Developing a sustainable network for primates in Ecuador (PRIMENET)

Final Report (Year 3)

Project number 14-040

Dr Mika Peck (PI), Diego Tirira, Ana Mariscal, Karina Paredes.

Darwin Initiative – Final Report

Darwin project information

Project Reference	14-040
Project Title	Developing a sustainable network for primates in Ecuador (PRIMENET)
Host country(ies)	Ecuador
UK Contract Holder Institution	The University of Sussex
UK Partner Institution(s)	
Host Country Partner Institution(s)	CORE PARTNERS: Murcielago Blanco, Ecuador Terra Incognita, QNCE (National Herbarium of Ecuador – administered by Corporación Botánica Ecuadendron) , Los Cedros Biological Reserve
Darwin Grant Value	£236 270
Start/End dates of Project	June 2005 – May 2008
Project Leader Name	Dr Mika Peck
Project Website	www.primenet.org.uk
Report Author(s) and date	Dr Mika Peck, Diego Tirira, Ana Mariscal (25th August 2008)

1 Project Background

The critically endangered brown-headed spider monkey (*Ateles fusciceps*) is endemic to the Chocó-Darién-Western Ecuador global biodiversity hotspot. Research has documented a recent population reduction of 80% due to habitat destruction, principally by national and international logging operations (Figure 1).

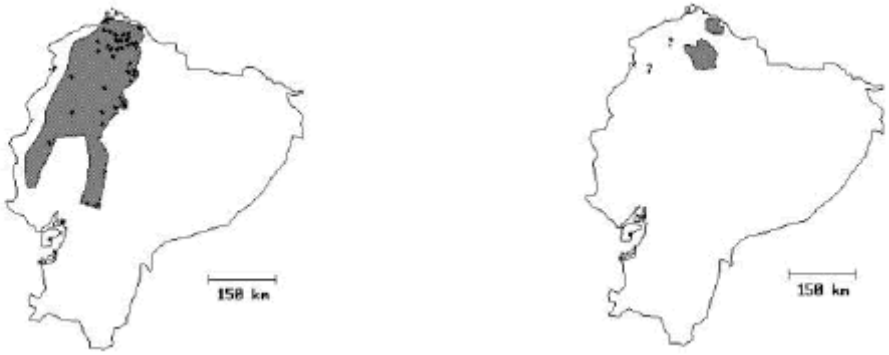

Figure 1. Left: Historical distribution of *Ateles fusciceps* in Ecuador. Right: Distribution in 2003.

The Darwin Initiative PRIMENET project aimed to advance the scientific basis for their conservation management - specifically the purpose is to conserve the critically endangered brown-headed spider monkey (*Ateles fusciceps*), vulnerable primates and habitats in NW Ecuador (Figure 2) based on a programme of monitoring, education and sustainable livelihoods.

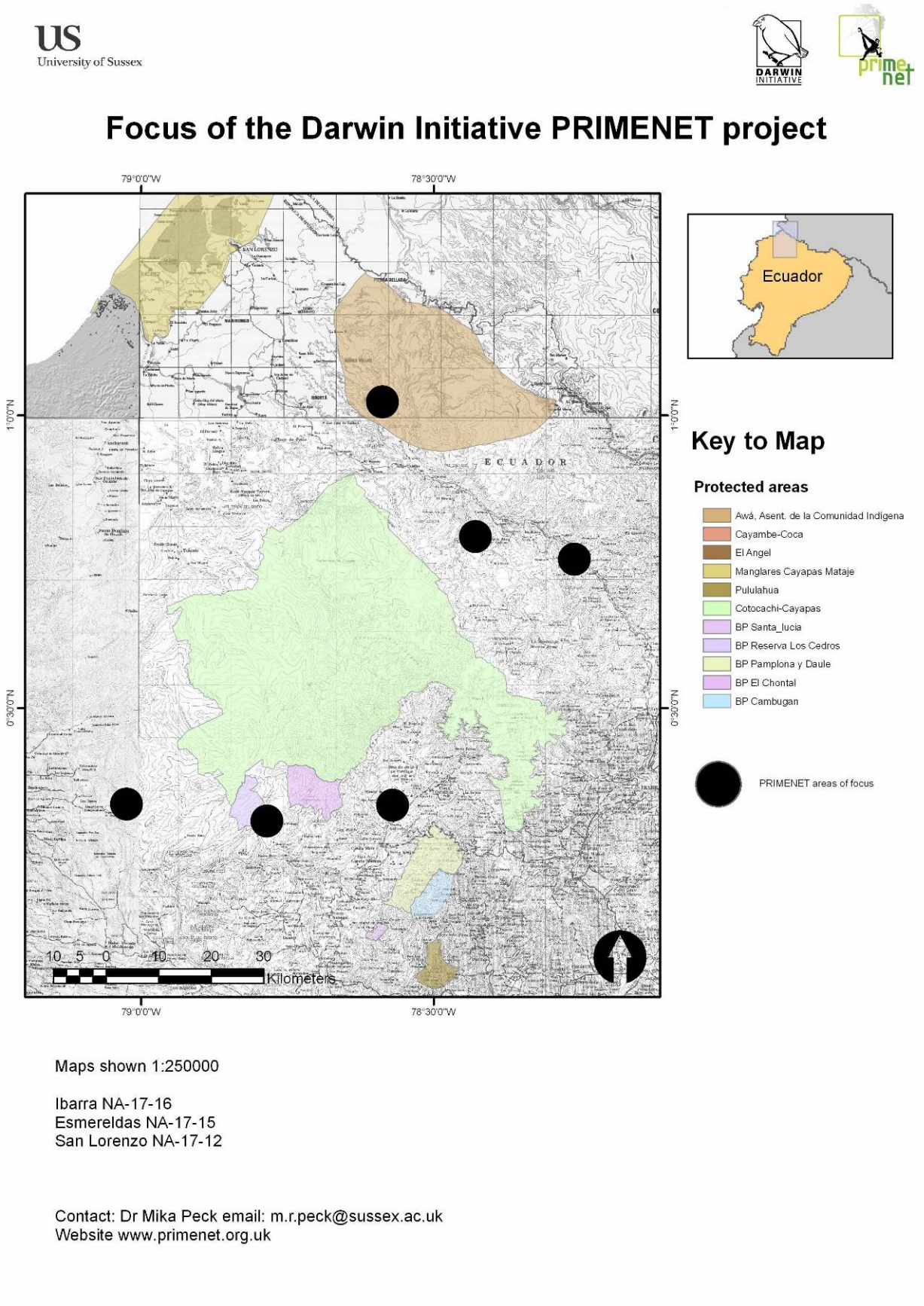

Figure 2. Focus of the Darwin Initiative PRIMENET project

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

Based on Ecuador's CBD National Biodiversity Strategy (Política y Estrategia Nacional de Biodiversidad del Ecuador 2001 – 2010) the Darwin Initiative PRIMNET project directly supported three critical strategic lines.

Strategic Line 1: via an educational programme that highlighted the status of the brown-headed spider monkey (*A. fusciceps*) at the local, national and international level to reduce hunting pressure, the pet trade and promote ecotourism by establishing A*. fusciceps* as a flagship species.

Strategic Line 2: via a programme of field research 1) resulted in inclusion of *A. fusciceps* in the top 25 most endangered primates 2006 – 2008 (Mittermeier et al, 2007) and raised the profile of this critically endangered species and 2) through development of a species and habitat action plan provided direct guidance for future conservation action in Ecuador. Additionally, through publication of the first field guides of mammals of Ecuador (and a specific field guide to the mammals of NW Ecuador) increased capacity of park guards, educational institutions and conservation organisations in the assessment of the status of primates and other mammalian fauna both nationally and regionally.

Strategic Line 3: by providing scientific information to the Ecuadorian government we ensured risks to habitat and A. fusciceps were taken into account in considering the cost-benefits of a mining EIA – resulted in the rejection of EIA for a 4000 ha open cast copper mine in the Intag region (NW Ecuador) and subsequently the declaration of the area as a protected forest under a local governmental ordinance.

The host country institutions benefited directly from Darwin Initiative funding to build capacity to meet CBD commitments. Specifically the DI PRIMENET project ensured:

1. A comprehensive strategy for protection of the critically endangered brown-headed spider monkey, other primates and their habitat was developed to guide future research. Conservation action was focused through remote sensing and GIS modelling to identify critical areas for conservation focus.

2. Researchers and parabiologists were trained in standard and innovative field survey methods to monitor endangered primates. A new NGO was established (Mamiferos y Conservacion) to support ongoing field surveys of the brown-headed spider monkey funded by the Peoples Trust for Endangered Species (2008 – 2009).

3. Ecuadorian biologist received specialist training in Participation, Power and Social Change though the MA at the Institute of Development Studies UK. This programme will enable community-level establishment and management of protected forest. Currently (2008 – 2009) we have sourced funding from the Network for Social Change to devolve decision-making to forest community level through real participatory procedures that aim to plan sustainable futures within the context of forest management plans. The training methods will be disseminated to other organisations - we have already been approached by the Ecuadorian Ministry of Environment to provide their staff with training in participatory techniques.

4. Botanists at the National Herbarium received training to MSc level and established field research programmes to a) assess sustainable use in non-timber forest products with the aim of developing sustainable livelihood options in forest communities, b) investigate forest dynamics to provide vital information for restoration reforestation in the region. As part of the exit strategy ongoing research funded through Earthwatch is investigating the potential role of 'aerial taxonomy' techniques in providing rapid habitat assessment data.

The project dealt directly with the Ministry of Environment and the CBD contact point with respect to all governmental permissions.

3 Project Partnerships

Were the partnerships based on demand stemming from the host country/ies and to what extent were all partners involved in project planning and decision making?

The project was initially seeded thorough communication between the Los Cedros Biological Reserve and the University of Sussex. The need to address the situation facing the brown-headed spider monkey and its habitat was highlighted and subsequently contact was made with local primate experts and botanists involved with field research and habitat conservation. Potential partners initially met during the Darwin Initiative funded pre-project visit to Ecuador in 2004 to develop collaboration and project ideas. At this stage links were made with the National Herbarium (through the Corporacion Botanica Ecuadendron) and Diego Tirira who was associated at the time with both the NGO Terra Incognita and the Ecuadorian Museum of Natural Sciences.

A memorandum of understanding was established between the University of Sussex and all partners before the project started – this is an important step to ensure all partners are aware of their responsibilities and required contribution to outputs.

A major challenge arose once funding from the Darwin Initiative was confirmed. On return to Ecuador to organise signing of the Memorandum of Understanding a rift had developed between the Museum and the Herbarium that threatened to undermine much of the planned project focus. Upon much reflection a decision was made by the PI to remove the Museum as a core project partner and link directly with the local expert, Diego Tirira, via the NGO Ecuador Terra Incognita. In 2007 an NGO dedicated to mammalian conservation (Mamiferos y Conservacion) was established and management of the primate survey and educational programme transferred to this organisation. In retrospect this has resulted in a much more dynamic project as there would have been major challenges should the finances have been tied into governmental organisations due to high levels of bureaucracy.

Describe the partnership between the UK lead institution and host country partner(s) and how this has developed over the life of the project.

Once established the UK partner focused on project management, primate survey methods development, GIS/remote sensing and network expansion, Corporación Botánica Ecuadendron (National Herbarium) on plant inventories and habitat assessment methods and Murcielago Blanco on primate survey and educational outreach.

The partners all worked together to produce materials, run the parabiologist workshops and coordinate field surveys. The core partnerships have worked well during the project and we are now continuing to work together on a number of projects to expand on work initiated during the PRIMENET project that focuses both on habitat survey and mammalian surveys. Another extra output is the establishment of a new NGO, headed by Diego Tirira, dedicated to mammal conservation in Ecuador (NGO Mamiferos y Conservacion).

Collaborations with other UK Institutions

University of Oxford-Brookes – The PRIMENET project made direct links with the MSc in Primate Conservation. Since 2005 six MSc students completed their MSc thesis projects with PRIMENET. Their projects have added considerably to the scope of the project and covered; 1) Field survey of the brown-headed spider monkey (*Ateles fusciceps*) using the DISTANCE method (£750 grant awarded by the Primate Society of Great Britain), 2) Feasibility of a population reinforcement programme for *A. fusciceps* at the Los Cedros Biological Reserve, 3) Establishment of a community-based restoration reforestation project, 4) Census of the mantled howler monkey (*Alouatta palliata*) in the Los Cedros Biological reserve using triangulation of vocalisations, 5) RAPID - Development of playback for rapid population assessment of the critically endangered brown-headed spider monkey in Ecuador (cofunded by Primate Conservation International, ABWAK Association of British Wild Animal Keepers and the International Primatological Society), and 6) Incorporating Environmental Impact Assessments and Population Viability Analyses into Multi-Criteria Decision Analysis for the Conservation of *Ateles fusciceps*. The work has resulted in presentation of results at conferences (e.g. Primate Society of Great Britain Winter Meeting) and publication of scientific papers. More papers are in the pipeline for publication in the near future.

University of Wales – In 2006 Austin Haffenden published his thesis carried out with the PRIMENET habitat assessment team on 'pioneer species ecology: co-existence and ecological differences amongst contrasting species' for an MSc in Environmental Forestry. It is expected that this will lead to a scientific publication in a peer reviewed journal.

Rainforest Concern (UK) – the NGO Rainforest Concern is working in NW Ecuador to establish a habitat corridor to connect remaining habitat in NW Ecuador. It also works to support and develop sustainable livelihoods. PRIMENET staff (PI, Botanist and MSc student) were invited to visit a number of sustainable alternative livelihood and reforestation projects they have supported in the region. This has resulted in a number of extra collaborations that included a community-exchange programme whereby local expertise in alternative livelihoods was disseminated through exchange programmes (funded by the Network for Social Change) and a long term project to support the establishment and maintenance of the protected forest corridor in NW Ecuador.

Holly Hills Trust (UK) – the trust provided over £4000 to UK and Ecuadorian students, expeditions and parabiologists during the PRIMENET project to support research and training. In 2008 the Trust has supported ongoing parabiologist surveys and the extension of field surveys in NW Ecuador with a total grant of £40000. The trust is now supporting a new project bid in 2008 to the Darwin Initiative with direct match funding of £75000 over 3 years as part of the PRIMENET exit strategy to focus on conservation of remaining forest in NW Ecuador (Canopy PACE – Promoting the Adaptive Capacity of cloudforest Ecosystems).

International

Missouri Botanical Gardens (USA) – Following incorporation of a permanent 1 hectare inventoried plot at the Los Cedros Biological Reserve into the 'Forest remnants of the Ecuadorian Pacific Coast' Project the MBG are continuing to support the habitat assessment work by providing expert advice.

Earthwatch – As part of the exit strategy our research network (mammals survey and botanical survey) has successfully applied for 3 years of funding from Earthwatch to carry out the 'Climate change, canopies and wildlife project' (http://www.earthwatch.org/expeditions/peck.html). The project will establish a programme at the Santa Lucia Cloudforest Reserve to monitor endangered mammals using camera trapping, develop aerial taxonomy keys for canopy crown species and establish an altitudinal transect to monitor temperature and cloud base height.

Ecuadorian

The field guide to mammals of Ecuador, published in March 2007, was a result of collaboration between PRIMENET, the University of Sussex, Conservation International and the Ecuadorian Museum of Natural Sciences. It is the first field guide for Ecuadorian mammals providing a key reference tool for parabiologists and PRIMENET researchers. The Mammals of the Rainforests of NW Ecuador was published in July 2008 in collaboration with Conservation International and Ecociencia.

DECOIN – strong links have been developed with this local NGO and we are supporting their initiatives by providing participatory skills (via the MA in Participation, Power and Social Change) to develop community protected forests.

The project has links to the CBD focal point thorough the Ministry of Environment that have supported all licences for botanical collection for the PRIMENET project.

Challenges

One aim of the project was to establish a centre of training for primate research at the Los Cedros Reserve. The reserve served as the base for parabiologist training in the first year and the field study centre for primate research resulting in the first published field studies on *A. fusciceps*. The original vision, that aimed to establish the Los Cedros Reserve as the principal field training site for parabiologist training was adjusted. The main reason was the difficulty

associated with logistics to ensure parabiologists could get to the site due to its isolation (6 hours by foot). In response we developed a mobile training programme where the parabiologist training took place in targeted communities.

The development of a parabiologist network has been complicated as it does challenge ingrained views of value within society that tend to see forest communities as 'lower class citizens'. The aim of the Darwin Initiative PRIMENET project was to integrate the skills and knowledge of forest communities within a scientific framework and to reward these community members directly for their contribution to monitoring etc. By centrally incorporating the MA in Participation, Power and Social change the aim was to generate awareness in project partners that support of parabiologists would raise the *status* of conservation activity in forest areas. The MA was however delayed to the third year of the project which resulting in delays to this aspect of the programme. Since the MA has been activated and participatory processes transferred to the Ecuadorian team there has been a marked improvement in this aspect. It is also clear that the parabiologist initiative would require much more support from local and national government and larger funding streams to ensure continuing education and salaries for fieldwork. However, there is clearly interest in this type of initiative as we have secured funding (Holly Hill Trust, Peoples Trust for Endangered Species) for a parabiologist/student team to continue monitoring *A. fusciceps* in key areas of conservation focus.

4 Project Achievements

The direct contributions to Ecuador's CBD 2010 targets are outlined in section 2 above. In terms of biodiversity protected, a direct impact of the Darwin Initiative PRIMENET project has been the provision of information to the Ecuadorian government that contributed to the rejection of the environmental impact assessment of a proposed multinational open-cast copper mine in NW Ecuador (Junin area). The mine would have impacted an area of up to 4000 ha. Since the EIA was rejected the company's mining concessions have been nullified due to a number of illegalities and the local government has recently (July 2008) declared the area a protected forest. This has resulted in the direct protection of 18000 hectares of forest.

The Darwin Initiative PRIMENET action plan based on remote sensing and GIS modelling will also guide future conservation efforts in NW Ecuador and provide further protection for the critically endangered brown-headed spider monkey.

4.1 Outcomes: achievement of the project purpose and outcomes

Since project initiation a great deal of progress has been made in understanding the status of habitat and populations of primates in the region. At the international level this culminated in the inclusion of *A. fusciceps* in the list of the top 25 most endangered primates worldwide for the period 2006 – 2008 and contributed to the rejection, by the Ecuadorian government, of an EIA for a proposed multinational open cast mine whose concessions covered 40 km^2. This dataset would have been unavailable had the Darwin Initiative PRIMENET project not existed.

Impacts due to the educational programme are hoped to contribute to addressing the key issues of hunting and habitat degradation. Reserve areas remain vulnerable to hunting from local communities, particularly at the 'edges', where economic pressures and limited educational resources obscure conservation value. The educational outreach programme worked at the village level throughout the region and at the national level to raise awareness of the status of the spider monkey and other primates and their habitat throughout the region. It is hoped that the value of the educational programme, and the material created for use in classrooms, will be recognised and incorporated in the teaching curriculum in the long term.

Sustainable livelihoods are the key to conservation success in the region. There is the urgent need to develop and support sustainable livelihood initiatives (as we have seen from our analysis of remote sensing data that deforestation is ongoing, with 56% of the forest habitat converted to other use from 1987 to 2001 within the 15km buffer zone of the Cotocachi-Cayapas Ecological Reserve). PRIMENET has played a key role in establishing a community exchange programme whereby expertise and best practise developed in one region in particular sustainable livelihoods can be disseminated to other interested community groups and organisations. The research programme also focuses on investigating potential sustainable use

of forest with information generated by the project (MSc botany) providing potential sustainable livelihoods options for community members. In the near future a key role will be played by reserves and protected forests in conserving forest habitat and associated species, particularly the larger 'charismatic mammals', which are already under huge pressure. There is the urgent need for direct financial support to ensure the protection of these remaining forests that goes beyond the scope of this Darwin project; however we are providing ongoing direct support (through the successful exit strategy) to reserves by increasing visitation rates by researchers, students and interested public that provides an income stream.

4.2 Outputs (and activities)

All seven outputs have been accomplished by the project. The success of each output is summarised below;

Partner institutions completed primate surveys and habitat assessments effectively. The project developed a number of innovative field techniques 1) an innovative playback survey tool for *A. fusciceps*, designed to address survey problems in the Andean foothills 2) Innovative habitat rapid survey methods were developed and applied by the botanical team 3) Aerial taxonomy techniques were investigated by the University of Sussex, with continuing funding from Earthwatch for a further 3 years. A total of five parabiologist training courses have taken place and proved to be extremely popular with field teams integrating with a number of parabiologists to undertake habitat and primate surveys and educational dissemination within communities to expand educational outreach.

The parabiologist training course incorporated participatory sessions to identify the causes of unsustainable behaviour many of which were community-specific. Threats varied and included negative impacts to biodiversity from mining (Intag region), palm oil plantations (Esmereldas) and uncontrolled tourism (Mindo).

Mapping and database development falls under 3 main outputs.

1. A GIS database has been developed by the University of Sussex allowing update of all primate survey information by parabiologists and primate researchers via an internet interface. The results can be accessed and displayed in Google Earth format by interested parties to display primate observations (www.lifesci.sussex.ac.uk/primate)

2. Analysis of remote sensing imagery has resulted in a land use mosaic map for NW Ecuador based on LANDSAT remote sensing imagery. Maps produced form the focus of habitat and species action planning and are downloadable free from the PRIMENET website.

3. A site-specific GIS database has been developed and established at the Los Cedros Reserve to be maintained with updated information from field surveys by reserve staff and volunteers.

Educational material has been published, and disseminated nationally, regionally and at village level. The environmental educational program with the parabiologist training program visiting 40 educational centres (primary, elementary and high schools) to raise environmental consciousness through workshops.

The Masters programmes for Ecuadorian staff resulted in an MSc in Botany in Ecuador and one biologist taking the MA in Participation and Social change in the UK. Training material for a 100 hour parabiologist training course was developed and the course rolled out in five regions training a total of 106 parabiologists.

Sustainable livelihoods: As part of the exit strategy a parabiologist team is currently surveying data deficient forest regions for the presence and abundance of primates (funded through the Holly Hill Trust and the Peoples Trust for Endangered Species). Community exchange programmes to disseminate sustainable livelihood alternatives and successful funding applications to a number of funding bodies have all contributed to long-term sustainable livelihoods in the region (See below for details).

Detail of Outputs

Output 1. Network established to monitor primate status and habitat using participatory field surveys and trained village-level parabiologists.

The activities are divided into 1) field surveys and 2) GIS database that will house all the collected information. A summary of future work (post Darwin funding) is also provided.

1) Field Surveys

Primate surveys (Mamiferos y Conservacion/University of Sussex/ Pontifica Univesdidad Catolica) - Primate field studies are now complete and have provided the first reliable data regarding population status and characteristics, activity patterns and habitat preferences of the three primate species inhabiting the study area, *Alouatta palliata*, *Ateles fusciceps* and *Cebus capucinus*. The field surveys formed the basis of thesis projects for 3 Ecuadorian undergraduate students who each spent one year in the field with the PRIMENET project at the Los Cedros Reserve (00° 18' N, 78° 47' W) and the Cristobal Colon area (00° 20' N, 79° 01' W). A number of other, shorter, field surveys were undertaken to determine the presence or absence of *A. fusciceps* in the study area.

In the first year of the project it became clear that standard primate survey methods would be difficult to apply in the increasingly marginal habitats that now make up the forested habitat of NW Ecuadorian primates. in NW Ecuador the remaining habitats are often found in mountainous areas that pose new problems for conservation programmes such as PRIMENET that are attempting to assess population status. Distance sampling using line transects are considered basic, economical and relatively precise methods for primate survey but there are major drawbacks. Mountainous terrain makes standardised methods such as these difficult to apply, both statistically and physically, and there is the urgent need to develop site-specific survey tools that take into consideration restrictions imposed by this environment.

The PRIMENET project established a series of line transects within the Los Cedros Reserve and generated the first estimates of population densities for the three resident primate species (see thesis results from Gavilanez-Endara 2006, Magnusson 2006 and Viki Hughes plus draft of papers for peer review) but there has been little interest from volunteers who visit the reserve to continue monitoring due to the steep nature of the transects required for statistical rigour!

In year 2 a new playback method, based on species-specific calls recorded from spider monkeys from the Los Cedros Reserve was developed. These methods use amplified calls of target species to either elicit vocal responses or to increase the rate of visual observations of the target species as they are attracted to the source of the sound. An MSc project by a student from the Oxford Brookes MSc in Primate Conservation carried out field validation of the method and a series of field surveys at sites throughout the altitudinal transect of the study region to investigate population density with altitude. The major practical conservation strength of this method is in speed at which presence and abundance estimates of the elusive spider monkey can be gained. This technique is to be applied by a parabiologist/student team to survey unprotected forest identified by the remote sensing analysis (see output 2 below). A paper detailing the survey method and the results is currently under preparation for publication in a peer reviewed journal.

Habitat assessment (Corporacion Botanica Ecuadendron - National Herbarium) – In collaboration with the Missouri Botanical Garden Rapid habitat assessment methods to investigate diversity and forest dynamics were developed. These methods were applied to the first site at the Los Cedros Biological Reserve (1500 masl). The habitat assessment team identified a second lowland site (Febres Cordero 300 masl) and fieldwork took place from January to March 07. Fieldwork was carried out in collaboration with parabiologists and botany students. This methodology, involving identification of samples to species level, will provide detailed information on structure, composition, diversity and forest dynamics. The samples are now all identified – the database is included in the supplementary material CD. The dataset – the first of its kind in to examine forest gap dynamics - is currently under analysis and due to result in a number of scientific publications.

The rapid assessment method developed still requires expert botanists to guide collection and undertake identification so the PRIMENET team were interested to see whether proxy methods can provide information on status of forest using teams of relatively untrained individuals. The field sites that formed the study sites for detailed assessment were revisited in the summer of 2007 by members of a Bournemouth University expedition that worked in collaboration with the Darwin Initiative project. The project received funding of £1000 from the Royal Geographical Society. They were provided with basic-level training and carried out a rapid assessment of the

30 plots (15×15m) at both Los Cedros and Febres Cordero previously characterised by our botanical team. By collecting structural and physical data and measuring time taken in measurements the data collected by these 'very rapid' assessment methods has been compared to the existing comprehensive vegetation surveys for each plot to evaluate the efficacy of each method in terms of cost and reliability. This work fits in with our aim to investigate a potential suite of simple tools and methods that could be rolled out for independent use by parabiologists. The results are to be presented at the British Ecological Society, both orally and in posters. A paper is under preparation for publication in a peer reviewed journal.

Focusing particularly on the habitat requirements of *A. fusciceps* a master's project from the Oxford-Brookes MSc in Primate Conservation investigated changes in keystone fig species across an altitudinal trend at the Los Cedros Reserve resulting in a peer reviewed publication (Shanee & Peck, 2008). This work was expanded to investigate species-specific changes in figs with altitude by Katherine Fitzpatrick from the University of Sussex with a successful grant bid to the RGS Monica Cole Research Grant fund (£1000) (Paper under preparation).

References

Shanee S, Peck MR (2008) Elevational changes in a neotropical Fig (Ficus spp.) community in North Western Ecuador. iForest 1: 104-106 (2008)

Aerial taxonomy - novel habitat assessment methods using low altitude aerial photographic methods: Advances in remote sensing techniques, and public access to imagery collected from satellites through interfaces such as Google Earth have the potential to provide a new rapid habit assessment toolkit. For example the Identification of species, or species groups, from aerial imagery of tree crowns can potentially provide a wide range of scientific information on the conservation status of forest by recognising rare and threatened canopy species, measuring a forests carrying capacity for frugivores and providing other ecological information important for restoration reforestation. However, at present the potential for using this tool is limited by a lack of field calibration. A field trial of an innovative method to assess habitat via the use of aerial images of the forest canopy - collected by a helium balloon photographic platform- was successfully carried out and formed the basis of a successful exit strategy funding proposal to Earthwatch (For details see section 4.6 below). The 'Climate change, canopies and wildlife' project will continue work carried out by PRIMENET to collect aerial imagery in the Western Andes using a model helicopter photographic platform. Pattern analysis will be used to determine the ability of automated algorithms in identifying species and species groups.

Both the botanical team and the primate survey team have been working successfully alongside parabiologists trained in September 2006 to collect habitat data and primate data from communities in the buffer zone. The links formed at the community level via the parabiologists has been critical to the acceptance of scientific teams in the communities. Without this kind of linkage scientific survey teams can run into difficulties as they are often viewed with suspicion, as they are commonly associated with mining surveys in the region.

Figure above. From left to right: Prototype helium balloon remote sensing platform, and imagery obtained showing crowns labelled and identified to species from the hectare plot established at the Los Cedros Reserve. Final methodology involved use of remote controlled helicopter photographic platform to collect low level imagery. Once the level of taxonomic resolution is determined the aim is to build 'aerial taxonomy' keys that can be used to identify density of keystone food species, such as figs, and indices of canopy connectivity that are critical to arboreal locomotion – ongoing work through successful exit strategy funding by Earthwatch.

2) PRIMENET GIS database

The large scale GIS map of NW Ecuador is now complete containing data layers that include altitude, remaining forest (from a supervised classification mosaic of LANDSAT imagery), protected areas and MAXENT modelling of primate distribution. The layers are all displayed in map format and build up to define the conservation action plan for the region based on remaining forest and hunting activity. The maps are available for download from the PRIMENET website (www.primenet.org.uk/resources). The full report that forms the species and habitat action plan '*Focusing conservation efforts for the brown-headed spider monkey (Ateles fusciceps) using remote sensing, predictive distribution modelling and playback field survey'* is available from the website and is included in the accompanying CD of resources.

Additional work that included analysis of LANDSAT imagery highlighted a 56% reduction in forest cover from 1987 – 2001 in the 15km buffer zone of Cotocachi-Cayapas Ecological Reserve (BSc thesis project June 2006). This highlights the ongoing rates of forest conversion in the buffer zone and the importance of defining and protecting remaining hotspots of habitat with populations of primates. The GIS dataset also formed the basis for a student project to estimate population viability under various conservation management plans (MSc thesis in Primate Conservation, Oxford-Brookes).

A bespoke PRIMENET database has now been completed by the IT department of Life Sciences at the University of Sussex (representing a further 'in kind' contribution of approximately £7000) to provide standardised long-term storage of primate and mammal observations. A web-based front end allows input of observations by parabiologists and field researchers. A linkage to 'google map' allows users instantaneous display of observations in a map format via the web. Access to the database via a login code is free to conservation and governmental organisations.

Output 2. GIS database established at Los Cedros Biological Reserve.

A GIS database (ARCVIEW 3.3) has been established at the Los Cedros Biological Reserve. It has layers that hold information on the trail systems, primate transects, and a standardised database for primate observations. Reserve staff received a 3-day course in analysis of observations to obtain density and abundance measures using the industry standard computer program DISTANCE 5.0 in September 2006. This course was advertised nationally and was attended by an international conservationist and two Ecuadorian PRIMENET students in addition to the Los Cedros staff member (Course handbook attached as supplementary material).

Output 3. Public awareness campaign focusing on primate conservation disseminated via network.

During the lifetime of the project the following material was generated:

Educational material prepared during the first year of the project

- 26 000 issues of the magazine *Ecuador Terra Incognita*.
- 5 000 posters of the PRIMENET project.
- 300 T-shirts.
- Three articles.

This material was distributed as follows:

Magazines: 22 000 issues were sold at national level in more than 70 cities or towns in the Ecuador. 4 000 issues have been distributed for free among local communities by PRIMENET in regions of particular focus, both in parabiologist and educational workshops. **Posters:** 3 000 posters were distributed for free amongst *Ecuador Terra Incognita* subscribers. 2 000 posters were given freely to communities. **T-shirts:** 200 T-shirt were distributed freely to local communities. 100 T-shirt were given to people and institutions involved in environmental protection in Ecuador. **Articles:** At the national level three articles outlining the PRIMENET project were published in editions of *Ecuador Terra Incognita* magazine in July of 2005, March 2006 and May 2006. Each publication had a print run of at least 22 000 copies.

Educational material prepared for the second year of the project

The material published in the second year included:

- 2 000 books "A field guide to the mammals of Ecuador". This is the first published general public guide to mammals of Ecuador with a special emphasis on primates.
- 3 000 issues of a special magazine prepared for the PRIMENET project. It includes information about the importance of Chocó region, its bio-diversity, mammalian fauna, primate conservation, aspects of natural resources conservation and a cartoon highlighting the importance of conserving brown-headed spider monkey populations.
- 3 000 stickers of the PRIMENET project.
- 283 T-shirts with a new design.

The educational material was distributed as follows:

Books: 1 980 books circulated at international and national level, 20 books have been given freely to communities, people or institutions involved with PRIMENET project. **Magazines, stickers and T-shirts:** 100% of this material has been distributed amongst the communities, people or institutions involved with the project PRIMENET, mainly during the educational and training workshops.

Educational material prepared for the third year of the project:

- 1 000 books "Mammals of the humid forests of Ecuadorian north-western." This is a field guide to the 165 mammals of NW Ecuador with an emphasis on primates.
- 3 000 educational booklets for children.
- An article (of three pages length) in the magazine *Ecuador Terra Incognita*.
- 500 issues of *Ecuador Terra Incognita* with a PRIMENET article.

This educational material has been distributed as follows:

Books: 600 books were distributed for free in educational institutions, environmental organizations, forest inspectorates, communities and people involved in the conservation of Ecuador's north-western forests. 400 books circulated at national level. **Educational booklets:** All the booklets were distributed in elementary schools inside the area of project focus. The booklets were designed for children from seven to 12 years of age. **Article and magazines:** The article was published in the magazine *Ecuador Terra Incognita* of March 2008. It explains the advances made by the Darwin Initiative project. The print run of Ecuador *Terra Incognita* of 26 000 copies was distributed at the national level, guaranteeing a large audience. 500 issues with this article were distributed for free among the main project actors and communities.

Environmental Educational programme

The environmental education programme worked in parallel with, and expanded upon the parabiologist training workshops. The environmental education programme was focused within two main areas: the southern region of the Cotacachi-Cayapas Ecological Reserve (principally the provinces of Imbabura and Esmeraldas) and the north of Cotocachi-Cayapas Ecological Reserve (within the buffer zone of the Awá Ethnic Reserve and the watershed of the Mira river). A detailed list of locations visited is shown in the table below. The educational programme was designed to work at two key levels. 1) At the level of formal educational centres (primary and secondary schools) and 2) At the level of communities and community organizations.

Predetermined communities were visited to contact key players such as presidents and village representatives and

directors and principals of educational centres. Within schools or institutes educators specialising in conservation topics, particularly teachers of social and nature Sciences were contacted. During these initial meetings the PRIMENET project was explained and the educational methodology and results sought through the educational program explained. The environmental education work took place from January and June of 2007 and from April to May of 2008. All educational material (described above) was distributed in this period. The program of environmental education followed a workshop format similar to parabiologist training and included the following topics; Ecuador, a mega-diverse country, The Chocó region - its importance and need for conservation, mammalian diversity of Ecuador, primates of north-western Ecuador, environmental problems in Ecuador, sustainable development, conservation of natural resources and development, the Importance of conservation.

A detailed list of the educational centres visited during the project can be found in Annex 6.

Dissemination to government, NGOs, general public and media: One of the final activities involved running a workshop (May 23 of 2008) in Quito to present project results to governmental institutions, NGO's, media and the public. The following presentations were given

- The brown-headed spider monkey in north-western Ecuador and the PRIMENET project. Presented by Diego G. Tirira.
- Characteristics of the dynamics of natural forests and a new methodological proposal for a quick vegetation inventory based on the presence of clearings in tropical rainy ecosystems. By Ana Mariscal.
- Characteristics and representative species flora ofthe study area, the cooperative León Febres Cordero, Guayacanes and 3 de Septiembre, located at the borders of Imbabura and Esmeraldas provinces. By Edison Jaramillo.
- Characteristics and representative species of the flora of the study area, Los Cedros Biological Reserve. By Rocío Manobanda.
- Floristic results of the rapid vegetation inventories in highlands and lowlands of the buffer zone around Cotacachi-Cayapas Ecological Reserve. By Miguel Ángel Chinchero.
- Habitat preferences of three primate species in a cloudforest of north-western Ecuador. By María Mercedes Gavilánez, Mika R. Peck, Diego G. Tirira and Santiago Burneo.
- Demographic parameters of *Ateles fusciceps* and *Alouatta palliata* in north-western Ecuador. By Xavier Cueva.
- Contributions from a participative approach to the conservation of natural resources. By Karina Paredes.
- A para-biologist's experiences. By Martin Obando (Community of Brillasol).

Participants included representatives of the following institutions; Foundation Altropico, Foundation Ave & Conservation, Foundation Cambugán, Foundation EcoCiencia, Foundation Las Golondrinas, Foundation Los Cedros, Foundation Maquipucuna, Foundation Sirúa, National herbarium of the Ecuador, Ministry of Environment of Ecuador, Ecuadorian Museum of Natural Sciences, National Police. Unit of Environmental Protection, Pontifical Catholic University of Ecuador, School of Biology, Pontifical Catholic University of Ecuador, Museum of Zoology, Moore project, Zaracay Radio, International Union for the Conservation of Nature (IUCN), Regional Office for South America, UNITA University, Central University of Ecuador (School of Biology), San Francisco University (Applied Ecology Department ECOLAP), University UNIBE.

Output 4. Masters level training for Ecuadorian Partners.

MA in Participation and Social Change at the Institute of development studies, IDS (Brighton, UK). Karina Paredes, from the primate survey and educational team has undertaken 2 stages in the UK and is currently completing her fieldwork component of her thesis (funded through the Network for Social Change) focusing on community participation in establishment of community protected forests with PRIMENET. She returns to the UK for a final 10 week period at IDS for completion of the MA in Jan 2009 (termination date changed due to shift in term times for MA programme). MSc in Forest Ecology at the University of San Francisco (Quito, Ecuador) - Nelson Miranda has successfully completed the taught component and passed the examination.

He is currently terminating his thesis project with the herbarium and PRIMENET that contributes to our goals of habitat assessment and sustainable livelihoods (see output 7 for more detail).

Output 5. Training centre for Parabiologists and local staff established at Los Cedros Biological Reserve.

Parabiologist training materials (Text, DVD, presentations) completed and applied during September 2006 Los Cedros Parabiologist training course. All material from the course is available on the CD included as supplementary material in report 4. In addition a DVD in Spanish and English was developed for reserve volunteers and parabiologists to demonstrate field methods and protocol for primate survey. Following the first parabiologist training course a mobile training structure was developed to bring the training directly to the communities.

Output 6. Parabiologists trained as certified primate and habitat ecologists

Among the main objectives of PRIMENET project was to train local residents in conservation of natural resources, wildlife and sustainable development. The aim was to ensure that local communities become engaged in conservation activity by subsequently engaging with PRIMENET field researchers. At the end of each workshop certificates were presented and a work schedule for the following months drawn up. Topics covered during the training courses included; Ecuador - a diverse country, mammals - what are they and how diverse they are, mammalian conservation, An introduction to the primates of Ecuador, primates of north-western Ecuador, Ecuadorian fauna (birds, reptiles, fishes), categories of the red lists, wildlife conservation, environmental problems in Ecuador, sustainable development, conservation of natural resources and development, Importance of natural resource conservation, key factors affecting biodiversity, conservation action, features of natural resources, training in the use of GPS, mapping and trail and transects marking, mapping of land use and borders, field surveys for primates.

The approach employed during these workshops, particularly when discussing issues of conservation, was mainly participative and practical as PRIMENET recognized the importance in empowering local people to analyze, plan and find their own solutions and alternatives to their environmental problems. With this objective in mind all PRIMENET staff attended a training workshop on January 2008 (led by Karina Paredes) to further understand participatory principles and methodologies. The participatory environment created during subsequent workshops was considered a key factor in attaining real participation, the free expression of attendants and effective two-way communication. The construction of a safe space to share ideas and raise confidence both at personal or group level was sought through icebreakers, games, creative forms of expression such as drama or drawing. Given the diversity of the groups, each workshop was designed to be flexible and respondent to their interest, educational level and objectives; thus none followed identical formats. The results obtained following each workshop could be measured not only in the success in delivering an educational message proposed by the project but the creation of friendships and trust fundamental for future collaboration. In addition, each workshop has been a great opportunity to learn from local people's experiences, realities and expectations, critical for enriching our vision and improving our performance.

A total of five para-biologist training workshops were carried out:

Workshop 1. Los Cedros Biological Reserve, Imbabura: The parabiologist training course (100 hours) completed with 25 participants from 8 communities of the Southern Buffer Zone of Cotocachi-Cayapas Ecological Reserve attending and successfully completing course (11th – 15th September 2006). Our website shows a short video providing an overview of parabiologist training; see it under resources at www.primenet.org.uk.

Workshop 2. Community of Cristóbal Colón, Esmereldas: Completed in June 2007 with 25 participants from communities belonging to the south-western buffer and impact area of Cotacachi-Cayapas Ecological Reserve.

Workshop 3. Community of Río Verde (Awá territory): Completed in February 2008 within the Awá indigenous territory with mid to highland indigenous Awá communities. This workshop inside Awá territory was critical as the Awá Ethnic and Forest Reserve is the second-most

important region for conservation of the brown-headed spider monkey. Lengthy negotiation with the Awá federation was necessary to allow the workshop to take place.

Workshop 4. Community of Pambilar (Awá territory): Completed March of 2008 with 32 people trained from 6 local Awá communities - mostly inhabitants of the lowlands. It is necessary to highlight that the first impression of resistance and wariness exhibited by the communities was overcome through participative methodologies involving activities carried out entirely in Awa-pit, their native language.

Workshop 5. Community of Guallupe (Imbabura): Completed in April 2008 in collaboration with the Las Golondrinas Foundation – in charge of management of the protected forest. 12 people attended from nine communities.

Output 7. Sustainable Livelihoods

A successful exit strategy has maintained the parabiologist network (through funding from the Holly Hill Trust and Peoples Trust for Endangered Species) and contributes directly to achieving this output. A further successful bid to Earthwatch has resulted in the 'Climate change, canopies and wildlife' programme that is generating financial sustainability for the community based Santa Lucia Cloudforest Reserve and expands monitoring to other threatened mammals such as the puma and spectacled bear using networks of camera traps. The project is also allowing us to continue development of the 'aerial taxonomy keys' by collecting images throughout the altitudinal range. Rainforest Concern has committed £10 000 to support this initiative over a period of 3 years. This ensures the ongoing economic support of Santa Lucia Reserve and staff and parabiologists already trained by PRIMENET.

The MSc thesis in botany is investigating the potential for sustainable forest use in four of the communities from which parabiologists are already trained. The aim is to identify plants with potential commercial value using sustainable extraction criteria.

Parabiologists attending the first workshop at Los Cedros highlighted their interest in maintaining links between communities. This has led to the development of an inter-community training initiative. We submitted a successful proposal for funding to the Network for Social Change (£2104) to allow community exchanges and knowledge/skills transfer. Members of communities with differing expertise have hosted workshops for other communities to explain sustainable livelihood options. The aim is to ensure the dissemination of initiatives that have already been shown to work. The first community exchange workshop took place at Cristobal Colon (30/07/07 to 3/08/07) where there is expertise in sustainable community management of logging (ECOMADERA project) and a community group of honorary wildlife inspectors that have successfully dealt with illegal dynamite fishing and hunting in the region. The second exchange programme took place in Chontal (23/09/07 to 27/09/07) where there is a great deal of experience in Community Ecotourism. The aim was to generate grassroots contacts and sustainable livelihood initiatives.

As previously mentioned, a key output of the PRIMENET project has been the generation of information resulting in the rejection of the EIA of a large copper mine in the INTAG region. The subsequent removal of many mining concessions and declaration of the forests as protected by the municipal government has meant that residents can now continue their efforts to develop in a sustainable manner. As the PI of the PRIMENET project I wish to extend my utmost respect for community members and local governmental representatives that have endured real hardship in standing up for a sustainable future in the face of intimidation and threat (for more information see www.decoin.org).

4.3 Project standard measures and publications

Publications with a significant impact on discipline include the two field guides to mammals of Ecuador:

- Mamiferos del Ecuador (Mammals of Ecuador), Diego Tirira, 2007 ISBN-13: 978997844651.
- Mamiferos de los bosques humedos del noroccidente de Ecuador (Mammals of the rainforests of NW Ecuador) ISBN 978-9942-01-736-9

These are the first complete guides to all mammals recorded to date in Ecuador and provide an invaluable resource for future monitoring of mammalian fauna in this biodiversity hotspot.

'The Field guide to Mammals of Ecuador' is currently being translated into English.

4.4 Technical and Scientific achievements and co-operation

The bulk of the scientific work is divided into three main components – 1) Primate survey, 2) Remote sensing, GIS and playback field survey methodology and 3) Habitat Assessment.

1) Primate survey (Murcielargo Blanco, Pontifica Universidad Catolica, Universidade Central, University of Sussex, University of Oxford-Brookes)

Staff: Diego G. Tirira, Karina Paredes, Xavier Cueva, María Isabel Estévez, María Mercedes Gavilánez, María Eliza Manteca, Martín Obando)

Abstract: Field studies using standard transect visual methods were carried out at the Los Cedros Reserve (UTM N 0747354 E 0033898, Altitude 1428 m) and at lowland sites around Cristobal Colon (Altitude approximately 200 m). The primate species studied were *Alouatta palliata, Ateles fusciceps* and *Cebus capucinus*. At Los Cedros, over seven months, daily surveys of primate groups were carried out along a route of 12.5 km. *Ateles fusciceps* was the least abundant species, with a registered density of 1.16 individuals/km^2. *Alouatta palliata* was found at densities of 3.88 individuals/km^2 and *Cebus capucinus* was the most abundant species (24 individuals/km^2). The densities observed are low in comparison with other published studies. We propose some hypotheses to explain the low densities obtained, based on body size and diet of the studied species, lower productivity in cloud forests, lower resource availability, differences in habitat type, along with methodological differences (See appendix 8 for the draft paper – accepted for publication in the journal *Neotropical Primates*). The results obtained in this study represent important information for the development of conservation and management plans for the primate species inhabiting this zone. At the lowland site the highest densities of *Ateles fusciceps* were observed in Tesoro Escondido, reaching a value of 16.6 individuals/km^2, whereas for other localities the estimates fluctuated from 13.2 individuals/km^2 for León Febres Cordero, 4.4 individuals/km^2 for Santa Rosa de Naranjal and 0.6 individuals/km^2 for Voluntad de Dios. The population density for *Alouatta palliata* registered in Santa Rosa de Naranjal was 2.1 individuals/km^2, for León Febres Cordero extremely low densities were observed possibly due to ongoing hunting activity. Further data collected based on resource use and habitat use is currently under analysis to investigate coexistence strategies for the three primate species at Los Cedros Reserve.

2) Remote Sensing, GIS modelling and RAPID – Developing a rapid primate survey method using playback (University of Sussex, Murcielargo Blanco, University of Oxford-Brookes, Universidad Central)

Staff: Mika Peck, James Thorn, Abigail Baird, Martin Padbury, Xavier Cueva

Abstract: A land use map of the study region in NW Ecuador was generated by creating a mosaic with minimum cloud cover from a series of LANDSAT images. Following supervised classification, Information on land use was analysed based on species-specific criteria by identifying remaining forest area that could still theoretically maintain a population of spider monkeys. This was combined with MAXENT predictive modelling of spider monkey populations to provide a predictive map of forest capable of containing populations of *A. fusciceps*. A playback field survey technique was developed and validated then used to survey *A. fusciceps* throughout the altitudinal gradient of the Western Andes. The dataset generated, based on surveys in areas where hunting was considered minimal, provide some indication of the densities expected throughout the altitudinal gradients present in the remaining habitat and allow the development of field survey protocols. Hunting risk was predicted by buffering lowland human habitations by circles of 9km radius and highland, mountainous habitations by radius 3km. The final combined dataset was used to generate a species and habitat action plan for NW Ecuador for the brown-headed spider monkey, *A. fusciceps*. A paper is currently under

preparation for publication in the journal *Oryx* and the full report can be downloaded from the internet at:
(http://www.primenet.org.uk/Documents/Remote%20sensing%20report.pdf)

3) Habitat Assessment - Botanical Fieldwork (National Herbarium, Missouri Botanical Garden, Los Cedros Reserve, Community of Leon Febres Cordero)

Staff: National Herbarium (Corporacion Botanica Ecuadendron) Ana Mariscal, Rocio Guaman, Jaramillo Carvajal, Miguel Chinchero, Nelson Miranda, Edwin Carrillo, Homero Vargas)

Objectives:

- Establish a permanent hectare plot at the Los Cedros Reserve
- Develop a rapid habitat inventory for forest at different altitudes to determine the state of conservation [Los Cedros Reserve (Imbabura) , Community of León Febres Cordero (Esmereldas)].
- Compare successional status of primary forest to secondary regrowth on abandoned farmland.
- Compare the vegetation and dominant groups at differing stages of succession in primary forest.

Abstract: The botanical fieldwork involved developing rapid inventory methods for vegetation based on forest gaps (disturbance) in forest ecosystems with the aim of 1) Investigating structure, composition and diversity 2) Identifying fundamental processes of forest dynamics 3) Obtaining information to help determine state of conservation of forest. 27 plots of 30m x 30m were established in primary forest in forest gaps, natural regrowth and closed primary forest at the Los Cedros Reserve (UTM N 0747354 E 0033898, Altitude 1428 m). The site is classified as cloudforest (Valencia et al. 1999), and is characterised by an abundance of mosses and epiphytes. A further 27 plots were established in forest near the lowland community of León Febres Cordero (UTM N 722589.25 E 36613.35 altitude 137 m) classified as evergreen premountain forest dominated particularly by palms. Subplots were used to investigate small trees and deadwood. For detailed methodology see annex 7. Additonal work included collaboration with the University of Bournemouth (expedition 2007) where we compared techniques for evaluation, by non-specialist teams, of habitat quality in sites previously characterised to species level. Methods developed provided rapid, replicable assessments of forest structure and most epiphyte groups examined (Results presented at BES 2008). Results from the Los Cedros Reserve based on a total collection of 2744 individual specimens from trees gave 337 species, from 40 genera and 61 families. Five families dominated; Cecropiaceae (18 %), Lauraceae (14 %), Melastomataceae (9 %), Rubiaceae and Moraceae (6 %). At an estimated 299 species per hectare, the Los Cedros reserve can be classified as amongst the most biodiverse forests in the world. In lowland forest a total of 1611 individual samples were collected made up of 257 species from 118 genera and 49 families. The five dominant families at this altitude were Arecaceae (14 %), Rubiaceae y Lecythidaceae (9 % each), Myristicaceae (8 %) and Cecropiaceae 7%. Further detailed analysis can be found in Annex 7 (More detailed analyses to investigate disturbance dynamics and papers for peer review and publication are current under preparation and copies will be forwarded to Darwin Initiative upon publication).

4.5 Capacity building

The Darwin Initiative project has increased host country partner capacity for biodiversity work. This is evident in ongoing collaborative work with the UK partner and generation of funding proposals (presented by host country organisations) to expand on work initiated by the PRIMENET project.

Institution building: Host country initiative to establish a new NGO dedicated to mammalian conservation (Mamiferos y Conservacion)

Organisational development: Increased capacity of National Herbarium (Corporacion Botanica Ecuadendron) to manage and execute projects.

Training and human resources: Legacy of undergraduate and postgraduate students trained in primate and habitat survey. Training of PRIMENET staff in participatory techniques ensuring

greater community/researcher/conservationist understanding and hence long term project success.

Sustainable financing: By incorporating scientific tourism within the Los Cedros Reserve through PRIMENET and the Santa Lucia Reserve (exit strategy) capability of reserves has increased financial sustainability.

Publication of the first field guides to mammals provides the raw materials for future biodiversity assessment in Ecuador by NGOs, Universities and the general public.

The project has provided a platform for multidisciplined research within the lead institution, the University of Sussex. The collaboration has been particularly strong between the Department of Geography, offering remote sensing expertise, and the Department of Biology and Environmental Sciences. A strong inter-institutional link has also been built between the Institute of Development Studies and the University of Sussex through the incorporation of the MA in Participation and Social Change. Strengthening Intra-institutional bonds has increased the capacity of the lead partner to provide adequate project management. A special note must be made of the excellent job carried out by the financial department with respect to budget management.

4.6 Sustainability and Legacy

The single most important achievement of the project was the provision of data to the Ecuadorian government that contributed to the rejection of the EIA of a large proposed copper mine that would have impacted on an area of some 40000 hectares. The subsequent declaration of the area as protected forest by the local municipalities has ensured further protection for these highly biodiverse cloudforests surrounding Junin in the Intag region.

The availability of scientific information to underpin critical development decisions by governmental authorities is critical to ensure balanced choices are made and the information dataset - demonstrating the existence of primary forest in the concession area through remote sensing and the potential impacts to biodiversity - would not have been available without the existence of the Darwin Initiative PRIMENET project.

The capital and social investment will ensure that links made between communities and NGOs involved in the project provide the opportunity for future collaboration – this is currently exemplified by the ongoing parabiologist survey programme and work by Karina Paredes to examine power structures in a post conflict area (Junin, INTAG) and work with communities to identify sustainable futures (Brillasol, INTAG).

A successful funding proposal to Earthwatch (‘Climate change, canopies and wildlife’) put forward by all PRIMENET partners is now based at the Santa Lucia Cloudforest Reserve and is expanding wildlife monitoring techniques to other large charismatic mammals such as the spectacled bear and big cats and provides the opportunity to further investigate aerial taxonomy techniques. This was inspired by the importance of scientific information on IUCN category species in the governmental decision to reject the EIA for the copper mine in Intag, as many protected areas, including Santa Lucia, are potentially threatened by a decision to mine minerals. A further contribution to sustainable development is the establishment of a Sussex University field course in ‘Tropical Forest Science’ in 2009 at the reserve in 2009 – further contributing to financial sustainability of reserves.

UK Project staff (PI Dr Mika Peck) is currently employed part-time by the University of Sussex and will start to work with the NGO Rainforest Concern from January 2009 to extend the rainforest corridor in NW Ecuador. As part of this collaboration to strengthen forest protection and restoration reforestation initiatives in Ecuador the University of Sussex, Rainforest Concern and PRIMENET partners NGO Mammiferos y Conservacion and the National Herbarium are proposing a future Darwin project Canopy PACE to promote the adaptive capacity of cloudforest Ecosystems. The success of the PRIMENET project and proven track record of working partnerships has ensured £75000 match funding for this proposal submitted in August 2008. Other partners are continuing to carry out research into mammalian and habitat conservation.

Resources from the project have been handed over to Ecuadorian partners and many now transferred to support the Earthwatch project based at the Santa Lucia Reserve.

As described above partners are still actively working together on ongoing research and active conservation, particularly focusing on identifying areas of conservation focus, developing sustainable incomes for existing reserves through scientific tourism and in expansion of protected areas in NW Ecuador – a success in the development of a sustainable network for primate conservation in NW Ecuador.

5 Lessons learned, dissemination and communication

A key lesson to be drawn from experience of this project is the importance of dissemination of scientific information to decision-making forums through networks that link communities, grassroots organisations, academics and government.

This was illustrated by the provision of information generated by the PRIMENET project to the Ecuadorian government when involved in deciding on an EIA for a large open-cast copper mine. To ensure that information generated by research is applied in society it was important to have direct links with communities and grassroots organisations actively involved in developing sustainable futures (in our case; local reserves, DECOIN, Rainforest Concern). In this case grassroots organisations approached PRIMENET for information on the status of forest in the proposed mining area.

The key lesson links, principally, to the need to disseminate project aims and achievements. This is critical particularly during the exit strategy of the project when working at the community level to ensure that communities do not feel they 'have been taken advantage of'. A common complaint reported during participatory work with communities is that they have never seen the results or benefits of previous projects that have taken place in their forests or communities. This is principally due to the building up of community expectations and a lack of communication by the relevant authorities charged with project management. As part of the exit strategy dissemination of project results included an article in the national magazine 'Terra Incognita', a presentation to governmental, academic and conservation organisations and, in addition, we will continue dissemination by revisiting communities in which parabiologist training took place to present the final results generated by the PRIMENET project at the grassroots level.

5.1 Darwin identity

All material developed contained the Darwin Initiative logo and written material stated that the project was a UK Darwin Initiative funded. This provided clear branding of PRIMENET as a Darwin Initiative project. As such the project had a clear identity as an independent Darwin Initiative project. The high profile of PRIMENET as a Darwin Initiative project resulted PRIMENET being approached by Rainforest Concern and the Holly Hill Trust to comment upon potential impacts of mining on spider monkey populations and habitat in the region and has led to ongoing support of the project as part of the exit strategy. In addition, Darwin Initiative funding has enabled leverage of substantial further funding for project activities both during and after the project end dates.

Within Ecuador the Darwin Initiative has a clear identity at the level of NGOs and Governmental organisations.

6 Monitoring and evaluation

The M&E system does provided guidance and feedback to partners and stakeholders during the lifetime of the project and the system is practical and of value. The use of the newly designed log frame (introduced last year by the Darwin Initiative) during reporting provides a better structure for evaluating progress. It might be of value, at the stage of project development, to provide clearer guidance to PIs regarding the development of quantifiable 'outcome indicators' and 'impact indicators' – perhaps successful examples from previous projects – particularly in monitoring purpose-level and final (impact) indicators. Although we

recognise that it can be difficult to provide a clear analysis for impacts that might be felt beyond the lifetime of the project it would be useful to have guidance on best practise.

Through a reporting schedule the project was also evaluated on an annual basis by the Ecuadorian Government and, at the final workshop in April 2008, the project was highly commended.

6.1 Actions taken in response to annual report reviews

All issues raised during annual reports have been responded to. All reviews were disseminated to project partners for discussion and analysis, providing a regular forum for reflection.

7 Finance and administration

7.1 Project expenditure

TOTAL SUMMARY

CLAIM HEADINGS	BUDGET	SPENT	% DIFFERENCE
STAFF			
RENT/OVERHEADS			
POSTAGE/OFFICE			
TRAVEL			
PRINTING			
CONFERENCES			
CAPITAL			
OTHER-FIRST AID			
OTHER-TRANSFER COSTS			
OTHER-BOOKKEEPING			
OTHER-PARABIOLOGIST			
TRAINING			
OTHER-HERBARIUM COSTS			
OTHER-MA PARTICIPATORY			
OTHER-AUDIT			
TOTALS	**£ 236,270**	**£ 236,143.62**	

BUDGET CHANGED FEB 2006 AGREED WITH MARGARET OKOT

Table showing grant expenditure against original budget. Categories with spending >±10% highlighted in yellow.

Two categories resulting in spends of >±10%; CAPITAL COSTS rose to 21% greater than budgeted and AUDIT COSTS fell by 50%. CAPITAL COSTS rose as the UK PI chose to to invest in the University of Sussex Pension scheme liberating funds from STAFF COSTS. This excess was subsequently invested in capital costs for the PRIMENET project.

A breakdown of capital costs can be found in Annex 9.

7.2 Additional funds or in-kind contributions secured

Extra direct funding secured during lifetime of project (total £101178)

Primate Society of Great Britain, Status of the Brown-headed spider monkey (*Ateles geoffroyi fusciceps*) in the Andean cloud forest of the Los Cedros Biological Reserve, Ecuador £750

Primate Conservation, Incorporated, RAPID - Development of playback for rapid population assessment of the critically endangered brown-headed spider monkey (*Ateles fusciceps*) £1525

International Primatological Society, RAPID - Development of playback for rapid population assessment of the critically endangered brown-headed spider monkey (*Ateles fusciceps*) £900

Holly Hill Trust, Undergraduate Research project support, £4000

Monica Cole Research Grant Application, Investigation of environmental tolerances of key food resources of the critically endangered Andean brown-headed spider monkey (*Ateles fusciceps*) £970

Network for Social Change, Ecuador - community training for sustainable development and conservation £2,104

Network for Social Change, Camera trapping and charismatic mammals £1,418

Peoples Trust for Endangered Species, 'Parabiologist Survey Team' - saving the top 25 endangered brown-headed spider monkey £5,000

Network for Social Change, EMPOWER - Conserving one of the Worlds most biodiverse hotspots through community empowerment £10,304

Holly Hill Trust, Parabiologist Training programme, £20,000

Holly Hill Trust, Camera Trapping Project, Holly Hill Trust £20,000

Earthwatch Institute, Climate change, canopies and wildlife £24,207

Rainforest Concern, Climate Change, Canopies and Wildlife £10,000

As part of the exit strategy the following direct matching funds have been secured (Total £90000)

Holly Hill Trust, Canopy PACE – Promoting the Adaptive Capacity of Cloudforest Ecosystems, £60000

Rainforest Concern, Canopy PACE – Promoting the Adaptive Capacity of Cloudforest Ecosystems, £30000

7.3 Value of DI funding

Through a programme of research, monitoring and environmental education, funding from the Darwin Initiative has enabled the host country to develop habitat and species action plan for the critically endangered brown-headed spider monkey, disseminate a focused environmental education programme at the local, national and international level, and built capacity to continue conservation efforts focusing on supporting existing reserves and protecting remaining forest habitat in NW Ecuador.

This project has averted negative impacts from mining and contributed to the declaration by the Cotocachi local government of protected status to 18000 hectares of forest in NW Ecuador. The PI and all partners wish to extend our gratitude to the Darwin Initiative for supporting this project.

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

Annex 1 Project's final logframe, including criteria and indicators

Project summary	Measurable Indicators	Progress and Achievements	Actions required/planned for next period
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* *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*		*Data generated by the PRIMENET project contributed to rejection by the Ecuadorian government of the Environmental Impact Assessment for a large proposed open cast copper mine in this biodiversity hotspot. This work was highlighted in the Darwin Initiative CEPA review report as an example of 'best practise'.*	*(do not fill not applicable)*
Purpose To *conserve* the critically endangered brown-headed spider monkey (*Ateles fusciceps*), vulnerable primates and habitats in NW Ecuador based on a programme of monitoring, education and sustainable livelihoods within local communities.	Primate and habitat monitoring programme in place by Yr 3 to monitor effectiveness of educational programme and increased habitat protection on primate species. Educational programme effectively disseminating conservation material to local communities.	There has been a great deal of success in achieving outputs and in conserving habitat in NW Ecuador with the rejection of the EIA of a 4000 ha open cast mine and subsequent declaration of 18000 ha of protected forest by local government. Reserves supported through successful exit strategy providing sustainable livelihoods. Parabiologist survey team supported by International NGOs to continue field surveys of critically endangered brown-headed spider monkey. Successful bid to Earthwatch by project partners ensuring sustainable livelihoods for cloudforest reserve. Education programme completed at local, national and international level.	Exit strategy: Funding bid to Darwin Initiative by partnerships developed through PRIMENET for Canopy PACE project – Promoting the Adaptive Capacity of cloudforest Ecosystems. Funding bids to international donors to maintain parabiologist teams after 2009 Link reserves and buffer zone communities to carbon sequestration funding through 'Plan Vivo'
Output 1. Network established to monitor primate status and habitat using participatory field surveys and trained village-level parabiologists.	Partner Institution staff carrying out primate surveys & rapid habitat assessments (Yrs 1,2,3). Up to 20 community parabiologists providing primate data and disseminating educational material.	Partner institutions effectively carried out primate surveys and habitat assessments. There is also a high degree of integration with parabiologists and their communities. Parabiologist training courses successful with **106 parabiologists completing course**. Field teams integrated with parabiologists to undertake habitat and primate surveys and educational dissemination. Reliable indicator.	

Activity 1.1 Robust Field survey data (Field reports) (Yrs 1,2,3).		Field reports received on time from all partners **Primate surveys (Murcilargo Blanco)** – Primate field study completed providing the first data regarding population status and characteristics, activity patterns and habitat preferences of the three primate species inhabiting a range of altitudinal gradients in the study area, *Alouatta palliata*, *Ateles fusciceps* and *Cebus capucinus*. **Habitat assessment (Corporacion Botanica Ecuadendron)** –Habitat assessment complete at highland (Los Cedros Reserve) and lowland site (Febres Cordero). Field sampling carried out in collaboration with parabiologists and botany students (Jan – Mar 07). Collected samples all identified by Herbarium staff and final data analysis and scientific papers under preparation (Dataset included with report). Successful field trial of innovative aerial habitat assessment methodology – that formed basis of successful bid from Earthwatch as part of exit strategy (see output 7 below) Partners successfully worked alongside parabiologists to collect habitat data and primate data from communities in the buffer zone. Bournemouth University expedition (Summer 2008) worked alongside parabiologists to establish a camera trapping network to expand monitoring to other charismatic mammals and to investigate rapid habitat assessment methods.
Activity 1.2. Field data published to database & GIS updated biannually (Yrs 2,3) and published to internet website.		Remote sensing GIS mapping of NW Ecuador complete and available from website (www.primenet.org.uk/resources). Analysis of LANDSAT imagery highlighted a 56% reduction in forest cover from 1987 – 2001 in the 15km buffer zone (see map) (BSc thesis project June 2006). Bespoke PRIMENET database completed by IT department of Life Sciences at the University of Sussex to provide standardised long-term storage of primate and mammal observations. A web-based front end allows input of observations by parabiologists and field researchers. A linkage to 'google map' allows users instantaneous display of observations in a map format. The database is currently in use by the parabiologist survey team. Access to the database free to conservation and governmental organisations.
Output 2. GIS database established at Los Cedros Biological Reserve.	Data from field surveys updated to database by trained local staff.	Database established and maintained with updated information from field surveys by reserve volunteers. 3 day DISTANCE sampling course provided by PI to Reserve Staff, International Conservationists and PRIMENET students (September 2006). Need to reinforce data collection and training as part of exit strategy.
Activity 2.1. GIS database published to internet showing distributions of		GIS database published to web April 2008

primates and habitat status (Yrs 2,3).		
Output 3. Public awareness campaign focusing on primate conservation disseminated via network.	Causes of unsustainable behaviour identified through participatory methods and public awareness material developed and printed (specific to indigenous Awa, Chachi, Afro Ecuadorian and Mestizo communities); up to 5000 copies per year distributed.	The parabiologist training course included participatory sessions to identify the causes of unsustainable behaviour; some were community specific and ranged from negative impacts from mining and palm oil plantations to uncontrolled tourism. Educational material has been published, and disseminated internationally, nationally, regionally and at village level.
Activity 3.1. Publication of material for environmental awareness campaign (Yrs 1,2,3).		Environmental awareness campaign material published in years 1, 2, 3. Full details of all material published can be found in section 4.2 (Output 3). Reliable indicator.
Output 4. Masters level training for Ecuadorian Partners.	Primate Survey Principal investigator (PI) qualifies in MA in Participation, development and social change. Botanics Research Assistant (RA) qualifies in MSc Botany (Forest Ecology).	Masters programmes proceeding as planned with successful completion expected in early 2009, delays to programme end for MA due to curriculum change at IDS. Reliable indicator.
Activity 4.1. MA certificate from IDS, UK (Yr 3). MSc certificate in Forest Ecology from San Francisco University, Ecuador (Yr 3).		MA in participation and social change at the Institute of development studies. Karina Paredes registered for the MA beginning in September 2007 – programme ends March 2009. MSc in Forest Ecology (Nelson Miranda - Botanist) – the student successfully completed year 1 and is currently terminating fieldwork thesis project (1 year) that contributes to PRIMENET goals of habitat assessment and sustainable livelihoods (see output 7)
Output 5. Training centre for Parabiologists and local staff established at Los Cedros Biological Reserve.	Training Centre materials established by Yr 2 and training underway of local staff and parabiologists (Yrs 2,3).	Training material for 100 hour parabiologist training course complete, 106 parabiologists trained to date. Parabiologist course based at Los Cedros for year 1 to train southern buffer zone parabiologists. Change to mobile training course to train parabiologists in SW and Northen buffer zones and Awa Indigenous Reserve.
Activity 5.1. Training course developed (Yr 1) and teaching materials published (Yr 2). DVD course ´training the trainer – running a parabiologist training course´ complete (Yr 3).		Parabiologist training materials (Text, DVD, presentations) completed, reserve staff trained in practical modules of the parabiologist training course (CD containing parabiologist training materials and DVD introducing field primate survey methods attached). Material deployed in all training courses.
Output 6. Parabiologists trained as certified primate and habitat ecologists.	Up to 20 community members trained as certified parabiologists (Yrs 2,3).	High degree of interest in parabiologist training total of **106 parabiologists** trained. Total of 5 parabiologist training courses implemented during lifetime of project.
Activity 6.1. Up to 20 parabiologists receive Parabiologist certificate		Parabiologist training course (100 hours) completed by 106 participants from 36 communities in NW Ecuador attending and successfully completing course.

'Forest ecology and field survey methods'.		
Output 7. Sustainable Livelihoods	Parabiologists supported long-term as per exit strategy. Other sustainable livelihood programmes identified and initiated.	Successful funding bid to the Peoples Trust for Endangered species and Holly Hill Trusr supporting parabiologist survey team. Successful funding bid to Earthwatch to maintain and expand the monitoring program and habitat assessment research ensuring financial sustainability for reserves. Community exchange programme externally funded to disseminate local knowledge in sustainable livelihoods between communities (Network for Social Change). MSc thesis (Botany): Potential for sustainable forest use in four communities in NW Ecuador, Imbabura Province. Questionnaires and interviews to identify the value of forest to communities will be followed by a field inventory using the habitat assessment methods developed in PRIMENET to identify plants with potential commercial value using sustainable extraction criteria.
Activity 7.1. Ongoing national and international funding after Yr 3. Links between Para-biologists and other sustainable livelihood projects established.		Successful funding proposals to Peoples Trust for Endangered Species and Holly Hill Trust supporting parabiologist survey team to maintain monitoring of critically endangered brown-headed spider monkey in areas identified by PRIMENET conservation action plan. Successful funding proposal submitted to Earthwatch 'Climate change, canopies and wildlife' with aim to maintain field surveys and expand to monitor other threatened mammals using networks of camera traps from June 2008. Habitat assessments to continue to develop aerial taxonomy methods. Rainforest Concern committed £10 000 to support the initiative. Inter-community training initiative received funding from the Network for Social Change (£2104) to allow community exchanges and knowledge/skills transfer. Members of communities with differing expertise host ed workshops for other communities to explain sustainable livelihood options.

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

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilisation of genetic resources			
Purpose – To conserve the critically endangered Brown -Headed Spider Monkey (*Ateles fusciceps*), vulnerable primates and habitats in NW Ecuador based on a programme of monitoring, education and sustainable livelihoods within local communities.	Primate and habitat monitoring programme in place by Yr 3 to monitor effectiveness of educational programme and increased habitat protection on primate species. Educational programme effectively disseminating conservation material to local communities.	GIS imagery published to Internet showing primate distributions and numbers. Monitoring programme providing robust primate data to GIS database (Field reports). Educational material published & disseminated to communities via network.	Network members remain viable and committed. Effectiveness of network and educational programme proven and disseminated to policymakers leading to long-term support by government and NGOs.
Outputs			
Network established to monitor primate status and habitat using participatory field surveys and trained village-level parabiologists.	Partner Institution staff carrying out primate surveys & rapid habitat assessments (Yrs 1,2,3). Up to 20 community parabiologists providing primate data and disseminating educational material.	*Robust Field survey data (Field reports) (Yrs 1,2,3).* *Field data published to database & GIS updated biannually (Yrs 2,3) and published to internet website.*	Parabiologists living in communities are able to provide reliable biological field data following appropriate training.
GIS database established at Los Cedros Biological Reserve.	Data from field surveys updated to database by trained local staff.	GIS database published to internet showing distributions of primates and habitat status (Yrs 2,3).	Sufficient training and support for local staff in maintenance of database.
Public awareness campaign focusing on primate conservation disseminated via network.	Causes of unsustainable behaviour identified through participatory methods and public awareness material developed and printed (specific to indigenous Awa, Chachi, Afro Ecuadorian and Mestizo communities); up to 5000 copies per year distributed.	Publication of material for environmental awareness campaign (Yrs 1,2,3).	Material developed is sufficiently targeted and reaches and positively influences local communities.
Masters level training for Ecuadorian Partners.	Primate Survey Principal investigator (PI) qualifies in MA in Participation, development and social change. Botanics Research Assistant (RA) qualifies in MSc Botany (Forest	MA certificate from IDS, UK (Yr 3). MSc certificate in Forest Ecology from San Francisco University, Ecuador (Yr 3).	Candidates for PI and RA positions sufficiently qualified to undertake and complete MA and MSc courses.

	Ecology).		
Training centre for Parabiologists and local staff established at Los Cedros Biological Reserve.	Training Centre materials established by Yr 2 and training underway of local staff and parabiologists (Yrs 2,3).	Training course developed (Yr 1) and teaching materials published (Yr 2). DVD course ´training the trainer – running a parabiologist training course´ complete (Yr 3).	All partners contribute relevant expertise to developing training material.
Parabiologists trained as certified primate and habitat ecologists.	Up to 20 community members trained as certified parabiologists (Yrs 2,3).	Up to 20 parabiologists receive Parabiologist certificate 'Forest ecology and field survey methods'.	Sufficient interest from within community members to become parabiologists.
Sustainable Livelihoods	Parabiologists supported long-term as per exit strategy. Other sustainable livelihood programmes identified and initiated.	Ongoing national and international funding after Yr 3. Links between Para-biologists and other sustainable livelihood projects established.	Parabiologist network provides rigorous scientific data and disseminated to policymakers leading to long-term support by government and NGOs.

Activities	
Workshops	*Yr 1 Project planning (2 wks - June 05). Training Parabiologists - methodological Review (2 wks May 06).* *Yr 2 Field methods - participatory surveys, plant inventory & rapid habitat assessment (2 wks May 07).* *Yr 3 Participatory community networks in conservation, Disseminating primate conservation data to the policy arena, and final review (2 wks May 08). University of Sussex Workshop/Mini conference.* *Participatory methods and conservation networks – Parabiologist workshop (2 wks Apr 08).*
Training courses	*Yr 1. Wilderness First Aid (Red Cross, Quito) – for field survey staff (Jul 05).* *Database management - local staff training ´Survey data management´ (2 wks May 06).* *Yr 2. Primate survey methods and environmental education for parabiologists ('Forest ecology and field survey methods') (2wks Sept 06).* *Yr 3. Primate survey methods and environmental education for parabiologists ('Forest ecology and field survey methods') (2wks Jun 07).*
GIS database	*Yr 2. GIS format database established and transferred to Los Cedros Biological Reserve (Apr 07).* *Yrs 2- 3. Data from field surveys updated to GIS database – GIS published to web and disseminated to policymakers (May 07+).*
Field Research programme	*Yr 1. Expeditionary field surveys (8 *14d/month) to communities in NW Ecuador within buffer zones and proposed ecological corridors to identify primate 'hotspots'. Identify potential parabiologists from community groups. Forest inventories and development of rapid habitat assessment methods.* *Yr 2. Ongoing field surveys (8 *14d/month) to collect primate observations from communities, distribute educational material and support community parabiologists. Field surveys to apply habitat assessment methods to regions observing primates. Collection of digital imagery from fieldwork to develop training DVDs* *Yr 3. Ongoing collection of field data and support for parabiologists through expeditionary surveys and habitat assessments (14 days/month for 8 months).*
Manuals	*Yr 1. Develop & publish community public awareness material (5000 copies) (Apr 06).*

Training Material *Community education material*	*Yr 2. 'Rapid habitat assessment' field manual and 'Participatory methods in field monitoring programmes' manual (Project specific draft Oct 06, complete May 08). Parabiologist training material - localise material to various community requirements (i.e. illustrated teaching materials), DVD instructional videos localised to language groups (Awa, Chachi, Spanish). Update and & publish Yr 2 community public awareness material (5000 copies).* *Yr 3. Full instructional course (DVD) in leading parabiologist training courses. Para-biologists training course material supported by DVD to illustrate fieldwork methods. Develop & publish Yr 3 community educational materials (5000 copies). Manual: Conservation education programmes – Monitoring the effectiveness of educational programmes (Draft Jan 08, Publication May 08).*
Publicity material *Publications*	*Publication of Darwin Initiative project information in Ecuador - Terra Incognita Magazine. Local Radio Broadcasts and National Radio Broadcasts. Press release to TV Yr 1, Yr 2 and Yr 3. Publication of educational and public awareness material (localised to appropriate language groups). Peer reviewed scientific publications (minimum 4) as result of project. Publication of field manuals. Darwin Initiative project Internet site developed to host GIS map of primate and habitat status, publicise project and disseminate results. Publication of Species Action and Habitat Management Plans (Yr 3)*

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	30	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		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	30	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	30	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

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

Annex 4 Standard Measures

Please quantify and briefly describe all project standard measures using the coding and format of the Darwin Initiative Standard Measures. Download the updated list explaining standard measures from http://darwin.defra.gov.uk/resources/reporting/. If any sections are not relevant, please omit or delete them.

Code	Description	Totals (plus additional detail as required)
Training Measures		
2	Number of Masters qualifications obtained	9 (2 directly funded by PRIMENET - end dates in 2009 + 7 MSc thesis projects)
3	Number of other qualifications obtained	
4a	Undergraduate training 8 Ecuadorian students (Field placements in botany & Primatology), 2 UK students, 1 Chilean. 7 University of Bournemouth Expedition members	18
4b	Number of training weeks provided to undergraduate students	45
4c	7 UK MSc Postgrads receiving training	7 (MSc Theses)
4d	Postgrad training weeks	35
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above) Appointed DI Ecuadorian Staff	10
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above) Community level: Parabiologists trained 106 attended parabiologist training course 4 attended workshop (DISTANCE sampling techniques) 7 attended camera trapping workshop Education Centres: 40 schools (2000 students) Canopy Access training BCAP certificate (PI)	106 (Parabiologist training) 12 (Advanced training) 2000 + (school workshops)
6b	Number of training weeks not leading to formal qualification 5 parabiologist training courses	5
7	Number of types of training materials produced for use by host country(s) Delivery Parabiologist training module, video and educational material	3
Research Measures		
8	Number of weeks spent by UK project staff on	18

Code	Description	Totals (plus additional detail as required)
	project work in host country(s) UK PI attends project setup/workshops & training 06, training course and field work 07, project exit strategy meetings 2008 (future proposal bids) (18 weeks total)	
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	3
10	Number of formal documents produced to assist work related to species identification, classification and recording. Publication of 'Mamíferos del Ecuador Guia de Campo' (Field guide to mammals of Ecuador')ISBN-13: 9789978446515 (NHBS bookstores) Publication of 'Mamiferos de los bosques humedos del noroccidente de Ecuador' 'Mammals of the rainforests of NW Ecuador' ISBN 978-9942-01-736-9	2
11a	Number of papers published or accepted for publication in peer reviewed journals	2 (4 + in preparation/awaiting submission)
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 (PRIMENET primate database, Species & Habitat action plan GIS database, Los Cedros GIS Database)
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	1 (TROPICOS)
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)	1 (All botanical samples lodged and registered at National Herbarium)
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	5 (parabiologist workshops) 1 (Government presentation) 5 (as part of exit strategy to revisit communities and present results)
14b	Number of conferences/seminars/ workshop presentations of project	7
15a	(National Press releases Ecuador)	5 [Press articles in Terra Incognita (July 2005, March 2006, May 2006), PRIMENET magazine

Code	Description	Totals (plus additional detail as required)
		published 2007, Article in Terra Incognita (March 2008)]
15b	local press releases or publicity articles in host country(s)	1 (PRIMENET magazine)
15c	Number of national press releases or publicity articles in UK	3 Press releases 2 major publications (Guardian 06, HERO 06)
15d	Local Press release UK , BBC Radio	2
16a	Number of issues of newsletters produced in the host country(s)	1
16b	Estimated circulation of each newsletter in the host country(s)	>3000
16c	Estimated circulation of each newsletter in the UK	
17a	Number of dissemination networks established	3 (Internet presence & discussion group, Parabiologist and community exchange network, PRIMENET network)
17b	Number of dissemination networks enhanced or extended	
18a	Number of national TV programmes/features in host country(s)	
18b	Number of national TV programme/features in the UK	
18c	Number of local TV programme/features in host country	
18d	Number of local TV programme features in the UK	
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	1 BBC Southern Counties
Physical Measures		
20	Estimated value (£s) of physical assets handed over to host country(s)	£16,606
21	Number of permanent educational/training/research facilities or organisation established	1 (NGO Mamiferos y Conservacion)
22	Number of permanent field plots established	3

Code	Description	Totals (plus additional detail as required)
23	Value of additional resources raised for project	In kind contributions (total £150432). Total Extra financial resources raised including exit strategy funding (£70100)

Annex 5 Publications

Provide full details of all publications and material that can be publicly accessed, eg title, name of publisher, contact details, cost. Mark (*) all publications and other material that you have included with this report

Type * **(eg journals, manual, CDs)**	**Detail** **(title, author, year)**	**Publishers** **(name, city)**	**Available from** **(eg contact address, website)**	**Cost** **£**
Magazine article (Copy sent to DI 2006)	*'Title',July 2005*	*Ecuador Terra Incognita*	*Almagro 1613 y República. Edificio M.S., oficina 502. Quito – Ecuador Tel/Fax: Ecuador + (02) 2529 956* www.terraecuador.net	*Approx £1.10*
Magazine article (Copy sent to DI 2006)	*'Ecuador Terra Incognita', March 2006*	*Ecuador Terra Incognita*	*Almagro 1613 y República. Edificio M.S., oficina 502. Quito – Ecuador Tel/Fax: Ecuador + (02) 2529 956* www.terraecuador.net *Download from PRIMENET website* www.primenet.org.uk	*Approx £1.10*
Magazine article (copy sent to DI 2007)	*'Ecuador Terra Incognita', May 2006*	*Ecuador Terra Incognita*	*Almagro 1613 y República. Edificio M.S., oficina 502. Quito – Ecuador Tel/Fax: Ecuador + (02) 2529 956* www.terraecuador.net	*Approx £1.10*
*Magazine article**	*'Ecuador Terra Incognita', March 2008*	*Ecuador Terra Incognita*	*Almagro 1613 y República. Edificio M.S., oficina 502. Quito – Ecuador Tel/Fax: Ecuador + (02) 2529 956* www.terraecuador.net	*Approx £1.10*
PRIMENET Magazine (copy sent to DI in 2007)	*2007*	*Murcielargo Blanco*	*Murciélago Blanco, Apdo. 17-17-761, Quito Ecuador* *Download from PRIMENET website* www.primenet.org.uk	*free*
Adhesive stickers*	2006	Murcielargo Blanco	Murciélago Blanco, Apdo. 17-17-761, Quito Ecuador	

Field Guide (copy sent to DI in 2007)	Mamiferos del Ecuador, Diego Tirira, 2007 (English title: Mammals of Ecuador) ISBN-13: 9789978446515	Ecuador: Murciélago Blanco, Quito, Ecuador UK: NHBS Environment Bookstore	Murciélago Blanco, Apdo. 17-17-761, Quito Ecuador Web: www.murcielagoblanco.com/ email: info@murcielagoblanco.com Available in UK from: http://www.nhbs.com	$40 (UK £38)
Field Guide* (Copy sent to DI in 2008)	'Mamiferos de los bosques humedos del noroccidente de Ecuador' ['Mammals of the rainforests of NW Ecuador'] ISBN 978-9942-01-736-9 Diego Tirira, 2007	Murciélago Blanco, Quito, Ecuador	Murciélago Blanco, Apdo. 17-17-761, Quito Ecuador Web: www.murcielagoblanco.com/ email: info@murcielagoblanco.com	$20
Children's Educational booklet*	Diego Tirira, 2008.	Murciélago Blanco, Quito, Ecuador	Murciélago Blanco, Apdo. 17-17-761, Quito Ecuador Web: www.murcielagoblanco.com/ email: info@murcielagoblanco.com	
Journal article	Elevational changes in a neotropical Fig (Ficus spp.) community in North Western Ecuador, Shanee S, Peck MR (2008).	iForest 1: 104-106 (2008)	iForest 1: 104-106 (2008)	
Species and Habitat Action Plan*	Developing a species and habitat action plan 'Focusing conservation efforts for the brown-headed spider monkey (*Ateles fusciceps*) using remote sensing, predictive distribution modelling and playback field survey.', Peck M.R. (2008)	PRIMENET	http://www.primenet.org.uk/Documents/Remote%20sensing%20report.pdf	Free

Annex 6 Darwin Contacts

To assist us with future evaluation work and feedback on your report, please provide details for the main project contacts below. Please add new sections to the table if you are able to provide contact information for more people than there are sections below.

Ref No	14-040
Project Title	Developing a sustainable network for primates in Ecuador (PRIMENET)
UK Leader Details	
Name	Dr Mika Peck
Role within Darwin Project	Principal Investigator
Address	JMS 5D24, University of Sussex, Brighton, BN1 9QG, UK
Phone	
Fax	
Email	
Partner 1	
Name	Diego Tirira
Organisation	Murciélago Blanco (Mamiferos y Conservación)
Role within Darwin Project	Host country project coordinator
Address	Apdo. 17-17-761, Quito Ecuador
Fax	
Email	
Partner 2	
Name	Ana Mariscal
Organisation	QNCE National Herbarium (Corporacion Botanica Ecuadendron)
Role within Darwin Project	Lead Botanist
Address	Rio Coca y Isla Fernandina
Fax	
Email	

Annex 7 List of educational centres visited during PRIMENET environmental outreach programme

Educational Centres visited during PRIMENET project

Locality	Name of the Institution	Contact (Director or Principal)
Province of Carchi		
Espejo 1	Escuela John F. Kennedy	Rosa Proaño
Río Verde	Escuela Pública de Río Verde	Johanna Rojas
Province of Imbabura		
Apuela	Colegio Nacional Mixto Apuela	Nelly Reyes
Cuajara	Escuela de Cuajara	Carlos Elías Almeida
Cuellaje	CEM (Red Cuellaje)	Marcelo Rojas
Cuellaje	Escuela José Luis Moreno	Net of Schools of Intag
El Cristal	Escuela León Tolstoi	Net of Schools of Intag
El Mirador de los Paltas	Escuela Miguel de Hidalgo	Net of Schools of Intag
El Paraíso	Escuela Santa Cruz	Net of Schools of Intag
El Puerto	Escuela local	José Ignacio Canelos
El Rosario	Escuela Luz de América	Net of Schools of Intag
García Moreno	Colegio Popular Técnico Gabriel García Moreno	Martha Moreno
García Moreno	Escuela Remigio Crespo Toral	Ligia Yépez
Guallupe	Escuela Pública La Carolina	Carlos Viteri
La Esperanza	Escuela Enrique Garcés	Net of Schools of Intag
La Loma	Escuela José Ignacio Burbano	Net of Schools of Intag
La Magdalena	Escuela 22 de Julio	Net of Schools of Intag
Limonal	Escuela San Daniel Combo	Santiago Aguilar
Nangulví Alto (Apuela)	Escuela Carlos Proaño Delgado	Net of Schools of Intag
Nangulví Bajo (Apuela)	Escuela Alberto Haro	Net of Schools of Intag
Nápoles	Escuela 12 de Febrero	Net of Schools of Intag
Peñaherrera	Escuela España	Net of Schools of Intag
Peñaherrera	Colegio Técnico Agropecuario José Peralta	Pedro Guzmán
Pueblo Viejo (Apuela)	Escuela Belisario Quevedo	Net of Schools of Intag
Río Verde	Escuela de la comunidad	Federación Awá
San Alberto	Escuela Patria	Net of Schools of Intag
San Antonio de Playa Rica	Escuela Francisco de Orellana	Net of Schools of Intag
San Jerónimo	Escuela FAE	Peter Ramos
San Joaquín	Escuela 2 de Agosto	Net of Schools of Intag
San Pedro	Escuela Ciudad de Riobamba	
Selva Alegre	CEM Plantel Central Selva Alegre	Pepe Moya
Urbina	Ciudad de Atuntaqui	
Province of Esmeraldas		
Cristóbal Colón	Escuela particular Nueva Esperanza	Julio Moreno
Cristóbal Colón	Escuela fiscal 28 de Septiembre	Emma Revilla
Pambilar	Escuela de la comunidad	Federación Awá
Zapallo	Escuela católica particular mixta 24 de Septiembre	Hartman Maza
Province of Pichincha		
Buenos Aires	Escuela fiscal 22 de octubre	Roger Vélez
El Tingo	Global Kids	María Soledad Tufiño
Province not defined		
Las Golondrinas	Colegio Nacional Técnico	Carmen Hurtado

	Esmeraldas	
Las Golondrinas	Colegio Nacional Cotacachi	José Bermeo

Annex 8 Summary of methods and preliminary analysis from botanical fieldwork (Spanish)

OBJETIVOS CUMPLIDOS DEL PROYECTO

- Realizar el inventario de una hectarea al interior en el Bosque Protector Los Cedros.
- Desarrollar un inventario rápido del bosque con el fin determinar el estado de conservación del hábitat en los diferentes sitios de estudio al interior del Bosque Protector Los Cedros y de la Comunidad León Febres Cordero en la Provincia de Esmeraldas.
- Comparar algunos estados de sucesión del bosque primario con sitios de bosque secundario de fincas abandonadas.
- Comparar la vegetación y grupos dominantes en diferentes etapas de sucesión del bosque primario.

Metodología

Inventario Rápido de Vegetación Basado en la Presencia de Claros, en Ecosistemas Boscosos, conlleva los siguientes objetivos:

- Investigar la estructura, composición y diversidad
- Identificar aspectos básicos relacionados con la dinámica del bosque
- Obtener información básica que ayude en la determinación del estado de conservación del bosque.

Materiales y equipos

Trabajo de campo
Cámara fotográfica, Fotómetro, GPS, Podadora aérea, Trepadoras, Big shop, Binoculares, Cinta métrica, Cinta diamétrica, Cintas de marcaje, Fichas metálicas, Marcadores para fichas metálicas, Piolas, Brújula, Soga, Fundas plásticas, Alcohol industrial, Fichas para toma de datos.

Área de Estudio

El bosque protector Los Cedros corresponde a un Bosque de neblina montano de acuerdo a Valencia *et al.* (1999). Caracterizado por presentar un dosel de hasta 25 m, con abundancia de musgos y epífitas. Comprendido en las coordenadas UTM N0747354 E 0033898 y altitud de 1428 m. Se establecieron un total de 27 parcelas de 30 x 30 m en bosque maduro.

La comunidad León Febres Cordero pertenece a la formación vegetal Bosque siempreverde piemontano según Cerón *et al.* (1999). Dominado por especies arbóreas especialmente palmas. Se encuentra comprendido en las coordenadas UTM N 722589.25 E 36613.35 y altitud de 137 m. Se establecieron 27 parcelas de 30 x 30 m.

Protocolos
Actividades Y Elementos A Considerarse Durante El Trabajo Experimental

En forma general para el inventario rápido de vegetación propuesto se consideró las siguientes actividades:

Identificación del área de trabajo.
Mediante el uso de mapas y visita de campo, se identificó cambios en el tipo de bosque, dependiendo de factores como: variación de altitud y tipo suelos.
Determinación de bloques de trabajo

Se establecieron 6 bloques de trabajo en la Comunidad León Febres Cordero y 4 dentro del Bosque Protector Los Cedros.

Determinación de Sub-bloques de trabajo

A cada bloque se dividió en 3 sub-bloques al azar con la finalidad de evitar la probabilidad de que las muestras se distribuyan en un solo sector al interior del bloque.

Identificación de claros

Al interior de cada sub bloque y alrededor de los senderos o trochas, existentes o abiertos se ubicaron claros de bosque o GAPs naturales donde se estimó el largo y ancho de cada uno.

Selección de claros

Para cada sub-bloque se seleccionó al azar un claro de bosque que fue utilizado como punto de muestreo inicial.

Selección de bosque secundario y cerrado

En cada sub-bloque se buscó a una distancia igual o mayor a 40 m de radio de cada claro de bosque, sitios de muestreo caracterizados por presentar en un 75 % características de bosque secundario; de igual forma se buscó sitios en donde la cobertura del dosel este cerrada y se encuentre dominado por árboles de gran tamaño y diámetro; a estos sitios se los denominara "Bosque cerrado".

Establecimiento de las parcelas de muestreo

A partir de un punto central de muestreo se establecieron parcelas de 30 x 30 m siguiendo las coordenadas norte, sur, este y oeste. Al interior de esta parcela se ubicó una segunda de 10 x 10 m y una tercera de 5 x 5 m subdivididas en secciones a, b, c y d para facilitar el trabajo ordenado, iniciando desde el norte y siguiendo la dirección de las manecillas del reloj para cada uno de los tipos de bosque: Claro, Secundario y Cerrado.

Mediciones Y Colección De Datos Al Interior De Cada Muestra

En cada punto de muestreo se han colectado los siguientes datos:

Parcelas de 5 x 5

- Inventario y colección de muestras botánicas de árboles juveniles y palmas desde 50 cm hasta 5 m.
- Colección de semillas por un lapso de 5 minutos con el esfuerzo de dos personas
- Observación de porcentaje de cobertura del dosel a diferentes niveles: 1-5 m; 5-10 m; 10-15 m; 15-20 m; 20-25 m; + 25 m.
- Observación de pendiente del terreno
- Observación de fauna (huellas, fecas, etc.)
- Toma de punto referencial usando un GPS
- Condiciones del clima
- Medición de luz
- Fotografía del dosel
- Conteo árboles mayores a 10 cm DAP desde el punto central de la parcela con el empleo de un instrumento conocido como Relascope.

Parcelas Para El Inventario De Especies Arbóreas sección de 10 x 10 m

- Medición del diámetro de especies arbóreas ≥ 5 ≥ 10 cm DAP.
- Estimación de la altura de la primera rama, la altura total y ancho de copa.
- Observaciones de forma de fuste de los árboles (Torcidos, doblados, bifurcados, dañados).
- Medición de diámetro y altura de madera muerta en pie y en el suelo además de realizar observaciones del grado de descomposición clasificado en tres categorías: Descomposición inicial, media y terminal).

Trabajo De Laboratorio

Las muestras botánicas fueron catalogadas y numeradas en la secuencia de 6707 a 8737 para el Bosque Protector Los Cedros y 8738 a 9255 para la comunidad León Febres Cordero para luego ser prensadas en papel periódico y conservadas con alcohol al 75 % dentro de fundas plásticas que se trasladaron a las instalaciones del Herbario Nacional del Ecuador QCNE para el proceso de secado y determinación taxonómica mediante la

utilización de claves dicotómicas, bibliografía especializada, comparación con muestras que reposan en la colección general y ayuda de especialistas botánicos. Las muestras reposan en las instalaciones del Herbario QCNE.

Resultados

Se colectó un total de 2032 muestras botánicas para el Bosque Protector Los Cedros y 517 en la comunidad León Febres Cordero siendo depositadas en el Herbario Nacional del Ecuador (QCNE) un total de 2549 muestras en papel periódico de las cuales solo las especies fértiles serán montadas y conservadas dentro de la colección general.

En el Bosque Protector Los Cedros se registró un total de 2744 individuos pertenecientes a 337 especies, 140 géneros y 61 familias (Anexo 1).

Las cinco familias más dominantes considerando el total del área muestreada son: Cecropiaceae con un 18 %, seguido de Lauraceae con 14 %, Melastomataceae 9 %, Rubiaceae y Moraceae con 6 % (Gráfico 1).

En el bosque maduro las familias abundantes fueron: Lauraceae con 20 %, Burseraceae con 8 %, Melastomataceae y Rubiaceae con 7 % y Clusiaceae con 6 %.

En los sitios de regeneración en fincas abandonadas las familias dominantes son: Cecropiaceae con 36 %, Melastomataceae 11%, Lauraceae 6 %, Moraceae 5 % y Rubiaceae 4 %.

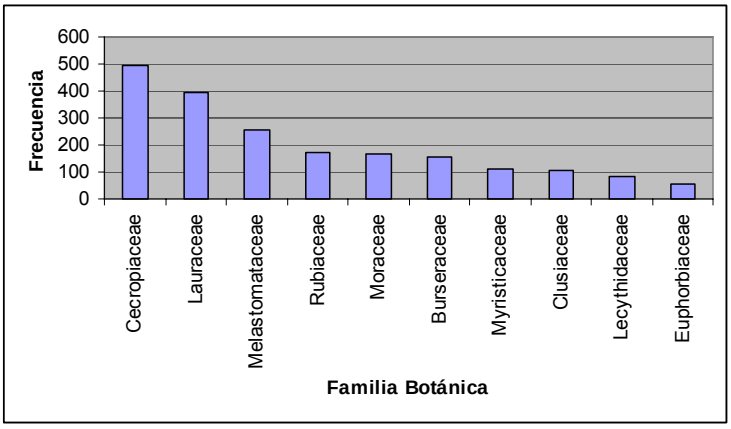

Gráfico 1. Familias botánicas más abundantes considerando la totalidad del área muestreada del Bosque Protector Los Cedros.

Las especies más abundantes fueron: *Cecropia andina* Cuatrec. con 6,7 %; *Cecropia ficifolia* Warb. ex Snethl. con 4,6 %; *Dacryodes cupularis* Cuatrec. con 4,5 %; *Cecropia* sp.2 con 3,9 %; *Otoba gordoniifolia* (A. DC.) A.H. Gentry con 3,8 % y *Persea* aff. *pseudofasciculata* Kopp con 2,2 %.

Dentro del bosque maduro se registra para Bosque Cerrado 151 especies, Bosque Secundario 150 y Claro de Bosque 146; las especies importantes con su abundancia relativa son: *Dacryodes cupularis* Cuatrec. 10%, *D. cupularis* 7 % y *Otoba gordoniifolia* (A. DC.) A.H. Gentry 6 %, respectivamente; cabe mencionar que esta clasificación está dada considerando la dinámica natural del bosque; es decir, sin influencia antrópica. Las 5 especies más dominantes para el bosque maduro son: *Dacryodes cupularis* Cuatrec. con 7,1 %; *Otoba gordoniifolia* (A. DC.) A.H. Gentry con 5,3 %; *Persea* aff. *pseudofasciculata* Kopp con 3,5 %; *Meriania finicola* Wurdack con 2,8 % y *Eschweilera integrifolia* (Ruiz & Pav. ex Miers) R. Knuth con 2,4 %.

En las áreas de regeneración en fincas abandonadas se encontraron 51 especies para cañaverales y 187 en áreas de pastizal y agricultura. Las especies dominantes son: *Cecropia andina* Cuatrec. con 13,4 %; *Cecropia ficifolia* Warb. ex Snethl. con 10,4 %; *Cecropia* sp.2 con 8,6 %; *Cecropia reticulata* Cuatrec. con 3,3 % y *Miconia* cf. *subnodosa* Triana con 2,8 %.

El índice de diversidad de Shannon Wierner da valores de 4,3 para Bosque Cerrado; 4,5 para Bosque Secundario y 4,5 para Claro de Bosque. Estos valores se interpretan como altamente diverso. El índice de Equitatividad da valores para BC, BS y CLB de 0.75, 0.78 y 0.77, respectivamente; supone un bosque con alta heterogeneidad en la composición florística.

Para las áreas de regeneración se obtuvo valores de 3,4 y 4; lo que se interpreta como medianamente diverso para el área de cañaveral abandonado y altamente diverso para regeneración de zonas dedicadas para pasto y agricultura, luego de un abandono. El índice de Equitatividad para RCA y RG es 0.59 y 0.70 respectivamente muestra un bosque heterogéneo en cuanto a la composición florística.

Los 4 sitios muestreados dentro del Bosque Protector Los Cedros son muy diversos con valores de 4,4; 4,2; 4,4 y 4,3.

El Índice de Similitud de Sorensen es 0.62 para Bosque cerrado - Bosque secundario, 0.55 para B. cerrado - Claro de Bosque, y 0.59 para B. Secundario - Claro.
Las áreas de regeneración Cañaveral y Fincas abandonadas tienen un valor Sorensen de 0.25 para Cañaveral - B. cerrado 0.16; y Regeneración fincas - B. Cerrado 0.46 (cuadro 1).

	BC	BS	CLB
BC			
BS	0.6246		
CLB	0.5589	0.5946	
RCA	0.1683	0.209	0.1726
RG	0.4615	0.5579	0.4625

Cuadro 1. Valores de Sorensen para estados de sucesión natural de bosque y áreas de fincas abandonadas. BC Bosque cerrado, BS Bosque secundario, CLB Claro de bosque, RG regeneración fincas agricultura y ganadería, RCA Regeneración cañaveral.

En la comunidad León Febres Cordero de la Provincia de Esmeraldas dentro de los 6 sitios muestreados, 3 corresponden a bosque maduro y 3 a bosques en regeneración luego de actividades antrópicas. Se registra un total de 1611 individuos que corresponden a 257 especies, 118 géneros y 49 familias (ver anexo 1).

Las cinco familias más abundantes para el área total de muestreo son: Arecaceae con 14 %, Rubiaceae y Lecythidaceae 9 % cada una, Myristicaceae 8 % y Cecropiaceae 7%.

Dentro del Bosque maduro las familias dominantes son: Arecaceae con 17 %, Lecythidaceae con 11 %, Myristicaceae 9 %, Fab-Mimosoideae 6 % y Rubiaceae con 5 %.

En los sitios de regeneración por actividades antrópicas las familias dominantes son: Rubiaceae con 19 %, Cecropiaceae con 18 %, Arecaceae y Clusiaceae con 8 %, cada una y Fab-Mimosoideae con 6 %.

Las especies dominantes en la Comunidad León Febres Cordero son: *Wettinia quinaria* (O.F. Cook & Doyle) Burret con 12.2 %, *Otoba novogranatensis* Moldenke con 5.2 %, *Guettarda hirsuta* (Ruiz & Pav.) Pers. 3.5 %, *Theobroma gileri* Cuatrec. 2.7 % y *Protium ecuadorense* Benoist 2.6 %.

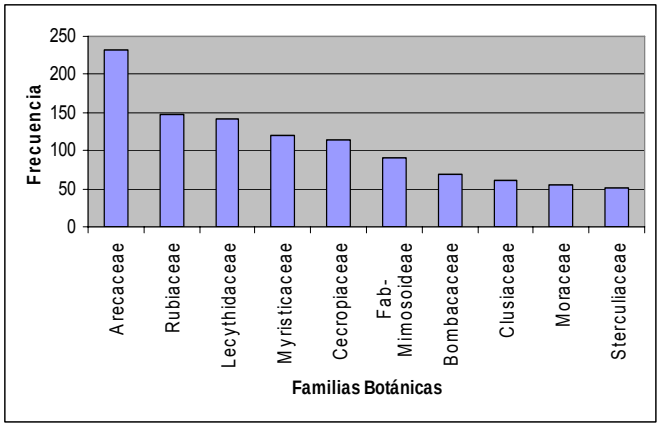

Gráfico 2. Familias botánicas más abundantes considerando la totalidad del área muestreada de la Comunidad León Febres Cordero.

En bosque maduro se registró 113 especies para Bosque Cerrado, 132 en Bosque Secundario y 122 en Claro de Bosque, la especie más abundante es *Wettinia quinaria* (O.F. Cook & Doyle) Burret dentro de cada estado sucesional del bosque con una abundancia relativa de 14 %, 17 % y 12 %, respectivamente. Las especies importantes para el área total muestreada de bosque maduro son: *W. quinaria* con 4%, *Otoba novogranatensis* 2 %, *P. ecuadorense* 1 %, *T. gileri* 1 % y *Bauhinia pichinchensis* Wunderlin 1 % En área de regeneración se encontró a *Guettarda hirsuta* (Ruiz & Pav.) Pers. con 13 % como dominante de 104 especies presentes.

El índice de diversidad de Shannon Wierner es 4, 4.1 y 4.2 para Bosque cerrado, Bosque secundario y Claro de bosque respectivamente lo que se interpreta como altamente diverso y 3.8 para Regeneración que se interpreta como altamente diverso.
El índice de Equitatividad para BC, BS, CLB y RG es 0.73, 0.75, 0.76 y 0.68, respectivamente; muestra un bosque heterogéneo en cuanto a composición florística.

El índice de Sorensen es 0.57 al comparar Bosque cerrado y Bosque secundario, 0.52 para B. cerrado y Claro de bosque y 0.51 para B. secundario y Cl. Bosque. Y entre B. cerrado y Regeneración 0.41 (cuadro 2).

	BC	BS	CLB
BC			
BS	0.5714		
CLB	0.5277	0.5197	
RG	0.4147	0.4407	0.4248

Cuadro 2. Valores de Sorensen para estados de sucesión natural de bosque y áreas de fincas abandonadas. BC Bosque cerrado, BS Bosque secundario, CLB Claro de bosque, RG regeneración fincas abandonadas

Annex 9 Breakdown of equipment costs

ATTACHMENTS

1) Sam Shanees Paper
2) Meches Draft Paper
3) GIS paper *
4) Species and Habitat Action Plans (Revise)
5) The EXCEL database of plants (botanical survey).*
6) Ministry of Environment reports – botanical *
7) EXCHANGE report *