(2)

20th January 2006

Davis Expedition Fund Committee
School of Biological Sciences
University of Edinburgh
Mayfield Road
EH9 3JH Edinburgh

Dear Madam/Sir,

Re: Davis Expedition Fund 2006

I wish to apply for the Davis Expedition Fund with our project entitled 'Upper Raspaculo River Valley Expedition - Botanical Assessment in the Maya Mountains of Belize'. I am a recent graduate from the University of Edinburgh M.Sc. course 'Biodiversity and Taxonomy of Plants'. I represent a team of six members: two recent graduates of the M.Sc. course, two current biology undergraduates of the University of Edinburgh, and two Belizean university students.

The proposed project is an independent peace of work which originates from the research interests of the two recent graduates. It aims to carry out a baseline floristic survey of a remote lowland semi-deciduous moist forest in Belize, which is recognised as a high priority conservation area inhabited by many endangered species such as Jaguars, Bairds Tapirs and Scarlet Macaws.

The increasing need for well-trained tropical field biologists is currently not met by sufficiently trained pioneers. With our educational background, we hope to contribute to this need by getting hands-on experience in leading and managing such challenging field projects.

I am hoping that the proposed project will interest you, and I am looking forward to hearing back from you soon.

Sincerely yours,

18 January 2006

TO WHOM IT MAY CONCERN

I am writing to support the application to the Davis Fund to support the project Upper Raspaculo River Valley Expedition: A Rapid Botanical Assessment in the Maya Mountains of Belize.

I have known * both as an undergraduate student in Plant Science and as a Postgraduate student in MSc Biodiversity and Taxonomy of Plants. Her performance throughout has been quite exceptional, and she obtained a well-deserved First Class Honours Degree in Plant Science and an MSc with Distinction in BTP. * also obtained an MSc in BTP in. Both women are highly organized, passionate and committed botanists, eager to apply skills and knowledge acquired in the MSc programme to botanical problems in the field.

The aims of the proposed expedition are very well focussed and of immediate relevance. They are to obtain baseline floristic data on species composition and vegetation types in the Upper Raspaculo watershed in Belize, for use in conservation and management of a riverine area within the Chiquibul Forest Reserve and National Park (CFRNP), an important habitat for many endangered animal species such as Jaguars, Baird's Tapir and Scarlet Macaw. Parts of this area are threatened with imminent flooding by a hydro-electricity project. As water levels rise towards November 2006 in adjacent forest areas, the habitat value of Upper Raspaculo for these species is expected to increase. The applicants comment that "Once a vegetation survey has been completed and conservation measures are implemented accordingly, the Upper Raspaculo watershed could remain a biodiversity "crown jewel" crucial in the wildlife corridor for the fauna and flora of Central America."

The team has given much thought to the project logistics, as well as to its scientific objectives, and have set up an impressive international support and advisory network. In Edinburgh, RBGE will function as the home institution for the proposed project, and * will act as the 24-hour UK contact. In London, Sam Bridgewater, an expert on the Belizean flora at the NHM, will collaborate with the team both in Belize and in the UK. He is regarded as the principal senior advisor on logistics and tropical fieldwork. In Belize, Las Cuevas Research Station (LCRS, a Belizean – British biodiversity research initiative) will act as the local host institution. * of LCRS is advising one of the expedition members, * is currently taking a year out to train with LCRS as a resident scientist. *, Head of the Natural Resources Management Program, will collaborate in data analysis, and it is intended that the results will be made available on the internet through the Biodiversity and Environmental Resources Database for Belize (BERDS). The expedition's risk assessment is also exceptionally detailed and well considered.

This is a well-considered proposal by competent and committed team, and I commend it to you for support.

Yours sincerely,

Upper Raspaculo River Valley Expedition

Botanical assessment in the Maya Mountains of Belize

URRVE 2006

By

The Royal Botanic Garden Edinburgh
&
The University of Edinburgh

Contents

Summary

The Upper Raspaculo River Valley Expedition (URRVE) will aim to produce a botanical assessment of the upper reaches of the Raspaculo watershed within the Chiquibul Forest Reserve and National Park (CFRNP) of Belize. Based on a satellite image of the area, vegetation types will be identified and ground-truthed. Aiming to compile a species list for the remote river valley, walkover transects and extensive collecting will be done. Furthermore, to assess the vegetation types of the area, Rapid Ecological Assessment (REA) vegetation transects will be done within each vegetation type recognised on the field. Data on the forest dynamics of the area will be gained by re-surveying a 1 ha forest plot originally established in 1991. The Raspaculo watershed has become an increasingly important habitat in recent months for many endangered species, such as Jaguars, Bairds Tapirs and Scarlet Macaws, due to flooding by a hydro-electricity dam further downstream. Data collected by the proposed study will be used to produce a detailed vegetation map that will be important for future conservation management plans of the area.

Introduction

Belize harbours some of the least fragmented areas of tropical forest remaining in Central America. Due to its geographic location and extensive areas of intact natural habitat, the country is rich in both biodiversity and undisturbed natural resources. It is estimated that the native flora includes 4,000 species of flowering plants, and the fauna contains 163 species of terrestrial mammals, 571 species of birds, 121 species of reptiles, 42 species of amphibians, and a total of 634 species of terrestrial invertebrates.

Some of these forested habitats are unrivalled within the Neotropics and are considered to be one of the world's most important hotspots for biodiversity. The speciality of Belizean plant diversity is the underlying limestone (Furley & Newey 1979; Dubbin *et al.* in press) which makes for a unique lithosphere that interacts with, and in many respects determines, the plant communities. The plant communities are found to be a biogeographically interesting mix of both Mexican and northern South American plants (Brewer *et al.* 2003). The forests of Belize constitute habitat crucial to the genetic health and overall functionality of the Mesoamerican Biological Corridor. The 36 protected areas of Belize cover some 900,000 hectares (ha), amounting to approximately 35% of the country, one of the highest proportions anywhere in the world.

Location Description

The CFRNP[1] is located in the Cayo District of Western Belize (Figure 1) and is a representative of the lowland and emergent semi-deciduous moist forest (annual average rainfall of 2500-4000 mm), long since recognised as a priority area for conservation (Meerman, 2005). The CFRNP has a geographical area of approximately 1744 km^2 and is part of the largest naturally forested tropical area in Central America, known as the Selva Maya. The CFRNP is fundamentally a limestone plateau naturally interspersed with meta-sedimentary outcrops. The Upper Raspaculo River (URR) is located in the north east of the park which is delimited by the Mountain Pine Ridge (MPR) in the north, by the main divide of the Maya Mountains to the east and south, and by the Belize/Guatemala border to the west. The CFRNP has generally been affected by some selective logging during 1950-1970, but the Upper Raspaculo has, due to its remoteness, remained mainly untouched since the Mayan occupation ca. 1000 years ago.

In a preliminary report on the scientific and biodiversity value of the Macal and Raspaculo watersheds (Figure 2), it was concluded that due to the remoteness and the strongly seasonal hydrodynamics, the two watersheds together constitute one of the most biologically rich and diverse regions remaining in Central America (Minty *et al.* 2001). Further, the faunal and floral records of the area (Rogers & Sutton 1991; Rogers *et al.* 1994, Rogers 2001; Minty *et al.* 2001) suggest that the Macal and Raspaculo watersheds serve as a critical seasonal food source for many endangered species particularly during the dry season (Table 1).

[1] For the purpose of this study the CFR and NP was considered as comprising one contiguous block of protected land, albeit with sections governed by different legal status, because they share the same biophysical characteristics

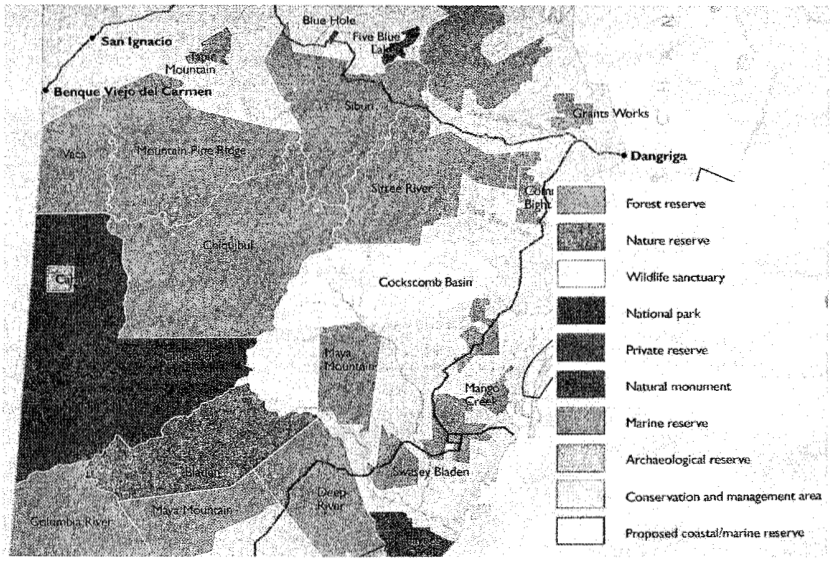

Figure 1 – Central section of a Belize Protected Areas Map (by Belize Zoo, NARMAP, and Forest Department) showing location of the Chiquibul Forest Reserve & National Park and Archaeological/Scientific Reserve Boundaries.

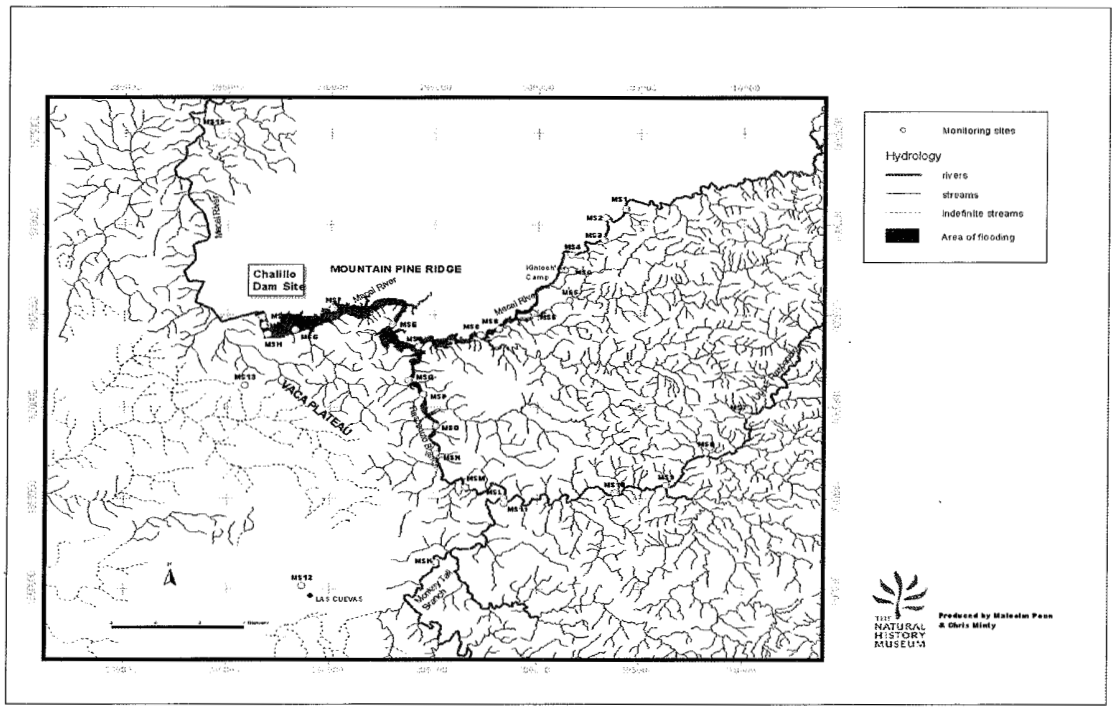

Figure 2 – Macal and Raspaculo Watershed

Table 1 - List of IUCN red list species that occur in the riverine habitat of the Raspaculo watershed.

Common name	Scientific name	IUCN status
Jaguar	*Panthera onca goldmanii*	Vulnerable
Ocelot	*Leopardus pardalis pardalis*	Vulnerable
Margay	*Leopardus wiedii yucatanica*	Vulnerable
Neotropical Otter	*Lutra longicaudus annectens*	Vulnerable
Baird's Tapir	*Tapirus bairdii*	Vulnerable
Central American Scarlet Macaw	*Ara macao cyanoptera*	Vulnerable
Morelet's Crocodile	*Crocodylus moreletii*	Endangered
Black Howler Monkey	*Alouatta pigra pigra*	Threatened
Puma	*Puma concolor mayensis*	Threatened

Research question

The area occupied by the riverine habitat in Belize is declining due to the construction of the Chalillo hydroelectric dam on the Macal River (Figure 2). The construction of the Chalillo dam was completed in 2005, and water levels on the Macal river and the lower reaches of the Raspaculo are estimated to rise and reach their maximum by November 2006 (Figure 2). Due to the inundation, the riverine forests of the Macal watershed will be lost and the importance of the Upper Raspaculo forests as the wildlife hotspot within the CFRNP will increase exponentially. On a national scale, Macal and Raspaculo watersheds hold 60% of Belize's broadleaf lowland riverine habitat (Minty *et al.* 2001), and to enable effective conservation action of the remaining Upper Raspaculo area, a detailed species list and a vegetation classification of the area are needed.

Baseline vegetation studies on the Macal river and the lower reaches of the Raspaculo exist (Urban 2001, Meerman 1999), but the upper reaches of the Raspaculo watershed remain mostly unexplored (Figure 3). The only botanical study of the area include a list of ca. 120 indicator species of Pteridophytes and a species list of trees and lianas from a 1 ha permanent forest plot (Figure 3; Joint Services Scientific Expedition to the Upper Raspaculo [JSSEUR]; Rogers & Sutton 1991). Based on their study, Rogers & Sutton (1991) conclude that the forests of the Upper Raspaculo seem to have a unique composition of species not found elsewhere in the country. Preliminary results from the 1 ha-plot survey (Rogers & Sutton 1991; Rogers *et al.* 1994; Rogers 2001) show the forests to be highly dynamic, probably resulting from the combination of steep topographic changes, limestone substrate, and regular hurricane disturbance. The dense and diverse herb layer of these forests on deep organic soils avoid erosion during the seasonal floods through the densely matted root systems typical of large grasses, *Heliconia*, Maranthaceae and Araceae.

The proposed work would significantly increase the understanding of the threatened riverine ecosystem and the rare plant and animal species supported within it. Consecutively, a gap analysis would enable the government of Belize to officially ascribe a conservation status to this declining habitat, and provide a crucial stepping stone for the commencement of action necessary to conserve this exceptional habitat. The importance of successful conservation management is easily agreed upon due to the large number of big cat and Tapir sightings as well as strong evidence that the Upper Raspaculo is one of few breeding places for an endemic sub-species of the Central American Scarlet Macaw. Once a vegetation survey has been completed and conservation measures are implemented accordingly, the Upper Raspaculo watershed could remain a biodiversity "crown jewel" crucial in the wildlife corridor for the fauna and flora of Central America.

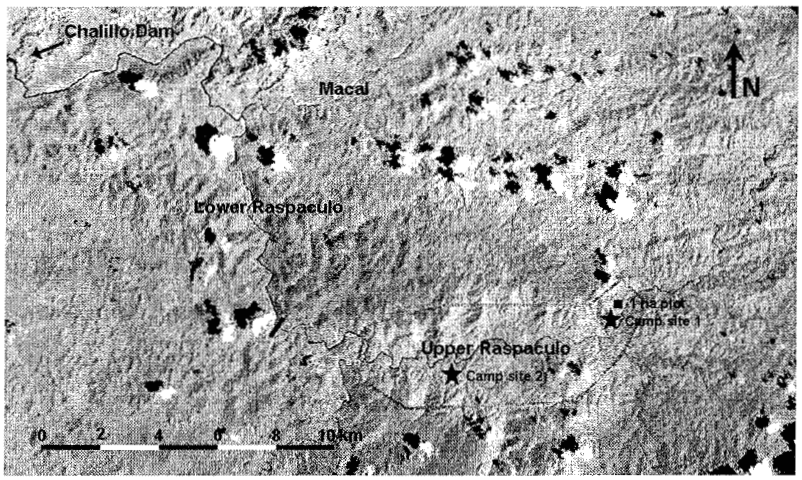

Figure 3 - Satellite map of the Macal and Raspaculo watersheds, based on a Landsat TM image of the area taken in 2001. The image is a false colour image in the bands 453. Orange brown colour in this image represent vegetation, blue-green colours are bare ground. Study area is shown by red line, camp sites marked with stars and the 1 ha plot shown. The black bar shows the estimated maximum water level mark.

The project would provide an excellent opportunity to collect living material of rare and endemic plants for the National Botanic Garden of Belize in Belmopan. In collaboration with us, Trekforce volunteers will transport plant material between the Upper Raspaculo base camps and Las Cuevas Research Station. This regular ferrying of plant material to LCRS enables better preparation, drying and preservation of living samples than relying on our team efforts alone.

Aims and objectives

The general aim of the proposed project is to carry out a baseline floristic survey of the species composition and vegetation types in the Upper Raspaculo watershed. The results will provide baseline data for conservation management of the threatened riverine area within the Chiquibul Forest Reserve and National Park (CFRNP) which is becoming increasingly important as a habitat for many endangered animal species such as Jaguars, Bairds Tapir and Scarlet Macaws due to recent flooding by a hydro-electricity dam further downstream.

The specific **scientific objectives** of this project are the following:

- to compile a **botanical species list** of the Upper Raspaculo;
- to characterise the **vegetation types** found throughout the Upper Raspaculo;
- to re-survey a 1 ha permanent forest plot in existence since 1991 to study the **forest dynamics** of the Upper Raspaculo;
- to collect live specimens of rare and endemic plants which will be given to the National Botanic Garden of Belize in Belmopan to assist in the establishment of the first national gardens.

Educational objectives of the project include training of four undergraduate students (two UK and two Belizean) in biological field study. Specific **educational objectives** of this project are the following:

- to train the students in **organising** a field study and **fundraising** for a project;
- to train the students in **field skills** such as canoeing, first aid, navigation, communication, specimen collection;

Educational objectives of the project include training of four undergraduate students (two UK and two Belizean) in biological field study. Specific **educational objectives** of this project are the following:

- to train the students in **organising** a field study and **fundraising** for a project;
- to train the students in **field skills** such as canoeing, first aid, navigation, communication, specimen collection;
- to train the students in scientific **field methodology** such as transect work, re-survey of permanent forest plots, data management, data analysis (statistics, GIS);
- to encourage students to get **experience** in field studies: the establishment of relationships on the professional and personal level will facilitate future conservation collaboration between Belizean and British institutions.

Methods

Reconnaissance

The methods will follow an extensive reconnaissance visit to the Upper Raspaculo, which has been planned to take place at the end of January 2006 by * who will be accompanied by staff from the Natural History Museum, London and Las Cuevas Research Station. Feasibility of proposed vegetation transects (see **Vegetation Survey** below) will be determined, and the proposed two base camps will be chosen and cleared, so that minimum time will have to be spent on setting up the camp in 2006. The Cuxta Bani helipad will be cleared to allow helicopter access for casualty evacuation.

Species list

Based on satellite imagery, vegetation types present in the Upper Raspaculo area will be assessed (Figure 3). Once the vegetation types are identified on the satellite image, these will be visited during the field period. Specific locations of interest within the watershed will be identified and extensive patrolling (walkover transects) will be done within the Upper Raspaculo watershed to record and collect voucher specimens of the local flora. All specimens collected will be deposited at the RBGE and Belmopan herbaria. Existing species lists from vegetation studies on the Raspaculo river will be included in the species list (Rogers & Sutton 1991; Rogers *et al*. 1994; Rogers 2001).

Vegetation survey

The vegetation survey will be done by using standardised Rapid Ecological Assessment (REA) vegetation transects (Meerman 2003, Meerman *et al*. 2004), adapted originally from the methodology used by the Forest Planning and Management Project in Belize (Shawe 1997). These transects delimit a 200 m × 4 m area which will be divided into 20 separate 10 m long segments. All trees with > 10 cm diameter at breast height (dbh) will be counted, dbh measured and species identified. Only those stems that have their base within the transect will be counted. Also, within each segment, notes will be taken on: soil type, slope, canopy height and canopy density. A minimum of three transects will be made during the field study: two at the vicinity of the Camp site 1 near Cuxta Bani, and one near the Camp site 2 (Figure 3).

With the data obtained, several biodiversity indices can be calculated: 1) number of species, 2) species abundance curves (i.e. number of very abundant species versus rare species), 3) Shannon's diversity index, and 4) level of evenness (i.e., number of individuals per species). Also, the following pieces of structural data can be collected for each of the transects: a) average stem dbh, b)

number of multi-stemmed trees, c) number of dead trees, and d) space per living tree (m^2). GIS will be used in analysing our results. The existing vegetation classifications of Belize by Wright (1959), Penn *et al.* (2004) and Meerman (2005), and the ecosystem map of Central America (World Bank & CCAD, 2001) will be used as the backbone when constructing the vegetation descriptions.

Permanent sampling plot

The plot-based work at Cuxta Bani was started in 1991 and re-surveys have been done in 1993 and 2000 (Rogers & Sutton 1991; Rogers *et al.* 1994; Rogers 2001). Methodology of data collection will continue to follow the instructions of the Smithsonian Institute, USA. The 1 ha plot is a 20 m × 500 m belt transect within a 25 ha plot. The plot is divided into 20 m × 20 m segments. Within the 1 ha plot, all trees and lianas with 10 cm dbh have been tagged. During the re-surveys, the trees within the plot have been re-measured (diameter and height) to provide data on growth, recruitment and losses within the forest plot. With the data obtained, we can extend the set to cover a full 16-year period, over which we can record and plot for possible changes in the following: 1) number of trees in the total area or segment, 2) number of individuals for a given species, 3) numbers of individuals for given size classes, 4) numbers of individuals being recruited to a given size class within a period of time. The data will be valuable for studying regeneration within a forest and provide practical guidance on the resource value of an area for sustainable utilisation of timber resources.

Living specimens

Living material of rare and endemic plants will be collected during the field period for the National Botanic Garden of Belize in Belmopan. Rare and endemic plants will be identified on the field and collected and packed for short transport from the camp site to the Las Cuevas Research Station (LCRS). The transport will be done by Trekforce volunteers who will work in close collaboration with the research team. This regular ferrying of plant material to LCRS enables the preservation of living material at LCRS where the plants will remain for a quarantine period. From thereon, the plants will be managed by LCRS.

Science education in Belize

The methods chosen for this vegetation survey allow for the training of four undergraduate natural resource and plant science students in botanical fieldwork by the two leading scientists * and *. The aim is to introduce the students to practical implications of fieldwork in remote locations and the importance of international and inter-disciplinary collaboration, but also to exchange knowledge about the local wildlife and to learn new techniques of identifying and collecting plant material. Upon return from the Raspaculo, a combination of workshops and discussions are to take place between the four undergraduates, the two expedition leaders (inspired by the experiences we gain during our data gathering in the field), and teachers of the San Ignacio School (see page 14). Workshops with the school kids will include group exercises and role games.

The data analysis from September 2006 to March 2007 will continue as a joint effort between the two countries, and will include the process of specimen deposition at the herbaria (Edinburgh and Belmopan, Belize). Further, raw data and research results will be entered into the Belize Biodiversity Clearing House Mechanism (CHM) and the Biodiversity and Environmental Resources Data System (BERDS) for Belize in forms of lists, maps, graphs and reports to link our study to the biodiversity, conservation and resource management work currently being conducted in Belize.

Logistics

Timeline

Preparation

During July-December 2005, the team has been planning the project and attended meetings and conferences in London. January-March 2006 will be spent fundraising, training and preparing for the field season. Reconnaissance in Belize was started by * in November 2005, and he will remain in Belize until the start of the field period in April. Reconnaissance to the field location in the Upper Raspaculo will be done at the end of this month (January).

Implementation

Four months (18 weeks) will be spent in Belize, from 15th April 2006 to 20th August 2006. Provisional timetable for the field period is given below:

DATES	WEEK	
April 15th-23rd	1	Arriving to Belize. Acclimatization. Preparations. Belizean members join team at Las Cuevas.
April 24th-30th	2	Training. Packing.
May 1st-7th	3	Canoeing up the Raspaculo River to Camp site 1. Equipment and food drop-off. Building the base camp. Species survey around the Camp site 1.
May 8th-14th	4	Re-surveying the permanent sampling plot.
May 15th-21st	5	Establishing vegetation transect 1 and data collection.
May 22nd-28th	6	Data collection continues.
May 29th-June 4th	7	Species survey around vegetation transect 1.
June 5th-11th	8	Establishing vegetation transect 2 and data collection.
June 12th-18th	9	Data collection continues.
June 19th-25th	10	Moving the base camp to Camp site 2. Building the new base camp.
June 26th-July 2nd	11	Species survey around Camp site 2.
July 3rd-9th	12	Establishing vegetation transect 3 and data collection/extended species survey.
July 10th-16th	13	Data collection continues.
July 17th-23rd	14	Packing up the base camp and canoeing back to Las Cuevas. Unpacking and organising plant material. Visiting collaborators in Belize. Identification of specimens begins.
July 24th-30th	15	Identification of specimens at Las Cuevas. Sending specimens back to UK.
July 31st-August 6th	16	Workshops in San Ignacio School.
August 7th-13th	17	Personal holidays (not included in the budget).
August 14th-20th	18	Personal holidays (not included in the budget). Leaving back to the UK.

Post-project

The end of August and whole of September will be used to do a preliminary analysis of the data collected. The aim is to present rough preliminary results in the 40th Anniversary meeting of the Belize-UK Association held in Edinburgh at the end of September 2006. All grant-giving bodies and sponsors will be updated as to the success of the expedition. Data analysis will continue after this; plant specimens are expected to arrive from Belize by the end of September, and work on the specimens can begin in October 2006. After a minimum of two months work on identification at

RBGE, a visit to NHM, London, will be made in January-February 2007 for a month (visit budgeted in this proposal). Data analysis will be split between Belize and UK as much as possible depending on the resources available in Belize (will be assessed and decided with Belizean team members). Reports will follow to all grant-giving bodies and other sponsors.

Transport

There are no easy ways into the Upper Raspaculo. Reasonable dirt roads terminate at Guacamallo Bridge on the Macal some 32 km west. An old, overgrown and not all-weather logging track continues for another 1 km to Blue Hole Camp on the lower reaches of the Raspaculo, where there is an abandoned Jungle Warfare Training Camp used until 1989 by the British Forces. To get above this point, the only realistic approach is to canoe upstream the Raspaculo. This has been achieved several times by other expeditions, but can only be done during the height of the dry season when the river is not flooding and the conditions are safest and most favourable. Our expedition will use four canoes (of which two are inflatable) proved ideal for many portages required due to the low water levels in the river during the dry season. Navigation can be done mainly through simple map to ground (GPS and compass), and by following the main river channel.

Accommodation

Long term base camps will be built in the Upper Raspaculo river valley in two locations which will be selected and cleared during the reconnaissance in January. Camp site 1 (Figure 3) has been used by previous expeditions, and the original layout of the camp will be followed when re-building the camp. Location of camp 2 will be chosen on the grounds of safety (away from animal tracks, potential flooding, land slips or deadfall), communication potential (to the outside world), and suitability (hammock trees, relatively flat ground, swimming hole). Upon arrival in April, the camp will again be checked for dangers of deadfall. Hygiene (latrine position and construction, waste disposal, food storage, above/ below camp water point siting) and general safety rules (fire hazards, cooking area, spider-, snake- and scorpion procedures, presence/absence tags and trip authorisations) will be inaugurated. The camp perimeter will be clearly marked with white tape. All members of the team will overnight in hammocks enveloped by a permethrin-soaked mosquito net. Equipment and food will be stored in two separate tents, which will also provide working space in the evenings.

Communications

Routine communication will be conducted via VHF radio from base camp to LCRS once a day by the communications officer. VHF radio was proven to be reliable from the heights around the Cuxta Bani where the LCRS repeater can be reached. *Emergency communication* will also be via VHF radio and satellite phone to Belize Central Security Ltd (BCL) who will coordinate a casualty evacuation if necessary. Training in the use of both VHF radio and the satellite phone will be done by all participants during the first two weeks in Belize. Contact numbers in case of emergency: BCL + 501 822 2149 (during hours) and 822 3505 (out of hours).

Permits

Permits for the field work have been applied for through the Forest Department, Government of Belize: the collection permit will allow us to collect and export plant material back to Edinburgh, and the camping permit will allow the team to camp at the Upper Raspaculo area for the specified period.

Funding

The total budget of the proposed project is £17 567 and includes prices for six expedition members (four from UK, two from Belize) in pounds sterling. Items marked with asterisks include material given in kind and borrowed by RBGE, Las Cuevas Research Station and Belize Zoo. From the total budget, £2000 is covered by personal contributions, and £350 by funds received from the James Rennie Bequest. From the remaining £15 215, £5 000 are sought from the Davis Expedition Fund.

Funding is currently being sought from the Carnegie Trust Fund (£1650 towards travelling costs), and the application is pending. During the next few weeks, funding will be sought from the following grant-giving bodies: Royal Geographical Society Fieldwork Grant, Royal Geographical Society Henrietta Hutton Research Grant, Percy Sladen Memorial Fund, Royal Botanic Garden Edinburgh Small Project Grant, Royal Scottish Geographical Society, Oleg Polunin Memorial Fund, People's Trust for Endangered Species, Weir Fund for Field Studies, Barnson Bequest, William Dickson Travelling Fund, and the Edinburgh University Small Project Grants.

Table 2 - Budget for the proposed project, in pounds sterling.

Pre-expenditure:	Flights Scotland-Belize (×4)	3600
	Travel insurance (4 UK and 2 Belizean members)	900
	Vaccinations and malaria tablets (×4)	610
	Food and lodging in the USA (2 days, ×4)	600
	RGS Explore weekend (×2)	250
	Wilderness medical course (×3)	225
	Canoe training day (×3)	200
	Visa (×4)	160
	Belize-UK association annual meeting (×2)	155
	Research permit	120
In field:	Food at camp (90 days, ×9)	2500
	Food and lodging in Las Cuevas (30 days, ×6)	1800
	Personal camping kits (×6)	1000
	Medical equipment	350
	Tree-spotter (15 days)	300
	Car rental including petrol	300
	Camping tools	300
	Digital camera	300
	Navigation tools (GPS, maps)*	200
	Solar panel	100
	Scientific equipment (Presses, poles, rope, etc.)*	100
	Satellite phone rent and VHF radios*	-
	Canoes (×4)*	-
Post-expenditure:	Visit to Natural History Museum, London (×2)	1400
	Postage of specimens from Belize to UK	500
	Total	**15970**
	Contingency (10%)	1597
	Final total	**17567**

Collaboration

Royal Botanic Garden Edinburgh (RBGE)

With increasing botanical collections from Belize, and as a joint partner in the LCRS, RBGE has a strong interest in the flora of Belize and its conservation. Based on discussions with Dr Stephen Blackmore, the Regius Keeper, and Dr Mary Gibby, the Director of Science, RBGE has confirmed that they will function as the home institution for the proposed project. RBGE will provide expertise in the local flora and unlimited use of the herbarium facilities needed for species identification when returning from fieldwork, and furthermore, computer facilities and working space will be available for the two principle investigators throughout the project.

Las Cuevas Research Station (LCRS)

LCRS was established as a Belizean – British joint initiative to facilitate biodiversity research and contribute practical knowledge for the sustainable development of tropical forests (Rogers 2001). *, ecologist and Head of Maya Forest Enterprises, has spent many years in the Chiquibul Forest working closely with local stakeholders and has experience in organising extensive field work in the area. LCRS will function as our overseas host institution. * will act as our 24-hour emergency contact in Belize during the field period. At the moment, * is acting as an advisor to one of our team members, * (undergraduate student at the University of Edinburgh, School of Biology), who is spending a year-long training period in LCRS as a resident scientist. This collaboration enables the best possible reconnaissance for our fieldwork.

University of Edinburgh

The year 2006 marks the 40th anniversary of University of Edinburgh expeditions to Belize. * took part in the majority of these expeditions and has shared his expertise in working in Belize from the early stages of our expedition planning. Peter will act as the 24-hour UK based contact throughout our field period due to his long-standing involvement in organising expeditions between the two countries. Furthermore, the School of Geosciences provides access to Geographic Information Systems (GIS) and satellite maps of Belize, specifically through the involvement of * and *.

University of Belize (UB)

Congruent with the Memorandum of Understanding between the two universities, two undergraduate students of the University of Belize Natural Resources Management Program will join the research team. The subsequent exchange of knowledge about the local fauna and flora is expected to significantly enhance the learning experience of all participants. *, Head of the Natural Resources Management Program at UB, is responsible for student allocations during 2006. Collaboration with the University of Belize will continue after the field period so that the Belizean team members will be part of the data analysis in summer/autumn 2006. Research results will be made available on the internet through the Biodiversity and Environmental Resources Database for Belize (BERDS).

Natural History Museum, London (NHM)

* from the NHM is collaborating with the team both in Belize and in the UK, and is an expert on the Belizean flora. He actively supports the expedition and is regarded as the principal

senior advisor on the logistics and methodology of tropical fieldwork. Further, in 1991, staff from NHM, e.g., *, * and *, launched the first research expedition to the Upper Raspaculo, where they delimited a permanent 1 ha forest plot. Data from this forest plot, covering survey-years 1991, 1993 and 2000, will be made available for our project to allow analysis of long-term forest dynamics of the study site. Finally, the NHM herbarium, together with RBGE, will aid in the identification of specimens from Belize.

Trekforce

Collaboration with Trekforce Guatemala/Belize is planned between LCRS and the Trekforce London Office. The collaboration would provide Trekforce volunteers experience in tropical fieldwork as these volunteers would work in transporting and drying plant specimens from the Upper Raspaculo base camp to LCRS where all drying and pressing will be done. Furthermore, with the help of Trekforce volunteers, live specimens can be transported from the base camp to LCRS to provide living material to the National Botanic Gardens of Belize.

Belize Zoo

*, the Director of the Belize Zoo, has taken part in the previous expeditions to the Upper Raspaculo (e.g., 1991 & 1993), and will provide two inflatable canoes to the planned expedition. Sightings of any animals, in which special interest from the zoo exists, will be recorded and given to the zoo.

Forest Department, Belize (FD)

Permission for collecting plant material has been sought from the FD (Conservation Division, Ministry of Natural Resources) prior to this application. Permission is advised to be sought three months before the start of field work, and when approved, will cost $200 BZ. After the field period, full project report and any publications resulting from the project will be provided to the FD. Further, a camping permit will be sought from the FD closer to the start of the field period.

San Ignacio School, Belize (SIS)

Team member * has started a project with *, the Vice Principle of the SIS, to renew the science education of the local primary school. The science syllabus of many Belizean schools are in need of modernisation but resources for changes are lacking. Our project aims to organise few workshops with the local teachers in SIS at the end of our field work period to better understand needs of support and lack of material in science education in Belize. The workshops will aim to produce information and material to Belizean schools that can be used in science education; this material will be based on the data gathered during the field study in the Upper Raspaculo area, and will aim to increase the understanding of the value of the area as a wildlife reserve.

University of Turku, Finland (UT)

The Amazon Research Team in the University of Turku, Department of Biology, is one of the leading research groups in tropical forest understorey herbs and ecology. As our project is limited in time and effort, no detailed study of the herbs of the Upper Raspaculo can be done, despite the fact that the herb layer is known to constitute an important aspect of the riverine habitats in Belize (Minty 2001; Urban 2001). However, by collaborating with Hanna Tuomisto and her team in the UT, we can get some information on the herb layer of the area. The specialist study groups of the

UT Amazon Research Team are Melastomataceae, Alismataceae and Pteridophytes; both herbarium and silica gel material will be provided for the UT team, and accurate identifications of the herbs will be gained in return.

Team Members

Group Leader

* German, demonstrator at Napier University Education:

- M.Sc. Biodiversity and Taxonomy of Plants, University of Edinburgh and RBGE.
- M.A. Physical Geography, University of Colorado, USA.
- B.Sc. Physical Geography, University of Maryland, USA.

Special skills:

- Fieldwork experience in botany from Northern and Southern Belize (Rio Bravo Conservation Management Area and Chiquibul Forest Reserve), in soil sciences and plant physiology from Germany and Colorado Rocky Mountains.
- Plant identification and taxonomy.
- Wilderness medical training through Lifesigns group.
- Teaching at University level.
- Digital mapping and GIS training.

Responsibilities during the expedition:

- Team leading and management, training.
- Plant identification.

Logistics Officer

*, Finnish, junior member of staff in the Edinburgh University Computing Services, Science Support Team Education:

- M.Sc. Biodiversity and Taxonomy of Plants, University of Edinburgh and RBGE.
- B.Sc. (Hons) Plant Science, University of Edinburgh.

Special skills:

- Fieldwork experience in botany from Northern and Southern Belize (Rio Bravo Conservation Management Area and Chiquibul Forest Reserve), Central and Southern Finland, and the Shetland & Fair Isles; in marine biology from the Southern archipelago of Finland.
- Plant identification and taxonomy.
- Wilderness medical training through Lifesigns group.
- Teaching at University level.
- IT skills and digital mapping.
- Experience in scientific publications.

Responsibilities during the expedition:

- Logistics and equipment, training.
- Plant identification.

Local Contacts Coordinator, Communication Officer, Health and Safety Officer 1

*, Scottish, student at University of Edinburgh

Education:

- 3rd year gap student, Plant Science, School of Biology, University of Edinburgh.
- Resident Scientist at Las Cuevas Research Station (LCRS), Chiquibul Forest, Belize.

Special Skills:

- Personal field training in forest survival by Ray Mears at LCRS.
- Experience in operating communications during expeditions in jungle conditions.
- Extensive field work experience from Southern Belize.
- Excellent Spanish.

Responsibilities during the expedition:

- Reconnaissance (January), local contacts, communications (radio and satellite phone), health and safety, science education workshops in San Ignacio.
- Photography.

Health and Safety Officer 2

*, Scottish, student at University of Edinburgh Education:

- 3rd year student in Biological Sciences, School of Biology, University of Edinburgh.

Special Skills:

- Wilderness medical training through Lifesigns group.
- Medicine and medicinal botany.
- Horticulture.

Responsibilities during the expedition:

- Health and safety.
- Live specimen collection.

Belizean Team Members

Two undergraduate students from the University of Belize Natural Resource Management Program, University of Belize, will join the expedition on the field. Both team members will be selected by Dr Ed Bols, the Head of the Natural Resource Management Program, during January/February 2006.

Education:

- Current students in the Natural Resource Management Program, University Belize.

Responsibilities during the expedition:

- Plant identification.
- Science education workshops in San Ignacio.

Health and Safety

Risk Assessment

A detailed risk assessment is appended to the back of this document. Statistically speaking, the majority of life-threatening dangers on expeditions arise from road traffic accidents and drowning. Apart from privately arranged pick-up and drop-off for travel between airport and LCRS, we do not anticipate the use of motorised vehicles. We will, however, travel on and camp near a river, a fact that heightens the risk of drowning during our expedition despite excellent swimming abilities of all members of the team. Therefore, adequate training will be provided from a professional company (Ed Batter) in the UK to refresh skills of navigating canoes, and life-vests and helmets will be worn when travelling in the river. Another frequent danger in tropical forest expeditions is deadfall from vegetation. Therefore, even short stops for lunch require a good check of the canopy and surrounding vicinity in a radius at least as large as the tallest trees.

The Foreign and Commonwealth Office advises travellers to Belize from the UK to confirm the update of primary courses and boosters recommended for life in Britain, as well as all following vaccinations for a stay longer than one month: Hepatitis A, Tetanus, Typhoid, Diphteria, Hepatitis B, Rabies and Tuberculosis. Strongly recommended are malaria prophylaxis and adequate medical insurance (see **Insurance** below).

Frequently encountered health risks such as dehydration, insect bites, sunburn or diarrhoea can easily be prevented by appropriate water intake, long-sleeved, loose clothing and rigorous personal hygiene. The risks of accidents can be minimised by constant full awareness of the surroundings, and regularly scheduled break times to counteract fatigue. Well before departure, all members will have a medical examination by their personal GPs and discuss any pre-existing medical conditions that may need to be reported to the insurance company, or need specific attention. Of equal importance, all members will undergo a dental check in good time prior to departure.

All four UK-based participants are trained in wilderness medical and first aid. Additionally, the two Health and Safety Officers * and * will organise first aid area and risk assessment re-evaluation at regular intervals. Our health and safety regime will be inaugurated at both base camps to ensure preparation for any emergencies. * will train the team to handle VHF and satellite phones to communicate emergencies with the contacts. Both VHF and satellite phones will be with the team at all times during the field period; radio channels and satellite phone numbers will be carried with the equipment on a laminated sheet of paper. The recommended survival first aid kit for 10 persons by Nomad travel stores will be carried with the expedition and kept at all times easily accessible, including times of travel. Smaller personal first aid kits will be carried by each team member AT ALL TIMES. The station manager at LCRS, Isidro Bol, is a paramedic with access to LCRS's large stash of medical supplies; he is the closest paramedic to our camp site.

According to the Foreign and Commonwealth Office, Belize is politically stable, and considered safe for travelling. Caution should be exercised when travelling through urban areas. Although fieldwork is scheduled throughout the dry season, local weather forecasts should be consulted on a regular basis to be prepared for prematurely commencing heavy rains.

Our 24h contacts in Belize (Chris Minty) and the UK (*) will be equipped with a comprehensive portfolio of any potentially important details for each team member (blood group, passport scan, next of kin, personal GPs in the home country, recommended specialists, and dentists in Belize, insurance documents, government embassies both in Belize and the UK); all these details will also be carried on the field in laminated format and will be kept with the satellite phone, as well as respective details in the personal pouch.

Emergency Procedure

The emergency procedure is to 1) administer first aid if feasible, 2) return to Las Cuevas Research Station (LCRS) with patient if practical, and/or 3) operate emergency evacuation as planned below for different types of casualties:

- **Life Threatening Casualty**: Belize Central Security Ltd (BCL) will coordinate with 25 Flt Army Air Corp for a casualty evacuation by helicopter (24 hour cover) and a straight flight to Miami (2 hour flight).
- **Serious Casualty**: Belize Medical Associate (BMA), transport to Belmopan by either car from LCRS (6 hours by road) or by helicopter (30 minutes by air).
- **Trivial Injury**: Luma Luz Hospital in Santa Elena (3 hours by road) OR Belmopan General Hospital (4 hours by road).

Insurance

All team members carry adequate medical insurance from Campbell Irvine Ltd. which covers, amongst other costs, medical, repatriation and associated expenses of up to £5,000,000, and personal liability of up to £2,000,000. Congruent with the contract, all insured expedition members are aware of the policy details, especially its failure to cover pre-existing medical conditions. Additionally, in any cases of necessary medical treatments, the insured person, or the person travelling with the injured or ill, will ask to be furnished with the medical report needed to file the insurance claim. Belizean team members and guides working for the expedition will be insured for the period of fieldwork and travel to and from LCRS. Their insurance will be organised from Belize through LCRS.

Output

The project will contribute towards the commitment of the Belizean government to the Convention on Biological Diversity (CBD) as communicated in part through Article 7. Identification and Monitoring, Article 8. In-situ Conservation, Article 9. Ex-situ Conservation, and Article 12. Research and Training by:

- compiling a **species list** of plants for the unexplored Upper Raspaculo River Valley;
- identifying and classifying the **vegetation types** present in the Upper Raspaculo River Valley, and thus allowing the **monitoring** of any possible future changes caused by the Chalillo dam on the ecosystems;
- collecting data needed in the selection and **management of protected areas** in Belize;
- contributing to the National Botanic Garden of Belize by collecting **living material** in the Upper Raspaculo River Valley;
- establishing the 16th year record of the 1 ha forest plot near Cuxta Bani for the study of **forest dynamics**;
- providing **education and training** for two local Belizean and two young British scientists in identification and collection of specimens, applied field methodology, data management and data analysis;
- **collaborating** with local teachers of a primary school to improve their science syllabus.

Other outcomes of the project will include manuscripts that are planned to be published in both national (both Belize and UK) publications and peer-reviewed international scientific journals. Reports of the field study will be sent to all sponsors and collaborators both in the U.K. and Belize.

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Fieldwork Assessment Form FA1

(Refer to Notes for Guidance before completing this form)

School Assessment No.	
Title of Fieldwork Activity:	Botanical Assessment in the Maya Mountains of Belize
Location(s) of Work:	Upper Raspaculo Watershed, Chiquibul Forest Reserve, Maya Mountains, Belize, Central America.
Duration (incl. dates From / To) :	From 15th April / To 20th August 2006

Brief Description of Fieldwork:
Based on a satellite image of the Upper Raspaculo river valley, vegetation types will be identified and ground-truthed. Aiming to compile a species list for the remote river valley, walkover transects and extensive collecting will be done. To assess the vegetation types of the area, Rapid Ecological Assessment (REA) vegetation transects will be done within each vegetation type. Data on the forest dynamics of the area will be gained by re-surveying a 1 ha forest plot originally established in 1991.

Hazard Identification: Identify all the hazards; evaluate the risks (low / medium / high) and describe all necessary control measures.

Hazard (s)	**Risk** L / M / H	**Control Measures**
Physical Hazards (e.g. extreme weather conditions, cliffs, caves, mountains, marshes, quicksand, fresh / seawater, mines, quarries, tides)		
Getting lost	H	• Each team carries a large-scale map, compass, GPS, whistle, and plenty of water with them. (Remember sharpening the machete will charge it magnetically, which may deflect compass needle – note position before and after sharpening). • Team members always work in groups of at least two people. • Majority of fieldwork will take place within a radius of 500 meters from the Raspaculo river. When moving away from the base camp, tracks will be marked by securing red ribbon where available around trees at 15 meter intervals – if not, trees will be marked at eye level with an obvious slash of the machete on both sides (away, and back towards the camp) to allow easy track back. • Camp perimeter will be marked clearly. • An individual number tag will be left with the guard so that it is known at all times how many people are IN and OUT of the camp. Never leave the camp alone OR without letting two other team members know about where you go, for how long, and with whom. When leaving the base camp, waist pouch with a survival kit will be held at all times. • All participants carry a survival kit in a waist pouch in case of getting lost or disorientated: pouch will include a lost procedure, a compass, a whistle and essential survival things for a night-over in the forest.
River	H	• All participants are good swimmers and trained in handling canoes. • When canoeing, life jackets and helmets will be worn at all times. • River will be crossed at its lowest point observed near the base camps, and these crossing points will be marked clearly so that only these crossing points will be used.

		• Numbers of river crossings will be minimised by using a system of ropes and an inflatable canoe to move equipment across. • River crossing techniques will be practised prior to field period. • If equipment is lost, back-up will be available at LCRS. • Base camps will be built only above high water mark, despite the fact that field work will be done during the dry season.
Hot weather	H	• All members will be aware of the severity of dehydration threat: drinking breaks will be held regularly during working days to habit team members to drink regularly. Salts will be available at all times, and adequate salt intake will be considered when preparing food. • Drinking water at LCRS is supplied by a system of caves, and is known to be safe. If recommended by LCRS staff, the water can be filtered. • During field period at base camps, drinking water will be taken from the river (upstream) and will be boiled (for min. 10 minutes) OR filtered from large debris and purified with Iodine to supply adequate water for drinking. • During travelling periods, drinking water will be taken from taps or bought depending on the area we are travelling through. • Sunburns will be prevented by adequate clothing: long sleeved shirts and trousers will be worn, and hats will provide protection for head and neck. Sun screen lotions will be carried on the field and used when necessary.
Falling trees/branches	M	• Always check canopy for hang-ups and site for standing deadfall before remaining at a certain spot even for short breaks. • Trees and branches around camp site will be carefully inspected, and pruned/cleared if necessary. Local knowledge from guide will be used when selecting the camp sites: camp with 100 m radius will be inspected for standing deadfall and hang-ups (see rules for base camp selection from RGS – EXPLORE 2005, attached). • If equipment is damaged or destroyed, back-up from LCRS can be arranged via VHF radio (or, if radio is lost, by walking or canoeing back to LCRS).
Falling off a tree	L	• No trees shall be climbed by the team members. Climbing for collecting specimens from mature trees is done primarily by using extended collecting poles, and if needed, by local guide employed by the expedition who is a professional tree climber who may insist on climbing without rope and harness.
Inclement weather	L	• Weather reports are monitored regularly at LCRS and early warning systems are in place via VHF radio. • Fieldwork is taking place within the dry season. If rainy season commences earlier than expected: Abandon all activity, break camp and return to LCRS.
Biological Hazards (e.g. poisonous plants, venomous /		

aggressive animals, soil or water micro organisms, insects)		
Poisonous snakes / amphibians	H	• Familiarization with all venomous snakes will take place near Belmopan through live, captive specimens prior to fieldwork (See Additional information below). • Thick-soled jungle boots and long trousers will be worn at all times during field work, as ground-dwelling snakes are well-camouflaged. No walking will be done by bare feet even at the camp site. • Extreme caution is required at all times when foraging (e.g., field work, fire wood collection). No bare-handed foraging through leaf litter. Especially ditches, caves and root cavities will be avoided where possible. • Torches must be carried at night, even when walking near the camp, and even if paths have been memorized. • Camp site area will be kept clean and tidy at all times to minimise the risk of snakes curling in piles of equipment etc. Equipment and food will be stored above the ground in tents to reduce the risk of snakes getting to places which are used regularly with bear handed people. Toilet seat will be closed after visiting the latrine to minimise the risk of snakes in this surprising place; stick will be used to clear the raised toilet seat from snakes beneath before using the latrine. • Emergency evacuation will be undertaken if necessary (see Emergency procedure below) and any anti-venom treatments will be provided at hospitals if needed.
Ticks and red mites	H	• Long-sleeved shirts and trousers tucked into boots will be worn when working on the field. • Regular tick and mite checks will be done to clear any bugs from the skin. Removal will be done by tweezers/fingers/Vaseline as necessary, and anti-bacterial liquid will be used to clean the bites afterwards to minimise any possible infections.
Poisonous plants (specific to local environment: e.g., white poisonwood tree, give and take palm)	M	• Three participants are already aware of the local hazards, and will, together with staff from LCRS, brief the other participants upon arrival (see Additional information below).
Sexually transmitted and/or blood-borne diseases (STDs, HIV-infection)	M	• Sexual intercourse will be avoided, or safe sex practised. • Sterile needles, syringes and condoms will be carried in the personal pack.
Water-borne diseases	M	• The water at Las Cuevas comes from a system of underground caves and is usually safe to drink. • In the field, water from the Raspaculo will be filtered, boiled for a minimum of 10 minutes and purified with Iodine (5 drops/l) 1 hour prior to its use in drinking and cooking. No threat is expected from it at this point, but cross-validation with locals will be initiated upon arrival. • To keep the water source as clean as possible, washing in the river will be done downstream from basecamp.
Infectious diseases	M	• Following the guidelines for field hygiene and sanitation used in the British Services, a latrine will be constructed 200m away from the river and

		downstream from camp: a 2 m^3 pit will be dug, upon which a raised seat will be built. The path to the toilets will be clearly marked and regularly cleared. • A urinal located to the side of the latrine will drain into the same pit; a hand-washing point provided with a water/Dettol/Savlon mix will be available. The construction procedure (including pictures) is explained in the JSSEUR 1993 expedition report (A-3-3). • A soakaway for dirty dishwater will be constructed, using a sieve filled with leaf litter to filter the waste water, regularly burning the leaves, as explained in the JSSEUR 1993 expedition report (A -3-3). • As recommended by the British Consulate to Belize, all participants will be administered full courses of vaccinations against **Hepatitis A** and **Typhoid** prior to the commencement of anti-malarial drugs. • All members will have checked with their personal GPs the necessity to boost any childhood vaccines (**Tetanus, Polio, Diphteria, MMR)** and to immunise against **Hepatitis B**, **Tuberculosis** and **Rabies**
Malaria	L	• Tablets of Chloroquine (prophylactic anti-malarial medication) will be taken weekly throughout the stay overseas, beginning one week prior to leaving, and continuing for a month after the return to the UK. • Contact with mosquitoes will be avoided by use of long-sleeved and loose clothing, and the use of insect repellants. • Mosquito nets, soaked in permethrin, will be used during the night. • Standby treatment for malaria will be taken into the field, and any fever will be taken seriously.
Dengue Fever (spread by mosquitoes)	L	• No vaccine available. Precautionary measures to avoid insect-bites especially during day time (see above). Symptoms of this serious illness will be acknowledged prior to the field period.
Leishmaniasis (skin disease caused by parasites carried in sandflies)	L	• The risk is minimised by sleeping above the ground, away from the sandflies, in hammocks. Mosquito nets are used during the night.
Chagas disease (late onset neurodegenerative disorder transmitted by Triatomine bugs)	L	• No known vaccine or cure; general bite avoidance measures against other insects mentioned above apply.
Onchocerciasis, or River Blindness (passed by blackfly vector found near fast-flowing water)	L	• No known vaccine or cure; bite avoidance measures above apply. Symptoms of skin rash, eye lesions, and/or subcutaneous bumps will be monitored for 2 years after return to the UK.
Anaphylactic Reactions	L	• Physical contact with poisonous plants and animals will be avoided by training people to recognise the most common ones (see Additional information below). • General rule: Don't touch if not necessary. • Antihistamine and adrenaline shots will be carried in the first aid kit.
Post-expedition diseases	L	• Members of the expedition will be reminded by the expedition leader of the possibilities of late-onset malaria or cutaneous leishmaniasis for 2 years after return to the UK, i.e. until October

		2008.
Chemical Hazards (e.g. pesticides, dusts, contaminated soils, chemicals on site)		NONE IDENTIFIED
Man-made hazards (e.g. machinery, electrical equipment, vehicles, insecure buildings, slurry pits, power and pipelines)		
Road Traffic Accident	H	• Motorized vehicles will be used only from airport to LCRS, and back. Minimised risk through hire of LCRS-owned truck + driver. • Night driving will be avoided.
Machete	H	• All members of the group will be trained in the use of a machete prior to the field period by the LCRS. Each team member is in charge of sharpening his/her own machete to make sure only sharp machetes are being used, reducing the risk of accidents caused by blunt knifes bouncing off hard woods. • When cutting through a forest in a line, only the first two people will be using machetes, and adequate distances to and between these leading people will be kept to reduce the risk.
Fire	M	• A designated camp-kitchen facility will be organised, where all cooking will take place. Cooking will be done on an open fire using fire wood collected from the woods AND on gas fire using a metal cooking ring. Open fire place will be cleared well so that no vegetation will be too near the fire, minimising the risk of forest fires. Also, bucket of water and dry soil, and a thick blanket will be kept close to the open fire at all times to use as fire extinguisher when necessary. Fire will be killed by water when not needed, and will not be left unattended at any time. • Burns to the body will be avoided by the use of cooking gloves when handling hot dishes. • Fire place will be marked so that it is visible during the daytime.
Destruction of specimens	M	• All collected plant specimens will be transported to the LCRS where they will be air-dried. This will minimise the risk of destruction of specimens by mould whilst drying as the drying facilities at LCRS are much better than on the field. • When transporting the specimens, they will be stored in plastic bags with air; in case of capsizing, these bags will float, and no specimens will hopefully be lost.
Personal Safety (e.g. lone working, attack on person or property, first aid)		
Lone working	L	• Lone working is not allowed due to the risk of getting lost or facing other dangers. General rule is to never leave the camp alone OR without letting two other team members know about

		where you go, for how long, and with whom.
Attack on property/person	L	• Upper Raspaculo is sometimes visited by Guatemalan palm leaf collectors due to the vicinity of the Belize-Guatemala border. Belize Army Forces patrol around Las Cuevas Research Station (forces based at the station) regularly reducing the risk of illegal collectors, but to minimise the risk of any problems to our expedition, two soldiers will be with the expedition at all times. Soldiers will remain at the base camps guarding the property. • Risk of attack on any person is very unlikely whilst in the Upper Raspaculo area; illegal collectors are not known to behave aggressively. The presence of the soldiers will minimise this risk. • Risk of attack on any person whilst in towns and cities in Belize or in the USA will be minimised by travelling as a group using taxis or rented vehicles, and by minimising overnighters: no nights will be spent in towns or cities in Belize, and for the needed stop-over in the USA hotels visited before from areas regarded as safe will be booked.
First aid		See Emergency procedure below
Routine communication		See Emergency procedure below
Emergency communication		See Emergency procedure below
Evacuation		See Emergency procedure below
Environmental impact (e.g. refuse, pollution, disturbance of eco-systems)		
Waste minimisation		• All flammable waste will be burnt in the open fire place at the base camp. Non-flammable waste will be stored in sealed bags and carried out to LCRS. Recycling of waste material will be done where applicable. • Waste will be minimised by carefully choosing food products when buying it in Belize. • The latrine will be deconstructed upon breaking camp, and its parts burnt. Latrine hole will be filled and covered with soil.
Disturbance to ecosystems		• Any rope or string used in delimiting transects or marking paths in the forest will be removed once work has finished. When paths are marked with a slash on the barks, these will be done so that the risk of fatally harming the trees is minimised. • Care shall be taken at all times to disturb flora and fauna as little as possible. • Vegetation will be cleared from the helipad and base camp areas, but the areas in need of full clearance will be kept to minimum.
Pollution		• 100% biodegradable soaps will be used in personal hygiene, in kitchen and when washing clothes in the river. • All broken equipment will be carried back to LCRS, and care will be taken to empty the base camps from any expedition equipment when abandoning them.
Local people and communities		• Economic impact on local community will be restricted to buying food for the field period, and two local people (local guide and a tree spotter).

		Locally common pay of 50 Belizean dollars per day will be paid for employees. Insurance will be bought from Belize to cover the local people working for the expedition for the occurrence of any accidents. • Working at LCRS supports local community in a sustainable way as LCRS employs local people continuously and supports economic activity through conservation. • Our work will be communicated to the local community by workshops in San Ignacio School at the end of our field period. • Two Belizean team members will enhance the communication of our work to the local community, and will continue to communicate the results of the expedition after the end of our field period. • Copies of any report or publication resulting from this study will be sent to the Forestry Department, Government of Belize.
Other hazards (e.g. procedural, manual handling) Please specify.		NONE SPECIFIED

**Continue on separate sheet if necessary*

Emergency Procedures: Specify arrangements for first aid, special emergency procedures, survival aids, communication, etc.)

Emergency procedure:
The emergency procedure is to 1) administer first aid if feasible, 2) return to Las Cuevas Research Station (LCRS) with patient if practical, and/or 3) operate emergency evacuation as planned below for different types of casualties:

- **Life Threatening Casualty**: Belize Central Security Ltd (BCL) will coordinate with 25 Flt Army Air Corp for a casualty evacuation by helicopter (24 hour cover) and a straight flight to Miami (2 hour flight).
- **Serious Casualty**: Belize Medical Associate (BMA), transport to Belmopan by either car from LCRS (6 hours by road) or by helicopter (30 minutes by air).
- **Trivial Injury**: Luma Luz Hospital in Santa Elena (3 hours by road) OR Belmopan General Hospital (4 hours by road).

Evacuation:
The presence of British Forces in Belize and their air base provides 24 hour cover for air evacuation whilst on field. Helipad next to the Camp site 1 at the Upper Raspaculo (used in previous expeditions) will be cleared prior to the start of the expedition so that access to air evacuation is certain.

First aid:
All four UK-based participants within the project are trained in first aid, but two Health and Safety Officers * and * will organise first aid area and risk assessment re-evaluation at regular intervals. The health and safety regime will be inaugurated at both base camps to ensure preparation for any emergencies. * will train the team to handle VHF and satellite phones to communicate emergencies with the contacts. VHF and satellite phone will be with the team at all times during the field period; radio channels and satellite phone numbers will be carried with the equipment on a laminated sheet of paper. A comprehensive portfolio of contacts for each team member (blood group, passport scan, next of kin, personal GPs in the home country, recommended specialists, and dentists in Belize, insurance documents, government embassies both in Belize and the UK) will be given to the 24h contacts in Belize and the UK prior to the start of the expedition; contact details will also be carried in laminated format on the field, kept with the satellite phone as well as with each team member in the personal pouch.
Recommended Survival first aid kit for 10 persons by Nomad travel stores will be carried with the expedition at all times, and kept at all times easily accessible, including times of travel. Smaller personal first aid kits will be carried by each team member AT ALL TIMES. The station manager at LCRS, Isidro Bol, is a paramedic with access to LCRS's large stash of medical supplies; he is the closest paramedic to our camp site.

Communication:
Routine communication will be held with the help of VHF radio (multiple channels but communication routinely done to LCRS) once a day by the communications officer *.
Emergency communication will be held by VHF radio (all channels can be used if necessary but LCRS and British Army Forces will be our first contacts) and satellite phone if necessary (phone numbers to British Army Forces and hospitals will be carried with the phone on a laminated paper).
Training in the use of both VHF radio and the satellite phone will be done by * during the first two weeks in Belize. * has both training and experience in the use of the equipment.

Additional Information: Identify any additional information relevant to the fieldwork activity, including supervision, training requirements, information, specialist equipment or clothing, inoculations, etc.

Training:
Training in navigation skills (use of maps, compass, and GPS), canoe handling and use of field equipment (e.g., collection poles, plant presses) will be held both prior to leaving the UK and after arriving to Belize. Training in the UK will be by Ed Bassett (canoe and navigation), * and * (field equipment) during the last weekend of February. Training at the Belize end will be organised by the station manager at LCRS, * , during the first two weeks of the expedition; this training will also include information on the threats specific to the Chiquibul forest reserve (e.g., poisonous local animals and plants) and the mediating responses recommended by the field station managers (local view on survival and rescue training included). Training will also include the use of machete. The station manager will be given information packet on the medical conditions and portfolio of contacts for each team member.

Insurance:
All team members carry adequate medical insurance from Campbell Irvine Ltd. which covers emergency evacuation and repatriation costs. The 24h Overseas Medical Emergency contact number is +44 (0) 20 7902 7405. Duration of cover could be extended after the date of purchase by contacting +44 (0) 1737 223 687. The policy covers, amongst others, medical expenses up to £5,000,000, personal liability up to £2,000,000, and legal expenses up to £15,000.

Permissions:
Permissions for the field work have been applied for at the Forestry Department, Government of Belize: collection permit will allow us to collect and export plant material back to Edinburgh, and the camping permit will allow the team to camp at the Upper Raspaculo area for the specified period.

Inoculations:
Vaccinations against Hepatitis A and Typhoid will be taken as recommended by the British Consulate to Belize. Anti-malarial drugs will be taken (weekly tablets of Chloroquine starting one week prior departure, and lasting until 1 month from returning to UK). All members will have checked with their personal GPs the necessity to boost any childhood vaccines (Tetanus, Polio, Diphteria, MMR) and to immunise against Hepatitis B, Tuberculosis and Rabies.

Is there suitable supervision (i.e. Staff to Student ratio)?	Yes ☐	No ☐	N/A ☐
Is permission required to work on site?	Yes ☐	No ☐	N/A ☐
Are there suitable travel arrangements and licensed drivers?	Yes ☐	No ☐	N/A ☐
Is adequate insurance coverin place? *(Contact Finance Office for advice, 50-9154)*	Yes ☐	No ☐	N/A ☐
Have all participants submitted next of kin information to field trip organiser / School Office?	Yes	☐	N/A ☐
Have route notification schedules been provided to Police or Coastguard?	Yes ☐	No ☐	N/A ☐

Assessment carried out by:

Name:		Date:	10th December
Signature:		Review Date:	19th January
Title (e.g. Group Leader, Lecturer, Research Student, etc): Group Leader			

Assessment Authorised by Head of School / Fieldwork Supervisor:

Name:		Date:	
Signature:			