

Project Anuran : An ecological research project concerned with the assessment and monitoring of anuran populations in the region around Las Cuevas, Chiquibul Forest Reserve, Belize.



Phase II – Proposal

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The declining amphibian crisis

Amphibians are integral components of many ecosystems often comprising the highest fraction of vertebrate biomass (Blaustein & Wake 1990; Blaustein *et al* 1994; Pearman 1997).

There conspicuous role is especially prevalent in the tropics where they play vital roles as regulators of arthropod abundance, in addition to providing a prey base for other tropical vertebrates (Guyer 1991; Beebee 1996). Moreover, as highlighted by many (Blaustein *et al* 1994; Beebee 1996; Wake 1998) amphibians are excellent indicators of environmental stress – a result of both their biphasic life style (terrestrial and aquatic) and their highly permeable skin (Duellman & Trueb, 1994). Recent reports have brought to world-wide attention the possibility that amphibian populations have, since the mid 1970's, been undergoing population decline, range reduction and even extinction (Blaustein & Wake 1990; Barinaga 1990; Wake 1991; Crump *et al* 1992; Blaustein *et al* 1994; Pounds & Crump 1994; Blaustein & Wake, 1995; Berger *et al* 1998; Wake 1998; Lips 1998; Alford & Richards 1999; Bury 1999; Houlihan *et al* 2000). Although some such reports are undoubtedly due to natural, stochastic population fluctuations, it is impossible that their collective result is merely coincidental. Such a decline could have drastic implications, not only in light of the present understanding of the functional importance of amphibians, but also as their demise heralds serious implications concerning the health of our environment. In order to respond to this problem and enable its assessment the Declining Amphibian Population Task Force (DAPTF) was established in 1990, under the Species Survival Commission of the International Conservation Union (IUCN).

Whilst some declines can be attributed to direct human impacts - habitat destruction, introduction of exotic diseases and predators, and poaching (Blaustein *et al* 1994) - more perplexing declines have been observed in remote areas seemingly protected from human interference (Blaustein & Wake 1990; Pounds & Crump 1994). One well studied example is in the immediate vicinity of Belize, the mysterious loss of 19 out of the 49 species of anurans inhabiting the Monteverde region of Costa Rica in the last decade (Campbell 1998). A number of more indirect anthropogenic causes have been suggested to have produced these declines; acid precipitation (Blaustein & Wake 1995), chemical pollutants and biomagnification (Beebee 1996), increased UV radiation (Blaustein *et al* 1994), exotic diseases (Berger *et al* 1998) and even global climate change (Blaustein & Wake, 1990; Wake, 1991), all of which can be attributed to the extreme sensitivity of amphibians to environmental disturbance. The growing evidence for this wide range of culpable candidates gives strength to the claim that amphibians can be used as essential bio-indicators of environmental health and resilience.

Role of Project Anuran

There is a critical absence of a consensus on the causes of the global decline in amphibian numbers, due to the dearth of short and long-term comprehensive studies on amphibian populations world-wide (Wake 1998). Belize contains some of the most extensive and valuable stretches of forest in Central America (Furley 1998), retaining 75% of its natural vegetation (Harcourt 1994), and as such providing a haven for much of the wildlife that has vanished from other surrounding areas (Romney *et al* 1959; Hartshorn *et al* 1984; Meyer & Foster 1996). Many populations of various species which are classified under CITES Appendix I and II in neighbouring regions enjoy relative prosperity within Belize's remarkably 'pristine' habitats (Hartshorn *et al* 1984). Moreover, the biology and abundance of many of its amphibian species remains largely unknown (Campbell. 1998; P. Stafford & J.R. Meyer personal communication) – this can be further reflected by discovery of 5 of the 33 known Belizean anuran species between 1990 – 1995 (Meyer & Foster 1996). Such facts describing this remarkable land serve to proffer it as an ideal country within which relatively

undisturbed anuran populations can be observed and provide possible clues as to these often-mysterious global declines. The Chiquibul Forest Reserve, situated in the forested interior west of the Mayan mountain divide represents one of the most ecologically important forests in Belize (Bird 1998). Furthermore, it harbours an especially unknown and undisturbed herpetofauna (Stafford 1991; Meyer personal communication), and as a consequence there is a high probability of population declines or even extinctions occurring unnoticed. The DAPTF in recognition of the secrets and heightened understanding this region could unveil, is co-ordinating the Mayan Forest Anuran Monitoring Project (MAYAMON), aiming to survey amphibian populations as part of a large, internationally funded biological monitoring project of the entire Selva Maya region (Carr & de Stoll 1999). This will serve to provide long term data on numbers and distribution, alongside acting as an early warning network for the environmental causation and predictions of any future declines / disturbance.

During the summer of 2000, Project Anuran (Phase I) successfully completed the first intensive assessment of the status and distribution of anurans (Amphibia : Anura) in the Chiquibul region. Data was collected on the species richness, relative abundance, and habitat associations of 22 species – highlighting the Las Cuevas site as one of the most diverse areas with respect to amphibian fauna in Belize (Miller & Miller 1995). This work provided a valuable contribution in two main areas. Firstly a detailed assessment was made of twelve of those twenty-one species (comprising the hylids or tree-frogs) from eight study sites over 28 nights, which provides a firm and comprehensive base from which to reassess the status and ecology of these local populations. Eight of the remaining nine species comprise the leaf litter or ground dwelling frogs, a group which due to their highly cryptic coloration, small size, and nocturnal habit are notoriously difficult to survey (Pearman *et al* 1995). Over 200 man-hours of night searches were made, alongside 50 drift-trap nights in order to assess this group, the result of which suggests a very low local abundance. Although the data return was poor, such an effort was very rewarding in the sense that it eliminated a number of survey methods as being unsuitable for this site, and allows future efforts to be concentrated more productively. Although the work conducted during 2000 represents a valuable contribution to the efforts of the DAPTF in its own right, there is considerable justification in continuing to intensively assess these populations. Such repeated assessments will provide a very useful insight into the temporal dynamics of the population assemblages – both of their viability and community structure. Fundamentally basic ecological information of this nature is desperately lacking in our understanding of many amphibian populations, and especially in Central America (Guyer 1990, Donnelly & Guyer 1994).

Aims and Objectives

Research Aim : To contribute to the understanding of the ecology and conservation of amphibian populations via intensive assessment of the status of species at the neo-tropical site of Las Cuevas (N16°44' W88°59').

Research Objectives :

- 1) To continue monitoring of eight sites previously assessed during 2000 using tested profitable survey methods
- 2) To compliment the present monitoring effort by the addition of a number of further sites, incorporating a broader range of sub-habitat types.
- 3) To concentrate effort to assess the diversity and estimated status of leaf litter anurans at sites identified as being suitable / known habitat type.

- 4) To incorporate an extended period of survey work at Rio Frio – a region of Caribbean Pine (*Pinus carribea*), with special emphasis on searching for further evidence of an individual of unknown identity collected during 2000 (*Rana* sp.).

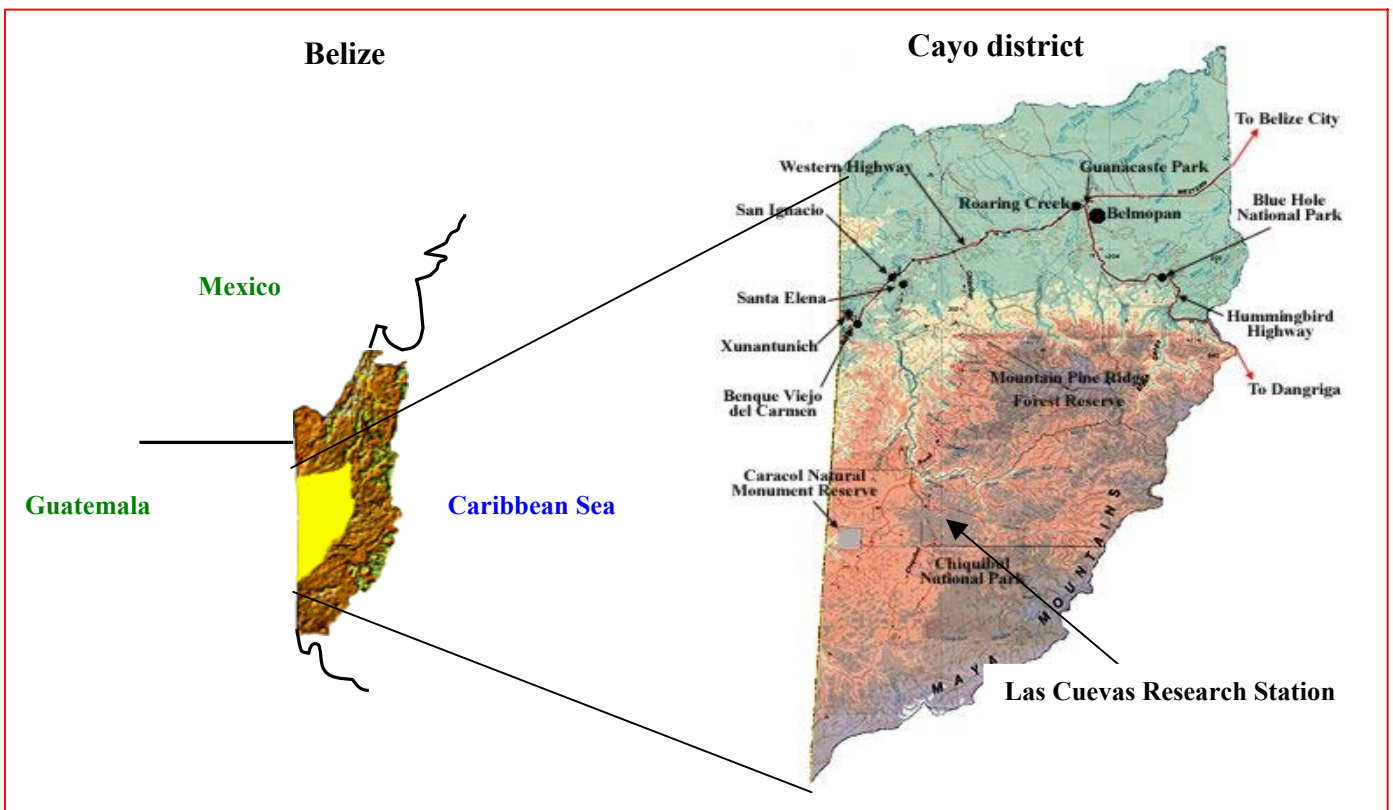
Further Objective

- 5) To continue efforts to establish firm links with a collaborative student group from the University of Belize, with an aim to consolidating closer ties between the student community from both institutions who are concerned about ecology and conservation management in Belize.

Methodology and Approach

Site : Las Cuevas Research Station, Chiquibul Forest, Belize

Las Cuevas Research Station (N16°44' W88°59') is situated in the Chiquibul Forest Reserve, lying within a much larger protected area of the Maya Mountains – Map 1. Map 2 illustrates the immediate area around Las Cuevas. It stands at about 500m with an annual rainfall of between 1500 and 2000mm and a vegetation mainly constituted by lowland subtropical moist forest (Hartshorn et al 1984). Since the collapse of the Mayan civilization around 900 AD there have been no permanent inhabitants of the region around Las Cuevas. However, the region has received a number of disturbances, both natural and human. Selective logging of mahogany (*Swietenia macrophylla*) and cedar (*Cedrela odorata*) occurred between 1936-46 and again in the late 1980's. The forest has been used by local people as a source of chicle (the latex of the sapodilla tree) and bayleaf palm thatch. Hurricanes have caused widespread destruction in the area over its recent history – namely in 1942 and 1961 – and large forest fires are not an uncommon occurrence.



Method and Procedures

Monitoring projects are by their very nature limited to following the protocol of previous years to enable a comprehensive and sensible assessment of any changes in species diversity or population status. In consideration of this, considerable advice of the highest quality was sought as to the most appropriate protocol to follow for Project Anuran, both to enable maximum return and a wide applicability with respect to other similar mesoamerican survey work. The fieldwork completed during phase 1 allowed such methods to be tailored to the peculiarities of the location and a protocol was constructed which produced a successful return. In retrospective consideration of data collected to date, there are a number of possible areas for improvement and expansion. With this in mind, a copy of our preliminary findings (and shortly forthcoming final report) is presently being reviewed by experts – principally J.C Lee the leading authority on the herpetofauna of the Yucatan peninsular, J.R Meyer the co-ordinator for DAPTF's mesoamerican program (to whom our results are the most pertinent), and P. Stafford the leading herpetologist of the Natural History Museum (London). Appropriate considerations arising from this process will be incorporated into our future protocol. However, for the main direction of research (assessment hylid frogs) methods will presently follow the below protocol – which having been constructed following considerable advice is (barring minor possible modifications) largely ideal for our aims.

Monitoring and assessment of vocalising species

Anuran Families that vocalize in breeding groups around bodies of water include all those not of (and some within) the Family, Leptodactylidae. Due to their commonly arboreal habitat, and small size the standard protocol for estimating their abundance is to monitor the vocalization of breeding assemblages. Eight sites have been chosen during 2000, representative of a number of different sub-habitats of the forest around Las Cuevas. Pond site selection was made following advice from local guides, and night walks around the area (Phase I). The position of these sites is shown in the Appendix. During Phase II we hope to supplement this work with an additional 4 sites, the location of which will be decided in the field to allow a more comprehensive assessment of the area. Surveys of these breeding ponds will run from 1900 hours to 0500 hours (or until calling ceases, if earlier). Each pond is surveyed over at least three repeats. Measurements taken on arrival at a pond include; depth of pond (deepest part), collection of water sample for pH and conductivity measurements, and a summary weather report. Following this, hourly recordings of species abundance and calling activity were made. Measures of abundance followed the Maya Forest Anuran Monitoring Project (MAYAMON) protocol (Meyer 1999) – this is the use of vocalisation categories to assess the abundance of each species for the first fifteen minutes of every hour – categories are as follows:

- **1 = 1-5 individuals**
- **2 = 6-20 individuals**
- **3 = 21-50 individuals**
- **4 = >50 individuals**

In addition to the vocalisation category an attempt will be made to assess calling activity over and above species presence *per se*. This can be done using a measure (analogous to the above) of calling intensity - measuring the frequency of calls of an average individual of each species for the first fifteen minutes of every hour. One call is taken as each noticeably distinct vocalisation per individual. This is a method devised during Phase I, and was considered a profitable addition to the standard monitoring protocol. Categories to be employed are described below:

- **1 = 1 or <1 calls / 15 minutes**
- **2 = 2-14 calls / 15 minutes**
- **3 = 5-10 calls / 5 minutes**
- **4 = 2-5 calls / minute**
- **5 = 6-10 calls / minute**
- **6 = 11-20 calls / minute**
- **7 = 21-40 calls / minute**
- **8 = >40 calls per minute**

Aside from the above, all anecdotal sightings of species are to be noted in a logbook.

In addition to the above the air and water temperature is recorded every hour, as was relative humidity (whirling psychrometer). Values observed for the entire night are; maximum and minimum temperature, volume of rainfall and duration and number of rainfall events. For each pond an assessment of the floral diversity has been made. A re-assessment of this will be made during phase 2 to monitor any local changes in vegetation, and additional sites can be individually assessed accordingly. Assessment is made by mapping the area surrounding the pond and noting all tree species with a DBH > 10cm within 10m of the pond edge.

Identification of vocalizations in this study follow reference to a tape produced by J. Meyer and J.C. Lee. Project Anuran has made its own minidisc recordings of nearly all species encountered at the Las Cuevas site. This will represent an important contribution to future assessment of local populations. Visual identification of all species is aided by a practical field guide compiled by Project Anuran with reference to texts; Meyer & Foster 1996, Lee (1996), Campbell (1998), Lee (2000) and the Belize Biodiversity Information database. Following field observations and revisions during 2000, this guide is presently under revision.

Monitoring and assessment of non-vocalising species

Having identified a large area around Las Cuevas as being exceptionally impoverished with respect to leaf litter anurans (*Eleutherodactylus* sp.), attention will be directed largely using a non-negative approach on areas identified as suitable during 2000. Such an approach, although biased, is the most profitable method to reliably assess the diversity of this cryptic group (Pearman *et al* 1995). As indicated in the research objectives the aim here is more simply to accurately consider the species richness of site – habitat and inter-specific data will be collected as below, but very low abundances prevent detailed ecological analysis. Identified areas include a stretch of riverbank alongside the Monkey Tail branch of the Raspaculo, and also to attempt what is the first preliminary assessment of ground dwelling amphibians further down the river in the Raspaculo valley. Methods follow recognised protocol outlined in Heyer *et al* (1994) employing 8x8m quadrats placed throughout the riparian zone, and also to establish a number of drift fences which proved illuminating (although limited) during 2000. Quadrat searching is conducted after 7.30pm following preliminary results obtained during 2000, employing four people to systematically search the whole area, working into the centre in a concentric pattern, turning over all leaf debris, logs and loose rocks. Alongside the date and duration of the search the following values are noted per quadrat :

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- Species present, their abundance, an estimate of snout vent length (SVL) and example photographs
- Summary weather report; including cloud cover and time since last rainfall
- Phase of the moon
- Air temperature
- Relative humidity (using a whirling psychrometer)
- Leaf litter depth and % ground cover
- % canopy vegetation cover
- vegetation type (% contribution of herbs, shrubs/small trees and mature trees)
- An index of vegetation density (scaled 1-5, with 1 being open and 5 being almost impassable)
- Soil pH
- Distance to nearest water source; including type of water source – permanent or temporary, still or moving
- An index of leaf litter wetness (scaled 1-5 with 1 being dry and 5 being surface water)
- An indication of the surface gradient (flat / gentle / moderate / steep slope)

Weather monitoring

Daily records will be made at 0900 of the rainfall volume and maximum/minimum temperature over the previous 24 hours. This is facilitated by the weather station presently available at the Las Cuevas site. Following 2000, further measurements will also be taken of rainfall intensity – volume fallen / hour (calculated by monitoring the duration of each rainfall event).

Itinerary

Pre – Expedition	Month	Description
Field Stage (Brief)	Dec Jan + Term 2	<ul style="list-style-type: none"> - Commence sponsorship / fundraising campaign - Commence inoculation programme - Commence publicity campaign - Start general familiarisation of literature / keys for members new in 2001 - Development and hosting of project website – www.ProjectAnuran.org - Finalise Belizean collaborators to enable their full integration into the project at this early stage
	Easter	<ul style="list-style-type: none"> - Amphibian handling practice and field trials of methods weekend (DAPT) - LSTS survival course (5 days) for new 2001 members - Attend biodiversity assessment course / conference at the RGS (BP)
	Term 3	<ul style="list-style-type: none"> - Purchase / order of equipment still withstanding - Final preparations
	Departure Week 1	<ul style="list-style-type: none"> - Start July - Union with Belizean collaborators, followed by one weeks acclimatisation and site familiarisation at Las Cuevas
	Weeks 2-7	<ul style="list-style-type: none"> - Monitoring programme of vocalising sites and non-vocalising areas as outlined in methodologies. This will continue on a rotational basis for 6 weeks.
	Week 8	<ul style="list-style-type: none"> - Consolidation of data and rest
Post Expedition	End Oct Oct 01 – Jan 02	<ul style="list-style-type: none"> - Prelim report completed - Lecture circuit, commencement of final report writing and any forthcoming articles
	Easter 02	<ul style="list-style-type: none"> - Final report published + distributed

Risk Assessment

An expedition to a remote region of tropical jungle can be associated with many real health and safety risks. This section outlines the risks, necessary precautions and avoidance measures alongside emergency contingencies. During the 2000 field stage thankfully no serious injuries arose, and the team was able to familiarise itself with onsite emergency and evacuation procedures. However, against unfortunate eventualities all previously implemented precautions will continue to be taken and underlie all our activities whilst in the field.

Health : (Belize is a relatively disease free country with no vaccination requirements by law but the following require precautions and avoidance measures)

Vaccinations and preventative medicine and avoidance measures applicable to Belize

- Rabies; A course of 3 doses over one month will be administered prior to departure – to be completed before commencement of anti-malarial drugs
- Hepatitis B; Full course of 3 injections over 6 months prior to departure to commence in January
- Malaria; Belize is not a high-risk area removing the necessity for drugs such as Mefloquine. However, the risk is a definite threat and a course of chloroquine will be taken commencing 1 week prior to departure. Preventative measures will be taken to reduce chance of a bite, to include; sleeping under small mesh (needed to prevent penetration by sandflies) nets soaked in repellent – premethrin, long leg/sleeved clothing to be worn after dusk – also loose to reduce chance of biting through cloth, use of DEET based repellent (although where possible naturally based deterrents such as citronella will be used in consideration of amphibian sensitivity to environmental degradation).
- Childhood vaccines – tetanus, polio, diphtheria and Hep A all to be boosted as necessary
- Typhoid vaccination. Care to be taken in basic hygiene procedures
- Dengee Fever; a disease spread by mosquitoes. No available vaccine – precautionary measures noted above to be taken
- Lishmaniasis; skin disease caused by parasites carried in sandflies. Above bite avoidance measures applicable, thin mesh size on nets (above). To seek medical help (see later) if abnormal skin lesions appear.
- Chagas disease; a late onset neurodegenerative disorder transmitted by Assassin bugs. No known vaccine or cure – avoided by bite precaution measures above.
- River Blindness; rare but possible in Belize. Passed by a blackfly vector found near fast flowing water – above precautionary measures.

Snake Bites :

Familiarisation of all venomous snakes will be undertaken before departure and during a 2 day safety and survival course on arrival at LCRS (Las Cuevas Research Station). Those species noted for observation are: Ground dwelling pit vipers; *Bothrops asper*, *Atropoides nummifer*, and *Porthidium nasutum*, rattlesnake *Crotalus durissus* are all easily camouflaged on forest floor, sturdy booted footwear is needed. The tree dwelling species *Bothriechis schlegelii* needs careful note in low branches and shrubbery. Coral snakes *Micrurus* spp. are brightly coloured but demand careful consideration.

- General precautions; Full clothing to be worn in dense undergrowth, ditches caves and root cavities to be treated with special care, to always carry a torch at night.
- In event of emergency; only in extreme circumstances will anti – venom be administered by unqualified persons – to avoid dangerous shock responses (the procedure detailed in the LCRS health and safety document will be memorised by all members). However, a

supply of anti-venom available from LCRS will be carried at all times in the group medical kit. Reference to A Guide to the Reptiles of Belize for familiarisation to occurrence and precaution.

- Emergency evacuation will be undertaken if necessary – see emergency procedure and cover.

Other animals:

There are a number of other possibly dangerous animals such as the jaguar and wild pig (warree), which the group will become familiar with measures to allow identification and avoid disturbance.

Medical Kits:

Each individual will carry a personal medical kit (plasters, disinfectant, bandages, diarolite, insect repellent – deet based – anti histamine tablets, paracetamol, suncream, NHM guide to snake bites, whistle, torch). The group will hold a more comprehensive kit. Furthermore an extensive camp kit is held at LCRS and the Station Manager Chris Minty and Chapal Bol are a qualified first-aider familiar with its use.

Medical Training:

Emily Fitzherbert, and Toby Gardner are qualified first aiders. Remaining members will attend a field safety and first aid course ran by Life Support Training Services in Cumbria (a course which proved excellent during 2000). All members will be familiar with the NHM field safety manual available from NHM.

Hygiene:

- Water; water supply at LCRS comes from a cave system and is quite safe. During phases away from LCRS Iodine will be used to purify which is deemed sufficient without the additional need to filter. Dehydration is acknowledged as a problem and care will be taken to take at least 4 litres per day with salts available at all times
- Latrines; during phases away from LCRS care will be taken to dig appropriate pits with disinfectant available for hand washing.
- Food; treated water to be used in all cooking. Supplies kept sealed and off the ground during storage. All waste to be burnt or carried out in sealed containers.

Field Safety:

Sensible measures to be taken whilst surveying in field; no forays into jungle unaccompanied, emergency packs and radio carried at all times, large scale map and compass to be carried at all times. One of the largest causes of fatality in the tropics is falling of dead timber, care will be taken in observing canopy whilst trekking and laying camp.

Political situation and climate:

The political situation in Belize is stable and not a cause for concern. Hot and humid climate with temperatures averaging 25 during the day and as low as 5 at night – see above for dehydration precautions. During period of stay cyclones and hurricanes are not uncommon and weather reports are monitored regularly at the station for early warning.

Insurance cover:

The relevant cover will include: early curtailment – return flight to UK, medical expenses incorporating search and rescue (£2,000,000), hospital benefit (£300), legal liability.

Emergency contingency:

The group is covered by insurance for medical evacuation, early return to UK and foreign treatment costs. A VHF radio available from LCRS will be carried at all times. The procedure in emergency follows: (1) Administer first aid if feasible (2) To return to LCRS with patient if practical (3) To inform LCRS station manager immediately line of contact if no reply – 25 Flt Army Corp on GMP 2000 satellite phone at LCRS, Belize Communications Ltd (Channel 7 or 8), British High Commission (Channel 6), Forest Dept Belize (Channel 2). Evacuation will commence depending on severity Luma Luz hospital (3 hours by road) in Santa Elana or Belmopan hospital. Air evacuation (24 hour cover) time to Belize Medical Associates, Belize City is 30min. A 2 hour flight can reach Houston hospital in the USA. This procedure was observed to be highly efficient during the 2000 field stage.

The above was complied with help by; Professor Warrell (Oxford Centre for Tropical Medicine), Dr Tim Brown (Ed University Health Service) and Chris Minty (station manager at LCRS). Reference to texts; RGS Expedition Medicine by D.Warrell & S.Anderson, Tropical Forest Expeditions by C.Jeremy & R.Chapman, University Health Service documents, LCRS Health and Safety document. A copy of a recent risk assessment by Dr Sutton of NHM

Team members

Fiona Bucknill (19)

Role; Logistics Officer & Treasurer

Fiona is a second year Biological Science student at Edinburgh University looking to honours in Zoology. Her commitment to conservation has been well demonstrated through working both with a local volunteer group, and on a summer renovation project in France. Extensive practical experience of desirable field skills such as photography and survival in harsh conditions give Fiona a firm background for involvement in an expedition of this nature. A strong desire to see and learn about the environment and culture of other countries encouraged her to travel independently to both India and the neotropics. This same desire coupled with her commitment and passion for conservation work serve to make Fiona an ideal candidate for the team.

Emily Fitzherbert (23)

Role; Scientific Coordinator & Chief Medical Officer

Emily is a final year ecologist at Edinburgh University and was a founding member of Project Anuran, being present on the 2000 field phase. She has a great deal of previous fieldwork experience both at home and abroad. Two summers as a research assistant with the Yellowstone National Park Wolf Project in addition to being a surveying co-ordinator for the sea turtle protection society of Greece. She is a qualified first-aider having worked as a Training Assistant for the Cumbrian Red Cross. She is a highly enthusiastic ecologist, and founding member of the new University Expedition Society (ExpEd), whilst maintaining a keen interest in conservation issues. Her extensive experience of planning and fundraising past ventures in addition her natural dedication make Emily definite asset to the team.

Toby Gardner (22)

Role; Project Co-ordinator

Toby is a final year ecologist at Edinburgh University, and was a founding member of Project Anuran, being present on the 2000 field phase. He has previous experience of expedition

planning gained from conservation and community work on a Raleigh International expedition to Uganda. Work for 7 months as an assistant warden in Ambleside YHA and 2 summers as a water-sports instructor both in Scotland and Greece has given Toby experience of logistics, safety and management skills. He is a very keen ecologist and has been intimately involved in the University Ecological Society as well as being a founding member of the new University Expedition Society (ExpEd). Planning and encouraging the continuation of an expedition has long been his ambition, and his enthusiasm and natural leadership abilities make him a dedicated member of the team.

Neil Hart (21)

Role: Fundraising Co-ordinator and International Liaison Officer

Neil is a second year Biological Science student at Edinburgh University looking to do honours in Zoology. He has a strong desire to work in the field of conservation, and to be able to apply both his scientific background and personal commitment to the considerable future challenges the field presents. This same desire led Neil to spend a summer vacation working as a volunteer in a marine ecology laboratory of the University of Auckland, New Zealand. This opportunity provided him with excellent experience of living and working in the field, and the many difficulties such work can present. A commitment to all aspects of ecology is further shown by his close involvement in the University Ecology Society. The above experiences and enthusiasm make Neil a valuable contribution to the team.

Belizean counterparts

Following the establishment of a great number of contacts in Belize, both in government and NGO's, a recruitment process is currently underway to select 2 suitable Belizean students to join Project Anuran Phase II. In light of problems encountered during Phase I extreme effort and care is being taken to ensure that students are personally keen to be involved in the Project and furthermore are able to do so from an early stage. It is deemed essential to the real success and continuation of any project of this nature to be in intimate collaboration and involvement with host country counterparts.

Budget

This is inclusive of the expenses for four Edinburgh members and two Belize students. Note that costs are less than Phase I as a significant amount of the vital equipment is non-perishable and has been already purchased.

	Type	£ per person	£ per group
Pre-departure	Flights ¹	500	2000
	Tax	50	200
	Accommodation at Las Cuevas ²		1500
	Film ³		150
	Affiliation ⁴		40

¹ As per BA via Cancun as the cheapest option

² As per LCRS costing Dec 00, includes bench costs and full use of facilities of the station

³ This may be less, as action is underway to secure in-kind sponsorship from photography companies

⁴ SSAR – Society for the Study of Amphibians and Reptiles

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	Training		
	Survival course	75	150
	London workshops	50	100
	Medical supplies and vaccinations ⁵		150
	Equipment		200
	Administration		150
In Field	Food ⁶		2000
	Research permit		75
	In country travel		200
Post expedition	Report printing and distribution		600
	Photographic development		150
Total			7665
10% contingency			766
Total			8431
Less personal contribution		400	1600
Target remaining			6831

Fundraising

Funds will be sought from the following grant-making bodies:

Barnson Bequest, BP Conservation Prize, British Ecological Society, Ede & Ravenscroft Conservation Prize, Edinburgh Trust No. 2, Explorers Club, Gilchrist Educational Fund, James Rennie Bequest, Royal Geographic Society, Royal Scottish Geographic Society, Shell Bursaries, Sigma Xi, Society for the Study of Amphibians and Reptiles, Davis Expedition Trust, Weir Fund for Field Studies.

In addition to this a number of companies are being approached for corporate sponsorship. Trips Worldwide sponsored Project Anuran Phase and it is likely that they may be interested in continuing support for Phase II.

Project Output and deliverables

Project Anuran Phase I has already produced a preliminary report of the initial findings of fieldwork during 2000 (available upon request), and a forthcoming full report which is due to be produced within the next three months. Further examples of output are a number of articles in relevant newsletters – Cuevas News (published), Frog Log DAPTF (in press), and British Herpetological Society Bulletin (in press). Another article in an associated herpetology journal is in the pipeline. A number of presentations have been given of our work, including to the 2nd Conference on UK research in Belize, held in September 2000.

⁵ This cost is only to supplement and replace the existing first aid supplies, which are fortunately still comprehensive

⁶ This is estimated from 2000 costs for 6 people, includes taking 2 weeks of catering at LCRS

Our work has been well received by the DAPTF and the Natural History Museum (London), both of whom serve to benefit considerably from its continued findings. Other recipients of our report both from Phase I and Phase II include: Belize Audubon Society, Belize Tropical Education Centre, British Ecological Society, British Herpetological Society, Ministry of Natural Resources of Belize, Royal Geographic Society, Royal Scottish Geographic Society, Royal Scottish Zoological Society, University of Belize, University of Edinburgh and WWF Central America.

Project Anuran Phase II will continue to produce the same degree of output, centred on both a preliminary report (within one month of return), and a full report (within six months of return), alongside continued presentations and lectures. As indicated in the justification of this proposal a number of further directions of consideration and analysis will be possible following the second year of work, as data can be used from both 2000 and 2001 field stages. It is hoped that our work will received continued interest in the relevant scientific press, perhaps gaining more interest following continuation of the study.

In addition to the producing hard copy reports, Project Anuran Phase II will host its findings on a website which will be operational within the next three months (www.ProjectAnuran.com). Importantly this will allow our data and findings to be easily accessed by other such research groups throughout the world, and crucially by collaborative agencies such as the DAPTF, whose operation requires quick and simple access to continued research output.

Contacts

The following have provided helpful information and ideas used in the compilation of this proposal;

Adriana Dinu (International Co-ordinator, Global Conservation Alliance), Chris Minty (Station Manager, LCRS), Daniel Bennett (University of Aberdeen) Dr David Sutton (NHM, London), Dr Graham Russel (IERM, Univ. Edinburgh), Dr Jack Meyer (Chair of DAPTF working group for Belize), Dr Peter Stafford (NHM, London), Dr Sandy Knapp (Project Leader, LCRS – London), Dr Tim Brown (Univ. Health Services), Ivan Scales (Rainforest Foundation), John Wilkinson (International Co-ordinator DAPTF), Major Alisdair Rogers (Leader of a number of joint services Expeditions to Belize), Margaret Jackson (Edinburgh University) Nicodemus Bol (Natural History Musuem) Pio Saqui (University College Belize), Professor Bill Sutherland (University East Anglia), Professor Bob Allison (Geography Dept, Univ. Durham), Professor David Warrell (Centre for Tropical Medicine, Oxford), Professor Julian Lee (Miami University), Professor Peter Furley (Geography Dept. Univ. Edinburgh), Rosie Trevalyn (Director, Tropical Biology Association), and Sharon Matola (Director, Belize Zoo).

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