

DARWIN INITIATIVE

FINAL REPORT

1. Basic Project Details

- Project Title: 4-volume fieldguide to herpetofauna of SE Asia.
- Contractor: University of Wales, Bangor
- Host country collaborating institute(s): Chulalongkorn University (Thai Turtle Lab), Thai National Science Museum (Zoology Division), Thai Red Cross (Queen Saovabha Research Institute).
- Grant Round: 3
- Grant Value: £ 33,000

2. Project Expenditure

- Total grant expenditure: £ 34,146
- Breakdown of expenditure (using expenditure categories in the original application form)

Heading	Budget	Expenditure (variance)
Rents, rates, heating		
Postage, telephone, stationary		
Travel & subsistence		
Equipment		
Library/materials		
<i>TOTAL</i>		

Variations in expenditure (+/- 10%): Since a large percentage of the budget was being spent by overseas partners, it proved very difficult to control strict adherence to the budget headings. However, clearly the postage/telephone/stationary budget was vastly overestimated, and was probably due to e-mail connections becoming established in all the collaborating institutions after the start of the project.

3. **Project Background/Rationale**

- Why was the project needed? Please explain the project development process.

The need for this project was identified initially by our collaborators, who have experienced difficulties in training students and in carrying out herpetological surveys as part of EIA commissioned from them by the Thai Govt because of the inadequacy of current identification guides to SE Asian species. Currently, up to seven separate volumes are required, of which some are over 50 years old and thus also requiring a good acquaintance with primary herpetological literature in order to keep track of systematic revisions and new species descriptions. More up-to-date volumes are limited in geographical coverage, and more significantly, lack species keys. This results in reptiles and amphibians often being neglected or inadequately surveyed during biodiversity assessments, and thus there is an urgent need for an up-to-date fieldguide for these taxa, for the whole of the South-east Asian region.

- How was it related to conservation priorities in the host country?

It provides a vital data base to be used in assessment and monitoring of biodiversity in the SE Asian region.

- How was the project intended to assist the host country to meet its obligations under the Biodiversity Convention?

As the project is regional, it will assist countries throughout the mainland SE Asian region (including Malaysia, Thailand, Laos, Vietnam, Cambodia and Myanmar) to meet their obligations under the Biodiversity Convention in the assessment and monitoring of biodiversity.

- Was there a clear 'end-user' for the project in the host country? Who?

Yes. In Thailand, all the local partners could be considered end-users. Chulalongkorn University is closely involved with the training of Masters and PhD students in ecological and taxonomic studies of herpetology, a very neglected field in the SE Asian region, and this will greatly facilitate subsequent training. Queen Savoabha Memorial Institute is involved with the preparation of antivenoms against venomous snakebite, and this guide will facilitate the identification of species (particularly of the green pit vipers, a focus of the project). Finally, personnel of the National Science Museum are closely involved with the surveying of herpetological biodiversity in Thailand and neighbouring countries. In other countries, similar organizations involved in education, conservation and snakebite treatment can be clearly identified as end-users (eg Cuc Phuong conservation project in North Vietnam).

4. **Project Objectives**

- What were the objectives of the project (as stated in the original application form)?

- to improve the ability to train surveyors of biodiversity who lack specialist herpetological knowledge, or access to such expertise, to identify reptiles and amphibians by providing a

series of accessible fieldguides containing keys, brief descriptions, and photographs to all species currently recognized in mainland South-east Asia.

- to promote the utility of reptiles and amphibians as indicators of biodiversity in an area where mammals and birds have often been selectively removed by hunting.

- to undertake remedial systematic work on some particularly difficult but commonly encountered taxa (e.g. Asian lancehead pitvipers); to identify cryptic taxa, define species boundaries, and improve knowledge of the species distribution and habitat requirements.

- Were the objectives of the project revised? If so, how?

No

- Have the objectives (or revised objectives) been achieved? If so, how?

The first two objectives will be achieved upon the publication of the guides. The third objective has been achieved. One publication on the systematics of Asian pitvipers has been produced (see attachment) and others are in preparation.

- If relevant, what objectives have not been achieved, or only partially achieved, and why?

5. **Project Outputs (see the attached list of project outputs which we would like you to use in compiling this section of the report)**

- What output targets, if any, were specified for the project? (Please refer to the project schedule agreed with the Department where relevant.)

Time spent on the project by the UK project leaders (output no. 8).

Novel systematic arrangements proposed and species survey results will be published in peer-reviewed journals (output no 11)

The production of a 4-volume fieldguide to the reptiles and amphibians of mainland South-east Asia (output no. 10).

National and international press releases associated with publication (output no. 15)

Matching funding for the publication of the fieldguides (output no 23).

NB. These outputs (apart from output no 8. and 11) will be coincidental with publication, and therefore will come after the end of the project.

- Have these been achieved?

Those that can be expected to be achieved prior to the publication of the fieldguides (see below) have been achieved. See details below:

Output 8: 40 weeks spent in host region by UK project leaders (Thailand, Malaysia, Vietnam, Laos).

Output 11A: 1 published paper (Molecular Phylogenetics and Evolution), 1 in press (Molecular Ecology).

- If relevant, what outputs were not achieved, or only partially achieved, and why?

Outputs 10 and 15 will be coincidental with publication, and therefore will come after the end of the project. This is in accordance with the agreed work schedule.

- Were any additional outputs achieved?

Yes. Details are given below

Output 10. Local language versions of vol. 1 (in Khmer, Lao, Thai and Vietnamese) have been produced and are currently in press.

Output 11B. The above conference will also result in the production of two further publications (symposium volume, in press).

Output 14C. UK project leaders presented results of the viper systematic study to a specialist conference (Biology of the Vipers) in Uppsala, Sweden (May 2000).

Output 14C. AM presented the aims of the project and the results of the systematic revision of the vipers at the "1st international conference on the treatment of snakebite victims" in Ho Chi Minh City, Vietnam (Nov 99).

Output 14D. AM presented a poster at a House of Commons reception, a "Science, Engineering and Technology Week" event (March 1999).

- If output targets were not specified, please state the outputs achieved by the project. As far as possible, we would like you to work through the list of outputs attached to this paper and to report on those which are relevant to your project.

N/A

6. **Project Operation/Management**

- Research projects - please provide a **full** account of the scientific work undertaken, outlining the methodology adopted, the staff employed and the research findings. The extent to which research findings have been subject to peer review should be addressed.

Only one objective can be interpreted as a research project, i.e. the systematic review of some taxonomically confused but significant taxa. This focused on the pitvipers, particularly of the

Trimeresurus group. The use of molecular markers has been shown to be a powerful means of recovering phylogenetic histories for many organisms. Nevertheless, since considerable morphological variation may be present within currently recognised species, character analysis is still appropriate to define the taxonomic units to be represented in the molecular study, and to derive reliable morphological characters (or combinations of characters) that may be used in keys. Specific details of techniques employed are given below:

a. Multivariate morphometrics. Morphological data is collected in the field from live which are then released unharmed at point of capture animals (or from road-kills in good condition). Data were analyzed using a number of powerful multivariate statistical techniques (e.g. canonical variate analysis) which allow considerably better resolution of complex patterns of variation than conventional taxonomic methods (which have clearly failed in this case).

b. mitochondrial (mt) DNA sequencing. Minute tissue biopsies (tail tips preserved in 70% ethanol and/or blood preserved in buffer) are sufficient to allow DNA to be extracted and target sequences (in this case, the cytochrome b gene) amplified by the polymerase chain reaction and then directly sequenced.

c. Phylogenetic reconstruction. A variety of different algorithms, implemented in Paup* v. 4.0b2a, were used to reconstruct phylogenetic relationships among taxa. Various sources of bias were additionally tested (eg., non-clock-like evolution, GC bias).

This study, based on mitochondrial cytochrome *b* sequences, was the first to include a large number of species (21) of the group and demonstrated that the current taxonomy does not adequately represent either the relationships or the genetic diversity present in the complex (published in the leading international, peer-reviewed, journal *Molecular Phylogenetic and Evolution*, earlier this year). This study also underlined the fact that, despite decades of study, the taxonomy of the green pit-vipers is still not fully resolved, and there are still cryptic species present. The results show, for example, that the common and widespread white-lipped pit-viper, *T. albolabris*, is clearly polyphyletic, consisting of at least three distinct groups. Further work, using the leading-edge technique of AFLP's (Amplified Fragment Length Polymorphisms), which access the nuclear genome, have corroborated these results and allowed us to propose a revised taxonomy for this species (in press in the leading international, peer-reviewed, journal *Molecular Ecology*).

Analysis of morphological variation, using multivariate morphometrics, has allowed us to find diagnostic characters between these new species for the construction of keys for inclusion in the book. The morphological work is currently being written up, and will be submitted for publication in peer-reviewed journals (and should result in further outputs within the next couple of years).

As well as subjecting the research results to peer-review, the manuscript for each volume is also peer-reviewed, to check taxonomic accuracy as well as ease of use.

Did any issues or difficulties arise in running and managing this project?

Work by host country Institutions was substantially delayed as subcontracts that needed to be signed by the Heads of Institutions before claims could be made, took a long time to be returned. This was partly exacerbated by several project personnel changing Institutions during the early part of the project.

7. Project Impact

- To what extent has the project assisted the host country to meet its obligations under the Biodiversity Convention, or to what extent is it likely to do so in the future? Please take account of the following in preparing this section of the report:

This project is designed to provide the means by which organisations and personnel involved in the conservation of herpetological biodiversity can achieve this. We will ensure that free copies of the books are distributed to such organizations in the region covered (Myanmar, Thailand, Lao PDR, Vietnam and Cambodia), which will be subsidized by the commercial sale of copies in the West.

The level of collaboration achieved between UK and host country institutions has been variable. In general, working relationships have been good and there are prospects for greater joint working/information exchange in the future. However, time is a severe limitation, especially with respect to collaborators from educational institutions. Thai and UK holidays do not coincide, which makes joint fieldwork problematic. One positive outcome of the movements of collaborators among institutions during the lifetime of the project (reported as a limitation elsewhere) is that the range of Institutions with which UK project leaders now have good connections has been extended.

8. Sustainability

- Did the host country institute(s) contribute resources to this project (these may have been provided in-kind, for example staff, materials etc)?

Resources in kind were provided: staff time for fieldwork, access to cheap accommodation and car hire, logistic assistance etc.

- If so, what is the monetary value of the resources committed to the project by the host country institute(s)?

Impossible to quantify.

- To what extent was Darwin funding a catalyst for attracting resources (including in-kind contributions) from other sources? Please provide details on the other sources from which resources were secured for this project.

It served as a catalyst to obtain funding for the actual printing and distribution of the book, as well as the preparation of illustrations for the species that could not be photographed, from Conservation International. A reduced version of the first volume of the fieldguide (turtles and crocodiles) has been printed in four regional languages (Khmer, Lao, Thai and Vietnamese), the translation and printing of which was funded by the World Bank.

- What is the monetary value of resources generated for the project from other sources (please provide an estimate for each funding source)?

World Bank: USD 10,000

Conservation International: USD 20,000

- To what extent is work begun by the project likely to be continued in the future (if this is relevant - some projects may come to a natural end at completion)? This is more likely to be relevant for research-based projects.

Fieldguides of this nature tend to become out of date rather quickly. Work will continue in keeping track of taxonomic and biodiversity literature, as well as obtaining additional photographs, so that regular updates are possible. These may be distributed via the internet, or if funding is available, through publication of new editions.

- Has the project acted as a catalyst for other projects/initiatives in the host country? Is it likely to do so in the future?

The fieldguides will increase the ability of the host (and other) institutions to make use of the herpetological resources in their countries for monitoring and basic research.

9. **Outcomes in the Absence of Darwin Funding**

- Had Darwin funding been unavailable for the project, what would have been the most likely outcome:

The project would have been at least substantially delayed, and it is very likely that it could not have proceeded. At any rate, it would have resulted in a substantially different end product, as the funding to allow directed fieldwork and museum visits was critical.

- Had this project not been undertaken, how would the users/beneficiaries of the project have met their requirements? Would other organisations/ initiatives have been able to meet their needs (at least to some extent)?

As indicated earlier, the fieldguides will replace and integrate material from a number of different sources. While these sources could have been referred to by the end-users, many of them will not have access to the facilities or resources required. The "photoguides" that currently exist are inadequate as they have restricted geographical coverage, are not peer-reviewed therefore lack taxonomic rigor, and generally lack keys. Therefore, existing sources are inadequate for the purpose of biodiversity surveys, unlike the fieldguides resulting from this project.

10. **Key Points**

- What would you identify as the key success factors of this project?

Hard work and patience.

- What were the main problems/difficulties encountered by the project?

There was a delay in beginning the project due to delays in signing the subcontracts by the Institutional heads of the host country collaborators. This was partly due to insufficient understanding of the way in which the project funding would be managed at the outset, which resulted in a lack of communication within host institutions. This was exacerbated by several changes of Institute by collaborators during the course of the project (J Nabitabhata moved to the National Science Museum from the National Research Council at the beginning of the project, Merel J Cox left the Thai Red Cross and moved to the US, which also led to the addition of Dr Lawan Chanhome to the team, and Dr van Dijk moved from Chulalongkorn University to TRAFFIC SEA at the end of last year).

Also, the time it would take to obtain photographs or other illustrations of all species of various taxa was underestimated and this is the main cause of delay in the production of the fieldguides.

- What are the key lessons to be drawn from the experience of this project? Please try to provide as much information on this point as you can so that others can learn from the experiences of your project.

It would be very useful to have drawn up a memorandum of understanding between the collaborating institutions, prior to the grant being awarded. This would have clarified the needs of the various institutions as well as the role each partner was expected to play.

Does the experience of this project imply a need to review arrangements for developing and managing projects funded as part of this Initiative?

No.

11. **Project Contacts**

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Host country project leader/co-ordinator:

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Other key people involved in the project at the host country collaborating institutes:

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- 'End users' for the output produced by the project in the host country (ie. government departments, agencies, universities, local communities etc)

Too many and varied to provide contact details for these in all 5 countries of the host region. In Thailand, the overseas partners represent the community of end-users. In other countries, end-users will be similar and will include educational institutions, government wildlife and conservation departments, non-governmental conservation organisations operating in the area (eg Wildlife Conservation Society and Flora and Fauna International). In addition, health service personnel dealing with the treatment of snakebite will also find the output of considerable use in identifying the species of venomous snakes responsible for bites (Eg Dr Trinh Xuan Kiem, Cho-Ray Hospital, Ho chi Minh City, Vietnam).

- Other project beneficiaries

Herpetological and conservation community in general, including amateur enthusiasts.

- Other key players involved in the funding/operation/utilisation of the project.

Co-funding:

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ATTACHMENTS:

1. Malhotra, A. and Thorpe, R.S. 2000. Mol. Phyl. Evol. 16: 199-211.