



## Evaluating the occurrence and conservation statuses of Sri Lankan Orchids (Orchidaceae): Observations on newly recorded species and undocumented regions

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### Abstract

Sri Lanka is a country with unique landscapes and positioning. Its land profile varies from coastal areas through lowland hills to central montane region, and the climatic zones governed by seasonal monsoons results in a significantly high biodiversity.

Sri Lanka together with Western Ghats is a biodiversity hot spot among the 35 regions known worldwide. Sri Lanka harbors 3154 species of which 894 are endemics belonging to different angiosperm families. The orchid flora of the country, with 189 known species including 55 endemics is one that contributes very much for this high endemism. However 70.6% are currently listed as nationally threatened species during National Red listing in 2012.

The present study was conducted to investigate the current status and occurrence of species of the family Orchidaceae within and outside the conservation areas including few unexplored/ undocumented regions in the country. Field visits were carried out mainly focusing on the flowering seasons. Fourteen different sites including Forest Reserves, Sanctuaries, Strict Nature Reserves and Wildlife Parks were taken into consideration during this study. Observations were made in the field and locations recorded, collected data were tabulated and compared with available information. The observation made during the present study would make a large contribution for updating the conservation status of orchids at national and global level red listing.

**Key words:** Conservation status, New records, Orchidaceae, Sri Lankan Orchids

### Introduction

Sri Lanka is a small island of 65,500 square kilometers located in the Indian Ocean close to the southern tip of peninsular India, between 7°00' N and 81°00' E. The equatorial position of the country ensures the uniform tropical climate throughout the year but the influence of the surrounding ocean keeps away the temperature extremes. The land profile of Sri Lanka varies from coastal areas through lowland hills to central montane region. Sri Lanka is characterized by two seasons as wet and dry mainly based on the two monsoons. Areas with transitional weather condition is called intermediate zone (Ashton *et al.*, 1997). The significant position, land profile, climatic and geological variations have consequently contributed to a considerably high biodiversity. The National Red List of Sri Lanka (2012), records, 3,154 Angiosperm species with 894 endemics, 2 Gymnosperms, 336 Pteridophytes with 49 endemics and 748 inland vertebrates.

However with the technological and industrial development together with the population growth, the forest cover of the country has been depleting, leading to a reduction in faunal and floral richness. Habitat destruction, direct exploitation for various reasons (medicinal, ornamental and trading purposes etc.) and pollution are the other likely scenarios which may have interrupted the essential and complex natural biological relationships (Fernando, 2012).

However, not only the human influence but also the natural disasters have made a huge impact towards the degradation of natural habitats in the past few years. According to Mittermeier *et al.* (2011), Sri Lanka together with the Western Ghats is a biodiversity hotspot among 35 other regions worldwide due to its richness of fauna and flora. Therefore, under this context the conserved areas play an important role in providing secure habitats towards the protection and management of this rich biodiversity, with high endemism.

Different categories of conserved areas are declared in the country harboring diverse range of fauna and flora. As established by IUCN protected area categories, there are seven main areas in the world (Dudley, 2008). Among these categories Sri Lanka has recognized three Strict Nature Reserves (SNR), 22 National Parks (NP), 64 Forest Sanctuaries (FS), and seven Forest Reserves (FR) which are managed by the Department of Wildlife Conservation of Sri Lanka. In addition to these, the country harbors two World Heritage Wilderness areas (WHW), and two Man and Biosphere Reserves (MAB) which were established by UNESCO and Conservation Forest (CF), they are governed by the Forest Department of Sri Lanka. However based on the observations and the available statistics it is time to evaluate if the protection expected through these protected areas is sufficient enough to safeguard the biodiversity of the region. Even though 8500 km<sup>2</sup> (13%) of land surface is protected by law under these categories, according to the National Red List of 2012, still 1,385 Angiosperms (43.9%) with 594 endemics (66.4%), 200 Pteridophytes (59.5%) with 33 endemics (67.3%) and 329 vertebrates (43%) with 225 endemics (68%) are listed as nationally threatened.

Among the angiosperm families, Orchidaceae is assumed to be a relatively recently evolved and occupying the crown of monocotyledons evolution. Their specialized floral characters, variety of habits and dust like seeds with the ability of long distance dispersal seems to play a role in their rapid evolution (Pridgeon, 2001). According to Zotz (2013), there are 27,135 species within 880 genera dispersed worldwide. Sri Lanka possesses 184 species belonging to 78 genera with one endemic genus and 50 endemic species (MOE, 2012). Members of the family Orchidaceae show a vast diversity in distribution, dispersing in all the possible habitats excluding polar regions and deserts. The habit of the members ranges from herbs, small shrubs and climbers with a very few being mycoheterotrophic. These species can grow in diverse habitat such as epiphytic, saprophytic, lithophytic and terrestrial (Fernando, 2012).

Considering the National Conservation Status (NCS) of the Sri Lankan orchids, 70.6% of the orchid species including 84% of the endemics are categorized as threatened. Within this 8.6% of the species with 12% of endemics are Critically Endangered (CR), 29.3% are Endangered (EN) including 48% of endemic species and 32.6% of species are Vulnerable (VU) including 24% of endemic species. Further, 2.2% of the species are Critically Endangered Possibly Extinct [CR(PE)] which includes one endemic, 14.1% are Near Threatened (NT) with 8% of endemics and only 6.5% of species out of total 184 are categorized under Least Concerned (LC) species. In addition 6.5% are listed under the Data Deficient category (DD) due to lack of information to assess their risks (MOE, 2012). Considering these figures, it is evident that the island's orchid species are not secured and research should be focused towards gathering information on their current status/ occurrence/ habitats which would provide basic information for conservation measures. Further these numbers are continuously changing, as a result of rapid and prolonged degradation of natural habitats. Updating of current states of each species is very important and demands constant monitoring and documentation focusing on field based accurate taxonomic studies.

The main aim of this study is observing and documenting the orchid species found in both within and outside the protected areas of the country in order to update the available data.

## Materials and Methodology

Information on the members of the family Orchidaceae were extracted by surveying literature (Jayaweera, 1981; MOE, 2012; Senaratna, 2001) and observing herbarium specimens deposited at the National Herbarium, Peradeniya (PDA). Field visits were carried out from November, 2013 to March, 2016 in order to collect and make observations on the recorded members of the family. During this period 16 main sites including protected areas, viz., MAB reserves, FS, NPs, SNRs and FRs were visited in different time frames. The locations of the visited sites are given in Figure 1. Specimens were collected as whole plant or pseudobulbs for species that were in abundance while observation/notes were made for species that were encountered in very low numbers. Collected locations were recorded using GPS (Global Positioning System) data points with latitude, longitude and elevation.

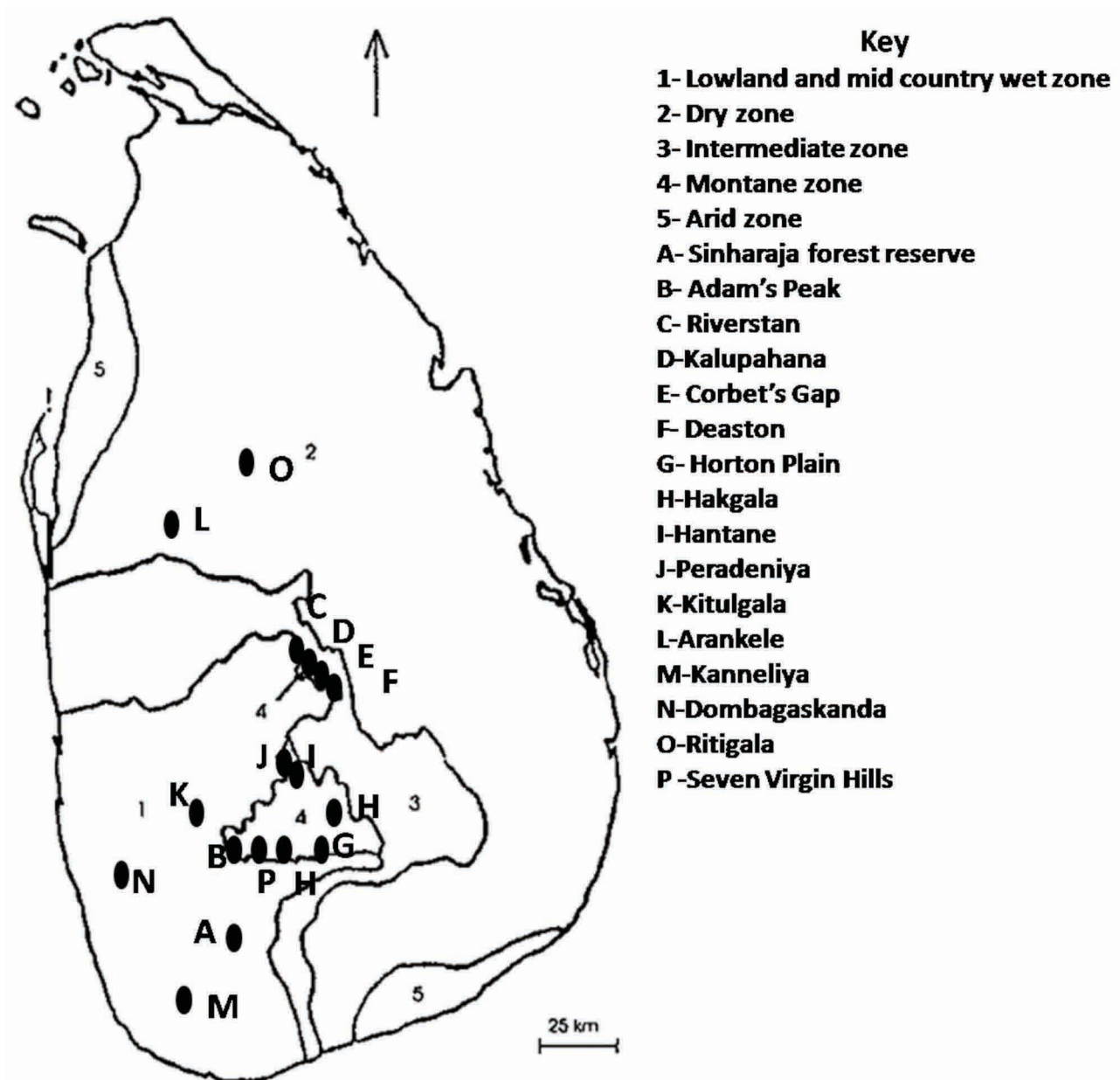


FIGURE 1. The map of Sri Lanka showing the locations of the visited sites during the study period.

## Results

Orchids including endemic, native and adventive species that were collected and observed in the different sites are given in the Table 1. Altogether 49 genera (62.8%) out of 78 genera documented in Sri Lanka were observed during the field visits. These records take account of 78 species (42.4% of the documented Orchid species in the country) including 23 (46% of recorded species) endemic species. Comparative species richness of each site together with endemic species recorded is given in Figure 2. Among the visited sites, Hakgala and Ritigala are SNRs. Deaston and Kanneliya fall under the MAB Reserves and Horton plain is a National Park. Sinharaja and the Central Highlands which include Adam's Peak, Knuckles mountain range (Riverstan, Kalupahana, Corbet's gap and Deanston) and Horton Plains are WHW sites. Hantane, Kithulgala, Dombagaskanda and Seven Virgin Hills are FRs. Among these, records from Deanston and Riverstan were documented for the first time. Deanston has recorded the highest number of species (25.6 %) and genera (36.7%). Highest endemism has been recorded in the Adam's Peak (34.8%) while Deanston (17.4%) records the second highest. Horton plains and Kanneliya have the same species richness but the later has a higher generic level richness and lower level endemism compared to Horton Plain. Even though Sinharaja has

shown a lower level species diversity, it has harbored comparatively large number of endemic species. Ritigala SNR has shown the lowest species and generic level diversity with no endemics.

The observed species are categorized based on the assigned NCS given in the National Red list of 2012 of Sri Lanka. The number of observed species belongs to the each NCS category is given in the figure 3.

Among the observed species, 57.7% of the species were listed under different threatened categories which included 35.9% of VU, 17.9% of EN and 3.8% of CR species. Further 23.1% are recognized as Nearly Threatened, 14.1% of the species that were listed as LC and 2.6% fell under DD category. However two species recorded; *Crepidium purpureum* and *Arundina graminifolia* have not been evaluated during the present red listing.

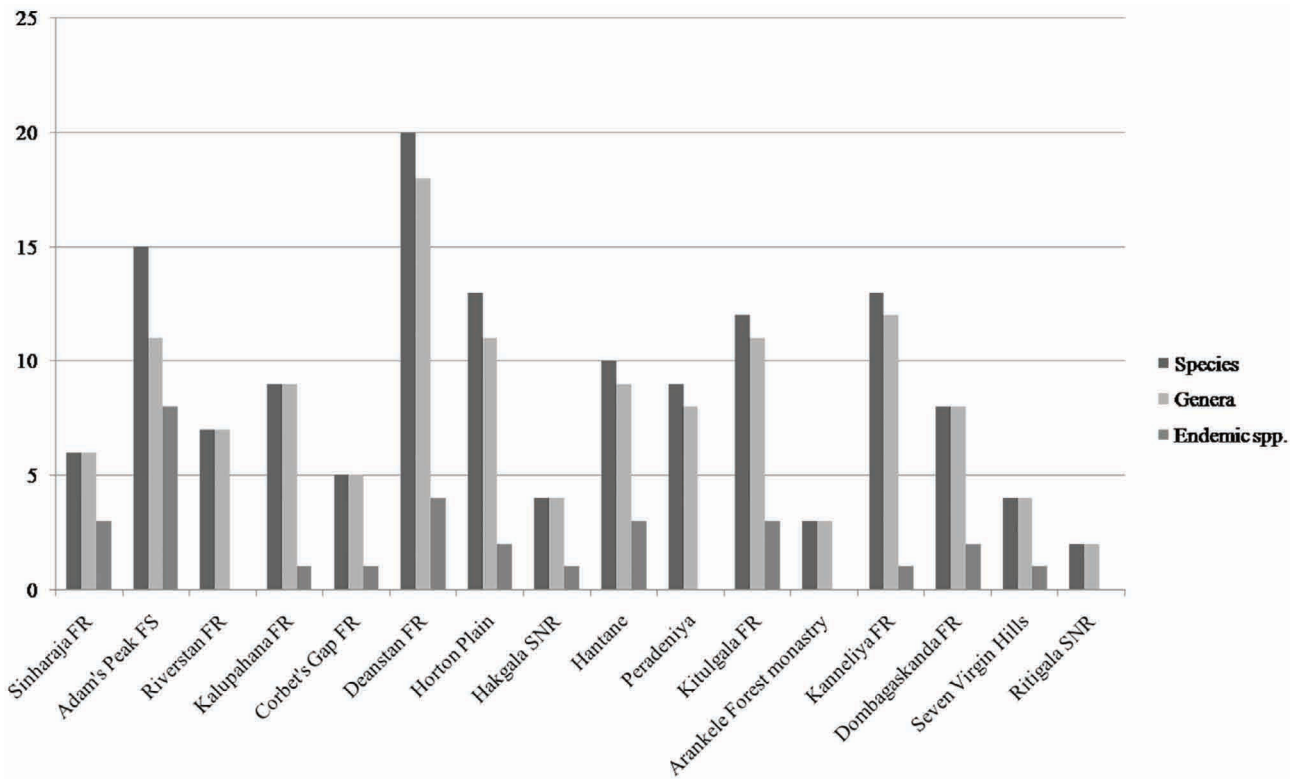


FIGURE 2. Occurrence of orchid species in different sites during the study period.

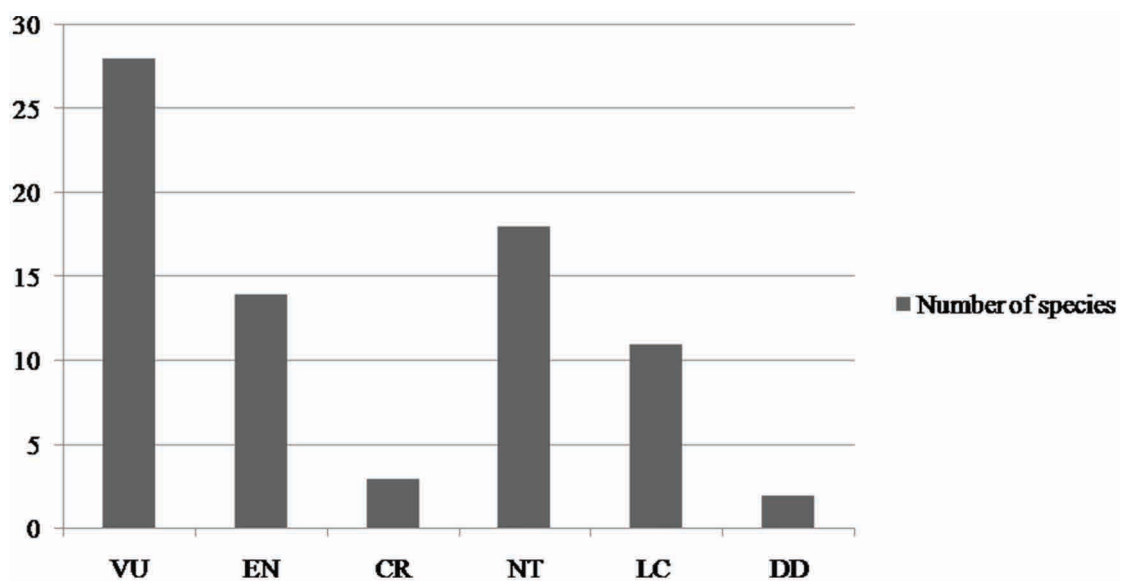


FIGURE 3. Categorization of species based on assigned NCS

**TABLE 1.** Occurrences of different orchid species encountered during the study period. Endemic species are indicated in an ‘\*’.

Genus	Species	Distribution (District; Province)
<i>Acampe</i> Lindley	<i>Acampe rigida</i> (Buch: Ham. ex J.E. Smith) P.F. Hunt	<b>Kithulgala</b> (Kegalle; Sabaragamuwa)
	<i>Acampe ochracea</i> (Lindl.) Hochr.	<b>Kithulgala</b> (Kegalle; Sabaragamuwa)
	<i>Acampe praemorsa</i> (Roxb.) Blatter & McCann	<b>Arankele</b> (Kurunegala; North western), <b>Polonnaruwa</b> (Polonnaruwa; North central), <b>Batticaloa</b> (Batticaloa; Eastern), <b>Polgahawela</b> (Kurunegala; North western), <b>Peradeniya</b> (Kandy; Central), <b>Wariyapola</b> (Kurunegala; North western)
<i>Acanthephippium</i> Blume	<i>Acanthephippium bicolor</i> Lindl. [Figure 4(A)]	<b>Hantane</b> (Kandy; Central)
<i>Adrorhizon</i> Hook. f.	* <i>Adrorhizon purpurascens</i> Hook. f.	<b>Kalupahana</b> (Matale; Central), <b>Deanston</b> (Matale; Central), <b>Adam’s Peak</b> (Ratnapura; Sabaragamuwa), <b>Hantane</b> (Kandy; Central)
<i>Aerangis</i> Rchb. f.	<i>Aerangis hologlottis</i> (Schltr.) Schltr. [Figure 4(B)]	<b>Royal Botanical Gardens</b> , <b>Peradeniya</b> (Kandy; Central),
<i>Agrostophyllum</i> Blume	* <i>Agrostophyllum zeylanicum</i> Hook. f.	<b>Sinharaja</b> (Ratnapura; Sabaragamuwa)
<i>Angraecum</i> Bory	<i>Angraecum zeylanicum</i> Lindl.	<b>Kanneliya</b> (Galle; Southern)
<i>Anoectochilus</i> Blume	* <i>Anoectochilus regalis</i> Blume [Figure 4(C)]	<b>Hantane</b> (Kandy; Central), <b>Deanston</b> (Matale; Central)
<i>Aphyllorchis</i> Blume	<i>Aphyllorchis montana</i> Rchb. f.	<b>Kanneliya</b> (Galle; Southern)
<i>Arundina</i> Blume	<i>Arundina graminifolia</i> (D. Don) Hochr.	<b>Sinharaja</b> (Ratnapura; Sabaragamuwa), <b>Adam’s Peak</b> (Ratnapura; Sabaragamuwa), <b>Hatton</b> (Nuwara Eliya; Central), <b>Horton Plains</b> (Nuwara Eliya; Central) <b>Haputale</b> (Nuwara Eliya; Central)
	* <i>Arundina minor</i> Lindl. [Figure 4(D)]	<b>Adam’s Peak</b> (Ratnapura; Sabaragamuwa)
<i>Bulbophyllum</i> Thouars	<i>Bulbophyllum elegans</i> Gardner ex Thwaites	<b>Adam’s Peak</b> (Ratnapura; Sabaragamuwa)
	* <i>Bulbophyllum thwaitesii</i> Rchb. f.	<b>Sinharaja</b> (Ratnapura; Sabaragamuwa)
	* <i>Bulbophyllum trimenii</i> (Hook. f.) J. J. Sm.	<b>Hakgala</b> (Nuwara Eliya; Central)
	* <i>Bulbophyllum wightii</i> Rchb. f.	<b>Corbet’s gap</b> (Matale; Central) <b>Deanston</b> (Matale; Central)
<i>Calanthe</i> R. Br.	<i>Calanthe sylvatica</i> (Thouars) Lindl.	<b>Kalupahana</b> (Matale; Central), <b>Hakgala</b> (Nuwara Eliya; Central), <b>Corbet’s gap</b> (Matale; Central), <b>Deanston</b> (Matale; Central) <b>Riverstan</b> (Matale; Central)
<i>Cleisostoma</i> Blume	<i>Cleisostoma tenuifolium</i> (L.) Garay	<b>Dombagaskanda</b> (Kalutara; Western), <b>Kithulgala</b> (Kegalle; Sabaragamuwa), <b>Kanneliya</b> (Galle; Southern)
<i>Conchidium</i> Griff	<i>Conchidium braccatum</i> (Lindl.) Ormerod	<b>Horton Plains</b> (Nuwara Eliya; Central)
	<i>Conchidium muscicola</i> (Lindl.) Lindl.	<b>Deanston</b> (Matale; Central), <b>Kalupahana</b> (Matale; Central)
<i>Coelogyne</i> Lindley	<i>Coelogyne odoratissima</i> Lindl.	<b>Horton Plains</b> (Nuwara Eliya; Central)
<i>Cottonia</i> Wight	<i>Cottonia peduncularis</i> (Lindl.) Rchb.f.	<b>Kanneliya</b> (Galle; Southern), <b>Dombagaskanda</b> (Kalutara; Western) <b>Kithulgala</b> (Kegalle; Sabaragamuwa)
<i>Crepidium</i> Blume	<i>Crepidium purpureum</i> (Lindl.) Szla.	<b>Dombagaskanda</b> (Kalutara; Western)
<i>Cymbidium</i> Swartz	<i>Cymbidium bicolor</i> Lindl.	<b>Polgahawela</b> (Kurunegala; North western) , <b>Kithulgala</b> (Kegalle; Sabaragamuwa), <b>Peradeniya</b> (Kandy; Central) <b>Kanneliya</b> (Galle; Southern)
	<i>Cymbidium ensifolium</i> (L.) Sw.	<b>Kanneliya</b> (Galle; Southern)
<i>Dendrobium</i> Swartz	<i>Dendrobium aphyllum</i> (Roxb.) C.E.C. Fisher.	<b>Corbet’s gap</b> (Matale; Central), <b>Peradeniya</b> (Kandy; Central)
	<i>Dendrobium nutantiflorum</i> A. D. Hawkes & A. H. Heller	<b>Deanston</b> (Matale; Central)
	<i>Dendrobium panduratum</i> Lindl.	<b>Kanneliya</b> (Galle; Southern)

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TABLE 1. (continued)

Genus	Species	Distribution (District; Province)
<i>Didymoplexis</i> Griff.	<i>Didymoplexis pallens</i> Griff. [Figure 4(E)]	<b>Royal Botanical Gardens, Peradeniya</b> (Kandy; Central)
<i>Diploprora</i> Hook. f.	<i>Diploprora championi</i> (Lindl.) Hook. f.	<b>Kithulgala</b> (Kegalle; Sabaragamuwa), <b>Sinharaja</b> (Ratnapura; Sabaragamuwa)
<i>Disperis</i> Swartz	<i>Disperis neilgherrensis</i> Wight	<b>Deanston</b> (Matale; Central), <b>Kalupahana</b> (Matale; Central) <b>Riverstan</b> (Matale; Central)
<i>Eria</i> Lindley	<i>Eria bicolor</i> Lindl.  * <i>Eria lindleyi</i> Thw.	<b>Horton Plains</b> (Nuwara Eliya; Central) <b>Riverstan</b> (Matale; Central), <b>Deaston</b> (Matale; Central), <b>Kalupahana</b> (Matale; Central) <b>Hantane</b> (Kandy; Central) <b>Deanston</b> (Matale; Central)
<i>Eulophia</i> R. Br. ex Lindley	<i>Eulophia epidendreaea</i> (J. Koenig ex Retz.) C. E. C. Fischer	<b>Kegalle</b> (Kegalle; Sabaragamuwa)
<i>Gastrochilus</i> D. Don	<i>Gastrochilus acaulis</i> (Lindl.) Kuntze	<b>Ritigala</b> (Anuradhapura; North Central)
<i>Habenaria</i> Willd.	<i>Habenaria acuminata</i> (Thw.) Trimen <i>Habenaria dolichostachya</i> Thw. [Figure 4(F)] <i>Habenaria crinifera</i> Lindl. * <i>Habenaria pterocarpa</i> Thw. [Figure 5(A)]	<b>Adam's Peak</b> (Ratnapura; Sabaragamuwa) <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa) <b>Dombagaskanda</b> (Kalutara; Western) <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa)
<i>Ipea</i> Lindley	* <i>Ipea speciosa</i> Lindl. [Figure 5(B)]	<b>Adam's Peak</b> (Ratnapura; Sabaragamuwa)
<i>Liparis</i> A. Rich.	<i>Liparis barbata</i> Lindl. * <i>Liparis brachyglottis</i> Reichb.f. ex Trimen. [Figure 5(C)] <i>Liparis elliptica</i> Wight [Figure 5(D)]  <i>Liparis viridiflora</i> Lindl. <i>Liparis wightiana</i> Thw.	<b>Riverstan</b> (Matale; Central), <b>Horton Plains</b> (Nuwara Eliya; Central)  <b>Hantane</b> (Kandy; Central), <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa) <b>Seven virgins Hills</b> (Nuwara Eliya; Central) <b>Horton Plains</b> (Nuwara Eliya; Central)
<i>Luisia</i> Gaudich.	<i>Luisia zeylanica</i> Lindl.	<b>Kalupahana</b> (Matale; Central), <b>Horton Plains</b> (Nuwara Eliya; Central), <b>Kithulgala</b> (Kegalle; Sabaragamuwa)
<i>Malaxis</i> Swartz	* <i>Malaxis discolor</i> (Lindl.) Kuntze <i>Malaxis versicolor</i> (Lindl.) Abeyw.	<b>Horton Plains</b> (Nuwara Eliya; Central) <b>Royal Botanical Gardens, Peradeniya</b> (Kandy; Central)
<i>Oberonia</i> Lindley	* <i>Oberonia longibracteata</i> Lindl. <i>Oberonia forcipata</i> Lindl. <i>Oberonia wightiana</i> Lindl. * <i>Oberonia weragamaensis</i> Jayaweera	<b>Hantane</b> (Kandy; Central) <b>Hantane</b> (Kandy; Central) <b>Horton Plains</b> (Nuwara Eliya; Central), <b>Dombagaskanda</b> (Kalutara; Western)
<i>Octarrhena</i> Thwaites	<i>Octarrhena parvula</i> Thw.	<b>Deanston</b> (Matale; Central)
<i>Peristylus</i> Blume	<i>Peristylus spiralis</i> A. Rich.	<b>Horton Plains</b> (Nuwara Eliya; Central)
<i>Phaius</i> Loureiro	<i>Phaius wallichii</i> Lindl.	<b>Deanston</b> (Matale; Central), <b>Hakgala</b> (Nuwara Eliya; Central), <b>Kalupahana</b> (Matale; Central)
<i>Phalaenopsis</i> Blume	<i>Phalaenopsis deliciosa</i> Rchb. f.	<b>Dombagaskanda</b> (Kalutara; Western), <b>Kithulgala</b> (Kegalle; Sabaragamuwa), <b>Sinharaja</b> (Ratnapura; Sabaragamuwa)
<i>Pholidota</i> Lindley ex Hooker	<i>Pholidota imbricata</i> Lindl.	<b>Hantane</b> (Kandy; Central), <b>Riverstan</b> (Matale; Central), <b>Kalupahana</b> (Matale; Central), <b>Seven virgins Hills</b> (Nuwara Eliya; Central), <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa), <b>Kanneliya</b> (Galle; Southern)
<i>Podochilus</i> Blume	<i>Podochilus falcatus</i> Lindl. * <i>Podochilus saxatile</i> Lindl. * <i>Podochilus warnagalensis</i> Wijewardana, Priyadarshana, Arangala, Attanagoda, Samarakoon & Kumara [Figure 5(E)]	<b>Kalupahana</b> (Matale; Central) <b>Kanneliya</b> (Galle; Southern) <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa), <b>Bogawantalawa</b> (Nuwara Eliya; Central)

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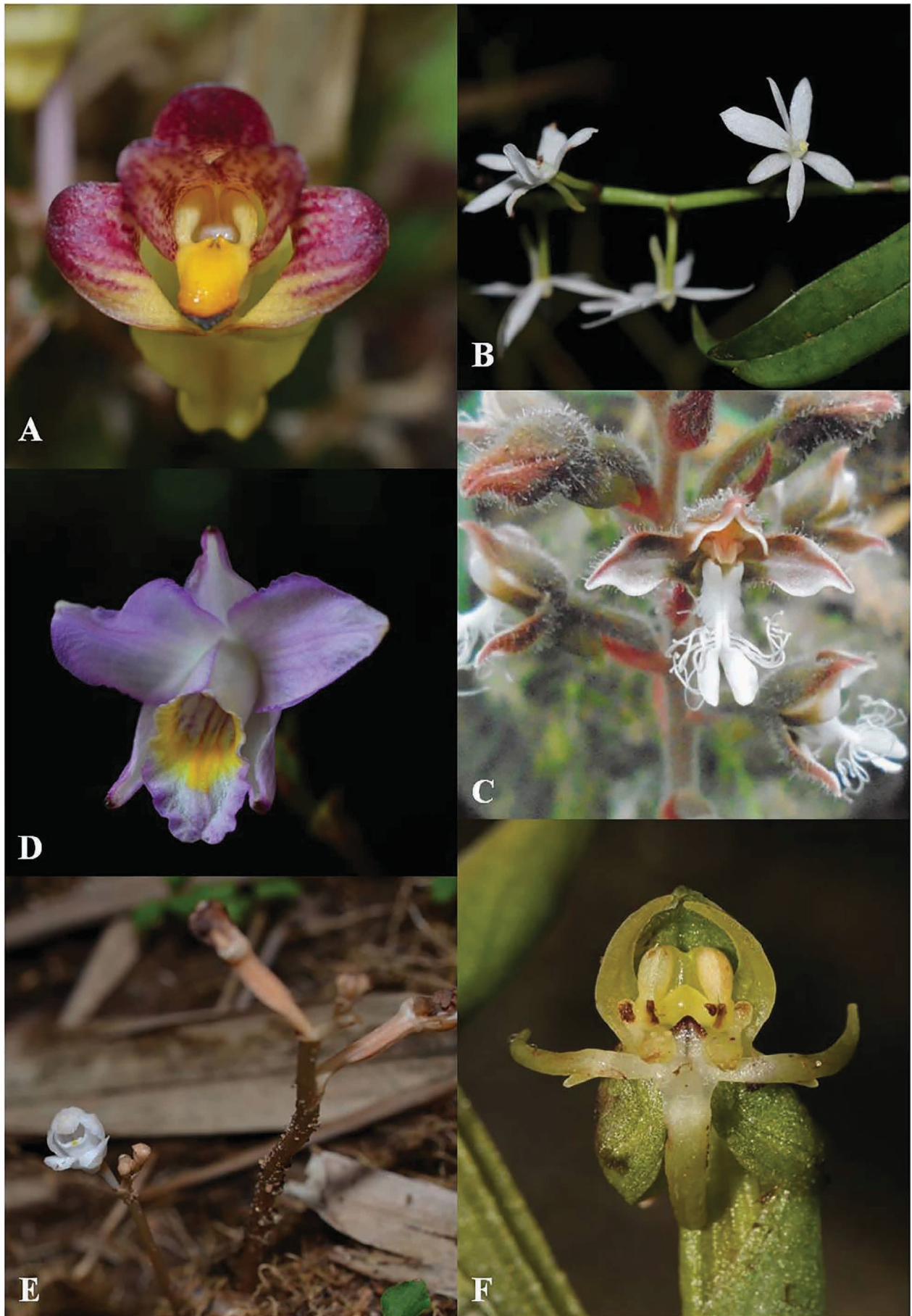
Genus	Species	Distribution (District; Province)
<i>Polystachya</i> Hook.	<i>Polystachya concreta</i> (Jacq.) Garay et Sweet	<b>Peradeniya</b> (Kandy; Central), <b>Hantane</b> (Kandy; Central), <b>Corbets' Gap</b> (Matale; Central), <b>Kanneliya</b> (Galle; Southern), <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa), <b>Hakgala</b> (Nuwara Eliya; Central) <b>Seven virgins Hills</b> (Nuwara Eliya; Central), <b>Riverstan</b> (Matale; Central)
<i>Pomatocalpa</i> Breda	<i>Pomatocalpa maculosum</i> (Lindl.) J. J. Sm.	<b>Kanneliya</b> (Galle; Southern), <b>Kithulgala</b> (Kegalle; Sabaragamuwa), <b>Dombagaskanda</b> (Kalutara; Western)
<i>Robiquetia</i> Gaudich.	* <i>Robiquetia brevifolia</i> (Lindl.) Garay  <i>Robiquetia rosea</i> (Lindl.) Garay  * <i>Robiquetia virescens</i> Ormerod & Fernando	<b>Horton Plains</b> (Nuwara Eliya; Central) <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa) <b>Riverstan</b> (Matale; Central), <b>Deanston</b> (Matale; Central), <b>Corbet's gap</b> (Matale; Central) <b>Adam's Peak</b> (Ratnapura; Sabaragamuwa)
<i>Satyrium</i> Swartz	<i>Satyrium nepalense</i> D. Don	<b>Adam's Peak</b> (Ratnapura; Sabaragamuwa), <b>Horton Plains</b> (Nuwara Eliya; Central)
<i>Sirhookera</i> Kuntze	<i>Sirhookera lanceolata</i> (Wight) Kuntze	<b>Hantane</b> (Kandy; Central), <b>Kanneliya</b> (Galle; Southern), <b>Riverstan</b> (Matale; Central)
<i>Spiranthes</i> Rich.	<i>Spiranthes sinensis</i> (Pers.) Ames	<b>Horton Plains</b> (Nuwara Eliya; Central),
<i>Taeniophyllum</i> Blume	<i>Taeniophyllum alwisii</i> Lindl.	<b>Arankele</b> (Kurunegala; North western), <b>Deanston</b> (Matale; Central)
<i>Tainia</i> Blume	<i>Tainia bicornis</i> Reichb. f.	<b>Deanston</b> (Matale; Central)
<i>Thrixspermum</i> Loureiro	* <i>Thrixspermum pugionifolium</i> (Hook.f.) Schlechter  <i>Thrixspermum pulchellum</i> (Thw.) Schlechter	<b>Kegalle</b> (Kegalle; Sabaragamuwa) <b>Kithulgala</b> (Kegalle; Sabaragamuwa) <b>Kanneliya</b> (Galle; Southern)
<i>Tropidia</i> Lindley	<i>Tropidia bambusifolia</i> (Thw.) Trimen  <i>Tropidia thwaitesii</i> Hook. f.	<b>Kithulgala</b> (Kegalle; Sabaragamuwa) <b>Kanneliya</b> (Galle; Southern)
<i>Vanda</i> Jones ex R. Br.	<i>Vanda tessellata</i> (Roxb.) Lodd.ex G. Don  <i>Vanda testacea</i> (Lindl.) Rchb. f.	<b>Royal Botanical Gardens, Peradeniya</b> (Kandy; Central) <b>Peradeniya</b> (Kandy; Central) <b>Arankele</b> (Kurunegala; North western)
<i>Vanilla</i> Plum. ex Miller	* <i>Vanilla moonii</i> Thw.	<b>Dombagaskanda</b> (Kalutara; Western)
<i>Zeuxine</i> Lindley	* <i>Zeuxine reginasilvae</i> Ormerod [Figure 5(F)]	<b>Kithulgala</b> (Kegalle; Sabaragamuwa), <b>Sinharaja</b> (Ratnapura; Sabaragamuwa), <b>Deanston</b> (Matale; Central)

## Discussion

The present study records 57.7% of the species recorded under the threatened category including 3.8% of CR species (*Didymoplexis pallens*, *Habenaria dolichostachya*, and *Liparis barbata*). *Didymoplexis pallens* was observed in the natural arboretum of the Royal Botanical Gardens, *Habenaria dolichostachya* from the Adam's Peak and *Liparis barbata* from the Riverstan. Since each of these species were observed from isolated sites, conservation of these sites needs priority. The most recorded category during the study was the VU group (36.8%). Further, two species included under DD category have been recorded in this study; *Liparis elliptica* from Hantane and Adam's Peak and *Podochilus warnagalensis* from Adam's Peak and Bogawantalawa.

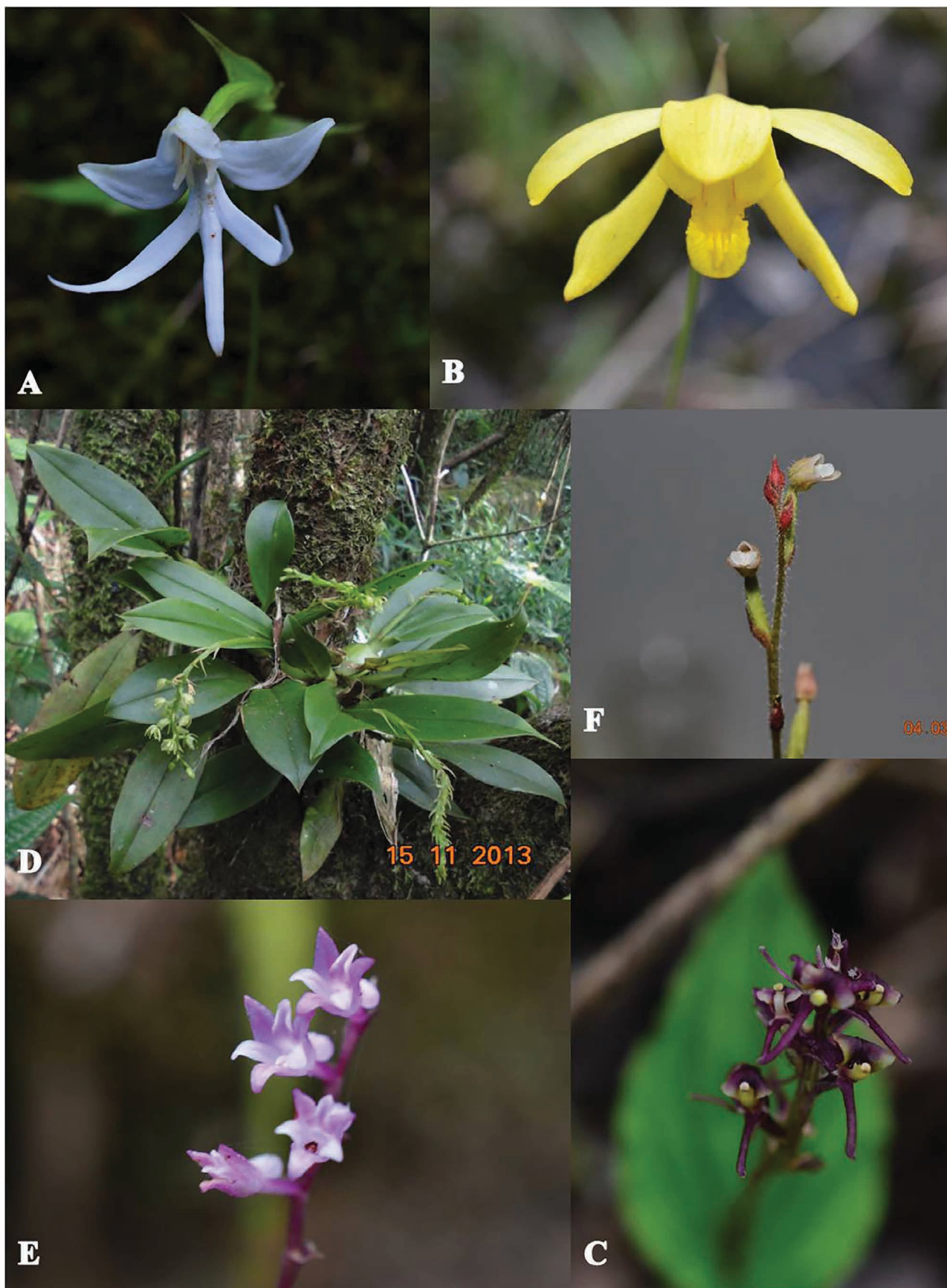
The observations made on occurrence of species, ecology, and habitat during the present study can be used to upgrade the existing Flora of Ceylon and the last version of the National Red List of Sri Lanka.

Observed / collected species are enumerated following: the conservation status cited based on the National Red List 2012 of Sri Lanka (MOE, 2012); Flowering seasons and species distribution are discussed compared to Jayaweera (1981) and Fernando & Ormerod (2008).



**FIGURE 4.** (A). *Acanthephippium bicolor* (B). *Aerangis hologlottis* (C). *Anoectochilus regalis* (D). *Arundina minor* (E). *Didymoplexis pallens* (F). *Habenaria dolichostachya*.





**FIGURE 5.** (A). *Habenaria pterocarpa* (B). *Ipsea speciosa* (C). *Liparis elliptica* (D). *Liparis brachyglottis* (E). *Podochilus warnagalensis* (F). *Zeuxine reginasilvae*.

### ***Acampe* Lindl.**

All the three recorded species were observed during the study. Among these, *A. ochracea* and *A. rigida* are stated as VU species and they also showed restricted distributions while *A. praemorsa* is a species of LC found in many locations (MOE, 2012). Even though the flowering season of *A. praemorsa* is recorded as September and November (Jayaweera, 1981), present observations has recorded flowering during March to July as well.

### ***Acanthephippium* Blume**

The only species found in Sri Lanka is *A. bicolor* Lindl. This species is EN (MOE, 2012). This species was observed in a small isolated patch in Hantane.

### ***Adrorhizon* Hook. f.**

The genus *Adrorhizon* is endemic to Sri Lanka and it consists of only one species *A. purpurascens* which flowers in September to November (Jayaweera, 1981). However during the present study period flowers were observed in July, August and December as well. The species is listed as VU (MOE, 2012), however widely dispersed populations of this species was observed in Deanston, Kalupahana and Hantane.

### ***Aerangis* Rchb. f.**

This genus is represented by single species, *A. hologlottis* which is considered as EN (MOE, 2012) and was not observed in wild in the sites visited during the present study. The species is recorded from Royal Botanical Gardens, Peradeniya, Nalanda and Aluthgama (Jayaweera, 1981). A naturally grown epiphytic population was observed at the Royal Botanical Gardens, Peradeniya.

### ***Agrostophyllum* Blume**

There is only one species found in Sri Lanka, *A. zeylanicum* and it is an endemic, VU species (MOE, 2012).

### ***Angraecum* Bory**

Sri Lanka harbours only one species, *A. zeylanicum* and is listed as a NT species. Even though this species was spotted in many different sites within the Kanneliya MAB reserve, plants were not observed in its periphery or in any other locations.

### ***Anoectochilus* Blume**

The two species occur in Sri Lanka, *A. elatus* and the endemic, *A. regalis*. During the current work only *A. regalis* was observed. This is an EN species (MOE, 2012), and during the present study it was recorded in Hantane and Deanston, in scattered patches on the forest floor. However, this species is undergoing direct exploitation for medicinal purposes which could be the reason for the current conservation status.

### ***Aphyllorchis* Blume**

*Aphyllorchis montana* is the only species found in this genus in Sri Lanka. In 1981, Jayaweera recorded that this species as rare and no live plant was observed. Record was made based on a specimen collected from Ambagamuwa near Rathnapura. A live plant was observed with flowers in Kanneliya, along Kabbale Kanda route in July. This VU species was observed only in Kanneliya FR, but cannot observe this species during the dry season in February.

### ***Arundina* Blume**

There are two species in Sri Lanka (*A. graminifolia* and *A. minor*) belonging to this genus and during the red listing only *A. minor* which is an endemic species has been evaluated as an EN species (MOE, 2012). A population of plants with a flower was observed near a waterfall in Adam's Peak. The commonly found *A. graminifolia* is an escape from cultivation (Jayaweera, 1981) and as a result not categorized under any national conservation status.

### ***Bulbophyllum* Thouars**

There are 12 species in this genus including 9 endemics. During this study, 4 species including 3 endemics were observed and all these species are stated as VU species (MOE, 2012). The flowering season of *B. trimenii* has been recorded to be September but flowers were observed in July during this study.

### **Calanthe R. Brown**

In Sri Lanka, there are 2 species belonging to this genus and only one was observed during this study period. *Calanthe sylvatica* (Syn: *Centrosis sylvatica* Thouars, *Calanthe purpurea* Lindl.), is a VU species (MOE, 2012). This species is one of the most frequently observed species during this study and it was widely dispersed large populations. However it is commonly attracted by the orchid growers and flower enthusiasts due to the showy large flowers thus results in large scale exploitation of this species.

### **Cleisostoma Blume**

There is only one species found in Sri Lanka, *C. tenuifolium* (Syn: *Epidendrum tenuifolium* L., *Sarcanthus peninsularis* Dalzell) and this is a NT species (MOE, 2012).

### **Coelogyne Lindl.**

Of the three species found in Sri Lanka, only the *C. odoratissima* was observed during this study which is considered as a VU species (MOE, 2012).

### **Conchidium Griffith**

There are three species found in Sri Lanka and two were encountered during this study period, *C. braccatum* and *C. muscicola* which are NT and LC species respectively (MOE, 2012).

### **Cottonia Wight**

Sri Lanka harbors only one species belong to this genus and observations were made from Kanneliya and Dombagaskanda where *C. peduncularis* was growing as an epiphyte and as a lithophyte in Kitulgala. This species also has a long rachis containing terminal flowers with characteristic shape of a female bee. This feature is used for attracting bees for pollination. *Cottonia peduncularis* is recorded as a NT species (MOE, 2012).

### **Crepidium Blume**

*Crepidium purpureum* [Syn: *Microstylis purpurea* Lindl., *Malaxis purpurea* (Lindl.) Kuntze] is the only species belong to this genus found in Sri Lanka. The National Red List of 2012, of Sri Lanka has not categorized this species under any conservation status. A finely dispersed population was observed at Dombagaskanda with flowers in end of July to early August.

### **Cymbidium Swart**

There are three species in Sri Lanka belong to genus *Cymbidium*. Two species were recorded, *C. ensifolium* and *C. bicolor* enlisted as VU and LC species respectively (MOE, 2012), where the latter is said to be occurring in low land wet zone (Fernando & Ormerod, 2008). However, observations were also made from Peradeniya (montane zone) and Polgahawela (intermediate zone) extending the area of occurrence and suggesting that this species is capable of adapting to the higher elevation with lower temperature and lower elevation with higher temperatures. A fairly large population of *C. ensifolium* was observed in Kanneliya, growing as a terrestrial plant on forest floor with scented flowers. In 1981, Jayaweera recorded this species as an epiphyte found in the sub-montane or mid-country tropical wet evergreen forests. Observations suggest that this species has wider dispersion reaching the low country wet zone and the habitat adapted to terrestrial growing.

### **Dendrobium Swart**

There are 7 species recorded from Sri Lanka out of which three species were observed during this study and identified as *D. aphyllum* (Syn: *Limodorum aphyllum* Roxb., *Dendrobium macrostachyum* Lindl.) (LC), *D. nutantiflorum* (Syn: *Dendrobium nutans* Lindl.) (NT) and *D. panduratum* (NT). Few specimens were observed in Ratnapura, Adam's Peak, Kandy and Kithulgala suspected to be *D. aphyllum*. However, the identification of these specimens were not confirmed, due to unavailability of flowers.

### **Didymoplexis Griffith**

Of the two species recorded, the study encountered only a population of flowering *D. pallens* (CR) at the arboretum in the Royal Botanical Gardens, Peradeniya in April 2014 (MOE, 2012), though it said to occur in the low land wet zone (Fernando & Ormerod, 2008).

### ***Diploprora* Hook. f.**

*Diploprora championi* (Syn: *Cottonia championii* Lindl.) is the only species of this genus found in Sri Lanka and this is a NT species (MOE, 2012).

### ***Disperis* Swart**

Only one species found in Sri Lanka *D. neilgherensis* (Syn: *Disperis zeylanica* Trimen, *Disperis walkeriae* Rchb. f.) and enlisted as a VU species (MOE, 2012). Jayaweera (1981) mentioned this species as *D. zeylanica* by stating that the Indian species, *D. neilgherensis* is a longer form of *D. zeylanica*. However in 2005, Kurzweil recognized all the Asian taxa in genus *Disperis* as one wide spread species, *Disperis neilgherensis* Wight. Recently observations were made on large populations of this species from Deanston, Kalupahana and Riverstan in the Knuckles range and lack of this species from other already mentioned sites can be due to extinction/drying out of the plant in vegetative phase.

### ***Eria* Lindl.**

There are 4 species described in Sri Lanka including three endemics. During this study, two species were observed *E. bicolor* and the endemic species *E. lindleyi* and the flowering season of the latter is recorded as March, April and September to December (Jayaweera, 1981). During the present study period, flowers were also observed in July. Both encountered species are stated as NT (MOE, 2012).

### ***Eulophia* R. Bown ex Lindl.**

There are 5 species reported in Sri Lanka and only one species was observed, *E. epidendreaea* [Syn: *Serapias epidendreaea* J. König in Retz., *Limodorum virens* Roxb., *Eulophia virens* (Roxb.)R. Br. ex Lindl.]. In 1981 Jayaweera stated that this species is observed as lithophytes and saprophytes on rocks in the intermediate and dry zone. However during the present study observations of this species were made from Kegalle in wet zone. This is a LC species (MOE, 2012).

### ***Gastrochilus* D. Don**

*Gastrochilus acaulis* [Syn: *Cleisostoma acaule* Lindl., *Saccolabium acaule* (Lindl.)Hook. f.,] is a NT species and is the only species stated under this genus in Sri Lanka (MOE, 2012). Jayaweera (1981) stated that this species is observed in sub-montane or mid-country tropical wet evergreen forests. However in 2008, Fernando & Ormerod have recorded this species in the lowland wet zone. During the present study observations of this species were made from Ritigala SNR, dry zone with recently developed fruit capsules in February.

### ***Habenaria* Willdenow**

There are 11 species found in Sri Lanka including 4 endemic species. During this study, 4 species were observed including two endemics. Three species were observed with flowers from Adam's Peak in Kuruvita- Erathna route; *H. acuminata* (Syn: *Ate acuminata* Thwaites) (VU), *H. dolichostachya* (CR) and *H. pterocarpa* (EN) and the latter two species are endemic (MOE, 2012). *H. crinifera* (VU) was observed in Dombagaskanda with flowers in August. However Jayaweera (1981) has stated that this species bear flowers in February, September and November.

### ***Ipea* Lindl.**

*Ipea speciosa* is an endemic EN species (MOE, 2102). It is hard to distinguish this species among grasses when there are no flowers and it does not bear leaves during the flowering season.

### ***Liparis* Richard**

There are 11 species found in Sri Lanka including 2 endemics. Throughout this study, 5 species including one endemic were observed. *L. barbata* (Syn: *Liparis wrayi* Hook. f.) is a CR species and observed with flowers in November and December (MOE, 2012). However the flowering season of this species has been recorded as July to August (Jayaweera, 1981). *Liparis brachyglottis* is an endemic EN species which was observed with flowers in October (MOE, 2012). The recorded flowering season is in September and January (Jayaweera, 1981). *Liparis elliptica* earlier recorded as a form of *L. viridiflora* by Jayaweera in 1981 but Fernando & Ormerod (2008) have established it as a separate species. This species is mentioned as a DD species (MOE, 2012). However during this study, this species was observed in large populations in Hantane and Adams' Peak. This data can be used to assess and establish the conservation status for this species. *Liparis viridiflora* (Syn: *Malaxis viridiflora* Blume, *Liparis longipes* Lindl.), observed in Seven Virgin hills and *L. wightiana* (Syn: *Liparis trimenii* Ridley) observed from Horton Plains are fallen under the NT and VU categories respectively (MOE, 2012).

### **Luisia Gaudichaud-Beaupré**

There are two species belonging to this genus and *L. zeylanica* (Syn: *Luisia tristis* Hook. f., *L. teretifolia* auct. non Gaudich) is a LC species (MOE, 2012).

### **Malaxis Swart**

This genus consists of 4 species including one endemic distributed in Sri Lanka. During the study period, three species were observed including an endemic species; *M. discolor* [Syn: *Microstylis discolor* Lindl., *Seidenfia discolor* (Lindl.) Szlach.] Fernando & Ormerod (2008) stated that this species is found in lowland wet zone, but the observations were made in Horton Plains. The details of herbarium specimens also suggest that this species has a wide range of distribution from lowland through sub montane to montane region. *Malaxis thwaitesii* [Syn: *Microstylis lancifolia* Thwaites, *Malaxis lancifolia* (Thw.) Kuntze, *Seidenfia lancifolia* (Thwaites) Szlach.] is a water associated orchid which was observed from Kithulgala and it is attached to the rocks in one of the streams in the forest. *Malaxis versicolor* [Syn: *Microstylis versicolor* Lindl., *Seidenfia versicolor* (Lindl.) Marg. & Szlach., *Microstylis rheedii* (Sw.) Lindl.] was observed with flowers in April. However, Jayaweera (1981) recorded the flowering season of this species as May to July. The first two species are VU and the later one is a LC species (MOE, 2012).

### **Oberonia Lindley**

There are 15 species recorded and 9 of them endemic to Sri Lanka. Only 4 species were identified and that includes 3 endemics. *Oberonia longibracteata* (VU) is an endemic species which was observed with the ability of vegetative propagation by means of producing propagules from leaves in Hantane (MOE, 2012). *Oberonia forcipata* (VU), *O. wightiana* (NT) and *O. weragamaensis* (EN) were also observed during the study period (MOE, 2012). Two species except *O. wightiana* are endemic to Sri Lanka.

### **Octarrhena Thwaites**

*Octarrhena parvula*, is the only species belonging to this genus found in Sri Lanka which is a VU species (MOE, 2012). This species shows a close morphological relationship to species of genus *Oberonia*.

### **Peristylus Blume**

There are 8 species recorded from Sri Lanka including two endemics. Among these one of the most common species observed was, *P. spiralis* (Syn: *Habenaria torta* Hook. f.) and this is a VU species (MOE, 2012). In 1981, Jayaweera has recorded that this species is discovered above 1220 m elevation in open slopes of the montane temperate forests although Fernando & Ormerod (2008), stated that this species is dispersed in submontane zone. Contrary to Fernando & Ormerod (2008), observations were made in Horton Plains at elevation of 2110 m in the montane zone.

### **Phaius Loureiro**

There are two species found in Sri Lanka and only *P. wallichii* [Syn: *Phaius tankervilleae* non (Banks ex L'Hérit.) Blume] was detected during this study period. This species was observed from different locations with different color variations of the flower labellum and it is enlisted as an EN species (MOE, 2012).

### **Phalaenopsis Blume**

There are two species found in Sri Lanka and *P. deliciosa* [Syn: *Kingidium deliciosum* (Rchb. f.) Sweet, *Phalaenopsis deliciosa* Rchb. f., *Phalaenopsis wightii* Rchb. f., *Doritis wightii* (Rchb. f.) Benth. ex Hook. f., *Aerides latifolium* Thwaites] was observed during this study which is a VU species (MOE, 2012).

### **Pholidota Lindley ex Hooker**

*Pholidota imbricata* (Syn: *Pholidota pallida* non Lindl.) is the only species found in this genus in Sri Lanka. This species is one of the most common species that observed and it is a LC species (MOE, 2012).

### **Podochilus Blume**

There are four species recorded from Sri Lanka including two endemic species with recently discovered *P. warnagalensis*. Three species were observed including the two endemics; *P. warnagalensis* (DD) and *P. saxatile* (NT) and *P. falcatus* (VU) (MOE, 2012). The second location, Champion Estate Bogawanthalawa recorded for *P. warnagalensis* is a new record for the species.

### ***Polystachya* Hooker**

Asian region including Sri Lanka contains only one species of this genus, *P. concreta* (Syn: *Epidendrum concretum* Jacq.) (Russell, *et al.*, 2010). This is a LC species and one of the most commonly observed species during the whole study period (MOE, 2012). The observed flowering season is October to May, slight deviation from the recorded data March, April and July to October by Jayaweera in 1981.

### ***Pomatocalpa* Breda**

There are two species found in Sri Lanka. *P. maculosum* (Syn: *Cleisostoma maculosum* Lindl., *Cleisostoma decipiens* Lindl.) was observed as NT species (MOE, 2012).

### ***Robiquetia* Gaudichaud-Beaupré**

There are 4 species recorded from Sri Lanka and two of them are endemics. Out of these, three species were observed including the two endemic species. *Robiquetia brevifolia* (Syn: *Saccolabium brevifolium* Lindl.) is a VU species and one of the two endemic species which was observed with flowers in February, October and December (MOE, 2012). Jayaweera (1981) recorded that the flowering season of this species as February to April and September. *Robiquetia rosea* (Syn: *Saccolabium roseum* Lindl.) (VU) is another observed species which flowers in March, April and December (MOE, 2012). According to Jayaweera (1981), March, April and September are the flowering times of the species. *Robiquetia virescens*, is an endemic, NT species (MOE, 2012).

### ***Satyrium* Swart**

*Satyrium nepalense* is the only species recorded from Sri Lanka and this was observed in the misty slopes of Adam's Peak and dry patana grasslands in Horton Plains. This has been stated as a NT species (MOE, 2012).

### ***Sirhookera* Kuntze**

*Sirhookera lanceolata* (Syn: *Josephia lanceolata* Wight) is a commonly observed, NT species (MOE, 2012). A slight deviation in the flowering season was noted as flowering observations were made in November and December but the literature records as May to September (Jayaweera, 1981).

### ***Spiranthes* Richard**

*Spiranthes sinensis* (Syn: *Neottia sinensis* Pers.) is the only discovered species of this genus in Sri Lanka and it is a NT species (MOE, 2012).

### ***Taeniophyllum* Blume**

There are two species in this genus including one endemic species. Observations were made only on *T. alwisii* (VU) from Arankele forest monastery in the intermediate zone (MOE, 2012). Early records show the distribution of the species in sub-montane and montane zones (Jayaweera, 1981; Fernando & Ormerod, 2008). Therefore the present observation will be a new site record for this species.

### ***Tainia* Blume**

Sri Lanka harbors only one species, *T. bicornis* (Syn: *Ania bicornis* Lindl.) and this is categorized as an EN species (MOE, 2012).

### ***Thrixspermum* Loureiro**

There are three species recorded in Sri Lanka including one endemic species. *Thrixspermum pulchellum* [Syn: *Dendrocolla pulchella* Thwaites, *Sarcochilus pulchellus* (Thwaites) Trimen] (VU) and the endemic species *T. pugionifolium* (Syn: *Sarcochilus pugionifolius* Hook. f.) (LC) were observed during this study (MOE, 2012). *Thrixspermum pugionifolium* was observed in Kegalle and Kithulgala (wet zone). In 1981, Jayaweera has recorded the distribution of this species in the tropical dry mixed evergreen forests in the dry zone and Fernando & Ormerod (2008) recorded as intermediate and dry zone.

### ***Tropidia* Lindley**

The two species found in Sri Lanka including the endemic species *T. bambusifolia* (Syn: *Cnemidia bambusifolia* Thwaites) and *T. thwaitesii* were observed during the present study. These two species are enlisted as EN species (MOE, 2012).

### ***Vanda* Jones ex R. Brown**

Sri Lanka harbors four species belong to the genus *Vanda* and two species, *V. tessellata* (Syn: *Epidendrum tessellatum* Roxb., *Vanda roxburghii* R. Br.) (VU) and *V. testacea* (Syn: *Aerides testacea* Lindl., *Vanda parviflora* Lindl.) (LC) were observed during the study period (MOE, 2012).

### ***Vanilla* Plumier ex Miller**

There are three species in this genus including one endemic species. *Vanilla moonii* is the observed endemic and it is stated as an EN species (MOE, 2012).

### ***Zeuxine* Lindley**

There are five species belong to this genus including two endemics. *Zeuxine reginasilvae* [Syn: *Zeuxine regia* non (Lindl.) Trimen] is the only observed endemic and it is an EN species (MOE, 2012). According to Jayaweera (1981), this species was observed in submontane or mid-country tropical wet evergreen forests, Fernando & Ormerod (2008) have recorded it in lowland wet zone. During the present study period, this species was observed from the sites in lowland wet zone and the sub montane zone. Our observation conflicts the available data.

Orchids have a sensitive and complex biological relationship with the surrounding habitat, such as mycorrhizal association for the germination and specific pollinators. According to the observations made during the field studies, almost all the visited sites are under human influence presently. Adam's Peak is a site with highest species richness but some of the observed species survives in very small populations. *Habenaria dolichostachya*, *H. pterocarpa* and *Arundina minor* are few of the species observed in the Adam's Peak in small populations and all these species were found close to foot paths and were getting disturbed due to man made constructions. Most of the forest reserves are undergoing certain level of human disturbance and wild plants are removed from the natural habitats for different reasons like medicinal use and collected by flower enthusiasts and growers. Disturbances by different wild animals such as elephants in Adam's Peak, wild boars in Hantane, Kalupahana, Kanneliya and Riverstan and as well as humans are responsible for the destruction of natural habitats. However the species existing outside of the protected areas are more vulnerable compared to the species surviving in the conserved regions. Access to the protected areas and removal of either fauna or flora are prohibited by law inside the protected areas. However due to lack of knowledge regarding these laws, illegal exploitation of protected species inside and outside of protected areas are still going on in a higher rate.

According to Jayaweera (1981) and Jayasuriya (1984), there were 29 species of orchids recorded from the Ritigala SNR. However, only three species were encountered during this investigation of which only two species were identified. The third species belongs to the genus *Eulophia* but could not be identified to the species level due to insufficient morphological characters. *Gastrochilus acaulis* is a new record for Ritigala SNR. During this study 13 species were recorded from Horton Plains NP. In 1981, Jayaweera recorded 11 species and Ranawana and Jayarathne (2016) mentioned seven species including three additional species from Horton Plains NP. This study has recorded 19 species in 17 genera including 5 endemics from the Knuckles region including Riverston, Deanston, Corbet's Gap and Kalupahana. Orchids occurring in the Riverston and Deanston have not been documented upto now. Seventeen species from Rangala- Corbet gap, and three species from Kalupahana forest have been recorded (Jayaweera, 1981). In 2003, Bambaradeniya and Ekanayake have documented seven species from the Knuckles region and in the present study we too recorded the occurrence of same species excluding *Vanda tessallata*. In 1981, Jayaweera recorded 8 species from Sinharaja Forest but we have recorded only 6 species. However, *Arundina graminifolia*, *Bulbophyllum thwaitesii*, *Diploprora championi*, *Phalaenopsis deliciosa*, and *Zeuxine reginasilvae* are new records for Sinharaja FR during the present study. There were 21 species recorded from Adam's Peak FS (Jayaweera, 1981), but the present study records only 16 species of which *Bulbophyllum elegans*, *Habenaria acuminata*, *Habenaria dolichostachya*, *Habenaria pterocarpa*, *Liparis elliptica* are new records. In 1981, even though Jayaweera recorded 20 species from Hakgala SNR, during the present study only 4 species were encountered and among them *Phaius wallichii* Lindl. is a new record. From Kanneliya Forest Reserve, only one species was recorded by Jayaweera in 1981, but this study records 13 species in 12 genera including 1 endemic species which is a very good record. However, Jayaweera (1981) mentioned 24 species from Hantane FR but the present study records only 10 species.

Different reasons could be attributed for not recording all the previously cited orchids in the visited sites; extracting plants in large scale for various reasons or natural disasters, some orchids are not visible unless they are in bloom (eg.; *I. speciosa*, and *D. pallens*), disappearance of vegetative parts above the soil surface during the dormancy period in the dry season (eg.; *A. regalis*, *Habenaria* species, *D. neilgherrensis*) and deviations among recorded and visited sites and trails. The actual number of orchids observed during the present study would have been increased if all the plants could have been identified down to the species level.

One of the drawbacks in conserving natural resources is the lack of the knowledge on what we actually have. In the present study also only 42.4% of the documented orchid species in Sri Lanka were recorded. Therefore continuous taxonomic surveys are required to monitor the conservation status, knowledge on each species and discovering new species with *in-situ* and *ex-situ* conservation measures.

## Conclusion

Occurrence of 78 wild orchid species including 23 endemics in 49 genera, dispersed in 14 different protected areas with few outside locations were recorded. Habitat information including natural threats and manmade threats were noted. Undocumented regions were explored and documented, as well as new records from explored regions were documented. Gathered data will be useful in revising the existing Flora of Ceylon and national and global level red listing.

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