Protected Areas Management and Wildlife Conservation Project

ADB Loan Number 1767-SRI (SF)

Consultancy Services Report

BIODIVERSITY BASELINE SURVEY: MINNERIYA NATIONAL PARK

Prepared for:
Department of Wildlife Conservation
Ministry of Environment and Natural Resources, Sri Lanka

INFOTECHS IDEAS Pvt. Ltd.

IN ASSOCIATION WITH

Specialists in Natural Resources Management

GREENTECH CONSULTANTS

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This series of biodiversity reports on seven protected areas is a product of the Biodiversity Baseline Survey undertaken in 2006-08, as a component of the Protected Area Management and Wildlife Conservation Project. Members of the team are listed below and those who have contributed directly to the production of this document are named under their respective taxonomic sections.

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1. INTRODUCTION

Biodiversity Baseline Survey

The Biodiversity Baseline Survey is a discrete Contract within the Protected Area Management and Wildlife Conservation Project, funded by the Asian Development Bank, World Bank Global Environment Facility and the Government of the Netherlands. It has been undertaken by ARD Inc. for the Ministry of Environment and Natural Resources in accordance with the *Contract for Consulting Services of Biodiversity Baseline Survey* (ADB Loan No. 1767 SRI (SF).

The overall aim of the Contract is to assess the current status of biodiversity within four protected areas[1] to inform their future management, using sound and practical scientific methods that can be repeated over time and applied more widely by the Department of Wildlife Conservation to other protected areas under its remit. The Contract has been implemented during the period April 2006 - March 2007, with field work undertaken from the beginning of July 2007 until mid-January 2007.

A one-year extension to this Contract was awarded by the Ministry primarily to enable three additional protected areas[2] to be surveyed and further sampling to be conducted in Ritigala and Wasgomuwa during the wet season. This Extension has been implemented by Infotechs Ideas (Pvt) Ltd, in association with Greentech Consultants (Pvt) Ltd, during the period October 2007-October 2008, with fieldwork undertaken between November 2007 and July 2008.

Minneriya National Park is one of the **seven protected areas** included in this Survey, chosen on account of its high importance for biodiversity within Sri Lanka's Dry Zone. The following **six taxonomic groups** were selected for purposes of the Survey on the basis of being (a) well known and of general interest to scientists and managers; (b) relatively easy to survey systematically and identify; and (c) potentially of value to protected areas management:

- Mammals
- Birds
- Amphibians
- Reptiles
- Freshwater fish
- Vascular plants

Purpose of this report in relation to contract objectives

This report documents the plant and animal species recorded by this Biodiversity Baseline Survey, assesses the richness of species found within the different habitats and considers the implications of these findings for the future management of the National Park. Along with reports for the other six protected areas, it addresses six of the ten objectives outlined in the Contract (Box 1.1).

This report should be read in conjunction with the Field Manual (DWC, 2008a), which documents the design of the Biodiversity Baseline Survey and methods used for sampling the different taxonomic groups in accordance with Objectives 1 and 2 of the Contract (Box 1.1). The Field Manual also describes how the field data are electronically stored and managed within a Biodiversity Information Management System and provides details about the preservation and curation of plant and animal specimens.

This report is intended for use by staff of the Department of Wildlife Conservation responsible for the management of Minneriya National Park and the educational outreach of those who live around its perimeter or visit it. It should also be readily accessible to other professional individuals and organisations interested in adding to our knowledge of biodiversity within this site, be it through the collection of field data or further analyses.

[1] Horton Plains, Peak Wilderness, Ritigala and Wasgomuwa
[2] Bundala, Minneriya and Udawalawe

Box 1.1 **Contract objectives addressed in this report are highlighted**

1. Establish baseline data and survey protocols for future biodiversity monitoring.
2. Establish sound, repeatable field methods appropriate for local conditions.
3. Establish rigorous methods for collection and management of data and specimens.
4. **Inform management planning by defining habitat preferences and distribution of a range of fauna/flora/assemblages and threats to them.**
5. **Identify habitats with rare, endemic and ecologically/culturally important species, guilds and assemblages.**
6. **Identify natural assemblages of plants/animals.**
7. **Provide natural history information on a range of species.**
8. **Inform management practices and identification of management zones, based on #5-7 above.**
9. **Make information, especially on the importance of each PA, available for education outreach.**
10. Improve technical skills of Departmental staff by provision of on-the-job training.

Importantly, this report, together with the Field Manual and records from this baseline survey held in the Biodiversity Information Management System (DWC 2007a, 2007b), provide the basis for monitoring future changes to the biodiversity of Ritigala Strict Natural Reserve and informing its management in so far as the constraints of the data allow.

2. MINNERIYA NATIONAL PARK

This section provides background information about the National Park that is relevant to this Survey. Unless otherwise indicated, it has been extracted from the current management plan (DWC, 2005) and further details can be found in the resource inventory of the previous management plan (DWC, 1997). Useful background information can also be found in IUCN (1990).

Designation, area and location

Minneriya was declared a National Park 12 August, 1997 (Gazette Notification no. 988/4). It encompasses an area of approximately 9,411 ha, which includes the former Minneriya-Giritale Sanctuary[3].

The National Park lies within a complex of protected areas that includes Minneriya- Giritale Nature Reserve (Blocks I, II, III and IV) and Sigiriya Sanctuary, all of which were established with different but complimentary goals. The Nature Reserve protects the catchments of the three ancient irrigation tanks (Minneriya tank, Giritale tank and Prakram Samudra), Sigiriya Sanctuary safeguards the natural environment of the ancient ruins and Minneriya National Park was created to capitalize on the flow of tourism to this part of the 'cultural triangle'.

More importantly, from a biodiversity conservation perspective, this complex is one the most important habitats in the Mahaweli region for the long-term conservation of the elephant (including displaced animals) and associated flora and fauna. Furthermore, it is contiguous with Wasgomuwa National Park, Riverine Nature Reserve, Flood Plains National Park, Kaudulla National Park and Somawathiya National Park, providing tremendous opportunities for conservation in the Dry Zone at a landscape scale.

Minneriya National Park lies in Polonnaruwa District, North Central Province. The main entrance abuts the Habarana-Polonnaruwa road.

Physical features

The topography is varied, with hills, patnas and talawas, and ranges in elevation from about 100 m to 500 m (Figure 1a). Much of the area lies within the lower peneplain, above which rise rock massifs including the dominant Sudukanda ridge. Minneriya, itself, is an ancient tank, with a catchment area of 24,000 ha, and is 2,550 ha in extent when full.

Geologically, the area lies within the Highland Complex or Khondalite group of rocks (Figure 1b). Soils comprise Great Group Level reddish brown latosolic soils, reddish brown earths, low humic cleys, mountain regosols and alluvium of variable texture and drainage (Figure 1c).

Climate

The Tropical Dry Hot Monsoon climate is characterised by: a bimodal pattern of rainfall; relatively uniform high temperatures throughout the year (mean = 28 ^{o}C); a protracted dry period prior to the main rainy season (October-January) during the north-east monsoon (Maha); and desiccating winds in May-August during the long, hot south-west monsoon. Annual rainfall is about 1500 mm, with a gradient of increasing rainfall from north to south. Relative humidity ranges from 59% to 97% and is lowest from May to September. Wind speeds reach 10 km/hour during the south-west monsoon.

[3] Minneriya-Giritale was originally notified as a sanctuary on 28 July 1938, with an area of 6,693.5 ha.

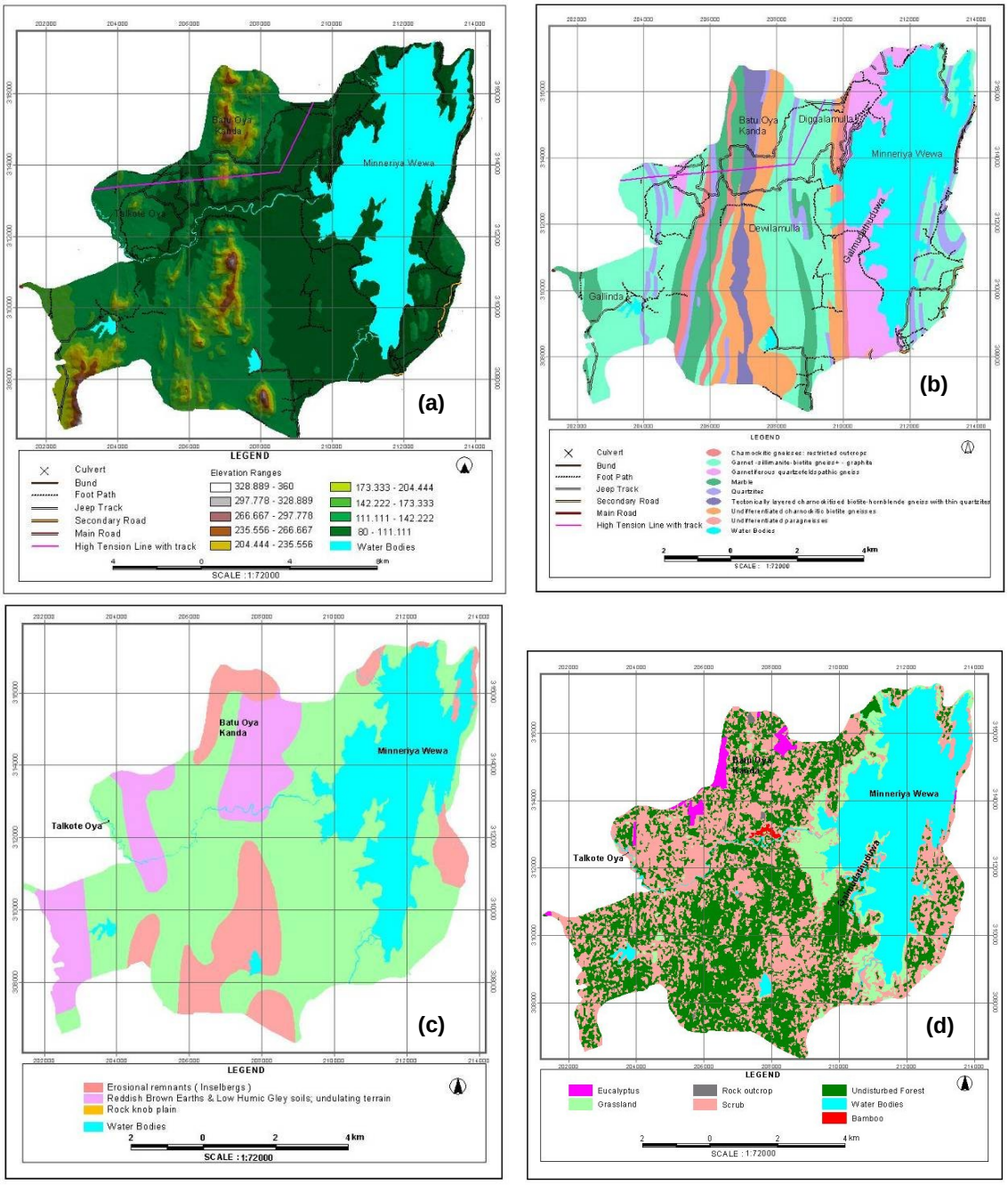

Figure 2.1 Maps of Minneriya national park showing (a) topography, (b) geology, (c) soils and (d) vegetation (Source: MENR, 2006)

Box 2.1 **Descriptions and images of the main vegetation types in Minneriya National Park[1] (Source: MENR, 2006)**

Dry-Mixed Evergreen Forest
(844.7 ha, 64.9% total area)

The undisturbed forest has the general appearance of a closed canopy forest, with a height not exceeding 30 m. Canopy species include *Sapindus emarginatus, Schleichera oleosa, Pterospermum canescens, Choloxylon swietinia, Vitex altissima, Diospyros ebenum, D. affinis, Manikara hexandra* and *Lepisanthus tetraphylla*.

Main subcanopy species are *Diospyros ovalifolia, Pleiospermium alatum, Cassia fistula, Grewia tilifolia* and *Diplodiscus verucosus*.

Disturbed Dry-Mixed Evergreen Forest
(extent not differentiated from undisturbed Dry-Mixed Evergreen Forest in MENR, 2006)

Patches of degraded forest in a range of seral stages of succession are found in undisturbed forest. Dominant species in disturbed Dry-Mixed Evergreen Forest are *Diplodiscus verucosus, Grewia tilifolia, Bauhinia racemosa, Cassia fistula* and some *Ficus* species.

Scrub (3,142.4 ha, 36.7% of total area)

Scrub is found in areas of degraded Dry-Mixed Evergreen Forest and abandoned chena (shifting cultivation).

Characteristic species include *Bauhinia racemosa, Carissa spinarum, Catunaregam spinosa, Dichrostachys cinerea, Flueggea leucopyrus, Gmelina asiatica, Grewia orientalis, Hugonia mystax, Ichnocarpus frutescens, Lantana camara, Limonia acidissima, Memecylon umbellatum, Phyllanthus polyphyllus, Scutia myrtina, Syzygium cumini, Toddalia asiatica* and *Ziziphus oenoplia*.

Bamboo
(163.6 ha, 12.6% of total area)

Dense stands of bamboo occur in a few parts of the National Park. Katu Una (*Bambusa arundinacea*) is the dominant species and grows in clumps up to some 15 m height. This species gradually replaces other species and the vegetation takes on the appearance of a plantation.

Grassland (75.3 ha, 5.8% of total area)

Grasslands occur in areas of abandoned shifting cultivation (chena) and in areas surrounding Minneriya tank. *Panicum miximum* (Guinea grass) is the dominant grass species. Isolated shrubs and trees may be scattered throughout grasslands.

[1] The other habitat types shown in Figure 3.1 are Rock Outcrop (21.6 ha, 0.3%), Eucalyptus (107.9 ha, 1.3%) and Water Bodies (1,756.7 ha, 20.5%) out of a total area of 8,566.1 ha, based on GIS analysis. Note that this total area is different to the notified area of 9,411 ha (see Section 2.1).

Vegetation

The dominant climax forest formation is Dry-Mixed Evergreen Forest. Other vegetation types such as narrow strips of riverine forest along streams, scrub in areas where the closed canopy high forest is degraded from anthropogenic activities, native bamboo dominated areas and vegetation associated with rock outcrops are distributed throughout the National Park (Figures 2.1d and 3.1). The main vegetation types are described, with images, in Box 2.

Flora and fauna

Biodiversity surveys and related research in recent decades include the National Conservation Review (Green and Gunawardena, 1997), an inventory of natural resources that includes original field work as

a part of a Global Environmental Facility Project (DWC, 1997) and a floral survey, as part of mapping the habitat of Minneriya, by MENR (2006). Existing knowledge about the diversity of plant and animal species is summarised in Table 2.1.

Table 2.1 Diversity of plant and animal taxonomic groups recorded by previous surveys

Survey/ Source	Taxon	Total number			
		Families	Genera	Species	Endemic species
National Conservation Review (Green and Gunawardena, 1997)	Minneriya-Giritale Sanctuary (66.9 km^2)				
	Woody plants	32	62	72	9
	Butterflies	4	7	9	0
	Molluscs	2	2	2	1
	Amphibians	0	0	0	0
	Reptiles	2	2	2	2
	Birds	10	10	13	2
	Mammals	6	7	7	0
	Minneriya-Giritale Block 1 Nature Reserve (75.3 km^2)				
	Woody plants	32	68	85	12
	Butterflies	5	12	16	1
	Molluscs	3	3	3	1
	Amphibians	2	2	3	2
	Reptiles	2	4	4	3
	Birds	20	24	27	2
	Mammals	9	11	11	1
Management Plan (DWC, 2005)	Minneriya National Park (94 km^2) **and** Minneriya Giritale Nature Reserve Blocks 1-4 (225 km^2)				
	Flowering plants			*237	#
	Fish	9	15	26	4
	Amphibians	4	7	9	2
	Reptiles	10	18	25	8
	Birds	60	126	160	6
	Mammals	16	21	24	3
Habitat map (MENR, 2006)	Flowering plants	51	152	190	13

***** Total number of plant species inventoried within an approximate area of 200 km^2.

Include two Wet Zone endemic trees, *Mangifera zeylanica* and *Myristica zeylanica*, and wild rice species, *Oryza eichingeri* and *Oryza granulate.*

Management

The vision in the Management Plan (DWC, 2005) is to conserve the reservoirs and their catchments, biodiversity, flagship species (elephants) and cultural diversity within Minneriya National Park and the adjacent protected areas of Giritale, Kaudulla and Sigiriya that together form a single management unit. The management goals and objectives are reproduced in Box 2.2.

Seven conservation themes have been identified with respect to the Minneriya-Giritale-Kaudulla-Sigiriya protected areas complex, namely:

- managing the habitat for elephants;
- expanding opportunities for nature-based tourism;
- developing new strategies for law enforcement;
- mitigating the human-elephant conflict;
- reducing natural resource dependencies of local communities through outreach measures;

- conserving biological and cultural diversity; and
- maintaining healthy wildlife populations.

Box 2.2 **Management goals and objectives for Minneriya National Park (DWC, 2005)**

Management Goals

- To conserve, with the support of the local communities, the biodiversity of the Minneriya-Giritale-Kaudula-Sigiriya protected areas complex, with special emphasis on the flagship species, the elephant.
- To protect the catchment of the three ancient reservoirs situated inside and on the periphery of the protected areas complex.
- To promote nature tourism and preserve the ability of the system to sustain tourism in the long run.

Management Objectives

- To provide suitable habitats for elephants at all times, with provision for approximately 400 elephants in the dry season.
- To expand opportunities for nature-based tourism and improve visitor services.
- To develop new strategies of law enforcement and provide facilities for law enforcement officers.
- To mitigate human-elephant conflict.
- To reduce the natural resource dependencies of the adjoining communities on the protected areas complex through community outreach measures.
- To promote and upgrade the integration of conservation of natural resources and cultural diversity within the protected areas complex.
- To ensure maintenance of healthy wildlife populations.

3. METHODS

Full details of the methodology developed for the Biodiversity Baseline Survey are provided in a separate Field Manual (DWC, 2007a). A brief overview is provided below, together with details of anything specific to the survey of Ritigala.

Minneriya was surveyed during the period from November 2007 to June 2008. Sampling was carried out principally in three main field sessions, lasting a total of approximately thirty days, between November and April. The Plant and Bird groups returned for additional sessions to collect sample four transects that had become inundated by the tank due to heavy rains experienced towards the latter part of the first field session.

Survey design and sampling procedures

The Biodiversity Baseline Survey covered terrestrial and aquatic habitats (i.e. rivers, streams, tanks, villus). Terrestrial habitats were identified using the outputs from the Habitat Mapping Project (MENR, 2006), based principally on the vegetation types while taking into account environmental gradients, such as altitude, aspect, geology and soils, for the location and alignment of transects.

Terrestrial habitats were sampled systematically for plants, amphibians, reptiles, birds and mammals using quadrats (100 m x 5 m) aligned at 150 m intervals along transects (1 km length). Four replicate transects were located within each habitat type. Opportunistic observations were also recorded along transects, between quadrats, and elsewhere within the Strict Natural Reserve.

Freshwater habitats were treated as a single type, which was sampled systematically for fish diversity and opportunistically for other taxonomic groups. The head, mid- and lower reaches of at least four rivers or streams within each sub-basin were sampled for fish and various measures of water quality.

The geographic coordinates of all sampling locations (i.e. quadrats and freshwater sites) are provided in Annex 1. Effort expended in sampling quadrats, freshwater and other sites using a variety of techniques is summarised in Annex 2.

Terrestrial habitats

Five vegetation types were used as a basis for sampling different terrestrial habitats for species diversity. While disturbed was not distinguished from undisturbed Dry-Mixed Evergreen Forest in the habitat mapping project (MENR, 2006), this distinction was made for the present Survey. Rock Outcrop, on the other hand, was not distinguished in this Survey, such habitat being considered as either disturbed or undisturbed Dry-Mixed Evergreen Forest. The five habitats are shown in Table 3.1, together with the number of replicate transects and quadrats located within each. Some of the 24 one-kilometre transects occupied more than a single habitat, which is why the total number of transects in shown Table 3.1 exceeds 24. This is due to the small expanse of habitats at some sampling locations, making it impossible to align a transect within a single habitat.

Table 3.1 Numbers of quadrats and associated transects sampled within each habitat

Habitat type	No. transects[1]	No. quadrats
Dry-Mixed Evergreen Forest	13	43
Disturbed Dry-Mixed Evergreen Forest	8	29
Scrub	4	10
Bamboo	1	4
Grassland	3	10
Total	**24**	**96**

[1]Conceptually, the number of transects equates to the number of replicates in each habitat. In practice, the total number of transects is 24 but the total number of replicates is 29, as some transects cover more than one habitat.

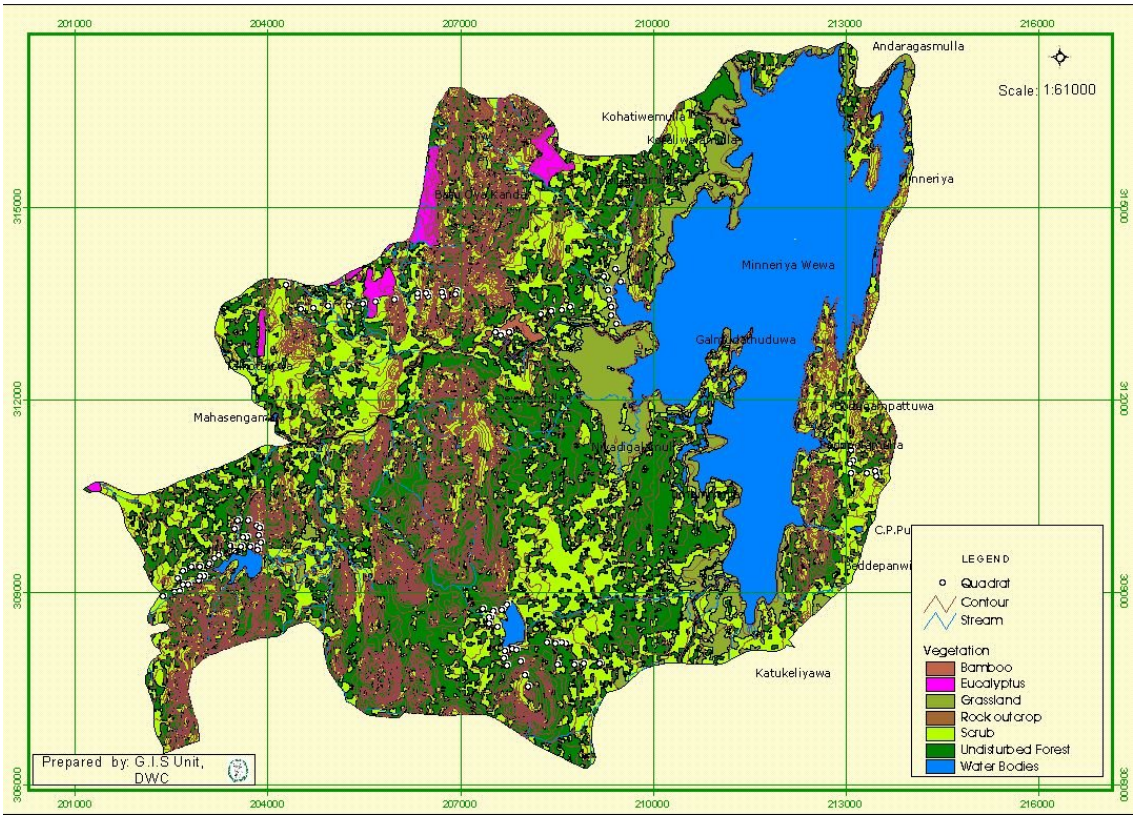

Figure 3.1 Vegetation map of Minneriya National Park (after MENR, 2006), with location of 96 quadrats sampled by Biodiversity Baseline Survey

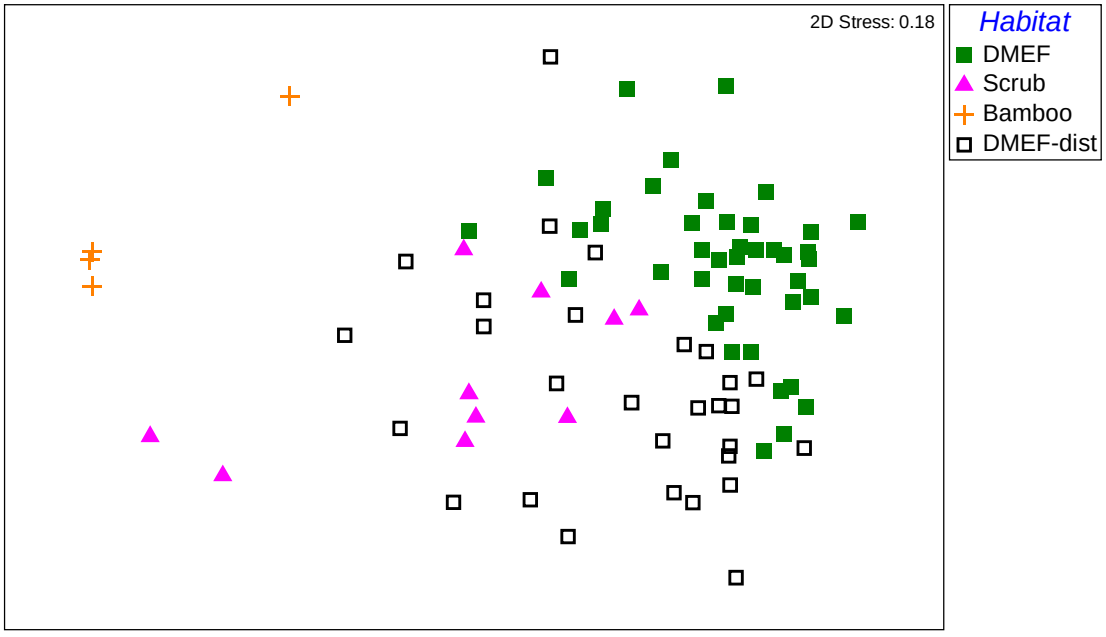

Figure 3.2 Multi-dimensional Scaling ordination of plant quadrats, based on square-root transformed abundance data and Bray-Curtis similarity for woody plant species and bamboo. (DMEF = Dry-Mixed Evergreen Forest; dist = disturbed)

A non-metric Multi-Dimensional Scaling ordination of Bray-Curtis similarities from square-root transformed species abundance data of plant quadrats (Clarke and Warwick 2001) is presented in two dimensions in Figure 3.2. These ordinations show quadrats of the same habitat type are widely distributed, except for Bamboo. Quadrats defined as Dry-Mixed Evergreen Forest, disturbed Dry-Mixed Evergreen Forest and Scrub overlap in species composition considerably. There was virtually no overlap in plant species between quadrats of woody plants and bamboo with those consisting of grasses, necessitating two separate ordination analyses to examine relationships of floristic associations in detail. These are evaluated in more detail in Section 4.3.

Freshwater habitat

A total of 42 sites in nine of the 23 river sub-basins within the National Park were sampled for fish. From four to seven attempts were made to sample fish from each site. The sampling sites comprised nine major streams (i.e. Madyamala Ela, Batu Oya, Dambagaha Ulpatha Ela, Erige Oya, Halmilla Ela, Kiri Oya, Mahaweli Ela, Pihimbiya Ela and Thalkote Ara) of the nine river sub-basins and four tanks (i.e. Madyamala Wewa, Halmillawa Wewa. Maha Wewa, Minneriya Wewa). Their distribution is shown in Figure 3.3.

The nine river sub-basins and four tanks were each treated as separate units for purposes of analysis.

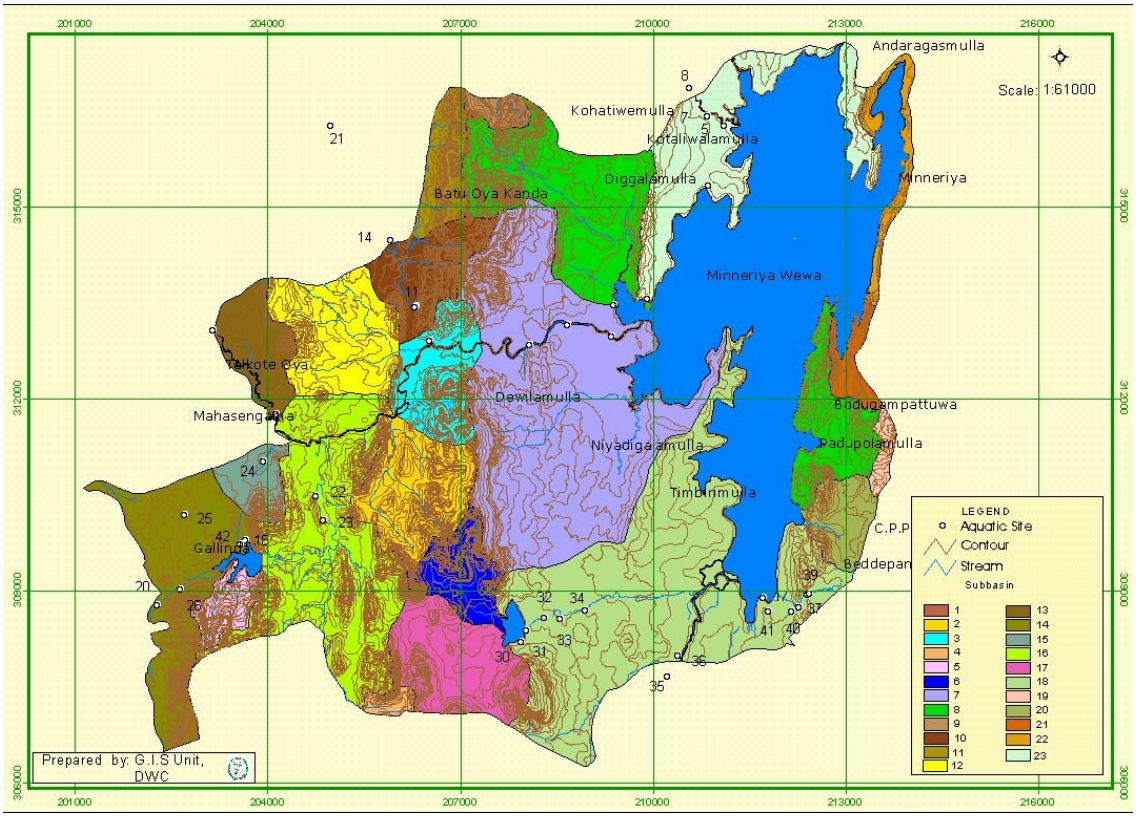

Figure 3.3 Map of river sub-basins in Minneriya National Park, with location of 42 freshwater sample sites

Biodiversity Information Management System

Field data are held in the Biodiversity Information Management System, a database application designed specifically for the Biodiversity Baseline Survey. The application is described briefly in the Field Manual (DWC, 2008a) and full details about its design and use are documented elsewhere. (DWC, 2007a, 2007b).

Herbarium and specimen collections

Numbers of herbarium and animal specimens collected during the Biodiversity Baseline Survey are summarised in Table 3.2 for each taxon. Details of voucher specimens are provided in Annex 3. Plant and animals specimens are lodged with the National Wildlife Training, Giritale and, in the case of plants, a duplicate set is deposited with the National Botanic Gardens, Peradeniya.

Table 3.2 Numbers of voucher specimens collected and identified for each taxon

Taxon	Voucher specimens		
	Total collected	No. identified	No. unidentified
Plants	18	18	0
Fish	165	164	1
Herpetofauna	24	20	4
Birds	0	0	0
Mammals	1	1	1

Data and analyses

Sample sizes and records

Field data comprise quantitative and opportunistic records. The sizes of datasets are summarised in Tables 3.3 and 3.4 for each taxonomic group. In Table 3.3 the number of records refers to records of species within quadrats; the number of individuals is the total number of individuals recorded for each species. In the case of birds, only those recorded within Bands 1 or 2 of Variable Circular Plots are treated quantitatively; those recorded in Band 3 (i.e. >20 m from the observer) are treated as opportunistic.

Table 3.3 Breakdown of quantitative and opportunistic records of plants and animals

Taxon	Total no. records	Total no. individuals	No. species identified	No. species unidentified
Quantitative records from within quadrats/sampling points				
Plants	1630	4409	107	4
Fish	279	2115	32	1
Amphibians	85	85	10	0
Reptiles	92	92	19	2
Birds	3448	3448	126	0
Mammals	305	677	28	1
Additional opportunistic records from outside quadrats/sampling points				
Plants	unavailable	unavailable	96	4
Fish	0	0	0	0
Amphibians	364	364	4	0
Reptiles	273	273	19	0
Birds	2918	2918	9	0
Mammals	372	1016	7	0

Opportunistic records contribute considerably to species inventories in the case of plants, birds and mammals. In the case of mammals, such records are based largely on indirect observations of tracks and scats or pellets. Fisherman reported an additional two species (*Anguilla bicolour* and *Zenarchopterus dispar*), both of which are indigenous, to those recorded during this Survey.

Table 3.4 Breakdown of quantitative and all records of species of plants and animals

Taxon	No. families	No. genera	No. species			
			Total	Endemic	Indigenous*	Exotic
Quantitative records from within quadrats/sampling points						
Plants	35	93	107	8	95	4
Fish	12	23	33	8	21	4
Amphibians			10	2	8	0
Reptiles			21	8	13	0
Birds			126	2	124	0
Mammals			29	4	24	1
All records (including opportunistic)						
Plants	52	164	203	14	173	16
Fish	12	23	33	8	21	4
Amphibians			14	2	12	0
Reptiles			40	12	28	0
Birds			135	3	132	0
Mammals			36	4	31	1

*Excludes endemic species.

Adequacy of sample sizes

Species discovery curves were calculated to estimate the likely number of species to be found in each habitat type for each taxonomic group. Both the Chao2 and Bootstrap methods were used from the PRIMER-E 2007 analytical software package (Clarke and Warwick 2001), following the recommendations of Magurran (2004) who evaluated a wide range of different statistical approaches.

These estimates, provided in Tables 4.1, 5.1, 6.1, 7.1 and 8.1 for the respective taxonomic groups, indicate that surveys in further locations are necessary to check for additional species in the case of all groups.

Analyses

Analyses were undertaken principally at the protected area and habitat or drainage unit levels. While the former provides an overview of the biodiversity values of the protected area, the latter is likely to be more useful for informing management about diversity within different habitats and sub-basins. A summary matrix of species diversity within each habitat or drainage unit is provided in Annex 4.

4. PLANT DIVERSITY ANALYSIS (Author: B.M.P. Singhakumara)

Introduction

The survey of Minneriya National Park was confined to the four most extensive and/or important of the six terrestrial habitats identified by the Habitat Mapping Project (MENR, 2006): Dry-Mixed Evergreen Forest, Scrub, Bamboo and Grassland. Additionally, a distinction was made between undisturbed and disturbed Dry-Mixed Evergreen Forest, as in the case of other protected areas covered by the Biodiversity Baseline Survey. Disturbed Dry-Mixed Evergreen Forest is distinguished by clearings in the forest, absence of canopy trees and a somewhat different species composition. The other habitat types (Rock Outcrop and *Eucalyptus* plantation), which account for just 1.6% of the total area of the National Park, were considered too small and fragmented to be accommodated within the Survey. Riverine Forest is not well developed in Minneriya due to the absence of any major rivers. Scrub is very extensive, accounting for nearly 50% of terrestrial habitats, and has developed in areas where Dry-Mixed Evergreen Forest has become degraded by past chena (shifting cultivation).

The vegetation types surveyed and their floristic composition are described in Section 2.4. Common plant families represented in the vegetation include Euphorbiaceae, Fabaceae, Rubiaceae, Sapindaceae, Ebenaceae, Sapotaceae, Tiliaceae and Verbenaceae.

A total area of 4.8 ha was sampled within the different habitats, details of which are summarised in Annex 2. Voucher specimens were collected and these are listed in Annex 3.

Diversity within habitats

A total of 203 species of vascular plants were inventoried during this Survey, of which 14 species are endemic, 7 are nationally threatened and 16 are exotic. Species recorded within quadrats total 107, of which 8 are endemic, and their distribution with respect to each habitat is provided in Annex 4.

Species richness and other measures of diversity are shown in Table 4.1. Species richness is highest for undisturbed Dry-Mixed Evergreen Forest, followed by disturbed Dry-Mixed Evergreen Forest. Scrub, Grassland and Bamboo are much less rich in species, in that order. Diversity measures are largely consistent with the species richness trends, the exception being the Gini-Simpson (1/D) diversity index which is lower for disturbed Dry-Mixed Evergreen Forest than for Scrub. This can be attributed to the more even distributions of abundance of the fewer species in Scrub, as indicated by the high value of Pielou's eveness index (J'=0.814).

Table 4.1 Plant diversity indices and estimates for habitats, based on quadrat sampling

Habitat type	Total	Dry-Mixed Evergreen Forest		Scrub	Bamboo	Grassland
		Undisturbed	Disturbed			
Total number of species	107	70	62	35	6	15
Number of endemic species	8	6	5	2	1	0
Diversity indices						
Species richness [s]	107	70	62	35	6	15
Shannon entropy [exp(H)]	29.87	21.01	19.11	18.07	2.37	5.04
Gini-Simpson [1/D]	17.55	13.32	8.75	12.15	1.60	3.04
Chao 2 estimate S	130.68	82.90	110.40	47.50	6.00	16.10
Bootstrap estimate S	121.16	78.90	70.90	41.30	7.30	17.20

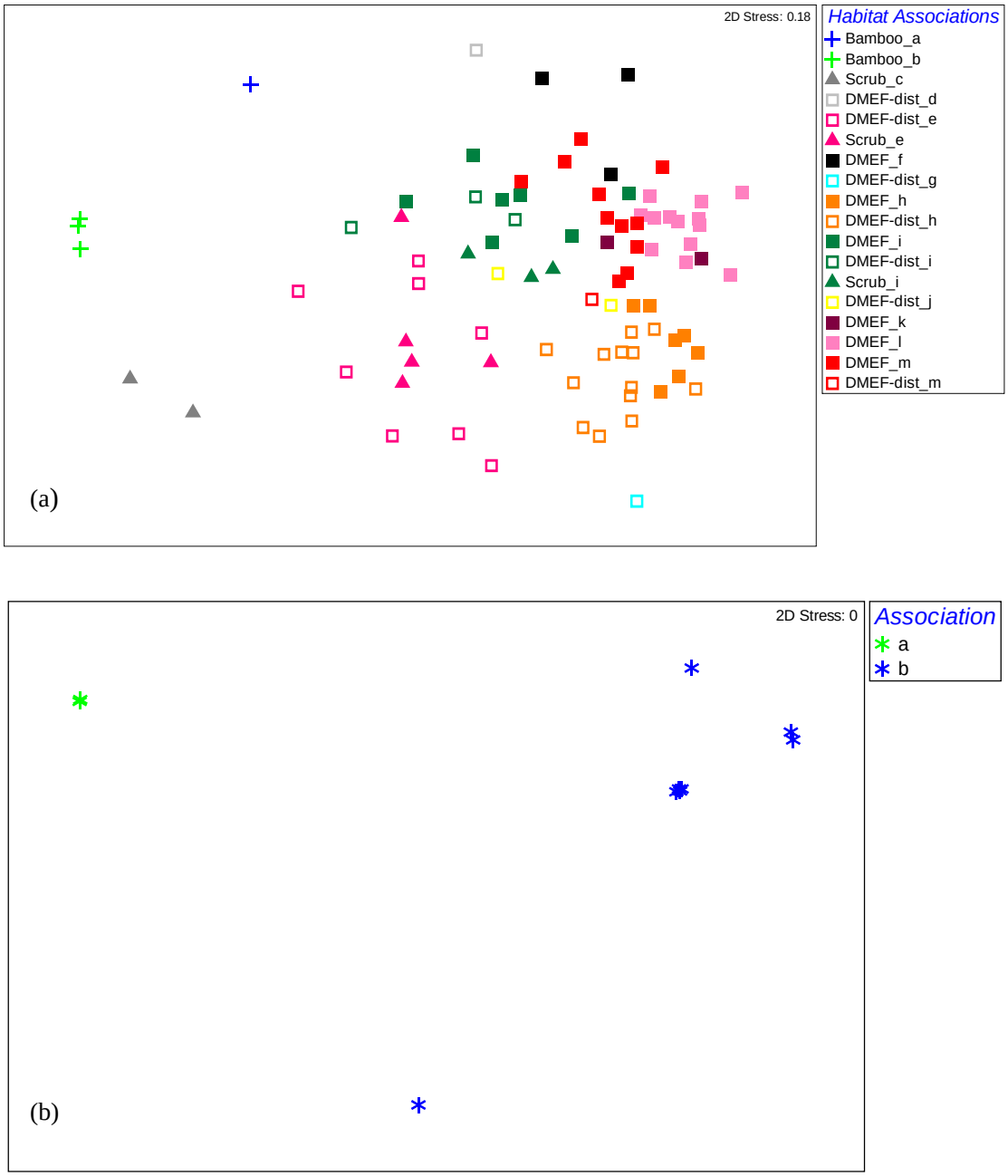

Figure 4.1 Multi-dimensional Scaling ordination of quadrats based on square-root transformed abundance data and Bray-Curtis similarity for (a) woody plants and (b) grasses/herbs

Discussion

Significant findings

The five habitats distinguished for purposes of this Survey, based on outputs from the Habitat Map Project (MENR, 2006), were subjected to a more detailed floristic analysis by applying the Simprof algorithm in the Primer E programme to a Bray-Curtis similarity matrix of the 86 non-grassland quadrats. The results of this analysis show that 13 floristic associations are statistically distinguishable, the complexity of which is shown in Figure 4.1a where the 13 identified associations are plotted with respect to habitat type. The 43 undisturbed Dry-Mixed Evergreen Forest quadrats

occur in six of the associations, the 29 disturbed Dry-Mixed Evergreen Forest quadrats occur in seven associations, the 10 Bamboo quadrats in two associations and the 10 Scrub quadrats in three associations. Both of the Bamboo associations are unique to that habitat type, as are three each to undisturbed Dry-Mixed Evergreen Forest and disturbed Dry-Mixed Evergreen Forest and one to Scrub.

A similar analysis for the 10 Grassland quadrats resulted in the identification of two unique associations (Figure 4.1b).

Adequacy and shortcomings of survey data

- The results of this Survey, in terms of the 107 woody plant species inventoried within 86 non-grassland quadrats, compare favourably with the 72 and 85 woody plant species recorded in Minneriya-Giritale Sanctuary and Nature Reserve, respectively, by the National Conservation Review (Green and Gunawardena, 1997). Reference to the Chao 2 and Bootstrap estimates of species richness in Table 4.1, however, shows that the total number of species is potentially much higher. Further sampling, therefore, is warranted.
- The 203 species of flowering plants recorded in this Survey is close to totals from previous inventories, notably the 237 species reported in the current Management Plan (DWC, 2005) and the 190 species inventoried as part of the recent Habitat Mapping Project (MENR, 2006). The majority of species recorded by the Habitat Mapping Project were woody plants.

5. HERPETOFAUNA DIVERSITY ANALYSIS (Author: P. Nihal Dayawansa)

Introduction

A total of 240 plots (5 x 5 m^2) were sampled daytime, using the Quadrat Cleaning Technique, and 16 plots (2.5 x 10 m^2) were surveyed at night, using the Visual Encounter Technique. Also, microhabitats that did fall within sampled plots were examined opportunistically. Of the 240 plots searched, no herpetofauna were found in 190 (79%) of them. The distribution of sampling effort is shown in Annex 2 for each habitat.

Twenty four voucher specimens were collected, of which four remain unidentified. These are listed in Annex 3. Totals of 14 species of amphibians, including two endemics, and 40 species of reptiles, including 12 endemics, were recorded during the Survey. These totals include species of five amphibians and 15 reptiles not recorded previously in Minneriya National Park. A list of species recorded within each habitat is provided in Annex 4.

Diversity within habitats

The results of alpha diversity analyses and estimates are summarised in Table 5.1, based on quantitative data gathered from sampling plots using the Quadrat Cleaning Technique. Key points arising from this analysis are:

- Highest species richness of amphibians was recorded in Grassland, followed by undisturbed Dry-Mixed Evergreen Forest. However, the latter habitat is richest in endemic species. Disturbed Dry-Mixed Evergreen Forest and Scrub are very depauperate in amphibian species and none was recorded in Bamboo. Diversity indices reflect these same trends.
- Highest species richness of reptiles was recorded from disturbed Dry-Mixed Evergreen Forest, followed closely by undisturbed Dry-Mixed Evergreen Forest, then Grassland and Scrub. None was recorded in Bamboo. Most endemic species were recorded in disturbed Dry-Mixed Evergreen Forest, followed by undisturbed Dry-Mixed Evergreen Forest. Scrub and Grassland are very low in reptile species and none was recorded in Bamboo. Diversity indices reflect these same trends, the exception being that diversity indices (Shannon entropy and Gini-

Table 5.1 Herpetofaunal diversity indices for habitats, based on quadrat sampling

Habitat type	Total	Dry-Mixed Evergreen Forest		Scrub	Bamboo	Grassland
		Undisturbed	Disturbed			
AMPHIBIANS						
Total number of species	10	4	1	1	0	8
Number of endemic species	1	1	0	0	0	1
Diversity indices						
Species richness [s]	10	4	1	1	0	8
Shannon entropy [exp(H)]	6.74	3.59	1.00	1.00		5.54
Gini-Simpson [1/D]	5.28	3.27	-	-		4.53
Chao 2 estimate S	10.30	4.90	1.30	1.30	-	9.60
Bootstrap estimate S	11.54	6.00	1.00	1.00	-	10.70
REPTILES						
Total number of species	21	10	13	3	0	7
Number of endemic species	8	4	6	2	0	1
Diversity indices						
Species richness [s]	21	10	13	3	0	7
Shannon entropy [exp(H)]	10.86	5.99	10.62	2.83		6.61
Gini-Simpson [1/D]	6.55	4.09	8.64	2.67		6.23
Chao 2 estimate S	31.00	11.10	33.30	5.00		7.00
Bootstrap estimate S	25.40	11.60	16.50	3.70		9.30

Simpson) are higher for Grassland than undisturbed Dry-Mixed Evergreen Forest. This is likely to reflect a more even distribution of abundance across species in Grassland than in undisturbed Dry-Mixed Evergreen Forest.

- The highest density of amphibians was recorded in Grassland, with 11 individuals/100 m^2. Highest densities of reptiles were recorded in undisturbed and disturbed Dry-Mixed Evergreen Forest, with five and four individuals/100 m^2, respectively.
- The endemic Tammanna skink (*Eutropis tammanna*), a new record for Minneriya, was recorded in disturbed Dry-Mixed Evergreen Forest and Scrub. The semi-fossorial spotted supple skink (*Lygosoma punctata*), also a new record, was recorded in Grassland.
- The painted lip lizard (*Calotes ceylonensis*) and lowland kangaroo lizard (*Otocryptis nigristigma*), both endemic, were recorded sympatrically in undisturbed and disturbed Dry-Mixed Evergreen Forest.
- The absence of both amphibians and reptiles from bamboo indicates that this habitat is unsuitable for herpetofauna, at least during the season surveyed.

Other noteworthy points arising from the Survey are:

- Two endemic genera of reptiles are present, namely *Lankascincus* and *Nessia*. The relict genus *Nessia* is represented by *N. sarasinorum* and another unidentified species which could be new to science. This species was collected as a reference specimen (DWC018).
- Six threatened species were recorded, including the Endangered Sarasin's snakeskink *Nessia sarasinorum.* Rare species recorded include rock python (*Python molurus*) and trinket snake (*Coeloganthus helena*).
- Three species of deadly poisonous snakes were recorded, namely common cobra (*Naja naja*), Russell's pit viper (*Daboia russelii*) and common Indian krait (*Bungarus caeruleus*).

Discussion

Significant findings

- Minneriya National Park is important for the conservation of herpetofauna, evident from its relative wealth of 54 species for a site that lies in the Dry Zone. These include two endemic genera, 12 endemic species and six threatened species of reptiles, including the Endangered Sarasin's snakeskink.
- Herpetofauna species richness is not as high nor are species as unique as in Ritigala Strict Natural Reserve, which also lies in the Dry Zone. A total of 76 species were recorded at Ritigala (DWC, 2008b), of which three amphibian and 25 reptile species were not recorded at Minneriya by this Survey. Conversely, all species of amphibians found at Minneriya were also recorded at Ritigala; and only seven species of reptile recorded from Minneriya were not found at Ritigala.
- Highest species richness and diversity for amphibians was recorded in Grassland, followed by disturbed Dry-Mixed Evergreen Forest. Amphibian species richness and diversity were noticeably higher in undisturbed Dry-Mixed Evergreen Forest than disturbed Dry-Mixed Evergreen Forest, the opposite being the case for reptiles. Bamboo is the least preferred habitat for herpetofauna.
- A total of 19 herpetofauna species (five species of amphibians and 14 species of reptiles) were recorded for the first time, based on inventories in the current management Plan (DWC, 2005). This includes an unidentified species of *Nessia* that could prove to be new science.

Adequacy and shortcomings of survey data

- Sampling effort is insufficient: estimates of potential species richness, calculated from the present sampling regime data (Table 5.1), indicate that sampling needs to be continued. In particular, too few replicates of Scrub, Bamboo and Grassland habitats were sampled.

6. BIRD DIVERSITY ANALYSIS (Author: Devaka Weerakoon)

Introduction

Three main methods were used to sample bird diversity in Minneriya National Park. They are variable circular plot method (VCP) for terrestrial habitats, counts at waterholes and opportunistic observations. A total of 384 VCPs were sampled, providing 6,367 records. The distribution of sampling effort across habitats is summarised in Annex 2. In addition, 37 observations were made opportunistically.

It was not deemed necessary to collect any voucher specimens during this Survey as all birds observed were identified without a doubt.

Diversity within habitats

A total of 135 bird species was recorded during the Survey, which includes three endemic species. Of the total number of bird species, only 126 were recorded in the first two bands of the VCPs and, therefore, subjected to further analysis. The nine species recorded in the third VCP band were treated as opportunistic observations. A list of bird species and their distributions in the different habitats is provided in Annex 4.

Levels of diversity and endemism within the different habitats are summarised in Table 6.1, accompanied by various measures of diversity. Highest species richness was recorded in undisturbed Dry-Mixed Evergreen Forest and, marginally less, in disturbed Dry-Mixed Evergreen Forest, followed in order by Grassland, Scrub and Bamboo. Measures of diversity (exp(H) and 1/D) are not consistent with these trends, being highest for Grassland, followed by disturbed Dry-Mixed Evergreen Forest., and lowest for Scrub. Higher diversity in sites with lower species richness is accounted for by more even distributional spread of species abundance.

Table 6.1 Bird diversity indices and estimates for habitats, based on species recorded within 1st and 2nd bands of VCPs sampled in quadrats

Habitat type	Total	Dry-Mixed Evergreen Forest		Scrub	Bamboo	Grassland
		Undisturbed	Disturbed			
Total number of species	126	91	88	56	41	73
Number of endemic species	2	2	2	2	1	1
Diversity indices						
Species richness [s]	126	91	88	56	41	73
Shannon entropy [exp(H)]	45.93	35.59	37.52	31.24	31.31	44.24
Gini-Simpson [1/D]	26.17	21.69	22.68	20.8	25.14	33.25
Chao 2 estimate S	142.40	113.00	144.30	63.7	61.00	99.00
Bootstrap estimate S	135.20	101.00	98.80	62.1	47.80	83.70

Discussion

Significant findings

- Minneriya is quite rich in bird species, given that it lies in the Dry Zone. It is important for a large number of common species, including wetland-associated species among which is a large population of Asian Openbill Stork (*Anastomus oscitans*).
- The grassland species assemblage is statistically unique, with a few species having been recorded only within this habitat.
- Of Sri Lanka's breeding resident species, 56% were recorded within the National Park. Three endemics were recorded, which represents 12% of Sri Lanka's endemic species. Only a few

migrant species were recorded.

- Only two of the recorded species are nationally threatened: both Drongo Cuckoo (*Surniculus lugubris*) and Yellow-crowned Woodpecker (*Dendrocopos mahrattensis*) are Vulnerable.
- None of the habitats was sampled adequately, as indicated by Chao 2 and Bootstrap estimates of species richness (Table 6.1). This is supported by other information in the current management plan, which provides an inventory of 160 species recorded in the National Park (DWC, 2005).

Adequacy and shortcomings of survey data

This dataset provides a reliable, geo-referenced baseline for Minneriya Park which can be used to inform its management. However, the data should be used judiciously, taking full account of the following limitations:

- Some habitats were not sampled adequately in spatial and temporal dimensions.
- Sampling was hampered by heavy rainfall experienced during all three field sessions which would have influenced bird activity and, therefore, their visual and/or auditory conspicuousness.

7. MAMMAL DIVERSITY ANALYSIS (Author: Mayuri R. Wijesinghe)

Introduction

Mammals were surveyed using live trapping and both direct and indirect observations to infer the presence of animals from fresh droppings, foot prints and other signs. A total of 48 quadrats was sampled quantitatively for small mammals, using Sherman's and Tomahawk traps, and all 96 quadrats aligned along 24 km of transects were surveyed for signs of mammals. Opportunistic observations of mammals and their signs encountered elsewhere in Minneriya National Park were also recorded. No mist netting of bats was undertaken.

The distribution of sampling effort across the different habitats is shown in Annex 2. One voucher specimen was collected and identified. Details of this specimen are provided in Annex 3.

Diversity within habitats

Twenty nine species of indigenous mammals were recorded from within quadrats and an additional seven species were recorded opportunistically. A list of species recorded within each habitat is provided in Annex 4. Key points are as follows:

- A total of 36 mammal species, belonging to 29 genera and 18 families, was recorded in this Survey. They comprise one bat species, 10 rodents including four species of squirrels, porcupine and five species of rats, a shrew, hare, three cats, two civets, four mongoose species, otter, jackal, seven species of ungulates, four primates including loris, and elephant.
- Four species are endemic, namely purple-faced leaf monkey (*Semnopithecus vetulus*), toque macaque (*Macaca sinica*), Sri Lanka flame-striped jungle squirrel (*Funambulus layardi*) and mouse deer (*Moschiola meminna)*.
- Ten species are nationally threatened, all of which are listed as Vulnerable (IUCN and MENR, 2007).
- The most commonly trapped or directly observed species were toque macaque, grey langur (*Semnopithecus priam*), spotted deer (*Axis axis*), elephant (*Elephas maximus*), hare (*Lepus nigricollis*) and antelope rat (*Tatera indica*).
- Otter scat and footprints were found in Scrub, probably left by an individual traversing rather than resident in such habitat.

Table 7.1 Mammal diversity indices and estimates for habitats, based on quadrat sampling

Habitat type	Total	Dry-Mixed Evergreen Forest		Scrub	Bamboo	Grassland
		Undisturbed	Disturbed			
MAMMALS						
Total number of species	29	22	19	16	7	14
Number of endemic species	4	3	2	3	0	3
Diversity indices						
Species richness [s]	29	22	19	16	7	14
Shannon entropy [exp(H)]	8.42	7.66	4.95	7.96	5.84	9.87
Gini-Simpson [1/D]	4.72	3.99	3.01	4.85	4.67	7.34
Chao 2 estimate S	29.80	34.30	20.30	41.00	7.00	64.00
Bootstrap estimate S	31.10	25.00	21.30	19.50	7.60	17.60

Levels of diversity and endemism, together with measures of diversity, within the different habitats are summarised in Table 7.1. The results, which are based on relatively small samples, indicate the following:

- Species richness is highest in undisturbed Dry-Mixed Evergreen Forest, followed by disturbed

Dry-Mixed Evergreen Forest, Scrub and Grassland. It is very much lower in Bamboo, which was used by some large herbivores and the occasional small mammal. The higher number of species found in Dry-Mixed Evergreen Forest may reflect a greater range of ecological niches available to mammals.

- Measures of species diversity are not consistent with species richness trends. Scrub, Grassland and to a lesser extent Bamboo all have higher Shannon entropy and/or Gini-Simpson indices than undisturbed and disturbed Dry-Mixed Evergreen Forest. Higher diversity in sites with lower species richness is accounted for by more even distributional spread of species abundance.

Discussion

Significant findings

- Minneriya is an important National Park for mammals, with 35 indigenous species of which four are endemic. Ten species are nationally threatened.
- A total of 24 species are listed in the current Management Plan (DWC, 2005), of which three are endemic, including the Sri Lanka golden palm cat (*Paradoxurus zeylonensis*) which was not recorded in the present Survey.
- The seasonally inundated Grassland habitat peripheral to Minneriya Lake is much frequented by elephant and herds of 200-300 may be seen during the drier months of July-October.

Adequacy and shortcomings of survey data

- Sample sizes for Bamboo and, to a lesser extent, Scrub and Grassland, were low. In the case of Scrub and Grassland, they are clearly inadequate, as the Chao2 and Bootstrap estimates are much higher than the recorded species richness (Table 7.1).
- The identity of bat species observed opportunistically could not be confirmed in the absence of any mist netting.

8. FRESHWATER FISH DIVERSITY ANALYSIS (Author: S.M.D. Ajantha U. De Alwis)

Introduction

The principal water body in Minneriya National Park is Minneriya Wewa which is a man-made, non-tidal, freshwater, retention lacustrine reservoir. The seasonal inflows of the Batu Oya, Erige Oya, Talkote Ara/Oya, Kiri Oya and Madyamala Oya from the west drain the majority of the 249 km^2 catchment area of the reservoir, yet contribute little to the total annual inflow. The major inflow is from the Elahera-Minneriya Yoda Ela, fed by the Amban Ganga via the Elahera anicut some 30 km south of the tank (CEA, 1993).

Little attention has been given to the aquatic faunal diversity of the Minneriya National Park. A wetland report and conservation management plan prepared by the Central Environmental Authority (CEA, 1993) provides an inventory of 31 species of fish in Minneriya Wewa, belonging to 12 families and 22 genera. These include four endemics and eight exotics. The current management plan for the National Park provides an inventory of 26 fish species, of which 4 are endemic (DWC, 2005).

Diversity within sub-basins

A total of 31 species of fish, belonging to 12 families and 21 genera, were recorded from the nine river sub-basins sampled in the present Survey, of which seven species are endemic, 20 indigenous and four are exotic species. The only nationally threatened species is the endemic blotched filamented barb (*Puntius srilankensis*), which is Endangered. The distribution of sampling effort across the different sites is shown in Annex 2 and a list of specimens collected and identified is provided in Annex 3. A list of species recorded within the different water bodies is given in Annex 4.

Drainage units

Levels of diversity and endemism, together with measures of diversity, within the drainage units are summarised in Table 8.1. Kiri Oya has much the highest species richness among the nine streams sampled, with twice as many species as Madyamala Ela, Batu Oya and Mahaweli Ela, the next most diverse streams. Species richness is much lower in Dambagaha Ulpatha Ela, Erige Oya and Halmilla Ela. Of the four tanks surveyed, highest species richness was recorded in Minneriya Wewa and second highest in Maha Wewa. Species richness is much lower in Madyamala Wewa and Halmillawa Wewa.

Table 8.1 Freshwater fish diversity indices and estimates for drainage units, based on sampling protocol. Rivers/streams are shown in black font and reservoirs/tanks in white font.

Water body	Total [N = 42]	Batu Oya [N = 2]	Dambagaha Ulpatha Ela [N = 2]	Erige Oya [N = 2]	Halmilla Ela [N = 2]	Kiri Oya [N = 8]	Madyamala Ela [N = 4]	Mahaweli Ela [N = 2]	Pihimbiya Ela [N = 2]	Thalkote Ara [N = 4]	Halmillawa Wewa [N =1]	Madyamala Wewa [N = 1]	Maha Wewa [N = 4]	Minneriya Wewa [N = 8]
Total number of species	31	12	7	7	5	25	13	12	9	9	6	5	14	18
Number of endemic species	7	3	2	2	3	7	3	5	3	4	1	1	6	2
Diversity indices/estimates														
Species richness [S]	31	12	7	7	5	25	13	12	9	9	6	5	14	18
Shannon entropy [exp(H)]	13.61	5.67	4.39	3.78	4.38	8.70	6.23	6.33	5.13	4.01	3.56	3.39	7.54	6.68
Gini-Simpson [1/D]	9.55	3.35	3.53	2.91	4.10	5.51	4.26	3.94	3.99	3.35	2.99	2.84	5.65	4.32
Chao 2 estimate S	33.25	n/a	n/a	n/a	n/a	35.13	25.50	n/a	n/a	9.00	n/a	n/a	26.25	21.60
Bootstrap estimate S	32.53	n/a	n/a	n/a	n/a	28.64	14.66	n/a	n/a	10.60	n/a	n/a	16.35	20.60

Species diversity measures are largely consistent with these trends, with one notable exception. Species richness is higher in Minneriya Wewa than Maha Wewa but species diversity is higher in the latter. This is due to the greater evenness in the distribution of species abundances in Maha Wewa, in contrast to the occurrence of common species (e.g. *Oreochromis niloticus, O. mossambicus*) in larger numbers in Minneriya Wewa.

The data in Table 8.1 and Annex 4 suggest that the endemic species tend to be more prevalent in streams than in tanks. All seven endemic species were recorded in Kiri Oya, including the Endangered *Puntius srilankensis* which is relatively abundant both here and in Erige Oya. Elsewhere, this species was recorded only in Thalkote Ara where it is scarce (Annex 4). Five endemics were recorded in the Mahaweli Ela but in low numbers, with the exception of *Chela laubuca*. Other streams sampled have only two or three of these endemics. Six of these endemics were recorded in Maha Wewa, most species being fairly numerous. Only two species were recorded in Minneriya Wewa and a single species in the other two tanks.

Water quality

No assessment was made of water quality as field equipment was not in working order.

Discussion

The CEA (1993) inventory of 31 fish species in Minneriya Wewa includes 15 species that were not recorded in this Survey, either in Minneriya Wewa or any of the other water bodies sampled (Annex 4). Only 18 species were recorded in Minneriya Wewa during the present Survey. The large difference between the two surveys could be due to a combination of different methodologies and sampling intensities, as well as seasons surveyed. Thus, as many as 47 species have been recorded from the water bodies in Minneriya National Park but more extensive sampling of Minneriya Wewa, in particular, is required in different seasons to confirm whether or not some of the previously recorded species, including the three endemic species, continue to be present. Also, the absence of the exotic carp species (*Hypothalmichthys molitrix*) in the present Survey is likely to reflect the termination of the Ministry of Fisheries programme several years ago to re-stock tanks with carp fingerlings. Earlier stocks may have been completely harvested over the years, given that this species is not known to reproduce in natural systems in this area, unlike in Uda Walawe Reservoir from where there are reports to the contrary.

Significant findings

- Minneriya National Park contains a diverse and important assemblage of fish represented by 29 (35%) of the 82 indigenous species of freshwater fish in the country. This total includes two species not recorded by the Survey team but reported by fisherman. It comprises seven (16%) of Sri Lanka's 44 endemic freshwater fish species, of which one species (*Puntius srilankensis*) is Endangered. The most abundant family is Cyprinidae and the most common genus is *Puntius*, also within the Cyprinidae.
- The high species richness and diversity and their relative abundance in Minneriya Wewa and Maha Wewa, together with the high proportion of endemic species in the case of Minneriya Wewa, indicate the importance of these two tanks as ecosystems for fish and the many bird species that are dependant on fish as their main food source.
- The absence of 15 species recorded previously in Minneriya Wewa (CEA, 1993) may be due to differences in sampling seasons and methods but it could also reflect changes in the fish fauna over the last 15 years. This requires further study as potentially nine indigenous species, including three endemics, could have been lost from the system. The presence of the exotic *Pterygoplichthys multiradiatus*, not previously recorded in Minneriya Wewa, is of concern as this species is considered by local people to be detrimental to indigenous species. Only recorded in low abundance in this Survey (Annex 4), fisherman reported that large numbers of this

species get entangled in their gill nets. It is thought that this species enters the tank accidentally from ornamental fish farms in the area.

- Examination of the distribution of exotic fish species within water bodies in the National Park shows that *Oreochromis mossambicus*, one of the first species introduced to Sri Lanka in 1958, is confined mainly to Minneriya Wewa where it is abundant. Elsewhere, it was recorded in Batu Oya and Kiri Oya but low in abundance. *O. niloticus* is the most abundant species recorded in Minneriya Wewa and it is more widely distributed, but low in abundance, in other water bodies.
- Streams are particularly important for retaining biodiversity in Minneriya National Park, exceptionally Kiri Oya with its highest species richness of any water body surveyed and also Madyamala Ela, Batu Oya and Mahaweli Ela. It is very important to maintain the present ecological and hydrological conditions of such streams.

Adequacy and shortcomings of survey data

- Estimates of potential species richness, using Chao2 and Bootstrap, were generated only for water bodies that were sampled from four or more locations. In most cases such estimates are much higher than recorded species richness, indicating the need for further sampling. In the case of Minneriya Wewa, with 18 species recorded, estimates are only a little higher (20-21) and do not account for the prior records of an additional 15 species not recorded during the present Survey, of which three are endemic and 6 are exotic species. Further sampling is required in Minneriya Wewa in different seasons to confirm whether or not such species continue to be present as well as elsewhere in other water bodies to achieve more robust estimates of potential species richness.
- Water quality should be measured and monitored, particularly given the importance of the fish fauna for conservation, fish-eating birds and as a fishery for local communities.

9. OVERVIEW (Authors: Michael J.B. Green, Ric How and U.K.G.K. Padmalal)

Data limitations

Examination of sampling adequacy for plant and vertebrate groups (Tables 4.1, 5.1, 6.1, 7.1 and 8.1) indicates that further sampling of al taxonomic groups would be appropriate to better document the biodiversity of Minneriya National Park. The further analyses presented in this section need to be treated with caution as data for some taxonomic groups in certain habitats are still preliminary in terms of sample size.

Comparative analyses

Flora and fauna diversity within habitats and drainage units

Species richness and diversity indices are shown in Table 9.1 for all terrestrial taxonomic groups within the five habitats surveyed at Minneriya. These data reflect the highly variable responses of terrestrial groups to the different habitats. Species richness is highest for plants, reptiles, birds and mammals in undisturbed and, to a lesser extent in most cases, disturbed Dry-Mixed Evergreen Forest (the most frequently sampled habitat); and for amphibians in Grassland. Undisturbed Dry-Mixed Evergreen Forest has the highest diversity for plants, disturbed Dry-Mixed Evergreen Forest for reptiles, and Grassland for amphibians, birds and mammals. The apparent anomalies between species richness and diversity in the case of birds and mammals can be explained by the more even distribution of species abundance, as considered in Sections 6.2 and 7.2, respectively.

Table 9.1 Flora and fauna diversity within terrestrial habitats [N is the number of quadrats.]

Habitat type	Total	Dry-Mixed Evergreen Forest		Scrub	Bamboo	Grassland
		Undisturbed	Disturbed			
	[N=96]	[N=43]	[N=29]	[N=10]	[N=4]	[N=10]
Species richness						
Plants	107	70	62	35	6	15
Amphibians	10	4	1	1	0	8
Reptiles	21	10	13	3	0	7
Birds	126	91	88	56	41	73
Mammals	29	22	19	16	7	14
Diversity index Shannon entropy [exp(H)]						
Plants	29.87	21.01	19.11	18.07	2.37	5.04
Amphibians	6.74	3.59	1.00	1.00	-	5.54
Reptiles	10.86	5.99	10.62	2.83	-	6.61
Birds	45.93	35.59	37.52	31.24	31.31	44.24
Mammals	8.42	7.66	4.95	7.96	5.84	9.87

The floristic relationship of 86 quadrats dominated by woody plants and bamboo presented earlier in Figure 4.1a shows the clear separation into 13 statistically different associations, including a clear distinction between the two associations in Bamboo habitat and the other 11 associations in the three habitats (undisturbed and disturbed Dry-Mixed Evergreen Forest and Scrub) dominated by woody plants. Similarly, two associations can be identified among the 10 Grassland quadrats examined (Figure 4.1b).

Datasets are sufficiently extensive for birds and fish to warrant similar analyses of their respective faunal assemblages. However, findings need to be treated judiciously because some habitats or drainage units are shown to have been inadequately sampled, based on Chao2 and Bootstrap estimates of potential species richness (Tables 6.1 and 8.1).

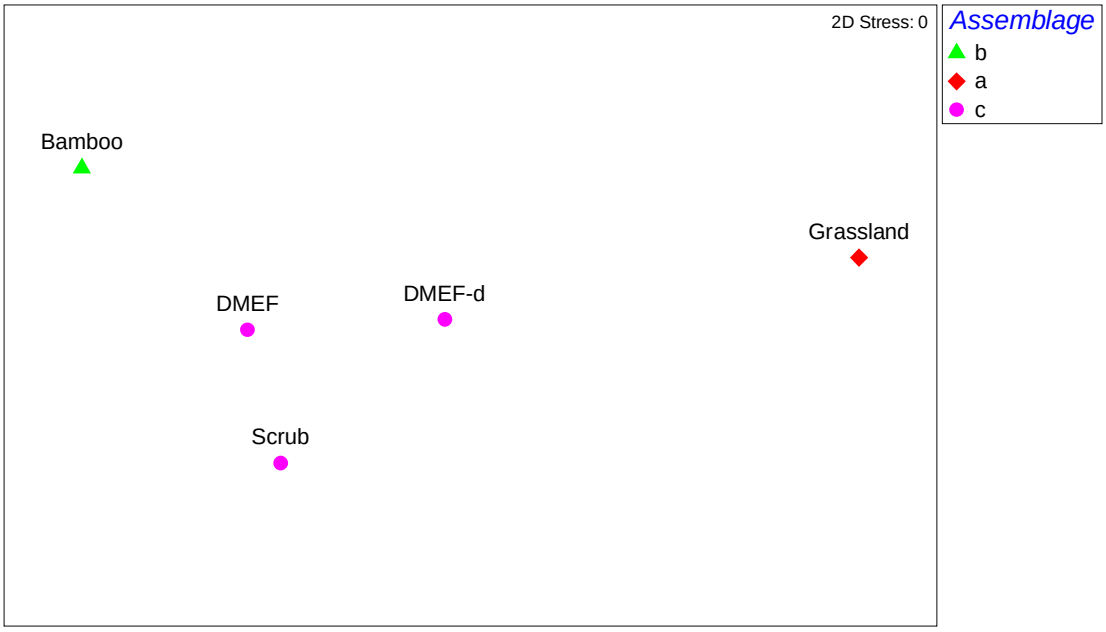

Figure 9.1 Multi-dimensional Scaling ordination of bird assemblages in the five habitats surveyed at Minneriya, based on square-root transformed abundance data and the Bray Curtis coefficient of similarity plotted in two dimensions. Assemblages are represented by different colours and symbols.

In the case of birds, three statistically different assemblages can be identified, of which one is confined to Bamboo, a second is unique to Grassland and the third is common to Scrub and both undisturbed and disturbed Dry-Mixed Evergreen Forest (Figure 9.1).

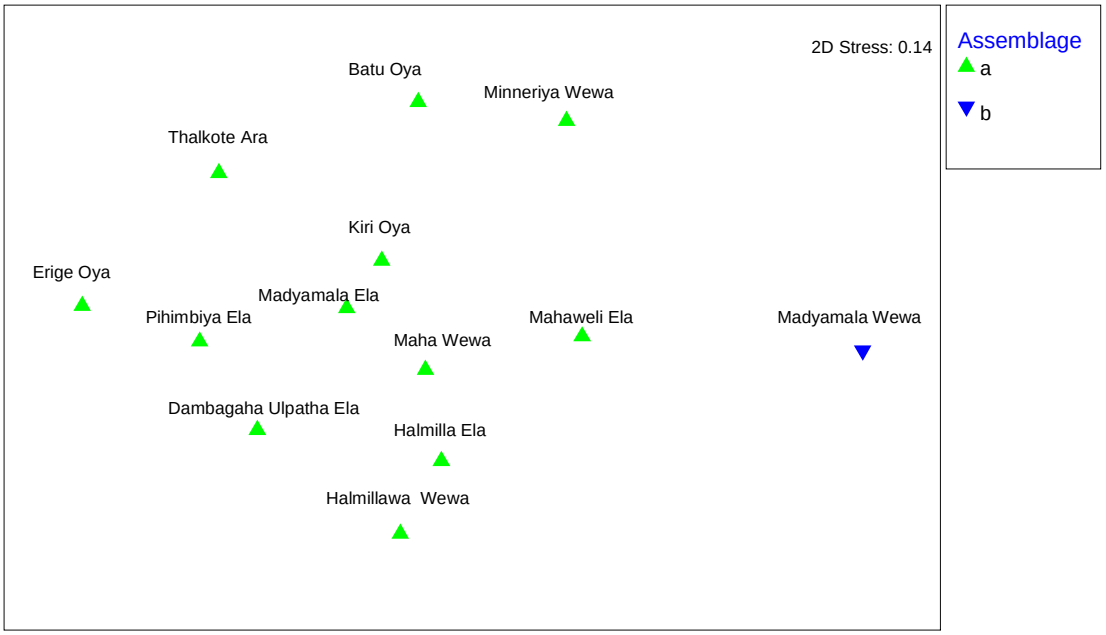

Figure 9.2 Multi-dimensional Scaling ordination of drainage units based on square-root transformed abundance data and Bray-Curtis similarity for fish assemblages plotted in two dimensions. Assemblages are represented by different symbols and colours.

Ordination analysis of fish assemblages shows that there is no statistical difference between drainage units and no difference between assemblages in rivers and tanks (Figure 9.2). The only exception is Madyamala Wewa, for which there is only a single sample and, therefore, this result is tentative.

Conclusions

Key findings arising from this Survey and their implications for conservation and management are summarised below. Future priorities for biodiversity monitoring and related research are identified.

Key biodiversity values

- Minneriya supports a high diversity of plant associations (15), particularly within its Dry-Mixed Evergreen Forest for which three associations are unique to undisturbed and three to disturbed forest types. A further two associations are unique to Bamboo, one to Scrub and two to Grassland. Of the remaining four associations, two are common to undisturbed and disturbed Dry-Mixed Evergreen Forest, one is common to Scrub and disturbed Dry-Mixed Evergreen Forest and one is common to undisturbed and disturbed Dry-Mixed Evergreen Forest and Scrub. This level of diversity is higher than recorded elsewhere in the Dry Zone at Uda Walawe for quadrats dominated by woody plants, which comprise 10 associations, but not those dominated by grasses, which comprise five associations (DWC, 2008c).
- The mosaic of terrestrial habitats supports an important and rich diversity of vertebrate species compared with some other protected areas in the Dry Zone. Herpetofauna records from Minneriya, for example, comprise 54 species as compared with 41 species recorded from Uda Walawe (DWC, 2008c). In both protected areas, records include a potentially new species of snakeskink, *Nessia*. The avifauna comprises 56% of the country's breeding residents, including many common species. The mammal fauna, comprising 36 species, is comparable in species richness to that of Uda Walawe (35 species) and Ritigala (37 species), based on records from the Biodiversity Baseline Survey (DWC, 2008b, 2008c).
- Species richness in highest in Dry-Mixed Evergreen Forest for plants, reptiles, birds and mammals; and in Grassland for amphibians. It is lowest for all plant and vertebrate taxonomic groups in Bamboo.
- Minneriya supports a resident population of 150-200 elephants. Herds of 200-300 may congregate during the dry season (July-October), when other elephants move into the National Park from the eastern side (DWC, 2005).
- The freshwater fish fauna includes seven endemic taxa in a rich assemblage of 29 indigenous species, which represents 35% of the 82 species of indigenous freshwater fish in the country. The fish fauna is important for certain piscivorous bird species and Minneriya Wewa is also important as a fishery for local communities.

Conservation and management implications

- The main habitats surveyed comprise a range of floristic associations and faunal assemblages of species that may require specific management provisions to ensure that their diversity is maintained. The spread of Bamboo, for example, may require intervention measures.
- Scrub, Bamboo and Grassland habitats was poorly sampled and may contain additional and potentially important associations of plants and assemblages of vertebrates.
- The persistence of a rich and diverse avifauna is predicated on the maintenance of healthy ecosystems and management regimes that encourage the juxtaposition of a diverse array of habitats, as indicated by the distinct assemblages within different habitats (Figure 9.1).
- It is very important to maintain the present ecological and hydrological conditions of streams such as Kiri Oya, with its exceptionally high richness of fish species, and also Madyamala Ela,

Batu Oya and Mahaweli Ela in order to safeguard the indigenous fish fauna.

- Present levels of fishing from Minneriya Wewa should not be exceeded as this could jeopardise the fishery and the bird fauna dependent on the fish. The presence of the exotic *Pterygoplichthys multiradiatus*, not previously recorded in Minneriya Wewa, is of concern as this species is well known to be detrimental to indigenous species.
- Data gathered from this Biodiversity Baseline Survey should be used to inform management activities, notably through the management planning and implementation process, and to provide new information on biodiversity for community outreach work and for the benefit of visitors. The special importance of the National Park and its surrounding complex of protected areas as a refugium in the Dry Zone for different ecosystems, plant associations and faunal assemblages, as well as elephant, a keystone species, should be highlighted in this outreach program.

Future directions and priorities

Baseline data and survey protocols have been established for future biodiversity monitoring for which future priorities are considered to be as follows:

- In the short-term, over the next five years, surveys should be expanded temporally (e.g. dry season) and spacially (notably Scrub, Bamboo, Grassland and, in the case of drainage units, Madyamala Wewa) to fill major gaps not covered by this Survey. This should include measures of water quality, which provide indicators not only of the health of aquatic systems but also the wider landscape in the National Park and the surrounding protected areas complex.
- In the longer term (7-10 years hence), monitoring should commence with repeat surveys undertaken in the same locations covered by this Survey and subsequent surveys undertaken.

The following research priorities arising from the results of the present Survey are identified as follows:

- More detailed analyses of floristic data for undisturbed and disturbed Dry-Mixed Evergreen Forest, in combination with such data for these habitats from other protected areas covered by this Survey, will provide a clearer understanding of the diversity of their associations and their relative conservation importance.
- More replicate samples of Bamboo to establish a sound baseline of its vertebrate diversity and subsequent monitoring to inform potential measures to control its spread and impact on other vegetation types.
- More intensive surveys of Minneriya Wewa are required to confirm the presence or absence of 15 species recorded some 15 years ago, comprising nine indigenous species, of which three are endemic, and six exotics.
- Assessing historic and contemporary changes in the composition and abundance of fish species is important in understanding past and potential impacts of exotics on indigenous and, especially, endemic species. Study of the impact of *Oreochromis* species on the indigenous and endemic fish fauna is considered to be a priority.
- A feasibility study of the removal of the exotic *Pterygoplichthys multiradiatus* from Minneriya Wewa, possibly with the support of the fishermen operating in the tank.

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Annex 1 Geographic coordinates of sampling locations

AQUATIC LOCATIONS

NAME	NORTHING	EASTING	SITE No.	No. SAMPLES[4]
Thalkote Ara	313423	206349	1	5
Rambawila (Minneriya Wewa)	313534	209908	2	1
Rambawila (Minneriya Wewa)	313534	209908	3	1
Rambawila (Minneriya Wewa)	313437	209389	4	2
Batu Oya (Minneriya Wewa)	316207	211093	5	1
Thalgasdoowa (Minneriya Wewa)	315287	210850	6	2
Batu Oya	316356	210827	7	1
Batu Oya	316781	210557	8	1
Kiri Oya	313135	208686	9	1
Kiri Oya	312961	209359	10	1
Thalkote Ara	313418	206340	11	1
Kiri Oya	312826	208102	12	1
Thalkote Ara	312892	206564	13	1
Thalkote Ara	314439	205966	14	1
Erige Oya	311770	204211	15	1
Erige Oya	313055	203230	16	1
Katukeliyawa (Minneriya Wewa)	308943	211691	17	1
Maha Wewa	309830	203742	18	1
Maha Wewa	309761	203654	19	1
Pihimbiya Ela	308821	202373	20	1
Kiri Oya (Gal linda side)	316207	205039	21	1
Kiri Oya (Gal linda side)	310511	204820	22	1
Kiri Oya (Gal linda side)	310126	204929	23	1
Dambagaha Ulpatha Ela	311040	204011	24	1
Dambagaha Ulpatha Ela	310211	202807	25	1
Pihimbiya Ela	309066	202742	26	1
Kiri Oya (Pekkulama side)	302377	202397	27	1
Kiri Oya (Pekkulama side)	302990	203278	28	1
Maha Wewa	309761	203653	29	1
Madyamala Wewa	308257	207967	30	1
Stream from Madyamala Wewa	308445	208047	31	1
Stream from Madyamala Wewa	308623	208319	32	1
Stream from Madyamala Wewa	308620	208573	33	1
Stream from Madyamala Wewa	308740	208948	34	1
Mahaweli Ela	307732	210209	35	1
Mahaweli Ela	308042	210376	36	1
Halmilla Ela	308795	212235	37	1
Halmilla Ela	308985	212360	38	1
Halmillawa Wewa	309006	212400	39	1
Katukeliyawa (Minneriya Wewa)	308723	212127	40	1
Katukeliyawa Beat Office (Minneriya Wewa)	308720	211760	41	1
Maha Wewa	309761	203653	42	1

[4] Number of samples refers to the number of attempts to catch fish, some of which were unsuccessful.

TERRESTRIAL LOCATIONS

Transect	Quadrat	Habitat	Altitude m	GPS start Easting	GPS start Northing
1	A	Dry-Mixed Evergreen Forest - disturbed	229	206976	313664
1	B	Dry-Mixed Evergreen Forest - disturbed	227	206969	313619
1	C	Dry-Mixed Evergreen Forest - disturbed	165	206774	313591
1	D	Dry-Mixed Evergreen Forest - disturbed	169	206756	313649
2	A	Dry-Mixed Evergreen Forest - disturbed	138	204363	313774
2	B	Dry-Mixed Evergreen Forest - disturbed	134	204588	313395
2	C	Dry-Mixed Evergreen Forest - disturbed	120	204794	313416
2	D	Dry-Mixed Evergreen Forest - disturbed	116	205016	313441
3	A	Grassland	95	209240	313894
3	B	Grassland	94	209422	314010
3	C	Grassland	92	209503	313823
3	D	Grassland	92	209313	313694
4	A	Bamboo	90	207576	313037
4	B	Bamboo	95	207670	313009
4	C	Bamboo	98	207666	312987
4	D	Bamboo	102	207790	313039
5	A	Dry-Mixed Evergreen Forest - disturbed	116	206542	313585
5	B	Dry-Mixed Evergreen Forest - disturbed	131	206517	313645
5	C	Dry-Mixed Evergreen Forest - disturbed	108	206388	313574
5	D	Dry-Mixed Evergreen Forest - disturbed	104	206383	313631
6	A	Dry-Mixed Evergreen Forest - disturbed	108	205330	313449
6	B	Dry-Mixed Evergreen Forest - disturbed	109	205551	313477
6	C	Dry-Mixed Evergreen Forest - disturbed	124	205734	313508
6	D	Dry-Mixed Evergreen Forest - disturbed	140	206028	313539
7	A	Grassland	93	209331	313540
7	B	Grassland	94	209361	313429
7	C	Grassland	94	209361	313298
7	D	Grassland	94	209436	313167
8	A	Dry-Mixed Evergreen Forest	108	208272	313323
8	B	Dry-Mixed Evergreen Forest	101	208430	313370
8	C	Dry-Mixed Evergreen Forest	102	208591	313372
8	D	Dry-Mixed Evergreen Forest	102	208720	313426
9	A	Dry-Mixed Evergreen Forest	62	203931	309754
9	B	Dry-Mixed Evergreen Forest	170	203929	309700
9	C	Dry-Mixed Evergreen Forest	165	203859	309645
9	D	Dry-Mixed Evergreen Forest	138	203817	309746
10	A	Dry-Mixed Evergreen Forest	144	203971	309807
10	B	Dry-Mixed Evergreen Forest	187	203942	309923
10	C	Dry-Mixed Evergreen Forest	219	203914	310069
10	D	Dry-Mixed Evergreen Forest - disturbed	170	203956	310032
11	A	Dry-Mixed Evergreen Forest	169	202476	308987
11	B	Dry-Mixed Evergreen Forest	158	202650	309048
11	C	Dry-Mixed Evergreen Forest	177	202742	309060
11	D	Dry-Mixed Evergreen Forest	156	202783	309160
12	A	Dry-Mixed Evergreen Forest	150	202865	309165
12	B	Dry-Mixed Evergreen Forest	144	203031	309228
12	C	Dry-Mixed Evergreen Forest	151	203099	309300
12	D	Dry-Mixed Evergreen Forest	153	203036	309295
13	A	Dry-Mixed Evergreen Forest	150	203780	310157

Transect	Quadrat	Habitat	Altitude m	GPS start Easting	GPS start Northing
13	**B**	Scrub	142	203769	309886
13	**C**	Grassland	133	203580	310021
13	**D**	Grassland	140	203620	310148
14	**A**	Scrub	138	203571	309674
14	**B**	Dry-Mixed Evergreen Forest	136	203665	309748
14	**C**	Scrub	151	203507	309757
14	**D**	Dry-Mixed Evergreen Forest	133	203710	309886
15	**A**	Scrub	150	202698	309261
15	**B**	Scrub	153	202788	309373
15	**C**	Scrub	149	202913	309442
15	**D**	Dry-Mixed Evergreen Forest	137	203047	309432
16	**A**	Dry-Mixed Evergreen Forest	150	203168	309453
16	**B**	Dry-Mixed Evergreen Forest	149	203183	309494
16	**C**	Dry-Mixed Evergreen Forest	154	203271	309560
16	**D**	Dry-Mixed Evergreen Forest	139	203339	309619
17	**A**	Dry-Mixed Evergreen Forest	121	207843	308174
17	**B**	Dry-Mixed Evergreen Forest	130	207725	308152
17	**C**	Dry-Mixed Evergreen Forest	130	207710	308027
17	**D**	Dry-Mixed Evergreen Forest	128	207764	307915
18	**A**	Dry-Mixed Evergreen Forest	125	207902	308167
18	**B**	Dry-Mixed Evergreen Forest	145	207966	307987
18	**C**	Dry-Mixed Evergreen Forest	223	208028	307771
18	**D**	Dry-Mixed Evergreen Forest	302	208089	307592
19	**A**	Dry-Mixed Evergreen Forest	117	207751	308858
19	**B**	Dry-Mixed Evergreen Forest	126	207672	308775
19	**C**	Dry-Mixed Evergreen Forest	133	207552	308768
19	**D**	Dry-Mixed Evergreen Forest	124	207387	308796
20	**A**	Scrub	118	207516	308656
20	**B**	Scrub	121	207611	308517
20	**C**	Scrub	123	207481	308656
20	**D**	Scrub	123	207479	308567
21	**A**	Dry-Mixed Evergreen Forest	112	208657	308258
21	**B**	Dry-Mixed Evergreen Forest	114	208605	308276
21	**C**	Dry-Mixed Evergreen Forest	93	208502	308256
21	**D**	Dry-Mixed Evergreen Forest	114	208370	308282
22	**A**	Dry-Mixed Evergreen Forest - disturbed	119	208940	307957
22	**B**	Dry-Mixed Evergreen Forest - disturbed	120	209177	307954
22	**C**	Dry-Mixed Evergreen Forest - disturbed	114	208789	307937
22	**D**	Dry-Mixed Evergreen Forest - disturbed	123	208530	307937
23	**A**	Dry-Mixed Evergreen Forest - disturbed	112	213080	311078
23	**B**	Dry-Mixed Evergreen Forest - disturbed	109	213035	311227
23	**C**	Dry-Mixed Evergreen Forest - disturbed	110	213018	311020
23	**D**	Dry-Mixed Evergreen Forest - disturbed	114	213033	310882
24	**A**	Dry-Mixed Evergreen Forest - disturbed	105	213435	310835
24	**B**	Dry-Mixed Evergreen Forest - disturbed	112	213418	310902
24	**C**	Dry-Mixed Evergreen Forest - disturbed	110	213285	310880
24	**D**	Dry-Mixed Evergreen Forest - disturbed	107	213277	310878

ANNEX 2 SUMMARY OF SAMPLING EFFORT: MINNERIYA NATIONAL PARK (Survey period: November 2007 – June 2008)

Key to habitats: **Du** DMEF-undisturbed; **Dd** DMEF-disturbed; **Sc** Scrub; **Ba** Bamboo; **Gr** Grassland; **Op** Opportunistic (all habitats)

Taxonomic group	Sampling effort achieved in the field									Method: description	No./km transect	Sampling intensity per habitat type (based on 4 replicates/habitat)
	Method	Sampling effort per habitat type (N = no. quadrats)										
		Du 43	Dd 29	Sc 10	Ba 4	Gr 10			Op			
Small mammals	No. traps set	231	154	66	22	55				**Sherman traps:** located at 10 m intervals within 2 vegetation quadrats (100m x 5m), for 4 nights	22 traps	22 x 4 x 4 = 352 trap nights/ habitat
	Total no. trap nights	924	616	264	88	220						
	No. quadrats sampled	21	14	6	2	5						
Larger mammals	No. traps set	42	28	12	4	10				**Tomahawk traps:** located at each end of 2 vegetation quadrats (100m x 5m), for 4 nights	4 traps	4 x 4 x 4= 64 trap nights/ habitat
	Total no. trap nights	168	112	48	16	40						
	No. quadrats sampled	21	14	6	2	5						
Bats	No. mist nets set	mist netting not undertaken								**Mist nets:** 2 nets (at canopy and ground levels) manned by 2 persons at 6-9am and at 4.30-6.30pm at appropriate location along transect	2 mist nets	2 x 2 x 4 = 16 mist net sessions (totalling 40 mist net hours)/ habitat
	Total hours of mist netting											
	No. quadrats											
	No. mist nets set									**Mist nets:** 2 nets (at canopy and ground levels) manned by 2 persons at 6-9am and at 4.30-6.30pm along selected waterholes, trails and near roosts	2 mist nets	2 x 2 x 4 = 16 mist net sessions (totalling 40 mist net hours)/ habitat
	Total hours of mist netting											
	No. locations											
All mammals	No. quadrats									**Direct observations:** along 1 km transects, recording perpendicular distance from transect to mammal sighted/ spoor	1 km	4 km, variable width/ habitat
Birds on land	No. VCPs completed	172	116	40	16	40				**Variable Circular Plots:** 8 VCPs (radius = 0-10m, 11-20m and >20m) aligned at each end of 4 vegetation quadrats (100m x 5m): birds recorded for 10 mins within each VCP, once at dawn and once at dusk	8 VCPs	8 x 2 x 4 = 64 VCP visits/ habitat
	No. quadrats sampled	43	29	10	4	10						
	No. transects surveyed									**Direct observations:** record birds along 1 km transects between vegetation quadrats	600m	2.4 km/habitat
Birds on water	No. locations on waterbodies counted									**Total counts**: for discrete water bodies, using one or more stations from which to record birds, as appropriate.	n/a	n/a
	Total no. waterbodies surveyed											
Birds	No. mist nets set	mist netting not undertaken								**Mist nets:** 2 nets (at canopy and ground levels) manned by 2 persons during daytime (total of hours)at appropriate location adjacent to transect	2 mist nets	2 x 4 x 6 = 48 mist net hours/ habitat
	Total hours of mist netting											
	No. locations											
Reptiles and amphibians	No. QCTs completed	110	75	20	10	25				**Quadrat cleaning (daytime):** 5 quadrats (5m x 5m) in open habitat, 10m x 2.5m in closed habitat) cleared in each of 2 vegetation quadrats (100m x 5m)	10 quadrats	10 x 4 = 40 quadrats (0.1 ha)/ habitat
	No. quadrats examined	22	15	4	2	5						
	No. nocturnal quadrats examined	unavailable								**100m x 5mm quadrats:** visual encounters at night time	1 quadrat	1 x 4 = 4 quadrats (0.04 ha/habitat)
Vascular plants	No. transects established	24 transects (1 km length) in total								**100m x 5m quadrats:** located at 150m intervals along 1km transect	4	4 x 4 = 16 quadrats (0.8 ha)/ habitat
	No. quadrats sampled	43	29	10	4	10						

Key to drainage units:	**NB** Total number of sampling sites is 42 but only 36 accounted for in table below, based on locations shown in Figure 3.3.												
Freshwater fish	**Sub-basin ref. no. (Figure 3.3)**	**3**	**7**	**10**	**13**	**14**	**15**	**16**	**18**	**23**	**Water quality:** pH, conductivity, phosphate, nitrate, dissolved oxygen, turbidity, temperature recorded at head, mid- and lower reaches of river	n/a	3 x 4 = 12 samples/ subcatchment
	No. fish/water quality locations	1	4	3	2	5	1	2	13	5			

Annex 3 List and reference numbers of voucher specimens

Family	Genus	Species	Specimen number	Date of collection
PLANTS - WOODY				
Annonaceae	*Polyalthia*	*korinti*	M009	
Apocynaceae	*Carissa*	*spinarum*	M006	
Bignoniaceae	*Stereospermum*	*colais*	M007	
Celastraceae	*Cassine*	*glauca*	M013	
Clusiaceae	*Garcinia*	*spicata*	M008	
Ebenaceae	*Diospyros*	*ebenum*	M012	
Ebenaceae	*Diospyros*	*ferrea*	M010	
Ebenaceae	*Diospyros*	*ovalifolia*	M014	
Euphorbiaceae	*Dimorphocalyx*	*glabellus*	M015	
Euphorbiaceae	*Drypetes*	*sepiaria*	M016	
Euphorbiaceae	*Phyllanthus*	*polyphyllus*	M017	
Euphorbiaceae	*Suregada*	*lanceolata*	M002	
Fabaceae	*Bauhinia*	*tomentosa*	M011	
Rubiaceae	*Ixora*	*pavetta*	M001	
Rutaceae	*Limonia*	*acidissima*	M019	
Tiliaceae	*Diplodiscus*	*verrucosus*	M003	
Tiliaceae	*Grewia*	*damine*	M004	
Tiliaceae	*Grewia*	*helicterifolia*	M020	
FISH				
Anabantidae	*Anabas*	*testudineus*	MR-1	24/11/07
Anabantidae	*Anabas*	*testudineus*	MB-1	27/11/07
Anabantidae	*Anabas*	*testudineus*	MK-13	29/11/07
Anabantidae	*Anabas*	*testudineus*	MME10	27/4/2008
Anabantidae	*Anabas*	*testudineus*	MHE-6	28/4/2008
Anabantidae	*Anabas*	*testudineus*	MHW-5	29/4/2008
Anabantidae	*Anabas*	*testudineus*	MKA -10	30/4/2008
Bagridae	*Mystus*	*vittatus*	MTA-8	12/01/2007
Bagridae	*Mystus*	*vittatus*	ME-5	12/02/2007
Bagridae	*Mystus*	*vittatus*	MKA-8	12/03/2007
Bagridae	*Mystus*	*vittatus*	MB-16	28/11/07
Bagridae	*Mystus*	*vittatus*	MK-6	29/11/07
Bagridae	*Mystus*	*vittatus*	MMW-4	25/4/2008
Bagridae	*Mystus*	*vittatus*	MMWS-10	25/4/2008
Bagridae	*Mystus*	*vittatus*	MHW-1	29/4/2008
Belontiidae	*Trichogaster*	*pectoralis*	MB10	28/11/07
Channidae	*Channa*	*striata*	MB-2	27/11/07
Channidae	*Channa*	*striata*	MKBO-2	05/01/2008
Channidae	*Channa*	*striata*	MM -11	05/02/2008
Channidae	*Channa*	*gachua?*	MDE-6	13/3/2008
Channidae	*Channa*	*gachua*	MM-10	16/3/2008
Channidae	*Channa*	*gachua*	MMWS-8	25/4/2008
Channidae	*Channa*	*punctata*	MMWS-11	25/4/2008
Channidae	*Channa*	*striata*	MHW-6	29/4/2008
Channidae	*Channa*	*gachua*	MK-22	03/10/2008
Cichlidae	*Etroplus*	*suratensis*	MKA-9	12/03/2007
Cichlidae	*Etroplus*	*suratensis*	MR-2	24/11/07
Cichlidae	*Etroplus*	*suratensis*	MB-5	27/11/07
Cichlidae	*Etroplus*	*suratensis*	MTD-3	27/11/07
Cichlidae	*Etroplus*	*maculatus*	MB-12	28/11/07
Cichlidae	*Etroplus*	*maculatus*	MK-15	29/11/07
Cichlidae	*Etroplus*	*suratensis*	MKBO-3	05/01/2008
Cichlidae	*Etroplus*	*maculatus*	MKBO-7	05/01/2008

Family	Genus	Species	Specimen number	Date of collection
Cichlidae	*Oreochromis*	*niloticus*	MKA-4	12/03/2007
Cichlidae	*Oreochromis*	*mossambicus*	MKA-5	12/03/2007
Cichlidae	*Oreochromis*	*mossambicus*	MR-4	24/11/07
Cichlidae	*Oreochromis*	*niloticus*	MR-10	25/11/07
Cichlidae	*Oreochromis*	*mossambicus*	MB-3	27/11/07
Cichlidae	*Oreochromis*	*niloticus*	MB-4	27/11/07
Cichlidae	*Oreochromis*	*mossambicus*	MTD-1	27/11/07
Cichlidae	*Oreochromis*	*niloticus*	MTD-2	27/11/07
Cichlidae	*Oreochromis*	*mossambicus*	MK-9	29/11/07
Cichlidae	*Oreochromis*	*niloticus*	MK-11	29/11/07
Cichlidae	*Oreochromis*	*niloticus*	MKBO-1	05/01/2008
Cichlidae	*Oreochromis*	*niloticus*	MMW-1	25/4/2008
Cichlidae	*Oreochromis*	*niloticus*	MMWS-13	26/4/2008
Cichlidae	*Oreochromis*	*niloticus*	MME9	27/4/2008
Cichlidae	*Oreochromis*	*niloticus*	MHW-4	29/4/2008
Cichlidae	*Oreochromis*	*niloticus*	MM-1	03/08/2008
Cobitidae	*Lepidocephalichthys*	*thermalis*	MPE-7	14/3/2008
Cobitidae	*Lepidocephalichthys*	*thermalis*	MK-26	15/3/2008
Cobitidae	*Lepidocephalichthys*	*thermalis*	MMWS-12	26/4/2008
Cyprinidae	*Amblypharyngodon*	*melletinus*	MKA-7	12/03/2007
Cyprinidae	*Amblypharyngodon*	*melletinus*	MR-8	24/11/07
Cyprinidae	*Amblypharyngodon*	*melletinus*	MB-8	27/11/07
Cyprinidae	*Amblypharyngodon*	*melletinus*	MTD-4	27/11/07
Cyprinidae	*Amblypharyngodon*	*melletinus*	MK-2	29/11/07
Cyprinidae	*Amblypharyngodon*	*melletinus*	MTA-4	30/11/07
Cyprinidae	*Amblypharyngodon*	*melletinus*	MM-9	16/3/2008
Cyprinidae	*Amblypharyngodon*	*melletinus*	MMWS-6	25/4/2008
Cyprinidae	*Amblypharyngodon*	*melletinus*	MME5	27/4/2008
Cyprinidae	*Chela*	*laubuca*	MB-17	28/11/07
Cyprinidae	*Chela*	*laubuca*	MK-16	30/11/07
Cyprinidae	*Chela*	*laubuca*	MDE-5	13/3/2008
Cyprinidae	*Chela*	*laubuca*	MMWS-2	25/4/2008
Cyprinidae	*Chela*	*laubuca*	MME1	27/4/2008
Cyprinidae	*Chela*	*laubuca*	MHE-4	28/4/2008
Cyprinidae	*Chela*	*laubuca*	MM-5	03/08/2008
Cyprinidae	*Devario*	*malabaricus*	ME-2	12/02/2007
Cyprinidae	*Devario*	*malabaricus*	MKA-2	12/03/2007
Cyprinidae	*Devario*	*malabaricus*	MR-6	24/11/07
Cyprinidae	*Devario*	*malabaricus*	MB-13	28/11/07
Cyprinidae	*Devario*	*malabaricus*	MK-1	29/11/07
Cyprinidae	*Devario*	*malabaricus*	MTA-1	30/11/07
Cyprinidae	*Devario*	*malabaricus*	MDE-2	13/3/2008
Cyprinidae	*Devario*	*malabaricus*	MMWS-7	25/4/2008
Cyprinidae	*Devario*	*malabaricus*	MPE -1	03/09/2008
Cyprinidae	*Esomus*	*thermoicos*	MB-15	28/11/07
Cyprinidae	*Esomus*	*thermoicos*	MK-3	29/11/07
Cyprinidae	*Esomus*	*thermoicos*	MTA-2	30/11/07
Cyprinidae	*Esomus*	*thermoicos*	MPE-5	14/3/2008
Cyprinidae	*Esomus*	*thermoicos*	MMWS-5	25/4/2008
Cyprinidae	*Esomus*	*thermoicos*	MME4	27/4/2008
Cyprinidae	*Garra*	*ceylonensis*	ME-7	12/02/2007
Cyprinidae	*Garra*	*ceylonensis*	MTA-5	30/11/07
Cyprinidae	*Garra*	*ceylonensis*	MK-17	30/11/07
Cyprinidae	*Garra*	*ceylonensis*	MM-6	03/08/2008
Cyprinidae	*Garra*	*ceylonensis*	MPE -4	03/09/2008
Cyprinidae	*Labeo*	*dussumieri*	MB-7	27/11/07
Cyprinidae	*Labeo*	*dussumieri*	MKBO-5	05/01/2008
Cyprinidae	*Puntius*	*srilankensis*	MTA-6	12/01/2007

Family	Genus	Species	Specimen number	Date of collection
Cyprinidae	*Puntius*	*dorsalis*	MTA-7	12/01/2007
Cyprinidae	*Puntius*	*amphibius*	MTA-9	12/01/2007
Cyprinidae	*Puntius*	*srilankensis*	ME-3	12/02/2007
Cyprinidae	*Puntius*	*dorsalis*	ME-6	12/02/2007
Cyprinidae	*Puntius*	*amphibius*	MKA-3	12/03/2007
Cyprinidae	*Puntius*	*amphibius*	MR-5	24/11/07
Cyprinidae	*Puntius*	*singhala*	MR-9	24/11/07
Cyprinidae	*Puntius*	*dorsalis*	MR-11	25/11/07
Cyprinidae	*Puntius*	*amphibius*	MB-9	27/11/07
Cyprinidae	*Puntius*	*amphibius*	MTD-5	27/11/07
Cyprinidae	*Puntius*	*srilankensis*	MK-5	29/11/07
Cyprinidae	*Puntius*	*amphibius*	MK-8	29/11/07
Cyprinidae	*Puntius*	*singhala*	MM -12	05/02/2008
Cyprinidae	*Puntius*	*amphibius*	MDE-1	13/3/2008
Cyprinidae	*Puntius*	*bimaculatus*	MDE-4	13/3/2008
Cyprinidae	*Puntius*	*amphibius*	MPE-6	14/3/2008
Cyprinidae	*Puntius*	*chola*	MMW-2	25/4/2008
Cyprinidae	*Puntius*	*singhala*	MMW-3	25/4/2008
Cyprinidae	*Puntius*	*bimaculatus*	MMWS-3	25/4/2008
Cyprinidae	*Puntius*	*ticto*	MMWS-4	25/4/2008
Cyprinidae	*Puntius*	*singhala*	MME2	27/4/2008
Cyprinidae	*Puntius*	*bimaculatus*	MME3	27/4/2008
Cyprinidae	*Puntius*	*chola*	MME6	27/4/2008
Cyprinidae	*Puntius*	*dorsalis*	MME7	27/4/2008
Cyprinidae	*Puntius*	*amphibius*	MME8	27/4/2008
Cyprinidae	*Puntius*	*ticto*	MME-11	27/4/2008
Cyprinidae	*Puntius*	*amphibius*	MHE-1	28/4/2008
Cyprinidae	*Puntius*	*singhala*	MHE-2	28/4/2008
Cyprinidae	*Puntius*	*amphibius*	MHW-3	29/4/2008
Cyprinidae	*Puntius*	*singhala*	MKA- 11	30/4/2008
Cyprinidae	*Puntius*	*amphibius*	MKA- 12	30/4/2008
Cyprinidae	*Puntius*	*amphibius*	MM-2	03/08/2008
Cyprinidae	*Puntius*	*ticto*	MM-4	03/08/2008
Cyprinidae	*Puntius*	*bimaculatus*	MM-7	03/08/2008
Cyprinidae	*Puntius*	*bimaculatus*	MPE -2	03/09/2008
Cyprinidae	*Puntius*	*singhala*	MK-18	03/10/2008
Cyprinidae	*Puntius*	*dorsalis*	MK-19	03/10/2008
Cyprinidae	*Puntius*	*ticto*	MK-20	03/10/2008
Cyprinidae	*Puntius*	*chola*	MK-21	03/10/2008
Cyprinidae	*Puntius*	*bimaculatus*	MK-23	03/10/2008
Cyprinidae	*Rasbora*	*caverii*	ME-1	12/02/2007
Cyprinidae	*Rasbora*	*caverii*	MKA-1	12/03/2007
Cyprinidae	*Rasbora*	*caverii*	MR-7	24/11/07
Cyprinidae	*Rasbora*	*caverii*	MB-14	28/11/07
Cyprinidae	*Rasbora*	*caverii*	MK-4	29/11/07
Cyprinidae	*Rasbora*	*caverii*	MTA-3	30/11/07
Cyprinidae	*Rasbora*	*caverii*	MDE-3	13/3/2008
Cyprinidae	*Rasbora*	*caverii*	MMWS-1	25/4/2008
Cyprinidae	*Rasbora*	*caverii*	MHE-3	28/4/2008
Cyprinidae	*Rasbora*	*caverii*	MHE-5	28/4/2008
Cyprinidae	*Rasbora*	*caverii*	MHW-2	29/4/2008
Cyprinidae	*Rasbora*	*caverii*	MM-3	03/08/2008
Cyprinidae	*Rasbora*	*caverii*	MPE -3	03/09/2008
Gobiidae	*Awaous*	*melanocephalus*	MKA-6	12/03/2007
Gobiidae	*Awaous*	*melanocephalus*	MR-3	24/11/07
Gobiidae	*Awaous*	*melanocephalus*	MB-6	27/11/07
Gobiidae	*Awaous*	*melanocephalus*	MK-12	29/11/07
Gobiidae	*Glossogobius*	*giuris*	MM- 13	05/02/2008

Family	Genus	Species	Specimen number	Date of collection
Gobiidae	*Glossogobius*	*giuris*	MMW-5	25/4/2008
Gobiidae	*Glossogobius*	*giuris*	MMWS-9	25/4/2008
Gobiidae	*Glossogobius*	*giuris*	MME-12	27/4/2008
Gobiidae	*Glossogobius*	*giuris*	MK-24	03/12/2008
Heteropneustidae	*Heteropneustes*	*fossilis*	MB-11	28/11/07
Heteropneustidae	*Heteropneustes*	*fossilis*	MK-14	29/11/07
Heteropneustidae	*Heteropneustes*	*fossilis*	MKBO-7	05/01/2008
Loricariidae	*Pterygoplichthys*	*multiradiatus*	MKBO-6	05/01/2008
Mastacembelidae	*Mastacembelus*	*armatus*	ME-4	12/02/2007
Mastacembelidae	*Mastacembelus*	*armatus*	MK-7	29/11/07
Siluridae	*Ompok*	*bimaculatus*	MK-10	29/11/07
Siluridae	*Ompok*	*bimaculatus*	MKBO-4	05/01/2008
AMPHIBIANS				
Bufonidae	*Bufo*	*melanostictus*	DWC023	11/03/2008
Bufonidae	*Bufo*	*melanostictus*	DWC024	11/03/2008
Bufonidae	*Bufo*	*melanostictus*	DWC021	11/03/2008
Ranidae	*Fejervarya*	*limnocharis*	DWC033	25/04/2008
Ranidae	*Polypedates*	*maculatus*	DWC032	23/04/2008
Ranidae	*Rana*	*gracilis*	DWC026	10/03/2008
Ranidae	*Rana*	*gracilis*	DWC022	11/03/2008
Ranidae	*Rana*	*gracilis*	DWC025	11/03/2008
Ranidae	*Rana*	*gracilis*	DWC020	12/03/2008
Ranidae	*Rana*	*gracilis*	DWC019	12/03/2008
REPTILES				
Colubridae	*Boiga*	*forsteni*	DWC030	23/04/2008
Colubridae	*Lycodon*	*osmanhilli*	DWC004	25/11/2007
Gekkonidae	*Hemidactylus*	*frenatus*	DWC006	27/11/2007
Gekkonidae	*Hemidactylus*	*frenatus*	DWC007	27/11/2007
Gekkonidae	*Hemidactylus*	*frenatus*	DWC008	27/11/2007
Gekkonidae	*Hemidactylus*	*triedrus*	DWC005	27/11/2007
Scincidae	*Lankascincus*	*fallax*	DWC001	25/11/2007
Scincidae	*Lankascincus*	*fallax*	DWC002	25/11/2007
Scincidae	*Lankascincus*	*fallax*	DWC029	23/04/2008
Scincidae	*Nessia*	sp.	DWC018	12/03/2008
Typhlopidae	*Typhlops*	sp.	DWC003	27/11/2007
Typhlopidae	*Typhlops*	sp.	DWC027	23/04/2008
Typhlopidae	*Typhlops*	sp.	DWC031	24/04/2008
Uropeltidae	*Rhinophis*	*oxyrynchus*	DWC028	27/11/2007
MAMMALS				
Muridae	*Rattus*	*rattus*	MI01	

Annex 4 List of species recorded from Minneriya National Park

Key to species geographic status:
E endemic, **I** indigenous; **M** migrant; **X** exotic

Key to species national conservation status:
EX extinct, **CR** critically endangered, **EN** endangered, **VU** vulnerable, **NT** near threatened

[N] number of quadrats sampled within each habitat. **+** indicates one or more records.

No information

Family	Genus	Species	Geographic status	Conservation status	Opportunistic	Total no. individuals/ records for quadrats [N=96]	No. quadrats within which species recorded in each habitat type					Prior records
							Dry-Mixed Evergreen Forest [N=43]	Dry-Mixed Evergreen Forest - disturbed [N=29]	Scrub [N=10]	Bamboo [N=4]	Grassland [N=10]	
PLANTS - woody												
Acanthaceae	*Barleria*	*prionitis*	I		+							
Acanthaceae	*Stenosiphonium*	*cordifolium*	I	VU	+							
Amaranthaceae	*Gomphrena*	*celosioides*	X		+							
Anacardiaceae	*Lannea*	*coromandelica*	I		+							
Anacardiaceae	*Nothopegia*	*beddomei*	I			10	3					
Anacardiaceae	*Spondias*	*pinnata*	I			1		1				
Annonaceae	*Miliusa*	*indica*	I			1		1				
Annonaceae	*Polyalthia*	*korinti*	I			63	21	2	1			
Annonaceae	*Polyalthia*	*longifolia*	I		+							
Annonaceae	*Xylopia*	*nigricans*	E			1	1					
Apocynaceae	*Alstonia*	*scholaris*	I			1	1					
Apocynaceae	*Carissa*	*carandas*	I			1	1					
Apocynaceae	*Carissa*	*spinarum*	I		+							
Apocynaceae	*Ichnocarpus*	*frutescens*	I		+							
Apocynaceae	*Wrightia*	*angustifolia*	I		+							
Araceae	*Cryptocoryne*	sp.	E		+							
Asclepiadaceae	*Wattakaka*	*volubilis*	I		+							
Asparagaceae	*Asparagus*	*racemosus*	I		+							
Asteraceae	*Ageratum*	*conyzoides*	X		+							
Asteraceae	*Elephantopus*	*scaber*	I		+							
Asteraceae	*Eupatorium*	*odoratum*	X		+							
Asteraceae	*Mikania*	*cordata*	I		+							
Asteraceae	*Vernonia*	*cinerea*	I		+							
Asteraceae	*Vernonia*	*zeylanica*	E		+							
Asteraceae	*Xanthium*	*indicum*	I		+							
Bignoniaceae	*Stereospermum*	*colais*	I			3		2				
Boraginaceae	*Carmona*	*retusa*	I			1	1					
Boraginaceae	*Cordia*	*dichotoma*	I			2	2					
Boraginaceae	*Ehretia*	*laevis*	I		+							
Capparaceae	*Capparis*	*rotundifolia*	I		+							
Capparaceae	*Capparis*	*sepiaria*	I		+							
Capparaceae	*Capparis*	*zeylanica*	I			1		1				
Capparaceae	*Crateva*	*adansonii*	I		+							
Celastraceae	*Cassine*	*glauca*	E		+							
Celastraceae	*Maytenus*	*emarginata*	I		+							
Clusiaceae	*Garcinia*	*spicata*	I			9	1	1				
Colchicaceae	*Gloriosa*	*superba*	I		+							
Combretaceae	*Terminalia*	*arjuna*	I			1	1					
Commelinaceae	*Commelina*	sp.	I		+							
Connaraceae	*Connarus*	*monocarpus*	I		+							
Convolvulaceae	*Argyreia*	*osyrensis*	I		+							
Convolvulaceae	*Evolvulus*	*alsinoides*	I		+							

Convolvulaceae	*Ipomoea*	*obscura*	I		+							
Convolvulaceae	*Ipomoea*	*pes-tigridis*	I		+							
Cycadaceae	*Cycas*	*circinalis*	I			1		1				
Cyperaceae	*Cyperus*	*rotundus*	I			6					1	
Cyperaceae	*Fimbristylis*	sp.	I			10					1	
Ebenaceae	*Diospyros*	*ebenum*	I	EN		31	15	9		1		
Ebenaceae	*Diospyros*	*ferrea*	I			10	2	3	2			
Ebenaceae	*Diospyros*	*malabarica*	I		+							
Ebenaceae	*Diospyros*	*oocarpa*	I	VU		1	1					
Ebenaceae	*Diospyros*	*ovalifolia*	I			185	38	16	3			
Euphorbiaceae	*Bridelia*	*retusa*	I		+							
Euphorbiaceae	*Cleistanthus*	*pallidus*	E			29	4	5				
Euphorbiaceae	*Croton*	*hirtus*	X		+							
Euphorbiaceae	*Croton*	*laccifer*	I			3	1	2				
Euphorbiaceae	*Croton*	*officinalis*	I		+							
Euphorbiaceae	*Dimorphocalyx*	*glabellus*	I			252	25	10				
Euphorbiaceae	*Drypetes*	*sepiaria*	I			481	36	21	4			
Euphorbiaceae	*Euphorbia*	*antiquorum*	I			14		3				
Euphorbiaceae	*Euphorbia*	*heterophylla*	X		+							
Euphorbiaceae	*Flueggea*	*leucopyrus*	I			9	1	4	1			
Euphorbiaceae	*Givotia*	*moluccana*	I			1	1					
Euphorbiaceae	*Mallotus*	*rhamnifolius*	I			234	39	10	1			
Euphorbiaceae	*Margaritaria*	*indicus*	I		+							
Euphorbiaceae	*Mischodon*	*zeylanicus*	I			3	1			1		
Euphorbiaceae	*Phyllanthus*	*polyphyllus*	I			102	26	12	5			
Euphorbiaceae	*Phyllanthus*	*reticulatus*	I			36					3	
Euphorbiaceae	*Sapium*	*insigne*	I			2	1	1				
Euphorbiaceae	*Suregada*	*lanceolata*	I			3	2					
Euphorbiaceae	*Tragia*	*plukenetii*	I		+							
Fabaceae	*Abrus*	*precatorius*	I		+							
Fabaceae	*Acacia*	*leucophloea*	I			2		1	1			
Fabaceae	*Alysicarpus*	*vaginalis*	I		+							
Fabaceae	*Bauhinia*	*racemosa*	I			61	4	8	9	3		
Fabaceae	*Bauhinia*	*tomentosa*	I			1	1					
Fabaceae	*Cassia*	*auriculata*	I		+							
Fabaceae	*Cassia*	*fistula*	X			42	10	13	2			
Fabaceae	*Cassia*	*occidentalis*	I		+							
Fabaceae	*Cassia*	*roxburghii*	I			1		1				
Fabaceae	*Cassia*	*tora*	I			2					1	
Fabaceae	*Crotalaria*	*laburnifolia*	I		+							
Fabaceae	*Crotalaria*	*verrucosa*	I		+							
Fabaceae	*Cynometra*	*zeylanica*	E		+							
Fabaceae	*Derris*	*parviflora*	E			15	4	6	1			
Fabaceae	*Derris*	*scandens*	I		+							
Fabaceae	*Desmodium*	*triflorum*	I			3					2	
Fabaceae	*Dichrostachys*	*cinerea*	I			1			1			
Fabaceae	*Flemingia*	*strobilifera*	I		+							
Fabaceae	*Mimosa*	*pudica*	X			1					1	
Fabaceae	*Painteria*	*nitida*	E		+							
Fabaceae	*Tamarindus*	*indica*	X		+							
Fabaceae	*Tephrosia*	*purpurea*	I			34					2	
Fabaceae	*Tephrosia*	*villosa*	I		+							
Fabaceae	*Uraria*	*picta*	I		+							
Flacourtiaceae	*Hydnocarpus*	*venenata*	E			1		1				
Hippocrateaceae	*Reissantia*	*indica*	I		+							
Hippocrateaceae	*Salacia*	*reticulata*	I			5	2		1			
Lamiaceae	*Hyptis*	*suaveolens*	X			38					2	
Lamiaceae	*Leonotis*	*nepetiifolia*	I		+							
Lamiaceae	*Ocimum*	*americanum*	I		+							
Lamiaceae	*Ocimum*	*gratissimum*	I		+							
Lauraceae	*Alseodaphne*	*semecarpifolia*	I			1		1				
Linaceae	*Hugonia*	*mystax*	I			3	1	1				
Loganiaceae	*Strychnos*	*benthamii*	E		+							
Loganiaceae	*Strychnos*	*potatotum*	I			1		1				
Loranthaceae	*Dendrophthoe*	*falcata*	I		+							
Malpighiaceae	*Hiptage*	*benghalensis*	I		+							
Malvaceae	*Abutilon*	*indicum*	I		+							
Malvaceae	*Hibiscus*	*eriocarpus*	I			18	2	5				

Malvaceae	*Hibiscus*	*micranthus*	I		+							
Malvaceae	*Sida*	*acuta*	I		+							
Malvaceae	*Urena*	*lobata*	I		+							
Malvaceae	*Wissadula*	*periplocifolia*	I		+							
Marsileaceae	*Marsilea*	*quadrifolia*	I		+							
Melastomataceae	*Memecylon*	*capitellatum*	E			14	5	2				
Melastomataceae	*Memecylon*	*umbellatum*	I			5	2	1				
Meliaceae	*Aglaia*	*elaeagnoidea*	I			3	1					
Meliaceae	*Azadirachta*	*indica*	I			3		3				
Meliaceae	*Munronia*	*pinnata*	I		+							
Meliaceae	*Walsura*	*trifoliolata*	I		+							
Moraceae	*Ficus*	*benghalensis*	I			1	1					
Moraceae	*Ficus*	*racemosa*	I		+							
Moraceae	*Ficus*	sp.	I			8	7	1				
Moraceae	*Streblus*	*asper*	I			1		1				
Moraceae	*Streblus*	*taxoides*	I		+							
Myrtaceae	*Eucalyptus*	sp.	X		+							
Myrtaceae	*Eugenia*	*bracteata*	I			39	8	7				
Myrtaceae	*Syzygium*	*cumini*	I			13	2	6	4			
Ochnaceae	*Ochna*	*lanceolata*	I			56	12	11	2			
Oleaceae	*Jasminum*	*angustifolium*	I		+							
Oleaceae	*Jasminum*	*auriculatum*	I		+							
Onagraceae	*Ludwigia*	sp.	I		+							
Orchidaceae	*Vanda*	*tessellata*	I	VU	+							
Periplocaceae	*Hemidesmus*	*indicus*	I		+							
Poaceae	*Bambusa*	*bambos*	I			28				4		
Poaceae	*Cymbopogon*	*nardus*	I		+							
Poaceae	*Cynodon*	*dactylon*	I			486					7	
Poaceae	*Eragrostis*	*tenella*	I			50					2	
Poaceae	*Imperata*	*cylindrica*	I		+							
Poaceae	*Isachne*	*globosa*	I			171					7	
Poaceae	*Ischaemum*	*rugosum*	I			22					3	
Poaceae	*Panicum*	*maximum*	X		+							
Poaceae	*Panicum*	*repens*	I			35					2	
Rhamnaceae	*Scutia*	*myrtina*	I		+							
Rhamnaceae	*Ventilago*	*madraspatana*	I			4	2	1				
Rhamnaceae	*Ziziphus*	*oenoplia*	I			35	6	13	4			
Rubiaceae	*Benkara*	*malabarica*	I			13	2	8				
Rubiaceae	*Canthium*	*coromandelicum*	I			27	6	8	2			
Rubiaceae	*Catunaregam*	*spinosa*	I			106	14	12	7			
Rubiaceae	*Discospermum*	*sphaerocarpum*	I			114	25	11				
Rubiaceae	*Haldina*	*cordifolia*	I	VU	+							
Rubiaceae	*Ixora*	*coccinea*	I			1	1					
Rubiaceae	*Ixora*	*pavetta*	I			11	7		2			
Rubiaceae	*Mitracarpus*	*hirtus*	I			8					2	
Rubiaceae	*Mitragyna*	*parvifolia*	I	VU	+							
Rubiaceae	*Mussaenda*	*frondosa*	I		+							
Rubiaceae	*Oldenlandia*	sp.	X			13					2	
Rubiaceae	*Psilanthus*	*wightianus*	I	CR	+							
Rubiaceae	*Psydrax*	*dicoccos*	I			1		1				
Rubiaceae	*Tarenna*	*asiatica*	I			56	9					
Rutaceae	*Acronychia*	*pedunculata*	I		+							
Rutaceae	*Atalantia*	*monophylla*	I		+							
Rutaceae	*Chloroxylon*	*swietenia*	I			36	4	5	2			
Rutaceae	*Clausena*	*indica*	I			2	2					
Rutaceae	*Glycosmis*	*angustifolia*	I			3	2	1				
Rutaceae	*Glycosmis*	*mauritiana*	I			8	6	1				
Rutaceae	*Glycosmis*	*pentaphylla*	I		+							
Rutaceae	*Limonia*	*acidissima*	I			8		1	2			
Rutaceae	*Murraya*	*paniculata*	I			5	3					
Rutaceae	*Pleiospermium*	*alatum*	I			43	13	4	1			
Rutaceae	*Toddalia*	*asiatica*	I			3	2		1			
Sapindaceae	*Allophylus*	*cobbe*	I			3	1		1			
Sapindaceae	*Dimocarpus*	*longan*	I			20	5					
Sapindaceae	*Filicium*	*decipiens*	I			1	1					
Sapindaceae	*Glenniea*	*unijuga*	E			1				1		
Sapindaceae	*Lepisanthes*	*senegalensis*	I			95	27	3	1			
Sapindaceae	*Lepisanthes*	*tetraphylla*	I			42	15	10	2			

Sapindaceae	*Sapindus*	*emarginata*	I			18	2	5	3			
Sapindaceae	*Schleichera*	*oleosa*	I			7	6		1			
Sapotaceae	*Madhuka*	*longifolia*	I		+							
Sapotaceae	*Manilkara*	*hexandra*	I			11	3	4	1			
Solanaceae	*Solanum*	*seaforthianum*	X		+							
Sterculiaceae	*Helicteres*	*isora*	I		+							
Sterculiaceae	*Pterospermum*	*suberifolium*	I			357	34	20	8			
Sterculiaceae	*Sterculia*	*foetida*	I			1		1				
Sterculiaceae	*Waltheria*	*indica*	I		+							
Tiliaceae	*Berrya*	*cordifolia*	I			11	5			1		
Tiliaceae	*Diplodiscus*	*verrucosus*	E			484	9	21	4			
Tiliaceae	*Grewia*	*damine*	I		+							
Tiliaceae	*Grewia*	*helicterifolia*	I			120	24	5	3			
Tiliaceae	*Grewia*	*orientalis*	I			4		3	1			
Verbenaceae	*Cissus*	*vitiginea*	I		+							
Verbenaceae	*Lantana*	*camara*	X		+							
Verbenaceae	*Phyla*	*nudiflora*	I		+							
Verbenaceae	*Premna*	sp.	I			1		1				
Verbenaceae	*Premna*	*tomentosa*	I			27	7	5	1			
Verbenaceae	*Stachytarpheta*	*jamaicensis*	X		+							
Verbenaceae	*Tectona*	*grandis*	X			3		2				
Verbenaceae	*Vitex*	*altissima*	I			35	8	9	2			
Verbenaceae	*Vitex*	*leucoxylon*	I		+							
Vitaceae	*Cissus*	*heyneana*	E			2	2					
Vitaceae	*Cissus*	*quadrangularis*	I		+							
AMPHIBIANS												
Bufonidae	*Bufo*	*melanostictus*	I		23	4			1		1	
Bufonidae	*Bufo*	*scaber*	I		5	0					1	
Microhylidae	*Kaloula*	*taprobanica*	I		5	3	1				1	
Microhylidae	*Microhyla*	*rubra*	I		11	3						
Microhylidae	*Ramanella*	*variegata*	I		8	1	1				2	
Ranidae	*Euphlyctis*	*cyanophlyctis*	I		79	14					2	
Ranidae	*Euphlyctis*	*hexadactylus*	I		35	10					3	
Ranidae	*Fejervarya*	*limnocharis*	I		129	28		1			2	
Ranidae	*Hoplobatrachus*	*crassus*	I		30	15					1	
Ranidae	*Philautus*	*regius*	E		14	0						
Ranidae	*Polypedates*	*maculatus*	I		14	2	2					
Ranidae	*Rana*	*gracilis*	E		6	5	3					
Ranidae	*Sphaerotheca*	*breviceps*	I		4	0						
Ranidae	*Uperodon*	*systoma*	I		1	0						
REPTILES												
Agamidae	*Calotes*	*calotes*			5	0						
Agamidae	*Calotes*	*ceylonensis*	E	VU	8	3	2	1				
Agamidae	*Calotes*	*versicolor*			24	4		2	1		1	
Agamidae	*Otocryptis*	*nigristigma*	E		22	13	8	5				
Bataguridae	*Melanochelys*	*trijuga*			11	0						
Colubridae	*Ahaetulla*	*nasuta*			3	1	1					
Colubridae	*Boiga*	*forsteni*				1		1				
Colubridae	*Chrysopelea*	*taprobanica*	E	VU	1	0						
Colubridae	*Coeloganthus*	*helena*			1	0						
Colubridae	*Dendrelaphis*	*tristis*			3	0						
Colubridae	*Dryocalamus*	*nympha*		NT	1	0						
Colubridae	*Liopeltis*	*calamaria*		VU	1	0						
Colubridae	*Lycodon*	*osmanhilli*	E		1	0						
Colubridae	*Oligodon*	*taeniolatus*			1	0						
Colubridae	*Ptyas*	*mucosa*			2	1					1	
Crocodylidae	*Crocodylus*	*palustris*			4	0						
Cylindrophidae	*Cylindrophis*	*maculata*	E		1	0						
Elapidae	*Bungarus*	*caeruleus*			1	0						
Elapidae	*Naja*	*naja*			4	1					1	
Gekkonidae	*Geckoella*	*yakhuna*	E		1	1					1	
Gekkonidae	*Hemidactylus*	*brookii*			5	0						
Gekkonidae	*Hemidactylus*	*depressus*	E		10	6	6					
Gekkonidae	*Hemidactylus*	*frenatus*			16	10	7	3				
Gekkonidae	*Hemidactylus*	*leschenaultii*			35	3	2	1				
Gekkonidae	*Hemidactylus*	*triedrus*			2	2	2					
Pythonidae	*Python*	*molurus*			1	1		1				

Scincidae	*Eutropis*	*carinata*			6	0						
Scincidae	*Eutropis*	*macularia*			15	4	2				2	
Scincidae	*Eutropis*	*tammanna*	E		5	2		1	1			
Scincidae	*Lankascincus*	*fallax*	E		41	30	25	3	2			
Scincidae	*Lygosoma*	*punctatus*			2	2					2	
Scincidae	*Nessia*	*DWC018*	E		1	1		1				
Scincidae	*Nessia*	*sarasinorum*	E	EN	1	1		1				
Testudinidae	*Geochelone*	*elegans*		VU	7	0						
Trionychidae	*Lissemys*	*punctata*		VU	1	0						
Typhlopidae	*Typhlops*	sp.			2	4	2	1			1	
Uropeltidae	*Rhinophis*	*oxyrynchus*	E		7	0						
Varanidae	*Varanus*	*bengalensis*			21	0						
Viperidae	*Daboia*	*russelii*			1	0						
Viperidae	*Hypnale*	*hypnale*				1		1				
BIRDS												
Accipitridae	*Accipiter*	*badius*			2	4	1	1			2	
Accipitridae	*Circus*	*pygargus*				1					1	
Accipitridae	*Haliaeetus*	*leucogaster*				8	5			1	2	
Accipitridae	*Haliastur*	*indus*			6	15	4	1	2		6	
Accipitridae	*Ichthyophaga*	*ichthyaetus*			26	6	1			1	3	
Accipitridae	*Ictinaetus*	*malayensis*			1	0						
Accipitridae	*Pernis*	*ptilorhyncus*				2		1			1	
Accipitridae	*Spilornis*	*cheela*			21	6	4	2				
Accipitridae	*Spizaetus*	*cirrhatus*			13	1	1					
Alaudidae	*Alauda*	*gulgula*				13					6	
Alaudidae	*Mirafra*	*assamica*			3	28		5	3		6	
Alcedinidae	*Alcedo*	*atthis*			11	22	10	1	2	2	1	
Alcedinidae	*Ceyx*	*erithacus*				1	1					
Anhingidae	*Anhinga*	*melanogaster*			2	0						
Apodidae	*Apus*	*affinis*				1					1	
Apodidae	*Collocalia*	*unicolor*				6	2	3				
Apodidae	*Cypsiurus*	*balasiensis*			1	3		1		1	1	
Ardeidae	*Ardea*	*cinerea*			8	9	1				6	
Ardeidae	*Ardea*	*purpurea*			3	2					2	
Ardeidae	*Ardeola*	*grayii*				4	1				3	
Ardeidae	*Egretta*	*garzetta*			4	10	1				6	
Ardeidae	*Mesophoyx*	*intermedia*			2	6					5	
Bucerotidae	*Anthracoceros*	*coronatus*			15	7	6	1				
Bucerotidae	*Ocyceros*	*gingalensis*			38	9	5	3		1		
Centropodidae	*Centropus*	*sinensis*			115	14	4	8	2			
Charadriidae	*Charadrius*	*dubius*				1					1	
Charadriidae	*Himantopus*	*himantopus*			2	3					3	
Charadriidae	*Vanellus*	*indicus*			18	22	3	3			6	
Ciconiidae	*Anastomus*	*oscitans*			5	3				1	2	
Ciconiidae	*Ciconia*	*episcopus*			2	2					2	
Ciconiidae	*Mycteria*	*leucocephala*			2	1					1	
Cisticolidae	*Cisticola*	*juncidis*			2	21		1			8	
Cisticolidae	*Prinia*	*hodgsonii*			1	4	1	3				
Cisticolidae	*Prinia*	*inornata*			7	28	2	6	2		7	
Cisticolidae	*Prinia*	*socialis*			20	34	3	8	3		7	
Cisticolidae	*Prinia*	*sylvatica*				5		4				
Columbidae	*Chalcophaps*	*indica*			4	6	5	1				
Columbidae	*Ducula*	*aenea*			1	8	1	5				
Columbidae	*Streptopelia*	*chinensis*			94	53	10	14	7		5	
Columbidae	*Treron*	*bicincta*			14	20	2	10	2			
Columbidae	*Treron*	*pompadora*			12	29	11	9	1			
Coraciidae	*Coracias*	*benghalensis*				3					2	
Corvidae	*Aegithina*	*tiphia*			182	353	38	28	9	4	10	
Corvidae	*Artamus*	*fuscus*				1					1	
Corvidae	*Coracina*	*macei*			2	3	3					
Corvidae	*Coracina*	*melanoptera*			36	28	12	9	2	1	1	
Corvidae	*Corvus*	*macrorhynchos*			13	9		1			6	
Corvidae	*Dicrurus*	*caerulescens*			6	3		2	1			
Corvidae	*Hemipus*	*picatus*				1	1					
Corvidae	*Hypothymis*	*azurea*			10	43	16	5	2	1		
Corvidae	*Oriolus*	*xanthornus*			93	50	13	9	7	2	5	
Corvidae	*Pericrocotus*	*cinnamomeus*			1	12	3	5		2		
Corvidae	*Pericrocotus*	*flammeus*			3	13	5	3		1		

Corvidae	*Rhipidura*	*aureola*				3	1				2	
Corvidae	*Tephrodornis*	*pondicerianus*			34	62	17	17	6		6	
Corvidae	*Terpsiphone*	*paradisi*			8	45	13	11	4	4	3	
Cuculidae	*Cacomantis*	*sonneratii*			1	1		1				
Cuculidae	*Clamator*	*jacobinus*			1	0						
Cuculidae	*Cuculus*	*micropterus*			7	2	1		1			
Cuculidae	*Eudynamys*	*scolopacea*			4	3		3				
Cuculidae	*Hierococcyx*	*varius*			1	0						
Cuculidae	*Phaenicophaeus*	*viridirostris*				4		4				
Cuculidae	*Surniculus*	*lugubris*		VU		1	1					
Dendrocygnidae	*Dendrocygna*	*javanica*				3	2					
Halcyonidae	*Halcyon*	*capensis*			22	8	2	1	1	1		
Halcyonidae	*Halcyon*	*smyrnensis*			36	25	6	8	3	1	4	
Hemiprocnidae	*Hemiprocne*	*coronata*			22	40	12	12	1		2	
Hirundinidae	*Hirundo*	*daurica*			2	13	4	2		1	5	
Hirundinidae	*Hirundo*	*rustica*			3	17	8	5		2		
Irenidae	*Chloropsis*	*aurifrons*			14	13	5	3	3			
Irenidae	*Chloropsis*	*cochinchinensis*			23	29	9	8	6			
Laniidae	*Lanius*	*cristatus*			24	11	4	3	1	1		
Laridae	*Chlidonias*	*hybridus*			2	9	5		1		1	
Meropidae	*Merops*	*leschenaultia*			1	3		1			2	
Meropidae	*Merops*	*orientalis*			18	51	11	8	6	3	9	
Meropidae	*Merops*	*philippinus*			14	14	5	1	1	1		
Muscicapidae	*Copsychus*	*malabaricus*			172	200	36	20	8	4	2	
Muscicapidae	*Copsychus*	*saularis*			13	5	3			1		
Muscicapidae	*Cyornis*	*tickelliae*			17	62	22	5	5	1	1	
Muscicapidae	*Luscinia*	*brunnea*			2	5	4	1				
Muscicapidae	*Muscicapa*	*daurica*				2	2					
Muscicapidae	*Saxicoloides*	*fulicata*			4	16	2	8	3			
Nectariniidae	*Dicaeum*	*agile*			1	31	11		4	1	1	
Nectariniidae	*Dicaeum*	*erythrorhynchos*			30	173	36	20	7	4	5	
Nectariniidae	*Nectarina*	*asiatica*			2	41	10	10	3		6	
Nectariniidae	*Nectarina*	*lotenia*			21	59	7	15	9	1	3	
Nectariniidae	*Nectarina*	*zeylonica*			54	213	35	27	9	4	8	
Passeridae	*Anthus*	*rufulus*				32		3	2		8	
Passeridae	*Dendronanthus*	*indicus*			1	6	3	1	1		1	
Passeridae	*Lonchura*	*malabarica*				1		1				
Passeridae	*Lonchura*	*malacca*			2	1		1				
Passeridae	*Lonchura*	*punctulata*				9	2	5			1	
Passeridae	*Lonchura*	*striata*				11	3	2	3		1	
Passeridae	*Motacilla*	*cinerea*				1					1	
Pegalaimidae	*Megalaima*	*haemacephala*			131	35	16	6	2	1	4	
Pegalaimidae	*Megalaima*	*rubricapilla*			120	49	17	12	3			
Pegalaimidae	*Megalaima*	*zeylanica*			350	118	31	19	6	2	4	
Pelecanidae	*Pelecanus*	*philippensis*			3	5	1				3	
Phalacrocoracidae	*Phalacrocorax*	*carbo*			1	1					1	
Phalacrocoracidae	*Phalacrocorax*	*fuscicollis*			3	1	1					
Phalacrocoracidae	*Phalacrocorax*	*niger*			6	14	2	5		2	2	
Phasianidae	*Coturnix*	*chinensis*				1		1				
Phasianidae	*Galloperdix*	*bicalcarata*	E		1	0						
Phasianidae	*Gallus*	*lafayetii*	E		166	23	11	8	1			
Phasianidae	*Pavo*	*cristatus*			41	1		1				
Picidae	*Celeus*	*brachyurus*			1	0						
Picidae	*Chrysocolaptes*	*lucidus*			3	2	1	1				
Picidae	*Dendrocopos*	*mahrattensis*		VU	1	2	1	1				
Picidae	*Dinopium*	*benghalense*			13	7	3	1	2		1	
Pittidae	*Pitta*	*brachyura*			17	6	1		2	1		
Podicipedidae	*Tachybaptus*	*ruficollis*			1	0						
Psittacidae	*Psittacula*	*cyanocephala*			1	2	1	1				
Psittacidae	*Psittacula*	*eupatria*			42	27	9		3			
Psittacidae	*Psittacula*	*krameri*			44	34	9	9	3	4	2	
Pycnonotidae	*Iole*	*indica*			2	3	1	2				
Pycnonotidae	*Pycnonotus*	*cafer*			101	146	25	25	8	3	8	
Pycnonotidae	*Pycnonotus*	*luteolus*			206	288	42	28	10	3	8	
Pycnonotidae	*Pycnonotus*	*melanicterus*			55	109	26	18	9	2	1	
Rallidae	*Amaurornis*	*phoenicurus*			4	0						
Strigidae	*Ninox*	*scutulata*			1	0						
Strigidae	*Otus*	*bakkamoena*				1		1				

Sturnidae	*Acridotheres*	*tristis*			4	18	2	5			5	
Sylviidae	*Chrysomma*	*sinense*			1	2		1			1	
Sylviidae	*Dumetia*	*hyperythra*			2	4		3			1	
Sylviidae	*Hippolais*	*caligata*				1				1		
Sylviidae	*Locustella*	*certhiola*				4			1	2		
Sylviidae	*Orthotomus*	*sutorius*			77	163	31	23	9	3	9	
Sylviidae	*Pellorneum*	*fuscocapillum*	E		113	87	23	17	6	2	1	
Sylviidae	*Phylloscopus*	*magnirostris*			13	44	15	1	4	2	1	
Sylviidae	*Phylloscopus*	*nitidus*			14	37	16	3	3		1	
Sylviidae	*Rhopocichla*	*atriceps*			6	24	7	3	4	3	1	
Sylviidae	*Turdoides*	*affinis*			15	14	2	10	1		1	
Threskiornithidae	*Threskiornis*	*melanocephalus*			1	3	1				2	
Turnicidae	*Turnix*	*suscitator*			1	3	1	2				
Zosteropidae	*Zosterops*	*palpebrosus*				7	3	3	1			
MAMMALS Values are based on either direct observations or signs (tracks, droppings etc.) confirmed with confidence.												
Bovidae	*Bubalus*	*arnee*	I	VU	25	0						
Bovidae	*Bubalus*	*bubalis*	X		1	0						
Canidae	*Canis*	*aureus*	I		27	4				1	1	
Cercopithecidae	*Macaca*	*sinica*	E	NT	285	240	10	3	4		1	
Cercopithecidae	*Semnopithecus*	*priam*	I	NT	153	43	8	3	1			
Cercopithecidae	*Semnopithecus*	*vetulus*	E	VU	1	2	1				1	
Cervidae	*Axis*	*axis*	I		189	180	15	12	4	4	5	
Cervidae	*Cervus*	*unicolor*	I		3	17	2	4	1	3	5	
Cervidae	*Muntiacus*	*muntjak*	I		2	0						
Elephantidae	*Elephas*	*maximus*	I	VU	71	35	10	2	4	1	5	
Felidae	*Felis*	*chaus*	I	VU	3	2	1	1				
Felidae	*Panthera*	*pardus*	I	VU	1	4	1	2	1			
Felidae	*Prionailurus*	*viverrinus*	I	VU	5	3	2					
Herpestidae	*Herpestes*	*brachyurus*	I		8	8	1	4	1			
Herpestidae	*Herpestes*	*edwardsii*	I		12	6	4	1	1			
Herpestidae	*Herpestes*	*smithii*	I		13	10	4	4		1		
Herpestidae	*Herpestes*	*vitticollis*	I		2	5		2			2	
Hystericidae	*Hystrix*	*indica*	I		8	5	1	2	1			
Leporidae	*Lepus*	*nigricollis*	I		95	25	11	2	1		1	
Lorisidae	*Loris*	*lydekkerianus*	I	NT	4	0						
Muridae	*Cremnomys*	*blanfordi*	I			7	4					
Muridae	*Mus*	*musculus*	I			2		1		1		
Muridae	*Rattus*	*rattus*	I			21	9	3	2	1	1	
Muridae	*Tatera*	*indica*	I		41	0						
Muridae	*Vandeleuria*	*oleracea*	I		1	0						
Mustelidae	*Lutra*	*lutra*	I	VU		4	1		2			
Rhinolophidae	*Rhinolophus*	*rouxii*	I		2	0						
Sciuridae	*Funambulus*	*layardi*	E	VU	2	1			1			
Sciuridae	*Funambulus*	*palmarum*	I		3	4	3				1	
Sciuridae	*Funambulus*	*sublineatus*	I	VU	4	1					1	
Sciuridae	*Ratufa*	*macroura*	I	VU	10	3	3					
Soricidae	*Suncus*	sp.	I			1		1				
Suidae	*Sus*	*scrofa*	I		10	21	6	4	3		1	
Tragulidae	*Moschiola*	*meminna*	E		21	10	3	4	1		1	
Viverridae	*Paradoxurus*	*hermaphoditus*	I		2	4		2	1			
Viverridae	*Viverricula*	*indica*	I		7	3	1				1	

Family	Genus	Species	Geographic status	Conservation status	Opportunistic - fishermen	No. individuals recorded within each drainage unit														Prior records
						Total no. individuals [N=42]	Batu Oya	Dambagaha Ulpatha Ela	Erige Oya	Halmilla Ela	Kiri Oya	Madyamala Ela	Mahaweli Ela	Pihimbiya Ela	Thalkote Ara	Halmillawa Wewa	Madyamala Wewa	Maha Wewa	Minneriya Wewa	
FISH **Opportunistic:** based on reports from fisherman. **Source of information for prior records:** CEA, 1993 (prior records relate only to Minneriya Wewa).																				
Anabantidae	*Anabas*	*testudineus*	I			47				4	1		1			31		1	9	✓
Anguillidae	*Anguilla*	*nebulosa*	I	VU																✓
Anguillidae	*Anguilla*	*bicolour*	I	NT	✓															✓
Bagridae	*Mystus*	*vittatus*	I			15	1		1		4	2			1	1	3		2	✓
Bagridae	*Mystus*	*keletius*	E																	✓
Belontiidae	*Trichogaster*	*pectoralis*	X			1	1													
Channidae	*Channa*	*gachua*	I			15		3			6	2		3				1		
Channidae	*Channa*	*punctata*	I			2						2								
Channidae	*Channa*	*striata*	I			8										1		3	4	✓
Cichlidae	*Etroplus*	*maculatus*	I			3	1				1								1	✓
Cichlidae	*Etroplus*	*suratensis*	I			26													26	✓
Cichlidae	*Oreochromis*	*mossambicus*	X			89	6				11								72	✓
Cichlidae	*Oreochromis*	*niloticus*	X			187	7				8	1	2			4	2	7	156	✓
Cichlidae	*Tilapia*	*rendalli*	X																	✓
Clariidae	*Clarias*	*brachysoma*	E																	✓
Clariidae	*Wallago*	*attu*	I																	✓
Cobitidae	*Lepidocephalichthys*	*thermalis*	I			12		6			2	3		1						
Cyprinidae	*Amblypharyngodon*	*melattinus*	I			203	46				43	9	5		71			8	21	✓
Cyprinidae	*Aristichthys*	*nobilis*	X																	✓
Cyprinidae	*Chela*	*laubuca*	E			405	3	15		22	215	59	31					60		
Cyprinidae	*Cirrhinus*	*mrigala*	X																	✓
Cyprinidae	*Ctenopharyngodon*	*idella*	X																	✓
Cyprinidae	*Devario*	*malabaricus*	I			169	2	2	14		55	7		5	73				11	
Cyprinidae	*Esomus*	*thermoicos*	E			90	10				62	7	7	2	1			1		
Cyprinidae	*Garra*	*ceylonensis*	E			47			4		1			23	8			11		
Cyprinidae	*Hypothalmichthys*	*molitrix*	X																	✓
Cyprinidae	*Labeo*	*dussumieri*	I			2													2	✓
Cyprinidae	*Labeo*	*rohita*	X																	✓
Cyprinidae	*Puntius*	*amphibius*	E			124	5	1		24	12		2	9	4	9		10	48	
Cyprinidae	*Puntius*	*bimaculatus*	I			63		1			21	17	2	1				21		
Cyprinidae	*Puntius*	*chola*	I			23					4		7				12			✓
Cyprinidae	*Puntius*	*dorsalis*	I			9			4		1		2		1				1	✓
Cyprinidae	*Puntius*	*singhala*	E			65				12	18		6				15	2	12	✓
Cyprinidae	*Puntius*	*srilankensis*	E	EN		54			21		31				2					
Cyprinidae	*Puntius*	*ticto*	E			36					5	2	1					28		
Cyprinidae	*Puntius*	*sarana*	E																	✓
Cyprinidae	*Rasbora*	*caverii*	I			385	3	18	48	25	98	62		21	40	26		41	3	
Cyprinidae	*Rasbora*	*daniconius*	I																	✓
Cyprinidae	*Tor*	*khudree*	I																	✓
Gobiidae	*Awaous*	*melanocephalus*	I			9					1								8	
Gobiidae	*Glossogobius*	*giuris*	I			10					2	3	1				1	3		✓
Hemiramphidae	*Zenarchopterus*	*dispar*	I		✓															✓
Heteropneustidae	*Heteropneustes*	*fossilis*	I			6	4				1								1	✓
Loricariidae	*Pterygoplichthys*	*multiradiatus*	X			2													2	✓
Mastacembelidae	*Mastacembelus*	*armatus*	I			2			1		1									✓
Osphronemidae	*Osphronemus*	*goramy*	X																	✓
Siluridae	*Ompok*	*bimaculatus*	I			4					2			1					1	✓