Submit by Monday 3 December 2012

DARWIN INITIATIVE APPLICATION FOR GRANT FOR ROUND 19: STAGE 2

Please read the Guidance Notes before completing this form. Where no word limits are given, the size of the box is a guide to the amount of information required.

Information to be extracted to the database is highlighted blue.

ELIGIBILITY

1. Name and address of organisation (NB: Notification of results will be by post and email to the Project Leader)

Name:	**Address:**
Prof. David W. Macdonald	Wildlife Conservation Research Unit Department of Zoology, University of Oxford, Recanati-Kaplan Centre, Tubney House, Abingdon Road, Tubney, OXON. OX13 5QL

2. Stage 1 reference and Project title

(max 10 words) Stage 1 Application Ref.: 2111 Improving anti-poaching patrol evaluation and design in African rainforests

3. Project dates, duration and total Darwin Initiative Grant requested, matched funding

Proposed start date: 1/4/2013 **Duration of project:** 3 years **End date:** 31/3/2016					
Darwin request	**2013/14 £**	**2014/15 £**	**2015/16 £**	**2016/17 £**	**Total £**
Proposed (confirmed and unconfirmed) matched funding as percentage of total Project cost:					

4. Define the outcome of the project. This should be a repetition of Question 24, Outcome Statement.

(max 100 words)
Poaching in Central Africa imperils wildlife, is illegal and undermines the sustainability of local livelihoods while legitimising a corrupted attitude between people and protected areas. The project uses robust but innovative technology, centred on acoustic monitoring, to design, implement and evaluate anti-poaching strategies, leading to the development of a novel decision-support system to be rolled out across Central Africa. Developed first for Korup NP (Cameroon), this evidence-based anti-poaching protocol is intended to efficiently protect wildlife source populations within protected areas, while laying the foundation for sustainable forest uses, and thus increased food security, job opportunities, and – ultimately – poverty alleviation.

5. Country(ies)

Which eligible host country(ies) will your project be working in. You may copy and paste this table if you need to provide details of more than four countries.

Country 1: Cameroon

6. Biodiversity Conventions

Which of the three conventions supported by the Darwin Initiative will your project be supporting? Note: projects supporting more than one convention will not achieve a higher scoring

Convention On Biological Diversity (CBD)	**Yes**
Convention on Migratory Species (CMS)	**No**
Convention on International Trade in Endangered Species (CITES)	**Yes**

6b. Biodiversity Conventions

Please detail how your project will contribute to the objectives of the convention(s) your project is targeting. You may wish to refer to Articles or Programmes of Work here. Note: No additional significance will be ascribed for projects that report contributions to more than one convention

(Max 200 words)

Both the CBD (Article 7a,b "Identification and Monitoring"; Article 8k,l "In-Situ Conservation") and the National Biodiversity Strategy and Action Plans in the region – the primary CBD implementation instrument at the national level – highlight the need for mechanisms to monitor wildlife and enforce wildlife legislation. The project outcome – an evidence-based anti-poaching decision-support system – directly contributes to fulfilling Central African countries' objectives under these articles. Moreover, the training provided to KNP and eventually regional protected area personnel contributes towards CBD Article 12a,c "Research and Training" compliance; namely the establishment of training programmes for the identification and conservation of biological diversity in developing countries, and the promotion and cooperation "in the use of scientific advances in [...] developing methods for conservation...".

Given that a large proportion of bushmeat poached within KNP is traded in large market towns across the border in Nigeria, the project also contributes to Cameroon's compliance objectives under CITES Article III ("Regulation of Trade in Specimens of Species Included in Appendix I") and Article VIII a,b "Measures to Be Taken by the Parties". The latter states that signatories should "provide for the confiscation" of and take measures to "penalize trade in, or possession" of CITES species.

Is any liaison proposed with the CBD/CITES/CMS focal point in the host country?

☑Yes ☐ No if yes, please give details:

As all project activities (including all anti-poaching patrols, arrests and wildlife confiscations) will occur within a protected area under the authority and by permission of the responsible ministry (MINFOF – a partner to the project), further liaison with national CBD or CITES focal points would initially be superfluous.. However, once the project website is operational, we will liaise with the focal points in order to promote the site to regional signatories of the conventions, and to help identify potential participants for the final workshop (Year 3).

7. Principals in project. Please identify and provide a one page CV for each of these named individuals. You may copy and paste this table if you need to provide details of more personnel or more than one project partner.

Details	**WildCRU - Project Leader**	**WildCRU - Project coordinator**	**James Madison University - Main**
Surname	Macdonald	Astaras	Linder
Forename (s)	David W.	Christos	Joshua
Post held	Professor of Wildlife Conservation; Director of WildCRU	Postdoctoral Researcher	Assistant Professor
Institution (if different to above)	University of Oxford	University of Oxford	James Madison University
Department	Wildlife Conservation Research Unit, Dpt. of Zoology	Wildlife Conservation Research Unit, Dpt. of Zoology	Sociology and Anthropology

Details	**Cornell University - Main**	**Korup Rainforest Conservation Society - Main**	**Ministry of Forest and Wildlife - Main**
Surname	Wrege	Orume	Fotendong
Forename (s)	Peter H.	Robinson Diotoh	Ferdinand Lateh
Post held	Senior Research Associate	Programme advisor	Conservator
Institution (if different to above)	Cornell University	Korup Rainforest Conservation Society (KRCS)	Ministry of Forestry and Wildlife Korup National Park
Department	Cornell Lab of Ornithology, Bioacoustics Research Program	-	Korup National Park

Details	**Programme for the Sustainable Management of Natural Resources – Southwest Region – Main**	**Coastal Forests Program of WWF-Cameroon - Main**
Surname	Stennmanns	Okon
Forename (s)	Frank	David
Post held	Program Consultant	WWF-CFP Korup site Manager
Institution (if different to above)	Team leader GFA / DFS	World Wildlife Fund Cameroon Program Office (WWF-CFP)
Department	-	-

8. Has your organisation received funding under the Darwin Initiative before? If so, please provide details of the most recent (up to 6 examples).

Ref. No	Project Leader	Title
10004	Fa, John & Macdonald, David W.	Devising solutions to bushmeat exploitation in the Sanaga-Cross region, Africa
14028	Sillero-Zubiri, Claudio	Conservation of Puna's Andean cats across national borders
17031	Loveridge, Andrew	Ecological sustainability of leopard trophy hunting in Zimbabwe
18013	Riordan, Philip	Building capacity for wild felid conservation in China
EIDPO021	Macdonald, David W.	Implementing an otter action plan for marine environments of Tierra del Fuego, Patagonia (2007-2009)
EIDPO038	Sillero-Zubiri, Claudio	High Andes conservation without borders

9. a-c

N/A

10. Please list all the partners involved (including the Lead Institution) and explain their roles and responsibilities in the project. Describe the extent of their involvement at all stages, including project development. This section should illustrate the capacity of partners to be involved in the project. Please provide written evidence of partnerships. Please copy/delete boxes for more or fewer partnerships.

Lead institution and website:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Wildlife Conservation Research Unit (WildCRU), University of Oxford www.wildcru.org	WildCRU is an acclaimed centre of excellence in conservation research and training, and a strategic partner in conservation initiatives the world over. In 2011, the Queen's Anniversary Prize for Higher Education was awarded to the University of Oxford in recognition of WildCRU's outstanding 25 years in conservation, including a succession of highly successful Darwin Projects. The project leader, WildCRU's founder and director Prof. David Macdonald, who delivered the 2011 Darwin Lecture, has over 30 years experience in coordinating large multi-partner projects and brings expertise, including from DI project 10004 which performed exceptionally on all deliverables, with regard to wildlife and bushmeat studies in Southwest Cameroon. Dr. Christos Astaras, the project coordinator, has conducted wildlife research in Korup region for eight years, and has an in-depth understanding of the local socioeconomic realities affecting conservation. WildCRU has been involved in the project since its inception (it being radically different from, but a legacy of Macdonald's DI 10004 project). In October 2012, WildCRU funded Astaras to undertake the scoping study, involving the on-going calibration of two acoustic sensors in Korup. Beyond overall project coordination, WildCRU will coordinate the acoustic surveys, contribute to data analysis and the training workshop, and ensure dissemination and legacy.

Partner Name and website where available:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Faculty of Anthropology, James Madison University (JMU) http://www.jmu.edu/socanth/anth	James Madison University (JMU), through the work of Dr. Joshua Linder, has been involved in this project since its inception, assisting with all aspects of its development. The foci of JMU's contribution will include leading line transect surveys, assisting with analysis and interpretation of transect and acoustic monitoring results, co-managing logistics and organizing the workshop in Year 3, and publication and dissemination through peer-reviewed articles and relevant stakeholders. JMU has strong capacity in South West Cameroon. Through his bushmeat and on-going line-transect surveys, Dr. Linder has incomparable experience during 10 years in bushmeat hunting and protected area management in this region. He is also the Director of JMU's study abroad program to Cameroon, which for the last three years, has taught American, European, and Cameroonian students about the biological and social dimensions of tropical forest conservation (see: http://www.jmu.edu/international/abroad/jmu_cameroon.shtml). Finally, Dr. Linder has access to historical forest survey data from the Korup area that will contribute important baselines for comparison to project outputs.
Have you included a Letter of Support from this institution?	**Yes**

Partner Name and website where available:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Bioacoustics Research Program (BRP), Cornell University http://www.birds.cornell.edu/brp/	The Bioacoustics Research Program (BRP) is a world leader in developing systems for acquisition of sounds in nature, their analysis, and their interpretation. Peter Wrege has directed acoustic monitoring research in Central Africa for six years, focused on forest elephant and illegal hunting, and has more than 25 years of experience directing field research in Africa and Central America. His expertise includes the adaptation and use of automatic detection algorithms for locating the sounds of forest elephants, chimpanzees, and gunshots in acoustic recordings, design of recording deployment systems for tropical environments, calibration of detection distances for various sounds of interest, and directing both basic and statistical analysis of acoustic recordings. Wrege is involved in this project's development and the design of the acoustic recording system that will monitor hunting activity and primate densities, and will personally direct instrument preparation, the training of assistants for acoustic monitoring, and design of protocols for calibrating the acoustic signatures of primates in the study area. His experience and access to the considerable resources of BRP ensure international levels of excellence in treatment and interpretation of the acoustic data.
Have you included a Letter of Support from this institution?	**Yes**

Partner Name and website where available:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Program for the Sustainable Management of Natural Resources – Southwest Region (PSMNR-SWR)	PSMNR-SWR is a development program of the Government of Cameroon co-financed by the Federal Republic of Germany through the German Development Bank KFW, in cooperation with the German Agency for International Cooperation (GIZ) (Phase 1: 2006-2011; Phase: 2011-2016). The purpose of the programme is the sustainable forest and wildlife management in and around protected areas in the Southwest Region of Cameroon – including KNP – by the affected *local* stakeholders and for their benefit with emphasis on the poorest segments of society. By also funding the KNP anti-poaching patrols and advising on their design, PSMNR-SWR plays a prominent role in the project and has been consulted from its early development stages (though formally added as a partner in Stage 2). With PSMNR-SWR's partnership, the project is afforded a) smooth collaboration with MINFOF and KNP management in implementing the project activities, and b) the mechanism to export the newly developed anti-poaching and wildlife monitoring protocol – once fine tuned – to additional protected areas in Cameroon. In turn, the concurrent PSMNR-SWR's efforts in >30 Korup periphery villages to improve local livelihoods sustainably via investments on income generating alternatives to poaching contribute to mitigate the resulting increased anti-poaching enforcement from this project
Have you included a Letter of Support from this institution?	**Yes (co-signed by MINFOF regional delegate)**

Partner Name and website where available:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Ministry of Forest and Wildlife (MINFOF), Cameroon http://www.minfof.cm/	Cameroon's Ministry of Forestry and Wildlife (MINFOF) is responsible for safeguarding the flora and fauna of protected areas and the sustainable management of the permanent forest domain. Our project partners – WWF, PSMNR, and KRCS – all regularly liaise and work closely with MINFOF to coordinate their activities in and around Korup National Park. MINFOF will be primarily responsible for issuing research permits, coordinating deployment of anti-poaching patrols in Korup in Year 2 of the project with UO and JMU, and gathering and sharing data on encounters with animals and human hunting signs collected by anti-poaching patrols. Their involvement is crucial since they ultimately determine conservation strategies and their development implications in Cameroon's protected areas. MINFOF has also conducted park-wide surveys of wildlife and hunting activity that will provide relevant baseline data from which to compare project results.
Have you included a Letter of Support from this institution?	**Yes (co-signed by PSMNR delegate)**

Partner Name and website where available:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Korup Rainforest Conservation Society (KRCS) http://www.facebook.com/KorupRainforestConservationSociety	Established in 2009, KRCS is a conservation NGO consisting of local people committed to protecting Korup's rich biodiversity. Experienced field-assistants, university graduates, village chiefs, ex-hunters and farmers make up the 40-member organization, which collectively has expertise in wildlife/botanical and social survey techniques. KRCS benefits from local recognition and respect by the KNP management and its conservation and development partners (PSMNR/WWF/GIZ). Most recently, it participated in JMU's biomonitoring surveys, the TEAM network's camera trapping project, and, as of October 2012, the proposed project's ongoing scoping study. Robinson Orume, founding member and leader of KRCS, is also a senior member of KNP management. In 2011 he completed a 7-month intensive course on applied conservation skills at WildCRU, and received this year the Conservation Leadership Programme award. KRCS has been involved in this project since its inception. Its members will conduct the transect surveys, and set and maintain the acoustic monitoring grid until KNP staff absorb this duty in Year 2. KRCS, under the guidance of the PSMNR-SWR, will also coordinate the household, hunter and tourist surveys designed to monitor the impact of the project on local livelihoods. In Year 3, they will coordinate the final training workshop to be held in Mundemba.
Have you included a Letter of Support from this institution?	**Yes**

Partner Name and website where available:	**Details (including roles and responsibilities and capacity to engage with the project): (max 200 words)**
Coastal Forests Programme of WWF-Cameroon (WWF-CFP)	The goal of WWF-CFP is to promote the conservation of Cameroon's biodiversity in the coastal region's landscapes, including Korup National Park, and seascapes. Their work attempts to meet the ecological needs of wildlife and habitats while minimizing human-wildlife conflicts. Since 1986, the WWF-CFP has been helping the government of Cameroon to promote and secure the protection of the Korup rainforest. In 2007 and 2010, WWF-CFP completed park-wide surveys of large mammals and human activities and they continue to conduct recce-walks in Korup to monitor wildlife. David Okon, WWF-CFP Korup site manager, will be primarily responsible for assisting with developing anti-poaching patrol deployment strategies in the core zone and for assisting with coordinating Linder's monthly line-transect surveys. Okon is a native of the region and has been involved with Linder's monthly line-transect surveys for over 1 year, has assisted Linder with forest and bushmeat surveys between 2003 and 2005, and has been working for Korup since 1995.
Have you included a Letter of Support from this institution?	**Yes**

11. Have you provided CVs for the senior team including the Project Leader	**Yes**

TECHNICAL EXCELLENCE

12. Problem the project is trying to address

Please describe the problem your project is trying to address. For example, what biodiversity and development challenges will the project address? Why are they relevant, for whom? How did you identify these problems?

(Max 200 words)

The importance of wild animal meat ("bushmeat") for the livelihood of forest-dependent people in the Congo basin is well documented (e.g. DI-10004). Yet, intense, pervasive, and often illegal hunting has dramatically increased the extinction risk of many species even within protected areas (PAs), which serve as critical "source" populations for species hunted in surrounding forest "sinks". Poaching threatens the food security of the rural poor who mostly depend on bushmeat protein – the "empty forest" syndrome being a stark reminder. It also cultivates contempt for wildlife laws in a way that undermines the PAs' integration as part of the fabric of sustainable development. Recognizing this, the CBD highlights the need for mechanisms to monitor wildlife and enforce legislation. Anti-poaching patrols are widely used as such mechanism, utilizing substantial conservation resources. However, few studies have systematically examined their efficacy in Afrotropical rainforests and none using experimental design. Lack of critical evaluation renders anti-poaching strategies – practically – blindfolded. We will develop and provide training for a novel, evidence-based decision-support system that designs and assesses the efficacy of anti-poaching patrols. This will improve efficiency of PA biodiversity conservation, including of "source" populations for species that can be sustainably and legally exploited in adjacent non-protected areas.

13. Methodology

Describe the methods and approach you will use to achieve your intended outcomes and impact. Provide information on how you will undertake the work (materials and methods) and how you will manage the work (roles and responsibilities, project management tools etc).

(Max 500 words – repeat from Stage 1 with changes highlighted)

Hitherto poaching has been almost impossible to quantify directly. However, since most hunting within Cameroon's Korup National Park (KNP) involves guns (snaring largely limited near settlements), new technology for monitoring gunfire revolutionises the potential to document poaching intensity, opening the door to efficient intervention. Our before-after experimental design will use novel acoustic monitoring techniques to record *continuously* (24hr/365) gun hunting activity under current/baseline (Year-1) and optimized (Year-2) anti-poaching patrol strategies within KNP. This unprecedented level of detail on hunting patterns is possible using a grid of autonomous recording units (ARUs) which digitally store low frequency sounds over 1.5km-radius for gunshots (>7km^2/ARU). Five ARUs will blanket the KNP core area (~35km^2), four will be placed along established transects and three near farms (~10km from core). The ARUs will also record calls of elephants and KNP's eight diurnal primates; all threatened by hunting (CITES-listed) and important for tourism. Monthly mammal surveys along four transects will provide data to estimate the ARU's species-specific detection ranges, and to calibrate the relationship between calling signatures and animal numbers. BRP specialists will use call recordings to develop species-specific detection algorithms for the automatic identification of primate calls in the acoustic data and fine-tune existing ones for gunshots/elephants. Putative sounds tagged by the algorithms will be manually screened to exclude similar sounds (e.g. branches breaking vs. gunshots).

Once Year-1 data analysis is completed, we will collaborate with Dr Niki Trigoni (Oxford University; Department of Computer Science) to develop optimal patrol deployment algorithms (routes/frequency/duration). Trigoni is an expert in optimality problems, with experience in similar questions ranging from traffic control to battlefield deployments. In Year-2, optimally designed patrols will be deployed in the core area, while farm and transect area patrolling will remain unaltered (control). Data collection protocol will be as in Year-1. In Year-3, we will examine hunting and wildlife activity patterns in optimized and control patrol regime sites, and

develop a model anti-poaching design and assessment protocol that adapts to acoustic monitoring feedback. KNP/PSMNR staff will be trained in its use and an acoustic data analysis and training centre will be established at KNP headquarters. To drive the new anti-poaching protocol's roll-out, we will share training material (English/French) via a project website, organize an international workshop for park managers, and provide follow-up support to those wishing to adopt the protocol.

To monitor the impact of increased anti-poaching efforts on local livelihoods, bushmeat trading, and tourism, PSMNR-trained KRCS members will use questionnaires and semi-structured interviews to survey hunters, households, markets, eateries, and tourists throughout the project. Hunters from three villages (10/village) will be interviewed monthly to recall last month's hunting activity and off-take levels. Households in the same villages (10/village) will be surveyed intensively for 30 days, four times per year, to evaluate the relative contribution of bushmeat to household consumption and trade. Markets and eateries in the towns of Mundemba and Manja will be surveyed monthly to monitor bushmeat availability and prices. Finally, tourists will be asked to complete pre-/post-visit questionnaires to assess visit expectation-satisfaction levels.

14. Outcome

Detail what the expected outcomes of this work will be. The outcome should identify what will change and who will benefit. The outcome should refer to how the project will contribute to reducing poverty while contributing to sustainable development and management of biodiversity and its products. A summary statement of this outcome should be provided in question 4 and 24.

(Max 250 words)

Poaching in KNP, as in other PAs, imperils wildlife, is illegal and undermines the sustainability of local livelihoods while legitimising a corrupted attitude between people and the park. By developing a decision-support system that uses field-evidence on gun hunting and wildlife activity patterns with cutting-edge optimization algorithms to design anti-poaching deployments, we dramatically increase KNP's capacity and efficiency to combat poaching with the resources available. The 26 KNP game guards currently search haphazardly or on the basis of educated guesswork; frustrated and demoralised, they can only retrospectively gauge their success on the basis of tri-annual large mammal surveys of population trends. Instead, our system will furnish them with reliable data at frequent intervals to customise their tactics to prevailing poaching patterns. The immediate benefit will be increased protection of conservation-priority species mostly affected by gun hunting (e.g. primates), for some of which KNP is their principal or only local stronghold (e.g. Preuss's red colobus, drill, chimpanzee). Increased populations of such charismatic species will directly strengthen the recently launched efforts of the government (MINFOF) to revive KNP's underexploited tourism and research potential (>£370,000 infrastructure investments), generating employment opportunities. Reduced poaching in KNP will also protect the "source" populations of economically important species that can be sustainably and legally exploited in surrounding forest "sinks", improving the food security and income-generating opportunities of local communities (28 villages within KNP's 3-km peripheral zone; >40,000 people in Korup region). Finally, rolling-out the anti-poaching decision-support beyond KNP will multiply the benefits and legacy of the project.

15a. Is this a new initiative or a development of existing work (funded through any source)? Please give details (Max 200 words):

The project is a new initiative that brings together ecology, wildlife conservation, bioacoustics, protected area management, sensor network computing, and international development specialists to address, for the first time, the lack of robust design and evaluation mechanisms for anti-poaching patrols in Afrotropical rainforests –the most widely used, yet rarely robustly scrutinized, mitigation measure for the bushmeat crisis within PAs. It was inspired by and builds on previous initiatives in Central Africa, such as BRP's Elephant Listening Project acoustic

monitoring research in Gabon and the Central African Republic (Wrege et al., 2010), JMU's studies on the impact of hunting on KNP's primate communities (Linder and Oates, 2011), WildCRU's bushmeat studies in Southwest Cameroon and Nigeria (DI project 10004), and developments in optimality problem solutions (e.g. traffic control management, battlefield deployments). The project also links closely with and directly supports PSMNR-SWR's ongoing efforts to promote participatory sustainable forest and wildlife management in and around KNP, focusing on the poorer segments of local communities.

15b. Are you aware of any other individuals/organisations/ projects carrying out or applying for funding for similar work? ☐**Yes** ☑ **No**

If yes, please give details explaining similarities and differences, and explaining how your work will be additional to this work and what attempts have been/will be made to co-operate with and learn lessons from such work for mutual benefits:

No. Although there are other projects that examine the impact of bushmeat trade in Central Africa and propose mitigation measures, our project is ultimately an anti-poaching technology development project.

15c. Are you applying for funding relating to the proposed project from other sources? ☐**Yes** ☑ **No**

If yes, please give brief details including when you expect to hear the result. Please ensure you include the figures requested in the spreadsheet as Unconfirmed funding**.**

We recently received an invitation to submit an application to the National Geographic Society/Waitt Grants Program, which provides early stage venture capital funds for projects promising "new breakthroughs in the natural and social sciences". Although we will pursue these funds to expand the capability of acoustic sensors to monitor additional wildlife species, these funds are not directly related to the proposed project.

16. Value for money

Please describe why you consider your application to be good value for money including justification of why the measures you will adopt will secure value for money?

(Max 250 words)

The project is exceptional value for money because it:

a) Increases the return-on-investment benefits of the KNP/PSMNR resources put into anti-poaching patrols (>£36,000/year), by optimally designing their deployment in response to field evidence. With a £0.07/ARU/day running cost (after initial investment) vs. £13.5/four-man patrol/day (*on-top* of monthly salaries), ARUs are ~200-fold more efficient for monitoring, permitting game-guards to focus on targeted patrolling of hunting hotspots and poacher arrests.
b) Strengthens KNP's tourist and research potential, by protecting charismatic species (e.g. primates) in a "no hunting core area". In turn, this will lead to greater revenue for the park, increased investment and increased employment opportunities for locals (including hunters) as field guides and research assistants. MINFOF has secured >£370,000 in tourism and research infrastructure in KNP, which is at risk of being wasted if anti-poaching strategies are not revolutionized and local wildlife populations effectively protected.
c) Protects "source" populations of bushmeat species which can be sustainably and legally exploited in surrounding forest "sinks". In doing so, the project indirectly contributes to the increased food and income security of >40,000 people living in the Korup region, promoting the interests of the many rural poor over the short-term benefits of the few poachers (avoiding another "tragedy of the commons").
d) Will have a multiplicative effect on its benefits, as the anti-poaching protocol is adopted in other PAs.
e) Generates essential baseline survey data on the importance of hunting for local livelihoods, tourism, and wildlife conservation, the current absence of which confounds conservation efforts.

17. Ethics

Outline your approach to meeting the Darwin Initiative's key principles for research ethics as outlined in the guidance notes.

(Max 300 words)

All the necessary permits for conducting research in Cameroon will be obtained for the duration of the project (Ministry of Research and Innovation; Ministry of Forests and Wildlife). In addition, WildCRU – as the lead institution – will comply fully with Oxford University's Local Ethical Review Process's (LERP) comprehensive guidelines and recommendations regarding animal welfare issues and ethical issues arising from this study involving wild animals. James Madison University will obtain permit from the Institutional Animal Care and Use Committee (IACUC).

Furthermore, WildCRU will obtain approval for this project from Oxford University's Central University Research Ethics Committee (CUREC), ensuring that research activities involving human participants are "conducted in a way which respects the dignity, rights, and welfare of participants, and which minimises risk to participants, researchers, third parties, and to the University itself". Specifically, free, prior, and informed consent (FPIC) will be obtained from all individuals involved in the bushmeat price, tourist, hunter and household socioeconomic surveys.

All aspects of our project engage and involve Cameroonian stakeholders to ensure their perspectives and well-being are addressed. In fact, the fieldwork is almost entirely conducted by trained Cameroon nationals who each have several years of training in conservation science, while KRCS/MINFOF members will also be trained to analyze acoustic data. *All* project staff originate from villages in the Korup area and are active KRCS members.

All project members will be afforded the same high standards of health and safety training and support. The team setting the ARUs in trees will have appropriate climbing and safety equipment and be adequately trained in their use. All field teams will have first aid kits, and injuries sustained during the project activities will be treated – as required – in the local medical facilities (Mundemba Hospital). An appropriate accident record book will be kept in the project headquarters.

PATHWAY TO IMPACT

18. Legacy

Please describe what you expect will change as a result of this project with regards to biodiversity conservation/sustainable use and poverty alleviation. For example, what will be the long term benefits (particularly for biodiversity and poor people) of the project in the host country or region and have you identified any potential problems to achieving these benefits?

(Max 300 words)

The project's primary legacy will be an improved capacity of KNP management to combat poaching and hence, of Cameroon to meet its CBD (Article 7 & 8) stated obligations to monitor species in need of conservation and to manage the identified threats to them. By combining unprecedented insight on spatiotemporal patterns of gun hunting and wildlife activities obtained from acoustic monitoring with cutting-edge optimal deployment algorithms, KNP staff will use a familiar tool – patrols – to maximize conservation impact with the human and financial resources typically available to them; a legacy of improved anti-poaching effectiveness and efficiency.

The project's legacy will also be an overall critical evaluation of anti-poaching patrols' ability to curb poaching. This is a frequently assumed but rarely tested assumption. If indeed acoustic data analysis shows a decrease in gun hunting intensity during the year-2 optimized patrols, then the project will have made a strong case in support of hiring additional game-guards across Central African PAs (creating justifiable employment opportunities in conservation).

The project will also afford increased protection to KNP populations of species which can be legally exploited in peripheral forests (e.g. rodents, small ungulates). With the KNP "source" populations for these species secured, efforts to promote sustainable hunting quota schemes of peripheral "sink" populations (e.g. in community forests) can gain momentum as a realistic step towards regional food and livelihood security. Currently, any such initiatives would be futile, while poaching of KNP's resources – much of it aimed for Nigerian markets across the border – remains uncontrolled and the poaching-cultivated contempt of wildlife laws remains unchallenged.

Finally, the project's legacy will also be baseline data for Korup region on gun hunting intensity, wildlife status, and the role of bushmeat/hunting in local communities. Currently, such information is missing, confounding monitoring and evaluating the impact of conservation and development initiatives.

19. Pathway to poverty alleviation

Please describe how your project will benefit poor people living in low-income countries. Projects are required to show how positive impact on poverty alleviation will be generated from your project in low-income countries. All projects funded under the Darwin Initiative in Round 19 must be compliant with the Overseas Development Assistance criteria as set out by the OECD. The outcomes of your research must at the very least provide insight into issues of importance in achieving poverty alleviation.

(Max 300 words)

The project will have direct and indirect benefits for Korup region's poor communities. In the short-term, twelve Korup region locals – mostly former hunters – will be employed to lead the field work, sort and document data, and undertake the surveys. While these positions are of a fixed term, they increase local capacity for high-calibre research, making KNP more attractive to national/international research projects. Research-related benefits are not to be underestimated, as they give value to the local knowledge of even poorly educated people.

As the project progresses it will indirectly benefit poverty alleviation in the region by protecting KNP's rich biodiversity. The benefits will ensue from both a) increased revenue and employment opportunities from tourism and research, and b) fostering the sustainable and legitimate exploitation of wildlife in KNP's peripheral zone. In the first case, reduced hunting in KNP core will result in increased populations of charismatic, tourist-attractive species such as the park's 8 diurnal primates – the archetypal rainforest animals. The project coincides with and builds on a significant government investment (£370,000) in necessary infrastructures to revitalize the tourist/research potential of KNP; a long-term objective specified in park's management plan. The planned tourist satisfaction surveys will also provide insight on the impact of poaching on the tourist potential of the park.

Secondly, poachers currently illegally exploit KNP's source populations of economically important species, reducing the natural dispersal of surplus animals to adjacent forests ("sinks") where exploitation is legal. The new anti-poaching protocol will better protect these source populations, for the equitable benefit of the many as opposed to the quick and illegal profit of the poachers. Importantly, the project outcome directly facilitates our partner's (PSMNR-SWR) regional-scale strategy to establish, in collaboration with the government of Cameroon, sustainable forest and wildlife management schemes in and around protected areas.

20. Exit strategy

State whether or not the project will reach a stable and sustainable end point. If the project is not discrete, but is part of a progressive approach, give details of the exit strategy and show how relevant activities will be continued to secure the benefits from the project. Where individuals receive advanced training, for example, what will happen should that individual leave?

(Max 200 words)

We envisage a stable and sustainable end point to this project; one where the KNP management has adopted the new anti-poaching design and assessment protocol and is able competently to implement it as part of its regular conservation actions and within the resources typically afforded to it by MINFOF/PSMNR. To achieve this, the project will first provide the necessary data collection and analysis equipment and training to a KNP and KRCS team. By including KRCS members in the training – all are local residents – we ensure continuity in the local capacity to implement the protocol regardless of future postings of MINFOF staff. The incorporation of acoustic monitoring in the KNP management plan, which is under revision in 2013, will secure the long-term inclusion of the process in MINFOF and PSMNR-SWR strategies. Anticipated increases in revenue from tourism and research will also contribute towards continuity of funding. Finally, by establishing a data analysis and training centre in Mundemba, we set the ground for making KNP the test-site/hub for future research on bioacoustics and anti-poaching strategy development, maintaining local capacity on top of future developments.

HIGHLY DESIRABLE

21. Raising awareness of the potential worth of biodiversity

If your project contains an element of communications, knowledge sharing and/or dissemination please provide a description of your intended audience, how you intend to engage them, what the expected products/materials there will be and what you expect to achieve as a result. For example, are you expecting to directly influence policy in your host country or is your project a community advocacy project to support better management of biodiversity?

(Max 300 words)

Once the new decision-support system for patrol design and evaluation is developed and tested in KNP, we will drive its adoption in other Central African countries. Through MINFOF (a project partner), we will first circulate project reports (in English and French) to Cameroonian conservators and then to other Central African protected area managers. These reports and other training material will also be posted to an interactive project website. WildCRU, having run since 2008 a post-graduate diploma specifically designed to increase applied conservation skills in lower income countries, has the expertise in designing appropriate course material, and has an in-house expert on web-learning (Dr Lucy Tallents). The website and training materials will also be incorporated in the WildCRU diploma training, expanding the project's outreach to current and future WildCRU graduates from Africa, Asia, and South America.

In Year 3, project personnel will organize a workshop in Mundemba (KNP headquarters) for at least 20 participants from Cameroon and neighbouring countries, presenting evidence for implementing acoustic monitoring and offering in-depth hands-on training on acoustic monitoring, data analysis, applying the deployment optimization algorithms and using the results to design anti-poaching patrols. At the workshop, we will identify at least two areas where the anti-poaching protocol will be next rolled-out (even as a pilot study) by the end of the project.

Peer-reviewed publications, that will include Cameroonian authors, will raise awareness about the value of acoustic monitoring as a stand-alone wildlife monitoring method as well (no observer bias or effect on animal behaviour; continuous data collection; suitability for low density/cryptic species). The species-specific algorithms developed for KNP's eight diurnal primates will be an important contribution of the project towards this direction, as each one requires considerable cost and skill for its development.

22. Importance of subject focus for this project

If your project is working on an area of biodiversity or biodiversity-development linkages that has had limited attention (both in the Darwin Initiative portfolio and in conservation in general) please give details.

(Max 250 words)

Foot patrols are almost ubiquitously used as the primary law enforcement mechanism within protected areas in the rainforest zone of Africa, often absorbing a substantial proportion of the available conservation resources. Yet, surprisingly, there has been little effort critically to examine their efficiency in achieving their goals, or systematically to examine ways of improving them. Often they just happen, with the assumption that more people patrolling more often is a goal in itself, and that more effort delivers better outcomes. But does it? The reality is that the benefits of anti-poaching patrolling have been more assumed than proven, reliant at best on metrics of success prone to collection and interpretation biases (number of cartridges/snares/footprints found, relative abundance of certain species). However, many species of interest occur at densities too low to be monitored effectively by traditional survey methods, and the spatiotemporal understanding of hunting patterns is very difficult to infer from indirect signs. Measures of success, or data on which to base adaptive management and procedural refinement of patrol design are frequently inadequate or absent. The project will introduce acoustic monitoring and optimality problem solving (previously applied in areas such as traffic control and battlefield deployment) as new mechanisms to inform anti-poaching patrols, de facto launching a debate within the scientific and applied conservation community on this long overlooked yet critical conservation issue.

23. Leverage

a) Secured

Provide details of all funding successfully levered (and identified in the Budget) towards the costs of the project, including any income from other public bodies, private sponsorship, donations, trusts, fees or trading activity.

Project partners:

WildCRU – Macdonald has secured a grant of **£XX/year** from the Quatermain Foundation for this project to cover ARU and batteries for the acoustic monitoring grid; access to **£1,500**-worth of legacy equipment for previous research in KNP (including a laptop computer for use in Cameroon).

JMU – £XX/year in matched-funding (technical expertise and staff salaries)

BRP – £XX in matched-funding (technical expertise and staff salaries); **£XX** in matched-funding (acoustic data storage in BRP servers for 5 years)

PSMNR-SWR – £XX/year in matched-funding covering the cost of the monthly anti-poaching surveys in KNP (26 game-guards; ~20 days/month patrolling; filed per diems and performance incentives/bonuses) for Year 1 and 2 of the project; **£XX** of funds to support the household and hunter surveys (Years 1-3); £XX in funds to cover the shipping of the ARU batteries to Cameroon for Year 3.

WWF-CFP – £XX (estimated) assistance with the importation of project equipment/consumables (batteries; Years 1-2)

b) Unsecured

Provide details of any matched funding where an application has been submitted, or that you intend applying for during the course of the project. This could include matched funding from the private sector, charitable organisations or other public sector schemes.

Date applied for	Donor organisation	Amount	Comments
n/a			

PROJECT MONITORING AND EVALUATION

MEASURING IMPACT

24. LOGICAL FRAMEWORK

Darwin projects will be required to report against their progress towards their expected outputs and outcomes if funded. This section sets out the expected outputs and outcomes of your project, how you expect to measure progress against these and how we can verify this. Further detail is provided in Annex x of the guidance notes which you are encouraged to refer to. The information provided here will be transposed into a logframe should your project be successful in gaining funding from the Darwin Initiative. The use of the logframe is sometimes described in terms of the Logical Framework Approach, which is about applying clear, logical thought when seeking to tackle the complex and ever-changing challenges of poverty and need. In other words, it is about sensible planning.

Impact

The Impact is not intended to be achieved solely by the project. This is a higher-level situation that the project will contribute towards achieving. All Darwin projects are expected to contribute to poverty alleviation and sustainable use of biodiversity and its products.

(Max 100 words)

The extent of the African bushmeat trade has reached crisis levels, threatening entire ecosystems as well as the food security and livelihoods of forest dependent rural populations. Protected areas are a key component in the strategy to address the crisis, and enforcement of wildlife legislation is critical to protected areas' success. By developing an improved design and evaluation of anti-poaching patrols in Central Africa, the project contributes to the *mitigation* of the bushmeat crisis overall, protecting endangered biodiversity, fostering the sustainable use of legitimate resources in park periphery, and generating alternative training and employment opportunities to hunting.

Outcome

There can only be one Outcome for the project. The Outcome should identify what will change, and who will benefit. The Outcome should refer to how the project will contribute to reducing poverty and contribute to the sustainable use/conservation of biodiversity and its products. This should be a summary statement derived from the answer given to question 14.

(Max 100 words)

Poaching in Central Africa imperils wildlife, is illegal and undermines the sustainability of local livelihoods while legitimising a corrupted attitude between people and protected areas. The project uses robust but innovative technology, centred on acoustic monitoring, to design, implement and evaluate anti-poaching strategies, leading to the development of a novel decision-support system to be rolled out across Central Africa. Developed first for Korup NP (Cameroon), this evidence-based anti-poaching protocol is intended to efficiently protect wildlife source populations within protected areas, while laying the foundation for sustainable forest uses, and thus increased food security, job opportunities, and – ultimately – poverty alleviation.

Measuring outcomes - indicators

Provide detail of what you will measure to assess your progress towards achieving this outcome. You should also be able to state what the change you expect to achieve as a result of this project i.e. the difference between the existing state and the expected end state. You may require multiple indicators to measure the outcome – if you have more than 3 indicators please just insert a row(s).

Indicator 1 revised	*"By year 3, KNP management maintains an acoustic monitoring grid which it actively uses to collect and analyze data on spatiotemporal patterns of gun hunting and wildlife activity, in order to design adaptively its anti-poaching patrols."* To date, KNP management relies only on the collection of indirect, potentially biased and difficult to interpret evidence to evaluate the success of its anti-poaching strategies (e.g. collection of spent cartridges, number of arrests). Acoustic monitoring, combined with line transect surveys, will provide KNP management with fine resolution data on the spatiotemporal patterns and trends of gun hunting and key flagship and bushmeat species in KNP. The following indicator milestones will be used to assess progress: • Trained KRCS members set up the acoustic monitoring grid (April-May 2013), developing a field protocol for efficiently changing batteries/memory cards every three months (end year 1). • BRP sound specialists develop species-specific detection algorithms for automatically identifying calls of Korup's eight diurnal primate species in the acoustic data (end year 1). • Calculate the detection range of acoustic recording units (ARUs) in KNP for gunshots and wildlife calls (end year 1). • Establish an acoustic monitoring data analysis centre at KNP headquarters (Mundemba) (end year 2). • Train 8 KNP staff in maintaining the ARU grid and 4 on analysing and interpreting the acoustic data (end year 2). • Incorporate acoustic monitoring as both a wildlife monitoring and an anti-poaching evaluation/design mechanism in the KNP Management Plan which is up for renewal in 2013-2014 (end year 1).
Indicator 2 revised	*"Gun hunting pressure is significantly reduced in monitored areas within KNP during year 2 compared to baseline data collected in year 1. The reduction is higher in the core area of KNP (-30%) where the new anti-poaching regime will be tested, compared to monitored control-sites in the periphery of the core (-15%) and near farms (± no change)."* The goal is deemed conservatively realistic given that the available number of game-guards (~26) will be able in effect to "flood" the 35-km^2 KNP core area to make it a high-risk zone for poachers. The following indicator milestones will be used to assess progress: • Obtain data on the baseline gun hunting pressure in the study area by analyzing the acoustic data from year 1. • Markedly increase ("flood") of anti-poaching effort in KNP's core zone for an entire year, using evidence on hunting patterns to adapt patrolling strategies throughout the year (year 2). • Establish a domestic and wild meat price monitoring scheme which, twice monthly, checks meat prices at different selling points (household, middleman, market, eating outlet) (year 1). Having this baseline information will help interpret the financial incentives that hunters have to target certain species. • Compare acoustic monitoring data on gun hunting pressure from core experimental and control areas from year 1 and 2 of the project (year 3).

Indicator 3	*"Korup's charismatic and endangered species are better protected in the core of the park, increasing the region's potential to generate sustainable benefits for local stakeholders from their protection through research and tourism employment opportunities."* Species such as the critically endangered Preuss's red colobus, and the endangered/vulnerable Nigeria-Cameroon chimpanzee, drill monkey, red-capped mangabey red-eared guenon, and forest elephant are found almost exclusively within KNP in the broader region. Therefore, carcass records for these species in villages around KNP's core area will almost certainly reflect poaching levels within the park (something which cannot be assumed for more widely distributed species). Due to their charismatic nature, these species are also thought to be important attractions for tourists, while a healthy faunal community is attractive to researchers (ecologists). The following indicator milestones will be used to assess progress: • Obtain baseline data on the relative abundance of the target species in KNP analyzing year 1 transect survey (encounter rates) and acoustic monitoring data (calling rates). • Obtain baseline data on the proportional and absolute contribution of the target species to the domestic and wild meat consumed and traded in three surveyed villages located near the KNP core area (tentatively Erat, Ikondokondo and Ngenye villages), via intensive household socioeconomic surveys (10 households/village; intensively surveyed 4 months/year) and hunter interviews (10 hunters/village; surveyed monthly). • Obtain baseline data on the pre-visit expectations and post-visit satisfaction level of visiting tourists via questionnaires (year 1 and 2). • Assess changes in relative abundance of target species in the forest and in consumption and trade records and evaluate changes in tourist satisfaction levels across years 1, 2, and 3.
Indicator 4 revised	*"KNP's protocol to design and evaluate anti-poaching patrols using evidence from acoustic monitoring techniques is adopted in at least two other protected areas in Central Africa by the end of the project (even as a pilot study)."* The intention of this project is not only to develop an improved anti-poaching protocol for KNP, but to change the current complacent reliance on poorly scrutinized anti-poaching strategies throughout the rainforest zone of the continent. The following indicator milestones will be used to assess progress: • Develop a project website sharing with fellow conservationists field-protocols (year 1), data analysis protocols (year 2) and the final report (year 3) among other documents. • Establish an acoustic monitoring analysis/anti-poaching patrol design centre adin Mundemba, where training of new staff on the new techniques can take place (end Year 2). • Organize a final workshop for 20 protected area managers (including international participants) in Mundemba during year 3, providing theoretical and practical training on acoustic monitoring and anti-poaching design techniques; identify PAs suitable for rolling-out the new protocol. • Provide follow up support for the establishment of pilot studies in at least two new protected areas.

Verifying outcomes

Identify the source material the Darwin Initiative (and you) can use to verify the indicators provided. These are generally recorded details such as publications, surveys, project notes, reports, tapes, videos etc.

Indicator 1 revised	• Project report detailing the field protocol for setting, maintaining and extracting data from the ARU grid (year 1; WildCRU/KRCS) • Code of species-specific detection algorithms (year 1; BRP) • Raw acoustic data from the sensors, stored at BRP (year 1-3). • KNP summary report of gun hunting and wildlife activity patterns (acoustic and line transect data; year 2-3; MINFOF). • KNP Management Plan (2013-2016) identifying acoustic-monitoring as a decision-support tool for anti-poaching patrol design and evaluation (year 2; MINFOF). • Cybertracker data recording the movement of anti-poaching patrols, in accordance to pre-determined routes (year 3; MINFOF/PSMNR-SWR).
Indicator 2 revised	• Project report presenting summarized baseline gun hunting and wildlife activity data from 12 ARUs and 4 line transects for year 1 (WildCRU/JMU/KRCS). • KNP report to PSMNR-SWR on the anti-poaching patrol activities in the core area during year 2 (year 3; MINFOF). • Project report presenting gun hunting and wildlife activity pattern changes between year 1 and year 2 (year 3; WildCRU/JMU/KRCS/ MINFOF).
Indicator 3	• Project report presenting summarized baseline wildlife activity data from 12 ARUs and 4 line transects for year 1 and year 2 (core and control sites) (WildCRU/JMU). • Completed tourist satisfaction questionnaires (year 1-3; KRCS) and annual KNP report of tourist numbers. • Project report presenting results from (a) household economic surveys (~36/household/year; 30 households; KRCS/JMU) and hunter surveys (12 villages/year; 10 hunters/village; KRCS).
Indicator 4	• Project website content (WildCRU) • Online and printed training material • List of participants attending training workshop; photographs/video (KRCS) • Official documents from protected areas adopting the new anti-poaching protocol, stating their intention to do so.

Outcome risks and important assumptions

You will need to define the important assumptions, which are critical to the realisation of the *outcome and impact* of the project. It is important at this stage to ensure that these assumptions can be monitored since if these assumptions change, it may prevent you from achieving your expected outcome. If there are more than 3 assumptions please insert a row(s). Revised to adhere more closely to SMART standards

Assumption 1	*Socioeconomic and political realities in Cameroon and neighbouring Nigeria (Cross River State) remain relatively stable* – Although in the past decade there have been brief periods of instability in Cameroon (most recently in January 2009), these are typically short lived (1-2 weeks), affect primarily life in the urban centers, and have little to no impact on the management of the protected areas. Tensions in Nigeria are currently limited to the north of the country, far away from the study area.
Assumption 2	*There is no dramatic increase in the hunting technology available to local communities (12-gauge shotguns, often locally constructed)* – The use of locally made single-shell shotguns is ubiquitous in the region, so there is no room for a massive increase in the capability of hunters to hunt wildlife. More advanced rifle guns are used only rarely by professional elephant hunters, and unless there is a collapse of Cameroonian civil-law, there is no expectation that the use of automatic rifles (currently strictly illegal) will become widely used.
Assumption 3	*The Ministry of Forest and Wildlife (MINFOF) of Cameroon remains committed to the German-Cameroonian cooperation programme of PSMNR-SWR* – The PSMNR-SWR programme is currently in its second phase which will continue for at least a half-year after the completion of this project. Given the success of the Phase 1 of the programme, there is a good chance that it will be extended by 5 years more (Phase 3).

Outputs

Outputs are the specific, direct deliverables of the project. These will provide the conditions necessary to achieve the Outcome. The logic of the chain from Output to Outcome therefore needs to be clear. If you have more than 3 outputs insert a row(s). It is advised to have less than 6 outputs since this level of detail can be provided at the activity level. Revised to adhere more closely to SMART standards

Output 1 revised	*"KNP staff are trained and able to implement the new anti-poaching evaluation and design protocol (year 2/3)."* -- Following careful analysis of year 1-2 data and lessons learned from the field, a step-by-step protocol to establishing, maintaining, and using an acoustic monitoring grid for informing anti-poaching actions will be developed and introduced to KNP management through training workshops.
Output 2 revised	*"Poaching patterns within KNP are understood so as to be effectively combated with available resources, affording wildlife in the park's core area (at least) a markedly higher level of protection (year2/3)."* -- Currently, the understanding of poaching patterns in the Korup region is primarily based on bushmeat market surveys (i.e. DI 10004) which examine the issue at the trade end. We will combine village/hunter surveys with detailed data on actual gun hunting pressure in the park over a 2 year period, to get a better understanding of the scale of the problem, its patterns in space and time, and the efficiency of different anti-poaching patrol designs to combat poaching.
Output 3 revised	*"The need to critically examine current anti-poaching design and evaluation strategies in Central African rainforests is recognized by key government agencies and conservationists in Cameroon, Gabon, Equatorial Guinea, Central African Republic, Congo-Brazzaville, DR Congo."* --

	The overall impact of the project beyond Korup region depends on rolling-out the lessons learned from this project to other protected areas, engaging key conservation practitioners (government, NGOs) and exporting the new anti-poaching design and evaluation protocol.

Measuring outputs

Output 1 *"KNP staff are trained and able to implement the new anti-poaching evaluation and design protocol (year 2/3)."*	
Indicator 1	The new anti-poaching protocol is approved by MINFOF and included in the new KNP management plan (year 2).
Indicator 2	A group of 8 KNP game guards is trained in setting and maintaining the ARU grid in the field, while 4 KNP management staff are trained in analysing the acoustic monitoring data (year 2).
Indicator 3	First anti-poaching report using acoustic monitoring data collected and analyzed by KNP staff is submitted to PSMNR-SWR/MINFOF (year 3).

Output 2 *"Poaching patterns within KNP are understood so as to be effectively combated with available resources, affording wildlife in the park's core area (at least) a markedly higher level of protection (year2/3)."*	
Indicator 1	Report submitted to MINFOF presenting gun hunting and wildlife activity pattern changes between year 1 and year 2 (24 months; 12 ARUs + 4 line transects + hunter interviews) (year 3).
Indicator 2	Report submitted to MINFOF presenting the findings of the socioeconomic surveys on the role of bushmeat in the livelihoods (food/income) of local communities (year 1-2 data; 3 villages) (year2).
Indicator 3	Peer-reviewed manuscript on the efficacy of anti-poaching patrols to combat hunting pressure within protected area is accepted for publication (year 3).

Output 3 *"The need to critically examine current anti-poaching design and evaluation strategies in Central African rainforests is recognized by key government agencies and conservationists in Cameroon, Gabon, Equatorial Guinea, Central African Republic, Congo-Brazzaville, DR Congo."*	
Indicator 1	Project website is developed and used as a communication forum for sharing the project findings with conservation practitioners (field protocols, data analysis protocols, project reports and publications). Material posted in English and French (year 1-3).
Indicator 2	A workshop providing theoretical introduction to and practical training on acoustic monitoring and anti-poaching patrol design and evaluation techniques is held in Mundemba for 20 Central African conservationists (year 3).
Indicator 3	Project partners are invited to advise management teams of protected areas wishing to incorporate the new anti-poaching protocol/acoustic monitoring in their area (2 PAs; year 3).

Verifying outputs

Identify the source material the Darwin Initiative (and you) can use to verify the indicators provided. These are generally recorded details such as publications, surveys, project notes, reports, tapes, videos etc.

Output 1	• KNP Management Plan (2013-2016) (year 2) • Visual inspection of acoustic monitoring data analysis centre at KNP headquarters (Mundemba) (end year 2) • Participants list of workshop training KNP staff in acoustic data analysis and interpretation (year 2/3) • Cybertracker data on game guard patrol routes (year 3) • Annual KNP report (year 3) to PSMNR-SWR on anti-poaching patrols
Output 2	• Household economic survey reports, KRCS (years 1-3) • Hunter survey reports, KRCS (years 1-3) • Tourist survey reports, KRCS (years 1-3) • Bush-meat price survey reports, KRCS (years 1-3) • Summary project reports of acoustic monitoring and line transect data (years 1-2) • KNP annual reports to PSMNR-SWR/MINFOF • Peer-reviewed publication on the efficacy of anti-poaching patrols to combat hunting pressure within protected area
Output 3	• Content of the project's website • Project developed data collection and data analysis training material (to be used during the workshop). • List of final workshop participants • Agreement records (formal letters, MoUs) of project partners to share know-how on anti-poaching design/evaluation and acoustic monitoring in general with protected area managers beyond Korup

Output risks and important assumptions

You will need to define the important assumptions, which are critical to the realisation of the achievement of your outputs. It is important at this stage to ensure that these assumptions can be monitored since if these assumptions change, it may prevent you from achieving your expected outcome. If there are more than 3 assumptions please insert a row(s).

Assumption 1	*Autonomous recording units (ARUs) function properly in Korup rainforest and are not vandalized/stolen* – The ARUs will be specifically customized by BRP engineers for deployment in the humid tropical rainforest (placed in weather-proof, spray-painted green boxes), and placed 8-10 m high up on trees where they will be inaccessible/hard to see for humans without climbing gear. Similar ARUs have been field-tested for months in Gabon by BRP staff with generally high reliability. In 2011, a TEAM Network camera-trap study in the same area of KNP reported no vandalism/theft of their cameras which are deployed at ground level. As a general precaution, the location of ARUs will be disclosed to people only on a need-to-know basis, they will be set away from permanent or hunting trails, and no signs will be left in the field (e.g. broken branches, tape markings etc.) marking the ARUs' location.

	The eight 6V batteries placed in the ARUs with each deployment are sufficient for 6 months of continuing data recording. However, we will replace batteries and memory cards at least every four months to account for any uncertainty in the life-span of batteries and limit data loss due to vandalism or electronic malfunction.
Assumption 2	*Development of species-specific detection algorithms for calls of Korup's eight diurnal primates is possi*ble – BRP sound analysts have the technical skills required to develop such detectors. They have already developed and tested such for elephants and gunshots in Gabon. The project will develop detection algorithms for primates, using at first species-specific long-distance calls. JMU and WildCRU researchers have years of research experience on KNP primates and can differentiate these calls easily – and so can the local field assistants. The development of the primate detectors will use available recordings from Gabon (some species), the Macaulay Library of Natural Sounds at Cornell University, and recordings made by the project at the Limbe Wildlife Center, Cameroon and within KNP. We will continue efforts to develop behaviour-specific detectors for certain species, with priority given to those of the most endangered and cryptic species (e.g. Preuss's red colobus, drill, Nigeria-Cameroon chimpanzee).
Assumption 3	*The villages of Erat, Ikondokondo and Ngenye (tentatively) will remain open to conducting surveys on the importance of bushmeat consumption and trading to local livelihoods* – The PSMNR-SWR has been working in communities within and in the periphery of KNP since 2007, promoting sustainable forest and wildlife management for the benefit of local stakeholders via investments on income generating alternatives to poaching. During this period, PSMNR-SWR and GIZ staff have developed good rapport with these communities. Moreover, by using KRCS members (locals to Korup region) to coordinate these surveys, and trained village animators (village residents) as the primary data collectors, we have taken steps to avoid the involvement of project members to which the surveyed people could feel antagonistic to or intimidated by (e.g. KNP management).

Activities

Define the tasks to be undertaken by the research team to produce the outputs. Activities should be designed in a way that their completion should be sufficient and indicators should not be necessary. Any risks and assumptions should also be taken into account during project design.

Output 1 *"KNP staff are trained and able to implement the new anti-poaching evaluation and design protocol (year 2/3)."*	
Activity 1.1	Acoustic monitoring grid (12 ARUs) and line transect network established in KNP; KRCS members trained
Activity 1.2	Collection of ARU and line transect data on gun hunting intensity and wildlife activity patterns in KNP
Activity 1.3	Species-specific detection algorithms developed; detection range of ARUs for wildlife calls/gunshots determined
Activity 1.4	Inclusion of novel anti-poaching protocol in the KNP Management Plan
Activity 1.5	Scoping analysis of year 1 baseline gun hunting/wildlife activity data completed; development of optimal algorithms for deployment of game-guards (cooperation with Dr Niki Trigoni)

Activity 1.6	Development of anti-poaching patrol design and evaluation protocol; posted on project website
Activity 1.7	Acoustic monitoring data analysis centre established in Mundemba
Activity 1.8	Train 8 KNP staff in maintaining the ARU grid and 4 on analysing and interpreting the acoustic data (end year 2).
Activity 1.9	KNP staff fully absorb maintenance, data collection and data analysis tasks from project staff

Output 2 *"Poaching patterns within KNP are understood so as to be effectively combated with available resources, affording wildlife in the park's core area (at least) a markedly higher level of protection (year2/3)."*	
Activity 2.1	Bushmeat price surveys undertaken
Activity 2.2	Hunter surveys undertaken (level of involvement in hunting)
Activity 2.3	Household socioeconomic surveys undertaken (bushmeat use/value)
Activity 2.4	Tourist satisfaction surveys undertaken
Activity 2.5	Project report on the scoping analysis of year 1 survey data (household/hunter/tourist) on the baseline local use/value of important conservation and bushmeat species and poaching patterns
Activity 2.6	Analysis of year 1-2 data; project report on the effect of increased KNP anti-poaching initiatives on gun hunting pressure, wildlife activity, and local use/benefits from hunted species (submitted to MINFOF).
Activity 2.7	Peer reviewed paper submitted

Output 3 *"The need to critically examine current anti-poaching design and evaluation strategies in Central African rainforests is recognized by key government agencies and conservationists in Cameroon, Gabon, Equatorial Guinea, Central African Republic, Congo-Brazzaville, DR Congo."*	
Activity 3.1	Launch project website
Activity 3.2	Upload year 1/year 2 summary reports to website / translated
Activity 3.3	Decide on dates/content of final workshop; circulate flyer among C. African conservation community
Activity 3.4	Select workshop members; make necessary travel arrangements for international participants
Activity 3.5	Hold workshop in Mundemba
Activity 3.6	Select most promising sites for exporting the anti-poaching protocol; formalize cooperation with project partners involved
Activity 3.7	Provide follow up support for the establishment of pilot studies in at least two new protected areas.

25. Provide a project implementation timetable that shows the key milestones in project activities. Complete the following table as appropriate to describe the intended workplan for your project.

	Activity	No of Months	Year 1				Year 2				Year 3			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 1	**KNP staff are trained and able to implement the new anti-poaching evaluation and design protocol.**													
1.1	Acoustic monitoring grid (12 ARUs) and line transect network established in KNP; KRCS members trained	2	x											
1.2	Collection of ARU and line transect data on gun hunting intensity and wildlife activity patterns in KNP	34	x	x	x	x	x	x	x	x	x	x	x	x
1.3	Species-specific detection algorithms developed; detection range of ARUs for wildlife calls/gunshots determined	9		x	x	x								
1.4	Inclusion of novel anti-poaching protocol in the KNP Management Plan	2				x								
1.5	Scoping analysis of year 1 baseline gun hunting/wildlife activity data completed; development of optimal algorithms for deployment of game-guards (cooperation with Dr Niki Trigoni)	4				x	x							
1.6	Development of anti-poaching patrol design and evaluation protocol; posted on project website	2					x	x						
1.7	Acoustic monitoring data analysis centre established in Mundemba	2									x			
1.8	Train 8 KNP staff in maintaining the ARU grid and 4 on analysing and interpreting the acoustic data (end year 2).	4									x	x		
1.9	KNP staff fully absorb maintenance, data collection and data analysis tasks from project staff	6										x	x	x
Output 2	**Poaching patterns within KNP are understood so as to be effectively combated with available resources, affording wildlife in the park's core area (at least) a markedly higher level of protection.**													
2.1	Bushmeat price surveys undertaken	36	x	x	x	x	x	x	x	x	x	x	x	x
2.2	Hunter surveys undertaken (level of involvement in hunting)	34	x	x	x	x	x	x	x	x	x	x	x	x
2.3	Household socioeconomic surveys undertaken (bushmeat use/value)	34	x	x	x	x	x	x	x	x	x	x	x	x

	Activity	No of Months	Year 1				Year 2				Year 3			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2.4	Tourist satisfaction surveys undertaken	36	x	x	x	x	x	x	x	x	x	x	x	x
2.5	Project report on the scoping analysis of year 1 survey data (household/hunter/tourist) on the baseline local use/value of important conservation and bushmeat species and poaching patterns	4				x	x							
2.6	Analysis of year 1-2 data; project report on the effect of increased KNP anti-poaching initiatives on gun hunting pressure, wildlife activity, and local use/benefits from hunted species (submitted to MINFOF).	4								x	x			
2.7	Peer reviewed paper submitted	3												x
Output 3	**The need to critically examine current anti-poaching design and evaluation strategies in Central African rainforests is recognized by key conservationists in Cameroon, Gabon, Equatorial Guinea, Central African Republic, Congo-Brazzaville, DR Congo.**		A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M
3.1	Launch project website; maintain it	30			x	x	x	x	x	x	x	x	x	x
3.2	Upload year 1/year 2 summary reports to website / translated	2						x			x			
3.3	Decide on dates/content of final workshop; circulate flyer among C. African conservation community	9					x	x	x					
3.4	Select workshop members; make necessary travel arrangements for international participants	4							x	x				
3.5	Hold workshop in Mundemba	1									x			
3.6	Select most promising sites for exporting the anti-poaching protocol; formalize cooperation with project partners involved	9									x	x	x	
3.7	Provide follow up support for the establishment of pilot studies in at least two new protected areas.	3												x

26. Project based monitoring and evaluation Describe, referring to the Indicators above, how the progress of the project will be monitored and evaluated, making reference to who is responsible for the projects monitoring and evaluation. Darwin Initiative projects are expected to be adaptive and you should detail how the monitoring and evaluation will feed into the delivery of the project including its management. Monitoring and evaluation is expected to be built into the project and not an 'add' on. It is as important to measure for negative impacts as it is for positive impact.

(Max 500 words)

The general coordination of the project, including overall M&E, will be the responsibility of WildCRU and builds on existing M&E mechanisms in place by the partners (e.g. KNP's semi-annual reports on anti-poaching patrols to PSMNR). However, each partner is responsible for providing evidence for maintaining the progress of their deliverables.

Specifically, Linder (JMU) will be responsible for coordinating, monitoring and evaluating the line transect surveys, with the assistance of Okon (WWF-CFP) as the in-country field coordinator. Each month, Okon will e-mail the line transect data to Linder, who will inspect the data for evidence of errors and discuss with Okon how to avoid such errors in subsequent months. Similarly, Astaras (WildCRU) will be responsible for coordinating the acoustic monitoring grid, with the cooperation of Orume (KRCS) as the in-country field coordinator. ARUs will be checked and acoustic data will be downloaded and sent to Astaras and Wrege for analysis at least every 4 months to assess the condition of ARUs and ensure no data are lost. The monitoring of KNP anti-poaching patrols for the first year will follow the M&E mechanism in place by PSMNR; WWF-CFP's Okon advises the KNP conservator on patrol deployment, the game guards use Cybertracker to record their patrol routes, and KNP reports quarterly to PSMNR on the results of these patrols. In the second year, when the patrol deployment will change based on optimal deployment algorithms, the same monitoring mechanism will remain, except that M&E will be coordinated by WildCRU/PSMNR. KRCS will be responsible for coordinating the tourist, bushmeat price, and village surveys, all of which will be supervised by PSMNR. A village animator will be trained/hired in each of the three villages to lead the data collection, with KRCS holding monthly follow up meetings with the animators to collate information and provide necessary support. Completed data sheets for the tourist, bushmeat, and household surveys will be scanned and e-mailed monthly to Linder, Astaras, and PSMNR supervisor who will each check for inconsistencies in the data. Finally, Wrege (BRP) will coordinate the acoustic data analysis, development of detection algorithms and training on data analysis (year 2/3).

As the project leader, Macdonald will ensure that all the partners are kept informed of the overall progress of the project at regular intervals and as need arises, in order to identify early on issues that will need to be addressed by adapting ongoing or planned activities. For this purpose, a project forum will be established (e.g. at www.groupsite.com). WildCRU is experienced in using such forums to coordinate activities of people working across the globe in different time zones and in the field. A detailed activity schedule, editable by all partners, will be maintained by WildCRU on the project forum. Each partner will be required to submit brief quarterly reports to the forum, as well as detailed annual GANTT charts. Twice-annually, Skype conference (Skype) calls will be held, to report on project progress. Emerging problems will be solved in working group discussion forums in the project.

FUNDING AND BUDGET

Please complete the separate Excel spreadsheet which provides the Budget for this application. Some of the questions earlier and below refer to the information in this spreadsheet.

NB: Please state all costs by financial year (1 April to 31 March) and in GBP. **Budgets submitted in other currencies will not be accepted.** Use current prices – and include anticipated inflation, as appropriate, up to 3% per annum. The Darwin Initiative cannot agree any increase in grants once awarded.

27. Value for Money

Please explain how you worked out your budget and how you will provide value for money through managing a cost effective and efficient project. You should also discuss any significant assumptions you have made when working out your budget.

(max 300 words)

All project partners have extensive experience conducting research in Central Africa, and – bar BRP – in Korup region specifically. Most recently, JMU (Linder) has been conducting monthly line transect surveys in the KNP for the past year, where as WildCRU (Astaras) led a KNP acoustic monitoring scoping study in October 2012 (ongoing till Jan. 2013). This meant that we were able to calculate with great precision and accuracy both the time required to complete project activities (e.g. accounting for road conditions) and the involved costs (e.g. salaries, transportation, food supplies).

In terms of efficiency, the field team members are already trained and have years of experience working in research projects. As such, there is going to be little to no period of adjusting to the project tasks, ensuring fieldwork efficiency from the very beginning of the project.

An important assumption made is that there is not going to be a dramatic change in the exchange rate of the Central African CFA franc (XAF) used in Cameroon and the pound sterling (GBP). Given that the CFA franc is guaranteed by the French treasury and has a fixed exchange rate to the euro (€1=CFA655.95) and that the pound sterling and the euro have a relatively stable exchange rate, we do not anticipate that our assumption is a problematic one. Some budget expenditures, such as JMU and BRP international travel expenses, were calculated in US dollars (USD), the exchange rate of which to the pound sterling fluctuates more. However, this accounts for only a relatively small proportion of the total budget.

Another assumption is that the 6V batteries used by the acoustic sensors cannot be found in Cameroon (as is currently the case) throughout the duration of the project. If this changes, then the cost of running the acoustic grid will be lowered.

FCO NOTIFICATIONS

Please check the box if you think that there are sensitivities that the Foreign and Commonwealth Office will need to be aware of should they want to publicise the project's success in the Darwin competition in the host country. ☐

Please indicate whether you have contacted the local UK embassy or High Commission directly to discuss security issues (see Guidance Notes) and attach details of any advice you have received from them.

Yes (no written advice) ☐ **Yes, advice attached** ☐ **No** ☑

CERTIFICATION 2013/14

On behalf of the trustees of University of Oxford

I apply for a grant of £240,024 in respect of **all expenditure** to be incurred during the lifetime of this project based on the activities and dates specified in the above application.

I certify that, to the best of our knowledge and belief, the statements made by us in this application are true and the information provided is correct. I am aware that this application form will form the basis of the project schedule should this application be successful. (*This form should be signed by an individual authorised by the lead institution to submit applications and sign contracts on their behalf.)*

I enclose CVs for project principals and letters of support. Our most recent audited accounts and annual report can be found at http://www.ox.ac.uk/about_the_university/facts_and_figures/financial_statements.html :

Name (block capitals)	Dr. Andrew Massoura
Position in the organisation	Research Services Manager, Research Services, University of Oxford

Signed	See note below	**Date:**	

SIGNATURE AVAILABLE IN SEPARATE (PDF) FILE

SIGNED ON NOV. 30/11/2012 BY DR. ANDREW MASSOURA

RESEARCH SERVICES MANAGER

RESEARCH SERVICES, UNIVERSITY OF OXFORD

Stage 2 Application - Checklist for submission

	Check
Have you provided **actual start and end dates** for your project?	✓
Have you provided your **budget based on UK government financial years** i.e. 1 April – 31 March and in GBP?	✓
Have you checked that your **budget is complete**, correctly adds up and that you have included the correct final total on the top page of the application?	✓
Has your application been **signed by a suitably authorised individual**? (clear electronic or scanned signatures are acceptable in the email)	✓
Have you included a **1 page CV for all the Principals** identified at Question 7?	✓
Have you included a **letter of support from the main partner(s) organisations** identified at Question 10?	✓
Have you **checked with the FCO** in the project country/ies and have you included any evidence of this?	checked website
Have you included a **copy of the last 2 years annual report and accounts** for the lead organisation? An electronic link to a website is acceptable.	✓
Have you **read the Guidance Notes**?	✓
Have you **checked the Darwin website** immediately prior to submission to ensure there are no late updates?	✓

Once you have answered the questions above, please submit the application, not later than midnight GMT on Monday 3 December 2012 to Darwin-Applications@ltsi.co.uk using the application number (from your Stage 1 feedback letter) and the first few words of the project title **as the subject of your email**. If you are e-mailing supporting documentation separately please include in the subject line an indication of the number of e-mails you are sending (eg whether the e-mail is 1 of 2, 2 of 3 etc). You are not required to send a hard copy.

DATA PROTECTION ACT 1998: Applicants for grant funding must agree to any disclosure or exchange of information supplied on the application form (including the content of a declaration or undertaking) which the Department considers necessary for the administration, evaluation, monitoring and publicising of the Darwin Initiative. Application form data will also be held by contractors dealing with Darwin Initiative monitoring and evaluation. It is the responsibility of applicants to ensure that personal data can be supplied to the Department for the uses described in this paragraph. A completed application form will be taken as an agreement by the applicant and the grant/award recipient also to the following:- putting certain details (ie name, contact details and location of project work) on the Darwin Initiative and Defra websites (details relating to financial awards will not be put on the websites if requested in writing by the grant/award recipient); using personal data for the Darwin Initiative postal circulation list; and sending data to Foreign and Commonwealth Office posts outside the United Kingdom, including posts outside the European Economic Area. Confidential information relating to the project or its results and any personal data may be released on request, including under the Environmental Information Regulations, the code of Practice on Access to Government Information and the Freedom of Information Act 2000.