



Land snail diversity in Sri Lanka

Darwin Initiative Annual Report

1.4.2001 to 31.3.2002

Darwin Initiative for the Survival of Species

Annual Report

1. Darwin Project Information

Project title	<i>Land snail diversity in Sri Lanka</i>
Country	<i>Sri Lanka</i>
Contractor	<i>The Natural History Museum</i>
Project Reference No.	<i>08/214</i>
Grant Value	<i>£137,031</i>
Start/Finishing dates	<i>1st October 1999 - 30th September 2002</i>
Reporting period	<i>1st April 2001 to 31st March 2002</i>

2. Project Background

The Sri Lankan land snail fauna is diverse and highly endemic but poorly known. Most of the diversity and endemism is restricted to the threatened and highly fragmented forests of the wet zone in the Southwest. A number of terrestrial gastropods are serious agricultural pests in Sri Lanka but the species involved had not been identified prior to this project. Resources in Sri Lanka for identifying land snails were almost non-existent.

3. Project Objectives

Revised December 1999

- To carry out molluscan collecting surveys, to provide distributional information and a computerised database and to establish reference collections at the Department of National Museums, Colombo and the University of Peradeniya.
- Preparation of a compact disc guide and information resource on the Sri Lankan snail fauna based on a review of the literature and including figures of all taxa and types where available. (enhanced objective but development currently suspended as of April 2001)
- Preparation of a field guide
- Preparation of a guide to the synanthropic/pest species

- Training of personnel to: (i) identify material (ii) conduct surveys (iii) undertake research projects
- Run an exhibition on the project at the National Museum, Colombo and at the Postgraduate Institute of Science, Peradeniya, Kandy. (added 2000/2001)

4. Progress

A brief history of the project to the beginning of this reporting period

The failure to reach agreement on control of the vehicles that were to be purchased precipitated our withdrawal from a partnership with the Zoological Survey/National Science Foundation /Education Department at the launch of the programme in October 1999. Plans to purchase vehicles were dropped and a replacement partnership was established with the Department of National Museums. The partnership with the Postgraduate Institute of Science, University of Peradeniya was established as planned. Miss Dinarzarde Raheem was appointed as a member of staff of the NHM Zoology Department to manage the programme in Sri Lanka where she is based at the Department of National Museums as a Research Officer. Initial surveys were carried out in representative habitat types across the country (apart from those in the war zone). Seven field assistants and three postgraduate students are employed and trained on the programme full time, two of the postgraduate student's salaries are funded locally. Additional full time undergraduate students at Peradeniya University carry out field experience projects on the programme and selected third year students conduct special honours research projects. Four field assistants and the two team leaders visited the Natural History Museum, London in August 2000 for training and research. An illustrated guide to Sri Lankan land snails was published as a book and compact disc.

Progress over the last year

Department of National Museums

A major problem with the Department of National Museums (DNM) institutional link developed from October 2001 and communication with the National Museum's staff almost ceased. Dr Mapatuna was not confirmed in her post as Director of National Museums and was ultimately replaced. During the intervening period there was a great deal of disruption and an acrimonious situation developed between the outgoing director and the new director. The Darwin Initiative project staff had their DNM passes withdrawn, access to the project office was restricted and no access was allowed to the collections area. The new Director has no interest in biology and was hostile to any work that Dr Mapatuna was involved with. Dr Mapatuna was accused of wrongdoing and her involvement with the Darwin project came into question. It took some time for the position to become clear and Dinarzarde Raheem's return to Sri Lanka was delayed until January. Until then Dinarzarde Raheem concentrated on working up the collections of survey material at the NHM. The Colombo team carried out some prearranged fieldwork followed by joint fieldwork with the Peradeniya team.

The situation at the DNMs was largely resolved when Fred Naggs visited Sri Lanka in February 2002. Prior to Fred Naggs' visit the situation had been explored with

support from Sandy Moss, Biodiversity Team, Environment Policy Department at the Foreign and Commonwealth Office and Alison Kemp, First Secretary at the British High Commission in Colombo. On Fred Naggs' arrival in Sri Lanka a meeting was held with Alison Kemp and Rohan Pethiyagoda. Following a meeting that Rohan Pethiyagoda held with the Minister of Culture, the Director of National Museums was instructed to co-operate with the Darwin project. We now have a basic working relationship with the DNM's. Nevertheless, because Dr Mapatuna was the Principal Investigator on official documents in Sri Lanka, including collecting permits, it was not possible to resume the Colombo based field programme until April 2002.

Field Programme

A very intensive field programme for the Colombo based team is now in progress.

The field programmes are now focussed in two species rich areas. The Colombo based team is surveying the extensive area of highly fragmented forests in the Southwest and thirty 100 x 2m transects have been carried out in the past year. Many of these forests are remote, difficult to access and often difficult to work in.

However, forests in the Southwest house the greatest diversity and close on 100% endemism: they have highest priority for investigation. Since the start of the project, the Peradeniya based team have carried out sixty-five 100 x 2m transects in a range of forests in the Knuckles region of the Central Highlands, most of these forests are accessible on day trips from Peradeniya. Mr Ranawana and Miss Raheem provide training in field practice, both being experienced in field surveys. Members of the two teams work together in various combinations in order to establish consistent field practice and common standards. Fred Naggs joined both teams in the field in February/March 2002 accompanied by Harold Taylor, Photographic Unit NHM. Harold Taylor received funding from his department and made an extremely valuable photographic record of the visit including many images of snails, including new and as yet undescribed species.

Research and postgraduate training

Three of the Sri Lankan participants have registered for higher degrees under the supervision of Fred Naggs. In view of the Darwin Initiative's current policy on graduate students, no Darwin funding has been spent on university fees. However, because the research work is based entirely on that of the Darwin project, their degree work will be considered as Darwin outputs.

Miss Dinarzarde Raheem's research programme was accepted for PhD registration at the University of Cambridge. Title: Land-snail diversity in Sri Lankan rainforest fragments. The focus of this work is to investigate the effect of deforestation and forest fragmentation on species survivorship in land snails. The impact of deforestation on extinction and the value of snails as key indicator species will be investigated in the context of developing conservation strategies. Miss Raheem was scheduled to spend three terms at Cambridge at the end of the project from October 2002. We have not been able to secure funding for this and Cambridge has now intermitted the final year until 2002-2004. Submission of a preliminary application to the Whitley Foundation for a Rufford PhD Grant progressed to a full application but after ten months deliberations the Trustees decided not to provide funding. The application received strong support from The Wildlife Heritage Trust of Sri Lanka

and an additional supporting reference from Professor John Lawton, Chief Executive Natural Environment Research Council. The decision of the Whitley Trustees is evidently based on their failure to recognise the conservation value of this research. Tony Whitten at the World Bank was approached but he could only suggest seeking corporate sponsorship. A new studentship was introduced in the Zoology Department at the NHM but our application for funding was not considered because the project had to be a standard three-year programme. We will not be eligible for a studentship to be introduced by the NHM next year for the same reason. An application for a student's award has been submitted to a separate NHM fund, which will be assessed in July 2002 and could result in a pledge for up to £5000 for the 2003/2004 academic year. A separate application for up to £5000 has been made for NHM Special Funding towards employing Miss Raheem at the NHM to write up the new taxa she has discovered.

Mr Lalith Kariyawasam's research programme has been accepted for MPhil registration at Kelaniya University. Title: A study of the species limits and distribution of *Euplecta* in Southwestern Sri Lanka .

Mr Kithsiri Ranawana's research programme (Peter Mordan is also acting as an external supervisor) was accepted for PhD registration at the Postgraduate Institute of Science, Peradeniya. Title: Patterns of distribution and ecology of land snails in the Knuckles region, Sri Lanka. Mr Ranawana is also engaged in surveys of land snail pest species in agricultural and horticultural areas (Kumburegama *et al* 2001). Miss Kumburegama has been awarded a first class honours degree on completion of her special degree student project: A survey of pest snails and slugs in vegetable growing areas of Nuwara Eliya, Badulla and Matale districts in Sri Lanka.

Mr Ranawana's team is also carrying out additional studies on the life history of *Oligospira* and *Acavus*. This work provides essential supporting data to allow interpretation of the radioisotope palaeoclimate study being conducted by Ms Melanie Leng at the NERC Isotope Geosciences Laboratory.

Tissues samples of key groups of the Sri Lankan land snail fauna have made a significant contribution to the construction of a phylogenetic tree of stylommatophoran land snails. This has led to a new understanding of the evolutionary history of the group and has opened up many new research possibilities including topics on rates of molecular evolution and historical biogeography (Wade *et al* 2000).

Peter Mordan gave a presentation on the project at the World Congress of Malacology held in Vienna in August 2001. Tony Whitten, Senior Biodiversity Specialist, World Bank, Washington, gave the inaugural address and keynote lecture at the conference. In his talk *Malacologists: where are your priorities?* a demonstration was given of the interactive compact disc that is under development and *Land snail diversity in Sri Lanka* was presented as a prime example of what malacologists should be doing.

Visits to the Natural History Museum by Sri Lankan participants

Two field assistants and Mr Ranawana from Peradeniya, one field assistant from the Colombo team and Mr Kariyawasam, from the Department of National Museums, visited the Natural History Museum, London for 4 weeks in July 2001. They made

extensive use of the collections for identifying their samples, made use of library and other museum facilities and were given training in various procedures and techniques. Mr Chimonides, Department of Zoology NHM, provided extensive support and training in Geographical Information Systems. Dinarzarde Raheem arrived in London on 21st July and continued to work on identifying material until January 2002.

Discovery of high species diversity and endemism in the 5% of rainforest left in Sri Lanka

Prior to the current investigations it had long been known that the Sri Lankan land snail fauna was diverse and highly endemic. However, the extent to which the diversity of the snail fauna was known had not been understood. It is now clear that the level of diversity is far higher than has previously been recognised. In addition to being a global hot spot of general biological diversity across a range of systematic groups, Sri Lanka is specifically a hot spot of endemic terrestrial molluscan diversity. Although there are areas such as tropical West Africa and oceanic islands such as Hawaii where endemic species diversity in snails is higher, the pattern of diversity in Sri Lanka is different. One or a few generic level groups dominate other high diversity snail faunas whereas Sri Lankan snails exhibit a broad pattern of diversity across a wide spectrum of systematic groups. The remaining wet forests, which occupy an area less than half the size of Greater London, possesses a snail fauna with diversity comparable to that of the whole of Northwest Europe. We are victims of our own success and a major difficulty is dealing with the large number of new species that have been discovered. Processing the collections and identifying species is a far greater task than was anticipated because of the large number of new species. Dinarzarde Raheem initially extended her stay in London to work on this material and because of the problems at the DNM and further delay in returning to Sri Lanka, was able to make significant progress in recognising many new taxa.

The programme will achieve a project objective in allowing workers in Sri Lanka to make routine identifications of the known snail fauna. However, it will remain beyond the scope of workers in Sri Lanka to describe adequately the many new taxa without further close collaboration with the Natural History Museum. The work that Dinarzarde Raheem carried out on the collections up until January 2002 has demonstrated that we have at least 100 undescribed species, all of which are endemic, and possibly eight new endemic genera. Fieldwork carried out in February and March, prior to the resumption, of a full field programme in April, has revealed more undescribed taxa. In addition we have discovered about 20 exotic, mostly pest species that had not previously been recorded from Sri Lanka.

It is at this basic but fundamental level of alpha taxonomy that a major barrier to progress is encountered. It is impossible to predict at the start of a project such as this that the known fauna would be increased by over 50%. Thus there is no provision in the programme for working up and publishing these new discoveries. The impediment is not a lack of available expertise or research resources but an absence of funding and institutional support for this type of work. Now that Dinarzarde Raheem is available for at least one year, funding is being sought for her to work up her collections and describe new taxa. In the case of the remaining 5% of Sri Lanka's rainforests, which harbour nearly all of these undescribed taxa, most criteria as set

out in Article 7(a) and Annex 1 in the CBD are relevant. However, alpha taxonomy occupies a well-recognised gap in funding sources.

Field Guides

Two field guides are in preparation: one on the native fauna and one on exotic, mostly pest species. These will be modelled on the Field Studies Council *Aids to identification in difficult groups of animals & plants* (AIDGAP). In addition to being low-cost productions these laminated guides are robust and unlike most so called field guides really are suitable for field use. After exploring costs, including those provided by the Field Studies Council, we have chosen A-R Book Builders, Singapore, as printers and notified them that we expect to have the guides ready for printing by the end of August 2002.

The pest/exotic species guide will include all known taxa in this category. The guide to the native fauna will have to be selective but will include examples of most of the described genera.

Workplan April 2002 - October 2002.

Mr Ranawana's team and members of the Colombo team will continue surveying forests in the Knuckles, monitoring populations of *Acavus* and *Oligospira*, and investigating the status of pest species. They will continue the project exhibition at the Postgraduate Institute of Science, Peradeniya, for which they will organise local publicity and press coverage.

Miss Raheem and the Colombo team will conduct an intensive field survey programme in order to secure as much data as possible for analysis and publication.

Fred Naggs, Peter Mordan and Harold Taylor at the Natural History Museum will work on the preparation of field guides.

The end of project conference will be jointly organised by all project workers and held at the Postgraduate Institute of Sciences in late September 2002.

5. Partnerships

In the absence of suitable institutional capacity in Sri Lanka, having Dinarzarde Raheem employed as a project manager has proved to be a very effective arrangement and the success of this is entirely due to her outstanding performance. There are significant advantages in her status as a Research Officer at the Department of National Museums where she is not subjected to the many constraints that have been imposed on DNM staff.

A number of complex issues have been encountered arising from the NHM being directly involved with the employment of Sri Lankan nationals in Sri Lanka. We benefited greatly from the active support of Dr Mapatuna when she was Director of National Museums. Partnership with the Postgraduate Institute of Science, Peradeniya University, is also managed through Dinarzarde Raheem with Kithsiri Ranawana acting locally from Peradeniya as a team leader.

Institutional weakness in government agencies is a major problem in Sri Lanka. However, we have developed strong links with the newly elected government and they have demonstrated a clear commitment to addressing this problem.

6. Impact and Sustainability

Because the original plan included advanced level teachers we have sought alternative ways of reaching a wider audience and gaining a more powerful impact than would be achieved by a newsletter alone, which was not thought to be an effective medium by the Sri Lankan partners. Efforts were concentrated on an exhibition on the programme at the Department of National Museums in Colombo. The exhibition was launched on 28th February 2001 with a reception hosted by the Director of National Museums and with leading academics, representatives of NGOs, the British Council and various Sri Lankan government departments in attendance. A schedule of school visits was arranged and there was a good response from the public, which was promoted by good press coverage and a report and interview by Young Asia Television. Following from this, Young Asia Television sent a team into the field with our project workers to record a programme on the project. The exhibition has been an enormous success and has relocated to the Postgraduate Institute of Science, Peradeniya, Kandy District. A number of information leaflets have been produced. A meeting on the project has been organised at the NHM in December 2002 for the Friends of Sri Lanka Association. A small photographic exhibition using project material will be on display in the NHM public area from the middle of July 2002 and a larger photographic exhibition will be on display in December 2002. A regular presentation on the project will be given for the general public in the new Darwin Centre at the NHM. In addition to these efforts to achieve a high profile in the UK and in Sri Lanka, there is ongoing local activity, such as village outreach sessions in survey areas.

The project office in the Department of National Museums is set up with computer facilities for operating a Geographical Information System; there is an adjoining collection's storage area and specimen processing laboratory. Mr Lalith Kariyawasam is a curator and member of staff of the Department of National Museums seconded to the project for its duration. His experience will allow him to make effective use of these resources on completion of the project. Mr Ranawana, as a Senior Lecturer in the Department of Zoology, will continue to make use of similar equipment and resources for future faunistic studies in the Department of Zoology, University of Peradeniya.

The Department of National Museums is the government-designated authority for collection based biotic research, such as taxonomy and biological monitoring. However, the institutional bases on which biological programmes are pursued in Sri Lanka are clearly inadequate. The institutional weakness of the DNMs as a centre for biological work has become very clear in the past year. The DNMs comes under the Ministry of Culture and Religious Affairs. Without an active biologist as director it will prove impossible to sustain a sufficient level of activity in the biological field. There is a clear need for a separate institution for biology in Sri Lanka. In addition to institutional weakness, various government departments such as wildlife, environment and forests, have come under different ministries, had overlapping

responsibilities and tended to compete in some areas, rather than co-operate. Anyone from outside attempting to run biological programmes in Sri Lanka might have support from one government agency only to find that another hindered them.

One way that I considered might improve this situation was for a bilateral agreement on biological diversity to be established between Sri Lanka and the UK. My reasoning was that a government-sponsored agreement of this nature should provide political direction in Sri Lanka to help establish common purpose and direction in Sri Lankan government agencies. However, the new government in Sri Lanka has launched an initiative that seeks to address the problem directly and its implementation should remove my justification for seeking a bilateral agreement.

For a number of years I have been involved with addressing the problem of institutional weakness for dealing with biological diversity in Sri Lanka. The most clear-sighted person I have come across in Sri Lanka in relation to this issue is Rohan Pethiyagoda and I have discussed the issues with him at length. Rohan is the Founder and Director of the Sri Lankan Wildlife Heritage Trust and the leading environmentalist in Sri Lanka. The newly elected government has brought him into the administration to formulate and implement environmental policies, including those relating to Sri Lanka's commitments under the CBD. In reorganising government departments and ministries the new government has already gone some way to improving co-ordination between departments involved with biology. The Forestry Department, Wildlife Department and Department of Environment have been brought under one ministry, the Ministry of Environment and Rohan Pethiyagoda has been appointed as the most senior civil servant in the Ministry.

In seeking to enshrine a long-term commitment to meeting Sri Lanka's implementation of the CBD Rohan is going to the root of the problem by drafting legislation to establish a Biological Diversity Authority under which an Institute of Biological Diversity will be established. The plans are that the NHM will act in an advisory capacity in the setting up of this institute and will be closely involved in its development and future direction. What we have in mind is long-term collaboration with, for example, the possibility of jointly run field stations, exchanges and joint training schemes between Sri Lankan and UK institutions.

This will clearly take time to put in place and Rohan is working to a five-year programme. For now and in the immediate future partnership with the DNMs is unsatisfactory and in the longer term the DNM is likely to lose its biological role to a new institution. As concerns impact and sustainability, the following is quoted from the supporting letter from Rohan Pethiyagoda addressed to The Whitley Awards Foundation for Dinarzarde Raheem's application for a Rufford PhD Grant:

'Studies such as Ms Raheem's have greatly influenced the government of Sri Lanka in its decision to pursue the establishment of a national biodiversity institute especially to facilitate and conduct studies of this nature. This, arguably, will be the most important spin-off of her work. The potential Ms Raheem has to contribute to such an organisation on completion of her PhD studies is significant.'

7. Outputs, Outcomes and Dissemination

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

Code No.	Quantity	Description
3	1	BSc Special Honours Sri Lankan national
4A	35	Peradeniya Zoology Dept undergraduate field training, plus seven field assistants (Sri Lankan nationals).
4B	60 weeks	forest and pest species field surveys/ lab work
5	3	Two PhD, One MPhil (full time students, Sri Lankan nationals)
8	6	Fred Naggs' & Harold Taylor's visit to Sri Lanka
	2	Exhibitions presented
14B	1	World Congress of Malacology 2001, Vienna Project featured in inaugural address as a model for future faunistic work in malacology
15A	2	Exhibition launch
18A	1	Young Asia Television coverage of exhibition, interview and field work
23	30 weeks	Accommodation expenses and most travel provided in UK for visiting Sri Lankans, including 4 weeks rental of flat
	24 weeks	Accommodation and some meals provided for Dinarzarde Raheem

Table 2: Publications

Type *	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)
*Proceedings of the 21 st annual session of the Institute of Biology, Sri Lanka	A preliminary survey of pest snails and slugs of vegetable crops in four districts of Sri Lanka. Kumburegama, Ranawana & Naggs, 2001	Institute of Biology, Sri Lanka	Institute of Biology, Sri Lanka 120/10 Wijerama Mawatha Colombo 7 Sri Lanka
*Proceedings of the Royal Society	A phylogeny of the land snails (Gastropoda: Pulmonata) Wade, Mordan, Clarke, 2000	The Royal Society London	
*Abstracts, World Congress of Malacology 2001, Vienna . Editors: Salvini-Plawen, Voltzow, Sattmenn & Steiner	Land snail diversity in Sri Lanka. Naggs, Raheem & Mordan, 2001	Unitas Malacologia, Vienna	

8. Project Expenditure

Table 3: Project expenditure during the reporting period

Item	Budget <i>1st April 2001 to 31st March March 2002</i>	Expenditure <i>1st April 2001 to 31st March 2002</i>
Salaries		
Miss Dinarzarde Raheem [Programme manager and research leader, Sri Lanka]		
Field/Research Assistants Colombo Team:		
Mr H. Sanjeeva		
Mr A. Jayasekera		
Mr L. Indrajit Perera		
Field/Research Assistants Peradeniya Team:		
Mr M. Samarasinghe (from 1 st April 2001 to 31 st January 2002, in this reporting period)		
Mr B.S.B Gamagedera (replacement for Mr Samarasinghe from 1 st February 2002)		
Mr V. Samarawickrema		
Mr P. Chandrasekera		
Mr H. Paranagama		
Local Field Guides		
Salary Total		
Postage, telephone, stationery		
Travel and subsistence		
Printing		
Local overheads		
Natural History Museum overheads		
Vehicle hire		
Total		

9. Monitoring, Evaluation and Lessons

Progress in the project's survey programme is self evident from the amount of data and reference collections that have been built up and the number of new species that have been discovered. In addition to regular contact by e-mail and visits from and to Sri Lanka, there is ongoing joint supervision of undergraduate and graduate studies between the Natural History Museum and the universities of Cambridge, Colombo, Kelaniya and Peradeniya and also the Postgraduate Institute of Science, Sri Lanka.

10. Author

Fred Naggs 1st April 2002

Revised 26th June 2002.