PARTICIPANTS OF EXPERT PANEL FOR PREPARATION OF LISTS OF LOWER PLANTS

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Angiosperms in Sri Lanka

Present status of Angiosperms in Sri Lanka

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Angiosperms, or flowering plants, are the most extensively studied group of plants in Sri Lanka. Sri Lanka's angiosperm flora has been explored, studied and documented by many botanists since the colonial times (Jayasuriya, 2007). Trimen's Handbook to the Flora of Ceylon (Trimen, 1893-1900), was considered as one of the most comprehensive floras of that time. Based on Trimen's Flora, Abeywickrama (1945) reported 1,065 genera and 2,855 species in 171 families. Out of those, 853 species were considered to be endemic to Sri Lanka.

The revision of the Trimen's Flora (Dassanayake et al., 1980-2000) described 3,771 angiosperm species in 1,363 genera and that included many naturalized species. The total number of endemic taxa (including varieties and subspecies) was about 1,000 according to that revision. Senaratne (2001) listed 4,143 flowering plant species in 1,522 genera belonging to 214 families. According to her 25% of these are exotics and out of the exotics 32% are naturalized. The National Red List of 2012 (MOE, 2012) included an updated list of angiosperms recorded in Sri Lanka. There were 3154 angiosperm species belonging to 186 families in that list. The number of endemic species in that list was 894.

Compared to the other countries in South Asia, angiosperm diversity in Sri Lanka is remarkably higher due to multitudes of factors. Origin, affinities and biogeography of our flowering plants have been discussed by several authors in the past (Trimen, 1885; Abeywickrama, 1945; Ashton and Gunatilleke, 1987). There are no endemic families in Sri Lanka. But there are 16 endemic genera (Table 01).

During the preparation of the current red list the distribution data of each species were carefully analyzed by an expert panel and only those species which were undoubtedly native were used for evaluation. Although the National Red List 2012 included 3154 angiosperm species (MOE, 2012), during the current red listing process it was observed that 127 species in the 2012 list need to be removed since they are either naturalized exotics, misidentifications or those species previously considered as cosmopolitan which are now being recognized for their real natural distribution, which is outside Sri Lanka. Those species were removed from the current list.

The current red list includes 59 species that were not included in the 2012 National Red List. Of those, 10 species are new species described since the publication of National Red List 2012 (Table 02). The other 49 indigenous were overlooked as they were not included in the Flora of Sri Lanka (Table 03). Thus, the total number of angiosperm species evaluated was now 3,086. These species are in 186 families. Although the 2012 red list included 894 endemic angiosperm species, 34 species out of them were reported to be not endemic. Therefore the number of endemic angiosperm species is 860.

Table 01. Endemic angiosperm genera in Sri Lanka.

	Family	Endemic Genus
1	Achariaceae	*Chlorocarpa* Alston
2	Annonaceae	*Phoenicanthus* Alston
3	Arecaceae	*Loxococcus* H.Wendl. & Drude
4	Celestraceae	*Kokoona* Thwaites
5	Dilleniaceae	*Schumacheria* Vahl
6	Gesneriaceae	*Championia* Gardner
7	Dipterocarpaceae	*Stemonoporus* Thwaites

	Family	Endemic Genus
8	Malvaceae	*Dicellostyles* Benth.
9	Monimiaceae	*Hortonia* Wight ex Arn.
10	Orchidaceae	*Adrorhizon* Hook.f.
11	Poaceae	*Davidsea* Soderstr. & R.P.Ellis
12	Podostemaceae	*Farmeria* Willis ex Hook.f.
13	Rubiaceae	*Diyaminauclea* Ridsdale
14	Rubiaceae	*Leucocodon* Gardner
15	Rubiaceae	*Nargedia* Bedd.
16	Rubiaceae	*Scyphostachys* Thwaites

Table 02. List of new species described since the publication of Red List 2012

	Family	Species	Conservation status
1	Aponogetonaceae	***Aponogeton dassanayakei*** Manaw. & Yakand.	EN
2	Aponogetonaceae	***Aponogeton kannangarae*** M.A.Silva, Deshaprema & Manamperi	CR
3	Gesneriaceae	***Henckelia wijesundarae*** Ranasinghe and Mich.Möller	CR
4	Nymphaeaceae	***Nymphaea nouchali* var. *versicolour*** (Sims) Guruge and Yakandawala	VU
5	Orchidaceae	***Dendrobium taprobanium*** Atthanagoda, Priyadarshana, Wijewardhane, Aberathna, Peabotuwage & Kumar	DD
6	Orchidaceae	***Gastrodia gunatillekeorum*** Bandara, Priyankara & Kumar	EN
7	Orchidaceae	***Oberonia meegaskumburae*** Priyad., Wijew. & Kumar	CR
8	Orchidaceae	***Podochilus warnagalensis*** Wijew., Priyad., Arang., Atthan., Samar. & Kumar	EN
9	Orchidaceae	***Pteroceras dalaputtuwa*** Atthanagoda, Priyadarshana, Wijewardana, Aberathna & Kumar	DD
10	Urticaceae	***Elatostema rigidiusculum*** (Thwaites ex Hooker) Ranil & Nadeeka	CR

Table 03. List of species which were not included in Red List 2012, added to the current list (Endemic taxa in bold text)

	Family	Species	Conservation Status
1	Amarylidaceae	*Pancratium parvum* Dalzell	DD
2	Anacardiaceae	***Semecarpus ochraceus*** Alston	DD
3	Anacardiaceae	***Spondias xerophila*** Kosterm.	VU
4	Apocynaceae	*Boucerosia indica* (Wight & Arn.) Plowes	DD
5	Apocynaceae	*Ceropegia gardneri* Thwaites	DD
6	Apocynaceae	*Vincetoxicum indicum* var. *intermedium* (M.A.Rahman & Wilcock) Meve & Liede	EN
7	Araceae	***Lagenandra dewitii*** Crusio & A.de Graaf	DD
8	Asteraceae	*Adenostemma madurense* DC.	DD
9	Asteraceae	*Dichrocephala integrifolia* subsp. *Integrifolia* (L.f.) Kuntze	VU
10	Callophyllaceae	***Calophyllum vergens*** P.F.Stevens	DD
11	Capparidaceae	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) Siddiqui & S.N.Dixit	LC
12	Eriocaulacee	*Eriocaulon longicuspe* var. *zeylanicum* Moldenke	DD
13	Euphorbiaceae	*Acalypha ciliata* Forssk.	LC
14	Fabaceae	*Canavalia africana* Dunn	DD
15	Fabaceae	*Crotalaria umbellata* Wight & Arn.	CR
16	Fabaceae	*Hylodesmum leptopus* (A. Gray ex Benth.) H. Ohashi & R.R. Mill	DD
17	Fabaceae	*Indigofera ultima* (Kuntze) Peter G.Wilson	DD
18	Fabaceae	*Sesbania procumbens* Wight & Arn.	DD
19	Flagellariaceae	*Flagellaria guineensis* Schumach.	DD
20	Lamiaceae	*Endostemon viscosus* (Roth) M.R.Ashby	DD
21	Lamiaceae	*Ocimum minimum* L.	DD
22	Lamiaceae	*Orthosiphon pallidus* Royle ex Benth.	DD
23	Lindernaceae	*Bonnaya oppositifolia* (Retz.) Spreng.	DD
24	Lindernaceae	*Bonnaya veronicifolia* (Retz.) Spreng.	DD
25	Lindernaceae	*Lindernia parviflora* (Roxb.) Haines	DD

	Family	Species	Conservation Status
26	Lobeliaceae	***Lobelia walkeri*** (C.B.Clarke) W.J.de Wilde & Duyfjes	DD
27	Malvaceae	*Grewia abutilifolia* Vent. ex Juss.	DD
28	Malvaceae	*Sida cuneifolia* Roxb.	DD
29	Malvaceae	*Thespesia populneoides* (Roxb.) Kostel.	DD
30	Menispermaceae	*Cissampelopsis walkeri* var. *walkeri* (Arn.) C. Jeffrey & Y. L. Chen	EN
31	Menispermaceae	*Cissampelopsis walkeri* var. ***floccosa*** Vanij. & Kadereit	EN
32	Moraceae	*Ficus virens* var. *matthewii* Chantaras.	DD
33	Nyctaginaceae	*Commicarpus chinensis* (L.) Heimerl	DD
34	Orchidaceae	*Arundina graminifolia* subsp. *graminifolia* (D.Don) Hochr.	DD
35	Orchidaceae	*Gastrochilus obliquus* (Lindl.) Kuntze	EN
36	Orchidaceae	*Nervilia concolor* (Blume) Schltr.	EN
37	Orchidaceae	*Nervilia plicata* (Andrews) Schltr.	VU
38	Orchidaceae	*Nervilia simplex* (Thouars) Schltr.	VU
39	Orchidaceae	*Spiranthes flexuosa* (Sm.) Lindl.	DD
40	Oxalidaceae	***Biophytum hermanni*** Veldkamp	DD
41	Poaceae	*Isachne minutula* (Gaudich.) Kunth	DD
42	Pontederiaceae	*Pontederia korsakowii* (Regel & Maack) M.Pell. & C.N.Horn	DD
43	Pontederiaceae	*Pontederia plantaginea* Roxb.	DD
44	Rhizophoraceae	***Carallia orophila*** Kosterm.	CR
45	Rhizophoraceae	***Carallia paucinervia*** Kosterm.	CR
46	Sapindaceae	*Dodonaea viscosa* subsp. *angustifolia* (L.f.) J.G.West	DD
47	Sapotaceae	***Isonandra alloneura*** Jeuken	DD
48	Solanacee	*Solanum insanum* L.	DD
49	Urticaceae	*Boehmeria virgata* subsp. *macrophylla* var. *longissima* (Hook.f.) Friis & Wilmot-Dear	DD

The Poaceae (grass family) has the largest number of species (248 species). The ten largest angiosperm families in Sri Lanka are given in Table 04. Nearly 45% of all angiosperm species in the country are in classified under those 10 families.

Table 04. The 10 largest angiosperm families in Sri Lanka.

	Family	Number of species	Number of endemic species	Percentage of endemic species (%)	Number of threatened species	Percentage of threatened species (%)
1	Poaceae	248	21	8.5	86	34.7
2	Fabaceae	217	13	6.0	102	47.0
3	Orchidaceae	193	63	32.6	137	71.0
4	Rubiaceae	174	97	55.7	87	50.0
5	Cyperaceae	171	10	5.8	63	36.8
6	Acanthaceae	106	41	38.7	52	49.1
7	Asteraceae	86	19	22.1	37	43.0
8	Melastomataceae	71	58	81.7	57	80.3
9	Lamiaceae	70	13	18.6	18	25.7
10	Malvaceae	69	9	13.0	20	29.0

In the 2012 Red list five species were listed as extinct (MOE, 2012). However, three of those species, *Rinorea decora* (Violaceae), *Rinorea bengalensis* and *Crudia zeylanica* (Fabaceae), were recollected during botanical surveys conducted after 2012. Therefore, only two species are now believed to be extinct. These extinct species are *Strobilanthes caudata* (Acanthaceae), and *Blumea angustifolia* (Asteraceae). Many species that were listed under the CR(PE) category were also recollected recently and now only 130 species are in that category.

Doona ovalifolia (Dipterocarpaceae) and *Alphonsia hortensis* (Annonaceae) were listed under the Extinct in the Wild Category (EW) in the 2012 Red List (MOE, 2012). *Doona ovalifolia* was later found in a natural habitat and now being placed under the critically endangered category (CR). *Eugenia xanthocarpa* (Myrtaceae) is added to the EW category in the current list. *Alphonsea hortensis* and *Eugenia xanthocarpa* are cultivated at Royal Botanic Gardens-Peradeniya.

Out of the 186 families evaluated, 64 families have 50% or more threatened species and in 25 families all species are recognized as threatened. These 25 families are each represented by less than 5 species and more than half of these families are represented by a single species. Only 40 families have no any threatened species.

The distribution of the threatened species shows that the highest number of threatened species are found in the wet zone districts such as Kandy, Ratnapura, Nuwara Eliya, Badulla, Matale, Galle and Kalutara. These districts also house the largest diversity of angiosperm species (Table 05). Data show that in Ratnapura, Kandy, Kilinochchi, Galle, Nuwara Eliya Kalutara, Kegalle, and Matara districts which have a higher number of species, over 60% of the endemic species are threatened (Table 05).

Table 05. Distribution of threatened plants in different Districts in Sri Lanka.

District	Total no. of taxa	Total no. of threatened taxa	Total no. of endemic taxa	Total no. of threatened endemic taxa	Percentage of threatened endemic taxa (%)
Kandy	1945	898	613	437	71.3
Ratnapura	1544	774	598	439	73.5
Nuwara Eliya	1302	693	426	301	70.7
Badulla	1173	453	255	160	62.8
Matale	1159	352	216	122	56.5
Galle	1066	443	396	280	70.8
Anuradhapura	949	209	101	47	46.6
Kalutara	931	387	346	236	68.3
Hambantota	899	159	78	29	37.2
Kurunegala	846	197	138	62	45
Monaragala	777	200	111	53	47.8
Kegalle	741	307	300	193	64.4
Matara	701	289	289	185	64.1
Puttalam	678	98	48	18	37.5
Colombo	644	161	118	63	53.4
Polonnaruwa	639	99	47	22	46.9
Trincomalee	608	90	26	9	34.7
Jaffna	553	94	18	7	38.9
Gampaha	469	79	55	32	58.2
Ampara	465	67	31	14	45.2
Batticaloa	463	70	20	11	55
Mannar	357	68	10	3	30
Vavuniya	218	33	10	5	50
Mullaitivu	100	13	8	2	25
Kilinochchi	61	10	4	3	75

Like many other groups of organisms, angiosperms are also threatened with many factors. Out of 3,086 species evaluated, 1,501 are threatened (critically endangered, endangered or vulnerable). This is about 48.6% of the total angiosperm flora in Sri Lanka. Threats to angiosperms may range from direct causes such as habitat loss and environmental pollution to indirect factors such as unavailability of pollinators or dispersal agents. Whatever, the causal factors there may be, the proportion of threatened angiosperm plant species is exceedingly high. Therefore, the findings of the Red List need to be paid serious attention without delay by all concerned.

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