



Project Knuckles 2005 [Phase II] Preliminary Report

Introduction

Project Knuckles is a scientific study to investigate and assess the status of the amphibians, reptiles and their habitats in the Knuckles Mountain Range, Sri Lanka. Spanning two years, the University of Edinburgh Research Expedition commenced work in the summer of 2004 with the assistance of Sri Lankan herpetological expert Mr. Ansem de Silva, President of the Amphibian and Reptile Research Organisation of Sri Lanka (ARROS) and a lecturer in herpetology at the Sri Lankan Universities of Rajarata and Peradeniya.

Project Knuckles 2004 was the first in-depth herpetofaunal study of the Knuckles Mountain Range and its forests. The main aim of the expedition was to provide information for the formulation of up-to-date conservation status reports of the globally threatened reptile species which inhabit the Knuckles range. Whilst the project managed to collect substantial amounts of information, due to logistical issues (such as difficult terrain and heavy rains) and lack of time, the project could not fully meet its objectives. Thus in 2005, two members of the previous team returned to Sri Lanka to consolidate the research of 2004 and in the process study new and previously undocumented reptile and amphibian species, thus exceeding the success of Phase I.

To date Phase II has encountered 75 species of reptile with 5 - 10 additional specimens which cannot be identified using available keys. This suggests that these species may be new to science, which will be confirmed with molecular and alpha taxonomical investigation, currently underway. The present study indicates that the Knuckles range harbours a higher diversity of reptiles and amphibians than previously known.

The Knuckles Mountain Range

The Knuckles Mountain Range displays the highest number of different climatic and vegetation zones in any area in the country. The vegetation type of utmost interest to the expedition is the upper montane cloud forest, considered the most endangered ecosystem on the island. Here a diurnal layer of fog engulfs the forest, keeping it cool, wet and dark - quite unlike any other location in the country. The development of this individual habitat type has led to the evolution of correspondingly individual species of reptile.

Much of the original pristine forest area of the Knuckles Mountains was cleared during the nineteenth century for the cultivation of coffee and then the widespread cultivation of tea. Some areas are still cultivated for vegetables using traditional slash and burn techniques. On occasion, fires can burn out of control and consume swathes of natural forest in the process. Despite being declared a forest reserve in 1873, areas lying above 5 000 feet were utilised for cardamom cultivation. During the 1960s this cardamom cultivation expanded considerably, and the Knuckles grew to become the country's highest producing cardamom area. Cardamom cultivation requires that the farmer select a suitable forest patch, clear the lower levels of vegetation and replace them with



cardamom plants. The canopy layer is left intact to provide shade and shelter from the elements. Once the cardamom plants are fully grown, the farmer must continue to weed the area, removing all other competing vegetation, preventing any natural reproduction of the forest.

As of the 5th May, 2000, an area of 17,500 hectares of the Knuckles range was declared a conservation forest by Gazette Notification. Areas above 1,067 metres (3,500 ft) in altitude are now protected. However, this declaration stipulates the abandonment of cardamom cultivation within the protected area. We have observed that instead of natural forest species, the cardamom has been replaced by a series of invasive weed species such as Mistflower (*Eupatorium riparium*) and Lantana (*Lantana camara*).

The Reptiles

As indicated earlier, the Knuckles Mountains host a wide diversity of reptile and amphibian species. The Leaf-nosed lizard (*Ceratophora tennentii*), is perhaps the region's best known reptile inhabitant. It is a geographical relict with a characteristic rostral appendage in the shape of a leaf on the end of its snout. These lizards are found only in the montane forests of the Knuckles and seem to have viable populations in most of the locations sampled, even where habitats have been altered, thus indicating that the species itself is very adaptable. Large numbers were even observed inhabiting Pine plantations (*Pinus carebea*) - a non-native forest type.

Other relict agamid species include the Sri Lankan Pygmy lizard (*Cophotis ceylanica*) and the Crestless lizard (*Calotes liocephalus*), both observed to be even rarer than the *C. tennentii*'s, through causes unknown. *Cophotis ceylanica* is a monotypic species but for years now, experts have suspected that the Knuckles population is distinct from the populations found elsewhere in the country. Anselm de Silva who has been studying the *Cophotis* in the Knuckles for the last 20 years, suspected that populations had fallen to a critical level. Mass mortality of *Cophotis ceylanica* has been documented during mid 1990's in the Nuwara Eliya and Hakgala area where hundreds of specimens died daily reducing previously high populations to virtual extinction. It is believed that these events may be caused by climatic changes. It is also possible that the *Cophotis ceylanica* population in the Knuckles suffered the same fate. However, to the relief of global herpetology, the project managed to locate six *Cophotis* individuals in the Knuckles, reassuring but due to the few numbers observed, indicative that a drastic population crash has occurred nonetheless. Existing data remains insufficient for the IUCN Sri Lanka and the Zero Extinction group to firmly conclude on the status of the lizard.

Also studied by the project were the newly described Dumbara Bent-toed Gecko (*Cyrtodactylus soba*) and the Four-toed Snake Skink (*Chalcidoseps thwaitesii*), both species being endemic to the Knuckles range and thus thought to be endangered. Prior to Project Knuckles, very little was known of their natural history.

In order to reassess the status of all of the above species, the project had to perform the first in depth study of their natural history, which included observations on their microhabitat, diet, parasites, territoriality, predators, reproduction, colour variations, thermoregulation, sympatric fauna, habitat associations and distribution.

Results

- To date, the project has physically verified and documented the presence of 76 species (of which 55.3% are endemic) of reptile inhabiting the Knuckles range. These findings surpass both those of Project Knuckles 2004 [Phase I] and the IUCN (Sri Lanka) survey (2003) results by an additional 23 species. Please refer to following Table:



Species sighted in the Knuckles Mountains

Taxonomic Group Family	Project Knuckles 2004 Number of species	Project Knuckles 2005 Number of species	IUCN Number of Species
<i>Crocodylidae</i>	0	1	0
<i>Bataguridae</i>	1	1	1
<i>Testudine</i>	0	1	0
<i>Trionychidae</i>	1	1	1
<i>Agamidae</i>	9	10	8
<i>Gekkonidae</i>	8	13	8
<i>Scincidae</i>	8	13	6
<i>Varanidae</i>	2	2	2
<i>Boidae</i>	0	1	1
<i>Colubridae</i>	16	21	16
<i>Elapidae</i>	1	2	2
<i>Typhlopidae</i>	1	3	1
<i>Uropeltidae</i>	3	4	4
<i>Viperidae</i>	3	3	3
Total	53	76	53

- The project has plotted the distribution localities of all of its target species, and a number of species which are not targets of the project but which are important to the Knuckles range nonetheless. The project identified natural biotic barriers which appear to influence the distribution patterns of many species. These barriers include the central ridge of the mountain range itself, which marks a division between the distributions of certain species. Unfortunately, due to the break down of the project's main laptop, it is not expected that the considerable GIS component planned for the expedition will be completed.
- The project has also discovered the existence of several species which were previously unknown to inhabit the Knuckles range, such as *Riopa singha*, *Nessia sarasinorum* and *Liopeltis calamaria*. It is also important to note that quite a few common snakes have not yet been recorded by our fieldwork, for example the Cobra, (*Naja naja*), Russel's Viper (*Daboia russellii*), Forsten's Cat Snake, (*Boiga forsteni*) and the Olive Keel-back Water Snake (*Atractium schistosum*)
- The project has documented the natural history of relict and endemic species such as the Leaf-nose Lizard (*Ceratophora tennentii*), Crestless Lizard (*Calotes liocephalus*), Four-toed Snake Skink (*Chalcidoseps thwaitesii*), and the newly described Dumbara Bent-Toed Gecko (*Cyrotodacylus soba*).
- Faecal samples of reptiles collected during the expedition were investigated by Veterinary Parasitologists of the University of Peradeniya. Investigations have revealed that some relict agamids were infected with pathogenic helminths. These may not be harmful in wild animals but in captivity their presence could be fatal. This is a vital finding as it has been proposed that some of these agamids be managed through a programme of captive breeding. Now it is to be proposed that any species management must take place in-situ.



Outputs

1. Working in conjunction with the Sri Lankan Universities of Rajarata, Peradeniya, Jaffna, Sri Jayawardenapura and Batticaloa (Eastern University), the project has trained 35 undergraduate students in the latest herpetological techniques, using both basic to more complex tools such as Global Position Satellite units and a variety of computer programmes. This has provided them with hands on experience in herpetology, encouraging them to participate in the conservation of Sri Lanka's reptiles and amphibians in the future. Whilst the majority of the students were aiming to continue their studies in herpetology and zoology, four of the students from the University of Peradeniya were set to graduate in Veterinary medicine. In addition to giving these students hands on experience in dealing with injured reptiles, it also assisted their skills in snake identification, important when dealing with animals which have been bitten. The students of Eastern University and the University of Jaffna are Tamil speaking. Project Knuckles has therefore provided training to members of both of Sri Lanka's principal linguistic groups. It is hoped that this knowledge will thus be passed on in both languages.
2. Whilst travelling to certain mountains, the project discovered a series of archaeological monuments, including two caves where Mesolithic Man once lived. These are now under investigation by the Archaeology department of the University of Peradeniya.
3. The project has documented various anthropological activities which are threatening the ecosystems and species of the Knuckles range. To try to counteract this, the project has initiated conservation education amongst the residents of the Knuckles range. This has involved the provision of coloured stickers of pictures of various important reptiles living in the area. It has also involved informing locals through demonstration the non-venomous nature of most of the region's herpetofauna. As residents generally regard all reptiles as venomous, many are needlessly killed. It is hoped that education will raise local residents' awareness not only of the non-venomous nature but also of the global importance of the endemic and threatened species living alongside them. Local knowledge and experience was regularly of great assistance to the expedition and one aim of Project Knuckles was to assess the full extent of this knowledge in the region. During Phase I the team carried out a Knowledge, Attitudes and Practices survey of the inhabitants of the Knuckles village of Mimure, considered the most isolated village in the country - road access to the settlement was only completed in 2003. By the end of the month of October we hope to conduct more awareness work at the Wildlife Society of Sri Lanka. We also hope to print a poster entitled 'The Diversity of the Knuckles Herpetofauna'. We intend to continue using the world wide-web as a medium for communicating our findings through the form of the project website (www.hoona.co.uk). This will increase the profile of the Knuckles range as a biodiversity hotspot of the world, encouraging more researchers to study its wealth of biodiversity.
4. A number of photographs taken during the project have been selected for use in the recent New Holland release 'A photographic guide to snakes and other reptiles of Sri Lanka', by Idraneil Das and Anslem de Silva. This is the first book of its kind aimed at increasing awareness amongst the public of the reptile diversity of the country.
5. A bilingual (Sinhala and Tamil) leaflet on venomous snakes, their identification and first aid procedure in the event of a bite will be printed by the project and distributed to 500 villagers during a health camp organised by the Kandy Divisional Forestry Office in an isolated rural village. It is envisaged that this exercise will increase awareness and confidence regarding snakes and other reptiles, thus discouraging the unnecessary killing of them



6. A one-hour power point presentation on the "herpetological diversity of the Knuckles ecosystem" will be presented to Advance - level students of several schools around the Knuckles on October 13th at Hasalaka as a part of the Knuckles Forestry Department educational program.
7. As of the end of September, Project Knuckles 2005 [Phase II] will have completed its field data collection. The extensive and well illustrated project report should be published according to schedule during the month of October. The findings of Project Knuckles will be published in local and international journals. To date 20 research papers have been written and co-authored by the team, Mr. De Silva and numerous experts around the world. These papers will be published in the format of a monograph: an edition of the journal '*Lyriocephalus*' (the only 'Zoological' indexed herpetological journal of Sri Lanka) entitled '*The Diversity of the Dumbara Mountains (The Knuckles Massif, Sri Lanka): With special reference to its herpetofauna. Lyriocephalus Special issue, 2005 October, Volume 6 Numbers 1 & 2*' which in addition to the papers of the Project Knuckles team will also contain numerous research papers from external scientists focussing on other taxonomical groups of the Knuckles range.
8. The information gathered during the project will be used for current taxonomical revisions by Mr. De Silva in collaboration with the following herpetologists: Professor Aaron Bauer (University of Villanova, on the Geckoes of Sri Lanka) and Dr. Christopher Austin (University of North Dakota, on the Skinks of Sri Lanka).

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