



## **Land snail diversity in Sri Lanka**

### **Darwin Initiative Annual Report**

**1.10.2000 - 30.9.2001**

# **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>1.10.1999 - 30.9.2002</i>
Reporting period	<i>1<sup>st</sup> October 2000 - 30<sup>th</sup> September 2001</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 post graduate 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**

An intensive field programme is 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 helped set up the exhibition in Colombo and joined both teams in the field in February/March 2001.

Field practice is based on rigorous health and safety assessments, which are reviewed regularly to minimise risk but fieldwork remains a high-risk activity. Despite its small size, Sri Lanka has a higher incidence of fatal snakebites than any other nation. Fatalities through elephant attack are very common and sloth bears are particularly common in some of the more remote areas visited, they are extremely dangerous and unpredictable. Two team members suffered venomous snakebites in the past year but are now fully recovered. Terrestrial leeches are very abundant in wet forest and are a major nuisance but a more serious problem is the ticks encountered in dry forest. Ticks are vectors of several serious diseases but while team members have required hospital treatment after sustaining several hundred tick bites within a few days, no incidence of tick borne disease has occurred.

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. (progress report enclosed). Miss Raheem will need 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 to date. Miss Raheem has submitted an application to the Whitley Foundation for a Rufford PhD Grant and this is currently under consideration.

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 (project proposal enclosed).

Mr Kithsiri Ranawana's research programme 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. (progress report enclosed).

Mr Ranawana is also engaged in surveys of land snail pest species in agricultural and horticultural areas (Kumburegama *et al* 2001 [copy enclosed]). 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 (copy of project report enclosed).

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 [copy enclosed]).

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.

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 21<sup>st</sup> July and is continuing to work on identifying problematic material. Mr Ranawana is currently managing the field teams and will be setting up the exhibition in Peradeniya.

Prior to the current investigations it had long been known that the Sri Lankan land snail fauna was diverse and highly endemic. The fauna was poorly known in the sense that the literature resources were scattered in many publications not available in Sri Lanka and adequate reference collections of specimens did not exist outside of the Natural History Museum in London. 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 and Dinarzarde Raheem has had to spend longer in London working on this than was expected. 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. It is at this basic but fundamental level of faunistic research that a major barrier to progress is encountered. It is impossible to predict at the start of a project such as this that, for example, 100 new species and four new genera will be collected and described. Thus there is no provision in the programme for working up and publishing the fifty new species and two new genera that have already been discovered and the additional new species that will be collected. 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.

## **Workplan October 2001 - April 2002.**

### **October -December 2001**

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 set up the project exhibition at the Postgraduate Institute of Science, Peradeniya, for which they will organise local publicity and press coverage.

Miss Raheem will continue working up the project's collections at the Natural History Museum, London, until the end of November. Most of December will be taken up in catching up on local administration and in organising the Colombo team's field programme for 2002.

### **January - April**

The Colombo based team's field surveys will continue from January 2002 with a series of field expeditions. They will be joined in the field by the Peradeniya team. Field surveys from Peradeniya will continue to be brief excursions. Fred Naggs will visit Sri Lanka in early February to monitor progress.

## **5. Partnerships**

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 might be imposed if she was within the DNM staff complement. Nevertheless 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 have benefited from the active support of the Director of National Museums who made a visit to the NHM for a month in January/February 2000 and explored the potential for extending the current Darwin programme into a broad based programme of co-operation between the DNM and the NHM. However, as the Director of National Museums is a political appointment this situation could change following the general election in Sri Lanka scheduled for December. 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. All scientific supervision is administered directly by Fred Naggs.

Within Sri Lanka the project is widely known and the two major natural history NGOs, the Wildlife and Nature Protection Society of Sri Lanka and the Wildlife Heritage Trust of Sri Lanka have requested articles for their journals, *Loris* and *Sri Lanka Nature*. Links have been established with the malacological research unit at Chulalongkorn University, Bangkok, with the possibility of pursuing joint studies into molluscan faunal associations and origins.

## **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 28<sup>th</sup> February 2000 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 is currently relocating to the Postgraduate Institute of Science, Peradeniya, Kandy District. We have been approached by editors of the two leading natural history magazines in Sri Lanka *Sri Lanka Nature* and *Loris* to write articles on the project.

In addition to these efforts to achieve a high profile nationally, there is ongoing local activity, such as village outreach sessions in survey areas. These aim to explain the importance of forests for conserving the diversity of plants and animals, including snails rather than providing detailed information about the project. In addition, it is also important to engage with local communities in survey areas from safety considerations. Villagers engage in a wide range of illegal activity in forests and the

resultant hostility to strangers needs to be overcome. Illegal gem mining and cannabis production are examples of activity which team members need to avoid but the trapping and killing of wild animals, especially where it involves the widespread practice of setting gun traps, could be lethal for field workers. It is therefore essential to obtain the services of local guides who are recommended by village headmen.

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 who, as a Senior Lecturer in the Department of Zoology, will continue to make use of similar equipment and resources in the Department of Zoology, University of Peradeniya, in future faunistic studies.

## **7. Outputs, Outcomes and Dissemination**

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

<b>Code No.</b>	<b>Quantity</b>	<b>Description</b>
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	3	Fred Naggs' visit to Sri Lanka
	1	Exhibition presented
14B	1	World Congress of Malacology 2001, Vienna Project featured in inaugural address as a model for future faunistic work in malacology
15A	1	Exhibition launch
18A	1	Young Asia Television coverage of exhibition, interview and field work
23	30 weeks 1 week Sri Lanka	Accommodation expenses and most travel provided in UK for visiting Sri Lankans, including 4 weeks rental of flat (£850) total estimated value £6000  Provided in Colombo for Fred Naggs' visit (estimated value £300)

**Table 2: Publications**

Type *	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
*Proceedings of the 21 <sup>st</sup> 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, Sattmann & 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	Expenditure

## **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 30<sup>th</sup> October 2001.