BIG CAT CONSERVATION AND SUSTAINABLE USE IN SOUTHERN AFRICA

PROJECT REFERENCE NUMBER: 162/09/015

Contents

Darwin Initiative for the Survival of Species

Final Report

1. Darwin Project Information

Project title	Big cat conservation and sustainable use in southern Africa
Country	Zimbabwe, southern Africa
Contractor	Dr David Macdonald, Wildlife Conservation Research Unit
Project Reference No.	162/ 09/015
Grant Value	£154 237.00
Starting/Finishing dates	April 2000 – March 2003

2. Project Background/Rationale

- Describe the location and circumstances of the project

Overseas the project was largely based close to Hwange National Park, Zimbabwe. The project has been based in two safari camps, first at Sikumi Lodge (Touch the Wild) and then subsequently Miombo Lodge (Dete) over the three year project. Both are situated just outside the border of the park, close to Main Camp (the main administrative and management centre for the Department of National Parks and Wildlife Management – DNPWLM). We undertook the fieldwork components of the work in the National park and in the areas adjacent to its boundaries. Our study site encompassed approximately 5000km^2 in the northern central and eastern part of the park, covering an area that was potentially impacted by hunting activities in the hunting concessions bordering the park boundary, and our study site.

In addition to time spent in Zimbabwe, project staff spent time (approximately 6 months of the total project period) at the Wildlife Conservation Research Unit (WildCRU), Oxford University, United Kingdom. WildCRU provided administrative and institutional support for the project, as well as expertise in desk-top publishing, statistical and professional support for the work undertaken in Zimbabwe. The regional component of the project was carried out at annual workshops, held at Lake Chivero game reserve, Zimbabwe (October 2000); Kiri camp, Okavango delta, Botswana (October 2001) and Malilangwe private game reserve, Zimbabwe (October 2002). The facilities at Kiri and Malilangwe were kindly made available by Rann safaris, Botswana and Richard Peek, Zimbabwe respectively.

- What was the problem that the project aimed to address?

Lions are emblematic of Africa, yet in the last three decades population numbers have declined dramatically. Some estimates suggest that the decline may have been as drastic as 50% - from around 35 000 lions in the late 1970s to as few as 18 000 in 2002. Being

charismatic predators lions are an important component of the tourist industry in African countries where this species occurs, and are therefore potentially important in attracting tourists to National Parks and earning revenue for relatively poor countries. However many big cat populations are also used on a consumptive basis by the tourist or trophy hunting industry. In many cases hunting is carried out without a clear idea of population size and structure, a situation that could lead to overexploitation and perhaps local extinction. This project aimed to address the issue of unsustainable hunting quotas for lion the population of Hwange National Park, Zimbabwe. Lessons learned in the case study of lion hunting in Hwange can be applied to exploited big cat populations elsewhere in the region and perhaps beyond. To this end our regional initiative has sought to develop links between similar projects with a view to developing common approaches, both to research and to conservation issues involving conflict between big cats and human activities.

- Who identified the need for this project and what evidence is there for a demand for this work and a commitment from the local partner?

As part of the DNPWLM Hwange National Park (1999-2003) management plan (DNPWLM, Zimbabwe 1998), it was recognised that little was known about carnivore populations in Hwange National Park and furthermore a study should be carried out to assess the impact of sport hunting on large carnivores. In addition concern within DNPWLM (initially warden of the DNPWLM management unit, Mr A. Searle) and stakeholders (primarily Mr L. Reynolds, Touch the Wild Safaris) within the Zimbabwean tourism and safari industry (both photographic and hunting), about apparently high levels of off-take of male lions from Zimbabwean lion populations by trophy hunters, prompted the initiation of this project. Dr A. Loveridge's (Zimbabwean post-doctoral student at WildCRU) experience in the Hwange area and contacts with stakeholders enabled identification of a suitable study site to undertake the fieldwork for this project.

3. Project Summary

- What were the purpose and objectives (or purpose and outputs) of the project? Please include the Logical Framework for this project (as an appendix) if this formed part of the original proposal or has been developed since, and report against this.

One of the major purposes of the project was to investigate the impact of sport hunting on the behaviour and demographic structure of the lion population in Hwange National Park, a species for which few data existed in this important part of the species range (a wilderness area of approximately 15 000km^2). We were to use behavioural ecological techniques to investigate and define important demographic and behavioural characteristics of the Hwange lion population for use in subsequent management scenarios. Both baseline data and data on the impact of trophy hunting, collected by this part of the project, were to be used in the production of a management plan for lions in Hwange National Park, and to be published in peer reviewed papers, in international journals. This work was also to be included in outputs of regional workshops.

Locally, workshops were run to train National Parks staff and disseminate information about the project and lion conservation and material distributed. Planning meetings were to be held regularly with National parks staff. The project also aimed to stimulate awareness of conservation issues amongst local stakeholders in the safari industry and develop a working relationship and rapport with this sector of the conservation community, including enhancement of their ability to use information collected by the

project to educate and stimulate awareness amongst tourists.

Regional workshops were to be organised yearly to encourage contact and links between workers in similar big cat conservation fields within the region. Efforts were to be made to contact as many regional scientists (working on sustainable use and conservation of big cats) and conservation managers as possible in order to create a network of projects and links that would have a long term legacy. Outputs of regional workshops were to include published proceedings from each workshop. Conservation awareness was to be stimulated in the local area by a peripatetic conservation teacher, who would travel to local schools to teach the school children about conservation and the importance of sustainable environmental management.

- Were the original objectives or operational plan modified during the project period? If significant changes were made, when was approval given by the Darwin Secretariat?

The practicalities of having a peripatetic teacher proved to be logistically difficult. We therefore came up with the innovative idea of obtaining professional training for some local youths in theatre and dance. The conservation oriented plays they produce and perform in the local area replaced the need for a teacher, provided employment for 12 people and had a much wider ranging impact. Permission for this change in operational plan was sought and obtained from the Darwin secretariat.

- Which of the Articles under the Convention on Biological Diversity (CBD) best describes the project? Summaries of the most relevant Articles to Darwin Projects are presented in Appendix I.

This project has been largely involved in investigating the impact of sustainable use of lions (article 3), an important component of the ecosystem of Hwange National park both in terms of economic value (to tourism) and as a vital umbrella species in the ecosystem (article 7, annex I). The project has investigated the impact of trophy hunting of lions, in the areas surrounding the park, on the viability and long-term sustainability of the population (article 12). The project has taken steps to ensure sustainable use and realistic management of lions through development of a management strategy for this species (and subsequent adoption of this management plan by the relevant government authority) (articles 6, 8, 10). In addition the project has fostered international ties and co-operation between scientists undertaking similar work (article 18) and has provided training for National Parks research staff during the course of the project (article 12). The project has developed and implemented an innovative method of raising the profile, at a local community level, of environmental issues and conservation education through theatre based conservation plays (article 13).

- Briefly discuss how successful the project was in terms of meeting objectives. What objectives were not achieved, or only partly achieved, and have there been significant additional accomplishments?

The ecological work of the project on lions and sustainable use in Hwange National Park was carried out as planned (detail given below). Reports, including a final report and management plan were submitted to DNPWLM. Results of this work were disseminated widely, through regional workshops and at a number of local workshops and through

interaction with stakeholders in the area. Scientific papers are currently being prepared.

At a regional level this project has achieved significantly in bringing together scientists and conservationists working on lions and other sustainable use issues in the southern African sub-region and beyond. Three annual, regional workshops have been held, facilitated by this project and attended by scientists from five African countries, UK and USA (details of participants given in Table 1). Workshop 1 (2000) addressed standardisation of census and fieldwork techniques, drawing on the experiences of a number of highly respected and experienced wildlife biologists. The resulting techniques can be used as a blueprint for anyone wishing to work on big cat populations, anywhere in the world. Workshop 2 revisited some aspects of census technique and in addition, produced a Bayesian model to investigate and explain the interplay of protection and conflict in the conservation of lion (and other big cat) populations. Workshop 3 continued to work on the model. In this session the model was refined and we began the process of confronting the model with real data from a wide range of protected populations, with which the workshop participants had first hand experience. Two workshop publications have been produced, printed, and widely distributed, the third is currently in press (publication 1 and 2 can be obtained from WildCRU, Dept of Zoology, South Parks rd, Oxford OX1 3PS at a cost of £10 and £20 respectively).

Outcomes, additional to the original project plan have included the following. The project's relationship with DNPWLM has developed significantly. A measure of the professional regard the project has engendered is our invitation to advise on quota setting on farmland in the area surrounding the park, subsequent to land redistribution in the area. This has potential to have a very high impact on future conservation choices in the area. In addition the project has been asked by DNPWLM to continue monitoring the lion population in the national park, and is discussing further reductions in lion trophy hunting quotas, which the project has been asked to monitor. The project's theatre group has enjoyed significant success in the area and have been involved in training other similar groups in Victoria Falls to do similar work there, supported by other NGOs (in particular the Holistic Management Unit, based in Jambesi, Zimbabwe. One of the large local safari companies (Wilderness safaris), which has lodges in the East of the park has offered to employ the theatre group to perform plays in the surrounding community area, which will further enhance the capacity of this group to disseminate a conservation message.

The project has established links with the Wildlife Veterinary unit (WVU) in Harare and has benefited from the help and advice of experienced veterinarian Dr C. Foggin. The project has, in storage, blood samples from all lions captured during the study. These will form the basis for a planned epidemiological study, in conjunction with the veterinary unit, to look at prevalence of Bovine Tuberculosis and Feline Imunodeficiency virus in the Hwange lion population. Dr A. Fahlman of the WVU has spent a total of six weeks collaborating with the project, assisting with captures of lions, providing training for project personnel and obtaining data on the use of Zoletil/ Medetomidine drug combinations in lion immobilisation.

Table 1: List of Participants at Regional Lion Conservation Workshops		
Participant	**Country**	**Project or Association**
Prof. D. W. Macdonald	U.K.	WildCRU,
Dr A. J Loveridge	Zimbabwe	WildCRU, Hwange Lion Project
Dr P. Funston	South Africa	Kalagadi Transfrontier lion project.
Mr E. Hermann	South Africa	Kalagadi Transfrontier lion project.
Mr G. Hemson	U.K. and Botswana	Makgadigadi lion project
Mr N. Monks	Zimbabwe	DNPWLM and Mana pools lion project
Mr R. Peek	Zimbabwe	Professional guide
Dr C. Sillero-Zubiri	U. K.	WildCRU/ Born Free Foundation
Mrs N. Purchase	Zimbabwe and Zambia	Matusadona and Liuwa lion project
Mr D. Purchase	Zimbabwe and Zambia	Matusadona and Liuwa lion project
Mr B. Eldridge	U.S.A.	US. Fish and Wildlife, Alaska
Mr N. English	Zimbabwe	DNPWLM, Warden Sinamatella, region Hwange.
Mr C. Winterbach	Botswana	Okavango lion project
Mrs H. Winterbach	Botswana	Okavango lion project
Dr G. Mills	South Africa	Kruger lion project. South African National Parks Chief scientist.
Dr L. Frank	Kenya and U.S.A.	Laikipia predator project
Dr D. Wilson	U.S.A.	Sustainable use expert
Ms J. Rapson	South Africa	PhD student, Rhodes University
Ms N. Lunt	Zimbabwe	Malilangwe lion project
Mr L. Reynolds	Zimbabwe	Professional hunter and guide
Dr T. Lynam	Zimbabwe	University of Zimbabwe
Mr Z. Davidson	South Africa	Hwange lion project
Ms K. Smith	South Africa	Hwange Lion project
Dr P. Stander	Namibia	Namibia predator monitoring project
Ms L. Hansen	Namibia	Namibia predator monitoring project
Dr A. Pole	Zimbabwe and U.K.	Save Conservancy
Mr L. Mangwashu	Zimbabwe	DNPWLM
Mr M. Nzehengwa	Botswana	Botswana Wildlife management
Ms L. Sechele	Botswana	Botswana Wildlife management

4. Scientific, Training, and Technical Assessment

- Please provide a full account of the project's research, training, and/or technical work.
- **Research** - this should include details of staff, methodology, findings and the extent to which research findings have been subject to peer review.

One of the major components of the project has undertaken ecological work in Hwange National park, Zimbabwe, to investigate the impact of sport hunting on lions in the area. We chose a study site of approximately 5000km^2 on the north-eastern border of the national park. We radio-collared or ear tagged and monitored 45 individual lions (26 female, 19 male) during the three year period for which the project has been operational. Lions were captured by project staff using chemical standard immobilisation techniques (training for which was obtained by A. Loveridge in 2000 and later by Z. Davidson in 2003, at the dangerous drugs course, held annually in Zimbabwe). Lions (one female per study pride, all mature males we encountered) were fitted with VHF radio-collars (Sirtrack, New Zealand). During 2002 we also fitted 4 GPS collars to male lions in order to obtain very detailed movement from these animals. The VHF radio-collared animals were located (using standard radio-tracking methodology) as often as possible by vehicle or by ultra-light aircraft (Fulcrum 912). GPS collars were pre-programmed to obtain a position every hour through the night (when lions are active), data was downloaded from the collars, remotely, once per month. Study groups of lions were monitored for changes in demographic structure and behaviour. In addition sightings of known animals, by project staff (see Table 2 for full research staff list), other researchers and safari operators, were recorded throughout. We collated information on hunting quotas in the area surrounding the national park, and have identified potential areas of concern. The project has presented its findings to the DNPWLM at the provincial level in a management plan. Currently a number of scientific papers are in preparation for submission to international refereed journals, disseminating the results of the ecological work carried out by the project. The following are the ecological study's key findings and recommendations (a detailed account of these is given in the attached DNPWLM report and management plan):-

- The population of lions (estimated from spatial and demographic data) in Hwange National Park is around 302 individuals, of which approximately 42 are adult males.

- High levels of off-take of mature males by sport hunters occur in the Hwange population- over 50% of mature males captured and marked during the study were later shot by hunters outside the park.

- The Hwange lion population shows some important ecological differences when compared to other populations. Males have home ranges at least twice (and up to four times) as large as female ranges and associate with more than one pride of females in contrast to other areas in Africa where each pride of females has a single coalition of males in attendance. This is an indication of low densities of males in the Hwange population, and increases vulnerability through a raised probability of enlarged male ranges extending beyond park boundaries.

- Sex ratios of cubs are skewed towards females and adult males are more rare in the population than expected based on other populations in Africa. The reason for skewed sex ratios of cubs is unknown, but it is thought that this feature of the population demography exacerbates the high levels of off-take of both adult and sub adult males by sport hunters, leading to low densities of males in the population.

- The hunting quota in the area around the park was set at 63 adult male lions and 3 females from 2000 - 2002. Given the number of lions estimated by the project the quota was clearly unrealistic. Suggested quotas, based on populations in East Africa and population models show an off-take of between 4 and 10% of mature males is sustainable. Based on these recommendations the off-take of males from the Hwange population should not exceed 4 individuals per year.

- Management recommendations suggested for the population included reducing the quota to within sustainable levels, introduction of regulations governing hunting practices close to the border of National Parks, increased monitoring of hunting trophies to insure trophy quality and sustainable hunting. Continued monitoring of the population is recommended.

- Subsequent to the presentation of our report to DNPWLM the provincial office took the decision to reduce the entire lion quota for the Hwange area by 50% in response to our recommendations, with plans to review the situation again in 2003 with a view to imposing a hunting ban for up to 3 years. In addition, with the assistance of the project, a system of monitoring hunting trophies has been put in place by DNPWLM. The training to undertake this task was given by the project. The project has been invited by the DNPWLM Provincial warden to continue to monitor the lion population.

Conservation education has proved to be an important component of the project. The project has sought to influence the perception of local people towards conservation and environmental issues by means of conservation plays performed by a specially trained theatre group, known locally as the Ingonyama players. This has proved enormously popular and culturally relevant in the local area. Conservation plays have been performed in schools and villages throughout the local area and as far away as Victoria Falls, reaching an estimated 2500 people. In addition the theatre group has created a livelihood for the 12 members of the group with enhanced potential for employment and a number of offers from commercial operations to perform in the tourist sector.

Table 2:- Project staff in ecological component of project			
Name	**Role**	**Duration on site**	**Nationality**
Prof. D. W. Macdonald	Overall project director / advisor	2 months	U.K.
Dr A. Loveridge	Project leader/ co-ordinator	2.5 years	Zimbabwe
L. Denlinger	Field worker	1 year	U.S.A
D. Switzer	Field worker	6 months	U.K.
Z. Davidson	Field worker	14 months	South Africa
K. Smith	Field worker/ administration	9 months	South Africa
W. Eldridge	Volunteer pilot/ field worker	6 months	U.S.A
D. Robertson	Volunteer field worker/ GIS trainer	2 months	U.S.A
P. Bennett	Volunteer Pilot/ pilot instructor	6 months	U.K.
J. Hunt	Field worker/ professional guide	1 year	Zimbabwe
B. DuPreez	Field worker/ trainee	1 month	Zimbabwe
M. Towindo	Field worker/ trainee	6 months	Zimbabwe
F. Hlongwane	Field worker/ trainee	2 years	Zimbabwe
P. Dladla	Field worker/ trainee	2 years	Zimbabwe
S. Mbomba	Administration	1 year	Zimbabwe
K. Nhira	DNPWLM scout/ trainee	2.5 years	Zimbabwe
J. Machengu	DNPWLM scout/ trainee	2.5 years	Zimbabwe

- **Training and capacity building activities** – this should include information on selection criteria, content, assessment and accreditation.

Table 3 details the DNPWLM personnel who received training from the project to increase their skills base in ecological work. Training included aspects of map reading, radio-telemetry, radio-collaring and capture (including taking blood samples, monitoring vital signs, use of capture drugs and darting equipment) of lions and other carnivores. Additionally training was given in radio-tracking, field skills (e.g. tracking signs and animal and vegetation identification), record keeping on data sheets and measurement of hunting trophies. Most training occurred while in the field, but some ad hoc training sessions were also undertaken at various times of the year (e.g. map reading, use of GPS unit in map reading, radio-tracking, trophy measurement). Mr P. Dladla, Ms M. Towindo and Mr N. Hlongwane were permanently attached to the project for between 6 months and 2 years (table 2) as trainees.

In addition to DNPWLM staff, project staff (Loveridge, Davidson) received training in GIS analysis, programming, deployment and data capture using Televilt GPS collars, capture and handling of wildlife and use of capture drugs (a prerequisite for any wildlife capture operations) and training for micro-light pilots licenses. Twelve local youths were trained by a professional theatre company (in two workshops) in aspects of conservation theatre (also known as ‘Theatre for Africa). This training gives these young Zimbabweans a means to make a living as well as contributing significantly to the education of the local community in environmental issues and sustainable use.

Table 3: DNPWLM staff who received training from the project	
Name	**Position in DNPWLM**
Mr P. Dladla	Scout/ trainee (paid for by project)
Ms M. Towindo	Scout/ trainee (paid for by project)
Mr N. Hlongwane	Scout/ trainee (paid for by project)
Mr K. Nhira	DNPWLM scout (ecology section)
Mr J. Machengu	DNPWLM scout (ecology section)
Ms M. Kanengoni	DNPWLM scout (ecology section)
Mrs B. Russell	DNPWLM technical officer/ ranger

5. Project Impacts

- What evidence is there that project achievements has led to the accomplishment of the project purpose? Has achievement of objectives/outputs resulted in other, unexpected impacts?

The ecological study of the way in which trophy hunting impacts the lion population in Hwange National Park, was completed during the duration of the project (although continued monitoring is underway and it is anticipated that this will continue). Evidence of the impact of the project's ecological work is evidenced by the fact that DNPWLM have adopted a number of the recommendations made by the project based on our research. The most important of these has been to reduce the lion-hunting quota in the area by 50%, with further reductions anticipated during 2004. Additionally DNPWLM has, again on the recommendation of the project, set up a program to monitor trophy quality of all species hunted in the area. The project has been able to provide additional training on measurement and recording of hunting trophies. Finally, DNPWLM have requested that the project continue to monitor the lion population, which if successfully undertaken will ensure a lasting legacy in this arena of conservation.

The regional aspect of the project has initiated regular meetings of a group of regional scientists (as detailed above). These meetings are anticipated to occur regularly in the future and therefore have potential for long-term impact conservation research, and ultimately policy, in the region. Strong links have been forged between regional projects as a legacy of the Darwin project. Collaborations have been set up between regional workers leading enhanced understanding of regional issues and synthesis of common approaches to global problems of big cat and large carnivore conservation. We feel this will lead to enhancement of regional management of this particular wildlife resource.

Conservation education has been undertaken in an effective, innovative and culturally relevant way. This has lead to an enhancement of environmental awareness in the local community, especially amongst school children. The theatre group has undertaken 108 separate performances in five local districts (Lupane, Jotsholo, Hwange, Victoria Falls and Gwaai) and we estimate that at least 5000 people have seen at least one of the plays. This investment in the future could ultimately lead to better management of environmental resources at a local level. Training of DNPWLM staff has provided

opportunities for individual capacity building in the ecology section of the department, giving opportunities to learn new skills not provided for junior staff by DNPWLM, especially in the current political and economic climate.

- To what extent has the project achieved its goal, i.e. how has it helped the host country to meet its obligations under the Biodiversity Convention (CBD), or what indication is there that it is likely to do so in the future? Information should be provided on plans, actions or policies by the host institution and government resulting directly from the project that building on new skills and research findings.

Ecological work of this project and the resulting data collected on the way in which lion populations are impacted by trophy hunting have been presented to DNPWLM, the government authority responsible for conservation and management of environmental resources in the country. DNPWLM have taken the management decision to reduce the lion hunting quota by 50% during 2003. Dialogue is ongoing with regard to a complete hunting ban for 3 years to allow population recovery. This management strategy will have far reaching effects for an important component of the local ecosystem, and perhaps wider reaching effects in the way in which big cats are conserved regionally, especially if the effects of the hunting ban are monitored in the light of baseline data collected during this project.

- Please complete the table in Appendix I to show the contribution made by different components of the project to the measures for biodiversity conservation defined in the CBD Articles.
- If there were training or capacity building elements to the project, to what extent has this improved local capacity to further biodiversity work in the host country and what is the evidence for this? Where possible, please provide information on what each student / trainee is now doing (or what they expect to be doing in the longer term).

Training of DNPWLM staff has occurred in an environment where there is little or no opportunity for ecological staff to acquire practical professional skills and therefore little hope of advancement within the institution for junior staff. Of the DNPWLM personnel that received training, only one is not longer working in the area (M. Towindo). P. Dladla and N. Hlongwane (both attached as trainees to the project) continue to be involved in fieldwork and conservation extension work with the project. Due to his enthusiasm and ability it is hoped that N. Hlongwane will fill the role of conservation liaison officer (CLO) in the next phase of the project, and will be responsible for management of the community outreach programme (which will include the theatre group). Mrs B. Russell was transferred to an adjacent management area in the National Park, and has been able to apply certain aspects of our training to her work with endangered black rhino.

Of the project staff who received training from being involved in the Darwin project, Dr A. Loveridge and Mr Z. Davidson gained valuable experience running the project and in addition were trained in use of GIS software, completed and passed the dangerous drugs course and gained a microlight pilot's licence. Both of these staff members will be involved in research and monitoring of lions in Hwange for at least the next three years, and will ultimately continue careers in the wildlife conservation arena, most likely within Africa.

- Discuss the impact of the project in terms of collaboration to date between UK and local partner. What impact has the project made on local collaboration such as improved links between Governmental and civil society groups?

The Wildlife Conservation Research Unit has strong links with DNPWLM (a parastatal government institution) in the Hwange area and has been asked to continue the work of monitoring the lion population in Hwange. Thus WildCRU will continue the hitherto fruitful partnership and collaboration with DNPWLM and facilitate communication between DNPWLM and other stakeholders in the area.

- In terms of social impact, who has benefited from the project? Has the project had (or is likely to result in) an unexpected positive or negative impact on individuals or local communities? What are the indicators for this and how were they measured?

The sustainable use of wildlife resources will ultimately affect Zimbabwean society at a number of levels. Ensuring that big cats are protected and therefore continue to enhance the desirability of Hwange as a tourist destination will ensure that tourism continues to play a role as a provider of employment in the area, as well as bringing valuable foreign currency into the economy of a relatively poor country.

On a more local scale the project has provided training for DNPWLM staff and other local people, which would otherwise be unavailable. It has trained twelve local youths, providing professional skills in drama and raised the profile of the resulting theatre group to the extent that their prospects and capacity to earn a living has been enhanced. As a group they are in demand by commercial operations locally and regionally (the group has been invited to play in both Botswana and South Africa). The theatre group itself and the conservation message that it advocates ultimately has the capacity to alter the perceptions of a substantial part of the regional community. Enhancement of environmental understanding has potential to improve local livelihoods, by encouraging sustainable and environmentally sound activities.

Project Outputs

- Quantify all project outputs in the table in Appendix II using the coding and format of the Darwin Initiative Standard Output Measures.
- Explain differences in actual outputs against those in the agreed schedule, i.e. what outputs were not achieved or only partly achieved? Were additional outputs achieved? Give details in the table in Appendix II.
- Provide full details in Appendix III of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications database which is currently being compiled.
- How has information relating to project outputs and outcomes been disseminated? Will this continue or develop after project completion and, if so, who will be responsible and bear the cost of further information dissemination?

We disseminated information about the project and it's outputs through talks and seminars (Loveridge: 3 talks to Wildlife Society, Zimbabwe; Macdonald: 3 presentations in UK); presentations at workshops (Loveridge: 5 presentations); through radio and television (Radio interviews: Loveridge: 2 in Zimbabwe, 1 in UK; one TV programme, channel 6, Oxford); through magazine articles (Macdonald: 2). We presented have presented results of research in the workshop publications we have produced. Currently scientific papers are in preparation. Additionally we anticipate that we will write 2-3 magazine articles and in October 2003 Macdonald will give a seminal lecture on the project to the London Zoological Society.

6. Project Expenditure

- Tabulate grant expenditure using the categories in the original application

- Highlight agreed changes to the budget

Permission was obtained to utilise budget allocated under running costs to cover the extra expense of new staff during 2002/3.

- Explain any variation in expenditure where this is +/- 10% of the budget

The reason for higher than expected costs are that staff costs were considerably higher than was budgeted for, largely because we took on extra staff for the year. The extra cost of doing so has been absorbed by Wildlife Conservation Research Units core funds, and therefore has not been included in the final claim.

Expenditure on telephone, postage and stationary at the field site in Zimbabwe during 2002/2003 has been included in running costs and are therefore not reflected in the above breakdown. In 2002/2003 travel and subsistence costs were 13% higher than the budget allocation and this is due to a larger staff than was originally anticipated leading to higher subsistence costs and more travel. Capital costs were subsidised by additional funds raised from the project therefore budgeted capital expenditure was approximately 15% lower than anticipated for 2002/2003.

7. Project Operation and Partnerships:

- How many local partners worked on project activities and now does this differ to initial plans for partnerships? Who were the main partners and the most active partners, and what is their role in biodiversity issues? How were partners involved in project planning and implementation? Were plans modified significantly in response to local consultation?

DNPWLM was the main local partner and is also the institution responsible for conservation and biodiversity within the country. Consultation over project activities and implementation of recommended management took place between the project and DNPWLM. Senior staff consulted at DNPWLM included Dr F. Murindagomo, (senior provincial ecologist), Mr E. Mafu (Warden, Main camp management compartment), Mr N. English (Warden Sinamatella intensive protection zone) and Mr O. Bepe (Provincial warden). The project also worked closely with local safari companies, initially with Touch the Wild safaris, but new and valuable links were made during the course of the project with other companies, notably Wilderness safaris and Miombo safaris. With the exception of the additional safari companies these partnerships were planned at the inception of the project.

Dr T. Lynam of the Tropical Resource Ecology Programme, University of Zimbabwe played a significant role in facilitating the modelling aspects of the regional workshops. This was an unanticipated but valuable partnership.

- During the project lifetime, what collaboration existed with similar projects elsewhere in the host country? Was there consultation with the host country Biodiversity Strategy (BS) Office?

The project had strong links with two other lion projects in Zimbabwe, one in Matusadona National Park (project leader G. Purchase), the other in Mana Pools National Park (project leader N. Monks). We anticipate continued liaison and collaboration with these projects. We have strong links and collaborate on an informal level with the Painted Hunting Dog Research Project in the Hwange area. We are currently collaborating with CIRAD (French Agricultural Aid and Extension Agency) to compile a manual on wildlife census techniques for use by DNPWLM and landowners who have newly acquired land.

- How many international partners participated in project activities? Provide names of main international partners.

In terms of the regional workshops facilitated by the project there are a large number of international partners from the following countries (Botswana, Kenya, South Africa, Namibia, U.K., U.S.A. and Zimbabwe). Details of individuals are listed in Table 1 above. Contact information for all participants is detailed in the two workshop publications mentioned above and in the third, which is currently in press.

In addition the project benefited from assistance from a number of international volunteers, all of whom brought specialist skills to the project and enhanced the ability of the project to complete the work in hand. Mr W. Eldridge (Pilot/ Biologist U.S Fish and Wildlife Service, Alaska) helped with aerial radio-tracking for a total of six months

(during 2001 and 2002), Ms D. Robertson and Ms L. Denlinger (both wildlife biologists with U.S. Fish and Wildlife, Alaska) worked as volunteer fieldworkers for 2 and 18 months respectively). Mr P. Bennett (specialist microlight pilot and instructor) helped with aerial radio-tracking for 6 months in 2003, and in addition trained Mr Z. Davidson for a micro-light pilots license.

- To your knowledge, have the local partnerships been active after the end of the Darwin Project and what is the level of their participation with the local biodiversity strategy process and other local Government activities? Is more community participation needed and is there a role for the private sector?

The main local partner, DNPWLM, is the authority that determines utilisation of natural resources, therefore our continued collaboration with them enhances and builds upon recommendations made by this Darwin project on the management of lions in Hwange National Park. Other stakeholders such as safari companies play a large role in identification of biodiversity issues in the area and are responsible for conservation and management of large areas both inside and outside the National Park. The big cat project met with considerable support from this sector as photographic safari operators see unsustainable hunting quotas as damaging to their business. As a major stakeholder in sustainable management of wildlife, and especially lions (a powerful draw-card in photographic safaris), the safari industry is an important pressure group to ensure sustainable use. Our results strengthen the position of such stakeholders when lobbying for reduced hunting quotas. Zimbabwe is currently undertaking a major land redistribution exercise. Many farms on the border of the park have been reallocated. New owners need guidance in management of wildlife resources. The project has been involved in dialogue with these individuals, facilitated by DNPWLM and is actively involved in helping to educate new landowners.

8. Monitoring and Evaluation, Lesson learning

- Please explain your strategy for monitoring and evaluation (M&E) and give an outline of results. How does this **demonstrate** the value of the project? e.g. what baseline information was collected (e.g. scientific, social, economic), milestones in the project design, and indicators to identify your achievements (at purpose and goal level).

The ecological work of the study showed that lions are hunted unsustainably in the hunting areas surrounding Hwange National Park. Our recommendations to DNPWLM have been taken seriously and quota reduction has taken place, with further reductions under consideration. This is a demonstrable and valuable achievement of the project. The project successfully facilitated three regional workshops, attended by regional scientists. Apart from the compilation, publication and distribution of workshop proceedings, the dialogue and collaboration resulting from these workshops make a valuable contribution to conservation in the region and are an important legacy of the Darwin project. Training was provided for seven DNPWLM staff, widening and improving the skills base of ecological staff on the ground. The project's innovative and culturally relevant

conservation education initiative has been extremely successful and could be used as a blueprint for dissemination and teaching of conservation issues in other areas of the world, and indeed perhaps globally.

- During the project period, has there been an internal or external evaluation of the work or are there any plans for this?

External evaluation of scientific findings will take the form of peer review of papers, currently in preparation, submitted to international journals.

- What are the key lessons to be drawn from the experience of this project? We would welcome your comments on any broader lessons for Darwin Initiative as a programme or practical lessons that could be valuable to other projects, as we would like to present this information on a website page.

Funding made available by wealthy countries for use in countries that are economically poor but rich in natural resources and biodiversity, can be used effectively provided partnerships are developed within the host country and suitable people within the host country are included in decision making. When local authorities have a stake in the outcomes of a project and are therefore able to take ownership of the results it is more likely that the legacy of the project will survive and ultimately benefit conservation of biodiversity. We were greatly assisted in implementing the study by the fact that DNPWLM had actually identified the issue before the project started and supported the work throughout. In this project we provided expertise, methods and techniques in behavioural ecology to assist DNPWLM with a conservation issue in an area were little expertise or access to funding exists. The fact that DNPWLM have been proactive in adopting management recommendations is to a large extent because they felt included in the implementation of the work throughout the project and are able embrace the results of the study.

Conservation education and training should be an integral part of a conservation project. Our experiences working with the local community through our conservation theatre group have been exceptionally rewarding and we believe has had a large impact on people's perceptions of environmental issues. We would recommend adoption of a similar approach in areas where this kind of conservation initiative is relevant.

9. Darwin Identity:

- What effort has the project made to publicise the Darwin Initiative, e.g. where did the project use the 'Darwin Initiative' logo, promote Darwin funding opportunities or projects? Was there evidence that Darwin Fellows or Darwin Scholars/Students used these titles?

The Darwin logo has been used on our outputs (e.g. on the covers of the workshop publications) and in communications with partners. The Darwin initiative has been acknowledged at seminars and on reports.

- What is the understanding of Darwin Identity in the host country? Who, within the host country, is likely to be familiar with the Darwin Initiative and what evidence is there to show that people are aware of this project and the aims of the Darwin Initiative?

The Darwin identity and logo was well recognised in the regional arena and in the conservation community within Zimbabwe. Staff working the project made every effort to ensure that partners and stakeholders were aware of the aims and objectives of the Darwin initiative and its role in facilitating the conservation of biodiversity in countries rich in natural resources, but economically poor.

- Considering the project in the context of biodiversity conservation in the host country, did it form part of a larger programme that dwarfed Darwin funding or was it recognised as a distinct project with a clear identity?

Although the Darwin big cat project had strong links with similar research projects in the country and region, the actually work undertaken by the project was to a large extent unique and was not, therefore, eclipsed by these associations.

10. Leverage

- During the lifetime of the project, what additional funds were attracted to biodiversity work associated with the project, including additional investment by partners?

From 2000 – 2003 the Mitsubishi Fund for Europe and Africa contributed £150 000 towards supporting this project. The University of Oxford gave xx to purchase the project's ultra-light aircraft. Marwell Preservation Society donated £5 000. In all, using the initial Darwin initiative award as leverage to attract additional funds we were able to raise a total of £ in additional funding.

- What efforts were made by UK project staff to strengthen the capacity of partners to secure further funds for similar work in the host country and were attempts made to capture funds from international donors?

The project has been invited to continue its work by the major partner, DNPWLM. To this end we are in the process of approaching donors to fund the project over the next three years. Our aim is to continue to monitor the lion population through a period when lion hunting has been curbed or even banned. We have been invited to apply for Darwin follow-up funding and have a number of funding proposals submitted, including one with the African Wildlife Foundation.

11. Sustainability and Legacy

- What project achievements are most likely to endure? What will happen to project staff and resources after the project ends? Are partners likely to keep in touch?

One of the major achievements of the project has been to draw attention to the unsustainable management of lions in the hunting areas surrounding Hwange National Park. We have been able to make management recommendations, to our partner DNPWLM to alleviate this conservation problem. Hunting quotas have been reduced and may be further reduced to sustainable levels. On a regional level links and collaborations have been set up between research projects. Communication between conservation projects in the region is a valuable achievement. The project is set to continue and staff and project resources will stay in place.

- Have the project's conclusions and outputs been widely applied? How could legacy have been improved?

The project has addressed the question of sustainable use of big cats, an issue that is common to many places in southern Africa. Our impact as a project will be improved by continuing with work the project has completed in the last three years by monitoring the recovering lion population. Our hope is that results of this study can be applied to similar situations where big cat populations are potentially overexploited.

- Are additional funds being sought to continue aspects of the project (funds from where and for which aspects)?

We have sought funding to continue the ecological study in Hwange National Park, to continue the conservation education this project initiated and to continue to facilitate regional workshops. We have applied, on invitation, to the Darwin Initiative for follow-up funding and to the African Wildlife Foundation and Liz Claibourne Trust.

12. Value for money

- Considering the costs and benefits of the project, how do you rate the project in terms of value for money and what evidence do you have to support these conclusions?

We have made a valuable contribution to the understanding of the way in which big cat populations respond to exploitation. This knowledge will contribute significantly to the way in which these species are managed in the future. Our local conservation, training and regional network have all been successfully undertaken and will have a lasing impact. These are demonstrable and valuable outcomes of the project and prove the project has given value for money. Over the three years the project has operational we have raised matching funds to support the funding already provided by the Darwin Initiative, greatly enhancing the original investment.

Author(s) / Date

Prof. D. W. Macdonald
Dr A. J. Loveridge

31/7/03

13. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Please complete the table below to show the extent of project contribution to the different measures for biodiversity conservation defined in the CBD Articles. This will enable us to tie Darwin projects more directly into CBD areas and to see if the underlying objective of the Darwin Initiative has been met. We have focused on CBD Articles that are most relevant to biodiversity conservation initiatives by small projects in developing countries. However, certain Articles have been omitted where they apply across the board. Where there is overlap between measures described by two different Articles, allocate the % to the most appropriate one.

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	**Project %**	**Article Description**
6. General Measures for Conservation & Sustainable Use	10	Develop national strategies which integrate conservation and sustainable use.
7. Identification and Monitoring	25	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities which have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	25	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	15	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	15	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.
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.
Total %	**100%**	**Check % = total 100**

14. Appendix II Outputs

Please quantify and briefly describe all project outputs using the coding and format of the Darwin Initiative Standard Output Measures.

Code	Total to date (reduce box)	Detail (←expand box)
Training Outputs		
1a	Number of people to submit PhD thesis	
1b	Number of PhD qualifications obtained	
2	Number of Masters qualifications obtained	
3	Number of other qualifications obtained	4 dangerous drugs courses passed by project staff (2). Microlight pilot licences passed by project staff (2)
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	
5	Number of people receiving other forms of **long-term** (>1yr) training not leading to formal qualification(i.e not categories 1-4 above)	5 Trainees on project – (as per table 2 above)
6a	Number of people receiving other forms of **short-term** education/training (i.e not categories 1-5 above)	
6b	Number of training weeks not leading to formal qualification	3 (to DNPWLM staff-telemetry seminars, darting and drugs, trophy measurement)
7	Number of types of training materials produced for use by host country(s)	
Research Outputs		
8	Number of weeks spent by UK project staff on project work in host country(s)	4 D. Macdonald at study site
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	1 report and management plan handed to DNPWLM
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	1 lion identification and home range data given to DNPWLM
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 Outputs		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	3 regional lion workshops, organised annually (2000, 2001, 2002)
14b	Number of conferences/seminars/ workshops **attended** at which findings from Darwin project work will be presented/ disseminated.	2 (CIRAD conference Main Camp, Hwange National Park; A2 farmers workshop, Main Camp, Hwange National Park.
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	2 (article in Oxford Today, article in WildCRU review)
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	
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	1 (Film on lions and project shown, filmed by Dr S. Norris, on channel 6)
19a	Number of national radio interviews/features in host country(s)	2 (two interviews by Mr P. Rowlinson for wildife radio show in Zimbabwe)
19b	Number of national radio interviews/features in the UK	
19c	Number of local radio interviews/features in host country (s)	
19d	Number of local radio interviews/features in the UK	1 (BBC radio, Oxford)
Physical Outputs		
20	Estimated value (£s) of physical assets handed over to host country(s)	
21	Number of permanent educational/training/research facilities or organisation established	
22	Number of permanent field plots established	
23	Value of additional resources raised for project	

15. Appendix III: Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications Database that is currently being compiled.

Mark (*) all publications and other material that you have included with this report

Type * (e.g. journals, manual, CDs)	**Detail** (title, author, year)	**Publishers** (name, city)	**Available from** (e.g. contact address, website)	**Cost £**
Workshop publication *	**Loveridge, A. Lynam, T and Macdonald, D. W. 2001. Lion conservation research workshop 1: survey techniques.**	**Russell Brookes LTD**	**WildCRU, Dept of Zoology, South Parks rd Oxford OX1 3PS**	**10**
Workshop publication *	**Loveridge, A. Lynam, T and Macdonald, D. W. 2002. Lion conservation research workshop 2: Modelling conflict**	**Russell Brookes LTD**	**WildCRU, Dept of Zoology, South Parks rd Oxford OX1 3PS**	**20**

16. Appendix IV: Darwin Contacts

To assist us with future evaluation work and feedback on your report , please provide contact details below.

Project Title	Big cat conservation in southern Africa
Ref. No.	**162/09/015**
UK Leader Details	
Name	Prof. D. W. Macdonald
Role within Darwin Project	Project supervisor
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