

Darwin Initiative – Final Report

(To be completed with reference to the Reporting Guidance Notes for Project Leaders
(<http://darwin.defra.gov.uk/resources/reporting/>) -
it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Darwin project information

Project Reference	17-008
Project Title	Can Hunting and Conservation of Endemic Annamite Ungulates be Reconciled?
Host country(ies)	Vietnam (Laos)
UK Contract Holder Institution	Department of Geography, University of Cambridge
UK Partner Institution(s)	WWF Greater Mekong- Vietnam Programme; Vinh University
Host Country Partner Institution(s)	Forest Protection Departments of Thua Thien Hue and Quang Nam Provinces' Vietnam; Hue University; American Museum of Natural History
Darwin Grant Value	
Start/End dates of Project	01/09/09 – 31/08/12
Project Leader Name	Nigel Leader-Williams
Project Website	http://www.geog.cam.ac.uk/research/projects/annamiteungulates/
Report Author(s) and date	Nicholas Wilkinson, Project Officer Nigel Leader-Williams, Project Leader Cao Tien Trung, Vinh University Van Ngoc Thinh, WWF Nguyen Quang Hoa Anh, WWF Luong Viet Hung, WWF Le Thuy Anh, WWF January 2013

1 Project Background

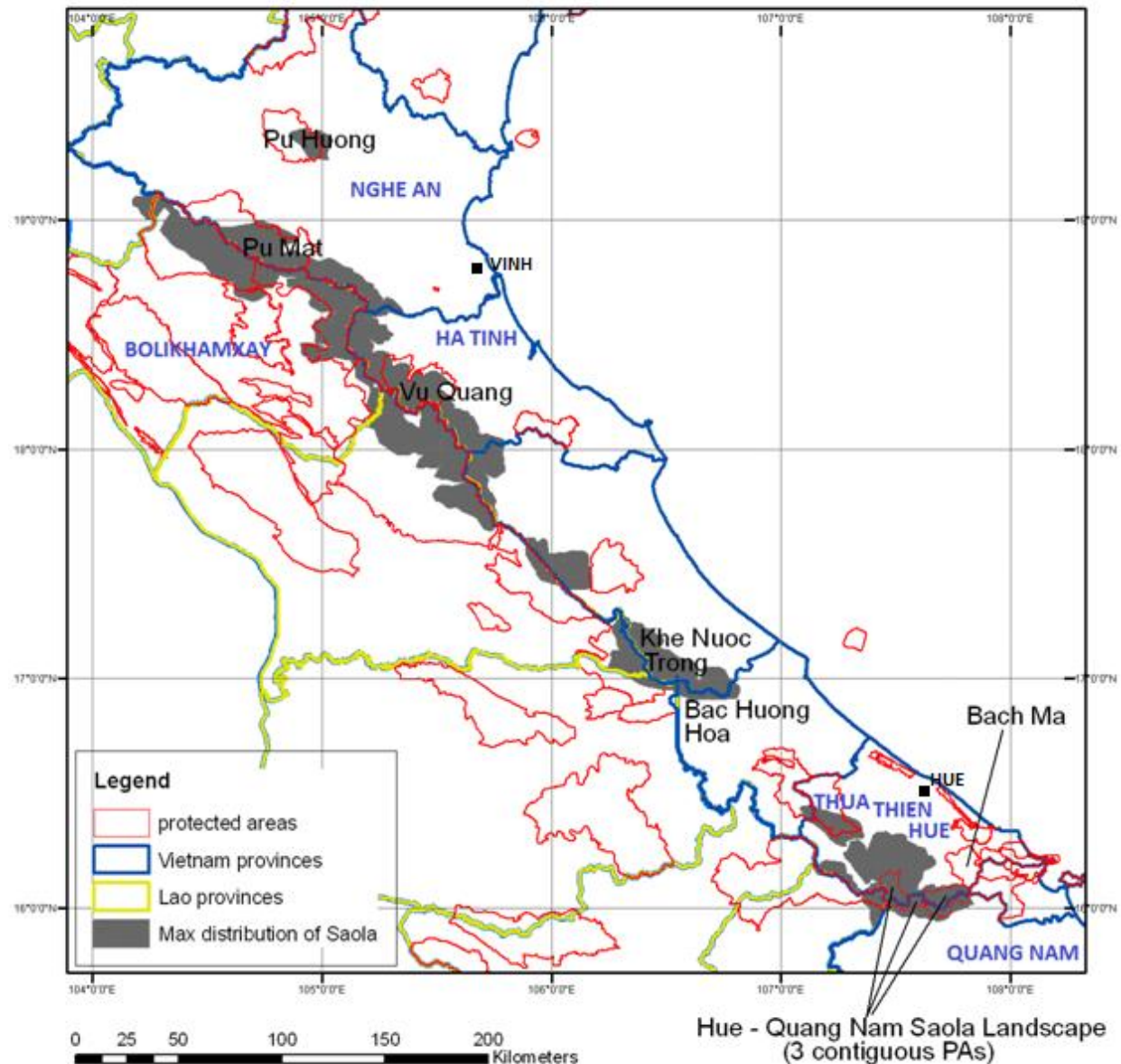
Three endemic ungulates¹ restricted to the Annamite mountains of Vietnam and Laos (see map) have only recently been described for science. The Saola, in particular, is of immense conservation concern, as a mono-specific genus threatened by indiscriminate snaring to supply the regional trade in wild meat.

The project prioritised multi-disciplinary research that engaged local communities that currently hunt Annamite ungulates, and that would help understand the economic basis for hunting. The project also built capacity to conduct high-quality conservation research in key Vietnamese universities, and engaged with conservation actors to plan and conduct research tied directly to possible conservation actions.

100 words

¹ The Saola *Pseudoryx nghetinhensis* and the large-antlered and Annamite muntjacs *Muntiacus vuquangensis* and *M. truongsongensis*

Figure 1 : Map of the Saola's range



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

The project has supported the *in situ* conservation of Saola and other endemic ungulates (Article 8) by:

- 1) supporting the development of a new, effective approach to conservation law enforcement in Vietnam by WWF Forest Guard and multi-agency teams.
- 2) using novel community mapping methods, collecting interview data relevant to local distributions and status of ungulate species to support prioritization of conservation action.
- 3) collecting data to produce a bioeconomic model designed to help evaluate future conservation strategies.

In addition, our community maps form repositories of traditional knowledge of place names, which are the foundation for local communities to read the landscape (Article 8j). These maps have been distributed to 35 communities in the Hue-Quang Nam landscape. We also have electronic maps of place names around Vu Quang and Pu Mat National Parks, which we hope future initiatives will distribute.

The project has built capacity of Vinh University for biodiversity research (Article 12) and formed a model and contacts for technical and scientific co-operation with DICE (University of Kent) and other UK universities (Article 18) in particular through:

- 1) providing direct training to students and young lecturers, through short courses by UK experts and through technical and financial support to conservation-related dissertation projects

- 2) developing training courses and gaining ministry permission to include them in existing masters courses.
- 3) developing links between Vinh and DICE which have led to further research collaboration beyond the scope of the project, and which may also lead to further collaboration on training.

Vietnam gives considerable power to provincial and district agencies. Consequently, we focussed on making strong partnerships with the provincial Forestry Protection Departments and Ministry of Agriculture and Rural Development offices in provinces where saola occurred (Figure 1, page 2), rather than working with the Vietnam Environmental Protection Agency of the Ministry of Natural Resources and Environment (MONRE), which is the CBD focal point, but lacks power at provincial and district levels.

3 Project Partnerships

DICE to Cambridge

The project proposal was originally submitted by **DICE at the University of Kent**, but was transferred to the **University of Cambridge** in October 2009. Nevertheless, DICE remained an important partner for training and academic capacity building.

Two host country components of the project

An initial planning meeting in September 2009 (see Table 5) agreed to manage the project as two separate components, administered by the two main host-country partners under separate sub-grants from Cambridge:

Training and academic capacity-building component (Outputs 1&2), was administered by **Vinh University**, and

Research and conservation planning component (Outputs 3&4) was administered by the **WWF Greater Mekong Programme** in collaboration with WWF's own established government partners in Thua Thien Hue and Quang Nam provinces

This model was formalised in the MoUs with these partners (Appendix 1), signed in November 2009.

Project Steering Committee

The project also established a Steering Committee, which met 3 times after an initial planning meeting (see Table 5). In addition to the two UK partners, Cambridge and DICE, and the two main Vietnam partners, WWF and Vinh, the Steering Committee included representatives of the following institutions:

- Thua Thien Hue Provincial Forest Protection Department (FPD)
- Quang Nam Provincial Forest Protection Department (FPD)
- Bach Ma National Park
- Thua Thien Hue Sao La Nature Reserve²
- Quang Nam Sao La Nature Reserve
- Hue University

¹ The two Saola Nature Reserves were established within the life of the project and members of their management boards joined the Steering Committee following their establishment.

UK Project Staff

The Darwin Project Officer (Nicholas Wilkinson) spent 72% of his time in Vietnam during the course of the project (Table 1 below). The Project Leader (Professor Nigel Leader-Williams) and Co-Investigator (Professor Douglas MacMillan) made five and three shorter trips, respectively, to participate in Steering Committee and other planning meetings (see Table 5) and to provide training to students (see Table 3).

Table 1: Total time spent in Vietnam by UK project staff

Name	Role	Days in Vietnam	Details of trips
Nicholas Wilkinson	Darwin Project Officer	797	Based in Vietnam with 3 trips back: April 2010, Jan 2011, Sept 2011-Feb 2012.
Nigel Leader-Williams	Project Leader	52	5 trips: Sept 2009, March 2010, April 2011, July 2011, July 2012
Douglas MacMillan	Project Co-investigator	32	3 trips: Sept 2009, March 2010, July 2011,

Working with Vinh University and DICE on Training and Academic Capacity Building

The project fostered a strong and dynamic partnership between DICE and Cambridge and the Department of Zoology at Vinh. Central to this partnership was the working relationship between Dr Cao Tien Trung, the Project Co-ordinator at Vinh and the Darwin Project Officer, Nicholas Wilkinson. The collaboration was enthusiastically supported by senior staff at Vinh, notably Professor Nguyen Ngoc Hoi, Rector of the University, and Professor Nguyen Xuan Quang of the Zoology Department. This support included generous co-financing from Vinh for project workshops and invaluable administrative support in obtaining visas and permissions for fieldwork. The university provided a furnished and networked Darwin Initiative Project Room in which the Project Officer could spend significant time working with Dr Trung and students involved in project work.

The enthusiasm and hard work of our partners at Vinh, and of Dr Trung in particular, were central to the success of training activities. One landmark success was obtaining approval from the Ministry of Education and Training for the conservation science teaching materials developed by the project to be taught in future university courses at Vinh.

The relationship between DICE and Vinh was central to the development of short courses and we were encouraged by the attitude of both institutions to possibilities for future collaboration. Professors Hoi and MacMillan in particular were enthusiastic about the idea of using the project's short courses as a starting point for collaboration on a full Masters course in Conservation Science. The university supported Dr Trung to come to the UK for a meeting at DICE on this subject in December 2011.

Although the goal of a collaborative Masters course has yet to be realised, the project has been a catalyst for further research collaboration between DICE and Vinh. For example, based on contacts made under the project a DICE PhD student based at Vinh from March-May 2012 to conduct fieldwork on the trade and conservation of pangolins.

Working with WWF and provincial partners on research and conservation planning

At its inception in 2009, this Darwin project represented the first significant grant explicitly devoted to Annamite Ungulate conservation following the first description of the Saola in 1993, and the subsequent description of other endemic species from the area. This was despite numerous previous efforts by *inter alia*, WWF and the Project Leader, to raise funds for such a charismatic species as Saola. Following the award of this Darwin grant in 2009, further significant international funds were raised for conservation of Annamite ungulates (Section 7.2), partially catalyzed through our own actions. There is also an ongoing planning process involving WWF and its government partners in the Hue-Quang Nam landscape.

Various contacts led to the ideas that formed the basis of our original proposal. The relationship with WWF and its government partners was based around the need to conduct key research to inform specific conservation actions. The relationship was based on years of previous collaboration, beginning with Professor Leader-Williams' academic supervision of Dr Barney Long, Project Manager of WWF's MOSAIC project in Quang Nam. Before this project began, Nicholas Wilkinson had been working for two years in a voluntary capacity for WWF on related issues.

As we implemented the Darwin project, the success of our work with WWF was based on two key principles:

- **Integration** with (and of) other projects and activities by WWF and its partners which were delivering conservation action.
- **Flexibility** in all aspects of our work, within the constraints of the project's logframe and budget.

Integration was facilitated because the Project Officer worked in close association with staff in WWF's offices in Ha Noi, Hue and Tam Ky, Quang Nam. A close working relationship was also maintained with the deputy heads of the provincial FPDs whose offices in Tam Ky and (initially) in Hue were in the same building as the WWF offices. Dr Van Ngoc Thinh, then WWF's landscape co-ordinator for the Central

Annamites was adept at identifying potential synergies between the Darwin project and WWF's conservation action.

Its inherent flexibility was essential to incorporate the changing approach to conservation action by WWF and its partners in Vietnam. We had initially planned to investigate and inform WWF's then dominant approach of achieving ungulate conservation primarily through community-based activities. Although WWF in Vietnam remains committed to working with communities to improve livelihoods and foster good relationships with PAs, WWF currently sees basic law enforcement as the primary means by which to achieve ungulate conservation under their Forest Guards model (see page 8), in parallel with attempts to negotiate solutions with communities (see p 16). It was therefore, necessary for us to adapt our plans for bio-economic modelling and community mapping to support these changing approaches.

Flexibility was also necessary to adapt to changes in the availability of resources. WWF's promises of co-financing to our project were maintained. However, we also had to consider how to deploy our available funds across the changing landscape of conservation actions that our research was intended to inform. Consequently, we sought synergies between research and action (eg, between data collection and patrolling, page 15) and helped raise further funds for action, notably the complementary CEPF project (see below). Conversely, in FY3 and FY4, the new CarBi project meant that we were able to concentrate more on research and rely on a much broader and better-funded process within WWF to deliver the changes to conservation management (see page 16).

We were able to achieve this level of flexibility by maintaining our commitment to initial project activities but not assigning fixed amounts to each activity in our budget. On the one hand, the research produced unforeseen methodological challenges while on the other, new sources of co-financing appeared for certain activities through synergies with other projects. For example, because we made the decision to rely on independently financed patrols to collect threat data (see page 15), we were able to support data collection on urban demand for wild meat to support our bio-economic model (see page 13).

However, all our collaborations with other WWF projects involved significant technical input from Darwin project staff, ensuring relevance of our research aims to conservation action. For example, we contributed considerable extra funding to a 'socio-economic assessment' already planned under the CarBi project. However our involvement included input to the design of the survey questionnaire to ensure it produced the kind of quantitative data needed for the bio-economic model planned by our project.

This model of collaboration was hugely productive but it did have two key disadvantages. First is that many activities cannot be unambiguously assigned to any particular project. Most of the technical input provided by the project to date has been through informal discussions and it is not always possible to be sure what would have happened if the project had not been there.

The second, and more serious, disadvantage was that our government partners had little direct oversight of flexible work plans that changed between the Steering Committee meetings. While our government partners appreciated our informal efforts to keep them in the loop at all times, the lack of official oversight may have reduced their sense of ownership of the project.

The complementary CEPF project

From May, 2010 to 31 August, 2012, WWF received a grant of US\$242,674 from the Critical Ecosystem Partnership fund for "Safeguarding the Saola within the Species Priority Landscape in Vietnam."

The Project Officer worked on the proposal for this grant with Sarah Brook, WWF Vietnam's Species Officer. The proposal was intended to be complementary to the Darwin project and, in particular, to the assessment of community use of the protected areas under our community mapping work (Activity 3.4). Indeed, the acceptance letter from CEPF explicitly stated that the proposal's success had been dependent on the prior existence of the Darwin project.

The main focus of the CEPF project was on implementing basic conservation actions within the landscape to reduce the threat of snaring to the Saola. However, in line with World Bank safeguards the project also aimed to assess and mitigate all impacts on local communities as a result of enforcement and other conservation activities. This aspect of the work is discussed further on page 16. A final report is available at:

http://www.cepf.net/SiteCollectionDocuments/indo_burma/FinalReport_WWF_SafeguardingSaola.pdf

Integrating research and training components

Responsibility for co-ordinating the two components of the project lay with Cambridge and, specifically, with the Project Officer who was the main active link between WWF and Vinh. He was responsible for drafting synergistic work plans for both components that were reviewed at Steering Committee meetings.

Distance was, however, a disadvantage of the necessary thematic division of the project. WWF are committed to working in the project focal area of Thua Thien Hue and Quang Nam while Vinh University, though more flexible, are based at the other end of the Saola's range in the provinces of Nghe An and Ha Tinh (see Figure 1).

In order to ensure that training and academic capacity building were not limited to Nghe An and Ha Tinh, Vinh University developed a formal agreement with Hue University at a meeting in September 2009. While Hue University did not receive a direct grant, students from Hue received training from the project through attendance of short courses (see Table 3) and have received partial-studentships from the project (see Appendix 3)

Most research and conservation planning activities were always intended for the Hue-Quang Nam landscape, although the range-wide community mapping (Activity 3.5) was an exception. Working with the Zoological Society of London, we raised additional funds to support this work in Pu Mat and Vu Quang National Parks in addition to work already completed in Pu Huong Nature Reserve. WCS Lao have also conducted community mapping work, based on our methods in parts of Bolikhamxay province. We continue to look for further funding to complete a range-wide survey under the aegis of the IUCN-SSC Saola Working Group.

Table 2: Essential Collaborations with other institutions

Institution	Activities	Contribution
Hue University	3.4, 3.8	Work with students on community mapping, ungulate last sighting interviews and quadrat method. See section 4.3 and Appendix 3. Training of students, see Table 3, p10.
IUCN-SSC Saola Working Group (SWG)	3.3, 3.9, 4.1	A forum for discussion on all issues, including interview methods (p 12). The project co-financed the SWG's second meeting Table 5, p17, which the Project Leader attended. Nicholas Wilkinson. Project Officer, and Van Ngoc Thinh and Sarah Brook (key WWF staff working on the project) are SWG members.
Centre for Geo-Genetics, University of Copenhagen and Copenhagen Zoo	3.9	We collaborated with researchers at these institutions to pilot a method they invented for detecting mammals based on DNA from leeches (see page 12)
Zoological Society of London and Ocean Park Foundation, Hong Kong	3.5	Collaborated on the development of (ZSL) and provided additional funds for (Ocean Park) the ungulate last sightings questionnaire surveys and associated community mapping (see page 12)
Critical Ecosystems Partnership Fund (CEPF)	3.4, 3.8.	Funded a WWF project, explicitly complementary to the current project. Have also now provided support to Vinh University to conduct leech-based and further interview surveys in Pu Mat National Park, based on the results of this project.
Wildlife Conservation Society, Lao PDR.	3.5, 3.9	Conducted community mapping and interview work based on our methods in Bolikhamxay province, Lao. Now engaged in collecting leeches for mammal detection at key Saola sites in Lao.
Anglia Ruskin University and Games for Nature	3.10	Facilitated piloting of a game-based bio-economic model (see page 15)
University of Texas	3.6, 3.9	A PhD student is planning to continue the research legacy of this project through collaborative analysis of interview data, and planning leech-based surveys in collaboration with both WWF and Vinh.
American Museum of Natural History	3.4, 3.8	Not an active partner in the course of the project, but previous support to work by Nicholas Wilkinson was critical to development of community mapping and habitat and threat survey methodology.
Emerging Leaders for Wildlife Conservation (EWCL) and Russell E Train Foundation	2.7, 3.8	Supported a May 2010 workshop on collection and use of patrol data (see page 15)

4 Project Achievements

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

The project has achieved its goal of research and training in support of actions to conserve flagship ungulate species of Vietnam and Lao PDR. Because of the nature of this work, we predict that much of the impact of this project is still to be felt. The project has contributed to the implementation of two new approaches to conservation in Vietnam, namely the WWF Forest Guards model and the Pilot Benefit Sharing Scheme in Bach Ma National Park. Taken in combination, these two complementary approaches provide the best hope for the conservation of the endemic ungulates in Vietnam.

We have built academic capacity at Vinh University and, to a lesser extent, at Hue. We have also created teaching materials which can be used widely within Vietnam. In particular, we have created practical research protocols, appropriate to low-budget student projects, based on an explicit respect of the value of traditional knowledge for conservation.

We have collected crucial information relevant to ungulate conservation and have developed new techniques and protocols to do it, which we expect to be more widely applied to the same question in the immediate future. And, by working closely with active conservation organisations, we have made sure that our work was relevant to real conservation decisions, even in the face of greatly changing circumstances and of new information.

Our findings, staff time and financial support have directly supported efforts to establish and strengthen protected areas and identify appropriate communities for inclusion in forest management and benefit sharing systems.

4.2 Outcomes: achievement of the project purpose and outcomes

i) Conducting applied conservation research on the highly endemic Annamite ungulate community and threats posed by hunting

The project has collected vital data on the ungulate community and the threat of hunting, which are now being used in:

- 1) bio-economic modelling to inform conservation of ungulates in the Hue-Quang Nam Saola Landscape.
- 2) producing recommendations for spatial prioritization of ungulate conservation across the northern Annamites, with a particular focus on the Hue-Quang Nam landscape and the area around Pu Mat National Park.

The production of research outputs relevant to these two strands is still ongoing.

The methodological challenges in producing data, ranging from community mapping ranging from community mapping, to extraction of mammal DNA from leeches, to representative surveys of demand for wild meat in urban centres were overcome through collaboration with existing partners and with other institutions (see section 3 above).

These new research methods were used to collect crucial information, both qualitative and quantitative, which is relevant to real conservation decisions. Furthermore, we also expect the research approaches we have developed to have a broader impact. Coupled with the success of our project in catalysing further Annamite ungulate conservation work (see section 7.2), and in training young conservationists in Vietnam (see below), we believe that we have initiated a broader programme of conservation-oriented research. To this end, we have produced a series of methods manuals and protocols in English and Vietnamese (see Annex 5 or project website). Some of these, notably the patrol datasheet (see page 15), are being used by ongoing initiatives and, based on interest from our partners and collaborators, we expect uptake of the others by new and future projects.

The most potentially spectacular methodological development was a powerful technique for surveying mammals based on extracting host DNA from haematophagous leeches (see page 12) which has been taken up enthusiastically by WWF and WCS Lao (section 7.2).

Analysis of the results of the bio-economic model and spatial prioritization continues at Cambridge as part of the Project Officer's PhD research, and also through collaboration with researchers at the University of Texas.

On the basis of the fieldwork data we have collected, we expect to submit the following papers to peer-reviewed journals during 2013-2014.

1. Prioritizing sites for conservation of rare and elusive ungulate species using interview records
2. Describing spatial and temporal patterns of threat based on patrol data
3. Economic value of forests in the Hue-Quang landscape to local communities.
4. Bio-economic modelling to assess the minimum conservation action needed for a critically endangered south-east Asian mammal

ii) Strengthening the capacity of leading universities within the region to produce well-trained graduates in biodiversity conservation who value traditional knowledge

The project has built academic capacity at Vinh University and, to a lesser extent, at Hue by:

- 1) training students and young lecturers through courses in key conservation-related subjects delivered by UK experts and developing Vietnamese language materials to form the basis of new, government approved Masters course modules
- 2) developing conservation science research methods appropriate for students in Vietnam and based on the use of, and balanced respect for, local knowledge
- 3) providing financial and academic support to Masters students to use these methods for their dissertations

The development of specific manuals and protocols to the new methods we developed was an unexpected and additional development to activities proposed in our original proposal. Final versions of these manuals have been made available on our website:

<http://www.geog.cam.ac.uk/research/projects/annamiteungulates/>

and WWF have provided funds to produce Vietnamese versions which will be uploaded once complete.

The materials for the short course will also be available on our website and, more importantly, can be taught at Vinh in future following a decision from the Ministry of Education and Training to allow this.

iii) Influencing on-the-ground community and government forest management systems.

The project has influenced on the ground management, and we expect that influence to continue as more research outputs are produced beyond the project's term.

In particular we provided crucial input to the development of the **WWF Forest Guards model**, funded by the CEPF and now the CarBi project. The Forest Guard teams implement forest law enforcement activities, under the leadership of the Protected Area Managers, in close cooperation with the provincial FPDs but funded largely with WWF money. A total of 40 Forest Guards have been recruited and are working in the Thua Thien Hue and Quang Nam Saola Nature Reserves. Over 293 patrols totalling 1,597 days, the Forest Guards have removed 19,480 snares, destroyed 391 illegal camps and 151 m³ of illegal timber.

This is in contrast to previous approaches in the landscape and elsewhere in Vietnam, which have usually been able to achieve little in terms of on-the-ground enforcement. A lack of supervision has led Nature Reserve staff to fail to implement the required level of patrolling while human resources and funds were limited. For this reason, the current government system of protected area management in Vietnam makes effective protection of wildlife impossible without external support, including the hiring of additional personnel. It was this realisation, coupled with the recent demise and extinction of the Vietnamese sub-species of Javan rhino, which led WWF Vietnam to change its approach to species conservation.

Our input to this new approach has included:

- initiating dialogue with rangers about patrol issues, starting with a workshop in May 2010, held with collaboration from EWCL Saola taskforce and Russell E Train
- directly supporting pilot patrols by rangers, before forest guards were hired, and reporting on their success in covering the landscape
- feeding experience from that pilot, and general experience of the landscape into the WWF Saola Taskforce discussions, through which the Forest Guards model was conceived.
- based on community mapping results, ensuring that local forest guards were recruited from the villages traditionally using the area of the nature reserves.
- designing a user-friendly, unambiguous and relevant data collection procedure for patrols with the participation of rangers and WWF enforcement staff.

- partially funding a WWF workshop held in Hanoi in March 2011, on enforcement in rugged and mountainous areas in South East Asia, to allow expertise from across the region to inform planning in the area.
- helping to raise the CEPF grant to further support patrols (see page 5)

All these activities also either produce benefits for the original aims of the project – in particular data on threat patterns (Activity 3.8) or derive directly from its outputs (e.g. community mapping, Activity 3.4)

Another significant development in forest management systems has been the initiation of a pilot **Benefit Sharing Scheme** with local communities at Bach Ma National Park. This rights-based scheme has been made possible due to a novel amendment to the law; Prime Minister's decision 126, dated 2/2/2012. Under this scheme, local communities will be given limited resource use rights within the national park. The allocation of park land to communities within the Bach Ma extension is based on the results of community mapping work by this project and the earlier work supported by AMNH. Crucially the boundaries follow the traditional use areas between villages even where these do not agree with the official commune boundaries.

Activities not implemented

There are three areas in which we have fallen short of our original expectations, as outlined in our project proposal:

1. We have collected a lot of data, and fed our preliminary results informally into appropriate forums. However, we have not succeeded in producing our intended suite of peer-reviewed publications (see page 7) within the project term. The main reason is the unexpected need for methodological innovation in data collection and analysis needed as the project and the wider conservation setting changed around us.

We responded to this situation by:

- embracing the challenge of developing new methodologies, as described above, and producing a series of manuals for the use of the methods best suited to uptake by future projects and researchers (see Annex 5 and project website)
 - committing to completing papers beyond the project term (see above)
 - presenting preliminary results informally to decision makers within the project's term.
 - maintaining close communication with host country partners and setting up a website to disseminate results of ongoing work
2. We have not provided sufficient training to Vietnamese lecturers to ensure capacity to teach the new modules in Vinh. The main reason was that we were unable to provide training to any Vinh lecturers at DICE due to insufficient English Language ability of potential candidates.

We responded to this setback by investigating future funding options for supporting a member of staff from Vinh to study in the UK.

3. We have also not supported any undergraduate theses as originally expected, because of a re-evaluation in August 2009 of the health and safety practicalities in supporting forest-based fieldwork by undergraduate student teams.

We responded to this setback by supporting more than the expected number of Masters students and by supporting fieldwork and training for undergraduates where possible (see Annex 4)

4.3 Outputs (and activities)

1: Improved capacity of Vinh University to produce graduates able to deliver the research components of Vietnam and Lao's contributions to the CBD.

Indicators

- Conservation courses developed in a Vietnamese university.
- Feedback from Vinh University lecturers and students.

Achievements:

Six new optional conservation-related modules have been added to Vinh University's Masters course in Zoology, and Vietnam's Ministry of Education and Training has given approval for their use. Vietnamese-

language course materials (Activity 1.4) for five of these courses will be made available through the project's website with the consent of the course leaders (Table 3). All short courses and training courses delivered received positive feedback from the students and lecturers who attended.

Four of the modules were based on the short courses developed under Activities 2.1 to 2.4 (see 3), and two additional modules were developed by the Project Leader and Co-Investigator (Professor Douglas MacMillan) in August 2011 (Activity 1.3). Thus, five of the six modules were developed with strong input from specialists from DICE and Cambridge.

This strategy for delivering Output 1 was decided at a meeting with key representatives of Vinh University in November 2009 (Activity 1.2) and following initial research by the Project Officer into the existing syllabus at Vinh (Activity 1.1). Nine of the Masters students attending the short courses have gone on to become lecturers at Vinh and other universities (see Appendix 2), hence we have provided some training Vietnamese University staff (Activity 1.5), even though we were not able to offer a studentship at DICE to a member of staff from Vinh (see above)

Table 3: Short courses offered by the project

Title	Project activity	Course Leader	Dates	Trainees
Community mapping *†	2.1	Nicholas Wilkinson (Project Officer)	3-9 Mar 2010	20 Masters students & young staff from Vinh and Hue universities and 4 provincial FPD and protected area staff from the Hue – Quang Nam landscape.
GIS for wildlife research and management *	2.2	Lê Trần Chấn (Geography Institute, Vietnam)	12-19 Mar 2011	14 Masters students and young lecturers from Vinh; 3 from Hue University & 4 protected area staff from reserves in Nghe An and Ha Tinh provinces.
Social Science Methods for Conservation *	2.4	Dr Rajindra Puri (DICE)	1-7 Nov 2010	13 Masters students and young lecturers from Vinh University, one from Hue University and seven PA staff from reserves in Nghe An, Ha Tinh and Thua Thien Hue Provinces.
Statistics and survey design in conservation *†	2.3	Dr David Sewell (DICE)	28 Feb- 6 Mar 2011	14 Masters students from Vinh University, 4 from Hue University and 7 PA staff from reserves in Thua Thien Hue and Quang Nam, Nghe An & Ha Tinh provinces
Conservation Management *†	1.3	Professor Nigel Leader-Williams, Cambridge	11-14 Aug 2011	8 undergraduate and 9 masters zoology students from Vinh, three FPD from Pu mat NP, Ke Go, Pu Huong NR, 3 young lecturers from Vinh
Biodiversity Economics. *†	1.3	Professor Douglas MacMillan, DICE	4-7 Aug 2011	8 undergraduate and 9 masters zoology students from Vinh, three FPD from Pu mat NP, Ke Go, Pu Huong NR, 3 young lecturers from Vinh
Conservation Management (repeat)	1.3	Professor Nigel Leader-Williams, Cambridge	15-18 Aug 2012	12 masters students from Vinh and Hue and 3 staff from FPDs of Nghe An, Ha Tinh & Thua Thien Hue provinces, 5 staff from Pu Mat, Vu Quang National Park. Ke Go NR, Saola La Hue NR, Pu Huong NR
Sightings interviews training †	3.5	Nicholas Wilkinson (Project Officer)	28 May – 1 st June 2012	8 masters students from Vinh and Hue, 3 undergraduate students from Lao PDR

* Adapted as an optional masters on the Vinh University Zoology course

† Vietnamese language materials to be available on project website. NB: the materials for the community mapping and sightings interviews training will be in the form of methods manuals.

2. Training of two Vietnamese students to MSc level at DICE, 10 Vinh and Hue university masters projects, both Lao and Vietnamese, supervised by DICE, and 20 Vinh and Hue university undergraduate projects supervised by DICE.

Indicators

- Students graduate from DICE, and Vinh and Hue, universities.
- Thesis reports from each project.

Achievements:

Two Vietnamese students completed their masters in Conservation Biology at DICE with full studentships from the project (Activities 2.5 and 2.6) and one (Mr Nguyen Anh Quoc) passed with Merit. Both the students studying at DICE came from the partner organisations in the focal landscape and have returned to their jobs in those organisations. Appendix 2 gives some more details on the career development of students after the project.

Four students from Hue University and six from Vinh University received half-studentships from the project for their Master's theses, in addition to fieldwork support. Of these, six (including all four from Hue) have completed their research and have already graduated. The remaining four are expected to graduate in 2013. Appendix 3 lists the students and their theses. English language thesis summaries will be made available on the project website later this year. Original theses are available from the respective universities.

An additional two Masters students from Hue and three from Vinh have had their Masters project fieldwork funded by the project, though they have not received scholarships. Those from Hue are expected to graduate in 2012, those from Vinh in 2014 (Appendix 3).

Although we were not able to support any undergraduate theses (see page **Error! Bookmark not defined.**), we did provide valuable field experience to three Laotian undergraduates who we supported to interview surveys on ungulate last sightings in Viengthong district, Bolikhamxay province, Lao, under Activity 3.5

All of these students conducted research designed to contribute to the project's research outputs (see Output 3 below). All received considerable technical support from the Project Officer in addition to their local supervisors. The project Co-investigator (Professor Douglas MacMillan) supervised Mr Quoc at DICE and Dr Cao Tien Trung supervised six of the nine Vinh students. All students received support from the Project Officer in planning and analysing their field research. Mr Ong Dinh Bao Tri, the then WWF Project Officer supported one of the students (Ms Nguyen Thi Thu Hieu) with the analysis of her results, using the geographical information software ArcGIS.

Apart from training of students, the project also aimed to provide training in analysis and interpretation of monitoring and other management data to FPD staff (Activity 2.7). This was not possible in its original conception because, as explained on page 7, above, we needed to concentrate on development of data collection methods, with basic analytical techniques still under development.

However we have provided training to FPD and protected area staff as follows:

- With the support of Vinh University, inviting FPD and PA staff to the short courses mentioned in the project proposal (see Table 3 above).
- Discussion and training in patrol data collection, beginning with a workshop in May 2010 (a collaboration with EWCL) on the general principles; followed by training of field teams in patrol data collection in summer 2010 (see section on patrol data collection, page15)
- One of the masters students trained at DICE is a member of staff of Thua Thien Hue Provincial FPD and one of those receiving a partial studentship from the project at Hue University is a member of staff of the scientific department of Bach Ma National Park (see Appendix 3).
- Training of rangers of the Thua Thien Hue and Quang Nam Saola Nature Reserves in the same quadrat method used by Mr Vong, and with support from the partner CEPF project.

This activity primarily applies to FPD and Protected Area staff from the Hue-Quang Nam "Saola landscape". However we have also provided training, both through short courses and through supporting masters degrees, to protected area staff from Nghe An and Ha Tinh provinces (see Table 3 above and Appendix 3)

3. Applied research ties all student work together into two outputs:

Indicators

- Report and published manuscript on the distribution of endemic ungulates across their range in Vietnam and Lao with recommendations on how to strengthen the two protected area systems to support national pledges to the CBD.
- Report and published manuscript on the bio-economics of the Hue-Quang Nam landscape and its implications for saola conservation at the community, protected area and ecosystem levels.

As discussed above (page 9), these reports and published manuscripts are not yet completed

Distribution of endemic ungulates:

Because current field-survey methods yield such low detection rates for ungulates, the project adopted a dual approach from the beginning. We investigated possibilities for new field survey methods, especially for Saola (activity 3.9) but we also collected (Activities 3.4 & 3.5) and collated (Activity 3.1) data from interviews with local people.

Distribution of ungulates 1: Leech-based surveys

Initial attempts to develop a suitable Saola survey method proved largely unsuccessful. However, in 2010, an opportunistic collaboration with Centre for Geo-Genetics in the University of Copenhagen produced a potentially powerful new method based on the extraction of host DNA from leeches.

In July 2010, a sample of twenty-five terrestrial leeches (*Haemadipsa*) were collected by the Project Officer at sites within the Bach Ma extension and Thua Thien Hue Saola Nature Reserve. These samples yielded diagnosable genetic sequences of five larger mammal species, including two Annamite endemics. The results have been published in *Current Biology* (2012, Volume 22, Pages R262–R263).

The pilot study did not detect Saola, although it did detect two other Annamite endemics, including one endemic ungulate. While we cannot guarantee that it will provide a valid method for targeted Saola surveys, we think it very likely and expect to know soon.

This method came too late for us to use it ourselves within the project's lifetime although we did investigate the possibility of collecting leeches for an occupancy study in the last months of the project but this proved impractical given the time commitments of rangers and forest guards. However, uptake of the method by WWF and other partners has been enthusiastic (see section 4.5 for more details)

Distribution of ungulates 2: Interview datasets

While the leech method is exciting, it will take time to produce results. Furthermore, leech-based surveys will require spatial prioritization if they are to be cost effective. In the immediate term information from local people remains crucial to prioritizing conservation action and also to prioritizing field surveys.

The project has produced three separate interview datasets, using three different methods developed by the project:

1. **Saola record database**
2. **'Beaning' method on community maps.**
3. **Last sightings questionnaire.**

The Saola record database (Activity 3.1) collates records from past surveys, most of which are interview records. It was developed by Mr Ong Dinh Bao Tri of WWF Quang Nam and the Project Officer and builds on earlier work by the Project Officer in 2006-2007 with support from WWF, AMNH and others. The database consists of:

- i. a standard data form in English and Vietnamese (an earlier version has also been translated into Lao)
- ii. a Microsoft Access database
- iii. a database interface within the geographical information software ArcGIS (Environmental Systems Research Institute)
- iv. A manual, in English, currently being translated into Vietnamese with support from WWF.

The data form and manual are available for download from the project website.

Currently the database contains data from the Hue-Quang Nam landscape. The data form has also been used to collect Saola records from the Pu Mat, Vu Quang and Viengthong areas, in conjunction with the range-wide community mapping (Activity 3.5) and the Wildlife Conservation Society of Lao has conducted community mapping and interview surveys for Saola in 18 villages in Saychamphone District, Bolikhamxay Province, using an earlier version of the data form developed by the project. The project has also collected published reports of past surveys from across the Saola's range.

The timetable of database development and data entry deviated from the original plan because of staff movements within WWF but the database was completed by the end of the project.

The beaning method was developed by the project, based on the Rapid Rural Appraisal technique of 'pilesorts' and on a 2008 pilot study by the Project Officer, supported by AMNH Community groups are asked to place beans on the map to indicate their perceptions about densities of the different ungulate species found in the area. This was conducted as part of the community-mapping in the Hue-Quang Nam landscape (Activity 3.4) and data were collected by Luong Van Duc and Ta Dinh Thanh, masters students from the Hue University of Science with supervision from the project officer and Mr Ong Dinh Bao Tri.

Mr Duc and the Project Officer worked together on methods of spatial analysis of the bean data. This was a surprisingly challenging problem, and we have now produced a preliminary set of maps for all ungulate species in the Hue-Quang Nam landscape based on these data. This report has been made available to WWF and partners and is available on request to conservation workers in the area.

The ungulate last sightings questionnaire was developed in collaboration with the Zoological Society of London, based on additional funds raised of 100,000 Hong Kong Dollars (approximately £8050) from the Ocean Park Foundation of Hong Kong. We ran this work in parallel with range-wide community mapping (Activity 3.5).

The method involves interviews with individual local people in which they are asked the date and location of their last sighting of each species. These data will hopefully yield very valuable comparative data about ungulate populations.

Dr Samuel Turvey of ZSL accompanied the Project Officer, Dr Trung, and a team of students on a pilot survey at two villages near Pu Mat National Park in March 2012. This was followed by community mapping in selected villages around Pu Mat and Vu Quang by project Masters students Vo Cong Anh Tuan and Vo Thanh Hung and then by a 3-day training course in the method by the project officer at Vu Quang from May-June 2012.

Following this, teams of students from Hue and Vinh universities interviewed a total of 210 people from the Hue-Quang Nam landscape and 214 from the Pu Mat – Viengthong area; including 36 from the Lao side of the border. An additional 33 personal sighting records were collected in Vu Quang National Park, though these data are not sufficient to give us a picture of ungulate distribution in the area.

These data were being collected right up to the project close date but have now been entered by the students and a preliminary analysis has been conducted by ZSL. We continue to work on representation and analysis of the spatial and temporal patterns revealed by these data.

Muntjacs

One particular drawback of interview data is that we found respondents were unable to reliably distinguish the different taxa of endemic muntjac. The taxonomy of the *rooseveltorum*-group muntjacs remains uncertain and the different taxa are, in any case, very similar and difficult to distinguish in interviews. The interview data may give us useful information about Saola, which is the most threatened of the endemic ungulates, and also the one with the greatest 'flagship potential'. For the muntjacs, future surveys using the leech method will be needed to produce useful data.

Bio-economic model,

Nguyen Anh Quoc and Douglas MacMillan's research into hunting patterns (Activity 3.7) confirmed that hunting was largely economically motivated, although norms of sharing of wild meat persist in some villages. This provided justification for a bioeconomic approach as planned.

Beyond, Mr Quoc's work, we were not able to find the expected opportunities for students to collect data relevant to bio-economic modelling. Instead, work related to species distributions proved a better fit with students' research interests.

In the project's FY3 we reviewed the sources of information needed for the model and concluded that more intensive work was needed to identify data requirements and define model structure. The Project Officer began intensive work on the model over two weeks in June 2011, drafting an initial schema based a review of the grey literature and discussions with knowledgeable conservationists. It became clear that the model would need to include economic parameters relating to trade and consumption, as well as to hunting.

Following a discussion at the following Steering Committee meeting, the Project Officer returned to Cambridge between September 2011 and February 2012 and produced a simple (algebraic) draft model which was presented back to the WWF Central Annamites team partners at a meeting in Hue on 15 May 2012. Unfortunately government partners were not able to attend that meeting and so a briefing

document about the model and the feedback from the meeting was circulated among the provincial FPDs and Nature Reserve staff and discussed informally with them.

The model received strong support and helpful feedback from WWF and partners who helped to identify key assumptions in the model structure and confirmed that new data would be needed to effectively parameterise the model, in particular:

- information about wild meat consumption and demand in the cities of the landscape
- basic socio-economic information from villages around the landscape
- information about the rates of detection of snares in the forest by patrol teams
- information about prices received by hunters for wild meat.

The meeting participants were unanimous that collecting these data would be of greater value than any further meetings or workshops. A large number of workshops for dissemination and discussion were planned under the CarBi project, providing a forum for feeding project results into the decision-making process after the project term.

Table 4: Sources of data for bio-economic model

Data	Relevant to Variable/s	Activity	Collaboration with
Factors influencing hunting practices (qualitative study)	[Model structure]	3.7	DICE. Conducted through Masters research by Nguyen Anh Quoc (WWF), supervised by Professor D. MacMillan (Project Co-investigator), with a studentship from project.
Survey on wild meat consumption in Hue City	Demand function	3.10	Milica Sandalj (University of Hohenheim, Germany) with additional support from WWF CarBi project and research team of 4 Hue University students.
Literature review of rural socio-economic studies	Opportunity cost of hunting	3.10	By Nguyen Viet Tran Nam, research assistant, hired by project.
Socio-economic survey of Hue-Quang Nam Landscape	Opportunity cost of hunting	3.10	A local Hue NGO (CORENARM) with strong links to the University. This activity was a collaboration with the CarBi project and CarBi will support the writing of the final report, which is ongoing.
Literature review of wild meat prices	Price of wild meat	3.10	By Nguyen Viet Tran Nam, research assistant, hired by project.
MIST data (collected by patrols)	Snare and hunter 'catchability'	3.8	WWF, NR management boards, CarBi, CEPF (see below for more information)
Work with WWF/FPD enforcement team	Costs of enforcement and values of fines	3.8	WWF, NR management boards, CarBi, CEPF.
Literature review of related species	Saola and other ungulate biology	Not done yet	To do at Cambridge
Agent-based model?	Animal catchability	Not done yet	To do at Cambridge

Consequently, on 7 June 2012, we requested Darwin to allow us to vire funds earmarked for conferences, workshops and seminars towards data collection to parameterise the model and received approval in mid-June. In the remaining 11 weeks of the project, we were able to:

- support a student from the University of Hohenheim to conduct a survey of wild-meat consumption and demand in Hue city, through 330 independent interviews, with the help of a research team of 4 Hue University students.
- support a local NGO (CORENARM), with strong links to Hue University, to conduct socio-economic surveys of 426 people in 25 villages following a questionnaire designed collaboratively with the project officer.

- contract a Vietnamese research assistant to create a database of wild meat prices from existing literature, and also to review that literature for data related to hunter opportunity cost.

At the end of the project, therefore, our available sources of data for the bioeconomic model were as shown in Table 4:

Habitat and threat surveys.

We originally envisaged developing an independent survey method to gather data on habitat and threats (Activity 3.8). However, at the first Steering Committee meeting, we decided to concentrate on making use of the data collected by patrol teams. There were four reasons for this decision:

- the large number of law enforcement patrols can produce a much larger volume of data than a small research team.
- it was neither appropriate nor possible to involve the limited number of rangers in separate survey activities at the same time that a critical new patrolling programme was being developed (see page 4)
- WWF was supporting the development of data collection by patrols associated with the use of the software MIST (Management Information SysTem; Ecological Software Solutions) so investigating such issues made sense institutionally.
- A pilot study supported by AMNH in August 2009 (in between the submission of the proposal and the project start date) demonstrated the difficulty of conducting any kind of straight transect in the Annamite terrain, and of using student teams to conduct such surveys.

To assist in the joint development of patrolling and data collection methods, the project directly supported the first ranger patrols in the three protected areas. Four 7-10 day patrols were carried out in each of the three protected areas.

Habitat and threat surveys 1: Patrol data

We began by developing protocols for recording data collected by patrols. The Project Officer worked with Luong Viet Hung (Protected Areas Manager, WWF) on design of the field datasheet and with Ong Dinh Bao Tri (WWF) on a digital database. The first draft of the datasheet was produced in April 2010 but was constantly revised during the period that the Darwin project was supporting patrols. This paper datasheet is still being used by the WWF forest guard patrol teams under the CarBi project. By the end of 2012, over a thousand such datasheets have been filled in representing 22 months of data collection in the two Saola nature reserves, that we will use for our analysis.

Great attention was paid to the design and translation of the datasheet and extensive feedback from the rangers allowed many difficulties and ambiguities to be resolved. It aims to make data recording by patrols simple, clear and effective and has proven easy to use. Some prior data collection procedures in Vietnam and elsewhere in the region suffer from design issues which render the data ambiguous and unusable or which are so time-consuming as to either interfere with effective patrolling or be abandoned in practice.

Analysis of patrol data

Data collected by patrol teams present a challenge for analysis as patrols do not follow the type of standardization and randomization protocols expected of surveys. It is therefore necessary to develop an analytical framework for these data to investigate both spatial patterns and trends

Furthermore, patrol data are potentially extremely valuable for direct monitoring of threats, and for investigating questions of 'catchability' of snares and hunters for the bio-economic model (see above), provided some of the same issues with the way they are collected can be resolved.

The software MIST, which is used mainly for its role in month-to-month management, does not present annual data in a way appropriate for research and monitoring. Annual reports as currently produced by the software take a naïve attitude towards statistics and are therefore quite misleading regarding distribution and relative abundance of threats and indicator species throughout the reserve in question.

This need to investigate patrol data in a research context was unexpected, arising as it did from a decision at the first SC meeting. Our response to it included supporting the research of two masters students: Mr Nguyen Xuan Truong, a member of staff of Thua Thien Hue FPD, as part of his MSc thesis at DICE, funded by the project, and a student from the Catholic University of Louvain, Belgium working as a volunteer intern at WWF with independent funding. The two analyses employed alternative approaches to the same question.

Habitat and threat surveys 2: Quadrat surveys

In July 2010 the Project Officer worked with Pham Doan Vong (Bach Ma National Park scientific division) to design an independent field survey method based on randomly located 200 x 200 m quadrats. Mr Vong used it to survey 24 squares within the Bach Ma extension of which 12 were distributed randomly. With support from the CEPF project, similar data were also collected in the two Saola Nature Reserves in 2011. A manual and datasheet for the method have been written in English and Vietnamese and are available through the project's website. A summary report on the quadrat data will be made available in 2013. Its main purpose is as an independent check on the data collected by patrols, and for exploratory analysis of threat distribution at a finer resolution.

4. Forest management plans within the Hue-Quang Nam landscape incorporate the results of applied Saola research to the benefit of conservation and community benefit sharing mechanisms.

Indicators

- Community forest management systems adapted based on the results of bio-economic model.
- New protected area management plans incorporate the results of participatory mapping, ungulate and snare distribution surveys and the bio-economic model

As discussed above (page 4) changes in WWF's approach to conservation in the landscape and the advent of the CarBi project process led us to re-consider the way in which this output had been framed. Instead of disseminating results directly to government processes before closing the project, we were instead part of an ongoing process of developing a working conservation model, in which WWF would continue to play a major role.

We also adapted the focus of the bio-economic model towards answering the question of how much enforcement might be necessary to provide an effective deterrent. It would be possible, however, to develop further models thereafter to investigate the potential of community-based approaches.

The **Community mapping in Thua Thien Hue and Quang Nam (Activity 3.4)**, while also a research activity, has been the main medium through which the project's work has influenced work with local communities.

Community mapping was conducted in a total of 60 villages around the landscape; 25 villages in Nam Dong district were surveyed in June 2010 by Nguyen Thi Thu Hieu and Luong Van Duc and 35 more in A Luoi district (Thua Thien Hue) and Dong Giang and Tay Giang districts (Quang Nam) by Nguyen Tien Hoang and Ta Dinh Thanh. All the researchers except for Mr Hoang were masters students from the Department of Environmental Science at the Hue University of Science with half-studentships from the project. Mr Hoang is a lecturer in the same department. The first round of fieldwork was overseen by the Darwin Project Officer, the second by Ong Dinh Bao Tri.

The community mapping used the 'beating' method (Section 3) to ask community groups about the areas which people from their village use to collect different forest products, including wild meat. This work was conducted by Ms Hieu and Mr Hoang.

Discussions with WWF and CEPF led to the policy of identifying villages with a potentially high impact on the PAs and who were most likely to suffer from strict enforcement of PA regulations. Analysis of the data by the Project Officer in Cambridge in 2011 identified 35 priority villages with more than 25% of use area within PAs.

Because of the lasting influence of traditional areas on relocated villages, the people using a particular protected area were not always those living closest. For example, the communities of Huong Huu commune (Nam Dong, Thua Thien Hue) have their traditional areas within the Thua Thien Hue Saola Nature Reserve and (in the case of village 7) in the Quang Nam reserve. The communities do still use these areas despite now being located at least 15km away and being outside the buffer zone of any protected area. As a result of these findings, the people of Huong Huu are now recognised as stakeholders by WWF and have been included in more activities, including those detailed below but also in the recruitment of forest guards. One resident of Huong Huu (out of 3 candidates) is still working in the Hue Saola Nature Reserve, a signal that the members of this community will continue to be considered in future as relevant stakeholders.

In December 2011 and January 2012, the CEPF project funded a team led by Dr Nguyen Van Loi of Hue University to visit these 35 villages. The team returned printed maps of forest areas showing local place names and protected area boundaries, to the local communities.

Dr Loi's team also identified affected over 800 households in these villages dependent on forest products and held consultation meetings with local communities about possible strategies to avoid negative impacts. Main strategies proposed in these discussions were alternative livelihood benefits outside the

forest, although community forestry also suggested. One suggestion was raising forest animals in captivity for meat but the most popular overall seemed to be support for husbandry of traditional livestock.

WWF, in response to concerns about World Bank Safeguards, has claimed to CEPF it will produce livelihood benefits to mitigate any impacts these communities will feel as a result of protection activities. However decisions have not yet been reached over what form these will take, or whether they will be able to cover all affected persons.

Table 5: Research planning workshops organised (independently or collaboratively) by the project (Activity 4.1)

	Title	Dates	Location	Participants	Outputs relevant to research
1	Initial planning meeting (Inception workshop)	21 Sep 2009	Hanoi	Senior representatives of all key partner organizations in Vietnam, including national FPD.	Feedback on research from SWG, List of research topics from University partners
2	Community-based Conservation Workshop	15-16 Mar 2010	Vinh	Vietnamese academics, NGO and bilateral donor agency staff, Provincial FPD staff, Local district admin and protected area staff, Other provincial staff & Project staff	Identified a range of community-based conservation options, but was less successful in revealing the expected method by which they were supposed to work. Highlighted importance of determining factors determining hunting (led to prioritization of activity 3.7) Revealed some potential changes in law relevant to CBC in future.
3	1st Steering Committee meeting	19 Mar 2010.	Hue	Steering Committee (i.e. representatives of provincial FPDs, Bach Ma, Vinh & Hue Universities. Saola Nature reserves not yet established)	Decisions: to use data collected by snare removal patrols as main data on habitat and threat. Not to investigate use of telemetry for ungulates under the project.
4	Enforcement in Mountainous Landscapes in South-east Asia. (co-funded with WWF GMPO)	15-17 Mar 2011	Hanoi	WWF staff working in such landscapes (12 protected landscapes & 7 countries represented) plus senior management of WWF. WWF staff and consultant working on enforcement from Quang Nam landscape.	Classification of enforcement tactics and discussion of which might be employed in the Thua Thien Hue Saola Nature Reserve. These informed landscape enforcement strategy drafted by Mr Tim Wood (consultant). Reveal complexity of spatial coverage by enforcement teams, relevant to bioeconomic modelling and spatial prioritization.
5	Second IUCN/SSC -SWG meeting (project contributed funds)	20-22 & 25-26 Apr 2011	Vinh & Hue	SWG only in Vinh (plus project leader) wider SWG-affiliates and international experts in Hue.	Presentation to wider audience of concept of using bioeconomic models to determine necessary level of enforcement (Project Leader) and of results of March enforcement workshop (Nick Cox WWF). Discussion of Saola survey methods.
6	2nd Steering Committee meeting	8th of Aug 2011	Vinh	Steering committee	Decisions: Project Officer to return to Cambridge for more work on bioeconomic model. Decision to investigate game-based models and socio-economic surveys.
7	Meeting to discuss bioeconomic model	15 May 2012	Hue	WWF staff working in Hue-QN landscape. Briefing document subsequently circulated to, and discussed with, government partners	Review of key assumptions and data sources for bioeconomic model: decisions about remaining data collection under project – led to final activities (see output 3 and table 2 above)
8	Final Steering Committee meeting	11 Jul 2012	Hue	Steering committee – Hue-QN landscape members	Discussed publication of project outputs, credits and acknowledgements. Need for another meeting to work out details of this. Also suggestions for future research.

9	Data discussion	31 Jul 2012		Steering committee	Decisions about rights, distribution and presentation of project data
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Attendance by project staff:

Project Leader (Nigel Leader-Williams):	1,2,3,5,6,8
Project Co-investigator (Douglas MacMillan):	1,2,3,6
Project Officer (Nicholas Wilkinson):	All meetings

4.4 Project standard measures and publications

See Annexes 4 and 5

4.5 Technical and Scientific achievements and co-operation

Detection of Mammal DNA in Leeches

The collaboration with Copenhagen University on the pilot for this method is likely to prove one of the biggest impacts of the project. Both our main host-country partners, WWF and Vinh University, as well as the Wildlife Conservation Society and the IUCN Saola Working Group have subsequently all raised substantial funds to support widespread leech-collection surveys throughout the northern Annamites (see section 7.2) and project personnel have been heavily involved in designing all these planned surveys. The first results from such surveys are expected in 2013

The high detection rate of mammal species on the pilot survey was a great surprise and the method has the potential to revolutionise surveys, not only for Saola, but for any forest dwelling mammal within the range of haemadipsid leeches (Sri Lanka to Tasmania plus Madagascar and several Pacific Islands).

In November 2011, the Project Officer visited Copenhagen to discuss the results and potential for future collaboration. Furthermore, impromptu meetings of the Saola Working Group were held in Vientiane, Lao in March 2012, primarily to discuss this issue. Professor Tom Gilbert of Copenhagen presented the first results, and protocols were drafted, under the CarBi project for leech-collection both by enforcement teams and by independent scientists. WCS and WWF have agreed to collaborate on methods and two large proposals to international donors are in preparation.

The project's financial contribution to this work has amounted to a total of VND 400,000 (£12.50) for leech collection equipment. However the Project Officer's time has been essential to co-ordinating all of the above activities.

As discussed above, the project has concentrated on the development of novel methods for data collection and analysis and on producing manuals for some of these methods, aimed at Vietnamese students.

Data collection methods developed by the project

- Three methods for use of interview data about ungulate presence (see page 12 above)
- One of the above (beating) can also be used for collecting data about community use zones, something which is lacking in most work on community forest use in Vietnam to date.
- Datasheet for patrol data collection (see page 15 above)
- Datasheet and protocol for quadrat-based habitat and threat surveys (see page 16)

Manuals to these methods are available on the project website

We have also developed protocols for wild meat demand surveys and socio-economic survey to determine opportunity costs of hunting (see page 14). The data collected with these methods will be used in collaborative research with researchers working for other projects and so cannot be publicised yet.

Masters theses

Eight masters theses, comprising two from Kent and six from Vietnamese universities, have already been produced by the project (Appendix 3).

The work by Nguyen Anh Quoc and Douglas MacMillan on hunting patterns in villages in Quang Nam has been accepted for publication in *Oryx*.

Data analysis methods developed by the project

Although we have not yet conducted sufficient analysis of project datasets for publication, important progress has been made in three areas of analysis:

1. Use of GIS and conservation planning software (Zonation, University of Helsinki) to use interview data, which is inherently uncertain for conservation decision-making. Progress made as part of Luong Van Duc's Masters research, in cooperation with the Project Officer.
2. Development of a specific approach to bio-economic modelling, based on original work carried out by the Project Leader in Zambia in the 1980s but adapted within the specific context of decision-making by WWF and partners in Vietnam. See FY3 report for more details on the modelling 'philosophy'.
3. Exploration of techniques to analyse data on threat factors and habitat variables collected by patrols, conducted using two distinct methods by Nguyen Xuan Truong, in his master's thesis, and by a student from the University of Louvain in her project report.

4.6 Capacity building

Students trained by the project:

Perhaps the most important capacity building we have undertaken is not of institutions, but of individuals. Appendix 2 gives the stories of the students we supported and how the project has helped many of them find careers in conservation and academia.

At Vinh University,

Improving the teaching capacity of Vinh University was one of the project's outputs and is therefore discussed in section 4.3, page 9.

The quality of arrangements for workshops held at Vinh (see Table 3 in section 4.3 above) improved during the course of the project, evidence that the university's capacity to host international workshops has also improved with the project's involvement.

Of WWF and partners in the Hue-Quang Nam landscape

Community mapping

The maps of village use areas by the main villages using the landscape have been handed back to key communities and also stored as GIS data made available to FPDs and protected area management boards. This process enhances the capacity of local communities and government agencies to discuss land use with one another in contexts ranging from community forest management to community assistance with law enforcement. The data on community use areas enhances the capacity of WWF and its government partners to effectively target community-based activities

WWF – Building the 'Forest Guards' model:

Our support to this critical new development in conservation in Vietnam is discussed on page 8 above.

Cambridge capacity building

The main project partner, the Department of Geography in the University of Cambridge, took over management of the project in October 2009, based on an application made by DICE at the University of Kent. At that stage, Cambridge did not have a conservation Masters up-and-running, nor did it frequently offer short course training. Consequently, the project still relied on Kent for UK-based Masters training and for input to short courses. However, Cambridge has now developed its own novel Masters in Conservation Leadership. Furthermore, the experience gained of offering short courses on this project will help Cambridge offer short course material that is highly relevant to conservation projects on the ground. Key issues such as English Language ability of potential students and previous academic background are critical. In the case of Vietnam, the technical ability of students is relatively high, but English Language is generally poor.

4.7 Sustainability and Legacy

The **methods and protocols for interview data** developed by the project will hopefully be taken up by other initiatives. Cambridge remains in touch with Vinh and WWF about the translation and future use of these methods.

- WWF have affirmed the importance of the Saola Record Database and expressed interest in its future development. A PhD student at the University of Texas has also expressed an interest in collaborating on updating the database with a view to using it for survey planning.

- Dr Trung is expecting to provide training in some of the interview methods developed by the project under Vinh University's new CEPF project (see section 7.2).
- Staff of WCS, FFI, Vu Quang National Park have also all expressed interest in the interview protocols developed by the project for use in their own initiatives in other 'Saola landscapes' within the Annamites.
- Nicholas Wilkinson is now the co-ordinator of the interview methods group of the IUCN-SSC Saola Working Group which provides a perfect forum for dissemination and further development of these methods.
- We plan further collaboration with ZSL to raise funds for additional ungulate sighting interviews.

Vietnamese students on limited budgets are not able to collect datasets on large mammal species because of the perceived need for expensive equipment (e.g. camera traps, DNA analysis) to study animals at the greatly reduced densities produced by intensive hunting. The interview methods we have developed allow students to collect useful data on these species and we expect them to be in demand for that reason. We also expect the quality of the materials to place them in demand; particular care has been taken over the details of the protocols, especially the Vietnamese-language datasheets, which require careful attention to avoid ambiguity.

Our **datasheet for patrol data collection** has been produced to the same standards and in close collaboration with rangers (though it was developed before the recruitment of WWF's forest guards). The nature reserve staff appreciate the datasheet and we consider that it is likely to be used in future provided that patrols continue. An editable version is needed has now been produced to allow adaptation in future. Copies of the seventh datasheet have also been given to staff of Pu Mat and Vu Quang National parks and Pu Huong Nature Reserve though further work would probably be necessary to ensure its use in these areas.

The **leech method** has been widely taken up by other institutions. This project's role in providing samples to test the method, though essential, was small. However the project has also put in considerable effort to publicising and explaining the method to other conservation organisations working in the Annamites, largely through the forum of the SWG.

WWF's forest guards are now collecting leeches on each patrol and expect the analysis to be conducted in 2013 by the Ecology, Conservation, and Environment Center (ECEC), at the Kunming Institute of Zoology (a joint venture with the University of East Anglia, UK). Ms Ida Baerholm-Schell, at the University of Copenhagen is currently receiving the results on leech samples collected on independent surveys by WWF, WCS and the University of Texas in Vietnam and Lao. The Saola Working Group and WWF have both raised large grants centred around the idea of this method (see section 7)

The **new modules established at Vinh** should continue to be taught, based on the **Vietnamese teaching materials** we have developed. While we were not able to provide sufficient training to Vinh staff to teach the courses, senior figures at the university have expressed their interest in the idea of inviting some of the same UK experts to give the courses again. Dr Trung, who is now the Dean of his faculty, is committed to this model and remains in touch with the Project Officer and with Professor MacMillan at DICE.

Aside from their use at Vinh, the teaching materials are likely to be more widely distributed. Vietnamese academia depends greatly on direct transmission of materials and English language capacity remains rather low (though it is improving). Interest in conservation subjects appears to be on the increase and so we expect that these materials will continue to be distributed and used in the country.

We fully expect that the **results of analyses of the project's datasets** will continue to inform relevant conservation decisions. The Project Officer, as well as Dr Trung and Dr Thinh all remain members of the IUCN-SSC Saola Working Group, whose next meeting will be held in June 2013. We expect to be able to present preliminary results of a prioritization of sites based on interview records at that meeting. We also plan to present preliminary results of an analysis of the economic value of forests to local people to partners in the ongoing CarBi project, and the Bach Ma Benefit-Sharing project on the same trip. We will maintain communication with our partners beyond that, and explore future opportunities to disseminate our results.

The project did not employ any full-time staff at the host country partners and all project staff continue to work for the same organisations (in some cases in more senior positions). The **students we have trained** have gone on to a variety of careers in conservation and academia (see Appendix 2) and may embody the most important and lasting legacy of the project.

5 Lessons learned, dissemination and communication

Flexibility: This was essential as a research project advising conservation; in a situation where an effective conservation model did not yet exist. It was also necessary because of the changes brought by new initiatives, unexpected at the project's planning and inception, which brought not only considerable new funding, but also new decision-making processes into play. We maintained our flexibility, co-operated with other projects and so remained relevant.

Serendipity: By being flexible, by communicating, and by considering the purpose and goal, rather than only the activities of the project. The discovery of the leech method and the development of the ungulate sighting interviews in collaboration with ZSL are obvious examples.

Collaboration: The importance of developing partnerships with other projects, and with other institutions, based on shared aims and collaboration on specific activities. Much was achieved within WWF by this approach. For example, the work on the demand for wild meat in urban Vietnam produced unique data that may show its possible elasticity. By collaborating with the Project Officer on survey design, and with Darwin's decision to allow the virement of funds towards this work, something much more useful was collected.

Some more specific lessons:

Designing datasheets and interview guides for surveys in Vietnam requires much attention to detail, and always several re-draftings. A simple translation of an English language datasheet into Vietnamese will never produce useable data, yet such datasheets are often produced by NGO projects. After the original translation, we developed our datasheets in Vietnamese and then translated them back to English. The Vietnamese language is often less precise in its grammar than English and wording must therefore avoid all ambiguity.

However, if data forms are to outlast a particular research initiative, it must be possible to edit them.

The very high densities of people around protected areas in Vietnam means that approaches to working with local communities developed in other areas may be difficult to apply. When there are 10 villages surrounding a PA, an organization may be able to develop a meaningful relationship with, and an in depth understanding of all of them. When there are 75 villages, this is a lot less feasible. Perhaps because of the influence of approaches used in other countries, projects in Vietnam often seem to research, or work with only a small proportion of the relevant communities. This is certain to yield mixed results.

Running a project across provincial boundaries is extremely difficult in Vietnam, and requires separate plans to be written, and committees set up, for each province. For a conservation research project that necessarily needs to cross boundaries, it is sensible to partner with a university which has a remit to work in all provinces, and which is capable of obtaining permission in all provinces for any more widespread activities. The administrative burden would otherwise become unmanageable.

Officially sanctioned modes of project management are required, in addition to informal ones. This project set up its own Steering Committee which functioned effectively. However, at the final meeting of that Steering Committee, key government partners reflected that a formally established Project Management Unit would have allowed them to justify their involvement to their seniors and gives them more real control to enforce internal deadlines.

About a year for English Language tuition is needed if seeking to offer Vietnamese university students places on international courses. While demand for international tuition is very high in Vietnam, people usually study English specifically to meet the required TOEFL/IELTS scores for a particular international course. Within NGOs and government organizations, where staff may have acquired language skills by working with foreigners, the case is less extreme. Hence, we were able to recruit two suitable candidates for DICE MSc's from WWF and Thua Thien Hue FPD, but could not find a suitable candidate from a university.

5.1 Darwin identity

All our teaching materials, manuals for field methods and data forms, bear the Darwin logo and acknowledge funding from the project. We believe that these outputs will have a life beyond the project and will continue to promote the Darwin identity for many years to come.

At Vinh University, project activities, especially workshops, were well publicised in the provincial media, including television coverage of the 2nd Saola Working Group meeting which mentioned Darwin and the UK government as a donor (see Appendix 5).

Vinh University set up a furnished and networked Darwin Initiative Room in the Department of Zoology, and placed it at the disposal of the project for meetings, workshops and supervisions.

At WWF the Darwin project fed results to a wider programme to conserve Saola, but Darwin was always managed and treated as a separate project.. Under the CarBi project, WWF has set 22 camera traps in core zone of the Saola Nature Reserves. A further. 25 extra camera traps have been purchased to be set in other areas of Saola Nature Reserves. The aims of the camera trap are to determine endemic ungulate distributions and densities. Forest guards are also collecting leeches in the Saola Nature Reserves as part of the CarBi project. Any joint outputs of the CarBi and Darwin projects will acknowledge Darwin's contribution.

6 Monitoring and evaluation

Based on what was proposed in Question 20 of the Stage 2 application to Round 17, the following were implemented:

- 1) As planned, the annual Steering Committee meetings (Table 5,p18) were used to assess progress against approved work-plans and revise the work-plan for coming year. This was fully necessary given the need for flexibility (see page 4) and represented a practical system for providing feedback to stakeholders.
- 2) As planned, a review of all research conducted by students has been completed and a document summarising all completed dissertations is available on the project website. Those students who have yet to submit their dissertation remain in touch with the Project Officer and we intend to update the website when their dissertations are complete.
- 3) A record has been kept of papers submitted for publication which, again, we plan to continue updating. So far only one paper has been published and one has been accepted.
- 4) As noted in the proposal, the quality of student work was assessed by external and internal examiners, depending on the regulations of each university. All students have passed their dissertations.
- 5) We planned to formally assess students' reception of short courses, through a questionnaire survey. However response was very low, due in part to difficulties in subsequent communication. However, informal feedback from both students and staff was very positive.
- 6) Work is ongoing to complete the project's research outputs (see page 6). Therefore, we have not yet been able to conduct an informal survey of WWF and FPD to seek their opinion on the value of the completed outputs and their associated recommendations. We did, however, conduct such a survey regarding the potential of such methods. This was conducted around the workshop in May 2012 and also at the final Steering Committee meeting. WWF and FPD partners were excited about the prospect of the bio-economic model for informing conservation action and showed strong support for the process of gathering data for and building the model.
- 7) In August 2012, the Project Officer received a very positive evaluation of the survey datasheet from the patrol data managers of both Saola Nature Reserves. In response to concerns about the inflexibility of the datasheet, an editable version was produced in MSWord and distributed to them and WWF.
- 8) We also planned an informal survey of the extent to which management planning had incorporated research findings. As discussed in this report, key impacts to date include: Identification of communities for involvement in community-based conservation and recruitment for Forest Guards and allocation of land to local communities under Bach Ma Benefit-sharing scheme following traditional boundaries, all based on community mapping results.
- 9) Unfortunately, plans for a project Closing Workshop fell through due to newly enforced regulations regarding the application for permission to hold workshops attended by foreigners which caused serious logistical problems. However we do:
 - plan to present preliminary results at meetings in 2013 and beyond (see section 4.7, page 21).
 - organise smaller workshops with project partners, to get informal feedback as discussed above.

Specific indicators are discussed in Annexes 1 and 2 and in section 4.2 and 4.3.

6.1 Actions taken in response to annual report reviews

No issues were raised in response to our annual reviews

7 Finance and administration

7.1 Project expenditure

Item	Oct 09 - Mar 10		Apr 10 - Mar 11		Apr 11 - Mar 12		Apr 12 - Aug 12		Total	
	Budget	Expend	Budget	Expend	Budget	Expend	Budget	Expend	Budget	Expend
<i>Staff costs specified by individual</i>										
Wilkinson, Cambridge										
Brook, project supervisor WWF										
Thinh, project manager WWF										
Admin staff WWF										
Trung, coordinator Vinh										
Vinh university admin staff										
UK staff total										
VN staff total										
<i>UK Overheads</i>										
UK Audit costs										
<i>UK Travel and subsistence</i>										
International Travel										
<i>UK Other Costs</i>										
Masters studentships in UK (x2)										
UK costs total										
<i>Host Country Overheads</i>										
Institutional overheads										
Office rental, heating, etc.										
Host Country Overheads total										
<i>Host Country Travel and Subsistence</i>										
National travel										
Fieldwork travel and subsistence										
Host Country Travel and Subsistence total										
<i>Host Country Operating Costs</i>										
Conferences, workshops and seminars										
Fieldwork operating costs										
Host Country Operating Costs total										
<i>Host Country Other Costs</i>										
Masters studentships in Vietnam										
Host Country Other Costs total										
Grand Total										

7.2 Additional funds or in-kind contributions secured

Ocean Park-ZSL

Funds from the Ocean Park Foundation of Hong Kong, raised by ZSL for the Last Sightings Surveys and community mapping work provided £8,500. (see Table 2, p6 and also p12)

WWF sources

The WWF CEPF Saola grant (see p5) provided a total of ca £57,920 relevant co-financing.

This comprised:

- Patrolling, and associated data collection (p15)
- Community mapping (p16)
- Map handback and consultation (Dr Loi's work, p16)
- Ranger training (May 2010 workshop, p10, and below)
- Relevant staff time

The staff time, in particular that of Sarah Brook, Luong Quang Hung and Van Ngoc Thinh, was critical to the success of collaborative activities with this project, in particular patrolling and associated data collection.

The May 2010 Ranger training workshop also received £4,625 from WWF's Russell E Train Foundation.

The CarBi project had spent approximately £150,000 in Thua Thien Hue and £85,000 in Quang Nam on patrolling and associated data collection by this project's closing date Aug 2012. This work has generated a large volume of data using the datasheet designed by this project and which will be useful for assessing threat distribution and parameters of the bioeconomic model (see pages 15 and 14). The patrols, incidentally, are also collecting leeches for DNA analysis based on the method piloted by this project. WWF also spend ca £10,000 of core funds on the first patrols.

The CarBi project also contributed £2640 to the socio-economic survey of the Hue-Quang Nam landscape.

Additional funds secured from WWF sources sum up to at least £310,185, or £275,535 excluding staff costs. The majority of this was to support the patrolling and associated data collection and training. This figure is still not complete however; among other things it excludes WWF co-financing for the workshop on enforcement and the Saola Working Group meeting, and for the work by the two student interns from Hohenheim and Louvain. The close integration of aspects of our work with other WWF projects (see page 4) makes it hard to calculate the full value of our co-financing.

Unfortunately, at the beginning of the project, we were faced with the loss of ca £80,000 of co-financing thought guaranteed due to the collapse of an existing project. This collapse was itself due to a disagreement between the two donors and was quite unexpected by WWF. Fortunately we were quickly able to make up the shortfall from other sources.

Vinh University sources

Vinh University has been extremely generous with its co-financing, reflecting the enthusiasm of the senior management for our project and going beyond the amounts originally promised as cofinancing. Key financial contributions include:

- £3000 towards the furnishing and upkeep of the project room (see page 4).
- £3791 towards the costs of the workshops held at Vinh (see page 18)
- £975 for fieldwork operating costs.

An extra £2,700 was also provided for staff costs, helping to deal with the additional administrative load from the Ocean Park grant. The university also provided a bedroom on campus free of charge to the Project Officer throughout the project's fourth financial year.

Other sources

In addition to the above we should also make mention of the additional funds from the IUCN-SSC SWG to support its second workshop, including paying for the Project Leader's flights.

Further funds from the SWG to hold a meeting in Vientiane in March 2012, inviting the project officer as well as partners from ZSL and Copenhagen to discuss opportunities for leech and interview based surveys, relevant to the legacy of this project.

Support from the Centre for Geo-Genetics in Copenhagen to conduct the leech pilot study and also to invite the project officer to Copenhagen in order to discuss future developments.

Post-project funding

As noted above, this project was the first major grant to concentrate on these unique and iconic species, since their spectacular discovery in the 1990s. The award of the Darwin grant has already catalysed other grants, as noted above. Furthermore, a number of large projects have been awarded since the project ended, and these grants begin in 2013. These new grants additional have the potential to continue aspects of this project's legacy. These include:

- £85,000 from the Save Our Species fund to WWF, in addition to £13,200 of internal funding to support leech-based surveys in the Hue-Quang Nam landscape.
- £13,000 from CEPF to Vinh University for leech-based surveys in Pu Mat National Park targeted based on interview data collected by this project in partnership with ZSL-Ocean Park.

Further grants amounting to hundreds of thousands of pounds have been raised by the Saola Working Group and WCS for leech-based surveys in Lao PDR.

Co-financing for Vinh University's CEPF project is being provided by researchers at the University of Texas, who are also applying for funds to expand the approach of leech-based surveys targeted based on interview results.

7.3 Value of DI funding

Since their discovery in the early 1990's, conservation work on the Annamite ungulates had been woefully lacking before the current project, largely due to a lack of funds. Since the beginning of this first project, that situation has comprehensively changed (see section 7.2 above). Although the catalytic value of the DI funding cannot be exactly measured, it is fairly certain that the WWF-CEPF project, the ZSL Ocean Park project and the new Vinh University CEPF project would not have occurred without the current project. While the leech-based method would have been developed without us, it is very unlikely that plans for leech-based surveys in the Annamites would be close to the stage they are at now if we had not conducted the pilot there and facilitated the subsequent dialogue between geneticists and fieldworkers.

Equally, our impression is that our catalytic effect has been greater than this. The project has supported people to spend some or all of their working time thinking about and investigating the issues related to Annamite Ungulate Conservation, which automatically leads to increased attention to the problem. The simple fact that the project's application was successful, after such a long period with no significant grants, was itself inspiring to further action. Indeed, this project represents a turning of the tide, and hopefully it has not come too late for the Saola and other endemic ungulates.

More specifically, without the current project:

- The students who were able to attend our short courses would not otherwise have received training in conservation subjects.
- Masters students supported by the project to study in Vietnam would probably have obtained their degrees. However, they would probably have been able to conduct little or no fieldwork, especially not on conservation-related work, without the Darwin project. They would therefore likely have completed theses based entirely on literature review and anecdote and would not have received the opportunity to collect the kind of quantifiable data required in professional research.
- The two students receiving support to study at DICE might not have received masters degrees at all, especially not the international degrees from foreign universities which are so valuable to their career development. They remain two of the very few Vietnamese nationals to have received direct degree-level training in conservation.
- The kind of targeted Vietnamese-language teaching materials in advanced conservation subjects that we produced are not being produced by any other project.
- Furthermore, no other project is developing manuals to collect quantitative interview data on animal species, or on community mapping, research methods which are accessible to student projects.
- More generally it is unlikely that methods for collecting data (as opposed to information) about wild animals from local people in Vietnam would have been developed.
- Without the community mapping work done by this project, WWF initiatives working with local communities under the CarBi project and future projects would not be accurately prioritizing actions to those communities most affected by conservation. For example, the people of Huong Huu commune in Nam Dong district are now recognized as stakeholders by WWF and partners because of their traditional claim to, and ongoing use of, the core zone of the Thua Thien Hue Saola Nature Reserve, a fact not previously recognised.
- In Thuong Nhat commune, also in Nam Dong, probably would not have land the land allocated to them under the Bach Ma Benefit-sharing pilot scheme divided according to traditional areas. Apart from the direct significance on the lives of these people, the appropriate allocation of land is a key factor affecting the chances of success of this critical initiative.

- The development of the WWF Forest Guard system in the Hue-Quang Nam landscape would probably have been delayed until after the start of the CarBi project, assuming it would have been possible to raise those funds before the system had been trialled.
- Without the datasheets developed by the project, it is very unlikely that the forest guard patrols would have been collecting usable baseline data with a potential to monitor the success of patrolling and map patterns of threats.
- In the same vein, it is unlikely that the work to collect socio-economic data in the Hue-Quang Nam landscape, or to assess demand for wild meat in Hue City would have collected valid quantitative data. While some information would have been produced, the collection of quantitative datasets required not only direct funding from this project but also the dedicated attention of someone with scientific training and a basic knowledge of Vietnamese in order to produce unambiguous datasheets.
- Vinh University would not have formed a research collaboration with DICE which has already facilitated one further study and promises be productive in future.

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

Project summary	Measurable Indicators	Progress and Achievements Sept 2009 - August 2012	Actions required/planned for next period
<p>Goal: 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</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 		<p>Our project has drawn on broad UK expertise and international collaborations to</p> <ol style="list-style-type: none"> 1. conduct critical research into the conservation of unique biodiversity and the potential for sustainable use of forest resources in Vietnam. 2. Train the next generation of Vietnamese conservationists and provide tailor-made teaching Vietnamese-language teaching materials. 	<p>The work begun by this project is far from over. Much of the data we have collected still needs to be analysed and the results published and reported back to our partners and other decision-makers. The research methods we have developed are already receiving broader application.</p>
<p>Purpose</p> <p>More effective conservation of a globally important ecosystem by i) conducting applied conservation research on the highly endemic Annamite ungulate community and threats posed by hunting, ii) strengthening the capacity of leading universities within the region to produce well-trained graduates in biodiversity conservation who value traditional knowledge and iii) influencing on-the-ground community and government forest management systems.</p>	<ul style="list-style-type: none"> • <i>Clear understanding of how to reconcile hunting, livelihoods and conservation through a bio-economic model.</i> • <i>First accurate understanding of distribution and habitat of endemic ungulates across northern Annamites</i> • <i>Capacity of research organisations enhanced through UK MSc training of two trainers and support in developing courses.</i> • <i>10 Vietnamese and Laotian masters and 20 undergraduate projects supervised by UK experts.</i> • <i>Forest management plans incorporate needs of ungulate species and local people.</i> 	<ul style="list-style-type: none"> • Key datasets have been collected for both the bioeconomic model and for an accurate understanding of distribution and habitat of endemic ungulates. Progress has involved development of novel data collection and analytical techniques and a draft algebraic model. Publication of results and associated recommendations are expected in 2013 and 2014, with cofinancing available from host partners for their presentation to decision-making forums. • Two Vietnamese students have received MSc training in the UK. Six new masters-level modules have been developed at Vinh University. • Fourteen Vietnamese masters students have received financial and academic support from the project to conduct conservation-related research, of 	<p>Some planned further work beyond the project's term includes:</p> <ul style="list-style-type: none"> • Produce a final bio-economic model and submit for publication. • Investigate techniques for species distribution modelling based on interview data and produce maps of species distributions; submit for publication. • Present initial findings to WWF and Saola Working Group in June 2013 • Vinh and DICE to investigate further collaboration, including repeats of short courses. • Vinh and WWF both to continue leech-based surveys using funds already raised for the purpose. • Collaboration with Vinh University and other organisations (WCS, SWG, ZSL) to continue interview surveys using last-sighting method in other sites.

		<p>which six have completed their dissertations and received their degrees.</p> <ul style="list-style-type: none"> • Three Laotian undergraduates have also completed field research with support from the project. • Community mapping work by the project has informed the allocation of resource rights to local communities and Bach Ma and will guide the inclusion of affected communities in ongoing WWF community work. 	
<p>Output 1. <i>Improved capacity of Vinh University to produce graduates able to deliver the research components of Vietnam and Lao's contributions to the CBD.</i></p>	<ul style="list-style-type: none"> • <i>Conservation courses developed in Vietnamese university.</i> • <i>Feedback from Vinh University lecturers and students.</i> 	<p>Six optional, conservation-related modules have been added to the masters course in zoology at Vinh University, based on materials developed by this project.</p> <p>Informal feedback from lecturers and students on the short courses has been positive.</p>	
<p>1.1: <i>Identify gaps in current syllabuses</i></p>		<p>Completed in FY1. Work by NMW and CTT reviewed and finalised at workshop in March 2010 (below).</p>	
<p>1.2: <i>Planning workshop with staff from DICE and Vinh university</i></p>		<p>Workshop held at Vinh in March 2010, attended by DCM and senior figures from Vinh. Further discussions have been held on possible future DICE-Vinh joint masters, including meeting at DICE in December 2011, attended by CTT. Participation by CTT and other Vinh staff in meetings hosted by Ministry of Education and Training (MoET) led to acceptance of new modules in a Decision dated May 2011.</p>	
<p>1.3: <i>Lectures by DICE staff at Vietnamese universities</i></p>		<p>Short courses in Conservation Management and Biodiversity Economics given by NL-W and DCM in August 2011. NL-W's course repeated August 2012. Additional single lecture by NL-W to ca 200 students in Vinh on 14th March 2010.</p>	
<p>1.4: <i>Development of new teaching materials</i></p>		<p>Materials from short courses in Conservation Management, Biodiversity Economics and Statistics and survey design in conservation translated into Vietnamese; to be made available on project website.</p> <p>In addition manuals for survey techniques relevant to Annamite ungulates (set of five) available in English on website. Vietnamese versions currently under preparation.</p>	
<p>1.5: <i>Training for Vietnamese university staff</i></p>		<p>Nine students attending short courses and one who received a partial studentship now hold lecturers positions, three of them at Vinh.</p>	
<p>Output 2. <i>Training of two Vietnamese students to MSc level at DICE, 10 Vinh and Hue university masters projects, both Lao and Vietnamese, supervised by DICE, and 20 Vinh and Hue university undergraduate projects supervised by DICE.</i></p>	<ul style="list-style-type: none"> • <i>Students graduate from DICE, and Vinh and Hue, universities.</i> • <i>Thesis reports from each project.</i> 	<ul style="list-style-type: none"> • Two students studying at DICE have received their masters degrees and returned their theses • Four students at Hue University and two at Vinh have been awarded masters degrees based on the research supported by the project. • An additional seven masters students from Vinh and one from Hue are still writing up their dissertations based on completed fieldwork 	

		<ul style="list-style-type: none"> • Three Laotian undergraduates have been supported to conduct field research. • The project officer has copies of all student dissertations (in original language) and remains in touch with the eight students still involved in research
2.1: Community mapping training (10 masters students and FPD staff)		Completed 3-9 Mar 2010, Trainer Nicholas Wilkinson (Darwin Project)
2.2: Training in GIS (students, FPD and university staff)		Completed 12-19 March 2011, Trainer Le Tran Chan (Geography Institute, VN)
2.3: Training in basic ecological survey methods (students, FPD and university staff)		Completed 28Feb – 6 March 2011, Trainer Dr David Sewell, DICE
2.4: Training in basic social survey methods (students, FPD and university staff)		Completed 1-7November 2010, Trainer Dr Rajindra Puri, DICE
2.5: Conservation Biology training at DICE (1 Masters student) (will include training relevant to landscape-wide snare and habitat surveys)		Two students from the Vietnamese partner institutions (one from WWF and one from Thua Thien Hue FPD) have received their degrees from DICE
2.6: Wildlife trade training at DICE (1 Masters student) (will include training relevant to research into hunting patterns)		Both students have taken the Conservation Biology course instead of the Wildlife Trade course but one of their dissertations nonetheless focused on the hunters who supply the wildlife trade.
2.7: Training in analysis and interpretation of monitoring and other management data (FPD staff)		<p>Training for FPD and Protected Area staff included:</p> <ul style="list-style-type: none"> • With the support of Vinh University, inviting FPD and PA staff to the short courses offered by the project (activities 1.3 and 2.1 to 2.4) • Discussion and training in patrol data collection, beginning with a workshop in May 2010 (a collaboration with EWCL) on the general principles; followed by training of field teams in patrol data collection in summer 2010 • Masters level training at DICE (Nguyen Xuan Truong, Hue FPD) ,Hue (Pham Doan Vong, Bach Ma NP) and Vinh (Vo Cong Anh Tuan, Pu Mat NP, Nguyen Van Hieu, Pu Huong NR, Vo Thanh Hung, Vu Quang NP) • Training of rangers of the Thua Thien Hue and Quang Nam Saola Nature Reserves in the quadrat method for snare and habitat surveys (see page 16) with support from the complementary CEPF project.
Output 3. Applied research ties all student work together into two outputs: i) models of endemic ungulate distribution across the wider landscape; ii) bio-economic model of hunting and ungulate abundance in the Hue-Quang Nam landscape.	<ul style="list-style-type: none"> • Report and published manuscript on the distribution of endemic ungulates across their range in Vietnam and Lao with recommendations on how to strengthen the two protected area systems to support national pledges to the CBD. • Report and published manuscript on the bio-economics of the Hue-Quang Nam landscape and its implications for saola conservation at the community, protected area and ecosystem levels. 	<ul style="list-style-type: none"> • Due mainly to an initial underestimation of the methodological challenges involved, analysis of data has not been completed and reports and published manuscripts remain under production, however: • Novel data collection methods have been developed (see section 4.5, page 18) with clear protocols in Vietnamese. • Full interview datasets on ungulate status and distribution have been collected in the Hue-Quang Nam Saola landscape, Pu Mat National park, the south of Viengthong district in Lao (near Pu Mat). Additional data have been collected in Pu Huong Nature Reserve and Vu Quang National Park and existing Saola record data have been collated from across the range. • A basic algebraic bio-economic model has been produced and valuable critical feedback received from the main host-country partner (WWF Vietnam) • Key datasets have been collected and compiled from the literature to inform the bioeconomic model (see Table 4, p14)

		<ul style="list-style-type: none"> • Analysis of these data to produce the planned outputs continues at Cambridge, and through collaborative relationships developed in the course of the project with other research institutions (Zoological Society of London and University of Texas) • We expect to publish the results of these analyses beyond the project term in 2013 and 2014. • We remain in communication with our host country partners and with the IUCN-SSC Saola Working Group, through which funds are expected to be available to present results of these analyses back to the relevant conservation decision-makers in 2013 and 2014. • At the same time, further proposals are being drafted in collaboration with our partners, for further data collection on the status and distribution of ungulates in other parts of the Annamites.
3.1: Construct range-wide database		<p>Protocols for recording Saola interview records have been developed in English and Vietnamese. A GIS-linked database has been constructed, linked to the participatory GIS (below). A comprehensive manual, including a draft scoring system is available on the project website and is being translated into Vietnamese. Records of Saola from across the range have been collated and are being entered, simultaneously with new records collected by this project.</p>
3.2: Construction of Participatory GIS		<p>A comprehensive, fine-scale map of landscape features in and around the Hue-Quang Nam Saola landscape has been produced, using names used by the indigenous Katu and Ta Oi people. The map is available as a GIS layer with associated polygon data of stream catchments. Similar place name layers have also been produced for Pu Mat and Vu Quang National Parks. An incomplete layer is available for Pu Huong NR.</p> <p>These data are much more detailed than any previously published maps of local place names in these areas.</p>
3.3: Expert workshop		<p>The second meeting of the IUCN-SSC Saola Working Group was held in April 2011</p>
3.4: Community mapping in Hue – Quang Nam		<p>Community mapping in the Hue-Quang Nam landscape has covered 58 villages, believed to include all those regularly using the area of the new reserves. Apart from the comprehensive map of landscape features (see 3.2 above), data were collected on villagers' use of different forest products by area. Maps of forest product use based on the 'beaning' method (see page 12) are available for all villages and were used to assess impacts to villagers from PA establishment under WWF's CEPF and CarBi project. Our mapping of traditional areas informed the allocation of land use rights to villages in Thuong Nhat commune under Bach Ma National Park's new Benefit Sharing mechanism. These data were collected by students and lecturers from the Hue University of Science, in collaboration with WWF.</p>

3.5: Range-wide community mapping	Community maps of village use areas were produced around Pu Mat and Vu Quang National Parks, as well as Pu Huong Nature Reserve. In Lao community maps of village use areas were made for the south of Viengthong district, Bolikhamxay province. Our methods of community mapping were also used by WCS-Lao elsewhere in Bolikhamxay. We are working to raise additional funds to complete the rangewide mapping.
3.6: Species distribution modelling	Species distribution modelling must, for the moment, be based on interview data which present unique challenges for analysis. Work by NMW, Ong Dinh Bao Tri (WWF), Luong Van Duc (Hue University) and collaboration with the University of Texas have all produced useful advances which are currently being combined. We expect to produce a model by the summer of 2013 for publication later that year. GIS data have been collected from across the range of the species.
3.7: Specific training for research into hunting patterns	Nguyen Anh Quoc received training from DCM for his masters research into hunting patterns. The research has been completed and results submitted for publication in <i>Oryx</i> .
3.8: Landscape-wide snare and habitat surveys	Following a decision to support data collection by patrols over independent surveys, we designed a datasheet which has been used to collect habitat and threat data on over 1000 independently funded patrol days. As with interview data, patrol data present unique challenges for analysis. Two alternative techniques for analysis have been trialled but further work is needed and will begin at Cambridge in 2013/ Additional data, using a quadrat-based method were collected from 36 random sites within the Hue Quang Nam landscape by ranger teams.
3.9: Targeted Saola surveys	No surveys were conducted under this project, however a novel method was developed through a collaboration with the University of Copenhagen which shows promise for future surveys. The method is based on detection of host DNA from terrestrial leeches. Both host country partners as well as WCS Lao have raised additional funds for leech-based surveys which have begun in 2012.
3.10: Bio-economic modelling	A draft algebraic model was produced and received positive feedback and constructive criticism from WWF at a workshop in May 2012. Key datasets have been collected in the last year of the project (see under Output 3 above)
<p>Output 4. <i>Forest management plans within the Hue-Quang Nam landscape incorporate the results of applied saola research to the benefit of conservation and community benefit sharing mechanisms.</i></p>	<ul style="list-style-type: none"> • <i>Community forest management systems adapted based on the results of bioeconomic model.</i> • <i>New protected area management plans incorporate the results of participatory mapping, ungulate and snare distribution surveys and the bio-economic model</i> <p>Due to changes in the approach and level of involvement of WWF (see page 4) it is no longer appropriate to think in terms simply of informing management plans but rather an ongoing process of decision making which is supported by several other large international projects. The project officer has been constantly providing input through meetings and informal discussions into planning for these larger projects, based on the insights gained from research.</p>

4.1: Research planning workshops	<p>See table Table 5, page 17 for a list of research planning workshops organised (independently or collaboratively) by the project.</p> <p>Annual Steering Committee meetings were held as planned to produce workplans for the following financial year.</p>
4.2: Protected area management planning & zonation	<p>The project supported the establishment of the new Saola Nature Resrves in Hue and Quang Nam by supporting meetings in 2010 to publicise the TTH Reserve and to facilitate the planning process for the reserve in Quang Nam.</p> <p>We supported the development of a data collection and storage system for patrol data (see 3.8 above) which supports annual decisions about protected area management.</p> <p>Informal feedback on preliminary results of interview surveys to WWF, through the protected area manager, has influenced the targeting of conservation action through patrols to areas with better evidence for the presence of flagship species.</p>
4.3: Evaluation of participatory resource-use planning approaches	<p>Following the Community-based Conservation workshop in Vinh in March 2010, we concluded that, without better provision in Vietnamese law for participatory resource-use planning, it would have little effectiveness on local livelihoods or on ungulate conservation.</p> <p>The partner project funded by CEPF supported a team from Hue University to conduct a consultation with local communities and provide a list of potential strategies for mitigation of the effects of protected area establishment on local communities.</p>
4.4: Participatory Resource Use Planning	<p>The assessment conducted by Dr Loi's team under the CEPF project concluded that it was beyond the project's resources to deliver sufficient benefits under any of the strategies proposed through the participatory process.</p> <p>WWF, under the CarBi project, and Bach Ma National Park, under the Benefit-sharing programme, have plans for participatory resource-use planning and allocation. Results from our community mapping and bioeconomic modelling research have provided crucial input to these processes and will continue to do so in the future. Direct benefits to local communities remain to be realised and assessed, however.</p>

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

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal: Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.</p>			
<p>Sub-Goal: To contribute to the CBD pledges of Vietnam and Lao to effectively protect their flagship ungulate species and assess the potential for sustainable hunting, though building academic capacity and undertaking applied research linked to community forest management and benefit sharing systems, and to protected area establishment and strengthening.</p>	<ul style="list-style-type: none"> • Academic capacity enhanced for applied research on endemic ungulates and patterns of hunting. • Improved understanding of the impacts of hunting practices on ungulate populations and their potential for sustainability. • Greater commitment by stakeholders and communities to reduce unsustainable hunting and protect ungulate species, especially the flagship saola. 	<ul style="list-style-type: none"> • Six dissertations have been produced by trained students with eight more being written up. One paper with a student as co-author has been submitted and more are expected in 2013. • Six new modules added at Vinh University. • Data for participatory maps of ungulate distribution and hunting have been collected at key sites in the northern Annamites and maps are being produced • A draft bio-economic model of hunting patterns has been produced for the Hue-Quang Nam landscape and key additional data collected to parameterize it. • Our partners' approach to ungulate conservation has changed radically and results of our community mapping and socio-economic surveys continue to inform management planning under ongoing initiatives 	
<p>Purpose More effective conservation of a globally important ecosystem by</p> <ol style="list-style-type: none"> i) conducting applied conservation research on the highly endemic Annamite ungulate community and threats posed by hunting, ii) strengthening the capacity of leading universities within the region to produce 	<ul style="list-style-type: none"> • Clear understanding of how to reconcile hunting, livelihoods and conservation through a bioeconomic model. • First accurate understanding of distribution and habitat of endemic ungulates across northern Annamites 	<ul style="list-style-type: none"> • Interview data have been collected and modelling techniques are being developed to produce maps of Saola distribution. Surveys being conducted by partners based on the novel leech-based survey method show promise for mapping the distribution of endemic muntjacs. • Reports and papers on the bio-economic model to be produced in 2013 	<ul style="list-style-type: none"> • The status of the flagship Saola in the Hue-Quang Nam landscape is critical and it is not certain that the species is extant there. The interventions may have come too late. We advocate the use of the methods we have developed to assess the status of the species here and at other sites. • The possibility of reaching sustainable solutions remains far from certain. The

<p>well-trained graduates in biodiversity conservation who value traditional knowledge and</p> <p>iii) influencing on-the-ground community and government forest management systems.</p>	<ul style="list-style-type: none"> • Capacity of research organisations enhanced through UK MSc training of two trainers and support in developing courses. • 10 Vietnamese and Laotian masters and 20 undergraduate projects supervised by UK experts. • Forest management plans incorporate needs of ungulate species and local people. 	<ul style="list-style-type: none"> • Course outline documents and teaching aids have been produced in Vietnamese. Positive informal feedback from students • Two MSc students have graduated from the University of Kent. • Degree certificates have been received from Vinh and Hue universities, Vietnam for the six completed theses. • WWF and its partners are now administering a major new grant to develop management models incorporating the needs of ungulates and local people. The pilot benefit sharing scheme in Bach Ma national park represents another model to incorporate the needs of local people 	<p>bioeconomic model will give guidance on the total expense needed to conserve the Saola and other ungulates, which will allow us to better assess the sustainability of the current conservation model.</p>
<p>Outputs</p> <p>1. Improved capacity of Vinh University to produce graduates able to deliver the research components of Vietnam and Lao's contributions to the CBD.</p>	<ul style="list-style-type: none"> • Conservation courses developed in Vietnamese university. • Feedback from Vinh University 	<ul style="list-style-type: none"> • Full presentations have been produced for 3 courses • Additional teaching aids and references, including tests are available for all courses. Manuals in field methods have also been produced. • Lecturer feedback questionnaires and student feedback questionnaires were not collected; only informal feedback was received. 	<ul style="list-style-type: none"> • Lecturers and other staff at Vinh appeared most willing to collaborate with the courses given • However, because we were not able to get a Vinh lecturer on the DICE MSc, it may be difficult for them to maintain the new courses in future. Vinh are investigating using other sources for future training, though English language skills remain an obstacle. • The students appear to appreciate the new course content and style of teaching.
<p>2. Training of two Vietnamese students to MSc level at DICE, 10 Vinh and Hue university masters projects, both Lao and Vietnamese, supervised by DICE, and 20 Vinh and Hue university undergraduate projects supervised by DICE.</p>	<ul style="list-style-type: none"> • Students graduate from DICE, and Vinh and Hue, universities. • Thesis reports from each project. 	<ul style="list-style-type: none"> • Official graduation certificates and transcripts, Dissertation reports and marks have been obtained. 	<ul style="list-style-type: none"> • Students with sufficient English skills did exist, though unfortunately not at Vinh • The students successfully completed their fieldwork without problems from weather and other unexpected variables and without any problems gaining permission.

<p>3. Applied research ties all student work together into two outputs: i) models of endemic ungulate distribution across the wider landscape; ii) bio-economic model of hunting and ungulate abundance</p>	<ul style="list-style-type: none"> • Report and published manuscript on the distribution of endemic ungulates across their range in Vietnam and Lao with recommendations on how to strengthen the two protected area systems to support national pledges to the CBD. • Report and published manuscript on the bio-economics of the Hue-Quang Nam landscape and its implications for saola conservation at the community, protected area and ecosystem level 	<ul style="list-style-type: none"> • Reports have not yet been published. • Effective management of protected areas still relies on foreign funding. 	<ul style="list-style-type: none"> • The Vietnamese government has shown it is willing to expand the protected area system, approving two new protected areas in the project focal area,
<p>4. Forest management plans within the Hue-Quang Nam landscape incorporate the results of applied saola research to the benefit of conservation and community benefit sharing mechanisms.</p>	<ul style="list-style-type: none"> • Community forest management systems adapted based on the results of bioeconomic model. • New protected area management plans incorporate the results of participatory mapping, ungulate and snare distribution surveys and the bioeconomic model 	<ul style="list-style-type: none"> • Results of the bioeconomic model are not yet available; however community mapping results have informed community forest management plans already. • We maintain contact with our partners and expect to feed results of the bioeconomic model into ongoing plans for community forest management when they are complete. • Annual plans for patrols in protected areas do target areas perceived to be important for ungulates and areas underpatrolled in previous years. 	<ul style="list-style-type: none"> • We do expect that results of research will indicate changes to management plans are required. However some significant changes in management practices have already taken place. • In Bach Ma, the government has shown flexibility in accepting new community management models, at least on a trial basis. • Support from communities for endemic ungulate conservation is not guaranteed. • The management boards of the new Saola Nature Reserves are willing to adapt to new ideas.

Annex 3 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring		Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	30	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity		Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training	60	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness		Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair

Article No./Title	Project %	Article Description
		and equitable way of results and benefits.
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
18. Technical and Scientific co-operation	10	Countries shall promote international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity, where necessary, through the appropriate international and national institutions.
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

Annex 4 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
1a	Number of people to submit PhD thesis	
1b	Number of PhD qualifications obtained	
2	Number of Masters qualifications obtained	8 (& more expected, see Appendix 3)
3	Number of other qualifications obtained	
4a	Number of undergraduate students receiving training	6
4b	Number of training weeks provided to undergraduate students	9 (3 Laotian students training for last interview surveys, 3 other undergraduates attending 2 short courses each)
4c	Number of postgraduate students receiving training (not 1-3 above)	ca 60 postgraduate students attending short courses (see Appendix 4)
4d	Number of training weeks for postgraduate students	123 training weeks for postgraduate students

Code	Description	Totals (plus additional detail as required)
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	
6b	Number of training weeks not leading to formal qualification	7
7	Number of types of training materials produced for use by host country(s)	8 (3x Vietnamese language short courses; 5x methods manuals
Research Measures		
8	Number of weeks spent by UK project staff on project work in host country(s)	125 (see Table 1)
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	
10	Number of formal documents produced to assist work related to species identification, classification and recording.	4 (interview manuals – to assist identification of species reported by interviewees)
11a	Number of papers published or accepted for publication in peer reviewed journals	2
11b	Number of papers published or accepted for publication elsewhere	
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	3 (P-GIS, Saola Record DB, patrol database)
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	
13a	Number of species reference collections established and handed over to host country(s)	
13b	Number of species reference collections enhanced and handed over to host country(s)	
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	1
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	3
15a	Number of national press releases or publicity articles in host country(s)	13+ articles in national print media, including dedicated news websites
15b	Number of local press releases or publicity articles in host country(s)	
15c	Number of national press releases or publicity	

Code	Description	Totals (plus additional detail as required)
	articles in UK	
15d	Number of local press releases or publicity articles in UK	
16a	Number of issues of newsletters produced in the host country(s)	
16b	Estimated circulation of each newsletter in the host country(s)	
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	2
18b	Number of national TV programme/features in the UK	
18c	Number of local TV programme/features in host country	3
18d	Number of local TV programme features in the UK	
19a	Number of national radio interviews/features in host country(s)	
19b	Number of national radio interviews/features in the UK	
19c	Number of local radio interviews/features in host country (s)	
19d	Number of local radio interviews/features in the UK	
Physical Measures		
20	Estimated value (£s) of physical assets handed over to host country(s)	
21	Number of permanent educational/training/research facilities or organisation established	
22	Number of permanent field plots established	
23	Value of additional resources raised for project	
Other Measures used by the project and not currently including in DI standard measures		
	Number of international press releases or publicity articles	1 (article on news website)
	Number of international TV programmes	1 (due to air in 2013)

Annex 5 Publications

Type *	Detail (title, author, year)	Publishers	Available from	Cost £
Journal Article	Screening mammal biodiversity using DNA from leeches Bærholm Schnell, I., Thomsen, P.F., Wilkinson, N., Rasmussen, M., Jensen, L.R.D., Willerslev, E., Bertelsen, M.F., Gilbert, M.T.P (2012)	Current Biology, 22(8) R262-R263	Paid access /Subscription	
Journal Article	Factors influencing the illegal taking of wildlife by trapping and snaring among ethnic communities in Vietnam Nguyen Anh Quoc, MacMillan, D.C. (In press 2013)	Oryx, in press Vol 47	Paid access/ Subscription	
Manual. English, Vietnamese in prep	Community Mapping for Saola conservation: Handbook Wilkinson, N. 2012	This project	Project website	0
Manual. English, Vietnamese in prep	Interview surveys for Saola: General guidelines Wilkinson, N. 2012	This project	Project website	0
Manual. English, Vietnamese in prep	The Saola record database: A user's guide Wilkinson, N & Ong Dinh Bao Tri, 2012	This project	Project website	0
Manual. English, Vietnamese in prep	Ungulate last sightings survey: handbook Wilkinson, N, Turvey, S & Cao Tien Trung, 2012	This project	Project website	0
Manual. English & Vietnamese	Saola threat and habitat surveys: Instructions Wilkinson, N & Pham Doan Vong, 2012	This project	Project website	0
Research report (contains potentially sensitive data)	Maps of forest product use by communities around the 'Hue-Quang Nam Saola landscape' <i>Nicholas Wilkinson, Lương Văn Đức, Nguyễn Thị Thu Hiếu, Nguyễn Tiến Hoàng, Tạ Đình Thanh. 2011</i>	This project	Contact project officer	0
Research report (contains potentially sensitive data)	Local knowledge of ungulate distribution in the Hue-Quang Nam Saola landscape (preliminary report) <i>Nicholas Wilkinson, Lương Văn Đức, Tạ Đình Thanh.</i>	This project	Contact project officer	0
Research report	Occupancy modelling using patrol data to assess threat distribution in the Hue-Quang Nam Saola	This project	Project website	0

	landscape. Yasmine El Bahyaoui.			
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A list of the masters theses produced under the project is in Appendix 3.

Annex 6 Darwin Contacts

Ref No	17-008
Project Title	Can Hunting and Conservation of Endemic Annamite Ungulates be Reconciled?
UK Leader Details	
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Name	Dr Van Ngoc Thinh
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Role within Darwin Project	WWF Project Manager
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Email	
Partner 2 (if relevant)	
Name	Dr Cao Tien Trung
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Role within Darwin Project	Vinh University Project Co-ordinator
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