



<http://www.darwin.gov.uk>



***Biodiversity assessment of limestone karst  
dependent bats in Myanmar (Burma)***

**Darwin Initiative Annual Report**

**April, 2003 – March, 2004**

# ***Darwin Initiative for the Survival of Species***

## ***Annual Report***

### **1. Darwin Project Information**

Project Ref. Number	162/11/019
Project Title	Biodiversity assessment of limestone karst dependent bats in Myanmar (Burma)
Country	Myanmar (Burma)
UK Contractor	Harrison Institute
Partner Organisation(s)	Yangon (Rangoon) University
Darwin Grant Value	2002/3 £42,677; 2003/4 <b>£39,958</b> ; 2004/5 £37,750 Total = £120,385
Start/End dates	April, 2002 – March, 2005
Reporting period (1 Apr 200x to 31 Mar 200y) and report number (1,2,3..)	April, 2003 – March, 2004
Project website	<a href="http://www.harrison-institute.org/darwin/index.html">www.harrison-institute.org/darwin/index.html</a>
Author(s), date	Dr Paul Bates, 8 April, 2004

### **2. Project Background**

- This is a joint project of the Harrison Institute/Zoology Department of Yangon (Rangoon) University. It comprises aspects of research, training, and conservation. The laboratory research and training takes place at Yangon University and the Harrison Institute. The field studies and training are conducted primarily in the limestone karst areas of eastern Myanmar
- In June, 2000, the Harrison Institute was the first international NGO to sign a memorandum of understanding and conduct a programme of research and training with the University of Yangon. The current Darwin project evolved from several small collaborative bat projects conducted by the two institutions
- Prior to the Darwin, five bat species, including one family of bats new to Myanmar, were discovered by the collaborative team and the limestone karst areas of Myanmar were identified as areas of great potential for the conservation of globally endangered bats
- The Darwin Initiative programme has built on these initial studies by increasing the scope of the research and training and by including a conservation component
- The Darwin project seeks to address two potential problem areas:
  - A need within Myanmar to increase the in-country capacity in biodiversity studies by creating a core group of scientists with the skills to collect data, analyse it and disseminate the information in an appropriate format for particular end-users. It is considered that without such skills, the future for the conservation of wildlife within Myanmar is severely jeopardised.
  - The need to meet Objectives B, D and E of the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law, Myanmar 1994 (towards work

of natural scientific research; protecting wildlife in danger of extinction and habitats thereof; to promote the policy of conserving natural areas). Specifically, a lack of data concerning the diversity, distribution, status, ecology and behaviour of bats in the limestone karst areas of Myanmar, with particular reference to those species roosting in caves.

### 3. Project Purpose and Outputs

- The purpose of the project is to ensure that Myanmar fulfils its potential in conserving limestone karst dependent bat species including globally threatened taxa
- Outputs of the project:
  - A national database of bats from limestone karst areas, for national and international circulation
  - An action plan for cave bats and management plans for key karst areas
  - A core of Myanmar graduates trained in biodiversity survey work
  - Identification key for Myanmar bats
- The outputs and proposed operational plan have not been modified over the last year.

### 4. Progress

- The project commenced in April, 2002. During the first year the following outputs were achieved.
  - three field surveys, to northern, eastern and south-eastern Myanmar
  - data gathered on the systematics, distribution, status, behaviour, echolocation and ecology of bats for a national database
  - first records of four bat species new to the fauna of Myanmar (*Rhinolophus stheno*, *R. acuminatus*, *R. macrotis* and *Pipistrellus pulveratus*)
  - eight cave sites identified as roosts for globally endangered bat species
  - a four day international bat workshop hosted at Yangon University with 29 presentations by delegates from 6 countries, including staff and students from a range of Myanmar universities
  - two field workshops organised, one at Mandalay University and one in Mon and Kayin States
  - eight Myanmar students received training in various aspects of bat studies (Mr Khin Maung Swe, Ms Khin Mie Mie, Ms Nyo Nyo, Ms Nu Nu Aye, Ms Khin Thein Soe, Ms Yin Yin Toke, Ms Aye Aye Khaing, and Ms Naing Naing Aung)
  - two students attended international conferences in UK (Mr Khin Maung Swe and Ms Khin Mie Mie)
- All outputs were achieved against the agreed baseline timetable for 2003-2004 and the logical framework (complete Annex 1) with the exception of:
  - handouts for Buddhist monks. Preliminary drafts for these handouts have been made in conjunction with bat educationalists from India but their content and presentation is not considered suitable and a final version has yet to be completed. The handouts have received less priority because
    - the disturbance of caves controlled by Buddhist monks is far less than anticipated prior to the commencement of the project

- the existing systems for controlling the harvesting of bats and bat guano are more sophisticated than originally anticipated and therefore the focus of such handouts has had to be changed to reflect this existing situation
- Additional outputs included:
  - the raising of \$17640 (approx = £10,080) from a range of sponsors (Total Oil, Premier Oil, Royal Geographical Society, Ghar Parau Foundation). \$11640 was used to cover the costs of 9 members of the Darwin team (2 UK scientists and 7 Myanmar students and staff, plus an additional 9 Myanmar students and staff and 7 foreign scientists, 6 from UK, in a biodiversity/geological survey of Tanintharyi Division). \$6000 is to be put towards the costs of the final publication of the Darwin project.
  - Collaboration with zoologists in Canada, USA, Portugal, and UK on a range of publications and research projects related to data collected during the Darwin Project. In addition, twelve weeks of training were provided by international scientists (in addition to the two UK Darwin scientists) during the field survey to Tanintharyi Division (this has an equivalent value of about £7000 in terms of donated time)
  - The Field key to cave bats was upgraded to include all 100 bat species in Myanmar because it proved difficult to make a definition between a 'cave bat' and a 'non-cave bat'. The resulting key is by its nature complicated and will be further modified and illustrated to simplify it. A grant of £750 was awarded in April 2004 by the Systematics Association/Linnean Society towards the costs of a professional artist to provide illustrations
- Achievements during the year included:
  - Data were collected (April, 2003 – March, 2004) on the systematics, distribution, status, ecology, diet, and behaviour of cave bats
  - Data were collected (April, 2003 – March, 2004) on bat echolocation calls
  - Publications for international journals were prepared in collaboration with Myanmar and international colleagues on (1) Myanmar's horseshoe bats (in press); (2) bats of the Rakhine coast (in press); (3) the globally endangered bumble-bee bat (in prep.); (4) the phylogeny of bats – including the bumble-bee bat (in prep.); (5) Myanmar's pipistrelles (in prep.); (6) a new species of horseshoe bat from Myanmar (in prep.); (7) monitoring Myanmar's cave bats using frequency division bat detectors (in prep.); (8) food habits of some insectivorous bats from Myanmar (in prep.).
  - Presentations by Darwin personnel of two Darwin papers at international conferences and five papers at Yangon University scientific meetings:
    - 1 paper in July, 2003 at the *Interactions in the Tropics a joint special symposium of the British Ecological Society and the annual meeting of the Association for Tropical Biology and Conservation* (Dr Iain Mackie)
    - 1 paper in August, 2003 at the *Fourth Biennial Conference of the Systematics Association* (paper by Mar Mar Thi and Paul Bates, presented by Paul Bates)
    - 5 papers in January, 2004 at the *Research paper presentations in honour of the 2003-2004 School Family Day, Yangon University* (Ms Khin Mie Mie, Ms Nyo Nyo, Ms Yin Yin Toke, Ms Naing Naing Aung, and Ms Mar Mar Thi)
  - 8 Zoology Department students (Mr Khin Maung Swe, Ms Khin Mie Mie, Ms Nyo Nyo, Ms Nu Nu Aye, Mrs Mar Mar Thi, Ms Yin Yin Toke, Ms Aye Aye Khaing and Ms Naing Naing Aung) and one staff member (Dr Si Si Hla Bu) were trained in aspects of the project. Two of the students completed their postgraduate theses (Mr Khin Maung Swe and Mrs Mar Mar Thi).

- Website published [www.harrison-institute.org/Darwin/index.html](http://www.harrison-institute.org/Darwin/index.html) outlining the objectives of the Darwin project and the outputs of the first year's work.
- Field surveys were conducted and data were collected for Management Plans for key cave sites and/or bat systematics, distribution, ecology, and behaviour
  - Mandalay and Shan State (April, 2003)
  - Mandalay, Shan, and Kachin States (an associated team with Mandalay University: April, 2003)
  - Mandalay and Shan State (August, 2003)
  - Bago Division (short study - August, 2003)
  - southern Tanintharyi Division (November, 2003)
  - Mandalay and Shan State (December, 2003)
  - northern Tanintharyi Division (short study - January, 2004)
- Voucher specimens, including two species (*Ia io*, *Coelops robinsoni*) new to the country and a further three species (*Rhinolophus* sp. 1, *Kerivoula* sp. 1 and *Kerivoula* sp. 2) apparently new to science were collected
- Workshops:
  - *Field study techniques* (practical training in Mandalay Division and Shan State, April, 2003)
  - *Bat behaviour, a study in seasonal variation of roost occupation* (Shan State, August, 2003)
  - *Tailoring a biodiversity project to the needs of end users*. This was conducted in conjunction with the Wildlife Conservation Society (New York) and Forestry Department, Yangon: March, 2004.
- Handouts for Buddhist monks and tour guides to popular caves discussed and preliminary drafts prepared but not completed.
- Significant difficulties encountered during the year:
  - It proved impossible to bring one Darwin student Mrs Mar Mar Thi to the Fourth Biennial Conference of the Systematics Association in Dublin (August, 2003) as she could not obtain an Irish visa (there is no Irish representation in Myanmar). We have taken steps by contacting embassies 6 months in advance to ensure that we do not encounter the same problem in 2004 when we wish to take students to Poland and Vietnam.
  - Two students (Mr Khin Maung Swe and Mrs Mar Mar Thi) were awarded PhDs on the basis of work partly carried out whilst being Darwin trainees. Although both students were committed to their research and were admirable in their field and laboratory studies, it is felt by the UK Darwin staff that the quality and depth of both theses did not warrant PhD on an international comparative basis. A more suitable award would have been MSc. However, the level of the award was prescribed by the Ministry of Education and not by the Darwin staff. This problem has been identified by and discussed with other international scientists currently working with Yangon University but there is no simple solution as it is currently a non-negotiable subject with the Myanmar authorities.
  - Project leader Dr Paul Bates was the recipient of a 'hate mail' letter that was sent to the British Embassy in Yangon, the Myanmar Embassy in London, sponsors (as listed on the web site) and various other interested bodies. The aim of the anonymous letter appears to be to try and effect the exclusion of Dr Paul Bates from Myanmar. The motive is not known but may be professional jealousy. The letter made a series of unfounded allegations,

which I am happy to report that to date the Myanmar authorities, sponsors (both Myanmar and international), and embassies have dismissed. All members of the project will continue to conduct their work in an open, transparent and committed manner.

- Although seven presentations and two papers were completed (with a further six in preparation), the majority of time was devoted to training and field research. The field survey to southern Tanintharyi (Nov, 2003) involving many foreign scientists and local students was particularly time consuming to organise. In 2004-2005, the emphasis will be switched to ensure that all research outputs are written up and presentations are made at international conferences in order to maximise the legacy of the Darwin project.
- The design of the project has not changed significantly over the year with the exception of the exit plan where we have increased the exposure of students from Yangon and Mandalay Universities to a range of international biodiversity experts. The aim has been to ensure that after the completion of the Darwin, there will be collaboration between Myanmar universities and foreign institutions in a variety of zoological studies (birds, invertebrates etc), botany and geology as well as in bat studies. In this way, the value of the Darwin grant will be increased and its legacy strengthened. However, the success of this approach is partly dependent on future international approaches to the funding of science in Myanmar.
- A timetable (workplan) for 2004-2005.
  - April, 2004: update website [www.harrison-institute.org/Darwin/index.html](http://www.harrison-institute.org/Darwin/index.html) outlining the the outputs of the second year's work.
  - April, 2004 – March, 2005: input data into cave-bat database
  - April, 2004 – March, 2005: input data into cave-bat echolocation database
  - April, 2004 – March, 2005: prepare publications based on 2002-4 research data (papers, books, presentations)
  - May, 2004: 1 UK member of the Darwin team to present results of the Darwin project at a workshop in Thailand entitled 'Toward sustainable practices and effective biodiversity management: a databank and network for the conservation and monitoring of southeast Asian mammal biodiversity'
  - June-July, 2004: Myanmar students to conduct surveys in Loikaw and Mogok areas (these areas are closed to foreigners)
  - August, 2004: 2 UK and 2 Myanmar members of the Darwin team to attend and make presentations at the 13<sup>th</sup> International bat research conference, which will be held in Poland
  - September, 2004: 2 UK and 10 Myanmar members of the Darwin team to attend the Trans-Karst 2004 International transdisciplinary conference on development and conservation of karst regions, which will be held in Hanoi
  - March, 2005: Final workshop at Yangon University – students to present papers on the outcomes of their research. The strengths and weaknesses of the Darwin project to be discussed and the way forward to be planned.

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

- The review was discussed with the staff of the Harrison Institute, Professor Daw Tin Nwe, Head of Zoology and Darwin staff and students of Yangon University. It was also circulated to various interested individuals including Professor Paul Racey, who is a trustee of the Institute and is also conducting a Darwin bat project in Madagascar

- A list of the thesis titles and progress of the Darwin trainees is included in the current report (Annex 2)

## 6. Partnerships

- The relationship with Yangon University has continued on a sound basis with good co-operation on all aspects of the project
- The Darwin project has increased collaborative links with Mandalay University, which is now a viable and productive second centre for the study of bats within Myanmar
- The Darwin team has developed new collaborative links with:
  - Dr Charles Francis of the National Wildlife Research Centre, Canadian Wildlife Service for the creation of a gene bank of South East Asian bats – part of the Barcodes of Life project [www.barcodinglife.com](http://www.barcodinglife.com)
  - Dr Emma Teeling of the Laboratory of Genomic Diversity, National Cancer Institute, Maryland, USA for the study of the phylogeny of bats based on molecular investigation (with particular reference to the globally endangered bumble-bee bat, *Craseonycteris thonglongyai*)
  - Dr Stephen Rossiter of Queen Mary College, London University for the study of the molecular systematics of Myanmar horseshoe bats (*Rhinolophus*)
  - Emmanuel Houzard of Total E&P Myanmar for the study and conservation of the bat fauna of the new Yadana Pipeline Nature Reserve in Tanintharyi Division
  - Dr J. L. David Smith, University of Minnesota co-ordinator of the ‘Tenasserim Range Transboundary project: an open conservation model’ – an international conservation project for Tanintharyi Division, with close links to the Smithsonian Institution
  - Gianluca Catullo, Institute of Applied Ecology, Rome for the dissemination of data on Myanmar’s bats during the forthcoming (May, 2004) SAMD workshop in Thailand (‘Towards sustainable practices and effective biodiversity management: a databank and network for conservation and monitoring of Southeast Asian Mammal Biodiversity’)

## 7. Impact and Sustainability

- Publicity for the project during the year included:
  - An interview with Dr Paul Bates concerning the Darwin project broadcast by Radio Free Asia (Burmese Service, based in Washington, USA) on 12 May, 2003
  - References to (Darwin) bat project (pages 10-11) in ‘Enhancing Regional and International Collaborations’ an occasional publication of the Government of the Union of Myanmar, Ministry of Education. March, 2003: 52 pp.
  - General article about Harrison Institute’s work in Myanmar in the flight magazine of Air Mandalay (one of two privatised airlines in Myanmar). Entitled ‘Myanmar: an alternative guide’; published in the Golden Flight, April-June, 2003 edition
  - Article in ‘7 Day News Journal’ (vol 2, no 9: 22-28 May) – a weekly newspaper published in Myanmar language in Myanmar. This short article gave brief details of the Darwin project, talked about the Darwin funding source and the collaborative links between Yangon University and the Harrison Institute

- An interview with Professor Daw Tin Nwe broadcast on the TV network MRTV-3 on 15 September, 2003. Entitled “Butterfly garden in Yangon” the programme included extended references to the Darwin bat project
- Tangible evidence for increasing interest and capacity in biodiversity studies include:
  - An increasing ability amongst the Darwin team members based at Yangon University to plan, conduct and collect data from the field without international assistance
  - The expansion and strengthening of a second centre for bat studies in Myanmar based at Mandalay University. This bat group has in turn formed a strong link with Dr Tigga Kingston (a UK bat specialist working for Boston University based in Malaysia). Dr Kingston was introduced to the Mandalay team by Dr Paul Bates as part of the Darwin workshop and field studies based in the Mandalay area in March, 2003 (see last report). In the summer of 2003, a member of the Mandalay team undertook a study visit to Dr Kingston’s field station in Malaysia
  - Negotiations are currently taking place with Total E&P Myanmar for long term funding of Yangon University students to conduct biodiversity research in the new nature reserve in northern Tanintharyi. The outcome of this is not known, although Total Oil has agreed to fund the Reserve for the next 20 years
  - Dr Paul Bates has intentionally broadened the focus during field surveys to include a range of international specialists from a variety of countries expert in different aspects of biodiversity. For example, during the field survey of southern Tanintharyi (November, 2003) the team included one additional UK bat expert, two UK South-east Asian birds specialists, a UK expert on Asian molluscs, two UK geologists with expertise in limestone karst, an Indian conservation educationalist and a US palm specialist. All these additional members worked with Myanmar student counterparts. The idea is to develop a range of biodiversity projects within the Myanmar university system with international links
  - A meeting was held in March, 2004 with representatives of the Wildlife Conservation Society (and the Forestry Department) to help ensure that students trained within the Darwin Initiative programme have skills relevant to international NGOs and thereby increase their future employment possibilities

#### **8. Post-Project Follow up Activities (max 300 words)**

- Purpose: To promote the conservation of bats in mainland Southeast Asia through the repatriation of taxonomic information
- Outputs:
  - A website hosted by the Harrison Institute [www.harrison-institute.org](http://www.harrison-institute.org) dedicated to the systematics of bats from Myanmar, Thailand, Lao PDR, Vietnam, and Cambodia
  - (A printed synopsis would be published at a future date for use in the field)
- Activities:
  - To collate, synthesise and publish data on the identification and systematics of the approximately 135+ bat species recorded from the region
  - To provide additional information on the echolocation, distribution, ecology, habits, and population/conservation status



- Rationale:
  - The website would be relevant to Articles 17 and 26 (Global Taxonomy Initiative) of the CBD
  - It would repatriate to Southeast Asia taxonomic and other information that is currently only available in the extensive collections and libraries of the UK/Western institutions
  - It would promote a greater understanding of the bat fauna of the region, and its role in the ecosystem and highlight endangered and at risk species
  - It would include keys that would facilitate the identification of species by non-specialists, for example conservationists and foresters
  - It would enable strong regional linkages to be built between bat groups operating in the different countries of SE Asia
  - It would allow free access to anyone with an interest in Southeast Asian bats
  - It could be easily and regularly updated
- Relationship to the current Darwin project and to the previous work of the Harrison Institute:
  - This follow-up activity would draw on the extensive data generated during the current Darwin project on the 100 Myanmar bat species
  - It would draw on the extensive collections and research of the Harrison Institute on the bats of Vietnam, Cambodia and Thailand. The Harrison Institute has published the two most recent definitive papers on the bats of Vietnam (2001) and Cambodia (2001)
  - It would draw on the recent Harrison Institute submissions to the IUCN (for the May, 2004 SAMD workshop in Thailand) of distribution maps and systematic synopses of 84 Southeast Asian bat species
  - It would draw on the experience of the Harrison Institute, which published a monograph on the bats of the Indian Subcontinent (1997), which was subsequently published in CD format (2000)
- Comparable projects
  - This would be the first definite guide to bats of the Old World published on-line. It could be seen as a flagship systematic publication of the Darwin Initiative.
  - The Field Museum of Natural History, Chicago has published *A synopsis of the Mammalian Fauna of the Philippine Islands* [www.fnmh.org/philippine\\_mammals](http://www.fnmh.org/philippine_mammals). This is a valuable publication, although it does not include the level of information envisaged for the proposed project
- The Harrison Institute has excellent contacts with the bat research community not just in Myanmar but throughout mainland Southeast Asia

## 9. Outputs, Outcomes and Dissemination

- Difference in outputs
  - The principal difference is the training of students. In the original timetable it was envisaged that four students would be trained in the first year to be replaced by four more for each of the two subsequent years. In practice, eight students (plus various staff) were trained in the first year. Seven remained with the project in the second year and one additional student

joined the group. These eight students plus an additional two are expected to remain with the project in the third year. The advantage of the current training programme is that the depth of knowledge for each student is greatly enhanced. Project theses are to be classified by the Myanmar authorities as PhDs rather than MScs as envisaged at the start of the programme (but see comments in Section 4: significant difficulties)

- The newsletter was published on the internet rather than as a paper handout
- The number of training weeks given by UK staff and visiting scientists was increased in order to counteract the years of academic isolation undergone by Myanmar universities. Also for this reason, foreign experts in academic fields (zoology, botany and geology) other than bats were included in the field survey teams. Each worked with one or more Myanmar student counterparts
- The project received greater publicity in Myanmar than originally planned
- The education component in the form of handouts to Buddhist monks and tour guides at popular caves was not completed, as field research showed that the issues involved were more complex than originally envisaged (see Section 4).
- Dissemination activities
  - Myanmar academic community – through reports, publications and regional workshops (Yangon, Mandalay and Shan State)
  - Myanmar general public – through newspaper and magazine articles and radio and TV programmes (for details see Section 7)
  - Ministry of Education – through discussions of senior Zoology Department, Yangon University staff and the submissions of reports and publications
  - Business community – through discussions with and submitting reports and publications to senior management in the oil (Total, Petronas and Premier Oil) and tourist industries (Air Mandalay, Road to Mandalay and a range of international hotels)
  - Diplomatic community – through close contact and submitting reports and publications to the British Embassy/British Council in Yangon and Myanmar Embassy in London
  - Conservation and research community, international and in Myanmar: discussions, workshops and the submission of reports and publications
- It is planned that the momentum of the current project be sustained by the involvement of some of the Myanmar bat team in the Yadana Pipeline Nature Reserve project (see Section 7) and by ensuring that during the lifetime of the current project a wide range of international biodiversity experts are invited to Yangon and have an opportunity of working with the students (see Section 7)

**Table 1. Project Outputs (According to Standard Output Measures)**

Code No.	Quantity	Description
14B	5	British Ecological Society/Association for Tropical Biology and Conservation, York University, July, 2003 (1 UK Darwin staff)
		Fourth Biennial Conference of the Systematics Association, Trinity College, Dublin, August, 2003 (1 UK Darwin staff)
		Poster presentation at Royal Geographical Society, March, 2004 (1 UK Darwin staff)

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		Guest speaker on 'Road to Mandalay' Orient Express, Ayeyarwaddy cruise, August, 2003. (1 UK Darwin staff)
		Yangon University workshop, January, 2004 (5 Myanmar Darwin students)
16A	1	Website for project published <a href="http://www.harrison-institute.org/Darwin/index.html">www.harrison-institute.org/Darwin/index.html</a>
14A	3	Technical workshops were conducted in April, 2003 (Mandalay Division) and August, 2003 (Shan State). Theoretical workshop on the needs of the end users in March, 2005 (Yangon University)
8	19	Harrison Institute staff conducted project work in the host country in all or parts of the following months: April, May, August, November, December, 2003 and January and March, 2004
13B	1	Voucher specimens taken of new and interesting bat taxa – collections divided between Yangon Univ and Harrison Institute
4C	4	8 postgraduate students received training in a variety of aspects of bat studies (Mr Khin Maung Swe, Ms Khin Mie Mie, Ms Nyo Nyo, Ms Nu Nu Aye, Mrs Mar Mar Thi, Ms Yin Yin Toke, Ms Aye Aye Khaing and Ms Naing Naing Aung)
4D	19	19 weeks of training were provided directly to Darwin trainees by Drs Bates and Mackie whilst in Myanmar; in addition guidance was given throughout the year by e-mail
4D	12	Exposure was given to the Darwin trainees and other students to a range of international biodiversity experts who accompanied the Darwin teams on field surveys
12B	2	Data gathered for cave-bat database and acoustic database from 3 of the 7 study areas – all 5 areas accessible to foreigners have now been studied
19B	1	Radio Free Asia interview with Paul Bates (12 May, 2003)
18C	1	MRTv-3 'global transmission' interview with Professor Daw Tin Nwe (15 September, 2003)
15A	1	7 Days News Journal (Vol. 2, no 9: 22-28 May) – in Myanmar language
15B	1	'Enhancing Regional and International Collaborations' an occasional publication of the Government of the Union of Myanmar, Ministry of Education. March, 2003: pages 10-11.
11A	2	Two papers accepted for publication in international journals; 1 submitted and 5 still being prepared.

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- In Table 2, provide full details of all publications and material produced over the last year that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications Database. Mark (\*) all publications and other material that you have included with this report.

**Table 2: Publications**

Type *	Detail	Publishers	Available from	Cost £
(e.g. journals, manual, CDs)	(title, author, year)	(name, city)	(e.g. contact address, website)	
Scientific paper*	A review of <i>Rhinolophus</i> (Chiroptera: Rhinolophidae) from Myanmar, including three species new to the country.  Paul Bates, Mar Mar Thi, Tin Nwe, Si Si Hla Bu, Khin Mie Mie, Nyo Nyo, Aye Aye Khaing, Nu Nu Aye, Thida Oo and Iain Mackie in press	Acta Chiropterologica	Harrison Institute <a href="http://www.harrison-institute.org">www.harrison-institute.org</a>	free
Scientific paper	Good vibrations: can bat detectors be used as a conservation tool to assess cave dependent bat diversity in Myanmar  Iain Mackie, Tin Nwe, Khin Mie Mie, Naing Naing Aung and Paul Bates submitted	Conservation Biology	Harrison Institute <a href="http://www.harrison-institute.org">www.harrison-institute.org</a>	free
Scientific paper*	First record of bats (Chiroptera) from Rakhine State, Myanmar (Burma)  Malcolm Pearch, Khin Mie Mie, Paul Bates, Tin Nwe, Khin Maung Swe and Si Si Hla Bu. in press	Natural History Bulletin of the Siam Society	Harrison Institute <a href="http://www.harrison-institute.org">www.harrison-institute.org</a>	free
Field key* (Initial draft)	To the 100 species of bat known from Myanmar	Harrison Institute	Harrison Institute	free
PhD thesis	Structural patterns of the wing osteology and its phylogenetic implications  Mar Mar Thi, 2004	Yangon University	Yangon University	\$10 to cover production costs

PhD thesis	A practical guide to current survey and identification method for bats (Mammalia: Chiroptera); a case study for Myanmar  Khin Maung Swe, 2004	Yangon University	Yangon University	\$10 to cover production costs
Presentation paper CD version*	Systematic Research in Myanmar  Mar Mar Thi and Paul Bates, 2003	Harrison Institute/ Yangon University	Harrison Institute	free
Presentation paper*	Echolocation signals of some bat species from Myanmar by analysis of time expanded recording  Khin Mie Mie, 2004	Yangon University	Yangon University	free
Presentation paper	Maintaining karst dependent bat diversity in Myanmar: a Darwin initiative approach  Iain Mackie, 2004	Harrison Institute	Harrison Institute	free
Presentation paper	Food habits of some insectivorous bat species in limestone karsts around Mon and Kayin States  Nyo Nyo, 2004	Yangon University	Yangon University	free
Presentation paper	Community structure of cave bats in some places in Myanmar  Yin Yin Toke, 2004	Yangon University	Yangon University	free
Presentation paper	Echolocation calls structures, monitoring and identification of cave roosting bats by using frequency division bat detector  Naing Naing Aung, 2004	Yangon University	Yangon University	free
Presentation paper	Structural patterns of the wing osteology and its phylogenetic implications  Mar Mar Thi, 2004	Yangon University	Yangon University	free

## 10. Project Expenditure

- Please expand and complete Table 3.

**Table 3: Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)**

Item	Budget (please indicate which document you refer to if other than your project schedule)	Expenditure	Balance
Rent, rates, heating, overheads etc			
Office costs (e.g. postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment			
Others			
Salaries (specify)			
Paul Bates			
Iain Mackie			
Si Si Hla Bu			
Myanmar trainees			
<b>TOTAL</b>	<b>36800.00</b>	<b>36800.00</b>	<b>0.00</b>

- No significant changes to the budget were made. However an additional £18380 was raised for the project. This comprised US \$17640 (approx = £10,080) from a variety of sources for field surveys and publications; £7000 received in kind in respect of time donated by visiting scientists who conducted training during field surveys (for details see Section 4: additional outputs) and £1300 for two air tickets to Myanmar (paid for by Total Oil and Orient Express).

## 11. Monitoring, Evaluation and Lessons

The purpose of the project is to ensure that Myanmar fulfils its potential in conserving limestone karst dependent bats, including globally threatened species.

- This requires the raising of the profile of bat conservation. The outputs of 2003-2004 that contributed towards this purpose are listed below.
  - Discussions and presentations (in Myanmar and abroad) to the
    - academic community
    - general public
    - Ministry of Education

- business community
- diplomatic community
- international and local conservation and research community

(for details see Section 9: dissemination activities and Section 6: partnerships)

- Involving additional scientists from a range of countries in the research projects
- Designing and hosting a website with information about the Darwin project
- Contributing articles and programmes to the local and international media
- Research is also required to achieve the project's purpose. The extensive field surveys of 2003-2004 when combined with those of 2002-2003 have identified the most important sites for the conservation of limestone karst dependent bats, including globally endangered species.
- The aim cannot be sustained without a core group of in-country scientists trained in the relevant skills and with good links to the international bat research and conservation community. Our training programme aims to produce such a group and although such a group in itself will not ensure the conservation of cave bats, its existence certainly increases the chances that the role of bats in the ecosystem is understood and that the diversity of bats is known and is seen as a priority in nature conservation.
- Lessons learnt: The practical difficulties of guiding and managing a multi-disciplinary field survey (Nov. 2003) involving a wide range of foreign scientists and a large group of in-country students are manifest, especially when operating in a border area of Myanmar with relatively limited transport and communication systems. Although successful in many ways, it is open to question whether the input of time spent organising this expedition (both for the UK and Myanmar staff) was repaid in terms of the research and training results.

## **12. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum)**

### **■ I agree for ECTF and the Darwin Secretariat to publish the content of this section**

- Helped develop an additional centre of bat research in Myanmar (in Mandalay); this should ensure a stronger legacy of the Darwin project on its completion, with twin centres in Yangon and Mandalay Universities.
- Assisted Mandalay University in the discovery of three species of microbat (two evening bats and a horseshoe bat) new to science and collected (with Yangon University students) an additional two species (an evening bat and a leaf-nosed bat) that are first records for Myanmar. This has increased the number of bat species known from Myanmar to 100, which is ten species more than are currently recorded from the whole of China, a country with 13 times the land area.
- Conducted seven field surveys during the year including a multidisciplinary expedition to southern Tanintharyi (Tenasserim); this included the first ever biodiversity survey of some of the islands of the northern Myeik (Mergui) Archipelago. The expedition involved 9 scientists from UK (7), USA (1) and India (1) and 16 Myanmar students with research interests in bats, birds, butterflies, molluscs, palms and karst geology. Additional funds for the expedition were raised from a number of sponsors and the surveys were planned and organised at the Harrison Institute and Yangon University.
- Data from the Darwin sponsored field surveys are being incorporated into a range of international bat research and conservation projects including the

international programme *Barcodes of Life* [www.barcodinglife.com](http://www.barcodinglife.com) and the IUCN project *Toward sustainable practices and effective biodiversity management: a databank and network for the conservation and monitoring of southeast Asian mammal biodiversity*.

- Promoted the message of bat conservation to the international business community in Myanmar, especially the oil company Total E&P Myanmar. Currently negotiating with Total to promote a bat research and conservation programme in the new Yadana Pipeline Nature Reserve in northern Tanintharyi Division. If successful, initial research would be carried out by Darwin trained Myanmar students and this would help to ensure a lasting legacy for the Darwin programme.



## Annex 2

Progress report on the Darwin trainees, including names, date taken on as a Darwin trainee, title of project, date postgraduate started, expected date of completion

\*Mr Khin Maung Swe, started as a Darwin trainee: April, 2002, Title: *A practical guide to current survey and identification method for bats (Mammalia: Chiroptera); a case study for Myanmar*, completed PhD thesis in September, 2002

\*Mrs Mar Mar Thi, started as a Darwin trainee: April, 2003 (although some interaction with the group since April, 2002), Title: *Structural patterns of the bat wing osteology and its phylogenetic implications*, completed PhD thesis September, 2003

Ms Khin Mie Mie, started as a Darwin trainee: April, 2002, Title: *Echolocation call structure of Myanmar bats*, expected completion 2004

Ms Nyo Nyo, started as a Darwin trainee: April, 2002, Title: *Diet of Myanmar bats, assessed through faecal analysis, in relation in relation to insect availability*, expected completion November, 2004

Ms Nu Nu Aye, started as a Darwin trainee: April, 2002, Title: *Aspects of the ecology and economic importance of Tadarida plicata (Buchanan, 1880), in Myanmar with respect to the ecological and economical factors*, expected completion March, 2005

Ms Yin Yin Toke, started as a Darwin trainee: April, 2002, Title: *Wing structure of some cave dwelling bats from Myanmar cave bats*, expected completion 2004

Ms Naing Naing Aung, started as a Darwin trainee: April, 2002, Title: *Monitoring Myanmar cave dwelling bats using a frequency division bat detector*, expected completion 2004

Ms Aye Aye Khaing, started as a Darwin trainee: April, 2002, Title: *Aspects of the roosting ecology of some cave-dwelling and non-cave dwelling sheath-tailed bats, Taphozous spp.*, expected completion 2005

Ms Wai Wai Myint, started as a Darwin trainee: April, 2004, Title: *Diet of two sympatric Scotophilus species in relation to insect availability*, expected completion November, 2005

\* Bat projects started prior to Darwin Initiative project, additional training given to complete theses

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2003/2004

Project summary	Measurable Indicators	Progress and Achievements April 2003-Mar 2004	Actions required/planned for next period
<p><b>Goal:</b> To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> <li>• The conservation of biological diversity,</li> <li>• The sustainable use of its components, and</li> <li>• The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</li> </ul>			
<p><b>Purpose</b> <i>(insert original project purpose statement)</i></p> <p>To ensure that Myanmar fulfils its potential in conserving limestone karst dependent bat species, including globally threatened taxa</p> <p>There are 92 bat species recorded from Myanmar, including endangered limestone dependent taxa, such as <i>Craseonycteris thonglongyai</i></p>	<p><i>(insert original purpose level indicators)</i></p> <p>That bats and limestone karst habitats are given equal status within the Protection of Wildlife and Natural Areas law as other 'priority' species and habitats (such as large mammals and forest habitats)</p> <p>Darwin trainees continue to promote bat conservation based on authoritative scientific research</p>	<p><i>(report impacts and achievements resulting from the project against purpose indicators – if any)</i></p> <p>The conservation of karst ecosystems is included as an objective of the National Commission for Environmental Affairs and is included in the Protection of Wildlife and Natural Areas Law; karst ecosystem conservation is included in the proposals of the Nature and Wildlife Conservation Division of the Forest Department</p>	<p><i>(report any lessons learned resulting from the project &amp; highlight key actions planning for next period)</i></p> <p>Forest Department continues to work with Yangon University on assessing conservation priorities</p>
<p><b>Outputs</b></p>			
<p><i>(insert original outputs – one per line)</i></p> <p>A national database of bats from limestone karst areas – for national</p>	<p><i>(insert original output level indicators)</i></p> <p>Publication of databases and dissemination of action plans</p>	<p><i>(report completed activities and outcomes that contribute toward outputs and indicators)</i></p> <p>Incorporation of database and</p>	<p><i>(report any lessons learned resulting from the project &amp; highlight key actions planning for next period)</i></p>

and international circulation		management plan recommendations in the publications of the Asia-Pacific forum on Karst Ecosystems	Field work can be carried out (previous experience since 1999 shows that this is the case)
Action Plan for cave bats and management plans for key karst areas	Graduation of MSc trainees	Incorporation of data into future IUCN Chiroptera action plans	Trainees will be available (already known)
A core of Myanmar graduates trained in biodiversity survey work			
Identification key for Myanmar bats			

*Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.*