

2. TAXONOMIC OVERVIEW OF THE PLANTS OF SINGAPORE

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The *Flora of Singapore* is to be published in 14 volumes with the taxonomic accounts systematically arranged in volumes 2–14 and the introductory chapters in volume 1. Each family is pre-assigned to a volume of which volumes 7 and 13 were published in 2019 (Middleton et al., 2019b, 2019c) and volume 4 in 2026 (Middleton et al., 2026). The first edition of volume 1 was also published in 2019 (Middleton et al., 2019a). The remaining volumes will be published when all the content intended for each volume is ready. The taxonomic hierarchy used, the assignment of families to orders, and the order of presentation of families follows Li et al. (2024) for bryophytes, PPG II (in press) for lycophytes and ferns, Christenhusz et al. (2011) for gymnosperms, and APG IV (2016) for angiosperms, each modified with updates from more recent studies when appropriate.

Traditionally, mosses, liverworts and hornworts were regarded as classes within a single plant division, Bryophyta sensu lato, i.e., Bryopsida/Musci, Marchantiopsida/Hepaticae and Anthocerotopsida/Anthocerotae, respectively. Although the monophyly of each group is now well established, their interrelationships have long been a subject of debate and controversy among plant systematists (see review in Donoghue et al., 2021). Recent advances in DNA sequencing technology have resulted in the availability of large datasets for phylogenomics and phylotranscriptomics. These have given increasing support for the bryophytes being monophyletic and the mosses and liverworts forming a Setaphyta clade that is sister to the hornworts (Bell et al., 2019; Harris et al., 2020; Donoghue et al., 2021). As generally accepted today, the bryophytes for the *Flora of Singapore* will be treated as three separate divisions, namely Bryophyta sensu stricto (mosses), Marchantiophyta (liverworts) and Anthocerotophyta (hornworts).

The classifications within each of the three bryophyte divisions have undergone constant modification and adjustment, particularly in light of molecular phylogenetic systematics (Crandall-Stotler et al., 2009a, 2009b; Goffinet et al., 2009; Renzaglia et al., 2009; Vilnet et al., 2009; Bechteler et al., 2023; Li et al., 2024). Of particular relevance for the *Flora of Singapore* is that the classification of the liverwort orders Jungermanniales and Porellales as presented in the first edition of volume 1 has been substantially changed (Bechteler et al., 2023). The arrangement of the bryophyte taxa in the *Flora of Singapore* will now follow the framework proposed by the Bryophyte Phylogeny Group (Li et al., 2024), with minor modifications. For instance, the Sematophyllaceae will be accepted in the broad sense including Pylaisiadelphaceae because the latter has been shown to be paraphyletic (Carvalho-Silva et al., 2017; Han & Jia, 2020). The Bryophyte Phylogeny Group system replaces the Frey & Stech

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(2009) system which was discussed in the first edition of volume 1. Worldwide, there are 45 orders of mosses and 142 families, of which 13 orders and 26 families are in Singapore; 23 orders of liverworts and 85 families, of which 9 orders and 17 families are in Singapore; and 5 orders of hornworts and 5 families, of which 2 orders and 2 families are in Singapore.

With approximately 13,000 species in the world, mosses are the largest group of bryophytes and second only to the angiosperms amongst the embryophytes (Goffinet et al., 2009). A worldwide checklist of 12,800 species of mosses was compiled by Crosby et al. (1999). Von Konrat et al. (2010) estimated that there were about 7500 species of liverworts whereas Söderström et al. (2016) compiled a list of 7486 species of both liverworts and hornworts, the hornworts numbering about 225 species (Xu et al., 2025). Pending a full revision of the species in all three divisions of bryophytes in Singapore, the current estimates of the numbers of species and taxa are in Chapter 1, Table 1. They will be treated in volume 2 of the *Flora*.

The ferns and lycophytes have traditionally been treated together under the general term of pteridophytes, or have been referred to as the ‘ferns and fern allies’. These terms have fallen out of favour as the ferns and lycophytes do not form a monophyletic group (Smith et al., 2006). Instead, it is now widely understood that the ferns are sister to the gymnosperms + angiosperms and that all three groups together are sister to the lycophytes. The Psilotaceae and Equisetaceae, previously recognised as evolutionary lineages distinct from the lycophytes and ferns, are now included within the eusporangiate ferns. Beyond this generally agreed framework, however, there has been considerable debate about the delimitation of orders, families and genera within the pteridophytes, particularly within the ferns, often despite a degree of consensus on the major phylogenetic lineages.

In Southeast Asia, the classification of ferns has generally followed systems proposed by Copeland (1947), Holttum (1947) and Pichi Sermolli (1977) although different authors have often had widely differing generic delimitations. Compare, for example, the generic concepts within the Thelypteridaceae by Holttum (1982) and Tagawa & Iwatsuki (1988) where Holttum recognises 22 genera and Tagawa & Iwatsuki recognise only two genera. PPG II (in press) leans more towards Holttum’s system.

In recent years there have been a number of new systems for the orders and families of ferns, particularly to incorporate the findings of molecular phylogenetic data. Smith et al. (2006) was the first major new classification system in this era which aimed to reflect the phylogeny of the ferns whilst maintaining as much stability in the names being used as possible. The classification system proposed by Christenhusz & Chase (2014), based on more or less the same overall phylogeny available to Smith et al. (2006), was a radical departure from existing classification systems for ferns and was consequently largely dismissed. The next major classification was by the Pteridophyte Phylogeny Group (PPG I, 2016) which began a process that has now led to PPG II (in press) which will be the system that is adopted in the *Flora of Singapore*. PPG I (2016) was criticised by Christenhusz & Chase (2018) for the large number of genera recognised in some fern families and in the Lycopodiaceae. The converse, however, is true for Davalliaceae and Dryopteridaceae where fewer genera are recognised in PPG I (2016) and PPG II (in press) compared to older treatments. Despite such differences, PPG I (2016) and PPG II (in press) have provided a standard and relatively stable framework for projects such as the *Flora of Singapore* where the focus is not on examining higher level relationships. There are no changes in family delimitation with regards to the lycophytes and ferns in Singapore between PPG I (2016) and PPG II (in press) but the family Dipteridaceae have been moved from the order Gleicheniales into the new order Matoniales. Although PPG

II (in press) does not present a linear sequence as formally as APG IV (2016) does for the angiosperms, the *Flora of Singapore* will nevertheless adopt the PPG system as the linear sequence for presentation of the families. In both PPG I (2016) and PPG II (in press), the ferns and lycophytes are formally referred to the classes Polypodiopsida and Lycopodiopsida respectively.

Of the three orders and three families of lycophytes listed in PPG I (2016) and PPG II (in press), two orders and two families are in Singapore. Of the 12 orders and 50 families of ferns recognised in PPG II (in press), ten orders and 23 families are in Singapore, one of which is only represented by naturalised or casual species. Pending a full revision of the species of lycophytes and ferns in Singapore, the current estimates of the numbers of species and taxa are in Chapter 1, Table 1. They will be treated in volume 3 of the *Flora*.

In contrast to the pteridophytes, higher level classification of the gymnosperms is fairly uncontroversial. The system proposed by Christenhusz et al. (2011), which is largely unchanged from earlier traditional classification systems, was followed in Middleton et al. (2026). There are only eight species of gymnosperms in three families in Singapore.

More than 80% of the plant species in Singapore are angiosperms. As noted for the bryophytes and pteridophytes above, angiosperm classification has been revolutionised through the incorporation of molecular phylogenetic data which has led to a series of papers by the Angiosperm Phylogeny Group progressively clarifying order and family delimitation (APG, 1998; APG II, 2003; APG III, 2009; APG IV, 2016). The Angiosperm Phylogeny Group are currently developing APG V. In these systems, the previous principal split into the monocots and dicots is dispensed with in favour of recognising a series of clades, culminating with the major orders and then families. In the form the phylogenetic tree is usually presented, the so-called basal dicots form a grade which is sister to the monocots plus the rest of the dicots. These non-basal dicots are referred to as the Eudicots. The bulk of the Eudicots are split between the Rosids and the Asterids, although there are many orders that do not belong to either major group. Altogether, APG IV (2016) recognises 64 orders and 416 families although there have been some updates on family delimitation in some orders since. In Singapore, 49 orders and 197 families are present, including 24 families known only from naturalised and casual species. There are a small number of changes from the family delimitation as presented in the first edition of volume 1 and these are discussed below. APG IV (2016) also presents all families in a linear sequence which will be the sequence in which they will be presented in the *Flora of Singapore* with some small updates for families that have come to be recognised since the publication of APG IV (2016). Pending a full revision of the species of angiosperms in Singapore, the current estimates of the numbers of species and taxa are in Chapter 1, Table 1.

Due to the markedly different sizes of the major clades, orders and families for angiosperms, and the practicalities of assigning families to volumes to maintain a similar size for each volume, the volume contents cut across the major clades, particularly the Rosids and Asterids. The volumes will not, however, split up any orders (in bold below). Those families known in Singapore only from naturalised or casual species are marked with an asterisk*. Families without any known native species but in which any species are treated as cryptogenic (see Chapter 1 for definition) are not marked with an asterisk. It is possible that further collecting and research may uncover additional families not included here. It is also possible that further research on the families listed here as only known from naturalised or casual species will result in their exclusion from the *Flora of Singapore* if no evidence is found that they are casual or naturalising despite claims in previous literature that they were. There are a

number of families where it is not yet certain if any of the species are native and it is hoped that the research undertaken for the *Flora of Singapore* will clarify these questions. It is, however, quite possible that the native status of some species and, consequently, some families will remain forever uncertain. These are not marked with an asterisk below.

The content of each volume will be thus:

Volume 2

This volume will include all families of mosses, liverworts and hornworts. There have been a considerable number of changes due to order and family realignments, particularly in the liverwort orders Jungermanniales and Porellales, the latter no longer present in Singapore and the families that were included within it in the first edition of volume 1 now being recognised in three different orders. Since the first edition was published (Middleton et al., 2019a), and because taxonomic revision of the bryophytes has continued for publication in volume 2, it has become clear that the records of several species for Singapore were based on misidentifications that, in some cases, were the only records of families and/or genera for Singapore. In addition to the changes resulting from the implementation of the Bryophyte Phylogeny Group system (Li et al., 2024), there has also been some readjustment of the families listed for Singapore resulting from the new identifications. Some of these changes were already implemented in Lindsay et al. (2022). The volume will include:

BRYOPHYTA (MOSES)

Polytrichales

Polytrichaceae

Diphysciales

Diphysciaceae

Archidiales

Leucobryaceae

Dicranales

Calymperaceae, Dicranaceae, Dicranellaceae, Fissidentaceae

Pottiales

Pottiaceae

Bartramiales

Bartramiaceae

Bryales

Bryaceae, Mniaceae

Rhizogoniales

Rhizogoniaceae

Orthotrichales

Orthotrichaceae

Hypnodendrales

Racopilaceae, Spiridentaceae

Hypopterygiales

Hypopterygiaceae

Hookeriales

Callicostaceae, Daltoniaceae

Hypnales

Hypnaceae, Meteoriaceae, Neckeraceae, Plagiotheciaceae, Sematophyllaceae,
Symphyodontaceae, Taxiphyllaceae, Thuidiaceae

MARCHANTIOPHYTA (LIVERWORTS)

Marchantiales

Cyathodiaceae, Marchantiaceae, Ricciaceae

Pallaviciniales

Pallaviciniaceae

Metzgeriales

Aneuraceae

Radulales

Radulaceae

Frullaniales

Frullaniaceae

Lejeuneales

Lejeuneaceae

Lophoziales

Adelanthaceae, Cephaloziellaceae

Lepidoziales

Lepidoziaceae, Lophocoleaceae, Plagiochilaceae, Trichocoleaceae

Jungermanniales

Calypogeiaceae, Jackiellaceae, Solenostomataceae

ANTHOCEROTOPHYTA (HORNWORTS)

Notothyladales

Notothyladaceae

Anthocerotales

Anthocerotaceae

Volume 3

This volume will include all families of lycophytes and ferns. The only major change from the first edition of volume 1 is that Dipteridaceae are now recognised in the order Matoniales rather than Gleicheniales. They are presented here in the sequence they will appear in the volume following PPG II (in press).

LYCOPODIOPSIDA (LYCOPHYTES)

Lycopodiales

Lycopodiaceae

Selaginellales

Selaginellaceae

POLYPODIOPSIDA (FERNS)

Psilotales

Psilotaceae

Ophioglossales

Ophioglossaceae

Marattiales

Marattiaceae

Hymenophyllales

Hymenophyllaceae

Gleicheniales

Gleicheniaceae

Matoniales

Dipteridaceae

Schizaceales

Lygodiaceae, Schizaeaceae

Salviniales

Salviniaceae*

Cyatheales

Cyatheaceae

Polypodiales

Lindsaeaceae, Pteridaceae, Dennstaedtiaceae, Aspleniaceae, Thelypteridaceae, Athyriaceae, Blechnaceae, Dryopteridaceae, Lomariopsidaceae, Nephrolepidaceae, Tectariaceae, Davalliaceae, Polypodiaceae

Volume 4

This volume has been published (Middleton et al., 2026) and includes the gymnosperms and the basal angiosperms. The basal angiosperms in Singapore include a particularly large number of trees found in the forest understorey in families such as Annonaceae and Lauraceae. There are many economically and locally important medicinal and culinary species in Lauraceae, Myristicaceae, Piperaceae and Schisandraceae. Although not listed in the first edition of volume 1, the Cabombaceae have been recorded as casual in Singapore (Lindsay et al., 2022; Chen, 2026). The volume includes:

GYMNOSPERMS

Cycadales

Cycadaceae

Gnetales

Gnetaceae

Cupressales

Podocarpaceae

ANGIOSPERMS

Nymphaeales

Cabombaceae*, Nymphaeaceae

Austrobaileyales

Schisandraceae

Piperales

Piperaceae, Aristolochiaceae

Magnoliales

Myristicaceae, Magnoliaceae, Annonaceae

Laurales

Hernandiaceae, Monimiaceae, Lauraceae

Chloranthales

Chloranthaceae

Volume 5

This volume will include the monocot order Asparagales. Several of the families in this order, particularly the Orchidaceae, are of economic value, primarily in the horticultural trade. This volume will also undoubtedly contain the largest number of species that have become Nationally Extinct or are the focus of concerted conservation action. The volume will include:

Asparagales

Orchidaceae, Hypoxidaceae, Iridaceae*, Asphodelaceae, Amaryllidaceae, Asparagaceae

Volume 6

This volume will include a number of monocot orders that come both before and after the Asparagales in the linear sequence proposed by APG IV (2016). This is for purely practical reasons to ensure that the three volumes containing the monocots will all be of roughly equal size. The Asparagales and Poales are both large and can each fill their own volume, leaving volume 6 to contain all other monocot orders. The families in volume 6 include many economically important species, particularly in the Arecaceae and Zingiberaceae. The sea grasses are in the Alismatales. In the first edition of volume 1, Thismiaceae was included in Burmanniaceae and Taccaceae was included in Dioscoreaceae. In this edition, however, we recognise all four families because, in more recent studies, Thismiaceae have been shown to be distinct from Burmanniaceae and Taccaceae distinct from Dioscoreaceae (Lin et al., 2022). In addition, Lindsay et al. (2022) included Acoraceae for Singapore. The Musaceae were included in the first edition of volume 1 but omitted from Lindsay et al. (2022) because that publication is explicitly a summary of previously published records and nobody has ever reported any native, naturalised or casual species for Singapore. The status of any Musaceae species in Singapore will be clarified before publication of volume 6. The volume will include:

Acorales

Acoraceae*

Alismatales

Araceae, Alismataceae*, Hydrocharitaceae, Cymodoceaceae

Dioscoreales

Burmanniaceae, Thismiaceae, Dioscoreaceae, Taccaceae

Pandanales

Triuridaceae, Stemonaceae, Pandanaceae

Liliales

Colchicaceae*, Smilacaceae

Arecales

Arecaceae

Commelinales

Hanguanaceae, Commelinaceae, Philydraceae, Pontederiaceae

Zingiberales

Heliconiaceae*, Musaceae, Cannaceae*, Marantaceae, Costaceae, Zingiberaceae

Volume 7

This volume has been published (Middleton et al., 2019b) and includes only the monocot order Poales. Two of the families, Typhaceae and Mayacaceae, are known only from naturalised species, three native families are very small, and the remaining two families, Cyperaceae and Poaceae, are very large. The Poaceae are the world's most economically important plant family. The volume includes:

Poales

Typhaceae*, Xyridaceae, Eriocaulaceae, Mayacaceae*, Cyperaceae, Flagellariaceae, Poaceae

Volume 8

From volume 8 onwards, the volumes will not well reflect the major clades of angiosperm phylogeny, except those that include only a single order (i.e., volume 10 – the Malpighiales and volume 13 – the Gentianales), due to a desire to keep the volumes of approximately equal size. Volume 8 will include a number of orders that form a grade to the clade that includes both the Superrosids and Superasterids, plus the Dilleniales and some families of Rosids (see APG IV, 2016). The Fabaceae are the world's second most economically important plant family (after Poaceae), containing very many edible species as well as species of widespread use in agriculture for fodder and soil improvement. Many are also important timber species, including several species that are now threatened due to over-exploitation. Vitaceae are also economically important, primarily due to grapes and the wine industry. Since publication of the first edition of volume 1, Nelumbonaceae are also now included (Lindsay et al., 2022). The volume will include:

Ranunculales

Menispermaceae

Proteales

Sabiaceae, Nelumbonaceae*, Proteaceae

Dilleniales

Dilleniaceae

Saxifragales

Daphniphyllaceae, Crassulaceae*, Haloragaceae

Vitales

Vitaceae

Fabales

Fabaceae, Polygalaceae

Volume 9

This volume will include all of the so-called Fabid orders (see APG IV, 2016) within the Rosid clade except for the Fabales which will be in volume 8. This includes a number of economically important families such as the Rosaceae with its many fruit species in temperate regions, Moraceae, which is the source of figs and jackfruit, Juglandaceae, which is the source of walnuts and pecans, and Cucurbitaceae, which includes a wide range of edible squash and melon species. Since publication of the first edition of volume 1, Begoniaceae are also now included (Lindsay et al., 2022). The volume will include:

Rosales

Rosaceae, Rhamnaceae, Cannabaceae, Moraceae, Urticaceae

Fagales

Fagaceae, Myricaceae, Juglandaceae, Casuarinaceae

Cucurbitales

Anisophylleaceae, Cucurbitaceae, Begoniaceae*

Celastrales

Celastraceae

Oxalidales

Connaraceae, Oxalidaceae, Elaeocarpaceae

Volume 10

This volume will include the Malpighiales which is the largest order in number of families in Singapore and the second largest order of dicots in number of species in Singapore, after the Gentianales. The order includes mostly tree species which range from the understorey to large canopy trees in families such as the Chrysobalanaceae. The Rhizophoraceae have a number of mangrove species. At least in Singapore, the Passifloraceae and Linaceae are climbers. Most of the families in this order in Singapore are of limited economic importance, except for their role

in the maintenance of ecosystem services (e.g., mangroves for coastal protection and seafood hatcheries) and limited provision of timber resources and fruits. The volume will include:

Malpighiales

Pandaceae, Irvingiaceae, Ctenolophonaceae, Rhizophoraceae, Erythroxylaceae, Ochnaceae, Bonnetiaceae, Clusiaceae, Calophyllaceae, Hypericaceae, Putranjivaceae, Centroplacaceae, Malpighiaceae, Trigoniaceae, Dichapetalaceae, Chrysobalanaceae, Achariaceae, Violaceae, Passifloraceae, Salicaceae, Peraceae, Euphorbiaceae, Linaceae, Ixonanthaceae, Picrodendraceae, Phyllanthaceae

Volume 11

This volume will include a number of so-called Malvid orders (see APG IV, 2016) within the Rosid clade. These include some of the most economically important fruit species in Singapore, including mangoes, rambutans, oranges and limes. The volume will include:

Myrtales

Combretaceae, Lythraceae, Onagraceae, Myrtaceae, Melastomataceae, Crypteroniaceae

Crossosomatales

Staphyleaceae

Sapindales

Burseraceae, Anacardiaceae, Sapindaceae, Rutaceae, Simaroubaceae, Meliaceae

Volume 12

This volume will include the remaining Rosid orders (see APG IV, 2016) plus the grade of orders at the base of the Superasterids and the true Asterid orders Cornales and Ericales. It is currently uncertain whether any of the species of Polygonaceae and Molluginaceae in Singapore are actually native. Of the three species of Nyctaginaceae in Singapore, one is naturalised, one is casual and one is cryptogenic. The families in this volume include the Dipterocarpaceae which dominate the structure of most Southeast Asian forests and are of enormous economic value. This value has also led to severe deforestation across much of Southeast Asia, including Singapore. This volume also includes the economically important family Brassicaceae, the source of cabbage and its innumerable different forms, and other edible species. Sapotaceae are also an economically important timber tree family as well as the source of gutta percha. Since the publication of the first edition of volume 1, Bixaceae are also now included and Phytolaccaceae excluded (Lindsay et al., 2022). Also, since the publication of the first edition, there has been further research on the problematic family delimitation in the Santalales and we now recognise an additional two families, Strombosiaceae and Erythropalaceae, which were previously included in Olacaceae. The volume will include:

Malvales

Muntingiaceae*, Malvaceae, Thymelaeaceae, Bixaceae*, Dipterocarpaceae

Brassicales

Caricaceae*, Capparaceae, Cleomaceae*, Brassicaceae*

Santalales

Olacaceae, Strombosiaceae, Erythrolaceae, Opiliaceae, Santalaceae, Loranthaceae

Caryophyllales

Plumbaginaceae*, Polygonaceae, Nepenthaceae, Ancistrocladaceae, Caryophyllaceae*,
Amaranthaceae, Aizoaceae, Petiveriaceae*, Nyctaginaceae, Molluginaceae,
Talinaceae*, Portulacaceae, Cactaceae*

Cornales

Nyssaceae, Cornaceae

Ericales

Balsaminaceae*, Lecythidaceae, Pentaphylacaceae, Sapotaceae, Ebenaceae,
Primulaceae, Theaceae, Symplocaceae, Styracaceae, Actinidiaceae, Ericaceae

Volume 13

This volume has been published (Middleton et al., 2019c) and includes only the large order Gentianales. This is the order with the Rubiaceae which has a particularly large number of understorey shrubs and trees in Singapore. It also contains the Gentianaceae and Apocynaceae, also with many understorey shrubs and trees, the latter also with a number of emergent trees and large forest lianas. The Rubiaceae are economically important for the coffee trade and as the source of quinine but in Singapore are most important in the horticultural trade. The Loganiaceae and Apocynaceae also have many horticulturally important species. The Apocynaceae are well-known as the source of many medicinal plants. The volume includes:

Gentianales

Rubiaceae, Gentianaceae, Loganiaceae, Gelsemiaceae, Apocynaceae

Volume 14

This volume will include all remaining Asterid orders. There are many tree species in the included families but overall, the volume is perhaps most notable for the large number of herbaceous species, particularly in the Solanales, Lamiales and Asterales. The volume includes economically important families such as the Solanaceae, with edible species such as tomatoes, chillies, potatoes and aubergines, as well as many species with medicinal uses. The Lamiaceae are well-known for including species used as herbs such as mint, basil, thyme, rosemary and sage. Since the publication of the first edition of volume 1, Metteniusaceae in the Metteniusales has now been recognised for Singapore (Lindsay et al., 2022). In addition, the species of Boraginales found in Singapore are no longer placed in Boraginaceae but in three different

families: Ehretiaceae, Cordiaceae and Heliotropiaceae (Cohen, 2025). Recent work has also suggested that the Aquifoliales as delimited in APG IV and as included in the first edition of volume 1 is not monophyletic (Zuntini et al., 2024). We therefore place the relevant families, Stemonuraceae, Cardiopteridaceae and Aquifoliaceae, into the orders as now delimited. The name Viburnaceae have been conserved over Adoxaceae as used in the first edition of volume 1 and must be adopted. The first edition also included Scrophulariaceae represented only by one casual species, *Cyrtandromoea subsessilis* (Miq.) B.L.Burt. *Cyrtandromoea* Zoll., however, is now placed in Phrymaceae (Liu et al., 2019), along with *Microcarpaea* R.Br. which was formerly included in Plantaginaceae, resulting in the addition of Phrymaceae to the *Flora of Singapore* and the removal of Scrophulariaceae. The volume will include:

Icacinales

Icacinaceae

Metteniusales

Metteniusaceae

Boraginales

Cordiaceae, Ehretiaceae, Heliotropiaceae

Solanales

Convolvulaceae, Solanaceae, Hydroleaceae

Lamiales

Oleaceae, Gesneriaceae, Plantaginaceae, Linderniaceae, Pedaliaceae*, Acanthaceae, Bignoniaceae, Lentibulariaceae, Verbenaceae, Lamiaceae, Mazaceae, Phrymaceae, Orobanchaceae

Cardiopteridales

Stemonuraceae, Cardiopteridaceae

Aquifoliales

Aquifoliaceae

Asterales

Campanulaceae, Pentaphragmataceae, Menyanthaceae, Goodeniaceae, Asteraceae

Escalloniales

Escalloniaceae

Dipsacales

Viburnaceae

Apiales

Torricelliaceae, Pittosporaceae, Araliaceae, Apiaceae