



Darwin Initiative Annual Report

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 2009

Darwin Project Information

Project Ref Number	17-012
Project Title	Belize large-mammal corridor project
Country(ies)	Belize
UK Contract Holder Institution	University of Southampton
Host country Partner Institution(s)	Panthera, University of Belize, Belize Forest Department
Other Partner Institution(s)	n/a
Darwin Grant Value	£173,989
Start/End dates of Project	1 st April 2009 to 31 st July 2012
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1 st April 2009 to 31 st March 2012, first Annual Report
Project Leader Name	Dr C. Patrick Doncaster
Project website	http://darwin.defra.gov.uk/project/17012/ http://www.belizewildliferesearch.com/index_files/Page972.htm
Author(s) and main contributors, date	C. P. Doncaster, B. Harmsen, R. Foster

1. Project Background

This project has a three-fold purpose: (i) to plan a workable natural corridor to connect protected areas in Belize; (ii) to implement this into the framework of existing protected areas and zoning plans of Belize; (iii) to establish an in-country tradition of training skills for Belizeans to study their own wildlife.

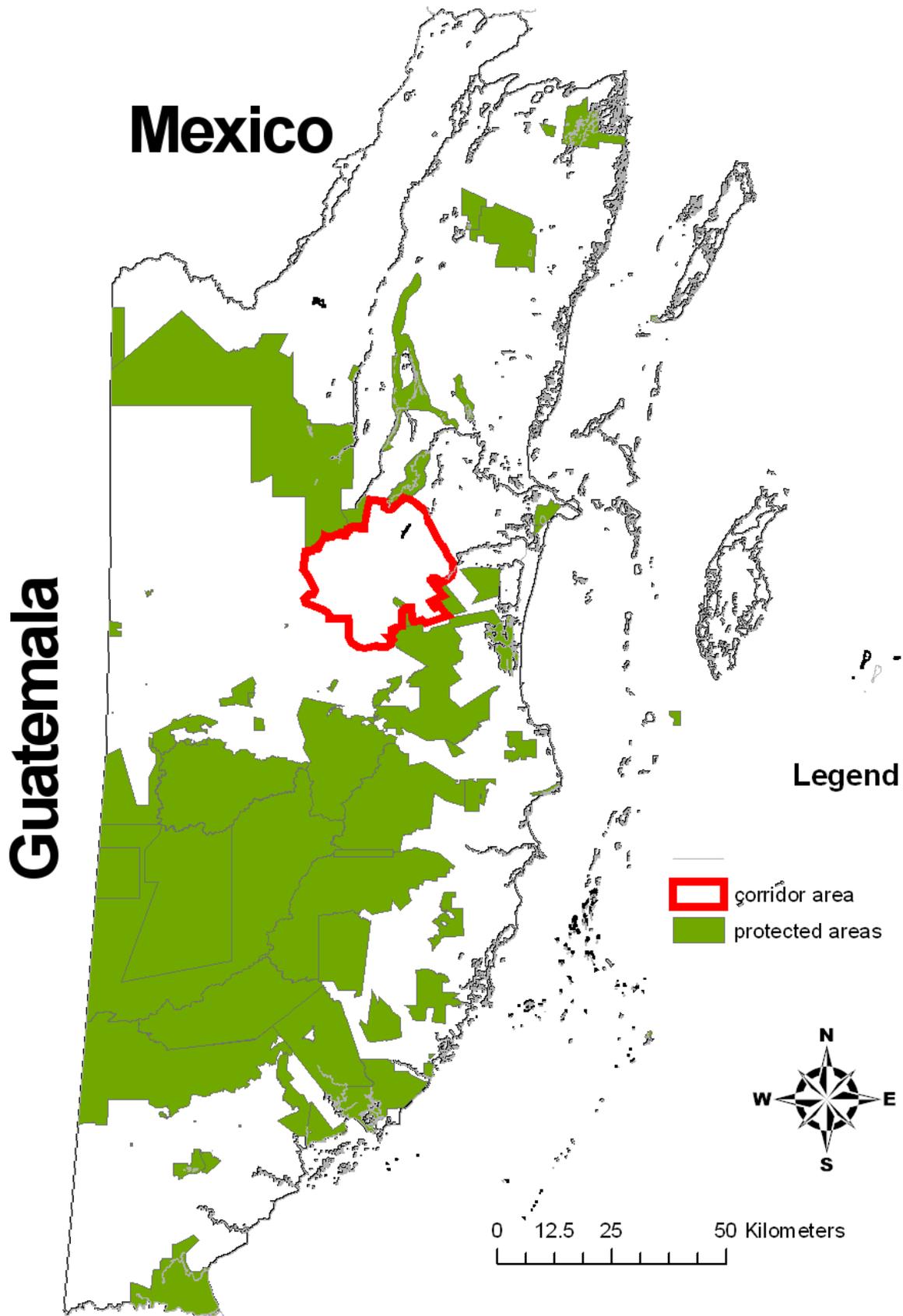


Fig. 1. Map of Belize showing the area (red) within which the natural corridor route will be identified to link existing protected areas (green).

2. Project Partnerships

Management structure

The project is a collaborative enterprise between Panthera, The University of Belize (UoB), and the Belize Forest Department (BFD), coordinated through the UK University of Southampton (UoS).

Panthera has an unparalleled level of on-the-ground expertise in mammal monitoring in Belize, with a visiting scientist connection established to the UoS which provides scientific and management expertise to the project. Both institutions are committed to helping build research capacity in Belize. Panthera is assisting the project with matched funds amounting to 48% of the total budget. The organisation is involved at all stages of the project. Its capacity encompasses (a) deployment of personnel, with Rebecca Foster contracted by Panthera to facilitate the project, and Bart Harmsen dedicated to the project in his role as the Panthera-funded Jaguar Research Fellow in Wildlife Conservation at the UoB; (b) provision of a large portion of necessary field equipment (camera traps, telemetry and trapping equipment).

The University of Belize provides the infrastructure and human resources for capacity building with its Environmental Research Institute (ERI) inaugurated in January 2010. The Institute's Terrestrial Science Director, Elma Kay, currently contributes 8% of her time to the project. This institute aims to train the next generation of Belizean environmental biologists to become highly skilled in wildlife monitoring and conservation management; the Darwin project is inputting teaching personnel and expertise to the development of training programmes focused on issues with establishing wildlife corridors. Undergraduate students of the UoB are contributing to mammal monitoring, and UoB is providing the capacity for them to do the necessary laboratory work and analyses, including teaching space, computer facilities, lab space and storage space.

The Belize Forest Department (BFD) is our link to the Ministry of Natural Resources and the Environment (MNRE), which is the ministry responsible for implementing the corridor of Priority Areas that is the intended legacy of this project. The Minister of Natural Resources and the Environment has already indicated his interest in securing a wildlife corridor between the two main blocks of protected wilderness in Belize (see his original letter of support for the Darwin project). The BFD is the body with which we consult on land-use management and law enforcement pertaining to natural resources. Within the Ministry, the BFD currently has Wildlife Program Officer Rasheda Sampson advising the Darwin Project on legal logistics. In addition to deployment of personnel, the BFD's capacity to be involved in the project encompasses provision of meeting rooms, and carrying out the necessary policy changes.

Changes to management structure over the reporting period

The management structure has seen a number of changes of personnel over the reporting period, of which several are associated with the 1-year delayed inauguration of the ERI. None of these changes have significantly impeded the progress of the project. We detail them all below.

The host-country coordinator, Bart Harmsen, is now employed by the ERI on a salary provided by Panthera as the ERI-Panthera Fellow in Wildlife Conservation (starting 1st February 2010). He reports to Elma Kay, Administrative Director of the ERI. He is in daily contact with Patrick Doncaster by email and telephone.

At the ERI, Said Gutierrez now holds the Darwin-funded post of Darwin Wildlife Biologist (since 1st February 2010). He reports directly to Bart Harmsen. He has regular meetings with Bart Harmsen and Rebecca Foster, and with Patrick Doncaster on his visits to the country.

Of the project's consultants, Rebecca Foster is now employed as Belize Jaguar Program Coordinator for Panthera (since 1st August 2009), taking over much of Bart Harmsen's previous role with them, and she reports to Howard Quigley. Omar Figueroa now receives a stipend as a researcher for Panthera (since 1st August 2009) whilst retaining his student status at University of Florida; he is also now a politically-appointed Senator in Belize. He has regular meetings with Bart Harmsen, Rebecca Foster and Elma Kay, and with Patrick Doncaster during his visits to Belize. Isabelle Paquet-Durand (DVM, PhD) has joined the project as the veterinarian consultant, advising on the safe handling and chemical immobilisation of wild-caught mammals.

At the BFD, George Hanson has left the employment of the BFD and is no longer seconded to Panthera (since end-February 2010); however he has agreed to continue helping the project. Rasheda Sampson, the BFD Wildlife Program Officer, has taken over George Hanson's role within the Darwin project. She reports to the Chief Forest Officer, Wilber Sabido, and has regular meetings with Bart Harmsen and Rebecca Foster.

In the field, Arturo Ramos is now employed by the ERI, funded jointly by the Darwin project and Panthera, (formally since September 2009) as Field Operations Manager. He reports to Bart Harmsen and Rebecca Foster in daily meetings and by telephone.

Of the external personnel, Project Leader Patrick Doncaster has visited Belize twice, at 6-month intervals for in-country management meetings, and he communicates regularly with in-country Darwin personnel via email and telephone. Howard Quigley visits Belize every 6-8 weeks and communicates regularly with in-country Darwin personnel via email and phone/Live Messenger.

Regular meetings are held at the ERI and BFD with Elma Kay, Bart Harmsen, Rebecca Foster, Omar Figueroa, Wilber Sabido, and George Hanson/Rasheda Sampson.

Other collaborations

Edinburgh University's Belize-based Darwin project has offered to explore the possibility of sharing their remote sensing data and digitised O.S. maps. Rebecca Foster participated in their workshop (25 January 2010) and provided them with information on wildlife use of savannahs in central Belize.

The project links to the CBD focal point through Elma Kay at the ERI, and Bart Harmsen and Rebecca Foster are advisors on the upcoming national report to the CBD concerning within-country progress and strategy on CBD commitments.

3. Project progress

See Annex 1 for a condensed description against the numbered logframe activities and means of verification.

3.1 Progress in carrying out project activities

1. Collection of rigorously calibrated information on movement through fragmented landscapes by neotropical mammals

Much of the land-tenure data is now mapped and we are building up detailed knowledge of the habitat structure from site visits (Bart Harmsen, Rebecca Foster, UoB Students), and from knowledge provided by Arturo Ramos.

In collaboration with Panthera, we have obtained over 1000 aerial photographs covering the northern third of the study area. These are proving difficult to format into an electronic map due to software complications, though we are being assisted on this task by remote sensing experts from the Darwin team at Edinburgh University. The electronic images and associated co-ordinates have been donated to the Lands Information Centre within the MNRE. Further satellite imagery and vegetation mapping data are being made available by the Edinburgh University Darwin Project. In addition Panthera have secured access to high quality satellite images of the study area through a Planet Action grant.

Transect grids have been identified for camera traps and surveys of mammal sign. Sign surveys are ongoing with the involvement of UoB students, as are camera trap surveys. Since April 2009, we have conducted two large-scale camera surveys to estimate jaguar density and habitat use within the study area and to document presence/absence of important prey species. The surveys cover effective sampling areas of ~ 230 km² and ~ 203 km² spanning the Western Highway which bisects the corridor study area. Omar Figueroa has trapped jaguars and pumas and fitted them with high-tech GPS collars to track their movements in relation to habitat and the highway. We are preparing to cage-trap and radio-collar ocelots, coatis, armadillos and pacas, and anticipate starting this campaign early in year 2. At the moment of

writing in late April, we can report that trapping has now commenced, and that after the first day of trapping a paca is walking around with a radio collar and is currently being tracked. Further trapping will follow to focus on tapirs, peccaries and deer. Isabelle Paquet-Durand, our consultant vet on the Darwin project, ran a training seminar on 25th March 2010 to teach all field staff how to safely handle and chemically immobilise mammals.

Whilst awaiting the arrival of the tranquiliser equipment and drugs necessary for live trapping, we have already deployed all the cage traps and are monitoring them regularly with camera traps. We bait them with meat, fish, grubs, fruit and vegetable material. The cameras are currently showing a high entry rate into the traps by a multitude of species. We therefore expect a very high trap success rate when trapping commences and we are confident that a large proportion of the collars will be deployed soon. This initial baiting suggests that we may catch margays, jaguarondis, and tayras, which are not on our original list of target species, but are rare predators of considerable conservation interest. We may fit individuals of these species with radio collars, if we have sufficient transmitters and field assistants to track the animals.

2. Instilling a tradition of objectively-based mammal monitoring in Belize

Said Gutierrez has commenced his training and teaching duties in the Darwin-funded post of Wildlife Biologist (since 1st February 2010). This appointment was made 8 months later than originally planned, due to the late inauguration of the ERI, and we currently have a Change Request pending to redistribute Darwin monies to extend his employment on these funds until end-May 2012.

Bart Harmsen and Rebecca Foster have led the undergraduate Wildlife Management course of the UoB Natural Resource Management Programme, thereby integrating solid wildlife expertise into student learning where none previously existed for this course. As well as contributing 20 lectures to it, they also set assignments and a field-course based on the Central Belize Corridor. The second group of 18 students will complete this course in May. Six UoB undergraduates have also signed up for 6-week internship on the project (May-July 2010). Eleven UoS undergraduates have committed to an 8-week period collecting data for the project (July-August 2010). This new development has been facilitated by the UoS Honours School of Biology, and the UoS Legal Services Department. Darwin personnel have met with UoB interns and UoS students to begin planning their study designs. For the UoS students this will be their first opportunity to engage with a large-scale conservation project abroad, and to work alongside Belizean undergraduate students. For the UoB and UoS students alike, it represents a unique opportunity for knowledge exchange. Their contribution to collection of field data will greatly enhance the scope of the project to analyse the simultaneous movements and interactions of a variety of mammal species.

Project Leader Patrick Doncaster gave an intensive 2-day course in study design for ecological fieldwork at the UoB on 22-23 March 2010, which was attended by 75 staff and students from the ERI, the Faculty of Science and Technology, and the Faculty of Management and Social Sciences.

On 25 March 2010, project personnel Said Gutierrez and Arturo Ramos, and two Belizean student volunteers from Galen University, were trained in zoonotic risks during handling and capture of wild mammals, emergency procedures during chemical immobilisation, and how to use a blow pipe.

3. Delineation of the belt of contiguous wilderness that will constitute the wildlife corridor

Studies on human-wildlife conflict, game hunting, and ecotourism potential have all been initiated, with outputs that are milestones for years 2 and 3 of the project. The game hunting study is likely to be continued as an MSc project; the ecotourism scoping study is being run in collaboration with the Belize European Tourism Association and Big Falls Farm (Belize River Farm Ltd).

The Big Falls Farm is a private property of ~142 km² covering almost one-third of the current corridor study area. A quarter of the property is pasture and arable, the remainder is broadleaf forest. Its 1,000 cattle are loosely managed and almost free ranging on parts of the property. They consequently suffer high losses to jaguars, triggering occasional lethal control of jaguars by the cowboys. As the cattle business continues to lose money, the manager is turning to other business opportunities such as logging and clearing forest for intensive arable agriculture. The manager has expressed an interest in developing an ecotourism venture on the property, particularly on and around Cox Lagoon within the corridor area,

but lacks the expertise to do so. We are working with him to ensure that developments are both economically and ecologically sustainable, and compatible with a functional wildlife corridor. Without the interaction we would risk losing this potentially crucial part of the proposed corridor area to intensive arable farming and logging operations. We are very grateful that the owners have welcomed the Darwin project onto the property, giving us permission to camera trap, live capture and collar wildlife to collect ecological data. Cox Lagoon is a pristine freshwater system that our initial survey suggests is a haven for wildlife, particularly during the dry season when water sources may be limited elsewhere. It also contains relatively high numbers of threatened wetland species, including the critically endangered Central American River turtle. With our assistance, the Belizean European Tourism Association (BETA) is investigating the potential for guided tours on the lagoon as a means of creating a profitable business for the farm that is also ecologically sustainable.

4. Advocacy, leading to implementation of the corridor within the legal framework of Belize

The UoB students have begun questionnaire surveys of local people to identify the socioeconomic factors that may influence the function of the area as a wildlife corridor, now or in the future, and to assess local attitudes to wildlife, and uses of wildlife products. Arturo Ramos comes from a village in the centre of the study area, and his employment as Field Operations Manager has done much to facilitate local acceptance of the corridor project. The Belize Zoo and its Tropical Education Centre lie at the centre of the corridor study area. The Zoo is using this fact to promote recognition of the Central Belize Corridor both nationally and internationally.

Senator Omar Figueroa and Elma Kay meet regularly to discuss land-use issues with government ministers and representatives. They recently met with the Deputy Prime Minister and Minister of Natural resources, as well as representatives from the Ministry's Policy and Planning Unit, to sensitize them on the corridor project and garner support. We consider it more appropriate and effective for the Ministers to meet with such highly-respected Belizeans as Elma and Omar than with foreigners associated with the corridor project (Patrick Doncaster, Bart Harmsen or Rebecca Foster). We have also initiated meetings with the Department of Agriculture, and the Belize Livestock Producers' Association (BLPA), on human-wildlife conflict. Verifiable government-related outputs are milestones for years 2 and 3 of the project.

3.2 Progress towards Project Outputs

1. Collection of rigorously calibrated information on movement through fragmented landscapes by neotropical mammals

Data collection on mammal densities and movements is on-going, with a density estimate of 4 jaguars per 100-km² within the study area, and some GPS data already collected by Omar Figueroa indicating movement of jaguars and pumas through the corridor study area. Currently there are GPS collars on five jaguars and three pumas. Since Omar Figueroa is a PhD student at the University of Florida, official reporting of his results will need to await the publication of his thesis and associated research papers.

For the present we can note that he has no records as yet of jaguars crossing the Western Highway, which is the main barrier bisecting the corridor study area. One of the collared pumas has crossed the highway, however, and our cameras have detected two ocelots on both sides. Although our on-going camera trapping has not detected the same jaguar on both sides of the highway, analysis of jaguar scats has revealed genetic mixing between the North and South, indicating some movement across the highway (unpublished data, Dr Marcella Kelly, Virginia Tec. USA). Through telemetry and high intensity camera trapping, the Darwin project will eventually reveal the frequency of these events.

Much of these data are relevant to the eventual analysis of least-cost paths which will be an output for year 3 of the project. This is likely to be done in a new collaboration with PhD student Angela Watkins, who is funded from 2009 to 2013 by the EPSRC Centre for Doctoral Training in Complex Systems Simulation at UoS, and co-supervised by Patrick Doncaster. She brings extra numerical expertise to the project which will expand the scope of data analysis.

We are behind schedule in live-trapping and sign and sighting surveys (Section 3.2.2 below), though we expect to catch up over the next 6 months by benefiting from the new development of field assistance from eleven UoS undergraduates (Section 3.1.2 above). There has been no change to the assumptions underpinning project goals.

2. Instilling a tradition of objectively-based mammal monitoring in Belize

The ERI is now fully functioning and has hired the Darwin-funded Wildlife Biologist who will be integral to the project activity of taking UoB students into the field for mammal monitoring. This monitoring has already begun, and the Wildlife Biologist is being trained in field techniques and data management. With his employment starting 8 months later than originally scheduled, his training in wildlife monitoring and teaching is also 8 months behind the original schedule. The mammal monitoring is behind schedule for this reason and also because the purchase of capital equipment was set back by a 5 month delay in release of funds during preparation of the Consortium Agreement between in-country partners. We nevertheless expect to complete all monitoring targets by the end of the project (end-July 2012).

The ERI is the first Research Institute in the UoB and in the country of Belize. Until now all of UoB's resources have focussed on teaching at the Associate and Bachelor's level, with no investment in research. One of the essential components missing in the UoB education is access to peer-reviewed scientific journals. This is a given for European and US students in terms of understanding how science is communicated and keeping up to date with the latest research. One of the ways in which UoS is building capacity through the Darwin project is by giving a select group of students electronic journal access. In his teaching role as Jaguar Research Fellow in Wildlife Conservation at the ERI, Bart Harmsen has organised a weekly Journal Club for undergraduates and staff on the Natural Resource Management Program (NRMP) and at ERI, with the aim of regularly accessing peer-reviewed scientific writing, improving critical thinking, and encouraging correct use of scientific methods and hypothesis testing within the NRMP and the ERI. This is an essential step on the way to ensuring that post-Darwin mammal monitoring is objective and scientifically robust in terms of study design and replication. Mammal monitoring within the corridor is already becoming one of the defining roles of the ERI. Corridor ecology featured within the National Research Agenda consultation workshop run by the ERI on 16-17 March 2010. This workshop is the first of two such sessions aimed at defining and prioritizing national research needs for Belize.

There has been no change to the assumptions underpinning project goals.

3. Delineation of the belt of contiguous wilderness that will constitute the wildlife corridor

The comprehensive corridor plan is underway and on schedule, as is the integration within this plan of knowledge on wildlife and urban development, including the construction of a database containing information about landowners and crown land within the corridor study area. Regular meetings have taken place with the key landowners and communities within the study area, and these will continue for the foreseeable future, always in close collaboration with BFD.

In August 2009 Galen University in Belize held the first Belize Wildlife Conservation Networking Conference. Its function was to bring together many stakeholders who until then had little contact with each other, yet are united by the common goal of wildlife conservation in Belize. Bart Harmsen presented a talk: 'Jaguar corridor and connectivity in Belize and to the outside'; Omar Figueroa presented a talk: 'Spatial ecology and conservation of jaguars and pumas in Central Belize'.

In February 2010 the BFD held a meeting to discuss the final draft amendments to the Wildlife Protection Act, prepared by Rasheda Sampson. Darwin representatives Bart Harmsen and Rebecca Foster and ERI staff member Said Gutierrez provided information on the sustainability of hunting.

There has been no change to the assumptions underpinning project goals.

4. Advocacy, leading to implementation of corridor within the legal framework of Belize

We are ahead of schedule on advocacy, though it would be premature to present means of verification at this stage of intense discussions with policy-makers, since most of these issues involve sensitive information of land use change at a national level.

There has been no change to the assumptions underpinning project goals.

3.3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Number planned for this reporting period	Total planned from application
Established codes				
3	Number of people attaining qualifications ¹	8	10	40
4A	Number of undergraduate students having received training ²	30	16	40
4C	Number of postgraduate students to receive training ³	1	1	2-4
4D	Number of training weeks to be provided ⁴	18	18	55
5	Number of people having received at least one year of training (excluding those above) ⁵	1	1	2-4
7	Number of training materials produced for use by host country ⁶	2	2	4
8	Number of weeks spent by UK PI Doncaster on project work in the host country	3	3	9
9	Number of species/habitat management plans (or action plans) to be produced for Governments, public authorities, or other implementing agencies in the host country	0	0	3
10	Number of individual manuals produced to assist work related to species identification, classification and recording ⁷	1	1	1
11A	Number of papers published or in press in peer reviewed journals ⁸	3	3	3+
11B	Number of papers to be submitted to peer reviewed journals	2	2	4-8
12A	Number of computer based databases to be established and handed over to host country	0	0	3
14A	Number of workshops organised to disseminate Darwin project findings ⁹	1	1	3
14B	Number of conferences/workshops attended to disseminate Darwin project findings ¹⁰	2	2	3

15A	Number of national press releases in host country ¹¹	3	3	5
15B	Number of local press releases in host country	0	0	5
15C	Number of national press releases in UK	0	0	1
15D	Number of local press releases in UK (<i>Southern Daily Echo</i> 6/4/2009)	1	1	0
17B	Number of dissemination networks enhanced ¹²	1	1	1
18A	Number of national TV features in host country ¹³	1	1	3-5
19A	Number of national radio interviews in host country ¹⁴	2	2	5
20	Estimated value (£'s) of physical assets to be handed over to Belize	£21,216	£21,216	£35,526
21	Number of permanent educational, training and research organisations established ¹⁵	1	1	1
22	Number of permanent field plots established ¹⁶	62	62	60
23	Value of resources raised from other sources (i.e. in addition to Darwin funding) for project work – confirmed funding ¹⁷	£49,620	£65,319	£155,107
New - Project specific measures	n/a			

¹ Eight of ten undergraduates passed the UoB Wildlife Management course in 2009.

² Ten undergraduates in 2009, 18 undergrads in 2010, plus two students from Galen University who attended the chemical immobilisation workshop.

³ Silverio Y. Marin

⁴ Training on the UoB Wildlife Management course, chemical immobilisation workshop, study design seminars, ERI Journal Club, providing in depth assistance with statistical analysis of 3 student projects.

⁵ Arturo Ramos

⁶ (i) *Protocol for Safe Live-Trapping, Handling and Chemical immobilization of wild Central American Mammals* for the Belize Forest Department; (ii) 20 *Wildlife Management* lectures and seminars by Bart Harmsen and Rebecca Foster for the undergraduate Natural Resource Management Programme, including assignments and field-course based on the Central Belize Corridor.

⁷ Harmsen, B. & Foster, R. (2009) *Big Falls Wildlife Research Status Report*. Belize Forestry Department internal report.

⁸ (i) Foster, R.J., Harmsen, B.J., Valdes, B., Pomilla, C. and Doncaster, C.P. (2010) Food habits of sympatric jaguars and pumas across a gradient of human disturbance. *Journal of Zoology*, 280: 309-318. (ii) Foster, R.J., Harmsen, B.J., and Doncaster, C.P. (2010) Sample size effects on diet analysis from scats of jaguars and pumas *Mammalia* (in press). (iii) Harmsen, B.J., Foster, R.J., Gutierrez, S.M., Marin, S.Y. & Doncaster, C.P. (2010) Scrape-marking behavior of jaguars (*Panthera onca*) and pumas (*Puma concolor*). *Journal of Mammalogy*, in press.

¹⁰ (i) *Belize Wildlife Conservation Networking Conference 2009* (13-15 August 2009 at Galen University, Belize); Bart Harmsen presented a talk: “Jaguar corridor and connectivity in Belize and to the outside”; Omar Figueroa presented a talk: “Spatial ecology and conservation of jaguars and pumas in Central Belize.” (ii) *Amendments to the Wildlife Protection Act Meeting* (26 February 2010 at the Belize Forest Department); Darwin representatives (Bart Harmsen and Rebecca Foster) and staff (Said Gutierrez) provided information on the sustainability of hunting. Bart Harmsen and Rebecca Foster both gave presentations at the XIII Regional congress of the Mesoamerican Society for Biology and Conservation 26-30 October 2010. Bart Harmsen presented data on potential biases for camera traps as a methodology to estimate the abundance of jaguars, and Rebecca Foster presented on the ecology of jaguars and pumas in a human dominated landscape.

¹¹ (i) *The Reporter* 6/4/2009 announcing the Darwin project; (ii) Panthera Newsletter Special Issue December 2009 http://www.panthera.org/documents/PantheraNewsletter_January2009SpecialIssue.pdf; (iii) national radio 27/3/2010 announcing Darwin sponsorship of the ‘wildlife corridor’ stage of the annual Belmopan to Belize City cycle race;

¹² Belize Wildlife Conservation Network; Bart Harmsen and Rebecca Foster have joined it as expert advisors on jaguars. <http://www.galen.edu.bz/belizewildlife/>

¹³ Breakfast Show feature called “Open Your Eyes” with Omar Figueroa

¹⁴ (i) BBC Radio for the British Army Training and Support Unit in Belize: Sharon Matola at the Belize Zoo interviewed Bart Harmsen and Rebecca Foster on their work for the Darwin project; (ii) “Open Your Eyes” (note 13 above).

¹⁵ The Environmental Research Institute at the University of Belize, inaugurated 28 January 2010.

¹⁶ 53 camera stations and associated trails cut by Arturo Ramos; 9 transects cut by undergraduate students of the University of Belize.

¹⁷ US\$75,949 at \$1 = £0.653 (US\$69,570 from Panthera and US\$6,379 from UB). UoB were unable to meet the originally projected commitment in matching funds (calculated for 10% of Elma Kay's time, not 8% as stated in the original budget), due to delays in the launch of the ERI and subsequent obtaining of project funds.

Table 2 Publications

Type (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
Journal article	Foster, R.J., Harmsen, B.J., Valdes, B., Pomilla, C. and Doncaster, C.P. (2010) Food habits of sympatric jaguars and pumas across a gradient of human disturbance.	Journal of Zoology (London)	C. Patrick Doncaster	-
Journal article	Foster, R.J., Harmsen, B.J., and Doncaster, C.P. (2010) Sample size effects on diet analysis from scats of jaguars and	Mammalia	C. Patrick Doncaster	-

	pumas			
Journal article	Harmsen, B.J., Foster, R.J., Gutierrez, S.M., Marin, S.Y. & Doncaster, C.P. (2010) Scrape- marking behavior of jaguars (<i>Panthera onca</i>) and pumas (<i>Puma concolor</i>).	Journal of Mammalogy	C. Patrick Doncaster	-

3.4 Progress towards the project purpose and outcomes

The purpose of the project is to have the Government of Belize adopt and implement a zoning plan for a corridor that connects two wilderness blocks in north and south Belize, supported by a national, objectively-based, mammal monitoring programme. All original assumptions (Annex 2) still hold true; indicators are adequate for measuring outcomes.

We have discovered that more of the corridor study area is privately owned than we had previously anticipated. Landownership data are difficult to track since there is no national database of land ownership. The current electronic databases have gaps because land titles pre-dating the early 1990s continue to be sold as paper titles. Depending on the age of these titles, the associated registrations can be distributed across several different government departments.

The higher proportion of land under private ownership will require us to adapt our approach to securing long-term economic and ecological sustainability for the corridor. We are currently evaluating options for government incentives and restrictions.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The project is having an impact on biodiversity in terms of the expert advice provided by the project representatives at the Inception Workshop held by the BFD to develop Belize's fourth national report to the United Nations Convention on Biological Diversity. At this early stage in the project we cannot verify other impacts on biodiversity, sustainable use or equitable sharing of biodiversity benefits. Our objective remains unchanged, to prevent future loss of biodiversity by implementation of the wildlife corridor.

4. Monitoring, evaluation and lessons

Project monitoring and evaluation

The measurable indicators of progress against the scheduled activities in the logframe are described in Section 3 above in relation to the project purpose, with outputs listed in Section 3.3, and summarized in Annex 1. In addition, Bart Harmsen and Said Gutierrez both have formal work plans designed to ensure timely implementation of the Darwin project activities. Elma Kay monitors their progress with monthly staff meetings and quarterly written reports. Rebecca Foster writes monthly reports to Panthera, detailing project progress. The reports are reviewed by Howard Quigley to ensure that the corridor research is moving forward.

Lessons learned from this year's work

We have developed our understanding of the process involved in changing and implementing land-use policy. Whilst the non-Belizean project personnel can manage the collection of data necessary to support the need for a wildlife corridor, the project must nominate Belizean members such as Senator Figueroa and the Administrative Director and Terrestrial Science Director at the ERI, Dr Elma Kay, to strategise land-use policy directly with the relevant Government officials.

We are learning more about the value of training UoB students and staff in academic skills of study design, evidence-based research, and effective communication. The current lack of research within the UoB, and absence of any post-graduate training programs, is now being addressed by Elma Kay from her new position as Administrative Director of the ERI. She is establishing a regional Masters Program in Biodiversity Conservation and sustainable Development in collaboration with multiple Caribbean Universities. The two within-country Darwin associates: Bart Harmsen and Rebecca Foster, have already agreed to assist with the teaching commitments of the wildlife part of this course. We will encourage these students to join the Darwin project, to integrate components of the project into their research theses. The Masters programme is planned to be ready in January 2011 but will likely not commence until July 2011 to align with international curriculum start dates.

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

The log-frame in the original submission was slightly modified on the recommendation of the LTS Portfolio Manager, in order to clarify outputs and synchronise numbering between log-frame and activities. The revision was accepted by Lesley Brown of LTS on 28/4/2009.

No issues were raised by the first half-year report.

6. Other comments on progress not covered elsewhere

The legacy of the project has been enhanced over the last year by Bart Harmsen now being employed by the ERI as Research Fellow in Wildlife Conservation, thereby further strengthening collaboration with the UoB. This allows for a more gradual exit strategy with respect to capacity building, with Bart remaining within the ERI wildlife programme for an extended period until a Belizean academic can take over the role.

Significant difficulties encountered during the year and steps taken to overcome these

Delays in the project initiation meant that limited resources were available for the project in the first 5 months, until all parties had signed the Consortium Agreement (Annex 4). Although Panthera covered some of the costs in anticipation of reimbursement at a later date, these funds were limited in their scope. This meant that we relied on the continued support of the project by Omar Figueroa in terms of trapping and collaring jaguars and pumas (with Panthera committing to bringing funds forward to this), and camera trapping using pre-existing camera-trap equipment within country. These cameras were old non-digital models, prone to breakdown in humid tropical conditions. Thus, the camera-trap effort was limited by frequent camera failure. An unusually wet rainy season and unexpected flooding in September caused further camera losses. This did however provide us with valuable information on flood-line levels within remote parts of the study area. The current digital cameras, which we have since purchased on Darwin funds as part of the ERI equipment legacy, are more robust and are functioning well under field conditions. We now know where to place them to avoid flood-prone areas during the wet season, when water levels can increase dramatically in one or two days.

The preparation of the Consortium Agreement between Darwin parties was a slow process because of the time needed by each party to assess the Agreement before signing. It is nevertheless a key document for ensuring project success. Since the Consortium Agreement has been signed, the purchase of equipment,

the hiring of staff and the implementation of work plans run smoothly through the official structures of each party; and all parties are clear about their commitment to the project.

Particular risks of the project

We foresee no particular risks of the project.

7. Sustainability

Within-country project profile and promotion of project

A Darwin Initiative Launch was held at the British High Commission in September 2009 for both the current Darwin projects in Belize. This was attended by members of the government from BFD, conservation NGOs (Program for Belize, The Nature Conservancy, Friends of Conservation and Development), the British Army, the University of Belize, as well as members of both Darwin teams.

The ERI was inaugurated at the UoB in January 2010, attended by the Deputy Prime Minister and Minister of Natural Resources and the Environment, and members of the press. The British High Commissioner talked about the contribution of the British government through the two current Darwin projects in Belize.

In other project promotions, Sharon Matola, Director of the Belize Zoo interviewed Bart Harmsen and Rebecca Foster on their work for the Darwin project in a BBC Radio interview for the local British Army Training and Support Unit in Belize. A documentary film about the research is on-going for a proposed television programme on the Belize corridor. Dr Alan Rabinowitz of Panthera visited in April 2009 and he and Omar Figueroa discussed the wildlife corridor on national television and radio. During the same visit Sharon Matola set up a community jaguar-day event in the centre of the corridor study area. The event was attended by members of the local community and by guest of honour, the Minister of State (in the Ministry of Labour, Local Government and Rural Development). Alan Rabinowitz and Omar Figueroa both gave speeches about the importance of the area as a wildlife corridor.

In the first of a number of exercises to gradually raise the public profile of the proposed corridor locally and nationally, the Darwin project sponsored Bz\$500 (£169) prize money to the winner of the 'Wildlife Corridor' stage of the Belmopan to Belize City cycle race held on 27 March 2010. This annual event attracts professional and amateur racing cyclists from all over the world. The sponsored sprint stage was held over the width of the proposed wildlife corridor where it crosses the highway. Panthera provided matching prize money. The event was reported on national radio, highlighting the corridor initiative and naming the Darwin Initiative, Panthera and the ERI as proponents of the wildlife corridor. Minister Gaspar Vega later informed Omar Figueroa of his pleasure with this public relations initiative.

Evidence for increasing interest and capacity for biodiversity resulting from the project

Interest in biodiversity is covered in Section 3.5, and developments on the exit strategy are noted in Section 6. In addition, we note that the corridor will be one of the major outputs of the ERI, which is increasingly focused on seeing this through to successful implementation. The ERI are developing a National Natural Resources Management Research Agenda with wildlife research as a major area, and will be focusing on the area of the central Belize corridor.

8. Dissemination

Plans are in place to we plan to distribute ERI brochures that highlight the Darwin project at the big Earth Day event organized by UoB on 22 April 2010, to which have been invited schools, conservation organizations, government agencies and the public at large. Apart from this plan, and the cycle race mentioned in Section 3.2.2, it is too soon in the project's development to disseminate findings and

outputs. Dissemination activities are mostly scheduled for year 3, and we anticipate continuing them in the host country when the project finishes, implemented through the ERI.

9. Project Expenditure

Table 3 Project expenditure during the reporting period (Defra Financial Year 1 April 2008 to 31 March 2009)

Item	Budget (please indicate which document you refer to if other than your project application or annual grant offer letter) As per 'Schedule 1 (revised)' of Consortium Agreement and Yearly Budget Breakdown, attached in Annex 4	Expenditure	Variance
Rent, rates, heating, overheads etc			
Office costs (e.g. postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment (specify)			
Others (specify)			
Salaries (specify by individual)			
TOTAL			

The variance corresponds to the under-spend for year 1 that was predicted in our Change Request of 25/1/2010 (the variations in Expenditure from that prediction are explained in the Quarter 4 Actual Expenditure).

10. 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 LTS and the Darwin Secretariat to publish the content of this section

The establishment of the ERI was substantially boosted by the two 2009 Darwin projects in Belize, which have become the inaugural research projects for the institute. Capital equipment to be handed over to the ERI at the end of the project will greatly increase their capacity to do research (vehicle, computer, camera traps, cage traps, immobilization equipment, GPS units, office equipment). The appointment of the Wildlife Biologist makes it possible for the ERI take students into the field, and to begin to meet the Darwin objective of establishing a tradition of wildlife monitoring in Belize. The ERI is becoming recognized by national government as a leader in ecological research and conservation.

We have photographs of animals, landscapes (savannahs, forests, lagoon), and people doing fieldwork. These are available on request from Rebecca Foster (rfoster@panthera.org).

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2009/10

Project summary	Measurable Indicators	Progress and Achievements April 2009 - March 2010	Actions required/planned for next period
<p>Goal: <i>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</i></p> <p><i>The conservation of biological diversity,</i></p> <p><i>The sustainable use of its components, and</i></p> <p><i>The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</i></p>			<i>(do not fill not applicable)</i>
<p>Purpose.</p> <p>A corridor zoning plan connecting two wilderness blocks in North and South Belize adopted and implemented by the Government of Belize, supported by a national, objectively-based, mammal monitoring programme.</p>	<p>Submission to government of evidence-based corridor zoning plan.</p> <p>Government recognition of the proposed corridor.</p> <p>Integration of mammal monitoring within training programmes of the ERI.</p>	<p>Scheduled for end of year 3.</p> <p>.</p> <p>Scheduled for end of year 3.</p> <p>.</p> <p>In progress with coursework marked from the first batch of students.</p>	<p>As per logframe.</p> <p>.</p> <p>As per logframe.</p> <p>.</p> <p>As per logframe.</p> <p>.</p>
<p>Output 1. Collection of rigorously calibrated information on movement through fragmented landscapes by neotropical mammals, using (1) mapping, (2) surveying sign, (3) trapping, (4) tracking.</p>	<p>Spreadsheet, GIS and photographic databases.</p>	<p>Spreadsheet, GIS and photographic databases established and expanding daily. Available on request.</p>	
<p>Activity 1.1 Establishment of survey grids.</p>		<p>Done.</p>	
<p>Activity 1.2 Sign and camera surveys.</p>		<p>In progress, on schedule.</p>	
<p>Activity 1.3 Trapping mammals for marking.</p>		<p>Scheduled for early year 2; photos of pacas entering baited traps available on request</p>	

Activity 1.4. Radio tracking.		Scheduled for early year 2
Output 2. Instilling a tradition of objectively-based mammal monitoring in Belize, and institutionalising this impetus within the UoB Environmental Research Institute (ERI).	<p>Registration of Said Gutierrez as Wildlife Biologist at the ERI.</p> <p>Assessed coursework by UoB undergraduate students. Data collection by UoB interns and UoS undergraduates.</p> <p>.</p> <p>Intensive statistics course run by Project leader Patrick Doncaster</p>	<p>Said Gutierrez began employment with the ERI in February 2010, and is beginning his training in wildlife expertise and teaching.</p> <p>The first group of 18 students will complete their course in May. Six UoB undergraduates have signed up for 6-week internship on the project (May-July 2010). Eleven UoS undergraduates have committed to an 8-week period collecting data for the project (July-August 2010). Darwin personnel have met with UoB interns and UoS students to begin planning their study designs.</p> <p>Done, 6 lectures/seminars 22-23 March 2010 to ~75 students and staff of the UoB.</p>
Activity 2.1. Courses and projects with UoB students; analysis of camera-trap and telemetry data		Courses are ongoing; data analysis is a milestone for years 2 and 3.
Output 3. Delineation of the belt of contiguous wilderness that will constitute the corridor connecting the northern and southern protected blocks of land.	Corridor plan, and integration within it of knowledge on wildlife abundance, distribution, movement and exploitation, and projected urban development either side of the corridor.	Ongoing.
Activity 3.1. Analysis of wildlife conflicts, mapping forest exploitation and potential for ecotourism		All have been initiated, with outputs that are milestones for years 2 and 3 of the project.
Output 4. Advocacy, leading to implementation of corridor within the legal framework of existing protected areas and zoning plans within Belize, and publication of results.	<p>Survey results, corridor land-use policy and legislation in place</p> <p>Journal articles in print, available as PDFs.</p>	<p>These are milestones for year 3 of the project.</p> <p>.</p> <p>Available on request.</p>
Activity 4.1. Student questionnaire surveys of local people; discussions, reports, and negotiations with government, signing official agreements.		Database of questionnaire results from year 1 is available on request, currently being analyzed by a Belizean post-grad doing a MSc in Mexico.
Activity 4.2. Acceptance of papers in peer-reviewed journals		Two papers related to the project have been published, in the <i>Journal of Zoology</i> , and in <i>Mammalia</i> . Other submitted papers and internal reports available on request.

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal:</p> <p>Effective contribution towards implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.</p>			
<p>Sub-Goal:</p> <p>To secure connectivity for all larger land mammals within Belize, currently threatened by segregation into isolated blocks in the north and south of the country, thereby enhancing connectivity with natural areas outside Belize.</p>	<p>Identified minimum conditions of habitat structure and quality for allowing free movement of medium to large mammals between existing protected areas.</p> <p>Indicator species: jaguar, puma, ocelot, tapir (CITES I), white lipped and collared peccaries (CITES II, hunted), red brocket and white tailed deer, coati, armadillo and paca (unlisted reference species).</p>	<p>Continued presence of target species throughout corridor areas, connecting freely with protected blocks at either end.</p>	
<p>Purpose</p> <p>A corridor zoning plan connecting two wilderness blocks in North and South Belize adopted and implemented by the Government of Belize, supported by a national, objectively-based, mammal monitoring programme.</p>	<p>Already declared interest by the Belizean government in a plan for zoning a corridor connecting the two protected wilderness blocks in north and south Belize, and conditions for implementation.</p> <p>Submission to government of evidence-based corridor zoning plan.</p> <p>Government recognition of the proposed corridor.</p> <p>Integration of mammal monitoring within training programmes of the ERI.</p>	<p>Continued existence and free movement of all studied taxa throughout the proposed corridor.</p> <p>Corridor protection implemented into law, thereby contributing towards Belize's commitment to the CBD.</p> <p>Recognition of corridor as integral to the proposed Mesoamerican Biological Corridor.</p> <p>Yearly increase in numbers of Belizean students studying wildlife and human-wildlife interactions within the corridor.</p>	<p>Government remains committed to the corridor (see Section 14).</p> <p>No major development severs the corridor before implementation of protection.</p> <p>UoB remains committed to its Environmental Research Institute.</p>

<p>Outputs</p> <p>1. Collection of rigorously calibrated information on movement through fragmented landscapes by neotropical mammals, using (1) mapping, (2) surveying sign, (3) trapping, (4) tracking.</p>	<p>Collection of data on density and movement of key neotropical mammal species within and through the corridor. Analysis by least-cost and other techniques to identify a corridor path with highest mobility.</p>	<p>Publications in peer-reviewed journals concerning movement and dispersion through corridor areas by neotropical mammals, co-authored by Belizean collaborators on the project.</p>	<p>Continued access to corridor area for fieldworkers throughout the data-collection period, and for post-project monitoring.</p>
<p>2. Instilling a tradition of objectively-based mammal monitoring in Belize, and institutionalising this impetus within the UoB Environmental Research Institute (ERI).</p>	<p>Appointment of a dedicated mammal-monitoring coordinator, and training for teaching courses in natural resource management at the ERI.</p> <p>Establishment of intensive training courses in natural resource management and wildlife monitoring, including GIS, offered to students, teachers and professionals in natural resource management.</p> <p>Collaboration of UoB with BFD to design an awareness campaign on wildlife law and potential conflicts, to be run by UoB students on their Bachelor programme in Natural Resources Management.</p> <p>Mammal monitoring within the corridor becomes a defining role of the UoB Environmental Research Institute.</p>	<p>Appointed coordinator trained in delivery of courses by Darwin core UK and Belize-based staff and consultants.</p> <p>ERI teachers trained in GIS techniques and field craft.</p> <p>Wildlife management training courses at the ERI outlive the Darwin project.</p> <p>Belizean scientists continue publishing in peer-reviewed journals on tropical mammalogy and conservation.</p>	<p>Continued commitment of the UoB to the ERI and to Belizean students in general for programmes monitoring neotropical mammals.</p> <p>ERI sustains success with securing outside funding sufficient to continue the wildlife teaching appointment after the end of the Darwin project.</p>
<p>3. Delineation of the belt of contiguous wilderness that will constitute the corridor connecting the northern and southern protected blocks of land.</p>	<p>Comprehensive corridor plan for connecting the two existing protected blocks in the north and south of the country.</p> <p>Integration within this plan of knowledge on wildlife distribution, movement and exploitation, and projected urban development</p>	<p>Published report of corridor plan.</p> <p>Distribution of report to government, BFD, and all local stakeholders.</p>	<p>Government through BFD upholds its current agreement to divulge development plans for the area.</p> <p>Continued access to private land to monitor movement and abundance of existing wildlife populations.</p>

	either side of the corridor.		
4. Advocacy, leading to implementation of corridor within the legal framework of existing protected areas and zoning plans within Belize, and publication of results.	Government agreement on zoning of the corridor area, following negotiations on land-use changes.	Lawfully binding document stating specifically which areas can be used for what purpose within the designated corridor area.	Government remains committed to the corridor and is willing to negotiate concessions against development as necessary and practical.

Activities (details in workplan)

- 1.1.1 Systematic mapping of the whole corridor zone in terms of habitat characterisations including urban parts (milestone for 1st 6 months).
- 1.1.1 Establishment of line transects and survey grids throughout the area, using a combination of a stratified design including all habitat types, and an even distribution throughout the zone. Project Leader to advise on data collection design during visits in years 1 and 2 (milestone for 1st 6 months).
- 1.1.3 Establishment of camera trap grids and locations throughout study area (milestone for 1st 6 months).
- 1.2.1 Systematic surveys for burrows of armadillos and pacas throughout the survey area in survey grids and survey lines (reporting milestones at yearly intervals).
- 1.2.2 Systematic surveys for footprints for all species along survey lines and in survey grids (milestones at yearly intervals).
- 1.2.3 Systematic sighting surveys (distance sampling surveys) for the ungulate species and coatis (milestones at yearly intervals).
- 1.2.4 Systematic nocturnal sighting surveys for armadillos and pacas (milestones at yearly intervals).
- 1.2.5 Camera trapping for identifiable species (ocelots, jaguars) for mark-recapture analysis and capture rates for prey species (milestones at yearly intervals).
- 1.3.1 Trapping of jaguars, pumas and tapirs with the use of snares, using existing expertise in Panthera (milestones at yearly intervals).
- 1.3.2 Peccary species stalked-down wind and darted, using existing expertise in Panthera (milestones at yearly intervals).
- 1.3.3 Ocelot, coatis, armadillos and pacas will be cage trapped as the safest means of trapping (milestones at yearly intervals).
- 1.3.4 Both deer species will be captured by down-wind stalking and darting, using existing expertise in Panthera (milestones at yearly intervals).
- 1.4.1 Radio tracking of all species with teams on the ground (milestones at yearly intervals).
- 2.1.1 Mammal-monitoring coordinator appointed to ERI (milestone for 1st 6 months), to coordinate the logistics of mammal monitoring and the interface between students and Darwin personnel, to be trained for teaching wildlife management by Darwin core personnel and consultants (milestones at yearly intervals).
- 2.1.2 Courses to UoB students in data collection, analysis and GIS for wildlife monitoring and natural resources management, initially run by Darwin UK and Belize-based personnel with assistance of mammal-monitoring coordinator; in final year run by coordinator now trained for teaching (milestones at yearly intervals).
- 2.1.3 Implementation of UoB projects to assist with end parts of activities 1, all of activities 2 and activities 4. Some responsible students will assist with activities 3 but this will always be done under expert guidance (milestones at yearly intervals).
- 2.1.4 Writing up of undergraduate projects and potentially master projects (milestones at yearly intervals).
- 2.1.5 Analyses of mammal-monitoring data from cameras and telemetry for least-cost optimal corridor path (milestones in years 2 and 3).
- 3.1.1 Study of potential conflicts with wildlife at corridor edges, through the Forestry Department and the Agriculture Department (milestones at yearly intervals).
- 3.1.2 Mapping hunting and forest extraction and studying the socioeconomic implications of this for corridor design (milestones at yearly intervals).
- 3.1.3 Mapping the potential and willingness by the local community to partially convert to ecotourism and explore possibilities through the Belize Tourism Board. (milestones in years 2 and 3, and final output).
- 4.1.1 Student questionnaires to residents to test willingness to buy into the corridor and economic incentives necessary to encourage buy in.
- 4.1.2 Meet regional MPs, to assess needs of constituents and public-relations strategy to encourage local buy-in to the corridor.
- 4.1.3 Meet Ministers of Agriculture, Lands, Tourism, to provide input to plans for an economic stimulus package in the corridor region.
- 4.1.4 Discussions with Dept Agriculture and Livestock Association, on minimising human/wildlife conflict in the corridor region.
- 4.1.5 Reports for the government as an input for discussion on corridor (final output).
- 4.1.6 Discussion and negotiation with government about corridor implementation (milestone in year 3).
- 4.1.7 Signing of official agreements (final output).
- 4.2.1. Writing of peer reviewed papers (final output).

Monitoring activities:

Indicator 1.1 Fulfilling all sample-size assumptions necessary to run models to create habitat maps, estimate abundance from camera trapping and surveys.

Indicator 1.2 Get adequate numbers of sign, sightings and photo captures to calculate abundance.

Indicator 1.3 Capture high enough numbers of individuals from each species based on expectation from indicator 2.

Indicator 1.4 Sufficient sample size of accurate fixes from each tagged individual and each species. Accuracy of trackers will be tested with fixed known collars.

Indicator 2.1 Adequate functioning of coordinator as an organiser, teacher/assistant, practical work, quality of work and understanding by students within the program.

Indicator 3.1 High cooperation from stakeholder communities.

Indicator 4.1 Implementation of corridor according to minimum requirements as discovered through the project.

Indicator 4.2 Acceptance of papers in well established peer reviewed papers.

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

Activity	Months	Year 1				Year 2				Year 3			
		1	2	3	4	1	2	3	4	1	2	3	4
1.1.1 Mapping of corridor area	4	X	X										
1.1.2 Establishment of line transects and survey grids	3	X	X										
1.1.3 Establishment of camera trap grids	3	X	X										
1.2.1 Systematic surveys of burrows for Paca and Armadillo	6			X	X		X	X		X	X		
1.2.2 Systematic surveys for footprints of all species	6			X	X		X	X		X	X		
1.2.3 Systematic sighting surveys for all ungulates and coatis	6			X	X		X	X		X	X		
1.2.4 Systematic night time sighting surveys for pacas and armadillos	6			X	X		X	X		X	X		
1.2.5 Camera trap surveys	8			X	X		X	X		X	X		
1.3.1 Trapping of jaguars, pumas and tapirs	4-6			X		X		X		X			
1.3.2 Trapping of peccaries	4-6				X		X		X		X		
1.3.3 Trapping of ocelot, coatis, armadillos and pacas	4-6			X		X		X		X			
1.3.4 Trapping of both deer species	4-6				X		X		X		X		
1.4.1 Radio tracking of all collared species	25			X	X	X	X	X	X	X	X	X	X
2.1.1 Mammal-monitoring coordinator appointed to ERI and trained for teaching	30	X	X	X	X	X	X	X	X	X	X		
2.1.2 Course work to UoB students	5		X			X				X			
2.1.3 Field projects to UoB students	8			X	X			X	X			X	X
2.1.4 Marking and assisting with reporting stage	3				X				X				X
2.1.5 Analyses of mammal-monitoring data for optimal corridor path (least-cost analyses)						X	X	X	X	X	X		
3.1.1 Study of Human-wildlife Conflict at edges of study area	6				X		X		X		X		
3.1.2 Study extraction and hunting levels within the study area	5					X		X		X			
3.1.3 Study potential for tourism for surrounding stakeholder communities	6				X		X		X		X		
4.1.1 Student questionnaires to residents on willingness and incentives to buy	4	X							X				

	into the corridor												
4.1.2	Meet regional MPs, to assess needs of constituents and PR strategy	3	X			X			X				
4.1.3	Meet Ministers of Agriculture, Lands, Tourism, to devise economic stimulus package	3	X			X			X				
4.1.4	Discussions with Dept Agriculture and Livestock Association, on human/wildlife conflict	3	X			X			X				
4.1.5	Reports to government	7				X			X		X	X	
4.1.6	Workshop negotiations with government	5				X			X			X	X
4.1.7	Signing of official agreements with government concerning corridor	1											X
4.2.1	Writing and submitting peer reviewed papers	4							X				X

Annex 3 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

This may include outputs of the project, but need not necessarily include all project documentation. For example, the abstract of a conference would be adequate, as would be a summary of a thesis rather than the full document. If we feel that reviewing the full document would be useful, we will contact you again to ask for it to be submitted.



Fig. A3.1 The logo of the UoB ERI, inaugurated in January 2010.



Fig. A3.2. Left: UoB students on the Natural Resource Management Programme creating transects in forest-savannah transition habitat for monitoring sign of mammals. Right: Field Operations Manager Arturo Ramos setting a camera trap on one of the students' transects. See report Sects. 3.1.1-2 (Photos 14/3/2010).



Fig. A3.3. Project Leader Patrick Doncaster delivering a 2-day short course in study design for the ERI on 22-23 March 2010, attended by 75 staff and students of the UoB. See report Sect. 3.1.2.



Fig. A3.4. Camera traps stationed at cage traps, showing a paca about to enter the trap, and an ocelot passing by the trap. Both of these are target species for the project. See report Sect. 3.1.1.