

A Guide to the Biodiversity of Knuckles Forest Region



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C.N.B. Bambaradeniya & S.P. Ekanayake



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C.N.B. Bambaradeniya & S.P. Ekanayake
IUCN - The World Conservation Union
Sri Lanka Country Office



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Binara Flower (*Exacum trinervium*) (Photo: Sarath Ekanayake)
The Sri Lanka Jungle Fowl (*Gallus lafayetti*)
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Foreword

Recognizing the conservation significance of this unique ecosystem, the Sri Lanka office of IUCN – The World Conservation Union, in collaboration with the Forest Department, undertook the preparation of a Management Plan for the Knuckles range of forests in 1994, with financial support from NORAD. Ever since, IUCN Sri Lanka has assisted in the implementation of this management plan through several initiatives that enable local livelihoods to be compatible with and mutually supportive of the conservation objectives of this unique forest range.

In collaboration with the Forest Department and the Upper Mahaweli Environment and Forest Conservation Division, in 1997, IUCN embarked on a three year GTZ funded project for the conservation of the Knuckles forest through a community participation programme aimed at weaning away communities from over-dependence on forest resources and reducing the pressure on the biological wealth of the area. Some of the activities promoted have been the construction of minor irrigation systems, introduction and promotion of pepper cultivation, agricultural extension, paddy farming, vegetable gardening, bee keeping, tree planting and mobilizing rural savings. The strengthening of local CBOs and community mobilization, vocational training for alternative livelihoods, biodiversity surveys and raising of conservation awareness amongst the various stakeholders were among the other activities undertaken.

More recently, in 2001, IUCN through assistance from the CEIF of the Ministry of Environment and Natural Resources, continued its work in this area facilitating participatory processes for benefit sharing from conservation initiatives and promoting income generation through credit and savings programmes targeting those communities depending on cardamom cultivation in the forest. During the course of IUCN's extensive fieldwork in the area, it became evident that the Knuckles range of forests has tremendous potential for eco-tourism, with its unique blend of nature, culture and adventure. The rich diversity of plants and animals, varying landscapes, panoramic scenery, traditional villages and adventurous treks will certainly be a rewarding experience for a visitor to Knuckles.

Thus, it is with much pleasure that IUCN presents this guide to the biodiversity of Knuckles, based upon first hand field experience in the area, with the hope that it would enable a visitor to enjoy the rich biological heritage of Knuckles and contribute to the conservation of this globally significant ecosystem.

Mrs. S. E. Yasaratne
Country Representative
IUCN, Sri Lanka

නකල්ස් වනාන්තරයේ පෞර්ව විවිධත්වය පිළිබඳව කෙටි සමාලෝචනයක්

නකල්ස් වන ප්‍රදේශය ශ්‍රී ලංකාවේ මධ්‍යම කඳුකරයේ මාතලේ හා මහනුවර දිස්ත්‍රික්කයන් හි හෙක්ටයාර් 21,000 ක් පුරා උස් කඳුකර බිම් හා උස් කඳුකර තැනි හරහා පැතිරී ඇත. මෙම ප්‍රදේශය දුම්රිය නිමිනය නම් ගැඹුරු, මහවැලි නිමිනයෙන් මධ්‍යම කඳුකරයෙන් වෙන් වී ඇත. මීටර් 900 ට වඩා උස් වූ ශිවර 35කින් නකල්ස් කඳු පන්තිය සමන්විත වන අතර මෙහි උසම ශිවරය ලෙස සටහන් වන්නේ මීටර් 1900 පමණ උස් වූ ගොමිබානිය කන්දයි. ශ්‍රී ලංකාවේ කිසිදු ප්‍රදේශයක දැකිය නොහැකි තරමේ ආකර්ෂණීය කඳු මුදුන් රාශියකින් සමන්විත වීම නකල්ස් කඳු පන්තියේ අනන්‍ය වූ, සුවිශේෂ වූ ලක්ෂණයයි.

මහවැලි පෝෂක ප්‍රදේශ වලින් 30% ක් පමණ රඳාපවතිනුයේ නකල්ස් වනාන්තරයේ පල පෝෂක ප්‍රදේශය මත වන අතර හසලක ඔය, මහ ඔය හා හින්ගහ නැගෙනහිර ප්‍රදේශයෙන් පහල මහවැලි පද්ධතියටත්, හුළු ගඟ නිරිත දෙසින් ඉහල මහවැලි ප්‍රදේශයටත් ගලා හැලෙන අතර වයඹ දෙසින් හෙල්ගම් ඔය හා කළු ගඟ ද ගලා හැලේ.

අතරමැදි දේශගුණික කලාපයක පිහිටා තිබීම හේතුවෙන් පුළුල් පරාසයක වර්ෂාපතන හා උෂ්ණත්ව රටාවන් මෙහි දැකගත හැකිය. උස් කඳු මුදුන් ප්‍රදේශ වසර පුරාම අතිශය හෙත් ස්වභාවයක් ගන්නා අතර වාර්ෂික වර්ෂාපතනය මි.මී 5000 ක් පමණ වේ. නැගෙනහිර පහල බෑවුම් තරමක වියලි කාලගුණයක් පවතින අතර වාර්ෂික වර්ෂාපතනය මි. මි. 2500 ක් පමණ වේ. මෝසම් කාලය පුරා තද සූළං පවතී.

පුළුල් දේශගුණික හා භූවිෂමතා පරාසයක් පැවතීමේ ප්‍රතිඵලය වන්නේ අර්ධ සදාහරිත වනාන්තර වල සිට කඳුකර වනාන්තර දක්වා වූ විවිධ වෘක්ෂලතා දර්ශ මෙම කලාපය තුල දැකගත හැකිවීමයි. මෙම විවිධ වෘක්ෂලතා දර්ශ මගින් වියලූ විවිධත්වයකින් යුත් ශාක හා සත්ව විශේෂ ප්‍රමාණයකට රැකවරණය සපයන අතර ඉන් සමහරක් ශ්‍රී ලංකාවට සුවිශේෂ වේ. දැනට වාර්තා වී ඇති දත්ත අනුව කුල 141 කට අයත් සපුෂ්ප ශාක විශේෂ 1033 නකල්ස් වනාන්තරයේ හමුවන අතර ඉන් 225 (25%) ක් ශාස්ත්‍ර විශේෂය. ඉතිරිය පදුරු හා පැලෑටි වේ. නකල්ස් හි හමුවන සපුෂ්ප ශාක වලින් 160 (15%) ක් ශ්‍රී ලංකාවට ආවේනික වන අතර 3% ක් ජාතික වශයෙන් තර්ජනයට ලක් වී ඇත. පෘෂ්ඨවංශී විශේෂ 247 ක් නකල්ස් වනාන්තරය තුල වාර්තා වී ඇති අතර මෙම ප්‍රමාණය ශ්‍රී ලංකාවේ මුළු දේශීය අග්‍රාන්තර පෘෂ්ඨවංශී විශේෂ වලින් 38% ක් නියෝජනය කරයි. නකල්ස් හි මුළු පෘෂ්ඨවංශී විශේෂ වලින් 26% ක් ආවේනික වන අතර 28% ක් ජාතික වශයෙන් වදවියාමේ තර්ජනයට ලක්වී ඇත. ශ්‍රී ලංකාවේ දැනට හමුවී ඇති පෘෂ්ඨවංශී විශේෂ අතරින් මීරිදිය මසුන් විශේෂ 3ක්, එක් උගයපිචි විශේෂයක් සහ එක් කටුසු විශේෂයක් ඇතුළුව ආවේනික විශේෂ 5ක් හමුවන්නේ නකල්ස් වනාන්තරය තුල පමණක් වීම විශේෂත්වයකි. එම නිසා නකල්ස් වනාන්තරය ගෝලීය වශයෙන්ද වැදගත් භූමි කලාපයක් ලෙස සැලකිය හැක.

නකල්ස් වනාන්තරය තුල සම්ප්‍රදායික මිනිස් ජනාවාස පටු ගංගා නිමින දිගේ හමුවන අතර ඔවුන් හෙල්මැලි ක්‍රමයට වී වගා කිරීමටත්, ඊට අතිරේකව හේන් ගොවිතැන් කිරීමටත් පුරුදු වී සිටී. වෙළඳ බෝග ලෙස හේ සහ එනසාල් නකල්ස් කඳු පන්තිය ආශ්‍රිතව වගා කොට ඇත. නකල්ස් වනාන්තරය ආශ්‍රිතව පයිනස් ශාක ප්‍රමුඛව ඇති කුඩා වන වගාද පිහිටා ඇත.

නකල්ස් වනාන්තර ප්‍රදේශයේ ඇති පේව විවිධත්ව හා ජල පෝෂණ වැදගත්කම වසර 100කට පමණ පෙර හඳුනාගන්නා ලද අතර 1873 දී නකල්ස් කඳු ප්‍රදේශයේ මීටර් 1500 ට වඩා ඉහල ප්‍රදේශය දේශගුණික රක්ෂිතයක් වශයෙන් ප්‍රකාශයට පත් කරන ලදී. ඉන් පසු වන ආඥා පනත යටතේ වන සංරක්ෂණ දෙපාර්තමේන්තුව මගින් සංරක්ෂණ ප්‍රදේශයක් ලෙස නීතිමය රැකවරණය ලැබී ඇත. 1987 වර්ෂයේදී ඉඩම් වාරිමාර්ග හා මහවැලි අමාත්‍යාංශය හා වන සංරක්ෂණ දෙපාර්තමේන්තුව මගින් නකල්ස් කඳු ප්‍රදේශයේ සංරක්ෂණ කටයුතු ඉහල නැංවීම සඳහා ව්‍යාපෘතියක් ලෝක සංරක්ෂණ සංගමයේ භාණ්ඩාගාර සහයෝගය ඇතිව ක්‍රියාත්මක කරන ලදී. මෙම ව්‍යාපෘතියේ අරමුණ වූයේ නකල්ස් සංරක්ෂණ ප්‍රදේශයේ මායිම් සලකුණු කිරීමත් නකල්ස් වන ප්‍රදේශ තිරසාර ලෙස කලමනාකරණය කිරීමට අවශ්‍ය, අදාළ කලමනාකරණ ප්‍රශ්න හඳුනාගැනීමත්ය. මෙම ව්‍යාපෘතිය සාර්ථක ලෙස නිමවීමත් සමග 2000 වසර දී හෙක්ටයාර 17000 ක නකල්ස් කඳුකර ප්‍රදේශය සංරක්ෂණ වනාන්තරයක් ලෙස රජය මගින් ප්‍රකාශයට පත්කරන ලදී.

වර්තමානයේදී මෙම සුවිශේෂ රක්ෂිත ප්‍රදේශයේ පේව විවිධත්වය එනසාල් වගාවන්, නීති විරෝධී පැය්විම්, වනාන්තරය ගිනි තැබීම්, සතුන් දඩයම් කිරීම්, නීති විරෝධී ලෙස මිරිදිය මසුන් හා විසිතුරු පැලෑටි එකතු කිරීම, නීති විරෝධී මැණික් පතල් හැරීම, කෘෂි රසායනික ද්‍රව්‍ය අධික ලෙස භාවිතා කිරීම, ආගන්තුක ආක්‍රමනශීලී ශාක හා සත්ව විශේෂ වල පැතිරීමද නිසා තර්ජනයට ලක්ව ඇත. මෙම වටිනා ස්වභාවික සම්පත මතු පරපුර වෙනුවෙන් රැක ගැනීම ජාතික වගකීමක් හා මෙහෙවරක් වනු ඇත.



An Introduction to Knuckles Forest Region

*Panoramic sceneries of mist-capped mountains..... stunning valleys..... impressive rock formations..... crystal clear streams..... hilly terrain.....cool breeze..... lush forests.....variety of animal and plant life..... picturesque rice terraces..... traditional villages.....smiling and hospitable people...
a unique blend of nature, culture and adventure*

The Knuckles forest region, covering an area of approximately 21000 ha, lies in the Kandy and Matale Districts of central Sri Lanka, spanning the upland and highland penneplains (Figure 1). It is separated from the main central highlands by a deeply incised valley of the Mahaweli river, commonly referred to as the 'Dumbara Valley'. The general landscape of the area is extremely rugged, with at least 35 peaks rising above 900m. The aggregation of spectacular peaks is a unique feature in the Knuckles forest range, found nowhere else in the island. The highest peak of the Knuckles mountain range is Gombaniya (1900 m).

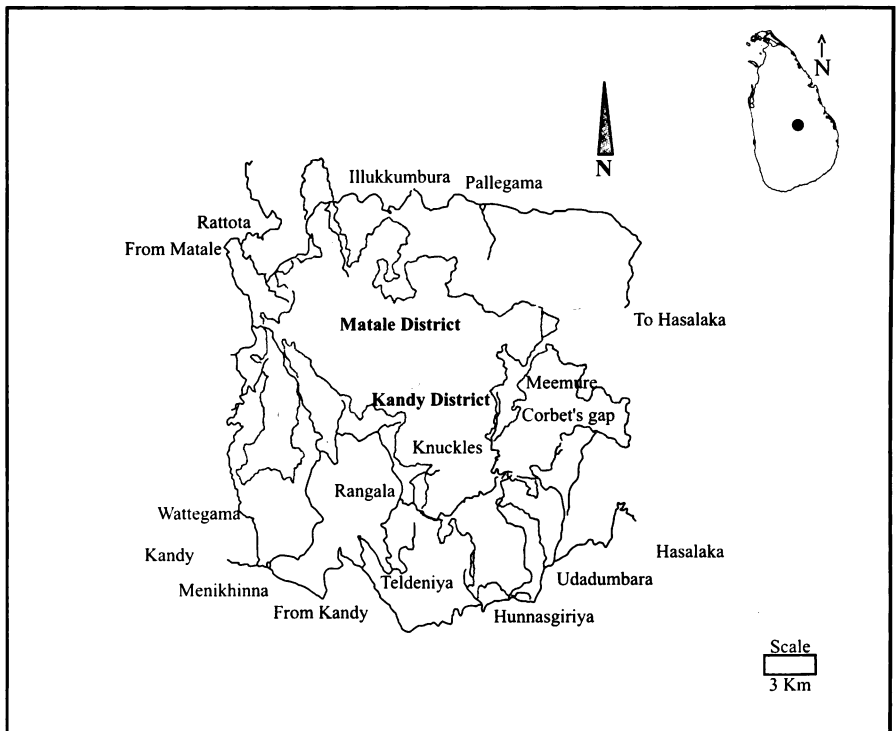


Figure 1: Location of Knuckles and access roads.

Origin of the name ‘Knuckles’

Originally, the villagers called this region the ‘*Dumbara Kanduvetiya*’, meaning ‘misty mountains’. The area was named as ‘Knuckles’ by British Surveyors, due to a prominent landscape feature – a group of five peaks that resemble the knuckles of a clenched fist, seen from many viewpoints in the area east and north-east of Kandy. The five peaks, extending from West to South-east include Kirigalpotta (1642m), Gombaniya (1900m), Knuckles (1852m), Koboneelagala (1544m) and Dotulugala (1564m), respectively.



Knuckles Mountain Range

(Sarath Ekanayake)

The Knuckles forest region is an important watershed, with several streams draining east into lower Mahaweli system (eg., Hasalaka Oya, Maha Oya and Heen Ganga), south-west into the upper Mahaweli system (eg., Huluganga), and north-west into the Amban Ganga system (eg., Teligam Oya and Kalu Ganga) (see Figure 2). The Knuckles catchment area contributes to about 30% of the water in Victoria, Randenigala and Rantambe reservoirs of the river Mahaweli.

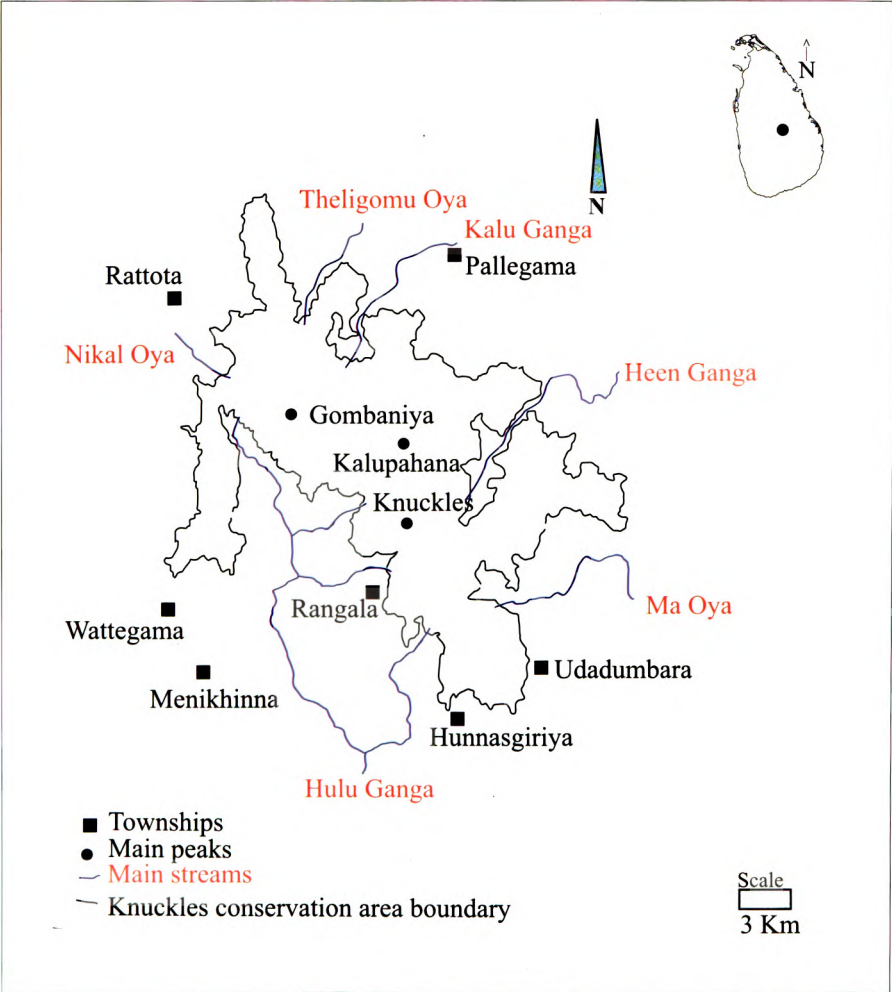


Figure 2: Main peaks and streams of Knuckles

The location of the Knuckles forest region in the Intermediate Climatic Zone in the island has resulted in a wide range of rainfall and temperature in different parts of the region. The highland areas of the Knuckles forest range is extremely wet throughout the year, with an average annual rainfall of about 5000mm, while the lower eastern slopes are much drier, with less than 2500mm. The area is also exposed to strong winds during monsoon periods.

The wide range of climatic and landscape features in the Knuckles region has resulted in a variety of natural vegetation types, ranging from lowland semi-evergreen forests to montane forests. These vegetation types harbour a rich composition of animals and plants, some of which are unique to Sri Lanka.

Although the hill ranges remain as uninhabited wilderness, traditional human settlements occur along the narrow river valleys. The villagers are involved in the cultivation of paddy in terraced fields, supplemented with chena cultivation. Commercial plantations of tea and cardamom are also located within the Knuckles forest range. Patches of plantation forests, dominated by *Pinus*, are located in areas bordering the Knuckles region.

The biological and hydrological value of the Knuckles forest region was recognized more than a century ago, when the areas above 1500m in the Knuckles range was declared as a climatic reserve in 1873. Since then, the area has received legal conservation status under the Forest Ordinance, administered by the Forest Department of Sri Lanka. In 1987, the Ministry of Lands, Irrigation and Mahaweli Development and the Forest Department initiated a project to enhance the conservation of Knuckles forest region, with technical assistance from IUCN – The World Conservation Union. This project was intended to demarcate the boundaries of the Knuckles protected area, and identify critical management issues that are relevant for planning the sustainable management of Knuckles forest region. Upon the successful completion of this project, the Knuckles forest was declared as a Conservation Forest (an extent of 17,500 ha) by the Government in April 2000. Subsequently, the whole area was declared as a National Man and Biosphere Reserve. The Knuckles forest reserve has also been nominated for declaration as an International Man and Biosphere Reserve and a natural World Heritage Site.



Useful Information for Visitors

Motorable Access Routes

Destination	Route	Time (hours)
1. Northern Area (Illukkumbura)	(a). Colombo – Kandy – Matale – Rattota – Illukkumbura	5
	(b) Colombo – Kurunegala – Galewela – Naula – Pallegama – Illukkumbura.	5
2. South West (Bambarella)	(a) Colombo – Kandy – Wattegama – Madulkelle – Bambarella	5-6
	(b) Colombo – Kandy – Teldeniya – Rangala – Bambarella	5-6
3. South East (Corbets Gap/Loolwatte)	(a) Colombo – Kandy – Teldeniya – Rangala – Thangappuwa – Corbets gap – Loolwatte – Deenstone Hunnasgiriya	5-6
4. East – North East (Meemure)	(a) Colombo – Kandy – Teldeniya – Rangala – Thangappuwa – Corbets gap – Kaikawela – Meemure	5-6
	(b) Colombo – Kandy – Teldeniya – Hunnasgiriya – Loolwatte – Corbets gap – Kaikawela – Meemure	5-6
5. North – South (Illukkumbura – Meemure – Loolwatte)	(a). Colombo – Kandy – Matale – Rattota – Illukkumbura – Pallegama – Handungamuwa – Hasalaka – Madugoda – Hunnasgiriya – Deenstone – Loolwatte – Meemure.	8-9

Based on the condition of the roads, the most convenient motorable access routes include 1a, 1b and 4b. A 4-wheel drive vehicle is recommended for the other access routes. The Forest Department permits entry through Illukkumbura and Deenstone, where tickets are issued at conservation centers located at the above sites.

Lodging and Camping Facilities

(A) Forest Department Bungalows and Camp Sites

At present the Forest Department maintains two bungalows located at Deenstone and Illukkumbura. Each of these bungalows has facilities to accommodate a maximum of eight adults in a comfortable manner. A new dormitory constructed at the Illukkumbura conservation center could accommodate up to 40 people. A visitor center with accommodation facilities is currently under construction at Kumbukgolla village.

Two designated camp sites of the Forest Department are located at Thangappuwa and Loolwatte. Both sites are located closer to perennial streams.

Reservations of Forest Department bungalows/camp sites should be made through the Head Office at Rajamalwatte Road, Battaramulle (TP: 866631/32, 875540).

(B) Private Guest Houses

The 'Eagles Crest' private guest house is located at Kobonilla, along the Hunnasgiriya – Corbet's gap road, about 13 km from the Hunnasgiriya junction. It could comfortably accommodate 10 adults. For prior reservations, contact 041-22402 / 034-76687 / 01-911316.



A panoramic view of hills and ridges in Knuckles
(*Channa Bambaradeniya*)

Nature Trails

(A) Walking trails

Area, Trail and Distance	Landscape features
North (Matale District): Illukkumbura – Kosgaswela (3km)	Semi-evergreen forest, streams, pond.
North (Matale District): Illukkumbura – Manigala (4km)	Semi-evergreen forest, streams, riverine forest, sub-montane forest, wet patana grassland
North (Matale District): Rathinda village – Duvili Ella falls (12km)	Village, Wet patana grasslands, lower-montane forest, streams, caves, water falls.
Southwest (Kandy District): Thangappuwa – Alugallena (8 km)	Hilly terrain, lower and upper-montane forest, grasslands, streams, Alugallena rock.
West (Kandy District): Madolkele – Kalupahana peak (10 km)	Hilly terrain, lower and upper-montane forest, streams, water falls.
East (Kandy District): Kumbukgolla – Nitre Cave (2.5 km)	Semi-evergreen forest, streams, water falls, riverine forest, Nitre cave.
East (Kandy District): Kumbukgolla – Dekinda stream (1.25 km)	Semi-evergreen forest, riverine forest, Dekinda stream
South-East (Kandy District): Deenstone – Dotalugala hill (3.5km)	Hilly terrain, streams, lower and upper montane forest.
South-East (Kandy District): Hasalaka – Ratna Ella water falls (2 km)	Village landscape, rice fields, irrigation canal bordering semi-evergreen forest, water falls.

(B) Motorable/Bicycling routes

The following routes enable to visit various locations in Knuckles forest range in a 4WD vehicle, a motor cycle or a mountain bicycle.

Area, Trail and Distance	Landscape features
North: Riverstone – Pitawalapathana – Illukkumbura (15 km)	Gradual descent passing upper-montane forest, wet patana grasslands, lower-montane forests, streams, villages and lowland semi-evergreen forest.
North: Pitawala – Rathninda village (8 km)	Home gardens, rice fields, scrubland, riverine forest, streams
Southeast: Hunnasgiriya – Deenstone – Loolwatte – Corbets Gap (19km)	Gradual ascent through pinus plantations, grasslands, lower-montane forests, tea estates, reaching the upper-montane forest.
Southwest: Corbet's gap – Thangappuwa (4.5 km)	Gradual descent passing upper-montane pygmy forests, lower montane forests, and streams, culminating in a tea landscape.
East: Corbet's gap – Kumbukgolla (11 km)	Gradual descent passing upper-montane forests, lower montane forests, savanna, semi-evergreen forest and streams, culminating in a village landscape with terraced rice fields and home gardens.
Northeast: Corbet' gap – Kaikawela – Meemure (15 km)	Gradual descent passing upper-montane forests, lower montane forests, savanna, riverine forests and streams, culminating in a traditional village landscape with terraced rice fields and home gardens.

Interesting Locations

Location	Features
Corbet's Gap (Deenstone-Meemure Road)	Panoramic view, unique rock formations, different vegetation types.
Nitre Cave (From Kumbukgolla village)	A cave created by long-term excavation of potassium nitrate
Alugallena Cave (From Thangappuwa)	A large cave beneath a rock
Meemure Village (From Deenstone)	A traditional ancient village landscape.
Pitawalapathana plains (From Riverstone)	A natural turf grassland, with a unique herbaceous species <i>Brachystelma lankana</i> (' <i>Patan Ala</i> '), Panoramic view.
Lakegala Peak (From Meemure village)	A panoramic view of the lowland landscape of eastern Sri Lanka.
Theligamu-Oya Stream (From Illukkumbura)	Rocky stream with pools and cool water. Ideal for bathing.
Mini Worlds End (From Deenstone)	A panoramic view of the lowland landscape of eastern Sri Lanka.
Huluganga Water falls (From Thangappuwa, on the way to Alugallena Cave)	A two-stepped, steep waterfall, surrounded by forest.
Ratna Ella Water falls (From Hasalaka)	A beautiful waterfall, with rock pools.



Alugallena Cave
(Sarath Ekanayake)



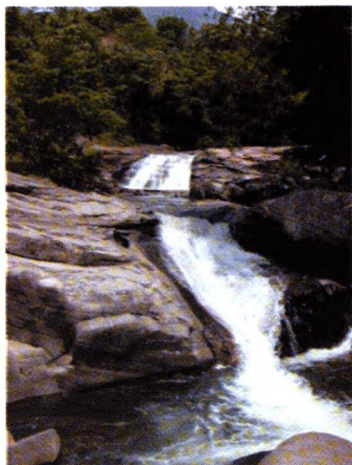
Lakegala Hill
(Sarath Ekanayake)



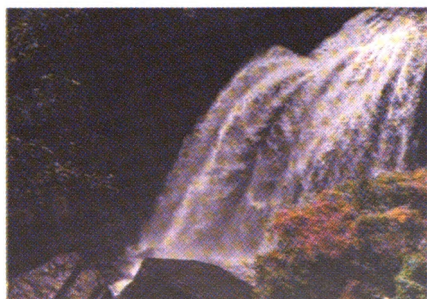
Nitre Cave
(*Sarath Ekanayake*)



Theligamu-o-ya rock pool
(*Sarath Ekanayake*)



Dekinda stream waterfall
(*Sarath Ekanayake*)



Huluganga waterfall
(*Pradeep Samarawickrema*)

Tips and Advice

- Since the Knuckles range is a Protected Area, prior permission must be obtained from the Forest Department to enter the forest.
- Campers, hikers and trekkers – be prepared for sudden changes in weather. The best seasons for hiking/trekking includes March – April and June – August, when the rainfall is low/less frequent.
- Avoid hiking/trekking alone since it may be difficult to locate the trail if lost. The undulating terrain also makes any accident that restricts one's mobility particularly dangerous if alone. Therefore, seek the assistance of a trained nature guide from the Forest Department Office (at Deenstone or Illukkumbura), who will ensure your safety along a designated trail.
- Prior to setting along a designated trail, be aware of its distance, general terrain and time to reach the end point. Make sure that you carry sufficient drinking water, food and a basic first aid kit. Let someone know your planned route, and when you plan to return.
- Be prepared for external parasites such as leeches and ticks. Leech socks and a suitable external parasite repellent would be very useful.
- Ensure that your shoes or boots are not worn out, since certain areas of trails are slippery.
- Start your trek at least by 7.30 a.m
- As you will be in a wilderness area, you are requested to kindly refrain from:
 - shouting, singing, clapping or playing musical instruments.
 - harassing, chasing, touching, handling or feeding wild animals.
 - collecting live animals, plants and their bi-products such as shells, horns, flowers and seeds
 - scattering or throwing litter in the park (especially non-biodegradable material such as plastic, polythene and glass bottles).
 - writing names, slogans on tree trunks and/or rocks.
 - polluting streams.
- Campers – use the designated area. Use existing campfire sites/rings. Do not take pet animals with you. Do not leave anything behind. Remember to put out all fires before leaving. Leave the site as clean as it was, so that others who follow can derive the same pleasure as you did.

- Stay on designated trails/footpaths/roads. Never take short cuts in natural habitats, as it can lead to the destruction of a number of small animals as well as vegetation.
- Drive slowly, and make sure that you do not run over animals.
- Do not drive too close to an animal. Getting too close to animals can lead to harmful consequences to their behavior, and result in unnecessary loss of energy as well.
- Avoid creating fires in natural areas. Do not throw cigarette butts or matchsticks that can easily result in accidental forest fires.
- A photograph of a wild animal is a rewarding souvenir, but in many instances, photographers can be disruptive intruders in the wild. Use telephoto lenses, the longer the better. Avoid flash photography when adequate light is present. Never bait animals with food.
- Respect the cultural differences in villages. Dress in a descent manner. Avoid behaving in an obscene manner. Refrain from bathing nude in streams, waterfalls and village wells.
- If you come across any person behaving in a harmful manner within the forest reserve, complain to forest authorities as soon as possible.
- Your expedition to Knuckles should enable you to further appreciate, value and preserve the rich natural and cultural heritage associated with our unique motherland Sri Lanka.

The following activities will be liable for punishment under the Forest Ordinance:

- Cutting, damaging, collecting or removal of any plants or parts of any plants.
- Hunting, shooting, trapping, fishing or capturing and/or removal of wild animals and their parts.
- Carrying and consumption of alcohol.
- Carrying and playing musical instruments, singing or making loud noises.
- Straying into the forest away from designated trails and paths.
- Littering the forest with non-biodegradable material.
- Indecent behaviour.



Vegetation types and Plants of Knuckles

Luxurious and transforming vegetation types spread across changing altitudes.....tall semi-evergreen forests in the lowlands extending to short pygmy forests in the peaks..... trees and shrubs adorned with fruits and colourful flowers.....ornamental orchids, ferns and mushrooms co-existing in large trees..... sweet-smelling lemon grass.....a natural botanical gardens offering a unique experience of nature's bounty.

Major vegetation types in Knuckles forest range

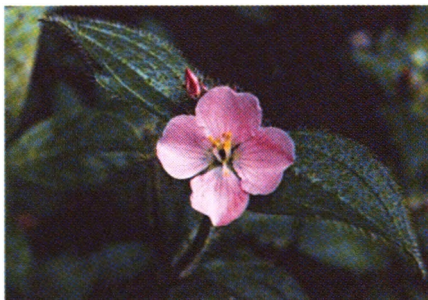
The topographic and climatic variation in the Knuckles region has resulted in the occurrence of several natural vegetation types. These include Montane forest, Sub-montane forest and Semi-evergreen forest types. Extensive strips of riverine forests are located in areas flanking rivers and streams, where the soil moisture is high. Some areas that consist of a rocky substratum and a thin layer of soil harbour rock outcrop forests. In addition to these natural vegetation types, man-influenced semi-natural vegetation types present in the area include patches of Wet Patana grasslands and extensive Dry Patana grasslands interspersed with Savannas. Man-influenced secondary vegetation types are located mainly in the forest edge areas, and these include scrublands/shrublands, home gardens and agricultural land. In addition, patches of plantation forests consisting of *Pinus* and *Eucalyptus*, are also located in different parts of Knuckles.

Plant species and their life forms

A total of 1033 flowering plants, belonging to 141 families, have been recorded from the above vegetation types in Knuckles. Among them, 255 (25%) are tree species, while the balance consists of shrubs or herbs. Of the total number of flowering plant species documented in Knuckles, 160 (15%) are endemic to Sri Lanka, while about 3 % are nationally threatened. A majority of these endemic species in Knuckles occur in the montane and sub-montane forest areas. Among the endemic plants, the herb *Brachystelma lankana* is restricted to Knuckles forest region, occurring in the patana grassland areas. Although the Knuckles forest range covers less than 0.5% of the land area in Sri Lanka, it represents almost one third of the island's flowering plant species. In addition to the flowering plant species, several species of lower plants, including ferns, mosses, bryophytes, fungi and lichens occur in the different vegetation types in Knuckles. Based on their habits, the flowering plants belong to several life forms. For instance, the mechanically independent plants include trees, treelets, shrubs, stem succulents and herbs, while the mechanically dependent plants include climbers consisting of woody lianas and herbaceous vines, epiphytes and parasitic plants.



Ixora coccinea
(Sarath Ekanayake)



Osbeckia parvifolia
(Pradeep Samarawickrema)



Phaius tankervilleae
(Pradeep Samarawickrema)



Christisonia bicolor
(Pradeep Samarawickrema)

Characteristic features of different vegetation and land use types in Knuckles

Montane Forests

Montane forests, also referred to as cloud forests, mist forests or upper montane forests, are the natural climax vegetation in the mountain areas above 1300m asl. These forests occur in Thangappuwa, Knuckles, Kalupahana, Gombaniya and Dotalugala hills of the Knuckles forest region. Often, a dense fog layer covers the forest, especially in the morning and evening. During the rainy season, the fog remains at both day and night.

These forests have a simple structure consisting of a dense growth of canopy forming trees (up to 8m) and a thick shrubby layer (upto 2m) beneath it. Trees are much branched, gnarled and canopies are aerodynamically shaped. The stems are colonized by many plant life forms; lichens, mosses, filmy ferns and various species of epiphytic orchids find it an ideal habitat. The forest floor harbours many species of ferns. The forest become stunted (2m-3m) in exposed peaks and ridges where strong winds blows throughout the year, hence 'pygmy forests'.

Montane forests are the primary catchment and watershed areas of the Knuckles region providing a year round water supply to sustain the ecosystems and livelihoods in the downstream areas. Moreover, their natural beauty, adventurous outlook, fauna and flora add to their attractiveness. Table 1 provides a list of common plant species in the Montane Forest.



Montane forest

(Sarath Ekanayake)

Table 1: List of common plant species in the montane forest of Knuckles region

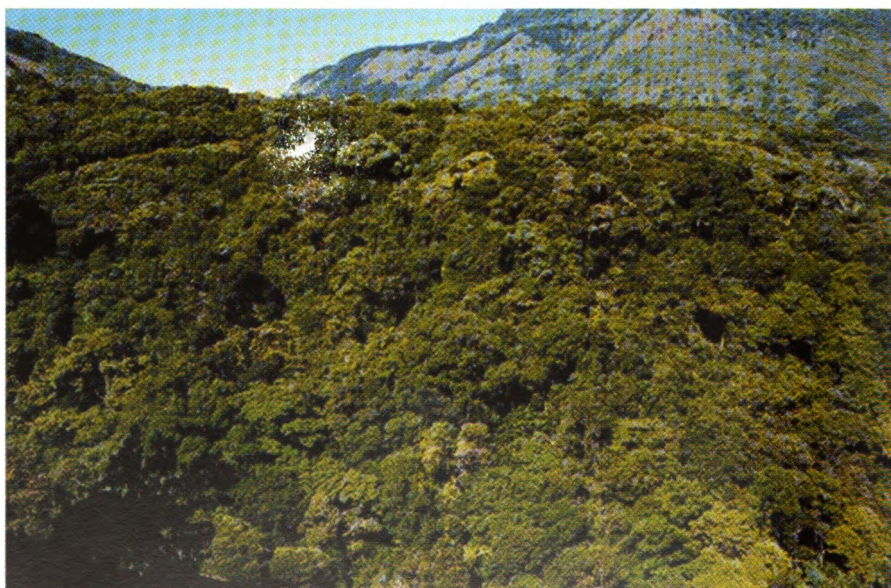
Life-Form	Family	Species	Local name
Tree	Clusiaceae	<i>Calophyllum trapezifolium</i>	Keena
Tree	Clusiaceae	<i>Calophyllum walkeri</i> ^{E,T}	Keena
Tree	Clusiaceae	<i>Garcinia echinocarpa</i>	
Tree	Anacardiaceae	<i>Semecarpus nigro-viridis</i> ^E	Badulla
Tree	Myrtaceae	<i>Syzygium umbrosum</i> ^{E,T}	
Shrub	Lecythidaceae	<i>Gaertnera walkeri</i> ^E	
Shrub	Rubiaceae	<i>Lasianthus oliganthus</i>	
Shrub	Acanthaceae	<i>Strobilanthes pulcherrima</i> ^E	Nelu
Shrub	Acanthaceae	<i>Strobilanthes sexennis</i>	Nelu
Climber	Rutaceae	<i>Toddalia asiatica</i>	
Climber	Pandanaceae	<i>Freycinatia pycnophylla</i>	Viyakeyya
Climber	Piperaceae	<i>Piper zeylanicum</i>	Walgammiris
Climber	Smilacaceae	<i>Smilax zeylanica</i>	Kabaresa
Climber	Liliaceae	<i>Asparagus falcatus</i>	Hathawariya
Climber	Melastomataceae	<i>Kendrikiya walkeri</i>	
Herb	Cyperaceae	<i>Carex lateralis</i>	
Herb	Rubiaceae	<i>Hedyotis lawsoniae</i>	
Herb	Hymenophyllaceae	<i>Hymenophyllum sp.</i>	
Herb	Davalliaceae	<i>Nephrolepis cordifolia</i>	
Herb	Poaceae	<i>Panicum gardneri</i>	
Epiphyte	Orchidaceae	<i>Adrorhizon purpuracens</i> ^{E,T}	
Epiphyte	Orchidaceae	<i>Eria bicolor</i>	
Epiphyte	Orchidaceae	<i>Oberonia sp.</i>	
Epiphyte	Orchidaceae	<i>Podochilus falcatus</i> ^T	
Parasite	Orabanchaceae	<i>Christisonia bicolor</i>	

Note: E – Endemic species; T – Threatened species

Sub-montane Forests

This natural vegetation type represents a transitional biological belt between highlands and lowlands. Typical patches of wet sub-montane forests are found in and around Kelabokka, Corbet's gap, and Riverston estate; between 600m-1300m asl. Sub-montane forests elsewhere in the Knuckles region are highly fragmented, denuded and reduced in area due to the expansion of tea, cardamom and various other human pressures. Forests found in and around Udumbarra area are classified as dry sclerophyllous sub-montane forests and found only in this geographic unit of Sri Lanka. This part being the eastern side of the Knuckles forest range experience more dry winds, hence the assemblage of flora and its structural features are adapted accordingly. Generally in both types of sub montane forests three strata can be recognized; canopy (15m), sub-canopy (5m) and shrub/herb layer (2m). Similar to the montane forests, trees are gnarled, stunted, much branched and aerodynamically shaped due to strong winds.

In the case of dry sclerophyllous sub-montane forests, the leaves of the canopy trees in general are small, shiny and covered with a prominent cuticle. Buttress formation is rare or absent. Presence of epiphytes such as orchids and lichens are not frequent as in the case with other sub-montane forests elsewhere in the Knuckles region. This can be attributed to the desiccating winds during May-August. Expansion of tobacco cultivation in the past at Udumbarra-Madugoda has left scars over parts of this sub-montane landscape. Functionally these forests play an equal role to montane forests, being primary catchment and watershed areas. Tables 2a and 2b provides a list of common plant species in the wet sub - montane and dry sub - montane forests of Knuckles respectively.



Sclerophyllous sub-montane forest

(Sarath Ekanayake)

Table 2a: List of common plant species in the wet sub-montane forest of Knuckles region

Life-Form	Family	Species	Local name
Tree	Meliaceae	<i>Aglaia congylos</i>	
Tree	Lauraceae	<i>Cryptocarya wightiana</i>	
Tree	Elaeocarpaceae	<i>Eleocarpus gladulifer</i> ^E	Malveralu
Tree	Lauraceae	<i>Litsea gardneri</i> ^E	
Tree	Myristicaceae	<i>Myristica dactyloides</i>	Malaboda
Tree	Symplocaceae	<i>Symplocos cochinchinensis</i>	Bombu
Tree	Myrtaceae	<i>Syzygium neesianum</i>	
Tree	Staphyleaceae	<i>Turpinia malabarica</i>	Gurenda
Shrub	Monimiaceae	<i>Hortonia floribunda</i> ^E	
Shrub	Rubiaceae	<i>Lasianthus oliganthus</i> ^E	
Shrub	Apocynaceae	<i>Rauvolfia densiflora</i>	
Shrub	Rosaceae	<i>Rubus indicus</i>	
Shrub	Icacinaeae	<i>Stemonurus coreaceus</i>	
Shrub	Acanthaceae	<i>Strobilanthes exserta</i> ^E	Nelu
Shrub	Acanthaceae	<i>Strobilanthes hookeri</i>	Nelu
Climber	Liliaceae	<i>Asparagus falcatus</i>	Hathawariya
Climber	Piperaceae	<i>Piper zeylanicum</i> ^E	Walgammiris
Climber	Smilacaceae	<i>Smilax zeylanica</i>	Kabaresa
Herb	Zingiberaceae	<i>Amomum involucreatum</i>	
Herb	Begoniaceae	<i>Begonia hirtella</i>	
Herb	Liliaceae	<i>Dianella ensifolia</i>	Monarapethan
Herb	Gesneriaceae	<i>Didymocarpus humboldtianus</i>	
Herb	Orchidaceae	<i>Malaxis purpuracence</i>	
Epiphyte	Orchidaceae	<i>Eria bicolor</i>	
Epiphyte	Orchidaceae	<i>Pholidota imbricata</i>	

Note: E – Endemic species

Table 2b: List of common plant species in the dry sub-montane forest of Knuckles region

Life-Form	Family	Species	Local name
Tree	Lauraceae	<i>Actinodaphne stenophylla</i> ^E	Metidavula
Tree	Euphorbiaceae	<i>Drypetes gardneri</i> ^E	Etaweera
Tree	Ochnaceae	<i>Gomphia serrata</i>	Rathgo
Tree	Euphorbiaceae	<i>Mallotus philippensis</i>	Nolabe
Tree	Rubiaceae	<i>Psychotria gardneri</i>	Labutharana
Tree	Myrtaceae	<i>Syzygium spathulatum</i> ^T	
Tree	Verbenaceae	<i>Vitex altissima</i>	Milla
Shrub	Euphorbiaceae	<i>Breynia vitis-idea</i>	
Shrub	Melastomataceae	<i>Memecylon umbellatum</i>	Korakaha
Shrub	Annonaceae	<i>Miliusa indica</i>	
Shrub	Oleaceae	<i>Olea polygama</i>	
Shrub	Rubiaceae	<i>Pavetta indica</i>	
Shrub	Pittosporaceae	<i>Pittosporum ceylanicum</i>	
Shrub	Rubiaceae	<i>Randia malabarica</i>	
Shrub	Moraceae	<i>Streblus asper</i>	Kolapollan
Climber	Menispermaceae	<i>Cissampelos pareira</i>	Ranketiya
Climber	Dioscoreaceae	<i>Dioscorea pentaphylla</i>	Katuala
Climber	Menispermaceae	<i>Hyserpa nitida</i>	Niriwel
Climber	Hippocrateaceae	<i>Salacia reticulata</i> ^T	Himbutu
Herb	Begoniaceae	<i>Begonia hirtella</i>	
Herb	Cyperaceae	<i>Carex filicina</i>	
Herb	Cyperaceae	<i>Carex jackiana</i>	
Herb	Hypoxidaceae	<i>Curculigo orchioides</i>	Bimpol
Herb	Urticaceae	<i>Procris crenata</i>	
Parasite	Loranthaceae	<i>Dendrophthoe neelgherrensis</i>	Pilila

Note: E – Endemic species; T – Threatened species

Semi-evergreen Forests

The semi-evergreen forests represent a major natural vegetation type in the lower elevations (below 700m) in the Knuckles region. These forests harbour many large trees such as *Crataeva religiosa*, *Phyllanthus indica*, *Sterculia foetida*, *Bombex ceiba* and *Vitex altissima* that shed their leaves during the long dry and windy season, mainly July-August, hence called semi-evergreen forests. The eastern lowland areas of the Knuckles region are rich with semi-evergreen closed canopy forests. Well developed semi-evergreen forests are located in and around Meemure, Pallegama and Illukkumbura. The forests consist of three strata; canopy (20-25m), sub-canopy (5-10 m) and ground herbaceous vegetation. Mature forests have a continuous canopy, hence the forest interior is dark and have a scanty ground vegetation. Walking in this forest is much easier. The vertical structure of this forest allows habitat partitioning for birds and other insects, enabling a higher animal diversity. Giant woody lianas are also an important structural element of these forests. Thickets of lianas could be found in more disturbed sites where they have taken advantage of canopy openings to establish themselves and spread into surrounding trees.

These forests also function as excellent catchments of river Mahaweli. They are very effective in intercepting rain with little or no soil erosion, and sustain perennial streams that are very important for the sustenance of downstream ecosystems. Table 3 provides a list of common plant species in the semi - evergreen forests of Knuckles.



Semi-evergreen forest

(Sarath Ekanayake)

Table 3: List of common plant species in the semi-evergreen forest of Knuckles region

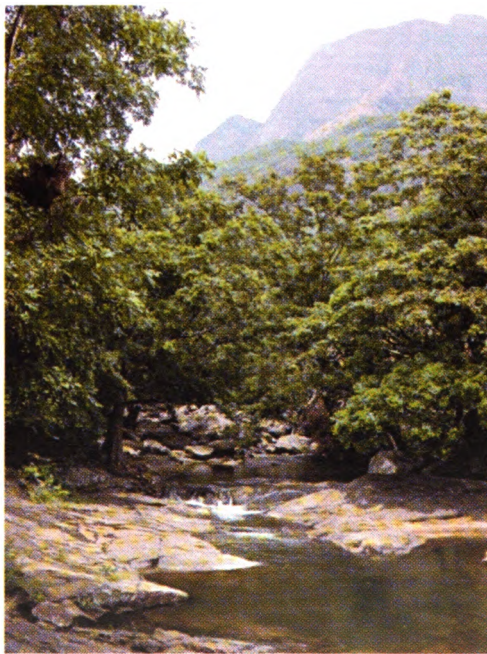
Life-Form	Family	Species	Local name
Tree	Sapindaceae	<i>Dimocarpus longan</i>	Mora
Tree	Ebenaceae	<i>Diospyros ebenoides</i> ^{E,T}	Yabara
Tree	Sapotaceae	<i>Palaquium hinmolpedda</i> ^E	
Tree	Celastraceae	<i>Pleurostylia opposita</i>	
Tree	Anacardiaceae	<i>Semecarpus nigro-viridis</i>	Badulla
Tree	Verbenaceae	<i>Vitex altissima</i>	Milla
Shrub	Euphorbiaceae	<i>Dimorphocalyx glabellus</i>	Weliwarana
Shrub	Rutaceae	<i>Glycosmis mauritiana</i>	Dodanpana
Shrub	Melastomataceae	<i>Memecylon umbellatum</i>	Korakaha
Shrub	Annonaceae	<i>Miliusa indica</i>	
Shrub	Rubiaceae	<i>Psychotria gardneri</i> ^E	Labutharana
Shrub	Moraceae	<i>Streblus asper</i>	Kolapollan
Climber	Palmae	<i>Calamus pseudotenuis</i>	Kukulwewel
Climber	Araceae	<i>Pothos scandens</i>	Potawel
Climber	Hippocrateaceae	<i>Salacia reticulata</i>	
Climber	Rhamnaceae	<i>Ventilago maderaspatana</i>	Niliwel
Climber	Apocynaceae	<i>Willughbeia cirrhifera</i> ^E	Kirindiwel
Herb	Cyperaceae	<i>Carex filicina</i>	
Herb	Hypoxidaceae	<i>Curculigo orchiodes</i>	Bimpol
Herb	Polypodiaceae	<i>Hemionites arifolia</i>	Uruhonda
Herb	Lamiaceae	<i>Leucas zeylanica</i>	Getathumba
Epiphyte	Loranthaceae	<i>Dendrophthoe neelgherrensis</i>	
Epiphyte	Polypodiaceae	<i>Drymoglossum piloselloides</i>	Pananpethi
Epiphyte	Cactaceae	<i>Rhipsalis baccifera</i>	
Epiphyte	Orchidaceae	<i>Vanda tessellata</i> ^T	

Note: E – Endemic species; T – Threatened species

Riverine Forests

Riverine forests flanking streams and rivers, form the interphase between stream and other terrestrial habitats. Extensive strips of riverine forest are found along the banks of streams such as Kaluganga (Pallegama), Theligomu oya (Illukkumbura), Heenganga (Meemure) and Karambaketiya Oya (Kaikawala). The distribution of this vegetation type can be as narrow as a few meters on the steeper terrain or over 10m wide in the flat areas in the lower reaches. Vegetation height is about 25m-35m with a closed canopy belt of forests. Sub-canopy (15m) and shrubs/herbs (0.5m-3m) layers can also be distinguished. General luxuriance compared to other forests makes it more akin to rain forests. Lianas are important constituents of the forest framework. This vegetation type also has a very high floristic richness, dominated by evergreen species such as *Terminalia arjuna*, *Madhuca longifolia*, *Mangifera zeylanica*, and *Diospyros malabarica*. This evergreen character can be attributed to the unlimited availability of ground water throughout the year.

These forests forms the frontline defence against stream bank erosion due to water currents. Thick root system of trees and shrubs acts as a protective cushion covering the banks. Well developed riverine forests provide convenient resting sites for a variety of vertebrate animals. Table 4 provides a list of common plant species in the riverine forests of Knuckles.



Riverine Forest

(Sarath Ekanayake)

Table 4: List of common plant species in the riverine forest of Knuckles region

Life-Form	Family	Species	Local name
Tree	Ebenaceae	<i>Diospyros malabarica</i>	Thimbiri
Tree	Moraceae	<i>Ficus hispida</i>	Kotadimbul
Tree	Moraceae	<i>Ficus racemosa</i>	Attikka
Tree	Flacourtiaceae	<i>Hydnocarpus venenata</i> ^E	Makul
Tree	Anacardiaceae	<i>Mangifera zeylanica</i> ^E	Etamba
Tree	Myristicaceae	<i>Myristica ceylanica</i>	Malaboda
Tree	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee
Tree	Euphorbiaceae	<i>Phyllanthus indicus</i>	Karau
Tree	Fabaceae	<i>Pongamia pinnata</i>	Karanda
Tree	Sterculiaceae	<i>Sterculia foetida</i>	Thelembu
Tree	Sapotaceae	<i>Madhuca longifolia</i>	Mee
Tree	Myrtaceae	<i>Syzygium cumini</i>	Damba
Tree	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk
Tree	Tetramelaceae	<i>Tetrameles nudiflora</i>	Muguna
Shrub	Rubiaceae	<i>Ixora coccinea</i>	Rathmal
Shrub	Pandanaceae	<i>Pandanus ceylanicus</i>	
Shrub	Euphorbiaceae	<i>Phyllanthus myrtifolius</i>	Gangawerella
Shrub	Rubiaceae	<i>Psychotria gardneri</i>	Labutharana
Climber	Fabaceae	<i>Acacia chundra</i>	Diyahinguru
Climber	Fabaceae	<i>Dalbergia pseudo-sissoo</i>	Ratabambara
Climber	Fabaceae	<i>Derris scandens</i>	Kalawel
Climber	Fabaceae	<i>Entada zeylanica</i>	Puswel
Climber	Rhamnaceae	<i>Ventilago maderaspatana</i>	Niliwel
Herb	Poaceae	<i>Digitaria longiflora</i>	
Herb	Poaceae	<i>Paspalidium flavidum</i>	

Note: E – Endemic species

Rock Outcrop Forests

The vegetation is basically a result of the thin soil layer associated with surface rock. Usually the soil depth is around 50 cm with little available water, particularly in drier areas. Sometimes plants grow attached to rock crevices. In addition to the wide temperature fluctuations experienced in these sites, water is one of the main limiting factors governing the biological diversity. Since trees, shrubs and herbs compete within the same soil volume, water and nutrition get exhausted. Rock outcrop vegetation is quite vulnerable to fire because it is the first to dry up with the onset of drought. Their distribution is highly fragmented and random; found throughout the entire climatic gradient of the Knuckles region. When it occurs in mountainous areas the forest becomes more stunted compared to an average montane forest, and floristically less diverse; mainly *Calophyllum* spp. occur. In the case of drier lowlands, the forest is more related to scrublands and degraded semi-evergreen forests. Three strata are found; trees (15m), shrubs (5m) and herbs (1m). There is no continuous canopy. Among the herbaceous vegetation *Sansevieria zeylanica* (Niyada) is more common.

Rock outcrop vegetation 'clothes' the rock preventing it from exposure. Rock crevices are ideal resting places for reptiles and other nocturnal animals. Since the rock outcrops are usually elevated from the ground they are favourite places of wild cats such as the Leopard which use them as vantage points in hunting. The short vegetation camouflages them effectively. At certain places small rock pools can be found, further attracting animals with water for drinking and bathing. Table 5 provides a list of common plant species in the rock-outcrop forests of Knuckles.



Rock-outcrop forest

(Channa Bambaradeniya)

Table 5: List of common plant species in the rock-outcrop forest of Knuckles region

Life-Form	Family	Species	Local name
Tree	Clusiaceae	<i>Calophyllum trapezifolium</i> ^{E.T}	Keena
Tree	Rubiaceae	<i>Canthium dicoccum</i>	
Tree	Capparidaceae	<i>Crateva adansonii</i>	Esuru
Tree	Moraceae	<i>Ficus arnottiana</i>	Kaputubo
Tree	Moraceae	<i>Ficus benghalensis</i>	Nuga
Tree	Moraceae	<i>Ficus virens</i>	
Tree	Celastraceae	<i>Pleurostyhia opposita</i>	
Tree	Tetramelaceae	<i>Tetrameles nudiflora</i>	Muguna
Shrub	Boraginaceae	<i>Carmona retusa</i>	Ketakela
Shrub	Rubiaceae	<i>Catunaregam spinosa</i>	
Shrub	Euphorbiaceae	<i>Euphorbia antiquorum</i>	Daluk
Shrub	Euphorbiaceae	<i>Flueggea leucopyros</i>	Katupila
Shrub	Thymelaeaceae	<i>Gnidia eriocephala</i>	Nahadunu
Shrub	Celastraceae	<i>Gymnosporia emarginata</i>	
Shrub	Verbenaceae	<i>Lantana camara</i>	Hinguru
Shrub	Melastomataceae	<i>Memecylon umbellatum</i>	Korakaha
Shrub	Rubiaceae	<i>Tarenna asiatica</i>	Tarana
Shrub	Rhamnaceae	<i>Ziziphus oenoplia</i>	Eraminiya
Climber	Fabaceae	<i>Acacia chundra</i>	Diyahinguru
Climber	Commelinaceae	<i>Commelina clavata</i>	Girapala
Climber	Moraceae	<i>Ficus pumila</i>	
Climber	Passifloraceae	<i>Passiflora foetida</i>	Padawel
Herb	Polypodiaceae	<i>Hemionites arifolia</i>	Uruhonda
Herb	Poaceae	<i>Pennisetum polystachion</i>	Illuk
Herb	Liliaceae	<i>Senсевieria zeylanica</i>	Niyanda

Note: E – Endemic species; T – Threatened species

Savanna

The savanna vegetation type has evolved due to frequent human created fires. In fact, fire is the main determinant of this vegetation type. Typical savanna could be found on hilly slopes below Corbet's gap area. The savanna has a very simple structure, with isolated trees (10m) scattered over vast expanse of grasslands. An important feature of these trees is that they are well adapted to survive fire. This could be attributed to the thick bark covering the stems, protecting the internal tissues from heat.

Annual human created fire is experienced during the dry season of May-August, when farmers burn the cleared patched of forest land to start chena cultivations. All the grasses and herbaceous vegetation is destroyed by fire. However, the underground parts of the grass and herbacious community remain alive to produce new shoots with the onset of rain. Lemon grass (*Cymbopogon nardus*) is the typical dominant grass of this community. The exotic Guinea grass (*Panicum maximum*) also grows quite aggressively in Savannas, at the expense of the local grasses. However from the point of herbivorous mammals, this is a good fodder plant. Young grass shoots appear after the burning season, and the savanna becomes a good feeding ground for wild herbivores. People also release their cattle to feed on savanna land. Table 6 provides a list of common plant species in the savanna of Knuckles.



Savanna

(Sarath Ekanayake)

Table 6: List of common plant species in the savanna of Knuckles region

Life-Form	Family	Species	Local name
Tree	Fabaceae	<i>Albizia odoratissima</i>	Panimara
Tree	Apocynaceae	<i>Alstonia scholaris</i>	Ruk attana
Tree	Euphorbiaceae	<i>Bridelia retusa</i>	Ketakela
Tree	Meliaceae	<i>Chukrasia tabularis</i>	Barawahik
Tree	Tiliaceae	<i>Grewia damine</i>	Damunu
Tree	Euphorbiaceae	<i>Phyllanthus embilica</i>	Nelli
Tree	Anacardiaceae	<i>Semecarpus nigro-viridis</i>	Badulla
Tree	Ulmaceae	<i>Trema orientalis</i>	Gedumba
Shrub	Meliaceae	<i>Cipadessa baccifera</i>	Halbemiya
Shrub	Euphorbiaceae	<i>Croton laccifer</i>	Keppetiya
Shrub	Cycadaceae	<i>Cycas circinalis</i>	Madu
Shrub	Sapindaceae	<i>Dodonaea viscosa</i>	Hupala
Shrub	Tiliaceae	<i>Grewia polygama</i>	Boradamaniya
Shrub	Sterculiaceae	<i>Helicteres isora</i>	Liniya
Shrub	Verbenaceae	<i>Lantana camara</i>	Hinguru
Shrub	Myrtaceae	<i>Psidium guajava</i>	Pera
Shrub	Rhamnaceae	<i>Ziziphus oenoplia</i>	Eraminiya
Herb	Poaceae	<i>Cymbopogon nardus</i>	Mana
Herb	Poaceae	<i>Cynadon dactylon</i>	Heen atora
Herb	Poaceae	<i>Dactyloctenium aegyptium</i>	
Herb	Poaceae	<i>Eragrostis nigra</i>	
Herb	Poaceae	<i>Imperata cylindrica</i>	Iluk
Herb	Poaceae	<i>Panicum maximum</i>	
Herb	Poaceae	<i>Themeda tremula</i>	Iluk
Climber	Connaraceae	<i>Rourea minor</i>	Radaliya

Patana grasslands

Patana grasslands are common on hills below 1000m asl, especially in areas between Rattota-Illukkumbura and Hunnasgiriya-Meemure. They occur mainly on lands where forest cover has been destroyed due to various human activities such as agricultural expansion (tea and chena), fire, and removal of timber species. Grasslands have a simple vegetation structure; just the sea of closely grown grassy cover upto 2m in height. Occasionally, isolated and scattered trees (upto 20m) and shrub (upto 3m) species can be seen. They could be further categorized as Wet Patana and Dry Patana grasslands, based on rainfall and soil moisture regime. Wet Patana grasslands occur in high altitude plains situated along the Thangappuwa-Alugallena trail.

The grassland called 'Pitawala Patana' close to Pitawala village, by the side of Rattota-Illukkumbura road, is an extra ordinary grassland with regard to its ecological uniqueness and aesthetic appeal. Pitawala Patana grassland is a natural turf grass community on a rocky expanse – a rare type of grassland, evolved in response to a particular ecological condition, that you find nowhere else in the country to that extent. Here, the grass cover of upto 10cm tall occupies an area of about 10ha of a gently sloping rock slab covered with a thin soil layer of 5-10cm. A semi-evergreen forest standing on somewhat deeper soil surrounds the grassland. Pitawala Patana is the grazing land of a large number of buffaloes and cattle owned by villagers in the vicinity. Presently this extremely beautiful expanse of grassland surrounded by towering hills, is apparently denuded by overgrazing and visitor pressure. Table 7 provides a list of common plant species in the patana grasslands of Knuckles.



Patana grassland

(Sarath Ekanayake)

Table 7: List of common plant species in the patana grassland of Knuckles region

Life-Form	Family	Species	Local name
Shrub	Euphorbiaceae	<i>Croton laccifer</i>	Keppetiya
Shrub	Verbenaceae	<i>Lantana camara</i>	Hinguru
Shrub	Thymelaeaceae	<i>Wikstroemia canescens</i>	
Herb	Amaranthaceae	<i>Achyranthes aspera</i>	Karalsabo
Herb	Amaranthaceae	<i>Allmania nodiflora</i>	
Herb	Poaceae	<i>Cymbopogon nardus</i>	Mana
Herb	Poaceae	<i>Cynodon dactylon</i>	Belathana
Herb	Poaceae	<i>Dactyloctenium aegyptium</i>	
Herb	Poaceae	<i>Imperata cylindrica</i>	Illuk
Herb	Poaceae	<i>Panicum maximum</i>	
Herb	Poaceae	<i>Pennisetum polystachion</i>	Illuk
Herb	Poaceae	<i>Themeda tremula</i>	Illuk
Herb	Poaceae	<i>Eragrostis ciliaris</i>	
Herb	Poaceae	<i>Ischaemum indicum</i>	
Herb	Fabaceae	<i>Desmodium triflorum</i>	Heenundupiyali
Herb	Asteraceae	<i>Elephantopus scaber</i>	Ethadi
Herb	Gentianaceae	<i>Exacum trinervium</i> ^{E,T}	Binara
Herb	Lamiaceae	<i>Hyptis suaveolens</i>	
Herb	Fabaceae	<i>Mimosa pudica</i>	Nidikumba
Herb	Aizoaceae	<i>Mollugo oppositifolia</i>	Walpathpadagam
Herb	Lamiaceae	<i>Ocimum sanctum</i>	Madurutala
Herb	Euphorbiaceae	<i>Phyllanthus debilis</i>	Pitawakka
Herb	Malvaceae	<i>Sida acuta</i>	Bawila
Herb	Malvaceae	<i>Urena lobata</i>	Pattaepala
Herb	Lentibulariaceae	<i>Utricularia bifida</i>	Nilmonaressa

Note: E – Endemic species; T – Threatened species

Scrublands

Scrublands are characterized by one stratum of shrubs (2 m) with many thorny or prickly species grown as an impenetrable thicket. In many instances isolated trees reaching upto 10 m can be observed. Some of them indicate that the previous stage may have been a savanna. Discontinuation of annual fires lead to the formation of such scrublands. Most scrublands are distributed around present and past settlements, frequently seen at Meemure, Illukkumbura, Pallegama and Ranamure. Scrublands occur as a patchwork over the landscape. Often, there is a clear boundary with the high forest indicating past disturbance at certain sites. Vulnerability to fire is more or less similar to grasslands. At the height of drought, scorching sun makes it more inflammable particularly due to the exotic *Lantana camara* which seems to produce certain essential oils that support burning.

Scrublands are good hiding and resting places of ground-dwelling birds, wild boars, hares, and other small mammals. Because of the impenetrable nature of the thickets many animals find it a safe abode to avoid predators. Elephants show a tendency to visit scrublands in search of preferred fodder plants. Table 8 provides a list of common plant species in the scrublands of Knuckles.



Scrubland

(Sarath Ekanayake)

Table 8: List of common plant species in the Scrubland of Knuckles region

Life-Form	Family	Species	Local name
Tree	Rubiaceae	<i>Canthium coromandelicum</i>	Kara
Tree	Rubiaceae	<i>Canthium dicoccum</i>	
Tree	Verbenaceae	<i>Premna tomentosa</i>	Seru
Tree	Ulmaceae	<i>Trema orientalis</i>	Gedumba
Tree	Rubiaceae	<i>Wendlandia bicuspidata</i>	Wanaidala
Shrub	Euphorbiaceae	<i>Dimorphocalyx glabellus</i>	Weliwarana
Shrub	Euphorbiaceae	<i>Flueggea leucopyros</i>	Katupila
Shrub	Sterculiaceae	<i>Helicteres isora</i>	Liniya
Shrub	Verbenaceae	<i>Lantana camara</i>	Hinguru
Shrub	Melastomataceae	<i>Memecylon umbellatum</i>	Korakaha
Shrub	Asteraceae	<i>Microglossa zeylanica</i>	
Shrub	Euphorbiaceae	<i>Phyllanthus polyphyllus</i>	Ambitilla
Shrub	Rubiaceae	<i>Randia malabarica</i>	
Shrub	Moraceae	<i>Streblus asper</i>	Kolapollan
Shrub	MoraceaeS	<i>Treblus taxoides</i>	Katu pol
Shrub	Rhamnaceae	<i>Ziziphus oenoplia</i>	Eraminiya
Climber	Aristolochiaceae	<i>Aristolochia indica</i>	Maduwel
Climber	Fabaceae	<i>Derris scandens</i>	Kalawel
Climber	Rutaceae	<i>Toddalia asiatica</i>	Kudumiris
Herb	Asteraceae	<i>Elephantopus scaber</i>	Ethadi
Herb	Lamiaceae	<i>Ocimum gratissimum</i>	
Herb	Melastomataceae	<i>Osbeckia octandra</i>	Bovitiya
Herb	Malvaceae	<i>Pavonia odorata</i>	
Herb	Asteraceae	<i>Tridax procumbens</i>	Thuththiri
Herb	Asteraceae	<i>Vernonia cinerea</i>	Monarakudumbiya

Home Gardens

Home gardens are the vegetation type found immediately around homesteads and are results of long-term human interventions. Occurrence of tree dominated multipurpose vegetation communities arranged similar to a natural forest is the main characteristic feature of these home gardens. Well developed multi-storey home gardens are located in villages such as Kaikawela and Meemure. However, the appearance varies in relation to the individual farmer practices. Generally, a canopy (20m), sub-canopy (10m) and shrub/herb layer (2m) could be recognized. Continuous canopy allows very little light to reach the ground. Often the structure is fast changing in time and space due to agricultural practices such as weeding, pruning, fencing, digging etc. Exotic and agricultural crop species are found in this habitat. Common tree species include Jak, Mahogany, Teak, Breadfruit, Mango, Avacado, Coconut, and Kitul Palm.

Home gardens are important faunal habitat providing animals with feeding and nesting sites. It provides people with fruits, nuts, yams, flowers, vegetables, medicines, firewood and timber throughout the year. This helps to reduce the pressure on natural forests. Table 9 provides a list of common plant species in the home gardens of Knuckles.



A view of a home garden

(Sarath Ekanayake)

Table 9: List of common plant species in the home gardens of Knuckles region

Life-Form	Family	Species	Local name and uses
Tree	Apocynaceae	<i>Alstoniamacrophylla</i>	Hawarinuga – Timber
Tree	Palmae	<i>Areca catechu</i>	Puwak – Poles
Tree	Moraceae	<i>Artocarpus heterophyllus</i>	Kos – Timber, Edible fruit
Tree	Moraceae	<i>Artocarpus nobilis</i>	Del – Edible fruit
Tree	Palmae	<i>Caryota urens</i>	Kithul – treacle, toddy, juggery
Tree	Palmae	<i>Cocos nucifera</i>	Pol – Edible fruit
Tree	Sapindaceae	<i>Filicium decipiens</i>	Pihimbiya – Timber
Tree	Euphorbiaceae	<i>Macaranga peltata</i>	Kenda
Tree	Anacardiaceae	<i>Mangifera indica</i>	Amba – Edible fruit
Tree	Meliaceae	<i>Melia dubia</i>	Lunumidella – Timber
Tree	Moringaceae	<i>Moringa oleifera</i>	Murunga – Edible Fruit
Tree	Lauraceae	<i>Persea americana</i>	Alipera – Edible Fruit
Tree	Apocynaceae	<i>Plumeria rubra</i>	Araliya – Flowers for praying
Shrub	Caricaceae	<i>Carica papaya</i>	Papol – edible fruit
Shrub	Rubiaceae	<i>Coffea arabica</i>	Kopi – Coffee
Shrub	Verbenaceae	<i>Lantana camara</i>	Hinguru
Shrub	Musaceae	<i>Musa paradisiaca</i>	Kesel – Edible Fruit
Shrub	Myrtaceae	<i>Psidium guajava</i>	Pera – Edible Fruit
Climber	Piperaceae	<i>Piper betle</i>	Bulath – Chewing, as essential item for traditional occasions
Herb	Solanaceae	<i>Capsicum anunum</i>	Miris – Spice
Herb	Araceae	<i>Colacasia esculenta</i>	Ala – Edible yam
Herb	Zingiberaceae	<i>Curcuma domestica</i>	Kaha – Spice
Herb	Fabaceae	<i>Mimosa pudica</i>	Nidikumba
Herb	Compositae	<i>Vernonia cinerea</i>	Monarakudumbiya
Herb	Zingiberaceae	<i>Zingiber officinale</i>	Inguru – Spice, Medicinal value

Agricultural lands

Although agricultural habitats are not effective in harbouring indigenous biodiversity, as compared to natural habitats, they play a key role in sustaining the livelihoods of village communities, while absorbing the human impacts directed towards natural ecosystems. A short account on different major agricultural habitats in the Knuckles region is as follows.

Cardamom plantations: Cardamom (*Ellettaria cardamomum* – Zingiberaceae) is a herbaceous plant (1.5m tall) cultivated under the canopy shade of montane and sub-montane natural forests (above 900m asl) in the Knuckles region. The fruits of Cardamom are an economically valuable spice. Cultivation of Cardamom over several decades in the Knuckles region has resulted in the degradation of montane and sub-montane forest ecosystems.

Tea plantations: Tea (*Camelia sinensis* – Theaceae) has been planted in wet mountainous areas (700m-1300m asl) of the Knuckles region since the British colonial era of Sri Lanka. Areas such as Rangala, Kelebokka, Thangappuwa, Panwila and Loolwatta harbour extensive tea cultivation.

Rice fields: Rice (*Oryza sativa* – Graminae) being the staple food of Sri Lankans, has been cultivated mainly in valleys and terraced hill slopes of the Knuckles region for several centuries, and form an essential component of the village landscape. Several traditional rice varieties are still been cultivated in remote villages of Knuckles, using traditional practices. Characteristic features of traditional terraced rice fields in the area include small fields ('liyaddas') with several bunds/levees, interspersed by irrigation canals lined with trees/shrubs, islands of tree cover and a threshing ground ('kamatha'). Rice fields, being temporary aquatic ecosystems, serve as important feeding habitats of many species of vertebrate animals. Therefore, rice fields enhance the biodiversity associated with human settlements.

Chena cultivations: Apart from paddy cultivation, practice of chena (a form of shifting cultivation) is yet another traditional agricultural system. Just before the onset of the north-west monsoon rainy season (October), a plot of natural forest land close to the village is cleared by burning and removal of shrubby and herbaceous plants. In the cleared plot of land, an array of various short term crops such as Chilli, Brinjal, Cassava, Maize, Pumpkin, Cucumber, Sweet potato, Kurakkan and Mustard are grown haphazardly. Chena is an important source of cereals, vegetables and yams to sustain the family, while any surplus crop is traded. Once the soil fertility of the chena gets depleted in 2-3 years, the land is left to fallow for 5-7 years while the farmer move into another forest land to start his chena anew. Scars in the forest landscape, such as a plot of shrubby growth in the middle of the forest, is a result of this fallow practice. This practice has been reduced to a considerable extent, mainly due to enforcement of conservation legislation, since chena practice is considered to be ecologically damaging. However, chenaland can still be seen in and around traditional villages like Meemure, Pallegama, Illukkumbura, Ranamure and Pitawala.

Vegetable plots: Short-term vegetable crops are cultivated in small plots of lands in almost all the settlements. Paddy land abandoned due to shortage of water, unproductive tea lands, and open areas of the homestead are used for vegetable cultivation. In highland areas such as Rangala, Thangappuwa and Hunnasgiriya, vegetables such as Potato, Cabbage, Carrots, Beet, Radish and Knokhol that grow well under cooler climatic conditions are cultivated. Common vegetables cultivated in foothill areas such as Meemure, Pallegama and Illukkumbura include Capsicum, Brinjal, Cucumber, Beans, Luffa, Bittergourd and Ochra.

Mixed spice groves: Often, this is an extension of the tree dominated home gardens. Perennial spices such as Pepper, Cloves, Cardamom, Coffee and Nutmeg are grown in a mixed cropping system. Gliricidia is grown as a host plant to facilitate the growth of Pepper vines, and also as a source of soil enrichment.

Plantation Forests: A couple of decades ago, the Forest Department initiated reforestation of the degraded lands of the Knuckles region with Pinus (*Pinus carebea* – Pinaceae), Eucalyptus and Acacia (*Acacia auriculiformis* and *A. mengium*). Presently, forest patches consisting solely of well grown Pinus, Eucalyptus or Acacia can be seen in many places in and around the Knuckles region.



Rice fields

(Charmalee Jayasinghe)



A Tea estate
(*Anura Helarawa*)



A Chenaland
(*Anura Helarawa*)



A Pinus plantation
(*Sarath Ekanayake*)



A Cardamom plantation
(*Sarath Ekanayake*)



Animals of Knuckles

A silent forest suddenly awakes to the sounds of life.....combined creeks of crickets, cicadas and frogs..... echoing calls of barbets and leaf-monkeys..... frequent chattering of bulbuls and squirrels..... the chirping calls of a passing mixed bird flock.....depicting a fraction of animal life that have thrived in this eternal land.....along the gentle flow of time

Invertebrate Animals

The variety of habitats and vegetation types in Knuckles forest range supports a rich composition of animals. Interesting invertebrate animals in Knuckles, better known as spineless creatures, include a rich array of spiders, insects, molluscs and many other forms. The forest-dwelling predatory spiders consist of web-building and non-web building forms, which protect the plants from pest insects. Among them, the Giant Wood Spider (*Nephila maculata*) displays its unique architectural skills by spinning a large vertical web up to 1m in diameter across gaps among trees. The non-web building forms include several species of Wolf spiders and Jumping spiders that stalk and ambush their insect prey. A few species of bird-eating spiders – commonly referred to as ‘tarantulas’ also occur in the forest, but they are seldom seen, as they hide in tree holes and crevices during day-time and venture out at night to hunt their prey, which includes large insects, small lizards, geckos, and fledgling birds.

The insect life in Knuckles is extremely diverse. The frequent call of cicadas and crickets, large mounds of termites, colourful and shiny wings of butterflies moving among the foliage are a few attractions that depict the richness of the group. The streams in Knuckles harbour several species of predatory dragon flies and damselflies. The larvae of these insects are aquatic, while the adults live closer to aquatic habitats, occupying a specific territory. The adult dragon flies stay vigilant in a particular perching spot and hover over their territory at regular intervals, looking for insect prey and also to ward off intruders, including members of their own kind! Numerous species of bees and butterflies could be observed especially during the morning hours, busily attending to the flowers of plants in different strata of the forest. These insects play a valuable role in the forest ecosystem, by facilitating pollination and thereby ensuring the sustenance of plant communities. The Bees vary in sizes. Some of them are social bees, while others are solitary.

The less-mobile forms include terrestrial molluscs that occupy mainly the forest floor, adorned with protective shells of different shapes, sizes and colours. Their aquatic counterparts could be observed attached to rocks in streams. The rocky streams are abounded with unique mountain crabs and shrimps. The above prominent invertebrates comprise a small fraction of the myriad spineless creatures that occur in the forest.



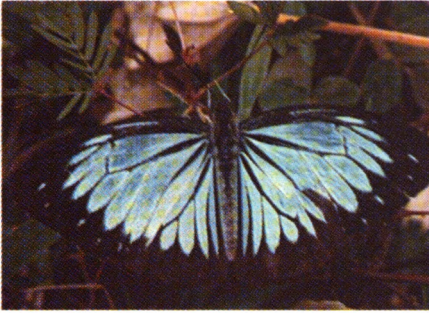
Tree living mollusc – *Acavus* spp.
(*Channa Bambaradeniya*)



Giant Wood Spider – *Nephila maculata*
(*Channa Bambaradeniya*)

Butterflies

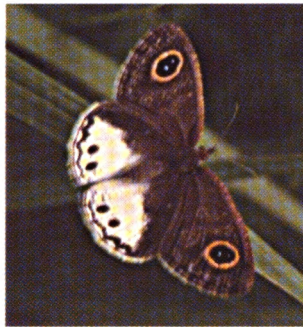
The butterflies in Knuckles appear in various sizes and colours. They are truly the winged angels of the forest. We recorded 60 species from different areas of the Knuckles forest region, of which 5 are endemic, while 8 are nationally threatened (Annex 1). The small blue butterflies, including the Lesser Grass Blue (*Zizina otis*) can be observed darting across the ground herbaceous vegetation. The brown butterflies, such as the Nigger (*Orsotraeina medus*) and Common Evening Brown (*Melanitis leda*) could be observed in the forest floor, extracting the juices of rotten fruit, animal dung or decaying vegetation. The tiger butterflies, such as the Common Tiger (*Danaus genutia*), possess bright coloured wings with patterns. They move between different strata of the forest, and escape from predatory birds, since they possess poisonous chemicals absorbed from food plants during their larval period. Among them, the endemic Tree nymph (*Idea iasonia*) occupies the canopy level, and its graceful gliding flight is truly charming! The pansies and eggflies belong to the dominant group of butterflies in Knuckles. Among them, the endemic Blue Oakleaf (*Kallima philarchus*) is a master of camouflage and mimicry – the arts of hiding true identity. It resembles a dead leaf when it is perched in a branch or twig, which enables it to avoid predatory birds. In case a bird gets too close to it, it falls to the ground mimicking the manner of a falling leaf! The groups of whites and yellows include the typical migrants among butterflies. Species such as the Lemon Immigrant (*Catopsilia pomona*) and the Common Albatross (*Appias albina*) are involved in annual local migrations in large aggregations. Members of this migratory group could be commonly observed gathered in large congregations along stream beds and drying water puddles along streams, engaged in the absorption of mineral nutrients. The swallowtails include the largest butterflies in Sri Lanka, including the endemic Birdwing (*Troides darsius*) and the Blue Mormon (*Papilio polymnestor*). These graceful butterflies usually occupy the mid and upper strata of the forest, while they also frequent the lower strata as well. The larval caterpillars of swallowtail butterflies mimic the droppings of birds, in order to afford protection from predators.



Blue Wanderer – *Pareronia ceylanica*
(Dammithra Samarasinghe)



Crimson Rose – *Pachliopta hector*
(Gehan De Silva Wijeyeratne)



White Four ring – *Ypthima ceylanica*
(Channa Bambaradeniya)



Blue Mormon - *Papilio polymnestor*

The Vertebrate Animals

The mosaics of landscapes and traversing streams in Knuckles have enabled a diversity of vertebrate animals to inhabit the area. The stone sucker fish that have conquered the rapids flowing through steep mountains, the never-ending calls of tree frogs, numerous species of lizards well camouflaged in the foliage, the melodious songs and calls of birds that echo from tree-tops, and the squirrels and monkeys that move among trees, provide a snap-shot of the better known higher animal life occurring in Knuckles. A total of 247 species of vertebrates have been recorded from the Knuckles forest range over the past 10 years, which represents approximately 38% of the inland native vertebrate animals in Sri Lanka. About 26% of the vertebrate species recorded from Knuckles are endemic to Sri Lanka, while 28% are nationally threatened. Interestingly, among the total vertebrate animals currently described in Sri Lanka, five endemic species, consisting of three freshwater fish, one amphibian and one lizard are restricted to the Knuckles Forest Range. This makes Knuckles a globally significant natural landscape.

Freshwater fishes

The network of streams in Knuckles harbour several species of freshwater fish. Although we were able to record only 15 species (Annex 2), published sources indicate that at least 25 species occur in the streams, especially in streams around the foothills of Knuckles area. Among the fish species that we recorded, 8 are endemic, of which 7 are nationally threatened. Three of the endemic forms (Phillips's Garra - *Garra phillipsii*, Blotched Filamented Barb - *Puntius srilankensis* and Martenstyn's Barb - *Puntius martenstyni*) are restricted to the streams of the Knuckles forest range. The different species of fish are adapted to inhabit specific segments of the streams, which could be differentiated according to the flow of water and bottom substrate. The endemic Stone Sucker (*Garra ceylonensis*) is the most common fish species that is distributed along streams flowing from higher to lower altitudes in Knuckles. This species and its cousin - Philipps's Garra are well adapted to inhabit rocky streams where the flow of water is rapid, as it possess a ventral sucker which enables it to cling onto rock surfaces, and graze on algae growing on such surfaces.

Amphibians

Of the 20 species of amphibians recorded from Knuckles, 12 are endemic and nationally threatened as well (Annex 3). Among them, the Kirtisinghe's Rock Frog (*Nannophrys marmorata*) is found only in the Knuckles Forest Range, inhabiting streamlets that drip along rocky surfaces. The species is well camouflaged, occurring under wet boulders and in rocky crevices. Several amphibian species inhabiting the Knuckles region are yet to be discovered and scientifically described. This is especially valid for the small tree frogs, which are often heard, than seen. Most members of the tree frog group, lay a small clutch of eggs in the moist forest floor, instead of in water. These amphibians become active with the onset of rains, after a short spell of dry weather. On such a day, the forest is filled with non-stop choruses emitted by males, in their bid to attract a female companion for breeding.

The Small-eared Tree frog (*Rhacophorus microtympanum*) could be commonly heard in the lower and upper montane forests, while the Corrugated Water frog (*Limnonectes corrugatus*) could be commonly heard near the streams flowing through the above forests.

Reptiles

The reptiles in Knuckles forest region range from small geckos and skinks to large monitor lizards and pythons. Of the 53 species recorded from the area, 23 species are endemic, while 24 species are nationally threatened (Annex 4). Interestingly, half of the Agamid lizard species in Sri Lanka are found in Knuckles. Among them, the endemic Leaf-nose Lizard (*Ceratophora tennentii*) is found only in the Knuckles forest region. The freshwater turtles and monitor lizards occur in areas below 500m asl, in the Knuckles forest region. A careful inspection of rocks and boulders will enable a visitor to observe the Great Forest Gecko (*Gonydactyles frenatus*), which is a large, endemic Gecko species. The serpents in Knuckles include non-poisonous species such as the Rat snake (*Coluber mucosus*) and Kukri snakes (*Oligodon* spp.), mildly poisonous species such as the Green Pit-viper (*Trimeresurus trigonocephalus*) and highly venomous species such as the Cobra (*Naja naja*), Common Krait (*Bungarus caeruleus*) and the Russell's Viper (*Daboia russellii*). The Indian Python (*Python molurus*), which is the largest serpent in Sri Lanka, occurs throughout the Knuckles forest region. The arboreal Green Vine Snake (*Ahaetulla nasutus*) is a commonly observed serpent in Knuckles.

Birds

The Knuckles forest range harbour a rich composition of forest birds. A total of 128 species have been recorded by us up to now, which includes 17 of the 23 endemic bird species in Sri Lanka (Annex 5). The total includes 10 species of winter migrants, while 20 species are nationally threatened. The Pale-billed Flowerpecker (*Dicaeum erythrorhynchos*) is the smallest bird in Knuckles, while the Black Eagle (*Ictinaetus malayensis*) is the largest. Among the endemic birds in Knuckles, the Yellow-fronted Barbet (*Megalaima flavifrons*), and the Lorikeet (Hanging Parrot – *Loriculus beryllinus*) are the most commonly seen species. Species such as Egrets, Herons and Kingfishers that prefer aquatic habitats, could be observed in and around rice fields located in the buffer zone of Knuckles.

Mixed-species feeding bird flocks are a common observation especially in mid-altitude areas of the forest. These flocks are a typical example of division of labour among birds, which enhances feeding efficiency and safety among participating members. A single flock may consist of 3-10 species flying in different strata of the forest, with about 10-60 individuals. A majority of flock members feed on insect prey. Species such as the Orange Minivet, Crested Drongo lead the flock, occupying the canopy. The Woodpeckers and Nuthatches in the flock hunt for insects in tree trunks. The Bulbuls, Barbets and Flycatchers move between the canopy and sub-canopy, while the Babblers hunt for insects in the understorey. The flock members communicate with each other almost non-stop, keeping a close eye for insect prey and on potential predators such as snakes and /or raptorial birds

that pose a threat to them. Mixed species bird flocks are more common in places such as forest edges, a gap created by a fallen tree, on roadside trees and along riverine forests. Such flocks also follow troupes of leaf-monkeys and macaques, as they could easily find insects that are flushed out when the above tree-dwelling mammals jump from one branch to another.

Mammals

Of the 31 species of mammals documented by us from Knuckles (Annex 6), 4 are endemic, while 9 are nationally threatened. These include small mammals (Rats, Mice, Shrews), bats, large herbivores (Deer, Sambar, Elephant, Buffalo), carnivores (Fishing Cat, Leopard, Mongoose), scavengers (Jackal, Wildboar) and tree-living (Macaque, Leaf-monkey, Squirrel) species. The Wildboar (*Sus scrofa*), Black-naped Hare (*Lepus nigricollis*) and the Mouse Deer (*Tragulus meminna*) are the commonly seen mammals in the Knuckles forest. A small population of elephant frequently visits the northern and northeastern parts of Knuckles, from the nearby Wasgomuwa National Park and the VRR Sanctuary. Although the villagers in Knuckles regularly loose their cattle to the Leopard inhabiting the forest, it is rarely seen. A drive through the forest along the Riverstone – Pallegama road or the Deenstone – Corbet's Gap road at dusk will enable a visitor to observe several mammals, including the Sambar, Wildboar, Hare, Mouse Deer, Small Civet Cat, Golden Palm Cat, Porcupine, Bandicoot and small mammals. A lucky visitor may get a chance of seeing a Fishing Cat or a Leopard.



Leopard – *Panthera pardus*

(Gehan De Silva Wijeyeratne)



Layard's Striped Squirrel –
Funambulus layardi
(Gehan De Silva Wijeyeratne)



Black-naped Hare – *Lepus nigricollis*
(Gehan De Silva Wijeyeratne)



Sambar – *Cervus unicolor*
(Gehan De Silva Wijeyeratne)



Barking Deer – *Muntiacus muntjak*
(IUCN)



Woolly-necked Stork – *Ciconia episcopus*
(Anil Kumararathne)



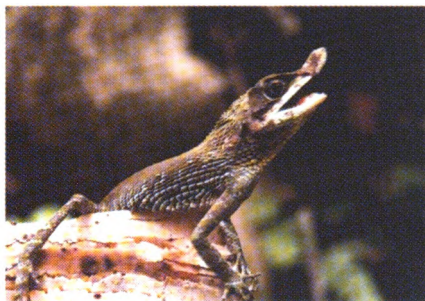
Sri Lanka Blue Magpie – *Urocissa ornata*
(Gehan De Silva Wijeyeratne)



Sri Lanka White Eye – *Zosterops ceylonensis*
(Gehan De Silva Wijeyeratne)



Sri Lanka Yellow-eared Bulbul – *Pycnonotus penicillatus*
(Gehan De Silva Wijeyeratne)



Tennent's horn lizard – *Ceratophora tennentii*
(Pradeep Samarawickrema)



Merrem's hump-nosed viper - *Hypnale hypnale* (Mendis Wickramasinghe)



Hump-nose Lizard – *Lyriocephalus scutatus*
(Pradeep Samarawickrema)



Green Pit Viper – *trimeresurus trigonocephalus*
(Pradeep Samarawickrema)



Spotted Bowfinger Gecko –
Geckoella triedrus
(Channa Bambaradeniya)



Crestless Lizard - *Calotes liocephalus*
(Channa Bambaradeniya)



Kirtisinghe's Rock Frog – *Nannophrys marmorata*
(Channa Bambaradeniya)



Kelaart's Dwarf Toad – *Adenomus kelaartii*
(Pradeep Samarawickrema)



Ferguson's Tree Frog – *Rhacophorus fergusonianus*
(Channa Bambaradeniya)



Village Life and Cultural Diversity in Knuckles

Elegantly thatched farm-houses..... home gardens with multi-storeyed vegetation.... stone barricades..... exotic arecanut groves..... fascinating rice terraces..... excellent toddy, juggery and treacle..... smiling villagers ancient customs, traditions and folklore a true bio-cultural landscape.

The villages in and around Knuckles forest region form a unique bio-cultural landscape. About 80 villages are located around the buffer zone of Knuckles. Traditional villages such as Meemure, Kaikawala and Galamuduna are true models of harmonious co-existence of man and nature. Until recently, most of these remote villages in Knuckles remained hidden in the forest, due to poor access. This may have been the very reason for these villages to exist as true traditional villages, sustaining their cultural heritage for several centuries, in this unique landscape locally referred to as 'Dumbara mitiyawatha' (Misty Valley).

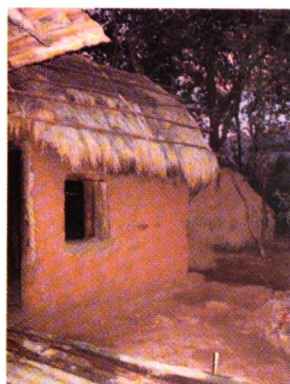
The Meemure traditional Sinhalese village is located in a valley between the two mountains of Kalupahana and Kehelpathdoruwa. The general village landscape consists of home gardens with multi-layered vegetation, farm-houses, terraced rice fields and/or chenaland, and irrigation canals. Several vantage points in Knuckles offer a breath-taking picturesque view of these bio-cultural landscapes. The traditional architecture in these villages depicts a unique blend of natural and cultural resources. The home gardens in villages such as Meemure are surrounded by a wall of laboriously arranged layers of stone, forming a barrier that is 3-4 feet in height. The intention of these barriers is to protect the crops grown in home gardens from animals such as wild boar, deer, sambar, cattle and buffalo. Narrow lanes bordered with neatly arranged rock walls separate the thatched farmhouses. Some traditional houses contain a central indoor garden. An oval-shaped Granary built with mud and covered with rice straw is located closer to the farmhouse, to store paddy. A cattle shed is another common structure closer to the farmhouse. Bundles of firewood collected from the forest are stacked neatly against the wall of the farmhouse.

The mountain slopes have been tamed into beautifully terraced rice fields, which receive water from irrigation canals connected to streams. The rice fields and traditional home gardens are separated by arecanut palm groves. A water well could be found at the border of the rice fields and home gardens. The traditional home gardens have been planted with all types of vegetation that is beneficial for the household, such as spices, medicinal herbs, edible yams, vegetables, fruit trees, timber trees, fodder plants and ornamental plants. In some home gardens, pepper is cultivated on a commercial scale. These home gardens depict a natural 'botanic garden', that blends well with the surrounding natural forest. The high species richness of birds and butterflies in home gardens bares direct testimony to the latter aspect.

The general lifestyle of villagers is very simple. Most of them are subsistence farmers, involved in the cultivation of paddy, supplemented with chena cultivation. Some of them are also involved in plucking cardamom, planted inside the forest. Farming practices are bound with auspicious times determined by village astrologers. Traditional folksongs are an essential element of paddy cultivation, sung by women during seedling transplanting,

manual weeding and crop harvest. Buddhism plays a major role in the day-to-day lives of traditional households in Knuckles, which has enabled them to appreciate, value and preserve the natural heritage of Knuckles regions for centuries. The villagers are extremely hospitable in nature, who are always ready to treat a visitor with a cup of tea, a herbal drink with juggery, or a mug of toddy - an excellent local brew made out from the sap of the flower of 'Kitul' Palm (*Caryota urens*). They rely on cattle for transporting goods between villages and sub-urban areas, and this practice is referred to as a 'thawalama' (Pack Ox). In the event of illness, the villagers rely on traditional ayurvedic physicians in their village. These ayurvedic physicians are true ethno-botanists, who possess a good knowledge on plants and their ayurvedic properties, passed down to them by their predecessors. The house-wives of the village are culinary experts, who are able to prepare several types of traditional sweet meats and curry dishes. The sweet meats are made using three major ingredients - rice flour, coconut and 'Kitul' Honey and such sweets form an essential item of festive occasions in the village. On such festive occasions, traditional dance troupes entertain the villagers with a splendid performance. The elders in the isolated villages have ensured the preservation of ancient customs/rituals, traditions, folksongs and folklore passed onto them by their ancestors. The threshing grounds in rice fields, commonly referred to as the 'kamatha' is the common meeting place of villagers who gather around to discuss important matters pertaining to their village. It is also a place where ancient customs/rituals related to rice cultivation is performed annually.

The traditional villages in Knuckles depict the rich cultural diversity associated with the unique natural landscape of Knuckles. Being isolated from the relatively well-developed sub-urban and urban areas, the rich cultural heritage passed down through generations have been well preserved in these remote villages. With the recent development initiatives such as access roads targeted towards improving the livelihoods of local communities in the area, sustenance of the cultural diversity for future generations is a matter of concern for villagers who have inhabited this rich bio-cultural landscape. Therefore, policymakers, conservationists as well as the general public who visit Knuckles should not only contribute to conserve the rich biological diversity of the area, but also contribute to sustain the rich cultural diversity that has been preserved by the local communities for centuries.



A simple farm house
(Sarath Ekanayake)



Stone barriers surrounding home gardens
(Anil Kumararathne)



Traditional rice cultivation
(Anil Kumararathne)



Pack Ox
(Sarath Ekanayake)



Conservation Issues in the Knuckles Forest Region

Degradation of forest ecosystems and habitats

Cultivation of cardamom under the forest canopy has contributed to the degradation of forest habitats, as it involves the clearance of the understorey and regular maintenance to harvest a good crop. This practice has been carried out for centuries, and cultivation of the crop on a commercial scale was commenced in 1805. Although the Forest Department had issued permits in 1960 to cultivate cardamom in an extent of only 75 ha, the area subjected to cultivation of this crop at present has increased up to about 3000 ha. About 50% of the cardamom cultivation are located in areas above 1000m altitude. Although the Forest Department has taken several measures to curtail the cultivation of the crop in the Knuckles forest range, villagers are still continuing the practice, as the crop fetches a high price (Rs. 2000 per Kg of dried cardamom). According to a recent survey conducted by the Forest Department, about 500 blocks of cardamom cultivation, each ranging from 2-200 ha are located within the Knuckles forest reserve. The forest area of approximately 21% of these sites is in a heavily degraded status, while 12% of the sites consist of an open canopy forest. The issue is further aggravated due to the location of about 90 cardamom processing and drying barns located in the Knuckles region, and all these barns are operated with fuel wood gathered from the forest. The latter practice has contributed to further degradation of the forest.

Although the rice fields located in the buffer zone of the forest have been maintained under traditional cultivation practices for several decades, the farmers have begun to use biocides and chemical fertilizers since of recent time. Interviews held with farmers revealed that biocides and chemical fertilizers are over-used, due to lack of awareness and agricultural extension services. Chemical residues carried in run-off could pollute streams, resulting in harmful impacts on aquatic life.

Large herds of domestic/feral cattle and buffalo pose a threat to sensitive ecosystems such as the Pitawalapatana plains, which has been adversely affected by over-grazing.

Careless visitors have contributed to littering of the forest with non-biodegradable material such as glass bottles, plastic material, and polythene.

Illegal gem mining also occurs in certain parts of Knuckles, and this had led to the degradation of habitats in areas subjected to mining. Chena cultivation and man-induced fires in chena land has resulted in the destruction of forest in several locations, especially in the buffer zone of the Knuckles forest range.

The sub-montane and montane forests in some areas (ie., along Thangappuwa – Alugallena trail, and Riverstone area) are subjected to the ‘die-back’ phenomenon, where tree species die off due to unknown reasons.

Direct exploitation of species

Illegal felling of timber and fuel wood species, and illegal hunting of animals is prevalent in the Knuckles forest region. Poachers either shoot animals, or set trap guns and noose traps to kill animals. Organized groups are involved in the collection of fish species from streams for the ornamental fish trade, while herbaceous plants are also gathered for ornamental plant trade. Over-collection of plant and animal specimens for commercial purposes and/or scientific study poses a serious threat, especially to the populations of endemic and threatened species in the Knuckles forest region.

Spread of invasive alien species

Several species of introduced plants and animals have invaded the Knuckles forest range, and pose a threat to natural ecosystems and native wild plants and animals of the area. The common invasive alien plants in the area include Lantana (*Lantana camara*), Koster's curse (*Clidemia hirta*), Wild sun flower (*Tithonia diversifolia*), and Mist flower (*Eupatorium riparium*). Common invasive alien animals in the area include feral buffalo (*Bubalus bubalis*), feral cats (*Felis catus*) and the Guppy fish (*Poecilia reticulata*).



A forest die-back area invaded by the alien Mist flower – *Eupatorium riparium*
(Sarath Ekanayake)

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Annex 1: List of Butterflies in the Knuckles Forest Region

Group/Family/Species	Central	North	South	East	West
Blues and Hairstreaks: Lycaenidae					
Common Cerulean - <i>Jamides celeno</i>	x	x	x		
Dark Cerulean - <i>Jamides bochus</i>	x	x	x	x	x
Dark Grass Blue - <i>Zizeeria karsandra</i> ^T		x			
Lesser Grass Blue - <i>Zizina otis</i>	x	x	x	x	x
Red Pierrot - <i>Talicauda nyseus</i>		x	x		
Family - Riodinidae					
Plum Judy - <i>Abisara echerius</i>	x	x			
Satyrs or Browns: Satyridae					
Common Evening Brown - <i>Melanitis leda</i>	x	x	x	x	x
Common Palm Fly - <i>Elymnias hypermnestra</i>	x	x	x	x	x
Common Bush Brown - <i>Mycalesis perseus</i>	x	x	x	x	x
Nigger - <i>Orsotriaena medus</i>	x	x	x	x	x
White Four-Ring - <i>Ypthima ceylonica</i>	x	x	x	x	x
Common Tree Brown - <i>Lethe rohria</i>	x	x	x	x	x
Ceylon Palm fly - <i>Elymnias singala</i> ^{E.T}	x	x			
Glad-eye Bushbrown - <i>Nissanga patnia</i>	x	x	x	x	x
Tigers and Crows: Danaidae					
Common Crow - <i>Euploea core</i>	x	x	x	x	x
Common Tiger - <i>Danaus genutia</i>	x	x	x	x	x
Blue Tiger - <i>Danaus hamata</i>	x	x	x	x	x
Glassy Tiger - <i>Parantica aglea</i>	x	x	x	x	x
Plain Tiger - <i>Danaus chrysippus</i>	x	x	x	x	x
Ceylon Tree Nymph - <i>Idea iasonia</i> ^{E.T}	x	x	x	x	x
Blue Glassy Tiger - <i>Ideopsis similis</i>	x	x	x	x	x
Ceylon Tiger - <i>Parantica taprobana</i> ^{E.T}			x	x	
Pansys, Eggflies: Nymphalidae					
Chocolate Soldier - <i>Junonia iphita</i>	x	x	x	x	x
Common Castor - <i>Ariadne merione</i>	x	x	x	x	x
Angled Castor - <i>Ariadne ariadne</i>	x	x	x	x	x
Common Eggfly - <i>Hypolimnias bolina</i>	x	x	x	x	x
Common Leopard - <i>Phalanta phalantha</i>			x	x	
Common Sailor - <i>Neptis hylas</i>	x	x	x	x	x
Chestnut-streaked Sailor - <i>Neptis jumbah</i>	x	x	x	x	x
Danaid Egg Fly - <i>Hypolimnias misippus</i>	x	x	x	x	x
Grey Pansy - <i>Junonia atlites</i>	x	x	x	x	x
Peacock Pansy - <i>Junonia almana</i>	x	x	x	x	x
Blue Oakleaf - <i>Kallima philarchus</i> ^{E.T}	x	x			
Lemon Pansy - <i>Precis lemonias</i>	x	x	x	x	x

Tamil Lacewing - *Cethosia nietneri*

Clipper - *Parthenos sylvia*^T

Black Prince - *Rohana parisatis*

Commander - *Moduza procris*

Blue Admiral - *Kaniska canace*

Whites and Yellows: Pieridae

Lemon Immigrant - *Catopsilia pomona*

Mottled Emigrant - *Catopsilia pyranthe*

Blue Wanderer - *Pareronia ceylanica*

Chocolate Albatross - *Appias lyncida*

Common Albatross - *Appias albina*

Common Grass Yellow - *Eurema hecabe*

Great Orange Tip - *Hebomoia glaucippe*

Jezebel - *Delias eucharis*

Three-spot Grass Yellow - *Eurema blanda*

Psyche - *Leptosia nina*

Birdwings and swallowtails: Papilionidae

Blue Mormon - *Papilio polymnestor*

Bluebottle - *Graphium sarpedon*

Tailed Jay - *Graphium agamemnon*

Common Jay - *Graphium doson*

Common Mormon - *Papilio polytes*

Common Rose - *Pachliopta aristolochiae*

Crimson Rose - *Pachliopta hector*

Lime Butterfly - *Papilio demoleus*

Red Helen - *Papilio helenus*^T

Common Birdwing - *Troides darsius*^{E.T}

Banded Peacock - *Papilio crino*

Additional Records

[illegible]

(Streams: North-east - Teligam-oya, Kaluganga, Heenganga; South-west - Huluganga)

Additional Records

Annex 3: List of amphibians in the Knuckles Forest Region

[illegible]

Annex 4: List of reptiles in the Knuckles Forest Region

Group/Family/Species	Central	North	South	East	West
Freshwater Turtles/Tortoises: Trionychidae					
Flapshell Turtle - <i>Lissemys punctata</i> ^T		X	X	X	X
Freshwater Turtles/Tortoises: Bataguridae					
Parker's Black Turtle - <i>Melanochelys trijuga</i> ^T		X	X	X	X
Monitor Lizards: Varanidae					
Water Monitor - <i>Varanus salvator</i>		X	X	X	
Land Monitor - <i>Varanus bengalensis</i>		X	X	X	
Agamid Lizards: Agamidae					
Green Garden Lizard - <i>Calotes calotes</i>	X	X	X	X	X
Common Garden Lizard - <i>Calotes versicolor</i>	X	X	X	X	X
Kangaroo Lizard - <i>Otocryptis weigmanni</i> ^{E.T}	X	X	X	X	X
Leaf-nose Lizard - <i>Ceratophora tennentii</i> ^{E.T}	X	X	X	X	X
Crestless Lizard - <i>Calotes liocephalus</i> ^{E.T}	X	X	X	X	X
Whistling Lizard - <i>Calotes liolepis</i> ^{E.T}	X	X	X	X	X
Humpnose Lizard - <i>Lyriocephalus scutatus</i> ^{E.T}	X	X	X	X	X
Montane Pigmy Lizard - <i>Cophotis zeylanica</i> ^{E.T}	X	X			
Geckos: Gekkonidae					
Common House Gecko - <i>Hemidactylus frenatus</i>		X	X	X	X
Fourclaw House Gecko - <i>Gehyra mutilata</i>		X	X	X	X
Great Forest Gecko - <i>Gonydactylus frenatus</i> ^{E.T}	X	X	X	X	X
Kandyan Day Gecko - <i>Cnemaspis kandianus</i>	X	X	X	X	X
Dwarf day Gecko - <i>Cnemaspis podihuna</i> ^{E.T}		X			
Crocodile Gecko - <i>Hemidactylus leschenaulti</i>		X	X	X	X
Spotted Bowfinger Gecko - <i>Geckoella triedrus</i> ^{E.T}			X	X	
Kandyan Gecko - <i>Hemidactylus depressus</i> ^{E.T}			X	X	
Skinks: Scincidae					
Common Lanka Skink - <i>Lankascincus fallax</i> ^E	X	X	X	X	X
Smooth Lanka Skink - <i>Lankascincus taprobanensis</i> ^{E.T}	X	X			
Ratsnake Skink - <i>Mabuya carinata</i>	X	X	X	X	X
Bronze-green Little Skink - <i>Mabuya macularia</i> ^E	X	X	X	X	X
Fourtoe Skink - <i>Chalcidoseps thwaitesii</i> ^{E.T}	X	X	X	X	X
Toeless Snake Skink - <i>Nessia monodactylus</i> ^{E.T}	X	X			
Serpents					
Rat snakes, Keelbacks etc: Colubridae					
Green vine snake - <i>Ahaetulla nasutus</i>	X	X	X	X	X
Brown Vine Snake - <i>Ahaetulla pulverulentus</i>	X	X	X		

Green Keelback - *Macropisthodon plumbicolor*

Rat Snake - *Coluber mucosus*

Boulenger's Bronzeback - *Dendrelaphis bifrenalis*

Checkered Keelback - *Xenochrophis piscator*

Buff-striped Keelback - *Amphiesma stolata*

Sri Lanka Cat Snake - *Boiga ceylonensis*

Gamma Cat Snake - *Boiga trigonata*

Forsten's Cat Snake - *Boiga forsteni*

Barnes's Cat Snake - *Boiga barnesi*^{E.T}

Dumeril's Kukri Snake - *Oligodon sublineatus*^{E.T}

Russel's Kukri Snake - *Oligodon taeniolatus*

Sri Lanka Flying Snake - *Chrysopelea taprobanica*^{E.T}

Ornate Flying Snake - *Chrysopelea ornata*^T

Trinket Snake - *Elaphe helena*

Cobras and Kraits: Elapidae

Cobra - *Naja naja*

Common Krait- *Bungarus caeruleus*

Shield Snakes: Uropeltidae

Large Shield Tail - *Pseudotyphlops philippinus*^E

Trevelyan's Earth Snake - *Rhinophis trevelyana*^{E.T}

Blyth's Earth Snake - *Rhinophis blythii*^{E.T}

Pipe Snake - *Cylindrophis maculata*^{E.T}

Blind Snakes: Typhlopidae

Common Blind Snake - *Ramphotyphlops braminus*

Vipers: Viperidae

Russell's Viper - *Daboia russellii*

Green Pit Viper - *Trimeresurus trigonocephalus*^{E.T}

Merrem's Hump-nosed Viper - *Hypnale hypnale*

Pythons: Boidae

Indian Python - *Python molurus*^T

Additional Records

		X		X		X		X	
X		X		X		X		X	
		X		X		X		X	
		X		X		X		X	
		X		X		X		X	
X		X		X		X		X	
X		X							
X		X							
		X							
		X		X		X		X	
		X		X					
		X		X					
		X							
X		X		X		X		X	
X		X		X		X		X	
		X		X		X		X	
		X		X					
		X		X					
		X		X		X			
X		X		X		X			
X		X		X		X		X	
X		X		X		X		X	
		X		X		X		X	
Central	North	South	East	West					

Annex 5: List of birds in the Knuckles Forest Region

Group/Family/Species	Central	North	South	East	West
Herons, Egrets and Bitterns					
Family - Ardeidae					
Cattle Egret - <i>Bubulcus ibis</i>	x	x		x	
Grey Heron - <i>Ardea cinerea</i>		x		x	
Indian Pond Heron - <i>Ardeola grayii</i>	x	x	x	x	x
Intermediate Egret - <i>Mesophoyx intermedia</i>	x	x	x	x	x
Little Egret - <i>Egretta garzetta</i>	x	x	x	x	x
Cormorants					
Family - Phalacrocoracidae					
Little Cormorant - <i>Phalacrocorax niger</i>		x			
Storks					
Family - Ciconiidae					
Woolly-Necked Stork - <i>Ciconia episcopus</i>			x	x	
Ibises					
Family - Threskiornithidae					
Black - Headed Ibis - <i>Threskiornis melanocephalus</i>			x	x	
Kites, Hawks, Eagles, Vultures and Harriers					
Family - Accipitridae					
Changeable Hawk Eagle - <i>Spizaetus cirrhatus</i>	x	x	x	x	x
Shikra - <i>Accipiter badius</i>	x	x	x	x	x
Crested Serpent Eagle - <i>Spilornis cheela</i>	x	x	x	x	x
Mountain Hawk Eagle - <i>Spizaetus nipalensis</i> ^T	x		x	x	
Black Eagle - <i>Ictinaetus malayensis</i>	x	x	x	x	
Junglefowl					
Family - Phasianidae					
Jungle Bush Quail - <i>Perdica asiatica</i> ^T	x	x			
Sri Lanka Jungle Fowl - <i>Gallus lafayetti</i> ^E	x	x	x	x	x
Sri Lanka Spur Fowl - <i>Galloperdix bicalcarata</i> ^{E.T}	x	x			
Rails, Crakes and Coots					
Family - Rallidae					
White-breasted Waterhen - <i>Amaurornis phoenicurus</i>	x	x	x	x	x
Plovers and Lapwings					
Family - Charadriidae					
Red-wattled Lapwing - <i>Vanellus indicus</i>	x	x	x		
Sandpipers					
Family - Scolopacidae					
Common Sandpiper - <i>Actitis hypoleucos</i>	x		x	x	

Pigeons and Doves

Family - Columbidae

Emerald Dove - *Chalcophaps indica*

Green Imperial Pigeon - *Ducula aenea*

Pompadour Green Pigeon - *Treron pompadora*

Spotted Dove - *Streptopelia chinensis*

Sri Lanka Wood Pigeon - *Columba torringtoni*^{E.T}

Parakeets and Lorikeets

Family - Psittacidae

Alexandrine Parakeet- *Psittacula eupatria*

Sri Lanka hanging Parrot - *Loriculus beryllinus*^{E.T}

Rose-ringed Parakeet - *Psittacula krameri*

Blossom-headed Parakeet - *Psittacula cyanocephala*

Layard's Parakeet - *Psittacula calthropae*^{E.T}

Cuckoos, Koels, Malkohas and Coucals

Family - Cuculidae

Asian Koel - *Eudynamis scolopacea*

Common Coucal - *Centropus sinensis*

Pied Cuckoo - *Oxylophus jacobinus*

Blue-faced Malkoha - *Phaenicophaeus viridirostris*

Common Hawk-Cuckoo - *Hierococcyx varius*^T

Owls

Family - Strigidae

Brown Fish Owl - *Ketupa zeylonensis*

Collared scops owl - *Otus bakkamoena*

Forest Eagle Owl - *Bubo nipalensis*

Nightjars

Family - Caprimulgidae

Jerdon's Nightjar - *Caprimulgus atripennis*

Indian Nightjar - *Caprimulgus asiaticus*

Frogmouths

Family - Podargidae

Frogmouth - *Batrachostomus moniliger*

Swifts

Family - Apodidae

Asian Palm Swift - *Cypsiurus balasiensis*

Edible Nest Swift - *Aerodramus unicolor*

House/White-rumped Swift - *Apus affinis*

Treeswifts

Family - Hemiprocnidae

Crested Treeswift - *Hemiprocne longipennis*

x		x		x		x		x	
x		x		x		x			
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x				x		x			
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	

Wagtails and Pipits
Family - Motacillidae

Indian Pipit - *Anthus rufulus*

Grey Wagtail - *Motacila cineria*^{WM}

Forest Wagtail - *Dendronanthus indicus*^{WM}

Cuckooshrikes and Minivets
Family - Campephagidae

Little Minivet - *Pericrocotus cinnamomeus*

Common Woodshrike - *Tephrodornis pondicerianus*

Black-headed Cuckooshrike - *Coracina melanoptera*

Orange Minivet - *Pericrocotus flammeus*

Large Cuckoo-shrike - *Coracina macei*

Pied Shrike - *Hemipus picatus*

Bulbuls

Family - Pycnonotidae

Black-headed Yellow Bulbul - *Pycnonotus melanicterus*

Red-vented Bulbul - *Pycnonotus cafer*

White-browed Bulbul - *Pycnonotus luteolus*

Black Bulbul - *Hypsipetes leucocephalus*

Sri Lanka Yellow-eared Bulbul -

Pycnonotus penicillatus^{E.T}

Yellow-browed Bulbul - *Hypsipetes indicus*

Leafbirds and Iora

Family - Irenidae

Common Iora - *Aegithina tiphia*

Jerdon's Leafbird - *Chloropsis cochinchinensis*

Shrikes

Family - Laniidae

Brown Shrike - *Lanius cristatus*^{WM}

Thrushes and Chats

Family - Turdidae

Oriental Magpie Robin - *Copsychus saularis*

White-rumped Shama - *Copsychus malabaricus*

Black- Backed Robin - *Saxicoloides fulicata*

Spot-winged Thrush - *Zoothera spiloptera*^{E.T}

Sri Lanka Whistling Thrush / Arrenga -

Myophonus blighi^{E.T}

Indian Blue Chat - *Erithacus brunneus*^{WM}

Babblers

Family - Timaliidae

Brown-capped Babbler - *Pellorneum fuscicapillum*^{E.T}

x		x		x		x		x	
x		x		x		x		x	
				x		x			
x		x		x		x		x	
						x		x	
x		x		x		x		x	
x		x		x		x		x	
		x		x		x		x	
x		x		x					
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x							
x		x							
x				x					
x		x		x		x		x	

Common Babbler - *Turdoides affinis*
 White-throated Babbler - *Dumetia hypertythra*
 Scimitar Babbler - *Pomatorhinus horsfieldii*
 Dark-fronted Babbler - *Rhopocichla atriceps*

Old World Warblers

Family - Sylviidae

Ashy Prinia - *Prinia socialis*
 Fantail Warbler - *Cisticola juncidis*
 Large-billed Leaf Warbler - *Phylloscopus magnirostris*^{WM}
 Common Tailorbird - *Orthotomus sutorius*
 Plain Prinia - *Prinia inornata*
 Sri Lanka Warbler - *Bradypterus palliseri*^{E.T}
 Green Tree Warbler - *Phylloscopus nitidus*^{WM}

Old World Flycatchers

Family - Muscicapidae

Asian Brown Flycatcher - *Muscicapa dauurica*^{WM}
 Tickell's blue Flycatcher - *Niltava tickelliae*
 Sri Lanka Dusky Blue Flycatcher - *Eumyias sordida*^{E.T}
 Grey-headed Canary Flycatcher - *Culicapa ceylonensis*
 Kashmir Red-breasted Flycatcher - *Ficedula subrubra*^{WM}

Monarchs and Fantail

Family - Monarchidae

Asian Paradise Flycatcher - *Terpsiphone paradisi*
 White-browed Fantail - *Rhipidura aureola*
 Azure Flycatcher - *Hypothymis azurea*

Tit

Family - Paridae

Grey Tit - *Parus major*

Flowerpeckers

Family - Dicaeidae

Pale-billed Flowerpecker - *Dicaeum erythrorhynchos*
 Thick-billed Flowerpecker - *Dicaeum agile*

Sunbirds

Family - Nectariniidae

Long - Billed Sunbird - *Nectarinia lotenia*
 Purple Sunbird - *Nectarinia asiatica*
 Purple-rumped Sunbird - *Nectarinia zeylonica*

x		x		x		x		x	
x		x				x			
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x				x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	
x		x		x		x		x	

Family - Zosteropidae

Sri Lanka Hill White-Eye - *Zosterops ceylonensis*^{E.T}

Family - Estrildidae

White-rumped Munia - *Lonchura striata*

Family - Sturnidae

Sri Lanka Hill Mynah - *Gracula religiosa*^{E,T}

Family - Oriolidae

Black-hooded Oriole - *Oriolus xanthornus*

Family - Dicruridae

White - bellied Drongo - *Dicrurus caerulescens*

Family - Corvidae

Blue Magpie - *Urocissa ornata*^{E.T}

Family: Sittidae

Velvet-fronted Blue Nuthatch - *Sitta frontalis*

Additional Records

[illegible]

Annex 6: List of mammals in the Knuckles Forest Region

Group/Family/Species	Central	North	South	East	West
Fruit Bats: Pteropodidae					
Common Flying Fox - <i>Pteropus giganteus</i>	x	x	x	x	x
Leaf-nosed Bats: Hipposiderosidae					
Schneider's Leaf-nosed Bat - <i>Hipposideros speoris</i>				x	
Loris: Lorisidae					
Slender Loris - <i>Loris tardigradus</i> ^T	x	x	x	x	x
Macaques and Langurs: Cercopithecidae					
Purple-faced Leaf Monkey - <i>Trachypithecus vetulus</i> ^{E,T}	x	x	x	x	x
Toque Monkey - <i>Macaca sinica</i> ^E	x	x	x	x	x
Pangolins: Manidae					
Indian Pangolin - <i>Manis crassicaudata</i>	x	x	x	x	x
Hares: Leporidae					
Black-naped Hare - <i>Lepus nigricollis</i>	x	x	x	x	x
Squirrels: Sciuridae					
Palm Squirrel - <i>Funambulus palmarum</i>	x	x	x	x	x
Flame-striped Jungle-Squirrel - <i>Funambulus layardi</i>	x	x	x	x	x
Giant Squirrel - <i>Ratufa macroura</i>		x		x	x
Grey Flying Squirrel - <i>Petaurista philippensis</i> ^T		x		x	
Porcupines: Hystericidae					
Indian Porcupine - <i>Hystrix indica</i>	x	x	x	x	x
Rats and Mice: Muridae					
Indian Bandicoot - <i>Bandicota indica</i>	x	x	x	x	x
Common House Rat - <i>Rattus rattus</i>	x	x	x	x	x
Sri Lanka Bi-colored Rat - <i>SriLankamys ohienensis</i> ^{E,T}	x	x			
Jackals: Canidae					
Jackal - <i>Canis aureus</i>	x	x	x	x	x
Civets, Palm Cats and Mongooses: Viverridae					
Small civet Cat - <i>Viverricula indica</i>	x	x	x	x	x
Indian Palm Cat - <i>Paradoxurus hermaphroditus</i>	x	x	x	x	x
Golden Palm Cat - <i>Paradoxurus zeylonensis</i> ^{E,T}	x	x	x		x
Brown Mongoose - <i>Herpestes fuscus</i>	x	x	x	x	x
Grey Mongoose - <i>Herpestes edwardsi</i>	x	x	x	x	x
Wild Cats: Felidae					
Fishing Cat - <i>Prionailurus viverinus</i> ^T	x	x	x	x	x
Leopard - <i>Panthera pardus</i> ^T	x	x	x	x	x

Otter: Mustelidae

Indian Otter - *Lutra lutra*^T

Elephants: Elephantidae

Asian Elephant - *Elephas maximus*T

Pigs: Suidae

Wild Boar - *Sus scrofa*

Mouse Deer: Tragulidae

Mouse Deer - *Tragulus meminna*

Deer: Cervidae

Spotted Deer - *Cervus axis*

Barking Deer - *Muntiacus muntjak*

Sambar - *Cervus unicolor*

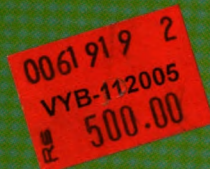
Buffaloes: Bovidae

Feral Water Buffalo - *Bubalus bubalis*

Additional Records

[illegible]





IUCN - The World Conservation Union

IUCN - The World Conservation Union was founded in 1948 and brings together 79 states, 113 government agencies, 754 NGOs, 36 affiliates, and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. Its mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. Within the framework of global conventions IUCN has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. IUCN has approximately 1000 staff, most of whom are located in its 42 regional and country offices while 100 work at its Headquarters in Gland, Switzerland.

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