Darwin Initiative Annual Report

Department for Environment Food & Rural Affairs

Important note: *To be completed with reference to the Reporting Guidance Notes for Project Leaders:*

it is expected that this report will be about 10 pages in length, excluding annexes

Submission Deadline: 30 April

Darwin Project Information

Project Reference	20-012
Project Title	Improving anti-poaching patrol evaluation and design in African rainforests
Host Country	Cameroon
Contract Holder Institution	Wildlife Conservation Research Unit (WildCRU), University of Oxford
Partner institutions	Cornell University (CU), James Madison University (JMU), Korup Rainforest Conservation Society (KRCS), Coastal Forests Program of WWF-Cameroon (WWF-CFP), Programme for the Sustainable Management of Natural Resources – Southwest Region (PSMNR-SWR), Ministry of Forest and Wildlife (MINFOF)
Funder (DFID/DEFRA)	DEFRA
Darwin Grant Value	£240,024
Start/end dates of project	April 2013 – March 2016
Reporting period and number	April 2014 – March 2015 (Annual Report 2)
Project Leader name	Prof. David W. Macdonald
Project website	*http://bioacousticmonitoring.wordpress.com/*
Report author(s) and date	Christos Astaras, David W. Macdonald, Peter Wrege, Joshua Linder – May 31, 2015

1. Project Rationale

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, in many parts of the African tropical forest zone, commercialized bushmeat hunting has dramatically increased harvest rates, reduced many game species populations, and altered forest structure and composition. Conservation efforts have largely been unable to curtail the intense, pervasive, and often illegal commercial bushmeat hunting even within the region's most important tropical forest protected areas – the cornerstones of biodiversity conservation and critical strongholds for many threatened species. Importantly, these protected areas serve as critical "source" populations for species hunted in surrounding forest "sinks", and therefore poaching undermines the sustainable and equitable sharing of wildlife benefits and threatens the food security of the rural poor who mostly depend on bushmeat protein. Moreover, poaching also cultivates contempt for wildlife laws in a way that undermines the PAs' integration as part of the fabric of sustainable development.

Recognizing this, species action plans, protected management plans and Biodiversity Strategies and Action Plans in the region – the primary CBD implementation instrument at the

national level – highlight the need for mechanisms to monitor wildlife populations and enforce wildlife 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.

With this project, we are developing and providing training for a novel, evidence-based decision-support system to design and assess the efficacy of anti-poaching patrols using novel application of bioacoustic monitoring techniques. This system will improve the efficiency of PA biodiversity conservation, including of "source" populations for species that can be sustainably and legally exploited in adjacent non-protected areas. By adapting it for use beyond the Korup National Park area of Cameroon's Southwest Region where it is being developed and tested (see map below), the project's legacy will be multiplied.
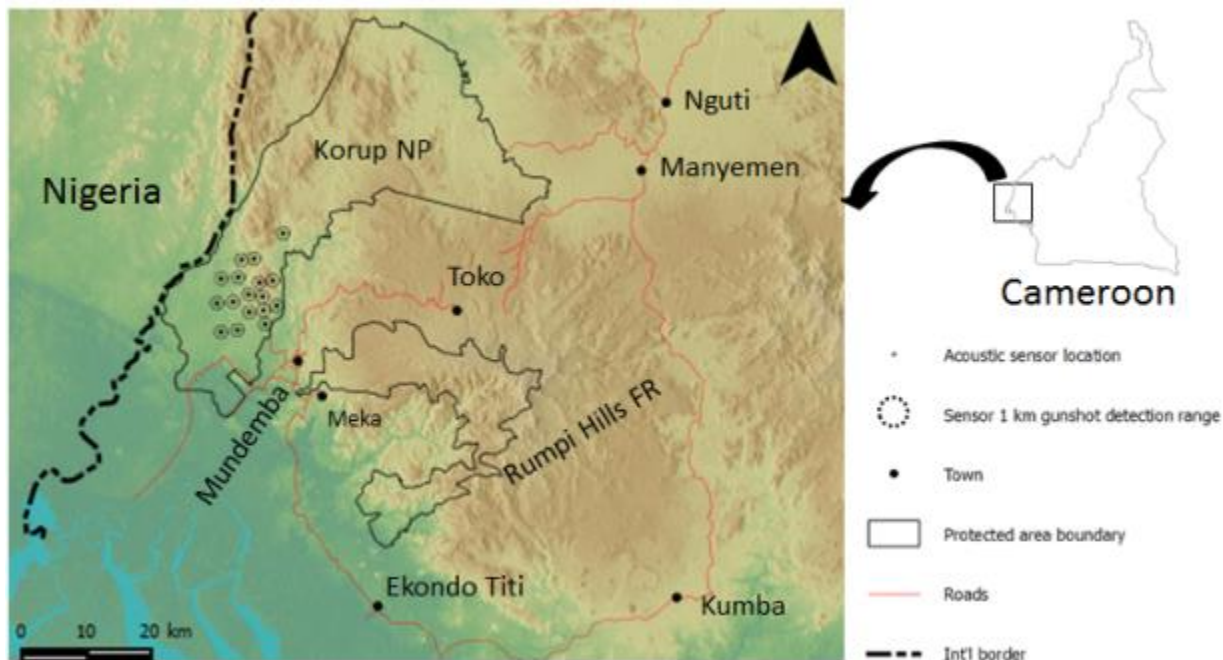

Figure 1: Location of Korup National Park in Southwest Region of Cameroon, as well as the acoustic grid established in June 2013. [Coordinates of Mundemba town: N 4.9707^{o} E 8.9101^{o}]

2.   Project Partnerships

Since its inception, our project has been a collaboration among Cameroonian government (MINFOF/Korup NP management) and conservation NGOs (WWF-CFP, KRCS), an international development programme (PSMNR-SWR) and international research institutions (JMU, CU, WildCRU). The partnerships were in place by the time the project started and were formalized with the signing of the collaboration agreement by all the partners in the first months of the project (Year 1). The partnership has remained strong during Year 2 and all partners have contributed as expected towards the completion of the Year 2 project activities.

As in Year 1 and according to the partnership, WWF-CFP assisted with the custom clearance of batteries and other consumables for the acoustic sensors (Annex 4.1).

As for Year 1, we applied for the necessary research permits from the Ministry of Research and Innovation (MINRESI – see Annex 4.2) and the Ministry of Forest and Wildlife (MINFOF) – the latter being the government agency responsible for authorizing projects within protected areas. In fall 2014, the MINFOF minister decided to annul <u>all</u> submitted applications because of reported corruption with the permit office. That meant that we had to resubmit our application. As we are partners with MINFOF and in direct collaboration with the Korup NP management for our activities, we have had no issues operating. We are still however trying to secure the document for our records. Our in-country partner – KRCS – is frequently inquiring about developments on this front.

The collaboration between PSMNR-SWR and KRCS was formalized in Year 1 and remains in effect, with KRCS in effect coordinating all the project's impact monitoring surveys (co-funded by the Darwin Initiative project funds and PSMNR-SWR).

Peter Wrege of CU together with Christos Astaras of WildCRU delivered a 5-day workshop on acoustic monitoring deployment, grid maintenance and data analysis for Korup NP, WWF, and KRCS members in December 2014, in preparation for the Year 3 absorption of the acoustic monitoring grid by a team of KRCS and KNP members (Annex 4.3).

The project coordinator, Christos Astaras, also travelled to Cameroon in July 2014 in order to participate in a workshop organized by DI partner PSMNR-SWR, presenting preliminary findings of the project's findings to all Cameroon-based DI partners and – importantly – other protected area Conservators from the Southwest Region of Cameroon (namely Mt. Cameroon National Park and Banyang Mbo Wildlife Reserve) (Annex 4.4 – photos). During the meeting, it was agreed that the acoustic monitoring protocol used in Korup is clearly a useful tool both for wildlife monitoring and anti-poaching patrol evaluation and design and should be therefore incorporated in official management documents of the park. Following discussions during the meeting, Astaras led the preparation of the first comprehensive wildlife monitoring plan for Korup National Park, which explicitly incorporates the use of acoustic monitoring techniques developed by the DI project in it. Moreover, it was agreed that Joshua Linder of JMU and Christos Astaras of WildCRU will co-author Korup NP's anti-poaching strategy (under development), where acoustic monitoring will be once again officially adopted as one of the management tools. Finally, as per the partnership agreement, Christos Astaras helped develop a detailed improved anti-poaching patrol strategy for Year 2 of the DI project, so as to effect a marked increase in anti-poaching patrol intensity in the core acoustic monitoring survey area of Year 1 (as per the project plan) (Annex 4.5). WWF trained the park game guards in August 2015 how to implement the new patrol schedule.

In Year 2, the list of collaborators increased further with the inclusion of U.S. Fish and Wildlife Service (USFWS) (as discussed in year 1 report), which funded the expansion of our acoustic monitoring network to the nearby Rumpi Hills Wildlife Reserve (acoustic grid of 10 sensors) (Annex 4.6).

3.   Project Progress

3.1   Progress in carrying out project activities

The Year 2 timetable included activities for each of the three project outputs. The most critical activities towards the project outputs continued as per the project schedule uninterrupted.

Specifically, the acoustic monitoring grid established in year 1 (Activity 1.1) continued – along with monthly transect surveys – to collect information on gun hunting intensity and wildlife activity patterns in Korup NP (Activity 1.2). Every three months, the 5-member KRCS team trained in Year 1 continued to replace the sensors' batteries and memory cards (June 2014, September 2014, December 2014, March 2015). The sensors have continued to perform very well generating a wealth of data that are currently analysed to examine whether patrol efforts in Year 2 have led to a decrease in overall hunting intensity in the park. No sensor has been lost due to field conditions or vandalism/theft.

In February 2014 (Year 1) two additional sensors (same make/model as those used in Korup NP) had been placed in neighbouring Rumpi Hills Wildlife Reserve using additional funds secured by the Lead organization (WildCRU/OU). Following the award of a USFWS grant, we expanded that acoustic grid to ten sensors in total in September 2014. The data from the Rumpi Hills will provide additional control data for the interpretation of gun hunting intensity data in Korup, as the sensors are placed in areas with reportedly similar hunting pressure and comparable distance to villages.

The monthly surveys of the four permanent 5-km transects have been continuing without any challenges. The data are collated and forwarded to JMU's Joshua Linder monthly and a preliminary analysis of the first 15 months' data can be seen in Annex 4.7.

Activity 1.3 involved the development of species-specific detection algorithms and the calibration of the ARUs by calculating the effective detection range of ARUs for wildlife/gunshots. Peter Wrege and his team at CU developed in Year 2 an improved gunshot detection algorithm, increasing significantly its sensitivity. All Year 1 data were re-analyzed using the new detector. Moreover, Wrege is currently working on improving the speed with which the sensor runs and the software dependencies of the algorithm – i.e. to make it possible to run without the need of proprietary software being installed on the computer (MatLab). Such a development would greatly facilitate the adoption of the anti-poaching patrol evaluation and design protocol developed by this project. Progress with the development of primate detection algorithms has remained slow, primarily due to the limited volume of suitable quality model calls to train the detectors. Detection algorithms have been developed for the red-capped managabey (*Cercocebus torquatus*), and the white-nosed (*Cercopithecus nictitans*), mona (*C. mona*), and crowned (*C. pogonias*) guenons. A drill (*Mandrillus leucophaeus*) algorithm is currently being developed using calls made from captive drills from the Limbe Wildlife Center in Limbe, Cameroon. Our chimpanzee detector has yet to locate calls in our data, which is a combination of the low density and calling frequency of the species within the acoustic grid area (although the species' presence is certain based on field observations). The table in Annex 4.8 summarizes the current progress towards the development of a detector for each species. We remain confident that with additional data collected in the field and from the sensors detection algorithms for the other three primates can be developed.

The field team has continued to collect coordinates/timing of primate calls in the forest to generate a large enough dataset that would permit us to improve our current expert opinion regarding the effective detection range of primate calls by the acoustic sensors. The development of this dataset remains slow to accumulate because many of the observations are made away from sensors, and hence are not informative. As mentioned in the half-year report, we conducted additional control gunshots in December 2014 to better understand the detection range of our sensors (currently often >1 km). We also experimented with dual microphone sensors to see if the directionality of a call could be obtained, with acceptable level of accuracy, from one sensor (Annex 4.9). This involved adjusting an aluminium flap on the side of the sensor, from which sound waves can bounce. Comparison of the time delay between the signal receptions at the two microphones (stored in different channels) could then be examined. The analysis of the data has not been concluded yet. The control gunshots were made by a Korup NP park ranger, under the supervision of project coordinator Christos Astaras, and the permission of the KNP Conservator.

The Ministry of Forest and Wildlife (MINFOF) has not proceeded with the revision of KNP's Management Plan in 2014 as originally anticipated. Therefore, Activity 1.4 (inclusion of the anti-poaching protocol developed by this project in the KNP management plan) could not be completed during Year 2. However, during a workshop held on July 15-16, 2014 in Buea, Cameroon, C. Astaras (OU) presented the preliminary analysis of the project's findings to the KNP management team and Cameroon-based DI project partners, emphasizing the value of acoustic monitoring as a tool for informing both wildlife monitoring and anti-poaching strategies (Annex 4.4). During the meeting, it was decided that the DI project would lead the development of the park's wildlife monitoring strategy and the 5-year anti-poaching strategy documents, ensuring that novel technological developments (such as the acoustic monitoring grid established by DI) would be included in the list of activities planned. C. Astaras (OU) and J. Linder (JMU) have since developed the first ever comprehensive wildlife monitoring strategy for the park (awaiting validation) in which acoustic monitoring is explicitly listed as one of the wildlife monitoring techniques to be employed by the park (Annex 4.10). Astaras and Linder are currently collaborating with PSMNR-SWR's Marc Parren to draft the 5-year anti-poaching strategy.

The scoping analysis of Year 1 baseline data has been completed (Activity 1.5) and the findings were presented in Buea, Cameroon by C. Astaras to all Cameroon-based DI project partners (PSMNR/MINFOF/KNP/KRCS/WWF), as well as the conservators of nearby protected areas Banyang-Mbo Wildlife Reserve and Mt. Cameroon National Park (Annex 4.11). During the meeting, C. Astaras developed and presented for discussion to the partners a proposed new rigorous anti-poaching patrol protocol for the KNP acoustic monitoring area, so as to be able to compare Year 1 baseline gun hunting data with hunting pressure under the new patrol regime (Annex 4.5). The new patrol protocol was accepted during the meeting and – following

training in Mundemba delivered by WWF-Cameroon – it was rolled out in KNP in late August 2014. Analysis of the cybertracker data of Year 2 has not yet been completed. We are awaiting the completion of a full year of increased patrol effort to proceed with the development of patrol optimization algorithms in collaboration with Dr. Niki Trigoni's team (University of Oxford). As a result, Activity 1.6 has been pushed back for Year 3 as well.

Regarding Action 1.8 (training of KNP management staff in maintaining the acoustic monitoring grid and analysing the data), we are ahead of schedule having provided a first workshop in Mundemba on Dec. 11-16, 2014. Specifically, P. Wrege (CU) and C. Astaras (WildCRU) provided training to four KNP team members (including the heads of the Wildlife Monitoring Unit and Anti-poaching Unit), the two WWF-CFP park advisors, and KRCS members on how to maintain the ARU grid (i.e. tree climbing, ARU sensor set up, battery/SD card change) and how to analyse the data using the audio software Raven (Annex 4.3). There will be a follow up training of the participants in Year 3 (Dec. 2015), after the park has adopted the maintenance of the acoustic grid (Activity 1.9).

The Year 2 activities towards Output 2 that commenced in Year 1 continued uninterrupted; namely the surveys of bushmeat prices (Activity 2.1), level of local hunters' involvement in hunting (Activity 2.2), bushmeat use by households in three different villages around the core study area (Activity 2.3) and the monitoring of tourist satisfaction from visiting Korup NP (Activity 2.4). Preliminary analysis of the hunter survey data (Annex 4.12) provide both valuable baseline information on the role of bushmeat hunting in local communities and much needed insight on hunting patterns that can help interpret better the acoustic data collected by the ARUs in the park. Specifically, we can obtain information on the success rate of hunters using gunshots, and therefore extrapolate the number of animals extracted from the park (adjusting gunshot records accordingly). The bushmeat prices help us estimate realistically the income generated by the hunters. The fact that the self-reported hunting activity patterns by our interviewees match closely the observed gunshot pattern from the park gives us confidence about the value of both techniques for monitoring hunting activity (Annex 4.13). Moreover, village level analysis of hunting patterns highlights the complexity of seasonal variations in hunting intensity (Annex 4.14). Until now, it has been generally assumed that gun hunting is lower in the rainy season. While this pattern is visible when aggregating all data together, it does not apply to all villages. Gun hunting remains high throughout the year for one village. This hints at a different role of hunting in these communities (e.g. opportunistic income-topping activity vs. full-time primary income generating activity). Recognizing and understanding this complexity can inform both the evaluation of the project's impact and future management strategies aimed at reducing people's dependency on illegal hunting. The household survey data are still being input in digital format for analysis. Preliminary analysis from one village (Ngenye, July-Aug. 2014) shows that only about half of the family meals contain any form of protein (46.6% ± 15.3% SD) and of those almost all contained either bushmeat (79.2% ± 13.5% SD) or fish (14.9% ± 11.5% SD) (Annex 4.15).

Preliminary results of the hunter/bushmeat price survey data were shared with the Cameroon based DI partners during the Buea meeting (July 2014), and J. Linder provided an update to PSMNR-SWR during his visit in May 2015. A report is currently under preparation. The delayed on-start of activities 2.1-2.4 in Year 1 (see Year 1 report) pushed backwards Activity 2.5. We are now aiming to combine 2.5 and 2.6 activities. A postgraduate student is currently analysing the hunter survey/bushmeat and acoustic data to examine evidence of anti-poaching patrols on hunting intensity.

The project website (Activity 3.1) was launched in Year 2. The summary report of Year 1 has not been shared on the website, but will be soon (Activity 3.2).We have received a limited but targeted number of inquiries about the use of acoustic sensors via the website, most recently from people working on developing a monitoring scheme of gun hunting within Guinea-Bissau's protected area network (pers. comm. with Andrea Ghiurghi). We are sharing both our preliminary findings with the use of acoustic sensors from Korup NP and technical/logistical aspects of the project that need to be taken into consideration. The timing of the final workshop (Activity 3.5) has been moved from Year 3-Q1 to Year 3-Q3 so as to be able to have the analysis of two full years of data to present. The workshop will also take place soon after the formal adoption of the project activities by the KNP/KRCS team, which is important for demonstrating the feasibility of adopting the proposed protocol to the workshop participants.

The date of the workshop has not yet been finalized (Activity 3.3), but it will be sometime in early December 2015. Preparations for the workshop (Activity 3.4) will start over summer 2015. Finally, during Year 2 the use of acoustic sensors for monitoring gun hunting intensity was rolled out to the first site outside Korup – namely the Rumpi Hills Wildlife Reserve (USFWS funds; Activity 3.6), while the USFWS has reached out to us to expand the acoustic monitoring to a third site in Nigeria (Mbe Hills).

3.2   Progress towards project outputs

We have made good project towards all three of the project's outputs and remain confident that they will be achieved by the completion of the project. Specifically, in terms of Output 1 we are currently working with DI partners to prepare the 5-year anti-poaching strategy of Korup NP, which will incorporate – among other strategies – the DI-developed anti-poaching patrol evaluation and design protocol that uses the acoustic grid data. Since the KNP management plan has not yet been revised, the inclusion of our anti-poaching protocol in it is likely not to happen during the project (Indicator 1). This is not a problem, as the 5-year anti-poaching strategy developed is in effect a more detailed and comprehensive plan for anti-poaching activities than what the more general management plan will entail when it is eventually reviewed. As such, the 5-year anti-poaching strategy document serves now as our new Indicator 1 for this output.

The acoustic monitoring training delivered by P. Wrege and C. Astaras in Korup NP's headquarters in Mundemba on Dec. 11-16, 2014 provided training to a total of 11 people. All participants were trained in setting and maintaining and the ARU grid and in analysing the acoustic monitoring data (Indicator 2). The trainees consisted of four MINFOF (rangers) members, two WWF-CFP staff stationed at KNP headquarters as advisors for wildlife conservation and monitoring, and five KRCS members of which two will form, together with KNP staff, the new KNP wildlife monitoring unit. Follow up training is scheduled for December 2015, a few days before the final workshop. The KNP team will take over fully the acoustic monitoring grid as of August/Sept 2015. Therefore, we believe that the submission of a report by the KNP team on the findings of the acoustic monitoring grid before the end of Year 3 is still a useful and informative indicator (Indicator 3) for Output 1.

In terms of Output 2, we are equally satisfied with the persisting relevance of the three indicators included in the project proposal. We are currently anticipating the final data from Korup (March-May 2015) that would complete 24 months of acoustic data. Analysis of the first 21 months is already advanced for acoustic, transect, and survey data (see preliminary findings in Annex). As discussed earlier, the information obtained from the hunter surveys has been especially useful not only for monitoring the impact of the project on local communities, which is their primary role, but also for informing the interpretation of the gunshot data from the sensors. For instance, using the hunter survey data we are able to calculate the number of hunters operating in the acoustic survey area, the success rate of hunters per gunshot and hence the actual off-take of animals from the park. Moreover, we are able to see the seasonal change in the offtake of different species and the proportion of bushmeat off-take from different methods (i.e. snaring vs. gun hunting). Importantly, the hunter surveys have highlighted the variation in hunting methods, intensity, and seasonality that exists in the region (at hunter and most importantly village level) that is important to incorporate in the design stage of conservation strategies. One solution for all will simply not work. Communities such as Ngenye for instance appear to follow the currently assumed seasonal pattern of gun hunting in the region (low in wet season / high in dry season) (Annex 4.14). The other two villages however (esp. Ikondokondo) show a persistently high gun hunting intensity pattern year round. Finally, the surveys can help us estimate the actual financial incentive of hunting for these communities and therefore the challenge faced by development projects that promote community wide income-generating alternatives to hunting. We are currently working on the preparation of a peer reviewed manuscript (Indicator 3) on the efficacy of anti-poaching patrols to combat hunting pressure within protected areas.

In terms of Output 3, we have already made significant progress last year in raising awareness among international donor organizations about the potential of acoustic sensors to improve evaluation and design of patrols in Central African rainforests, securing the USFWS grant that allowed the establishment of an acoustic grid in Rumpi Hills Wildlife Reserve. Year 3 is when the findings of the first two years of the project need to be disseminated broadly to PA

management teams in Central Africa, and we are working on that. The project website has been established (Indicator 1). We need still to share our preliminary findings on the website. The website has already successfully brought us into contact with teams in Guinea-Bissau and Nigeria who are interested in adopting acoustic monitoring for gun hunting monitoring in African protected areas. We believe that the website has an important role to play in achieving this output and we intend to increase its content and modes of information sharing currently available in it. The final workshop in Mundemba is currently being planned (Indicator 2) and it will certainly be central in disseminating the project findings to key institutions in the region. As mentioned earlier, we are currently in communication with teams in two different countries regarding the value of the developed anti-poaching patrol evaluation and design protocol, and we anticipate that more sites will be included in the list following the workshop (Indicator 3).

3.3   Progress towards the project Outcome

We remain satisfied both that the indicators set during the project application phase remain relevant for monitoring progress towards achieving the project outcome and that we are on track with achieving the project outcome by end of Year 3. As described in Section 3.1, the Year 2 activities progressed well. Specifically, we continued the data collection from the acoustic grid, transects and hunter/household/tourist surveys, conducted additional control gunshots to understand better the detection range of gunshots by the sensors, provided training to KNP management team members on analysing and interpreting the data, drafted the park's wildlife monitoring strategy incorporating the use of acoustic monitoring, and are currently drafting the park's 5-year anti-poaching strategy – all milestones of Outcome Indicator 1. We have not yet completed the development of the primate call detection algorithms, but we continue working on their completion (Annex 4.8). The establishment of an acoustic data analysis centre is also expected to take place after the Year 3 workshop.

In terms of the Indicator 2 milestones, the Buea workshop in July 2014 resulted in the preparation of a detailed patrol strategy for the acoustic survey area for Year 2 and the KNP team and WWF-CFP oversaw its implementation. We have yet to fully analyse the Cybertracker (patrol route) data collected from the patrols (ongoing). Final analysis will require patrol data until August 2015. The bushmeat price surveys in Mundemba have not shown a significant change in meat/bushmeat/staple food prices in the region between Years 1-2 (Annex 4.16) but there was a marked decline in the total volume of bushmeat sold in August/September 2014 (esp. in primates). This was due to the bushmeat market crackdown in Nigeria (where Korup meat is primarily sold) in response to the report of Ebola cases in the neighbouring country.

We have continued monitoring monthly the permanent transects in the park to obtain information on the relative abundance of target wildlife species in the area (Annex 4.7) – a milestone for Indicator 3. We still need to run a similar analysis using the acoustic data, once the primate detection algorithms are finalized. Hunter surveys provide detailed information on the relative representation of different species in the bushmeat trade, and the reports about the current pressure on the critically endangered Preuss's red colobus are especially worrisome (Annex 4.12). We hope that the off take reduces in Year 2-3 data. Unfortunately, the number of tourists visiting the park has been so low since the project started that there has been only a limited number of tourist satisfaction surveys completed. It appears increasingly likely that we will not have sufficient data to permit robust analysis in that field by Year 3. We can assess relative abundance changes of target species however, via all the other data collected as part of Outcome Indicator 3.

The only milestone towards Indicator 4 that we have had to delay until Year 3 is the development of an acoustic data analysis centre in Mundemba. As explained in the previous paragraph, we will help establish it – providing also the necessary training – after the Year 3 final workshop.

3.4   Monitoring of assumptions

We remain confident that the three Output level assumptions of our project remain true. Once again, in Year 2 all the ARUs worked without problems and we had no sensor vandalized or stolen. We remain careful as to who knows the exact location of the sensors and they are not placed along transects where detection by passing hunters could be high. In terms of

assumption 2, the development of species-specific detection algorithms, we are making good progress in that field and remain confident that all species will have a detection algorithm developed by Year 3. The most challenging species remain the Preuss's red colobus (*Procolobus preussi*), for which training calls for the detectors have been hard to obtain, and the differentiation between calls of *Cercopithecus mona* and C. *pogonias* and calls *Cercocebus torquatus* and *Cercopithecus nictitans*. Finally, the three surveyed villages (Ekon I, Ikondokondo and Ngenye) have been very receptive of the project's work in their communities and the support extends not only to participating households, but also the traditional councils of these villages. We do not anticipate any problems as to their continued participation in the project.

The outcome level assumptions of the project remain true. Tensions in the Nigeria-Cameroon border region remain limited to the far north of the country (where Boko Haram and other militant groups are active across the border) and does not affect at all the distant, culturally/ethnically/religiously different rainforest zone to the south. We have no evidence from MINFOF/Korup NP management that novel hunting technologies are used in the park, and the German-Cameroonian collaboration programme (PSMNR-SWR – partner to the DI project) remains strong.

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The link between sustainable management of wildlife resources and rural poverty alleviation is well understood. The dramatic new insight on gun hunting intensity in Korup NP, afforded by analysis the acoustic monitoring data, came as a shock to our Cameroonian partners present at the July 2014 workshop, including MINFOF staff. It was these findings that led to the recognition that the 5-year anti-poaching patrol strategy needed to be re-hauled in lieu of the project findings, and that a wildlife monitoring strategy document should be developed. The natural resources of the area are exploited at rates not previously thought, even at the core of the park. The hunter survey data provided an equally shocking insight on how significant the financial incentives to continue hunting can be for some hunters. Development/poverty alleviation projects focusing on promoting sustainable alternatives to hunting must provide income generating activities that compare favourably to the quick and significant profits from hunting. Otherwise, the opportunity cost from being involved in new economic activities will be too high to make them viable.

The hunter surveys also showed that hunting patterns are different not only at the level of individuals, but at the level of entire communities. The drivers of these community-level differences need to be understood (e.g. distance to markets? cultural?) in order to develop targeted actions that are likely to be successful both in terms of rural development and biodiversity conservation.

Although the household survey data have not been yet analysed fully, it appears that bushmeat is certainly an important component of local diet but the species diversity is lower than that of the species extracted from the forest. Further analysis is required once all data is in, but it seems that bushmeat is primarily a source of income even in the more remote communities and that the bulk of the volume is not consumed locally. Understanding these trends over time and across communities is important for ensuring that both food security and biodiversity conservation is achieved in the long run in the region. The outbreak of the Ebola virus in West Africa in 2014 and the ensuing bushmeat market closures across the border from Korup for over a month showed that political will exists to quickly shut down the bushmeat outlets. Examination of our data (bushmeat-hunter-household surveys + acoustic data) will shed light on the effect and duration that such drastic enforcement measures can have on the bushmeat trade, consumption and hunting intensity in Korup.

The anti-poaching patrol protocol developed and tested in Korup provides the region's wildlife management authorities a powerful tool to understand and combat the bushmeat trade which – having reached crisis levels – threatens entire ecosystems as well as the food security and livelihoods of forest dependent rural populations. The project's goal to roll-out the protocol to other areas, as already done in Rumpi Hills Wildlife Reserve, has the potential to significantly improve the ability of local authorities to effectively manage communal natural resources. This improves the protection of source populations of species that can be legally hunted in adjacent communal forests.

Beyond fostering the sustainable use of legitimate resources in KNP periphery, our project also provides training and employment opportunities to local communities. In Year 1, we provided training (e.g. acoustic monitoring, various survey techniques) to 14 locals (mostly former hunters). In Year 2, we provided similar training to the 11 participants of the December 2014 workshop (KRCS/KNP/WWF staff) and to six people at the village of Meka, where the Rumpi Hills acoustic monitoring team was recruited from. This large community to the east of the study area and at the foothills of Rumpi Hills has not benefited until now by the research activities focused almost exclusively on nearby Korup NP. The value of our project in the area therefore extends beyond the training of these six people from the village. It generated debate within the community on the role that the Rumpi Hills Wildlife Reserve can have for the local economy. Alternative paradigms to hunting for valuing natural resources were discussed; many of the community members were not happy – least of all the hunters. But the debate has started because of the project's activities in the area, and this is important.

Our project has also continued to provide support to the local conservation NGO – and DI partner – KRCS. Through projects like this one, KRCS gains important project management and data collection/analysis skills that will enable it be a positive catalyst for promoting research-related benefits in the region, and hence increasing local valuing of wildlife for something other than hunting.

Finally, our project alone may not be able to drive tourist revenue for the region, but with time the improved conservation of charismatic species in the local protected areas (combined with the commitment of the government for infrastructural improvements via an international grant) could bring change in this economic sector as well.

4. Project support to the Conventions (CBD, CMS and/or CITES)

As stated in the proposal, 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 already provided to Korup NP (and eventually to other 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.

At the moment, liaising with national CBD or CITES focal points has been deemed premature, 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). Our stated intent to contact the focal points in the project's third year prior to the final workshop in order to identify potential participants remains true.

5. Project support to poverty alleviation

The project is working towards reducing poaching in Korup NP, therefore protecting the "source" populations of economically important species that can be sustainably and legally exploited in surrounding forest "sinks", indirectly 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). In doing so, the project promotes the interests of the many rural poor over the short-term benefits of the few poachers (avoiding another "tragedy of the

commons"). The data obtained from the household surveys, hunter and bushmeat price surveys provide insight into the nature and scale of these benefits for local communities.

Though these economic benefits are anticipated in the medium and long term, as mentioned earlier in Section 3.4, the project has already directly employed since Year 1 (and continued to do so in Year 2) 14 local people (part-time 6; full-time 8) and offered economic benefits via occasional employment (e.g. porters, drivers, rent) to a lot more. Since the USFWS funded monitoring started in Rumpi Hills Wildlife Reserve, an additional 5-6 have been employed every three months to maintain the acoustic grid.

Finally, we anticipate that the adoption of the anti-poaching patrol evaluation and design protocol tested at Korup will be rolled out at additional protected areas in the region, creating new employment positions in the wildlife management sector. Often, the game guards are hired from communities in the periphery of the protected areas, as is the case with Korup NP.

6.   Project support to Gender equity issues

The project was not designed with actions aimed specifically at addressing gender equality issues. However, the success of our project has encouraged men and women from the Korup and Rumpi Hills area to become members of KRCS and to participate in other research project. For example, Joshua Linder is currently engaged in a study examining local perceptions of zoonotic, infectious diseases in the Korup area and has recruited several women (including those from Ikonkondo and Meka Ngolo) who have now been trained in anthropological methods. These women were already aware of the DI project and understood the value of effective, applied research.

By indirectly improving the food security and income-generating opportunities of local communities, our project also benefits all community members equally regardless of their sex, age or ethnic group. Although female household heads are those who decide and prepare the family meals, improved food security would benefit all household members.

7.   Monitoring and evaluation

We are satisfied with the progress outcome and output indicators set during the design phase of the project as well as the specific milestones set for each (see sections 3.1-3.3 for more details). The milestones are incremental and easily evaluated as having been achieved or not (e.g. baseline data collection and analysis is a very pragmatic milestone for instance to monitor progress, as is training provided to local people, detection algorithms developed etc.).

The only change that we foresee in the M&E plan of the project is with the tourist satisfaction surveys. It becomes increasingly apparent that the number of tourists is so low that there are not going to be sufficient surveys filled to get a good understanding whether the tourist satisfaction has increased in the park during the project period. We will continue collecting them, as there is long term value in having the responses of the few surveys, but we do not consider them anymore a monitoring tool.

8.   Lessons learnt

We have continued to have seasonal problems in Year 2 with the posting of the acoustic data to Cornell University, as the roads are bad in the rainy season and it was not always possible to travel to Limbe from Mundemba to use the courier. In one case, we also had the empty SD cards delayed at the Cameroonian customs on return, for no apparent reason. Such issues will cease to exist once we establish the acoustic data analysis lab in Mundemba.

The outbreak of the Ebola virus in West Africa in the summer of 2014 – and especially the arrival of the disease in Nigeria – led the Nigerian government to crack down on bushmeat markets across the country for a brief period of time in August 2014, including the neighbouring state of Cross River (where most of the bushmeat extracted from Korup NP is sold). This development was monitored by us both in terms of issues pertaining to the safety of our field team (i.e. during bushmeat surveys) and because it undoubtedly will create some "noise" in the data that we are collecting in the forest. We consider this development however an opportunity to examine the effect of the market closures (and local perceptions of Ebola) on gun hunting, bushmeat selling and prices, and bushmeat consumption, since we have all the monitoring mechanisms in place.

9.   Actions taken in response to previous reviews (if applicable)

There were three issues raised by the reviewer of last year's annual report that we will address here. The first concern was that the Terms of Reference (ToR) between KRCS and PSMNR-SWR supplied at Annex 4.6 of last year's annual report did not clearly show how the ToR was a binding contract between the two signatories. We provided the ToR as evidence that the two DI partners had progressed with preparations for the surveys, and that PSMNR-SWR was stepping up to the matched funding that they had agreed they would provide for the surveys. We do not believe that the DI project should dictate to the DI partners how to word their bilateral contracts. This ToR was deemed sufficient for PSMNR-SWR to manage German Government money, and therefore we naturally considered it to be sufficient for the project's purposes. Moreover, both KRCS and PSMNR-SWR have signed the DI project collaboration agreement which details the role of each partner in delivering the planned project activities. In a sense the ToR was not needed. It was prepared for the internal records of the two project partners and appended in our report only as evidence of progress towards planned activities.

The second issue raised by the reviewer noted a discrepancy between last year's reported progress in Annex 4.8 table and the main body of the report. Specifically, while the report mentioned that the development of three species' detection algorithms was delayed because of lack of training calls, the table mentioned a fourth one – the Red-eared guenon. This was a valid comment and an omission on our side. The table in Annex 4.8 was accurate and we forgot to mention the fourth species in the text.

The third issue had to do with the lack of reference in last year's annual report about progress towards Activity 2.5. This is a valid comment. Due to the delayed on start of the surveys in Year 1 (as mentioned in the annual report), Activity 2.5 did not commence in Year1-Q1. Since then, we have collected the necessary data and presented the preliminary findings to our partners in Cameroon. However, a formal report was not produced, and – as we explain in section 3.1 of this report – we propose that Activity 2.5 and 2.6 are combined in Year 3.

10.   Other comments on progress not covered elsewhere

As we have mentioned earlier sections, during Year 2 a new 10-sensor acoustic grid was established in Rumpi Hills Wildlife Reserve with the support of USFWS funds (Sept. 2014). In addition, we set up two new acoustic sensors near the village of Ikondokondo, with the primary purpose of exploring the possibility of using acoustic sensors as an elephant warning system for farmers who have experienced crop damage. The sensors were first set up in June 2014 and were acquired and maintained with funds donated by the Save Wildlife Conservation Fund (https://www.save-wildlife.org/en). Along with the acoustic data, the villagers record all incidents of crop damage in their farms. We want to examine whether the acoustic sensors reliably record the presence of elephants when damage is caused, and if the elephants are present in the area year round or only during the rainy season when most damage is caused. We have yet to analyse the data, but all DI partners are interested in exploring this issue in the future once the pilot study is concluded. The two IKK sensors are also providing additional control data on levels of gun hunting in the area, which can help interpret the main data from within Korup NP. Finally, this pilot study can develop in a full human-elephant conflict mitigation project in the future only because the local capacity to maintain acoustic grids and to interpret the data collected has been brought to the region by our DI project. KRCS will play a central role in its implementation in the future.

We are also continuous looking for ways to develop even more energy efficient acoustic sensors, in order to make the anti-poaching patrol design and evaluation protocol to be more logistically and financially viable to operate. Increased energy efficiency would mean lower number/weight/cost of batteries with each deployment. While Cornell University is pressing on with the development of a new sensor, we are also in contact with the developer of a new open-source/off-the-market components acoustic sensor (named "SOLO" because anyone can build it). James Christie is the developer and we shared our experience about the characteristics that such a sensor would need to have if it is to be used in the harsh rainforest environment. Not only would such a sensor be cheaper to run, but as it uses off-the market components, it would be possible to fix them on site (using spare parts). We intend to bring a couple of these sensors to Korup to show to the final workshop participants and to field test them.

11.   Sustainability

The interest in the improved anti-poaching evaluation and design potential afforded to protected area managers by our project has already generated a stir among conservation community members, especially when the findings of the first nine months of gunshot data were presented to MINFOF managers and Cameroon based DI partners (WWF/PSMNR/KRCS/KNP) in Buea on July 2014 (C. Astaras). It was following this meeting that the KNP conservator felt confident that the acoustic monitoring protocol should be incorporated in the 5-year anti-poaching strategy and wildlife monitoring strategy plans of the park, and the DI partners agreed to draft those documents incorporating in them the use of acoustic monitoring/new anti-poaching protocol. PSMNR-SWR has already ordered a few extra acoustic sensors to pilot short term acoustic monitoring grids in parallel with camera trapping grids in the protected areas of Takamanda NP and Banyang-Mbo Wildlife Sanctuary. Moreover, PSMNR-SWR was impressed by the preliminary findings of the hunter surveys and intends to maintain these surveys in the long run in the three communities, and possibly expand them to additional villages. This ensures that not only the acoustic grid will continue to operate past the completion of the project, but also some of the monitoring indicators.

Key to the sustainability of the project, we believe, is the delivery of a successful final workshop in Year 3, where the findings of the project and the value of the anti-poaching acoustic-based protocol is shared with regional PA managers, and the eventual development of more efficient acoustic sensors (to bring down further the cost of running an acoustic grid). We intend to pursue the development of such new sensors beyond the completion of the project, applying for additional funds as needed. Finally, the development of an acoustic data analysis centre in Mundemba by the end of year 3 would permit the low cost analysis of the data within Cameroon, both for the Korup NP data and data from other protected areas. Moreover, we want the capacity training provided by the project to form the foundation stone for making Korup the test-site/hub for future research on bioacoustics and anti-poaching strategy development.

12.   Darwin Identity

As explained in the Year 1 annual report, the project has always been – and still remains – identified among all project partners as the "Darwin Initiative" project and not as the sole initiative of any partner's institution or as part of a larger programme. All of our application material to USFWS for instance identified current project activities in Korup NP as being funded by the UK government under the DI scheme. Within Cameroon, familiarity with the Darwin Initiative mission is typically limited to university educated members of the conservation and development sector who have at one point or another in their career considered applying to or applied for a DI grant or worked for a DI project. Beyond these individuals, the recognition of DI among sector professionals is limited to that of a "funding scheme".

13. Project Expenditure

Table 1   project expenditure during the reporting period (1 April 2014 – 31 March 2015)

Project spend since last annual report	2014/15 Grant (£)	2014/15 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
David W. Macdonald Project Leader				
Christos Astaras Project coordinator				
Consultancy costs				
Overhead Costs				
Travel and subsistence				The trip of project coordinator C. Astaras in Dec. 2014 was extended in duration so that he could be involved in the acoustic monitoring training workshop of KNP staff in Mundemba. Moreover, C. Astaras made an additional trip to Cameroon in July 2014 to present the findings of Year 1 data to MINFOF staff and Cameroon based partners. That trip was deemed essential for the successful continuation of the project, as it was via this workshop that the KNP staff were persuaded that the data supported an increased anti-poaching patrol effort in the study area and that the 5-year anti-poaching and wildlife monitoring documents of Korup NP should include explicitly the inclusion of the acoustic methods we have developed. Part of the second trip travel costs were covered from third party funds of Oxford University.
Operating Costs				
Capital items (see below)				
Acoustic Recording Units (ARU) *12				We had anticipated at the beginning of the project that one sensor would need replacement after one year of deployment due to the elements or theft and/or vandalism. The sensors have all proved to be robust and such a replacement was not necessary.

Project spend since last annual report	2014/15 Grant (£)	2014/15 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
ARU accessories (microphones, cables, etc.)				We only had to replace one plastic box containing the sensor in Year 2, due to damage from squirrel gnawing. All microphones and cable functioned well and did not require replacement.
Others (see below)				
Field supplies (torches, boots, first aid kit etc.)				We had to buy a few extra field consumables (tapes, gunshot cartridges) for a field trip in December 2014, during which we made control gunshots at known distances from sensors in order to estimate the gunshot detection range of the sensors.
Shipping of ARUs/batteries to Cameroon				The same number of batteries were shipped via the same route to Cameroon (check in luggage + international air freight) as last year, but we managed to reuse some of last year's duffle bags reducing the overall cost a bit.
Website development/ hosting (Cameroon)				We eventually set up the website in the UK using Di team skills and free online hosting.
TOTAL	**41,452**	**41,303**		

14.   OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

I agree for the Darwin Secretariat to publish the content of this section

The analysis of our acoustic monitoring data from Korup NP has provided unprecedented insight in the spatial and temporal distribution and overall intensity of gun hunting in the heart of Korup NP – a Central African protected area benefiting from an established anti-poaching patrol strategy and a small but committed game guard team. That illegal hunting ("poaching") was taking place in the region and inside the park is not news – hunting is ubiquitous across Central Africa. What is an outstanding achievement however is that for the first time game guards in Korup NP can have timely, field-based, unbiased information to guide their next step – and access to quality information is paramount for the success of law enforcement activities around the world. Our project not only provides this information, but it does so in an affordable way that can be rolled-out to other protected areas in the region – effectively bringing in a game-changing "ace-in-the-sleeve" in the battle against the bushmeat crisis in the Central African rainforest zone. Acoustic monitoring data may not stop triggers from being pulled, but it empowers the people who do, helping them plan their patrols and – crucially – evaluate the impact of their efforts.

Moreover, examination of the hunter survey data highlights the challenges faced by integrated conservation and development projects that try to introduce alternative income generating activities to illegal hunting in rural communities. The amount of money obtained by a handful of individuals in one year can surpass that brought into a community by even large development projects. It is therefore not surprising then that adoption and retention of alternative activities is low. The opportunity cost of established, experienced hunters is too high to find such activities enticing. We suggest that hunter-focused initiatives need to be planned in addition to any community-wide strategies, by employing full-time the hunters in the field of conservation. Moreover, the "carrots" of such efforts should be accompanied by the "stick", enforcement of wildlife hunting and trafficking laws – something that often is not seen as a priority/sensitive topic to fund by donors.

Annex 1:   Report of progress and achievements against Logical Framework for Financial Year 2014-2015

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
Goal/Impact 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.		Our project has continued to generate unprecedented insight on the spatiotemporal hunting activity in the biodiverse Korup region of Cameroon, already empowering the resource limited authorities of the Korup NP (and eventually those of other areas) to better understand the effect of current anti-poaching strategies, so as to improve them based on robust field evidence.	███
Purpose/Outcome 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.	• 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. • 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). • 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. • 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).	In Year 2, we completed the collection of the baseline gun hunting data in Korup NP, established a new acoustic grid in nearby Rumpi Hills Wildlife Reserve which will also serve as a control site for the Korup grid, and continued the monitoring surveys (bushmeat price/hunter/household/tourist), monthly transect surveys and acoustic data collection. We also presented the results of Year 1 to our Cameroon based partners in a workshop in Buea, Cameroon and designed an increased patrol strategy for the survey area during Year 2 (implemented as of Aug. 2014). We provided training to KNP, KRCS and WWF-CFP staff in the maintenance and deployment of the acoustic sensors and the analysis of the collected data. We also prepared the Korup NP's wildlife monitoring strategy, introducing acoustic monitoring as one of the main data collection tools for certain species, and commenced the preparation of the park's 5-year anti-poaching strategy (where acoustic monitoring will also play a major role in the design and evaluation of patrols). Finally, we developed a new and improved gunshot detection algorithm and re-analysed Year 1 data using it.	The main activities of Year 3 involve the completion and validation of the 5-year anti-poaching strategy plan for Korup NP, transfer of the acoustic monitoring grid maintenance to KNP management, comparison and reporting of the Year1 – Year 2 data, finalization of the detection algorithms for diurnal primate calls, training (additional) of KNP/KRCS members on acoustic data analysis, establishment of an acoustic data analysis lab in Mundemba, and the delivery of the final workshop.

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
Output 1. KNP staff are trained and able to implement the new anti-poaching evaluation and design protocol (year 2/3).	1. The new anti-poaching protocol is approved by MINFOF and included in the new KNP management plan (year 2). 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). 3. First anti-poaching report using acoustic monitoring data collected and analyzed by KNP staff is submitted to PSMNR-SWR/MINFOF (year 3).	1. The Ministry of Forests and Wildlife (MINFOF) has not started the review of the KNP management plan. During the Year 2 workshop held in Buea, Cameroon, the DI partners agreed that instead two more detailed park documents are developed where the new anti-poaching protocol (and acoustic monitoring in general) is included: the 5-year anti-poaching strategy plan of KNP and a wildlife monitoring plan for KNP. Therefore, in its new form, we believe that this indicator remains an appropriate one, as the two documents are going to be even more detailed than the management plan would be about the proposed activities, and are going to be equally binding/guiding for the park management team once validated. The wildlife monitoring document has been already completed and awaits validation. The 5-year anti-poaching strategy is under development (led by OU/JMU/PSMNR partners). 2. In year 1 we trained the KRCS members than have been running the acoustic grid. In Year 2 we trained a total of 11 KNP/KRCS/WWF-CFP staff in the acoustic grid deployment, maintenance and data analysis. In Year 3 we will provide additional follow up training, so that the park can adopt the acoustic grid in Year 3. Given that the goal of this project is for the Korup NP management team to be able to run this monitoring scheme on its own after the completion of the DI project, this indicator remains an important one. 3. This indicator will follow the successful achievement of indicators 1 and 2.	
Activity 1.1 Acoustic monitoring grid (12 ARUs) and line transect network established in KNP; KRCS members trained		The acoustic monitoring grid was set by CU's Peter Wrege in early June 2013 and it has been running without problems since then. In Sept. 2015 (Year 3) the maintenance of the grid will be handed to the KNP management, as per the project's plan.	
Activity 1.2 Collection of ARU and line transect data on gun hunting intensity and wildlife activity patterns in KNP		The collection of ARU (acoustic) and line transect data (monthly) started as per schedule in Year 1 and continues to date. The monitoring grid will continue in Year 3 as planned.	
Activity 1.3 Species-specific detection algorithms developed; detection range of ARUs for wildlife calls/gunshots determined		In Year 1, we improved the automatic detection algorithms for gun shots and elephant rumbles, and developed new ones for four of the most vocal primate species in Korup (*Cercocebus torquatus, Cercopithecus mona, C. pogonias* and *C. nictitans*). In Year 2 we improved considerably the efficiency of the gunshot detector, tested a detector for chimpanzee calls (but have not found yet chimpanzee (*Pan troglodytes ellioti*) calls in the Korup data we have searched), and commenced the development of the detector for drill monkey calls (*Mandrillus leucophaeus*). We have been unsuccessful in obtaining library calls for the two remaining species. In Year 3, we want to complete all the primate detectors, as well as to further improve the gunshot detector so that it can run faster and with less memory and software dependencies. We now also have data from Rumpi Hills, where the endangered Preuss's guenon (*Cercopithecus preussi*) can be found. If possible, a detector for that species will also be developed. Finally, we conducted additional control gunshots to better estimate the mean detection range of gunshots by the acoustic sensors.	
Activity 1.4 Inclusion of novel anti-poaching protocol in the KNP Management Plan		The Ministry of Forests and Wildlife (MINFOF) has not pushed forward with the review of the KNP management plan. During the Year 2 workshop held in Buea, Cameroon, the DI partners agreed that instead two more detailed park documents are to be developed where the new anti-poaching protocol (and acoustic monitoring in general) can be included: the 5-year anti-poaching strategy plan of KNP and a wildlife monitoring plan for KNP. The wildlife	

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
		monitoring document has been already completed and awaits validation. The 5-year anti-poaching strategy is under development (led by OU/JMU/PSMNR partners) and will be completed in Year 3. If the management plan is reviewed in Year 3, we will include the anti-poaching protocol in it as well.	
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)		The scoping analysis of Year 1 baseline data has been completed and the findings were presented in Buea, Cameroon by C. Astaras to all Cameroon-based DI project partners (PSMNR/MINFOF/KNP/KRCS/WWF), as well as the conservators of nearby protected areas Banyang-Mbo Wildlife Reserve and Mt. Cameroon National Park. The development of optimal patrol deployment algorithms will be completed in Year 3, once a full year of data under the increased anti-poaching effort has been collected (Aug. 2015).	
Activity 1.6 Development of anti-poaching patrol design and evaluation protocol; posted on project website		The completion of this activity is dependent on the optimal patrol deployment algorithms (part of A 1.5) is completed. In Year 2 a project website was created. Once the algorithms are developed, we will post the findings on the website.	
Activity 1.7 Acoustic monitoring data analysis centre established in Mundemba		We have already trained members of the KNP management team in the deployment and acoustic data analysis. As DI project, we are assisting PSMNR (a DI partner) to create at KNP a 4-member strong wildlife monitoring unit consisting of 2 KNP and 2 KRCS members. Once the unit is formally established and takes over the maintenance of the acoustic grid, we will help provide the necessary equipment and software for the development of the acoustic monitoring data analysis centre in Mundemba. This should be in place before the end of the project.	
Activity 1.8 Train 8 KNP staff in maintaining the ARU grid and 4 on analysing and interpreting the acoustic data (end year 2).		We have already trained 11 KNP/KRCS/WWF-CFP members in December 2014 (Year 2) in acoustic grid deployment and data analysis. We will provide in Year 3 follow up training, to ensure that the skills have been retained once the park's monitoring unit takes over the maintenance of the grid.	
Activity 1.9 KNP staff fully absorb maintenance, data collection and data analysis tasks from project staff		The KNP monitoring team will take over the maintenance of the acoustic grid in September 2015 (Year 3). We anticipate to assist the unit with the analysis of the data for one more time (Sept-Dec 2015 data) and then – following the final training – they should be able to run the analysis on site.	
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).	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). 2. Report submitted to MINFOF presenting the findings of the socioeconomic surveys on the role of bushmeat in the livelihoods of local communities (year 1-2 data) (year 2). 3. Peer-reviewed manuscript on the efficacy of anti-poaching patrols to combat hunting within PA is accepted for publication (year 3).		1. This remains an appropriate indicator for this output and it can only be achieved once the year 2 data have been collected and analysed (so beginning of Y3). 2. As above, this indicator is relevant. We have until now provided only a preliminary analysis of the hunter/household/bushmeat survey results to PSMNR/KNP during J. Linder's meeting with the partners in Cameroon (May 2015). A final report of 1.5 years' worth of data will be submitted by Sept. 2015. 3. This remains a useful indicator. We anticipate to submit our first manuscript within summer 2015 and to submit a second one before the completion of Year 3.

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
Activity 2.1 Bushmeat price surveys undertaken		As with all the surveys, there was an original delay in the on start of the data collection face in Year 1, but since October 2013 twice-monthly data are collected from bushmeat bulk sellers, local eateries and markets on the price of bushmeat and regular meat. These surveys will continue throughout the duration of the project.	
Activity 2.2 Hunter surveys undertaken (level of involvement in hunting)		The surveys have started and are taking place monthly in three villages. They will continue throughout the remaining period of the project. The data from these surveys have proven especially useful for the interpretation of the gun hunting patterns observed in the acoustic data in the park.	
Activity 2.3 Household socioeconomic surveys undertaken (bushmeat use/value)		The dry season 2-month intensive household surveys were conducted in Jan-Feb 2014, Aug-Sept 2014 and Jan-Feb 2015 as per schedule. In Year 3, we will conduct the same surveys in Aug-Sept 2015 and Jan-Feb 2016.	
Activity 2.4 Tourist satisfaction surveys undertaken		The tourist satisfaction surveys are continuing but there is a very small number of tourists that come to the park for the data to be very informative. We will continue collecting the data in Year 3 but remain doubtful of their monitoring value for now.	
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		The completion of one year worth of hunter survey data was completed only in Dec. 2014. Since then, we digitized all the bushmeat/hunter survey data and presented preliminary results to PSMNR in May 2015. However, a formal report has not been completed yet. We will complete the report during Year 3, combining it together with the report of Activity 2.6.	
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).		The completion of two years' worth of acoustic data will happen in June 2015, and a full year of increased patrolling effort in August 2015. Therefore the comparison of the Year 1 baseline data and a full-year of increased patrol data can only take place in Year 3. Preliminary analysis is already under way and some results are presented in this report.	
Activity 2.7 Peer reviewed paper submitted		We anticipate to submit our first manuscript within summer 2015 and to submit a second one before the completion of 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.	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). 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). 3. Project partners are invited to advise management teams of protected areas wishing to use the new anti-poaching protocol in their area (2 PAs; year 3).	1. During Year 2, the project website was created. In Year 3, we intent to increase the use of the website as a source of data dissemination. We have not yet provided French translations for the website's content. 2. The workshop will be organized in year 3. 3. We have already secured funds from USFWS and established a new acoustic grid in the Rumpi Hills Wildlife Reserve (established Nov. 2014). We are also involved in discussions for introducing an acoustic grid in a Nigerian PA where the SMART management scheme is in place, to examine how the two can be integrated. So, there is already significant progress towards this indicator.	

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
Activity 3.1 Launch project website		We created the project website in Year 2.	
Activity 3.2 Upload year 1/year 2 summary reports to website / translated		In Year 3 we expect to both translate the website content in French (summer 2015) and to use it to disseminate the reports that will be developed (see progress reports for reports above).	
Activity 3.3 Decide on dates/content of final workshop; circulate flyer among C. African conservation community		We aim for an early December 2015 final workshop date, but the exact dates are expected to be finalized by July 2015. It is only then that the workshop will be advertised within the Cameroonian and C. African community.	
Activity 3.4 Select workshop members; make necessary travel arrangements for international participants		As mentioned above, the final workshop will be held in year 3 so these activities will be scheduled for Q1-Q2 of Year 3.	
Activity 3.5 Hold workshop in Mundemba		This is an activity that will be completed in Year 3.	
Activity 3.6 Select most promising sites for exporting the anti-poaching protocol; formalize cooperation with project partners involved		We have already roll-out the acoustic monitoring element of our work in Rumpi Hills Forest Reserve and will be always looking for additional sites where the final anti-poaching patrol and evaluation protocol can be established. We are sharing our experiences with people from Guinea-Bissau (early stage of communication), so there may be an export of the findings of the DI project to West Africa as well.	
Activity 3.7 Provide follow up support for the establishment of pilot studies in at least two new protected areas.		An acoustic grid has been already established in Rumpi Hills Wildlife Reserve and we are in discussions of assisting with its establishment in a second site in Nigeria. The long-term legacy of the project depends on the adoption of our anti-poaching protocol throughout Central Africa, so this is an important activity (outcome indicator).	

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: 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: 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.	• 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. • 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). • 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. • 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).	Indicator 1: • 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: • 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).	• 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. • There is no dramatic increase in the hunting technology available to local communities (12-gauge shotguns) – 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. Modern rifle guns are used only rarely by 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.

		Indicator 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).
		• 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.	
Outputs: **1**. KNP staff are trained and able to implement the new anti-poaching evaluation and design protocol (year 2/3).	1a. The new anti-poaching protocol is approved by MINFOF and included in the new KNP management plan (year 2). 1b. 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). 1c. First anti-poaching report using acoustic monitoring data collected and analyzed by KNP staff is submitted to PSMNR-SWR/MINFOF (year 3).	1a. • KNP Management Plan (2013-2016) (year 2) • Cybertracker data on game guard patrol routes (year 3) 1b. • 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) 1c. • Annual KNP report (year 3) to PSMNR-SWR on anti-poaching patrols	• Autonomous recording units (ARUs) function properly in Korup rainforest and are not vandalized/stolen • Development of species-specific detection algorithms for calls of Korup's eight diurnal primates is possible
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).	2a. 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).	2a. • 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)	• Autonomous recording units (ARUs) function properly in Korup rainforest and are not vandalized/stolen • The three survey villages will remain open to surveys on the importance of bushmeat to local livelihoods

	2b. 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).	• KNP annual reports to PSMNR-SWR/MINFOF 2b. • 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	
	2c. Peer-reviewed manuscript on the efficacy of anti-poaching patrols to combat hunting pressure within protected area is accepted for publication (year 3).	2c. • Peer-reviewed publication on the efficacy of anti-poaching patrols to combat hunting pressure within protected area	
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.	3a. 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). 3b. 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). 3c. 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).	3a. • Content of the project's website 3b. • Project developed data collection and data analysis training material (to be used during the workshop). • List of final workshop participants 3c • 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.	• Autonomous recording units (ARUs) function properly in Korup rainforest and are not vandalized/stolen • Development of species-specific detection algorithms for calls of Korup's eight diurnal primates is possible • The villages of Ekon I, Ikondokondo and Ngenye will remain open to conducting surveys on the importance of bushmeat consumption and trading to local livelihoods

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

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
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
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.

Annex 3 Standard Measures

Table 1   Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Number planned for reporting period	Total planned during the project
6A	Training of KRCS and Korup NP staff in the deployment and maintenance of acoustic monitoring grid (6 in 1 week/Y1 + 8 in 1 week in Y2); training of KRCS members as survey coordinators and animators (4 in 1 week/Y1); training of KRCS and Korup NP staff in acoustic data analysis (4 in 1 week/Y2); training of workshop attendants in acoustic grid design and use of ensuing data (15 in 1/2 week/Y3).	10	11		21	8	37
6B	See comment above – most training per person is for a week	2	1		3	1	5
7	Manual detailing the field protocol for setting, maintaining and extracting data from the ARU grid (created by CU); Manual detailing the data analysis protocol for ARU grid data (created by CU); Anti-poaching design and evaluation protocol (to be presented to Y3 workshop participants)	1	1		2	1	5
9	KNP wildlife monitoring protocol (incl. acoustic monitoring section); KNP 5-year anti-poaching strategy (incl. acoustic monitoring section)		1		1	0	2
11A	One paper presenting the research and conservation potential of the new protocol (Y2) and one reporting on the overall findings of the project (Y3)		0		0	1	2
11B	as above		0		0	1	2
12A	Acoustic monitoring data collected from Korup NP (Y2/3)				0	0	1
14A	Year 3 final workshop for 20 Central African protected area management professionals				0	0	1
14B	Presentation of Year 1 DI project findings (Buea, July 2014) – Workshop "Wildlife Monitoring in Korup NP and Banyang-Mbo Widllife Sanctuary"		1		1	1	1

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Number planned for reporting period	Total planned during the project
20	Acoustic grid sensors for Korup NP (including SD cards), computer for data analysis at Korup NP HQ in Mundemba, laptops (2), tree climbing gear (Yr1), software for acoustic analysis (Yr1), flatbed paper-fed scanner (yr1), GPS units (y1), 10 new acoustic sensors for Rumpi Hills Grid + 2 for IKK village (Yr2),	£7,790	£14,500		£22,290	£450	£8,570
21	Acoustic data analysis lab at Korup NP HQ in Mundemba		0		0	1	1
23	Matched funding of DI partners as per proposal (Years 1-3); USFWS funds for Rumpi Hills acoustic grid (Year 2); Sensors for IKK deployment (Year 2)						

Table 2   **Publications**

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Manual	"Acoustic Monitoring Project – Korup N.P. SM2/UHP Co-deployment Instructions", Wrege P.H., Griffiths E.T., Powers M.E., Kingensmith A., Allen P.E., Ross J.C., 2013	The Cornell Lab of Ornithology		free
DI Newsletter	"Reducing illegal poaching which harms local communities leads to greater food and livelihood security in Cameroon" June 2014 – Christos Astaras	Darwin Initiative	http://www.darwininitiative.org.uk/assets/uploads/2014/05/Darwin-Initiative-Newsletter-June-2014-Final21.pdf	free
Wildlife Monitoring Strategy – Korup NP	"Monitoring wildlife status and population trends in Korup national park" Christos Astaras, Joshua Linder, Philip Forboseh 2014	Korup National Park	(awaiting validation) Korup National Park, Mundemba, Cameroon	free

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to putting the project number in the Subject line.	✓
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	n/a
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	✓
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	n/a
Have you involved your partners in preparation of the report and named the main contributors	✓
Have you completed the Project Expenditure table fully?	✓
Do not include claim forms or other communications with this report.	