWMA ecologist identified to attend the Oxford Diploma course and attendance facilitated by the DI project

Annex 2   Project's final logframe, including criteria and indicators

LOGICAL FRAMEWORK

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.			
Sub-Goal: Promote leopards as ecological flagships to reduce loss of biodiversity in whole ecosystems and as components of biodiversity to be sustainably used to generate revenue to benefit people.	Leopard populations are stabilised and increase, leopard habitats are conserved, providing protection for other components of biodiversity. Use of species is managed within sustainable limits.	• Non-detriment findings by National CITES Technical Committee submitted to CITES for the species • Future surveys show leopard habitats are better protected and leopard populations healthy	
Purpose To collect ecological and management data to support a National Leopard Management Strategy and to build local and regional consensus to create and implement a conservation strategy to manage leopards and their habitats on a sustainable basis.	Increased understanding of the distribution, viability and previous management of leopard populations and improved motivation, capacity and tools to monitor and manage them.	• Survey data and technical information published as reports and peer reviewed papers, workshop reports published and disseminated • Information made publicly available to raise awareness • National Leopard Management Strategy published	• Ecological data collected through continuing collaboration of project partners • Workshops are attended by stakeholders and consensus reached on leopard management • Political motivation to protect and manage leopards as a sustainable resource is in place

Outputs			
1. National leopard survey provides knowledge of distribution, population viability and wider ecosystem that will inform national management.	• Surveys of distribution and abundance of leopards and other mammals undertaken in 12 protected areas, 2 conservancies and 2-3 rural districts councils (years 1 and 2)	• Technical survey report published and made available to stakeholders • Information made available via websites and pamphlets • Peer reviewed papers submitted for publication	• Permissions remain in place to undertake surveys, collaboration between partners continues • Methods appropriate to survey leopards and suitable data collected and analysed
2. Impacts of trophy hunting on behavioural ecology and population viability recognised and incorporated into management during the life of the project and ultimately into policy through a National Management Strategy	• Technical knowledge gained in years 1-3 by project scientists on the impacts of trophy hunting on behavioural ecology and viability of leopard populations, and put forward for inclusion in national planning, changes in management and policy	• Technical reports made to PWMA yearly • Results and recommendations disseminated nationally and regionally through websites and printed material • Peer reviewed scientific papers submitted for publication	• Permissions remain in place to undertake research • Suitable and sufficient data collected using appropriate research tools • Data analysed and made available for use by managers
3. Trends in past management and utilisation identified and used to inform management during the life of the project and incorporated into the National Management Strategy	• Database of historical leopard management and utilisation compiled by project staff by year two	• Database available to managers • Reports disseminated to stakeholders and via project website • Peer reviewed papers submitted	• Data made available by stakeholders, RDCs, PWMA • Data effectively collated by project staff
4. Sustainable management of leopard populations and leopard habitats implemented through National Leopard Management Strategy	• National Leopard Management Strategy workshop held to devise strategy, in consultation with and attended by all stakeholders in year three	• Workshop reports prepared and disseminated • National Leopard Management Strategy disseminated to stakeholders, approved by Minister	• Co-operative relations established with all stakeholders • Stakeholders and resource managers willing to contribute to and adopt a management strategy
5. Improved regional collaboration and technical exchange between conservation managers and scientists in southern Africa	• Regional technical and management meetings organised by the project (years 1 and 2). • Potential regional collaborations set up to enhance project impact	• Two regional technical and management workshops facilitated, with scientists and managers invited from region • Workshop reports prepared and disseminated	• Regional scientists willing and motivated to collaborate with the project • Scope exists for regional collaboration

6. Local conservationists monitor important components of biodiversity, using skills acquired during project, leading to improved monitoring of leopard trophy hunting off-takes and management of leopard populations and their habitats	• 25 PWMA (field and administration staff), 5 RDC, 3 Forestry and hunting staff trained in monitoring of leopard populations, trophy hunting and survey methods • 2-4 Zimbabweans gain valuable training and experience on project, 2-3 Zimbabwean graduates receive diplomas	• Annual reports to PWMA • Annual project reports • Pre-survey training sessions at all 17 sites to be included as part of national survey	• Staff motivated to learn and apply new skills • Staff continue to be supported by PWMA and RDCs in conducting monitoring and management activities • Most project trained staff remain in conservation organisations • Entry requirements met by applicants for diploma course

Activities (details in workplan)

1.1 National leopard survey to determine leopard population size and distribution at ~17 sites across the country

1.2 Baseline survey data compiled. Results disseminated, reports to decision makers in management institutions, data inform quota allocation, CITES non-detriment findings

2.1 Detailed ecological study to measure the demographic impacts of trophy hunting, undertaken at hunted and un-hunted study sites, results inform management strategy

2.2 Results disseminated, published in relevant peer reviewed journals, lessons inform management of leopards and setting of hunting quotas

3.1 To inform future management, data on historical leopard hunting and management trends complied, database analysed for trends in quota allocation, trophy size, off-take 3.2 Identify shortcomings of system and future management requirements. Propose solutions as part of National Strategy based on field/ historical data

4.1 Design a stakeholder driven National Leopard Management Strategy through participatory workshop

4.2 Approval sought by project partners from Minister for Environment & Tourism for National management strategy. Strategy endorsed

5.1 Two Regional technical workshops, attended by regional and local scientists, conservationists and managers, organised. Knowledge transferred and collaborations established

5.2 Workshops reports (2) complied, published and distributed to all stakeholders and workshop participants

6.1 Identify training needs, conduct field training exercises (surveys, radio-tracking, analysis of data), conduct in-house training programmes for administration staff

6.2 Develop training manuals where needed (e.g., survey manual; quota allocation; trophy measurement protocols). Manuals used in conjunction with training sessions

6.3 Identify host country personnel for Diploma training course

Monitoring activities:

Indicator 1: Robust data available via monitoring data (collected by project-trained staff and with project protocols) to show that leopard off-take is demonstrably sustainable and allowing annual report, based on scientific evidence, to be made to CITES, by the CITES technical committee

Indicator 2: Leopard utilisation sustainable and populations stable (indicated by comparison of future surveys against baseline data collected by project) leading to habitat protection and improved benefits generated for stakeholders and communities

Annex 3   Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use	5	Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	30	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	30	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	20	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	10	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	5	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

Article No./Title	Project %	Article Description
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
1a	Number of people to submit PhD thesis	1 (to be submitted in later 2013)
1b	Number of PhD qualifications obtained	
2	Number of Masters qualifications obtained	
3	Number of other qualifications obtained	2 (post-graduate diplomas)
4a	Number of undergraduate students receiving training	
4b	Number of training weeks provided to undergraduate students	
4c	Number of postgraduate students receiving training (not 1-3 above)	
4d	Number of training weeks for postgraduate students	50 (2 x students at conservation in practice diploma course, attendance facilitated by project)
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	21 attend survey training
6b	Number of training weeks not leading to formal qualification	
7	Number of types of training materials produced for use by host country(s)	1 (Spoor survey manual)
Research Measures		
8	Number of weeks spent by UK project staff on project work in host country(s)	25
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	
10	Number of formal documents produced to assist work related to species identification, classification and recording.	
11a	Number of papers published or accepted for publication in peer reviewed journals	
11b	Number of papers published or accepted for publication elsewhere	
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	3 (survey databases, camera trap database and trophy hunting/ quota database)

Code	Description	Totals (plus additional detail as required)
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	
13a	Number of species reference collections established and handed over to host country(s)	
13b	Number of species reference collections enhanced and handed over to host country(s)	
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	2
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	2
15a	Number of national press releases or publicity articles in host country(s)	
15b	Number of local press releases or publicity articles in host country(s)	
15c	Number of national press releases or publicity articles in UK	
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	3
16b	Estimated circulation of each newsletter in the host country(s)	
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	
18b	Number of national TV programme/features in the UK	
18c	Number of local TV programme/features in host country	
18d	Number of local TV programme features in the UK	
19a	Number of national radio interviews/features in host country(s)	1 (ZPWMA public relations office)
19b	Number of national radio interviews/features in the UK	
19c	Number of local radio interviews/features in host country (s)	

Code	Description	Totals (plus additional detail as required)
19d	Number of local radio interviews/features in the UK	
Physical Measures		
20	Estimated value (£s) of physical assets handed over to host country(s)	£10 000 (project assets still in use in the fieldwork or used by other field projects)
21	Number of permanent educational/training/research facilities or organisation established	
22	Number of permanent field plots established	18 (survey sites)
23	Value of additional resources raised for project	
Other Measures used by the project and not currently including in DI standard measures		
	Papers planned for publication in 2013/14	5

Annex 5 Publications

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Report	Preliminary Non-detriment finding assessment	PWMA/ Panthera		Nil
Survey Report (*)	duPreez, B, Groom, R., Mundy, M and Loveridge, A. 2010. Results of the Bubye Valley Conservancy Spoor Survey 2010	Unpublished		Nil
Poster	Leopard awareness poster	ZAMSOC	_____	Nil

Annex 6 Darwin Contacts

Ref No	DAR17-031
Project Title	Ecological sustainability of leopard trophy hunting in Zimbabwe
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Partner 1	
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