THE FIRST RECORD ON BIODIVERSITY OF THE NATURAL ARBORETUM OF SEETHAWAKA WET ZONE BOTANIC GARDENS, SRI LANKA

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Summary

Seethawaka Wet Zone Botanic Garden (SWBG) in Avissawella of Sri Lanka is a recent addition to the Botanic Garden Network of Sri Lanka. This documentation reveals flora and fauna of the natural arboretum of the Botanic Garden for the first time. The dominant woody species were determined using Important Value Index calculated using 13, 15m ×10m stands. Twenty seed traps (1m x1m) were randomly placed to determine the seed rain. Fauna was recorded through opportunistic surveys conducted during day and night. Composite samples of top soil up to 10cm depth taken at random from stands were tested for pH, conductivity, total contents of nitrogen, phosphate and potassium using standard methods. Arboretum of SWBG accommodated 52 woody species belonging to 31 families including 11 endemic and 05 threatened plant species. The most dominant arborescent species were Mallotus tetracoccus, Syzygium caryophyllatum *and* Litsea longifolia. *The undergrowth was represented by 60 plant species from 31 plant families into which 02 endemic and 02 threatened species were included. The preliminary investigation on lower plants included 09 species of ferns and allies from 06 families. The seed rain at SWBG varied seasonally, April-June > January-March > July-September > October-December and the relative contribution of species was* Alstonia macrophylla > Mallotus tetracoccus> Syzigium caryophyllatum> Pagiantha dichotoma > Macaranga peltata. *Sixty seven bird species belonging to 34 families also included 8 endemic species and a threatened species . Fish in the lake included 07 species belonging to 04 families including 02 endemic and 02 threatened species. Nine species of Mammals from 07 families included one threatened species. Twelve species of reptiles from 8 families were also reported including 03 endemic and 02 threatened species. The floristic details and soil characteristics [pH (5.71 -6.87), conductivity (1.87- 3.94 μScm^{-1}), total Phosperous (106-260ppm), Potassium (105-817 ppm), N% (0.12-0.25)] reflected a wide variation among stands. SWBG house a rich diversity of flora and fauna of wet zone easily observable to local and foreign visitors. While providing many ecosystem services to the environment, the arboretum of SWBG also acts as a 'nature laboratory' for environmental education and research. SWBG is thus considered to be an exclusive site which greatly contributes to* in-situ *conservation.*

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INTRODUCTION

Botanic gardens act as model organizations that link people with the environment through their documented collections of living plants, and activities conducted towards conservation, ecological restoration, environmental education and research. Strengthening multifunctional roles of botanic gardens in achieving economic, social and environment sustainability in the face of escalating global challenges of the 21st century is widely accepted (Botanic Gardens Conservation International, 2012). In this endeavor new botanic gardens were developed in different bio-climatic regions of Sri Lanka including Seethawaka Wet Zone Botanical Garden (SWBG) at Illukkovita, Avissawella of the lowland Wet Zone which was declared open to public on 21st March 2015.

As other botanic gardens of Sri Lanka, history of SWBG also reflects consequences of colonialism and industrial development in the country. Known as "Panghakulawaththa" in the past, this area is of historical importance to Sri Lankans as the location at which King Rajasinghe I of Seethawaka stored his weapons during his ruling period 1581-1593 (https://en.wikipedia.org/wiki/Rajasinha). Colonial influences later converted the land into plantations of rubber and tea, and after many years clearing and land acquisition by the Land Commission, succeeded this area to transform into a regenerating wet zone forest. Thus, at present the site represents a more naturalistic environment and acts as a demonstration site of lowland wet zone ecosystems of Sri Lanka reflecting its potential to strengthen public awareness and interests towards conservation of biodiversity.

This paper intends to fulfill the first target of the Global Strategy for Plant Conservation (GSPC-2020), "*plant diversity is understood, documented and recognized*" with respect to SWBG, and discloses the initial status of biodiversity of the arboretum.

METHODOLOGY

Seethawaka Wet Zone Botanic Gardens (6°57'11"N, 80°13'06"E) located at Avissawella covers an extent of 105 acres of land approximately at 100 msl. It receives an annual average rainfall of 3662 mm and year round average temperature of 27.2 °C (Department of Meteorology) and represents bioclimatic features of the lowland Wet Zone of the country. At SWBG about 50% of the area consists of the arboretum in which the arborescent vegetation has not been disturbed during recent developments (Figures1&2). We enumerated flora in thirteen stands of 15 m ×10 m size in the arboretum area which is planned to be left aside without conversion.

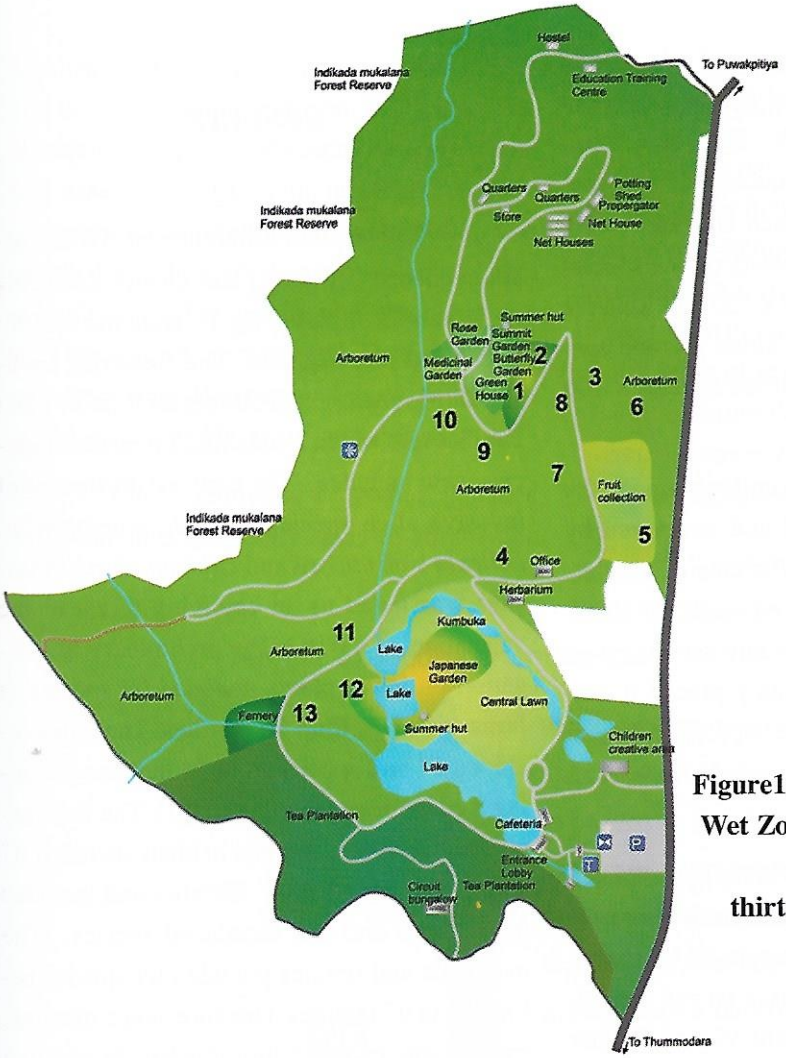

Figure1: Map of Seethawaka Wet Zone Botanical Garden indicating thirteen sample stands

Figure 2: The arborescent flora of Seethawaka Wet Zone Botanical Garden

Ecological dominance of arborescent plant species was identified by the Important Value Index [IVI = RF + RD + RC where, Relative Frequency (RF) = frequency of one species / total frequency of each species X 100, Relative Density (RD) = density of one species / total density of all species x 100 and Relative Basal Cover (RC) = basal cover for one species/ total basal cover of all the species x 100 (Krebs, 2005)].

Floristic degree of similarity among the stands was also evaluated and compared by Jaccard and Sorenson coefficients of similarity. Two plots were recognized similar at 100% (Kimpouni *et al.*, 2013). Twenty seed traps of size 1m x 1 m were randomly placed 0.75m above the floor to determine species richness, abundance of seed rain at quarterly basis of an year.

Composite samples of top soil obtained up to 10cm depth from stands were tested for pH, conductivity, total contents of Nitrogen, Phosphate and Potassium based on soil analytical methods in Manual RRIM 971 of Rubber Research Institute Malayasia. Soil chemical parameters and woody species richness of stands were subjected to cluster analysis using PAST ecological software version 2.17b to recognize heterogeneity of the soils of the arboretum.

Opportunistic surveys were conducted during day and night to record fauna that inhabit SWBG. All species were identified using standard literature.

RESULTS

The natural arboretum of SWBG accommodates 52 woody plant species belonging to 31 families, including 11 endemic and 05 threatened plant species. The flowering herbs and shrubs represented 60 species from 31 plant families into which 2 endemic, 2 threatened species were included. The early establishment of invasive alien species *Alstonia macrophylla*, *Dillenia suffruticosa* and *Clidemia hirta* at few sites was noted as an emerging threat to the vegetation of SWBG. The preliminary investigation on lower plants included 09 species of ferns and allies from 06 families. The fauna included 67 bird species from 34 families including 8 endemic species (Annex B). The fish species that inhabited aquatic habitats included 07 species belonging to 04 families and included 02 endemic and one threatened species. The mammals and reptiles included 09 species belonging to 07 families. One threatened mammal species was included into this list. In addition 12 species of reptiles from 8 families were also reported at SWBG. Three endemic species of them have been reported threatened.

The arboretum canopy was 2-6m high with small gaps representing woody species of disturbed lowland rain forests confirming the early seral stages of rainforest succession. The most dominant arborescent species that significantly contributed to the IVI were *Mallotus tetracoccus, Syzygium caryophyllatum* and *Litsea longifolia* (Table 1). It was also noted that the

dominance of *Mallotus tetracoccus* was mainly due to occurrence of many relatively larger individuals that significantly contributed to the relative basal cover. The dominance of *Syzygium caryophyllatum* and *Litsea longifolia* was mainly due to the high abundance of much larger individuals (higher density, high frequency and high basal cover components). Next most common trees were *Macaranga peltata, Symplocos cochinensis and Melicope lunu-ankenda.*

The undergrowth vegetation included small saplings of woody species, shrubs and few herbs and was dense in places which received ample sunlight through canopy gaps.

The seed rain at SBG varied seasonally exhibiting the highest input of seeds in April-June months followed by January-March > July-September > October-December. The pattern of seed input in stands also reflected the relative contribution of seven woody plant species, *Alstonia macrophylla* > *Mallotus tetracoccus*> *Syzigium caryophyllatum*> *Pagiantha dichotoma* > *Macaranga peltata* (Figure 3).

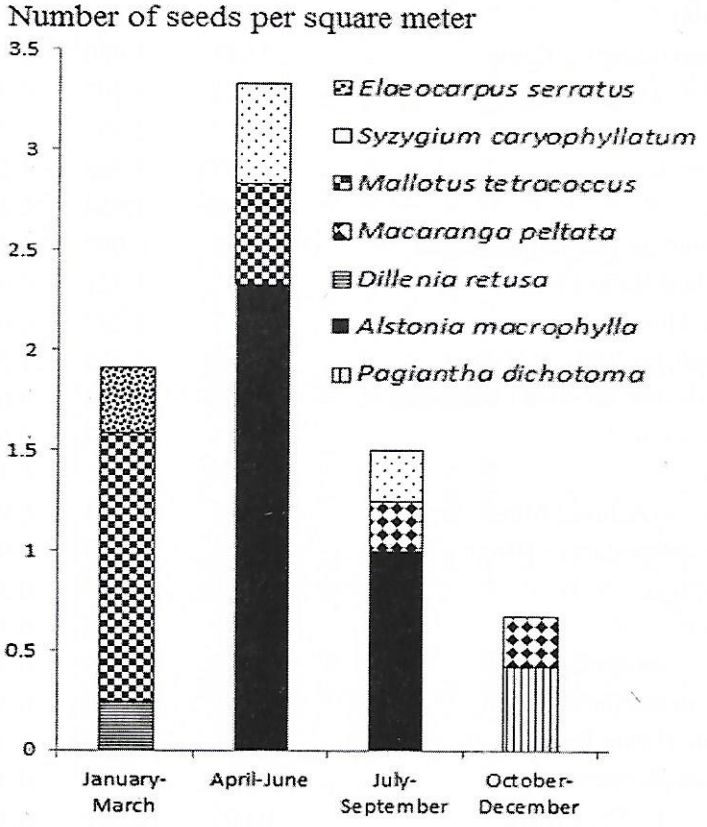

Figure 3: Seed rain of stands at the arboretum SWBG in the year 2015

Table 1. Important Value Index (IVI) of the arborescent flora of SWBG.
[The three most ecologically important species and their respective values are in bold font.
RF-Relative Frequency, RC- Relative Cover, RD- Relative Density,
IVI-Important Value Index]

Plant Species	RF	RC	RD	IVI
***Mallotus tetracoccus* (Roxb.) Kurz**	0.083	18.449	16.258	**43.0**
***Syzygium caryophyllatum* (L.) Alston**	0.102	9.742	22.699	**42.63**
***Litsea longifolia* (Nees) Trimen**	0.102	13.554	13.804	**37.54**
Macaranga peltata (Roxb.) Muell. Arg	0.065	11.307	9.816	27.60
Symplocos cochinensis (Lour.) S. Moore	0.093	5.189	6.442	20.89
Syzygium neesianum Arn.	0.083	7.798	3.681	19.81
Melicope lunu-ankenda (Gaertn.) T. Hartely	0.046	3.276	4.601	12.51
Fagraea fragnans	0.037	3.632	2.761	10.10
Gomphia serrata (Gaertn.) Kanis	0.046	1.480	3.988	10.10
Artocarpus nobilisThw.	0.028	5.997	0.920	9.70
Dillenia retusa Thunb.	0.028	2.993	2.761	8.53
Elaeocarpus serratus L.	0.037	3.406	1.227	8.34
Vitex pinnata L.	0.009	2.954	0.307	4.19
Pagiantha dichotoma (Roxb.) Markgraf	0.028	0.092	1.227	4.10
Carallia brachiata (Lour.) Merr.	0.019	1.321	0.920	4.09
Bridelia mooni Thw.	0.019	1.287	0.613	3.75
Alstonia macrophylla Wall, ex G. Don	0.019	0.255	1.534	3.64
Bhesa ceylanica (Arn. Ex Thw.) Ding Hou	0.019	0.923	0.613	3.39
Nephelium lappaceum L.	0.019	0.872	0.613	3.34
Caryota urens L.	0.009	1.931	0.307	3.16
Hevea brasiliensis (A.Juss.) Muell. Arg.	0.019	0.154	0.920	2.93
Chaetocarpus castanocarpus (Roxb.) Thw	0.019	0.029	0.920	2.80
Alstonia scholaris (L.) R. Br.	0.009	1.220	0.307	2.45
Artocarpus heterophyllus Lam	0.009	0.806	0.307	2.04
Clerodendrum phlomidis L.	0.009	0.059	0.920	1.91
Schumacheria castaneifolia Vahl	0.009	0.660	0.307	1.89
Memocylon umbellatum Burm. f.	0.009	0.480	0.307	1.71
Garcinia hermonii Kosterm.	0.009	0.077	0.307	1.31
Gaertnera vaginans (DC.) Merr.	0.009	0.029	0.307	1.26
Olax zeylanica L.	0.009	0.029	0.307	1.26

Table 2. Variation of Similarity Coefficients of Jaccard and Sorenson among the stands

Similarity Coefficient of Sorensen (%)	Similarity Coefficient of Jaccard (%)												
plots	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1	100	12.5	17.65	31.25	23.52	18.75	25	28.57	33.33	31.25	29.41	18.75	31.25
2	22.22	100	27.27	25	25	30	40	33.33	28.57	36.36	23.08	8.33	7.14
3	30	42.86	100	30.77	30.77	50	33.33	40	25	13.33	20	0	0
4	47.62	40.00	37.50	100	80	45.45	41.67	25	50	38.46	26.67	23.08	20
5	38.10	40.00	47.06	88.89	100	45.45	54.54	25	40	38.46	26.67	23.08	20
6	31.58	46.15	47.06	62.50	62.50	100	50	30	26.67	45.45	41.67	27.27	23.08
7	40	57.14	66.67	58.82	70.59	66.67	100	40	33.33	54.54	28.57	15.38	13.33
8	44.44	50.00	50.00	40.00	40.00	46.15	57.14	100	28.57	36.36	33.33	8.33	25
9	50	44.44	57.14	66.67	57.14	42.11	50.00	44.44	100	31.25	22.22	26.67	23.53
10	47.62	53.33	40.00	55.56	55.56	62.50	70.59	53.33	47.62	100	26.67	14.29	20
11	45.45	37.50	23.53	42.11	42.11	58.82	44..44	50.00	36.36	42.11	100	30.77	35.71
12	31.58	15.38	33.33	37.50	37.50	42.86	26.67	15.38	42.11	25.00	47.06	100	45.45
13	47.62	13.33	0.00	33.33	33.33	37.50	23.53	40.00	38.10	33.33	52.63	62.5	100

Table 3. Some soil properties and woody species richness of stands. Symbols N P K indicate total nitrogen, phosperous, potassium levels respectively.

Stand	Coordinates N & E	Chemical Parameters of soil					Woody species richness
		Conductivity (μScm^{-1})	pH	N %	P (ppm)	K (ppm)	
1	N: 6°.89655' E: 80°.17150'	2.83	6.46	0.22	106.39	817.59	12
2	N: 6°.89698' E: 80°.17186'	3.60	5.46	0.19	122.49	702.58	6
3	N: 6°.89690' E:80°.17202'	3.94	6.52	0.15	85.45	1173.33	8
4	N:6°.89488' E:80°.17197'	2.16	6.50	0.15	186.85	239.29	9
5	N: 6°.89425' E: 80°.17402'	2.46	5.71	0.25	260.88	278.59	9
6	N:80°.17219' E:6°.89591'	2.53	6.42	0.15	232.16	171.82	7
7	N:6°.89573' E:80°.17201'	1.87	6.32	0.12	220.29	627	8
8	N:6°.89637' E:80°.17193'	3.23	6.24	0.19	131.41	504.15	6
9	N:6°.89615' E:80°.17160'	2.77	6.43	0.22	137.50	105.38	12
10	N:6°.89642' E: 80°.17080'	2.34	6.57	0.22	111.71	597.17	9
11	N:6°.89440' E:80°.16974'	2.24	5.94	0.07	120.10	172.41	10
12	N:6°.89398' E:80°.17009'	2.41	6.87	0.17	54.87	125.28	7
13	N:6°.89339'	2.31	6.19	0.09	54.97	115.04	9

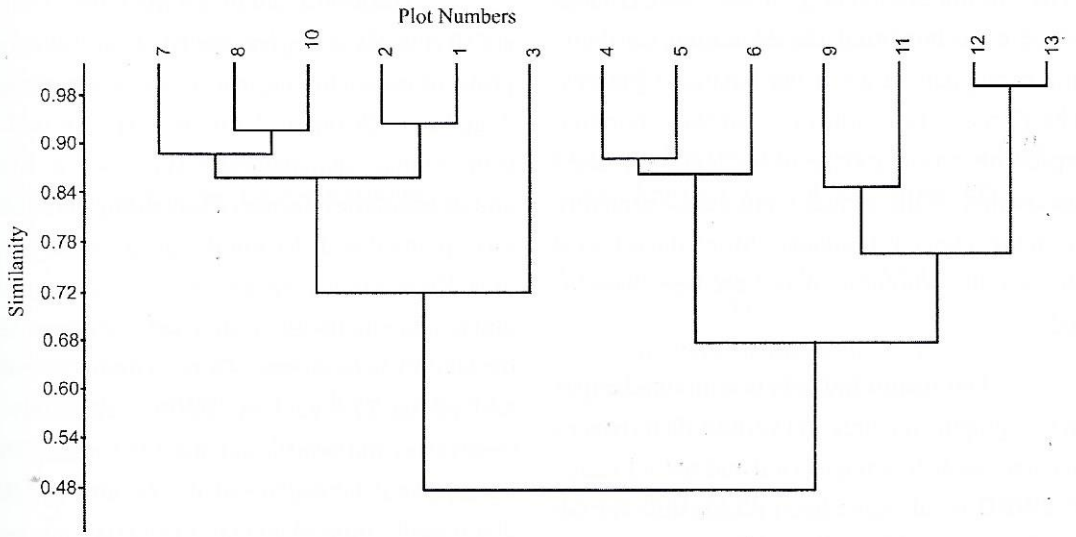

Figure 4: Dendrogram of plots reflecting soil nutrient status and woody species in stands (plots).

The weak uniformity in the floristic composition among stands of the arboretum was reflected by the Jaccards and Soresnsen coefficients as the similarity of the floristic diversity was mostly reaching <50% among the stands although broadly varied within the range of 0 - 80% according to Jaccards and those of Soresnsen 0- 71% (Table 2).

The soil pH of the stands also varied from 5.71 -6.87 while the conductivity ranged from 1.87- 3.94 μScm^{-1} reflecting a wide variation in mineral ions. The soil macronutrients contents varied K>P>N and changed significantly among stands (Table 3).

The total P was low than 100ppm in stands 3, 12 and 13. The lowest total N was reported from stands11 and 13, while that of others varied between 0.12-0.25 ppm.

Bray-Curtis model of cluster analysis separated stands based on their soil nutrient levels exhibiting two clusters at ~ 0.50% similarity as stands 1,2,3,7,8,10 were relatively rich in soil nutrients than that of stands 4,5,6,9,11,12,13. Further separation of clusters at ~60-70% similarity reflected the changes P and K content in soil (separation of 4.5.6 from others and 3 from others as seen in each cluster) and woody species richness (separation of 9,11 from 12, 13).

DISCUSSION

The biodiversity of the arboretum of SWBG comprises of natural and semi-natural habitats and house a rich diversity of flora and fauna easily observable by the visitors. It is evi-

dent that the biodiversity of the SWBG landscape have increased the economic, aesthetic and ecological value of the botanical gardens. The floristic data indicated that the arboretum represents an early stage of lowland rain forest succession. With arrival from seeds probably from the adjacent Indikada –Mookalana Forest Reserve the arboretum may have been benefitted.

Our results indicate that minor changes in topographic features and various disturbances occurred at different temporal and spatial scales at SWBG would have been responsible for the heterogeneity of the soils and floristic composition of the arboretum. Proposed modifications in the site may also impact upon plant distribution. Nevertheless, the biodiversity of the botanic garden exhibits a great potential to strengthen eco/nature tourism by serving as a representative sample of a disturbed lowland rain forest. However, it is extremely important that the authorities pay careful attention on regular check–ups and monitoring of its biological wealth for its sustenance as the Sri Lanka's only Wet Zone Botanic Garden. Steps to be taken without delay to control the spread of invasive alien species in the premises, as at present the site accommodates two woody invaders, *Alstonia macrophylla* and *Dillenia suffruticosa* which have proven potential extension of their spread within the arboretum through high seed input (*Alstonia macrophylla*) and vegetative spread (*Dillenia suffruticosa*). As disturbance due to development is a common pathway of introduction of invaders, it is vital that the spread of invasive species of the site should be monitored.

The arboretum of SWBG house a variety of microhabitats for survival of a diverse group of invertebrates, insects and lower plants. Together with other habitats that are under professional management such as the lake and its tributaries, fernery, Palmatum, Kumbuka (area planted with *Terminalia arjuna*) and lawn area, SWBG holds the potential both to improve and regenerate the ecosystem services provided by natural ecosystems. Thus, within the context of the 21st century, SWBG represents a significant national asset for Sri Lanka. The semi-natural landscape of the botanic garden could easily support education and training sectors at school and university levels, botanical research, biodiversity conservation as well as public education. Establishment of an Education Centre, Herbarium, Plant nursery and a Center for sale of indigenous plants in this premises may facilitate active involvement of individuals of different societal and professional levels.

Nevertheless, as the youngest botanical garden in Sri Lanka, SWBG requires further improvements to fulfill its targets for conservation. Establishment of a code of conduct will help to protect the uniqueness of SWBG and maintain as a sustainable landscape of semi-natural habitats. It will also strengthen its services as a refugia to sustain species that are in declining populations, maintain pests and disease free environment, prevent further introduction and spread of invasive alien species, and to develop strategies to stimulate visitation and community involvement in conservation oriented programmes.

There is no doubt that the biodiversity of SWBG will fulfill all targets of GSPC 2020 in the future.

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Annex A : An inventory of flora of the arboretum of SWBG
(E- endemic, V- Vulnerable, I – Invasive)

Family	Scientific name	Common Names (S)- Sinhala (E)- English	Taxonomic & Conser--vation Status
Trees and Woody Climbers			
Anacardiaceae	*Anacardium occidentale* L.	Kaju (S), Cashew nut (E)	
Anarcardiaceae	*Lannea coromandelica* (Houtt.) Merr.	Hik (S)	
Anarcardiaceae	*Semecarpus gardneri* Thw.	Badulla (S)	E
Anarcardiaceae	*Mangifera zeylanica* (Blume) Hook. f.	Wal- Emba (S)	E
Apocynaceae	*Pagiantha dichotoma* (Roxb.) Markgraf.	Divi Kaduru (S), Eve's Apple, Forbidden fruit (E)	
Apocynaceae	*Anodendron paniculatum* (Roxb.) A. DC.	As-Wel, Dul(S)	V
Apocynaceae	*Alstonia macrophylla* Wall, ex G. Don	Havari-nuga (S)	I
Apocynaceae	*Alstonia scholaris* (L.) R. Br.	Eth-mada, ruk-attana(S)	
Arecaceae	*Caryota urens L.*	Kitul (S), Toddy Palm (E)	
Calophyllaceae	*Mesua ferrea* L. Na (S).	Iron wood. (E)	
Centroplacaceae	*Bhesa ceylanica* (Arn. Ex Thw.) Ding Hou	Uru-Honda, Et-Heraliya, Pelang (S)	E
Combretaceae	*Terminalia arjuna* (Roxb.) Wight &Arn.	Kumbuk (S)	
Dilleniaceae	*Dillenia retusa* Thunb.	Godapara (S)	
Dilleniaceae	*Tetracera sarmentosa* (L.)Vahl	Korossa-Wal (S)	
Dilleniaceae	*Dillenia suffruticosa* (Griffith)Martelli	Para (S)	I
Dipterocarpaceae	*Dipterocarpus zeylanicus* Thw.	Hora (S)	E
Ebenaceae	*Diospyros walkeri* (Wight) Guerke	Porowa Mala, Kaluwelle (S). Bastard Ebony. (E)	V
Elaeocarpaceae	*Elaeocarpus serratus* L.	Weralu (S), Ceylon Olive (E)	
Euphorbiaceae	*Macaranga peltata* (Roxb.) Muell. Arg	Kenda, Pat-kenda (S)	
Euphorbiaceae	*Mallotus tetracoccus* (Roxb.) Kurz	Bu-Kenda (S)	
Euphorbiaceae	*Chaetocarpus castanocarpus* (Roxb.) Thw	Hedawaka (S)	

Family	Scientific name	Common Names (S)- Sinhala (E)- English	Taxonomic & Conser--vation Status
Lamiaceae	*Vitex pinnata* L.	Milla (S)	
Lauraceae	*Litsea longifolia* (Nees) Trimen	Rat-Keliya (S)	E
Lauraceae	*Cinnamomum verum* J. Presl	Kurundu (S). Cinnamon(E)	
Lauraceae	*Persea macrantha* (Nees) Kosterm.	Ululu (S)	V
Lecythidaceae	*Barringtonia racemosa* (L.) Spreng	Diya-Midella (S)	
Loganiaceae	*Fragaria fragrans* Roxb	Mal karabu (S), Tembusu (E)	
Monimiaceae	*Hortonia angustifolia* (Thw.) Trimen.		E,V
Moraceae	*Artocarpus nobilis* Thw.	Wal –Del, Sinhala Del, Bedi del (S)	E
Moraceae	*Ficus hispida* L. f.	Kota-Dimbula (S)	
Moraceae	*Ficus nervosa Heyne ex Roth.*	Kalu-Maduwa (S)	
Myristicaceae	*Horsfieldia irya* (Gaertn.) Warb.	Iriya, Ruk-gedi (S)	
Myrtaceae	*Syzygium caryophyllatum* (L.) Alston	Heen-Dan, Rin-Dan (S)	
Myrtaceae	*Syzygium neesianum* Arn.	Panu Kera (S)	
Ochnaceae	*Gomphia serrata*(Gaertn.) Kanis	Bo-Kera, Kera, Go-kera (S)	
Olacaceae	*Olax zeylanica* L.	Mella (S)	
Phyllanthaceae	*Bridelia retusa* (L.) A. Juss.	Ketakala (S)	
Phyllanthaceae	*Bridelia mooni* Thw.	Patkela (S)	E
Phyllanthaceae	*Aporusa lanceolata* (Tul.) Thw.	Heen Kebella, Veli-Mediya (S)	E
Phyllanthaceae	*Glochidion stellatum* (Retz.) beddome	Kirilla (S)	E
Polygalaceae	*Xanthophyllum zeylanicum* Meijden.	Palala (S)	E
Rhizophoraceae	*Carallia brachiata* (Lour.) Merr.	Dawata (S)	
Rubiaceae	*Timonius flavescens* (Jack) Baker	Angana (S)	
Rubiaceae	Gaertnera vaginans (DC.) Merr.	Pera thambala (S)	
Rutaceae	*Melicope lunu-ankenda* (Gaertn.) T. Hartely	Lunu-ankenda (S)	
Rutaceae	*Toddalia asiatica* (L.) Lam.	Kudu miris (S)	
Rutaceae	*Acronychia pedunculata* (L.) Miq.	Ankenda (S)	
Sapindaceae	*Nephelium lappaceum* L.	Rambutan (S)	
Symplocaceae	*Symplocos cochinensis* (Lour.) S. Moore	Wal-Bombu (S)	

Family	Scientific name	Common Names (S)- Sinhala (E)- English	Taxonomic & Conser--vation Status
Thymelaceae	*Gyrinops walla* Gaertn	Walla-Patta (S)	V
Ulmaceae	*Trema orientalis* (L.) Blume	Gadumba (S), Charcoal tree(E)	
Verbenaceae	*Clerodendrum phlomidis* L.	Pinna (S)	
Shrubs & Herbs			
Araceae	*Pothos scandens* L.	Pota-wel (S)	
Aristolochaceae	*Thottea seliquosa* (Lam.) Ding Hou	Thapasara Bulath (S)	
Asparagaceae	*Asparagus racemosus* Willd	Hathawariya (S)	
Asteraceae	*Wedelia biflora* (L.) DC.	Moodu-Gam-Palu (S)	
Asteraceae	*Ageratum conyzoides* L.	Hulan-tala (S), goat weed (E)	
Asteraceae	*Eleutheranthera ruderalis* (Swartz) Sch. Bip.		
Asteraceae	*Emilia sonchifolia* (L.) DC.	Kadu Pahara (S)	
Cleomaceae	*Cleome rutidosperma* DC.		
Cyperaceae	*Hypolytrum nemorum* (Spreng. sub sp. nemorum Vahal.)		V
Cyperaceae	*Fimbristylis dichotoma* (L.) Vahl sub sp. dichotoma		
Cyperaceae	*Fimbristylis cinnamometorum* (Vahl) Kunth		
Cyperaceae	*Carex indica* L.		V
Cyperaceae	*Cyperus melanospermus* (Nees) Valken		
Cyperaceae	*Fuirena ciliaris* (L.) Roxb.		
Cyperaceae	*Cyperus bifax* Clarke.		
Diascoreaceae	*Dioscorea esculenta* (Lour.) Burkill	Heen/ Katu –kukulala, java-ala (S), Asian yam (E)	
Euphorbiaceae	*Croton hirtus* L Herit	Gan-veda, val-tippili (S)	
Euphorbiacea	*Euphorbia hirta* L.	Bu-Dada-Kiriya (S)	
Fabaceae	*Desmodium heterophyllum* (Willd.) DC.	Maha-Undupiyaliaya (S)	E
Fabaceae	*Caesalpinia bonduc* (L.) Roxb.	Kalu-Vavuletiya, Kumburu-Wel (S)	
Fabaceae	*Desmodium heterocarpon* (L.) DC.	Et-Undupiyali (S)	
Hypoxidaceae	*Curculigo orchioides* Gaertn.	Bim-Thal, Heen-Bin-Tal (S)	
Lamiaceae	*Hyptis capitata* Jacq.		
Lamiaceae	*Hyptis suaveolens* (L.) Poit.		

Family	Scientific name	Common Names (S)- Sinhala (E)- English	Taxonomic & Conser--vation Status
Leeaceae	*Leea indica* (Burm. F.) Merr.	Burulla, Gurulla (S)	
Malvaceae	*Urena lobata* L.	Patta-Epala, Epala (S)	
Malvaceae	*Sida acuta* Burm. f.	Gas-Bebila (S)	
Malvaceae	*Hibiscus furcatus* Roxb.	Na Pirittha (S)	
Melastomataceae	*Clidemia hirta* (L.) D. Don	Kata kalu bovitiya (S)	I
Melastomataceae	*Melastoma malabathricum* L.	Maha-Bovitiya (S)	
Melastomataceae	*Osbeckia octandra* (L.) DC.	Heen Bowitiya (S)	
Melastomataceae	*Memocylon umbellatum* Burm. f.	Kora-Kaha (S), Blue Mist (E)	
Melastomataceae	*Memecylon rhinophyllum* Thw.		E
Onagraceae	*Ludwigia peruviana* (L.) Hara	Beru-diyanilla (S)	
Oxalidaceae	*Biophytum reinwardtii* (Zucc.) Klotzsch	Gas-Nidikumba (S)	
Oxalidaceae	*Oxalis barrelieri* L.		
Passifloraceae	*Passiflora foetida* L.		
Periplocaceae	*Hemidesmus indicus* (L.) R. Br.	Iramusu, Heen-Iramusu (S)	
Poaceae	*Panicum notatum* Retz.		
Poaceae	*Setaria parviflora* (Poir.) M. Kerguelen	Kavalu, Kawalu (S)	
Poaceae	*Lophatherum gracile* Brongn.		
Rhamnaceae	*Ziziphus oenoplia* (L.) Mill.	Heen Eraminiya (S)	
Rubiaceae	*Spermacoce latifolia* Albert		
Rubiaceae	*Mussaenda frondosa* L.	Mus-Wenna, Mussenda (S)	
Rubiaceae	*Spermacoce assurgens* Ruiz & Pavon		
Rubiaceae	*Mitracarpus hirtus* (L.) DC.		
Smilacaceae	*Smilax zeylanica* L.	Heen-Kabaressa (S)	
Solanaceae	*Physalis micrantha* L.	Nalal Batu, Lin Mottu, Heen-Mottu (S)	
Srophulariaceae	*Scoparia dulcis* L.		
Verbanaceae	*Lantana camara* (L.)	Ganda pana (S), Lantana, Wild sage (E)	
Verbanaceae	*Stachytarpheta indica* (L.) Vahl	Nil nakuta (S)	

Family	Scientific name	Common Names (S)- Sinhala (E)- English	Taxonomic & Conser--vation Status
Ferns & Allies			
Blechnaceae	*Blechnum orientalae*	Baru-koku (S)	
Gleicheniaceae	*Dicranopteris linearis* (Burm.f.) Undrew	Kakilla (S)	
Marattiaceae	*Angiopteris evecta* (Forst.) Hoffin.	Wal-meda (S)	
Marsileaceae	*Marsilea quadrifolia*		
	Microporus vernicipes (Berk.) Imazeki		
Polypodiaceae	*Drynaria quercifolia* (L.) I. SM	Benduru (S)	
Polypodiaceae	*Lygodium microphyllum* (Cav.) R. Br.	Pamba-wel (S)	
Pteridaceae	*Adiantum latifolium* Lam.		
Pteridaceae	*Pityrogramma calomelanos* (L.)		
Pteridaceae	*Pteris ensiformis*Burm.f .		

Annex B: An inventory of fauna in arboretum of SWBG [E: endemic; V: vulnerable; En: endangered; Nt: nearly threatened; Cr: critically endangered]

Family	Scientific Name	Common Names S- Sinhala, E- English	Conservation & Taxonomic Status
Accipitridae	*Haliastur indus* (Boddaert, 1783)	Bamunu Piyakussa (S), Brahminy Kite (E)	
Accipitridae	*Spilornis cheela* (Latham, 1790)	Silu Sarapakussa (S), ,Crested Serpent Eagle (E)	
Accipitridae	*Accipiter badius* (Gmelin, 1788)	Kurulugoya (S), Shikra (E),	
Accipitridae	*Ictinaetus malayensis* (Temminck,1822)	Kalukussa(S), Black Eagle (E)	
Aegithinidae	*Aegithina tiphia* (Linnaeus, 1758)	Podu Iorawa (S), Common Iora (E)	
Agamidae	*Calotes versicolor* (Daudin, 1802)	Gara katussa (S),Common garden lizard (E)	
Agamidae	*Lyriocephalus scutatus* (Linnaeus, 1758)	Gatahombu katussa / Karamal bodiliya (S), Lyre head lizard / Hump snout lizard (E)	En,V
Agamidae	*Otocryptis wiegmanni* (Wagler, 1830)	Gomu talikatussa / Pinum katussa / (S), Sri Lankan kangaroo lizard (E)	En
Alcedinidae	*Alcedo atthis* (Linnaeus, 1758)	Mal Pilihuduwa (S), Common Kingfisher (E),	
Alcedinidae	*Halcyon smyrnensis* (Linnaeus, 1758)	Layasudu Madi-pilihuduwa (S), White-throated Kingfisher (E)	
Aplocheilidae	*Aplocheilus dayi*(Steindachner,1892)	Uda handeya (S),Day's killifish (E)	E, En
Apodidae	*Cypsiurus balasiensis* (Gray, JE,1829)	Asiaa Thal-thurithaya (S), Asian Palm Swift (E)	
Apodidae	*Apus affinis* (Gray, 1830)	Punchi Thurithaya (S), House Swift (E)	
Ardeidae	*Egretta garzetta* (Linnaeus, 1766)	Punchi Anu-koka (S), Little Egret (E)	
Ardeidae	*Mesophoyx intermedia* (Wagler, 1829)	Sudu Madi-koka, (S), Intermediate Egret (E)	
Ardeidae	*Bubulcus ibis* (Linnaeus, 1758)	Geri-koka (S), Cattle Egret (E)	
Ardeidae	*Ardeola grayii* (Sykes, 1832)	Kana-koka, (S), Indian Pond Heron (E)	
Balitoridae	*Schistura notostigma* (Bleeker, 1863)	Puwak Badilla / Kandukara Ahirawa (S), Banded mountain loach (E)	En,Nt
Bataguridae	*Melanochelys trijuga* (Schweigger, 1812)	Parkerge gal ibba (S),Parker's black turtle (E)	
Bucerotidae	*Ocyceros gingalensis* (Shaw, 1811)	Sri Lanka Alu Kandaththa(S), Sri Lanka Grey Hornbill (E)	E

Family	Scientific name	Common Names (S)- Sinhala (E)- English	Taxonomic & Conser--vation Status
Ferns & Allies			
Blechnaceae	*Blechnum orientalae*	Baru-koku (S)	
Gleicheniaceae	*Dicranopteris linearis* (Burm.f.) Undrew	Kakilla (S)	
Marattiaceae	*Angiopteris evecta* (Forst.) Hoffin.	Wal-meda (S)	
Marsileaceae	*Marsilea quadrifolia*		
	Microporus vernicipes (Berk.) Imazeki		
Polypodiaceae	*Drynaria quercifolia* (L.) I. SM	Benduru (S)	
Polypodiaceae	*Lygodium microphyllum* (Cav.) R. Br.	Pamba-wel (S)	
Pteridaceae	*Adiantum latifolium* Lam.		
Pteridaceae	*Pityrogramma calomelanos* (L.)		
Pteridaceae	*Pteris ensiformis*Burm.f.		

Annex B: An inventory of fauna in arboretum of SWBG [E: endemic; V: vulnerable; En: endangered; Nt: nearly threatened; Cr: critically endangered]

Family	Scientific Name	Common Names S- Sinhala, E- English	Conservation & Taxonomic Status
Accipitridae	*Haliastur indus* (Boddaert, 1783)	Bamunu Piyakussa (S), Brahminy Kite (E)	
Accipitridae	*Spilornis cheela* (Latham, 1790)	Silu Sarapakussa (S), ,Crested Serpent Eagle (E)	
Accipitridae	*Accipiter badius* (Gmelin, 1788)	Kurulugoya (S), Shikra (E),	
Accipitridae	*Ictinaetus malayensis* (Temminck,1822)	Kalukussa(S), Black Eagle (E)	
Aegithinidae	*Aegithina tiphia* (Linnaeus, 1758)	Podu Iorawa (S), Common Iora (E)	
Agamidae	*Calotes versicolor* (Daudin, 1802)	Gara katussa (S),Common garden lizard (E)	
Agamidae	*Lyriocephalus scutatus* (Linnaeus, 1758)	Gatahombu katussa / Karamal bodiliya (S), Lyre head lizard / Hump snout lizard (E)	En,V
Agamidae	*Otocryptis wiegmanni* (Wagler, 1830)	Gomu talikatussa / Pinum katussa / (S), Sri Lankan kangaroo lizard (E)	En
Alcedinidae	*Alcedo atthis* (Linnaeus, 1758)	Mal Pilihuduwa (S), Common Kingfisher (E),	
Alcedinidae	*Halcyon smyrnensis* (Linnaeus, 1758)	Layasudu Madi-pilihuduwa (S), White-throated Kingfisher (E)	
Aplocheilidae	*Aplocheilus dayi*(Steindachner,1892)	Uda handeya (S),Day's killifish (E)	E, En
Apodidae	*Cypsiurus balasiensis* (Gray, JE,1829)	Asiaa Thal-thurithaya (S), Asian Palm Swift (E)	
Apodidae	*Apus affinis* (Gray, 1830)	Punchi Thurithaya (S), House Swift (E)	
Ardeidae	*Egretta garzetta* (Linnaeus, 1766)	Punchi Anu-koka (S), Little Egret (E)	
Ardeidae	*Mesophoyx intermedia* (Wagler, 1829)	Sudu Madi-koka, (S), Intermediate Egret (E)	
Ardeidae	*Bubulcus ibis* (Linnaeus, 1758)	Geri-koka (S), Cattle Egret (E)	
Ardeidae	*Ardeola grayii* (Sykes, 1832)	Kana-koka, (S), Indian Pond Heron (E)	
Balitoridae	*Schistura notostigma* (Bleeker, 1863)	Puwak Badilla / Kandukara Ahirawa (S), Banded mountain loach (E)	En,Nt
Bataguridae	*Melanochelys trijuga* (Schweigger, 1812)	Parkerge gal ibba (S),Parker's black turtle (E)	
Bucerotidae	*Ocyceros gingalensis* (Shaw, 1811)	Sri Lanka Alu Kandaththa(S), Sri Lanka Grey Hornbill (E)	E

Family	Scientific Name	Common Names S- Sinhala, E- English	Conserva & Taxonon Sta
Campephagidae	*Coracina melanoptera* (Rüppell, 1839)	Kalu-his Kovul-saratiththa (S), Black-headed Cuckooshrike (E)	
Campephagidae	*Tephrodornis pondicerianus* (Blyth, 1847)	Podu Wana-saratiththa (S), Common Woodshrike (E)	
Campephagidae	*Pericrocotus flammeus* (Forster, JR, 1781)	Dilirath Minivitha (S), Scarlet Minivet (E)	
Cercopithecidae	*Macaca sinica* (Linneaus, 1771)	Sri Lanka Rilawa (S), Sri Lanka toque monkey (E)	
Cercopithecidae	*Semnopithecus vetulus* (Bennett, 1833)	Sri Lanka Kalu-wandura (S), Purple-faced leaf monkey (E)	E,E
Charadriidae	*Vanellus indicus* (Boddaert, 1783)	Rath-yatimal Kirella (S), Red-wattled Lapwing (E)	
Cisticolidae	*Prinia inornata* (Sykes, 1832)	Sarala Priniya (S), Plain Prinia (E)	
Colubridae	*Ptyas mucosa* (Linnaeus 1758)	Gerandiya (S). Rat snake (E),	
Colubridae	*Ahaetulla nasuta* (Bonnaterre, 1790)	Ahaetulla (S),Green vine snake (E)	
Columbidae	*Streptopelia chinensis* (Scopoli, 1786)	Alu Kobeiyya (S), Spotted Dove (E)	
Columbidae	*Chalcophaps indica* (Linnaeus, 1758)	Neela-Kobeiyya (S), Emerald Dove (E)	
Columbidae	*Ducula aenea* (Linnaeus, 1766)	Neela Mahagoya (S), Green Imperial Pigeon (E)	
Corvidae	*Corvus levaillantii* (Lesson, 1831)	Kalu Kaputa (S), Large-billed Crow (E)	
Cuculidae	*Eudynamys scolopacea* (Linnaeus, 1758)	Kowula (S), Asian Koel (E)	
Cyprinidae	*Puntius vittatus* (Day, 1865)	Bandi Titteya (S),Silver barb (E)	
Cyprinidae	*Rasbora microcephalus* (Bleeker, 1859)	Caveri Randiya (S), Carverii Rasbora (E)	
Cyprinidae	*Rasbora dandia* (Valenciennes, 1844)	Dandiya / Kehel Dandiya (S), Striped rasbora / Common rasbora (E)	
Cyprinidae	*Systomus spilurus* (Gnther, 1868)	Mas Pethiya (S), Olive barb (E)	
Dicaeidae	*Dicaeum agile* (Tickell, 1833)	Mathudu Pililichcha (S), Thick-billed Flowerpecker (E)	
Dicruidae	*Dicrurus caerulescens* (Linnaeus,1758)	Kawuda (S),White-bellied Drongo (E)	
Elapidae	*Naja naja* (Laurenti,1768)	Naya (S),Indian cobra (E)	
Estrididae	*Lonchura malacca* (Linnaeus, 1766)	Hisakalu Weekurulla (S), Black-headed Munia (E),	
Gobiidae	*Sicyopterus griseus* (Day, 1877)	Gal weligouwa (S),Stone goby (E)	

Family	Scientific Name	Common Names S- Sinhala, E- English	Conservation & Taxonomic Status
Herpestidae	*Herpestes edwardsii* (Geoffroy Saint-Hilaire, 1818)	Alu Mugatiya (S), Grey mongoose (E)	
Hirundinidae	*Hirundo rustica* (Linnaeus, 1758)	Atu Wahilihiniya (S), Barn Swallow (E)	
Hirundinidae	*Hirundo hyperythra* (Blyth, 1849)	Nithamba-rathu Wahilihiniya (S), Red-rumped Swallow (E)	E
Hystricidae	*Hystrix indica* (Kerr, 1792)	Ittewa (S), Porcupine (E)	
Laniidae	*Lanius cristatus* (Linnaeus, 1758)	Bora Sabariththa (S), Brown Shrike (E),	
Leporidae	*Lepus nigricollis* (Pallas, 1778)	Wal Hawa (S),Black-naped hare (E)	
Manidae	*Manis crassicaudata* (Geoffroy Saint-Hilaire, 1803)	Kaballewa (S), Pangolin (E)	Nt
Meropidae	*Merops orientalis* (Linnaeus, 1758)	Punchi Binguharaya (S), Green Bee-eater(E)	
Meropidae	*Merops philippinus* (Linnaeus, 1758)	Nilpenda Binguharaya (S), Blue-tailed Bee-eater (E)	Cr
Meropidae	*Merops leschenaulti* (Vieillot, 1817)	Thambala-hisa Binguharaya (S), Chestnut-headed Bee-eater (E)	
Monarchidae	*Terpsiphone paradisi* (Linnaeus, 1758)	Asia Rahanmara (S), Asian Paradise- flycathcher (E)	
Motacillidae	*Dendronanthus indicus*(Gmelin, 1789)	Wana-halapenda (S), Forest Wagtail (E)	
Motacillidae	*Anthus rufulus* (Vieillot, 1818)	Keth Varatichcha (S), Paddyfield Pipit (E)	
Muscicapidae	*Muscicapa daurica* (Pallas, 1811)	Asia Bora Masimara (S), Asian Brown Flycatcher (E)	
Muscicapidae	*Copsychus saularis* (Linnaeus, 1758)	Polkichcha (S),Oriental Magpie Robin (E)	
Muscicapidae	*Saxicoloides fulicata* (Linnaeus, 1766)	Indu Kalukichcha (S),Indian Robin (E)	
Nectariniidae	*Nectarina zeylonica* (Linnaeus, 1766)	Nithamba Dam Sutikka (S), Purple-rumped Sunbird (E)	
Nectariniidae	*Nectarina asiatica* (Latham, 1790)	Dam Sutikka (S), Purple Sunbird (E)	
Oriolidae	*Oriolus xanthornus* (Linnaeus, 1758)	Kahakurulla (S),Black-hooded Oriole (E)	
Passeridae	*Passer domesticus* (Linnaeus, 1758)	Gekurulla (S),House Sparrow (E)	
Phalacrocoracidae	*Phalacrocorax niger* (Vieillot, 1817)	Punchi Diyakava (S), Little Cormorant	
Phalacrocoracidae	*Phalacrocorax fuscicollis* (Stephens, 1826)	Indu Diyakava (S), Indian Cormorant(E)	
Picidae	*Chrysocolaptes lucidus* (Scopoli, 1786)	Lepita Maha-karela (S), Greater Flameback (E)	

Family	Scientific Name	Common Names S- Sinhala, E- English	Conservatio & Taxonomi Statu
Psittacidae	*Loriculus beryllinus* (Forster, JR, 1781)	Sri Lanka Giramaliththa (S), Sri Lanka Hanging Parakeet (E)	En
Psittacidae	*Psittacula eupatria* (Linnaeus, 1766)	Labu Girawa (S), Alexandrine Parakeet (E)	
Psittacidae	*Psittacula krameri* (Linnaeus, 1766)	Rana Girawa (S), Rose-ringed Parakeet (E)	
Psittacidae	*Psittacula cyanocephala* (Linnaeus, 1766)	Pandu Girawa (S) , Plum-headed Parakeet (E)	N
Psittacidae	*Psittacula calthropae* (Blyth, 1849)	Sri Lanka Alu Girawa (S), Sri Lanka Layard's Parakeet (E)	En, Nt
Pycnonotidae	*Pycnonotus melanicterus* (Gmelin, JF, 1789)	Kalu Hisasi Kondaya (S), Black-crested Bulbul (E)	En
Pycnonotidae	*Pycnonotus cafer* (Linnaeus, 1766)	Kondaya (S),Red-vented Bulbul(E)	
Pycnonotidae	*Pycnonotus luteolus* (Lesson, 1841)	Bamasudu Kondaya (S), White-browed Bulbul (E)	
Pycnonotidae	*Hypsipetes leucocephalus* (Gmelin, JF, 1789)	Kalu-kondaya (S),Black Bulbul(E)	
Pythonidae	*Python molurus* (Linnaeus, 1758)	Pimbura (S),Indian python (E)	
Rallidae	*Amaurornis phoenicurus* (Pennant, 1769)	Laya-sudu Korawakka (S), White-breasted Waterhen (E)	
Ramphastidae	*Megalaima zeylanica* (Gmelin, JF, 1788)	Polos Kottoruwa (S), Brown-headed Barbet (E)	
Ramphastidae	*Megalaima flavifrons* (Cuvier, 1816)	Sri Lanka Ranmhunatha Kottoruwa (S), Sri Lanka Yellow-fronted Barbet (E)	En
Ramphastidae	*Megalaima rubricapilla* (Gmelin, JF, 1788)	Rathmhunath Kottoruwa (S), Crimson-fronted Barbet (E)	
Ramphastidae	*Megalaima haemacephala* (Statius Muller, 1776)	Rathlaye Kottoruwa (S), Coppersmith Barbet	
Rhipiduridae	*Rhipidura aureola* (Lesson, 1831)	Bama-sudu Pawanpenda (S), White-browed Fantail (E)	
Sciuridae	*Funambulus palmarum* (Linnaeus, 1766)	Leena (S), Palm squirrel (E)	
Sciuridae	*Ratufa macroura* (Pennant, 1769)	Dandu-leena (S), Giant squirrel (E)	

Family	Scientific Name	Common Names S- Sinhala, E- English	Conservation & Taxonomic Status
Sturnidae	*Acridotheres tristis* (Linnaeus, 1766)	Mayna (S),Common Myna (E)	
Suidae	*Sus scrofa* (Linnaeus, 1758)	Wal Ura (S),Wild boar (E)	
Sylviidae	*Orthotomus sutorius* (Pennant, 1769)	Battichcha (S),Common Tailorbird (E)	
Timalidae	*Turdoides affinis* (Jerdon, 1845)	Demalichcha (S), Yellow-billed Babbler (E)	
Tytonidae	*Ketupa zeylonensis* (Gmelin, JF, 1788)	Bora Kewul-bakamoona (S),Brown Fish Owl (E)	
Tytonidae	*Ninox scutulata* (Raffles, 1822)	Bora Ukusu-bassa (S),Brown Hawk Owl (E)	
Uropeltidae	*Rhinophis homolepis* (Hemprich, 1820)	Depath thudulla (S),Kelaarts earth snake (E)	E,En
Varanidae	*Varanus bengalensis* (Daudin, 1802)	Talagoya (S),Land monitor (E)	
Viperidae	*Daboia russelii* (Shaw & Nodder, 1797)	Tith polonga. (S), Russell's viper (E)	
Viperidae	*Hypnale hypnale* (Fitzinger 1843)	Polon thelissa (S), The Merrem's hump nose viper (E)	
Zosteropidae	*Zosterops palpebrosus* (Temminck, 1824)	Peradigu Sithasiya (S), Oriental White-eye (E)	