



A PRELIMINARY SURVEY OF THE REPTILE FAUNA IN NILGALA FOREST AND ITS VICINITY, MONARAGALA DISTRICT, SRI LANKA

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Abstract

Nilgala Conservation Forest Area (NCFA) is an intermediate zone forest situated in the south east of Sri Lanka. During our four-year study we recorded 70 species of reptiles, which represents about 33% of the total Sri Lankan reptile fauna. This number includes eighteen species that are recorded from the NCFA for the first time and ten nationally threatened species. Ten unidentified species were also recorded during the survey period. The results of this study indicate that the Nilgala forest area supports a rich reptile faunal diversity. Unfortunately, this important forest is threatened by fire, illegal logging, chena cultivation, rubber plantation, granite rock blasting, gem mining and road kills. It should be considered an area of high conservation priority.

Key words: Sri Lanka, Intermediate zone, savannah, reptiles, threats, ecology, conservation

Introduction

Based on published sources, a total of 210 species of reptiles (Lizards – 97 *sp.*; Turtles and tortoises – 9 *sp.*; Snakes – 102 *sp.* and Crocodiles – 2 *sp.*) have been recorded from Sri Lanka. Of these 210 species 120 (57%) are endemic to the island (de Silva, 2006; Maduwage *et al.*, 2009; Manamendra-Arachchi *et al.*, 2007; Smith *et al.*, 2008; Somaweera, 2006; Somaweera & Somaweera, 2009; Wickramasinghe *et al.*, 2007). To date, however, herpetofaunal diversity in the dry and

intermediate zone forest areas of the island have not been well studied. The present survey was undertaken to document the reptile fauna of the Nilgala Conservation Forest Area (NCFA), an intermediate zone forest that is one of the largest and most important forest areas in the Monaragala District. Extensive field surveys were conducted from 2004 to 2007. One of the major drawbacks to conserving reptile fauna in Sri Lanka is the lack of knowledge of their distribution and ecology. It is

therefore essential to gather information on the diversity of the reptile fauna in different areas of the country, as a first step towards conservation. This paper will serve to enhance the current knowledge of the reptile diversity within the NCFA, an area that is at present poorly studied (de Silva *et al.*, 2004; Karunarathna *et al.*, 2006).

Study Area

NCFA is a forest ecosystem covering 12,432 hectares in the Bibile divisional secretariat. ‘Nilgala’ literally means ‘blue rock’. According to Gunatilleke & Gunatilleke (1990) the major vegetation type is lowland tropical dry mixed evergreen forest. Commonly found trees include Aralu (*Terminalia chebula*), Bulu (*Terminalia bellirica*) and Nelli (*Phyllanthus emblica*). Other trees such as *Terminalia arjuna* (Kumbuk), *Schleichera oleosa* (Kon) and *Diospyros ebenum* (Kaluwara) are also present. Common shrubs such as *Carissa spinarum* (Karamba), *Zizyphus rugosa* (Eraminiya), *Lantana camara* (Baloliya) and *Eupatorium odoratum* (Podisingchomaran) occur

(Karunarathna *et al.*, 2008). NCFA is located between 7°08’ – 7°14’ N and 81°16’ – 81°20’ E, approximately 11 km east of Bibile town (Fig. 1).

Eleven habitat types were identified and sampled during the survey and a brief description of these habitats is given (Table 1). The altitude ranges from 200 m to 700 m above sea level within the boundaries of the NCFA. The general climatic conditions in the Nilgala area can be described as moderately cool, turning humid during the northeast monsoon season. The average annual rainfall is around 1,750 mm, with most of the rainfall occurring from December to March, and only occasional rains in other months. The weather gradually becomes very dry from August to December with highest temperatures recorded in August. The mean annual temperature in the NCFA is 28°C with a maximum of 32°C and minimum of 24°C. NCFA is also important as a major watershed for Gal Oya and Panmedilla Oya throughout the year. There are several peaks within the NCFA with “Yakun Hela” being the highest (700 m).

Table 1: Description of major habitat types in NCFA and vicinity (see Plate 1 for figures)

Habitat Type	Description of Habitat Type
1. Chena	Trees belonging to the family Rutaceae are dominant and grow up to 5 m; scattered bushes present; main cultivation is maize, banana and finger millet. Leaf litter is very low.
2. Home Gardens	Mixed cropping with woody plants like <i>Mangifera indika</i> , <i>Chloroxylon swietenia</i> , <i>Schleichera oleosa</i> , <i>Tamarindus indika</i> ; trees grows up to 15 m; shade is about 50%; leaf litter content is high and wet.
3. Paddy fields	Paddy fields are moderate in extent (about 1 acre); wallowing sites are frequent along the fields; field bunds are narrow; <i>Oryza sativa</i> dominant.
4. Riverine forests	Shade 80% with large tall trees growing up to 20 m; <i>Mangifera ceylanica</i> , <i>Maduca longifolia</i> , <i>Terminalia chebula</i> <i>Diospyros ebenum</i> and <i>Diospyros malabarica</i> are the dominant species; thick wet leaf litter layer available; decaying logs are common.
5. Road Sides	Generally consist of small bushes growing up to 2 m. Species such as <i>Maduca longifolia</i> , <i>Terminalia bellirica</i> and <i>Mangifera zeylanica</i> can also be found in several areas.
6. Rock-outcrops	Large rock boulders and grassy areas with seasonally moist cascade habitats. Shade 20% with tall trees such as <i>Ficus mollis</i> , <i>Diospyros ebenum</i> and <i>Terminalia bellirica</i> .
7. Savannah forests	Prominent trees <i>Terminalia chebula</i> , <i>Terminalia bellirica</i> and <i>Phyllanthus emblica</i> ; forest mixed with 1 or 2m height grass (<i>Cymbopogon nardus</i> , <i>C. winterianus</i> and <i>Imperata cylindrica</i>).
8. Shrub-Bush areas	1m to 2m tall and randomly distributed on open soil. Common species are <i>Stachytarpheta urticaefolia</i> , <i>Ipomoea batatas</i> , <i>Anacardium occidentale</i> , <i>Carissa spinarum</i> , <i>Zizyphus rugosa</i> , <i>Lantana camara</i> and <i>Eupatorium odoratum</i> .
9. Small Ponds	Seasonally flooded, mud ponds, gem pits, agricultural wells, drinking wells, mud pits, clay pits; shade is maximum 30%.
10. Streams	Perennial flowing water bodies, 1m to 10m wide; visibility high, and turbidity low. Shade is about 40% and dominant trees are <i>Diospyros malabarica</i> , <i>Terminalia arjuna</i> and <i>Cynometra</i> species.
11. Tanks	Open water bodies, covered by macrophytes (25 %). Maximum water-level April to October with low water level in other periods.

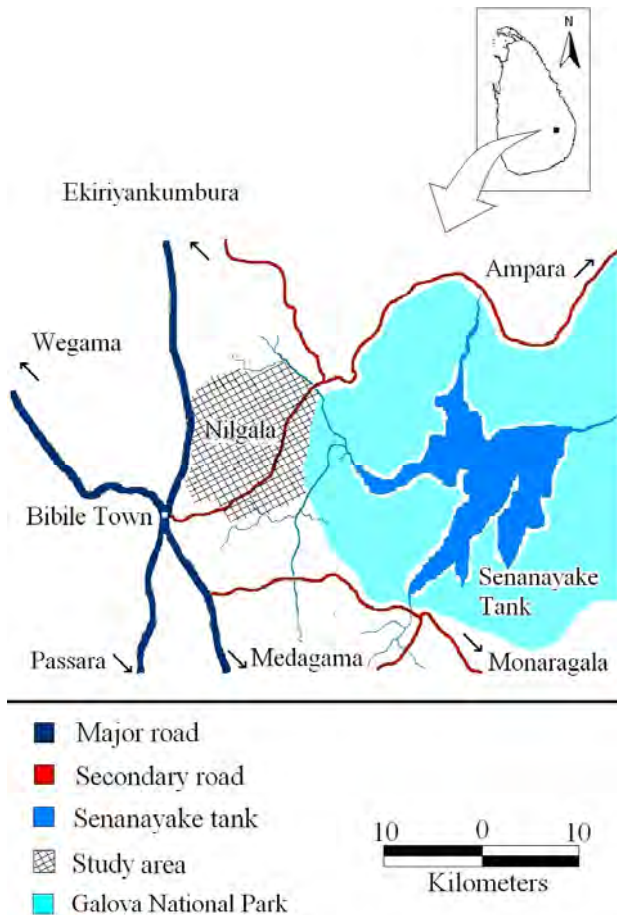


Fig. 1: Map of the Bibile Divisional Secretariat showing the study area. Nilgala Forest is in cross-bars.

Material and Methods

The present study was carried out from January 2004 to December 2007 with a total of 68 field days (8 hrs / day) covering both the wet and dry seasons. General area surveys were carried out in eleven different habitat types within the NCFA. Surveys were conducted by both day and night. Flashlights were used at night. All habitats including water bodies, under rocks, logs and decaying vegetation, and trees and bushes up to 5 m were thoroughly searched for the presence of reptiles. All collected specimens were examined carefully and recorded prior to being released back to their original point of capture. Basic environmental parameters such as temperature and humidity were recorded at locations where specimens were observed. Rainfall data were obtained from the nearest weather station (Welipitiya Coconut Plantation, Badulla) from the National Meteorological Department in Colombo. Road kills were examined but not collected. Most road kills were extensively damaged and thus are not included in the tables as they could not be identified to the species level. The specimens were identified through the use of field guides and

identification keys given by Boulenger (1890), Deraniyagala (1953 & 1955), Das & de Silva (2005), De Silva (1980), de Silva (1990), Greer (1991), Smith (1935 & 1943), Taylor (1950), Wall (1921), Whitaker & Captain (2004). Threat category was determined according to the National Red List (IUCNSL & MENR, 2007). Forest type, floral identification and nomenclature were done using Ashton *et al.* (1997); Gunatilleke & Gunatilleke (1990) and Senaratna (2001).

Results and Discussion

A previous study of the reptile fauna of NCFA was conducted over three months of 2003 by de Silva *et al.* (2004). Their study recorded 40 species of reptiles, but did not include several common species of reptile fauna from the area. Hettige *et al.* (2000) recorded 29 species of reptile in a survey of the fauna of Gal Oya National Park. The present four-year survey recorded 70 known species of reptile and a further 10 unidentified species. The results are presented in Table 2. The reptiles recorded belong to 17 families and 49 genera. The 10 unidentified species, all of which might be new to science, belong to the genera *Calotes*, *Cnemaspis*, *Cyrtodactylus*, *Dendrelaphis*, *Hypnale*, *Nessia*, *Ramphotyphlops*, *Rhinophis*, *Typhlops* and *Xenochrophis*.

The following species were recorded for the first time in NCFA; *Ahaetulla pulverulenta*, *Aspidura brachyrrhos*, *Boiga beddomei*, *B. trigonata*, *Chrysopelea taprobonica*, *Dendrelaphis bifrenalis*, *Dryocalamus nympha*, *Liopeltis calamaria*, *Oligodon sublineatus*, *Bungarus ceylonicus*, *Calliophis melanurus*, *Cylindrophis maculatus*, *Rhinophis oxyrhynchus*, *Cnemaspis podihuna*, *Geckoella yakhuna*, *Hemidactylus leschenaulti*, *Dasia halianus* and *Eutropis bibronii* (see Karunarathna & Karunarathna, 2005; Karunarathna *et al.*, 2005).

These records show that at least 33% of Sri Lanka's extant reptiles are present in the NCFA. There is also a significant representation of the country's amphibians (see Karunarathna *et al.*, 2008). We believe this high diversity in intermediate zone forest habitats is mainly due to the availability of a number of microhabitats, including man-modified habitats that are favorable to reptiles. According to these results, NCFA has the highest reptile richness in an Intermediate or Dry zone forest of Sri Lanka.

Of the total of 70 species 25 (36 %) are endemic to Sri Lanka. The survey recorded 5 (7%) data

deficient species, 13 (19%) near threatened species and 10 (14%) threatened species. The family with the largest number of species present is Colubridae (26 *sp.*), followed by Gekkonidae (13 *sp.*), Scincidae (7 *sp.*), Agamidae (5 *sp.*), Elapidae (4 *sp.*), Viperidae (3 *sp.*) and Varanidae (2 *sp.*). The leading number of endemic species is in Gekkonidae (9 *sp.*), Colubridae (6 *sp.*), Agamidae, Scincidae and Uropeltidae (2 *sp.* each), Elapidae, Viperidae, Trionychidae and Cyliodrophidae (1 *sp.* each) respectively (Table 2). In NCFA aquatic colubrids are frequently found and 3 out of the 6 species recorded from the country occur. According to Vogel & David (2006), specimens of *Xenochrophis cf. piscator* from Sri Lanka are actually an undescribed species.

When considering the 80 species (including undescribed) by their primary mode of living there are 34 (42.5%) terrestrial, 28 (35%) arboreal, 8 (10%) aquatic and 10 (12.5%) fossorial species. In terms of the species diversity in each habitat type, the highest species richness occurred in Home Gardens (45), followed by Rock-outcrops (33), Chena (30), Shrub/Bush habitats (30), Riverine forests (25), Road Sides (22), Savannah forest (21), Paddy fields (15). Small Ponds, Streams and Tanks (8 species each) showed the lowest species richness. The high species richness in the Home Gardens habitat may be due to the high amount of leaf litter, shade, micro-habitats and also the abundant availability of food items such as small vertebrates and invertebrates on which to feed. The highest number of endemic species was found in Home Gardens (14), followed by Rock-outcrops (13), Riverine forests (11), Shrub/Bush areas (8), Savannah forest (5), Chena (5), Road Sides (4), Paddy fields (3) and Tanks (2). Small Ponds and streams (1 species each) showed the lowest number of endemic species.

Conclusion and Recommendation

During the survey period several threats to the reptile fauna of the NCFA were observed and recorded. These included irresponsible forest fires, illegal logging, extensive use of chemicals for agriculture including rubber plantations, forest clearing for chena cultivation, gem mining, granite rock blasting and road kills. People living around the NCFA frequently use fire to clear the underbrush, prepare the ground for the next cultivation cycle and hunt for animals (Karunaratna *et al.*, 2005). These fires are very frequent in the months of August and September and destroy the habitats suitable to the reptile fauna.

Illegal logging activities seriously impact the quality of the forests. The local communities are involved in paddy and chena cultivation in the vicinity of the NCFA. These people use chemical fertilizers, pesticides and weedicides. Another significant threat to the reptile fauna of the area is road kills. Many animals that attempt to cross the Bibile – Ampara main road, which cuts across the NCFA end up as road kills. The research team has observed and recorded that reptile mortality is particularly high on this road after rains (Karunaratna *et al.*, 2006).

This investigation into the reptiles of the NCFA and its vicinity clearly shows that the Nilgala Forest is an important location in terms of herpetofaunal diversity (Fig. 2). Formal and informal education should be developed, not only in primary and secondary schools but also in driving schools and in universities to promote knowledge of the natural environment of the area. It is also evident that the NCFA acts as an important refuge for endemic, rare and threatened reptiles in the Intermediate zone of the Uva province. The NCFA and its surrounding habitats have been understudied, a fact which is evident from the documenting of 18 species new to the NCFA during this survey. Our preliminary study clearly shows that there is a need to conduct a comprehensive reptile survey in the NCFA. Such a study will help in compiling a more complete list of reptiles and also aid in determining the status of the different species within the NCFA. The latter may be critical because of the imminent anthropogenic pressures within and around the NCFA.

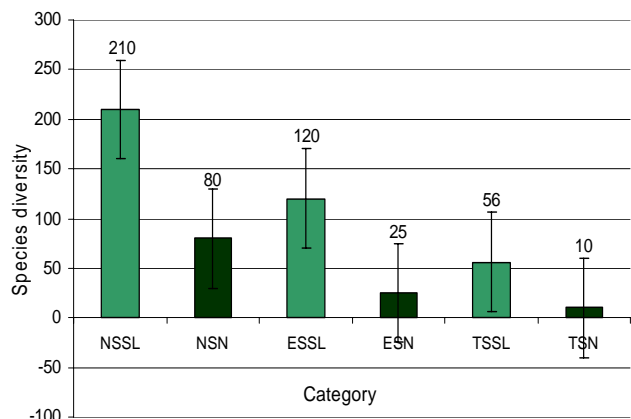


Fig. 2: Comparison of reptile diversity of Sri Lanka and NCFA. (Abbreviations: NSSL – total number of reptile species in Sri Lanka; NSN – total number of reptile species in Nilgala (including undescribed species); ESSL – number of endemic species to Sri Lanka; ESN – number of endemic species in Nilgala; TSSL – number of threatened species in Sri Lanka and TSN – number of threatened species in Nilgala).

Table 2: Reptile fauna recorded from the Nilgala Forest Area and their habitats. Abbreviations: Chena (CH); Home Gardens (HG); Paddy fields (PF); Riverine forests (RF); Road Sides (RS); Rock-outcrops (RO); Savannah forests (SF); Shrub / Bush areas (SB); Small Ponds (SP); Streams (ST); Tanks (TK); Endemic (E); Most Probably Endemic (E?); Threatened (T); Near Threatened (NT); Data Deficient (DD).

Scientific Names and Author citation	Status	CH	HG	PF	RF	RS	RO	SF	SB	SP	ST	TK
Family - Boidae												
1 <i>Python molurus</i> (Linnaeus, 1758)			+			+			+	+	+	+
Family - Colubridae												
2 <i>Ahaetulla nasuta</i> (Lacépède, 1789)		+	+	+	+	+	+		+			
3 <i>Ahaetulla pulverulenta</i> (Duméril et al., 1854)	NT	+		+					+			
4 <i>Amphiesma stolatum</i> (Linnaeus, 1758)				+				+	+	+	+	
5 <i>Aspidura brachyorrhos</i> (Boie, 1827)	E / NT		+			+						
6 <i>Atretium schistosum</i> (Daudin, 1803)				+	+						+	+
7 <i>Boiga beddomei</i> (Wall, 1909)	DD		+		+							
8 <i>Boiga ceylonensis</i> (Günther, 1858)		+	+						+			
9 <i>Boiga forsteni</i> (Duméril et al., 1854)			+			+			+			
10 <i>Boiga trigonata</i> (Schneider, 1802)		+	+						+			
11 <i>Chrysopelea ornata</i> (Shaw, 1802)	NT		+		+							
12 <i>Chrysopelea taprobonica</i> Smith, 1943	E / T	+					+					
13 <i>Coelognathus helena</i> (Daudin, 1803)			+	+	+			+				
14 <i>Dendrelaphis bifrenalis</i> (Boulenger, 1890)	E						+		+			
15 <i>Dendrelaphis tristis</i> (Daudin, 1803)		+	+			+			+			
16 <i>Dendrelaphis cf. schokari</i>	E?		+				+					
17 <i>Dryocalamus nympha</i> (Daudin, 1803)	NT				+		+					
18 <i>Liopeltis calamaria</i> (Günther, 1858)	T					+						
19 <i>Lycodon aulicus</i> (Linnaeus, 1758)		+	+		+		+		+			
20 <i>Lycodon osmanhilli</i> Taylor, 1950	E		+						+			
21 <i>Lycodon striatus</i> (Shaw, 1802)		+	+				+		+			
22 <i>Macropisthodon plumbicolor</i> (Cantor, 1839)	NT		+				+					
23 <i>Oligodon arnensis</i> (Shaw, 1802)		+					+		+			
24 <i>Oligodon sublineatus</i> Duméril et al., 1854	E	+	+		+		+					
25 <i>Oligodon taeniolatus</i> (Jerdon, 1853)		+				+						
26 <i>Ptyas mucosus</i> (Linnaeus, 1758)		+	+	+		+	+	+	+	+		
27 <i>Sibynophis subpunctatus</i> (Duméril et al., 1854)		+	+	+				+				
28 <i>Xenochrophis asperrimus</i> (Boulenger, 1891)	E			+						+		+
29 <i>Xenochrophis cf. piscator</i>	E?									+	+	+
Family - Elapidae												
30 <i>Bungarus caeruleus</i> (Schneider, 1801)		+	+		+	+	+	+	+			
31 <i>Bungarus ceylonicus</i> Günther, 1864	E / NT		+									
32 <i>Calliophis melanurus</i> (Shaw, 1802)	NT					+		+				
33 <i>Naja naja</i> (Linnaeus, 1758)				+		+		+	+			
Family - Typhlophidae												
34 <i>Ramphotyphlops cf. braminus</i>	E?		+							+		
35 <i>Typhlops cf. mirus</i>	E?		+		+		+					
Family - Cyliodrophidae												
36 <i>Cylindrophis maculatus</i> (Linnaeus, 1758)	E / NT		+	+	+					+		
Family - Uropeltidae												
37 <i>Pseudotyphlops philippinus</i> (Müller, 1832)	E/DD		+			+				+		
38 <i>Rhinophis oxyrhynchus</i> (Schneider, 1801)	E/DD							+		+		
39 <i>Rhinophis cf. punctatus</i>	E?					+						
Family - Viperidae												
40 <i>Daboia russelii</i> (Shaw & Nodder, 1797)		+	+			+			+			
41 <i>Hypnale hypnale</i> (Merrem, 1820)		+		+						+		
42 <i>Hypnale cf. zara</i>	E?		+		+	+						
43 <i>Trimeresurus trigonocephalus</i> (Sonnini & Latreille, 1801)	E		+		+		+					

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Scientific Names and Author citation	Status	CH	HG	PF	RF	RS	RO	SF	SB	SP	ST	TK
Family - Crocodylidae												
44 <i>Crocodylus palustris</i> Lesson, 1831											+	+
Family - Bataguridae												
45 <i>Melanochelys trijuga</i> (Schweigger, 1814)	NT			+						+	+	+
Family - Testudinidae												
46 <i>Geochelone elegans</i> (Schoepff, 1795)	T	+						+		+		
Family - Trionychidae												
47 <i>Lissemys ceylonensis</i> (Gray, 1856)	E / T			+							+	+
Family - Agamidae												
48 <i>Calotes calotes</i> (Linnaeus, 1758)			+			+				+		
49 <i>Calotes ceylonensis</i> Müller, 1887	E / T	+	+			+				+		
50 <i>Calotes versicolor</i> (Daudin, 1802)		+	+			+	+	+	+			
51 <i>Calotes cf. liolepis</i>	E?				+							
52 <i>Otocryptis nigristigma</i> Bahir & Silva, 2005	E		+		+							
53 <i>Sitana ponticeriana</i> Cuvier, 1829		+						+	+			
Family - Chamaeleonidae												
54 <i>Chamaeleon zeylanicus</i> Laurenti, 1768	NT						+					
Family - Gekkonidae												
55 <i>Calodactylodes illingworthorum</i> Deraniyagala, 1953	E / T						+	+				
56 <i>Cnemaspis alwisi</i> Wickramasinghe & Munindradsa, 2007	E/DD		+		+		+					
57 <i>Cnemaspis kumarsinghei</i> Wickramasinghe & Munindradsa, 2007	E/DD		+		+		+					
58 <i>Cnemaspis podihuna</i> Deraniyagala, 1944	E / T				+							
59 <i>Cnemaspis cf. tropidogaster</i>	E?							+				
60 <i>Cyrtodactylus cf. fraenatus</i>	E?				+			+				
61 <i>Geckoella triedrus</i> (Günther, 1864)	E / NT				+		+					
62 <i>Geckoella yakhuna</i> (Deraniyagala, 1945)	E				+		+	+				
63 <i>Gehyra mutilata</i> (Wiegmann, 1834)		+	+									
64 <i>Hemidactylus parvimaclulatus</i> Deraniyagala, 1953		+	+				+					
65 <i>Hemidactylus depressus</i> Gray, 1842	E		+		+		+					
66 <i>Hemidactylus frenatus</i> Schlegel, 1836		+	+				+					
67 <i>Hemidactylus leschenaulti</i> Duméril & Bibron, 1836		+				+		+				
68 <i>Hemidactylus hunae</i> Deraniyagala, 1937	E / NT							+	+			
69 <i>Hemidactylus lankae</i> Deraniyagala, 1953	E	+	+					+		+		
Family - Lacertidae												
70 <i>Ophisops leschenaulti lankae</i> (Deraniyagala, 1953)	T						+	+				
Family - Scincidae												
71 <i>Dasia halianus</i> (Haly & Nevill, 1887)	E / NT					+		+				
72 <i>Lankascincus fallax</i> (Peters, 1860)	E	+	+		+		+		+			
73 <i>Lygosoma punctata</i> (Gmelin, 1799)		+	+					+				
74 <i>Eutropis beddomii</i> (Jerdon, 1870)	T		+					+				
75 <i>Eutropis bibronii</i> (Gray, 1838)	T							+				
76 <i>Eutropis carinata lankae</i> (Deraniyagala, 1953)		+	+				+			+		
77 <i>Eutropis macularia</i> (Blyth, 1853)							+					
78 <i>Nessia cf. sarasinorum</i>	E?		+		+							
Family - Varanidae												
79 <i>Varanus bengalensis</i> (Daudin, 1802)		+	+	+		+	+	+	+			
80 <i>Varanus salvator</i> (Laurenti, 1768)		+	+	+	+	+				+	+	+

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PLATE 01



Fig. 03: Chena cultivations



Fig. 04: Paddy fields



Fig. 05: Riverine forests



Fig. 06: Rock-outcrops



Fig. 07: Savannah forests



Fig. 08: Small Ponds



Fig. 09: Streams



Fig. 10: Tanks

PLATE 02



Fig. 11: *Aspidura brachyorrhos*



Fig. 12: *Dryocalamus nympha*



Fig. 13: *Lycodon osmanhilli*



Fig. 14: *Lycodon striatus*



Fig. 15: *Geochelone elegans*



Fig. 16: *Melanochelys trijuga*



Fig. 17: *Cnemaspis* cf. *tropidogaster*



Fig. 18: *Hemidactylus depressus*

PLATE 03



Fig. 19: *Hemidactylus hunae*



Fig. 20: *Ophisops leschenaulti lankae*



Fig. 21: *Eutropis beddomii*



Fig. 22: *Lankascincus fallax*



Fig. 23: Illegal logging



Fig. 24: Granite rock blasting



Fig. 25: Road kills



Fig. 26: Man made fire