

FLORA

OF SINGAPORE

Vol. 4

Cycadales, Gnetales, Cupressales, Nymphaeales,
Austrobaileyales, Piperales, Magnoliales,
Laurales & Chloranthales



FLORA of SINGAPORE

Volume 4



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Volume 4

**CYCADALES
GNETALES
CUPRESSALES
NYMPHAEALES
AUSTROBAILEYALES
PIPERALES
MAGNOLIALES
LAURALES
CHLORANTHALES**

Edited by

D.J. Middleton, J. Leong-Škorníčková & S. Lindsay



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Spine: fruit of *Myristica elliptica* Wall. ex Hook.f. & Thomson

All painted by Waiwai Hove. The artwork was funded by a generous donation from Mr Tan Jiew Hoe through the Garden City Fund, a registered charity and Institution of Public Character established by the National Parks Board Singapore. For more information, visit www.gardencityfund.org.

DEDICATION



We dedicate this volume of the *Flora of Singapore* to the late Dr Leong Chee Chiew, former Executive Director of National Parks, Gardens and Nature Reserves. He was a pioneer of nature conservation in Singapore and instrumental in the establishment of the *Flora of Singapore* project.

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David J. Middleton
Jana Leong-Škorničková
Stuart Lindsay

INTRODUCTION

Volumes 7 and 13 of the *Flora of Singapore* each featured only one order of angiosperms, Poales and Gentianales respectively. In contrast, Volume 4 of the *Flora of Singapore* includes three orders of gymnosperms and six orders of angiosperms, providing detailed descriptions of 208 species of which 198 are native. The sequence in which they are published in this volume follows the linear classification systems for gymnosperms by Christenhusz et al. (Phytotaxa 19 (2011) 55–70) and for angiosperms by the Angiosperm Phylogeny Group (APG IV, Bot. J. Linn. Soc. 181 (2016) 1–20).

The few gymnosperms in Singapore belong to three families in three orders, the cycad family Cycadaceae in the order Cycadales, the family Gnetaceae in the order Gnetales, and the conifer family Podocarpaceae in the order Cupressales. The Cycadaceae are a monogeneric family with about 120 species found in East Africa, Madagascar and Southeast Asia through to Polynesia. The only other family of the cycad order, Zamiaceae, are larger, more diverse and more widespread but are not found in Singapore. Both families have very large numbers of threatened species. The Gnetales include only the Gnetaceae which in turn include only the genus *Gnetum* which is found in tropical and subtropical Asia, West Africa and South America. The conifer family Podocarpaceae are a largely southern hemisphere family, extending into warm temperate regions of the northern hemisphere. The conifers as a whole, however, are most diverse in the temperate northern hemisphere. With five species, the Gnetaceae are the largest gymnosperm family in Singapore; the Podocarpaceae have two species; and the Cycadaceae have one species.

Historically, the flowering plants were traditionally divided into two groups, the monocotyledons, or monocots, and the dicotyledons, or dicots. The monocots are a monophyletic group to be treated in volumes 5 to 7 (volume 7 has already been published), but the dicots are not monophyletic and constitute an evolutionary grade of orders which are included here in volume 4 and a separate large monophyletic group called the Eudicots to be treated in volumes 8 to 14 (volume 13 has already been published).

The angiosperm families included in volume 4 constitute what are often known as the ‘basal angiosperms’ or ‘early-diverging dicots’, which are those families that were the first to diverge from the evolutionary tree that leads to most flowering plants. These are the plant families that in the past were thought to be most ‘primitive’, a term that should be avoided because it misrepresents the evolutionary processes and adaptations that have resulted in all plants found today. The basal angiosperms found in Singapore belong to six orders and 12 families, Nymphaeales (Cabombaceae, Nymphaeaceae), Austrobaileyales (Schisandraceae), Piperales (Piperaceae, Aristolochiaceae), Magnoliales (Myristicaceae, Magnoliaceae, Annonaceae), Laurales (Hernandiaceae, Monimiaceae, Lauraceae) and Chloranthales (Chloranthaceae).

The Nymphaeales include three families, six genera and about 80 species worldwide. In Singapore, there is only one native family, Nymphaeaceae, with one genus and one species. There is an additional family, Cabombaceae, represented in Singapore by one genus and one casual species.

The Austrobaileyales include three families, five genera and about 100 species worldwide. In Singapore, there is only one family, Schisandraceae, with one genus and two native species.

The Piperales include three or four families, 18–20 genera and about 4335 species worldwide. In Singapore, there are two families, Piperaceae and Aristolochiaceae. Piperaceae have two genera, one of which is native and the other introduced, and 20 species, 16 of them native, three of them introduced and the remaining one poorly known and not yet identified to species. Piperaceae are best known as the source of black pepper (*Piper nigrum* L.). Aristolochiaceae have two native genera and four species, three of them native and the fourth introduced.

The Magnoliales include six families, about 133 genera and 3270–3370 species worldwide. In Singapore, there are three families, Myristicaceae, Magnoliaceae and Annonaceae. The order includes many horticulturally and commercially important species. Myristicaceae have five genera and 33 species, of which 32 are native and one was formerly naturalised. Magnoliaceae have one genus and four native species. Annonaceae are the largest family of basal angiosperms in Singapore with 29 genera, 27 of which are native, the native status of one is uncertain (cryptogenic), and one is only known from an introduced species. Altogether, there are 79 species, of which 76 species are considered native, 1 species is considered cryptogenic, and 2 species are introduced.

The Laurales include seven families, about 90 genera and 3020–3230 species worldwide. The largest family is the rather poorly known yet economically important Lauraceae with potentially many as-yet undescribed species in tropical regions. In Singapore, there are three families, Hernandiaceae, Monimiaceae and Lauraceae. Hernandiaceae have two genera and two native species. Monimiaceae have two genera with one native species and one cryptogenic species. Lauraceae have 14 native genera and 51 native species although one of those has yet to be identified to species.

The Chloranthales include only one family, Chloranthaceae, with four genera and about 75 species worldwide. In Singapore, there is one genus with one native species.

Since volumes 7 and 13 were published in 2019, conservation assessments of all Singapore native plant species have been included in the *Singapore Red Data Book* edition 3 (Middleton et al. in Davison et al. (ed.), *Singapore Red Data Book*, ed. 3 (2024) 454–514). Except in the circumstance where new data has led to a revision of the published conservation assessment or the species was not treated in the *Singapore Red Data Book* edition 3 (for example, for new records), the conservation assessments given in this and future volumes of the *Flora of Singapore* are references to those in Middleton et al. (in Davison et al. (ed.), *Singapore Red Data Book*, ed. 3 (2024) 454–514). The global conservation assessments given are those from the online *IUCN Red List of Threatened Species* or provisional assessments presented by the author. When the assessment is from the *IUCN Red List of Threatened Species*, a simple reference to ‘IUCN Red List, 2026’ is given, noting the year the assessment was checked rather than calculated. If the reader requires more information on the global conservation assessments provided in the *Flora of Singapore*, including who did the assessment, when they did the assessment and the methodology used, we refer the reader to the online *IUCN Red List of Threatened Species*. If the reader requires more information on the Singapore assessments, we refer the reader to Middleton et al. (in Davison et al. (ed.), *Singapore Red Data Book*, ed. 3 (2024) 454–514).

In the *Flora of Singapore: Checklist & bibliography* (Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 1–860), around 900 names were listed as having been misapplied in Singapore. A considerable amount of work was conducted by the authors to ensure all scientific plant names used in the literature for plant species in Singapore were accounted for and that the mistakes and misunderstandings of the past were clarified for current and future users. This work continues in even greater detail in the *Flora of Singapore* volumes. A similar process has not been conducted for vernacular plant names, i.e. for those plants that have names in any of the national languages, English, Mandarin Chinese, Malay or Tamil, or in any other language used by people in Singapore. Indeed, the process to verify the vernacular names of plants in Singapore would be very different to the approach used for scientific plant names and would arguably be much more complex. In the past, it has been common to reproduce plant names given in works such as the *Plant Resources of South-East Asia* (PROSEA) series of books, the *Flora of Peninsular Malaysia*, and other literature from the region but this approach will not be continued in this or future volumes of the *Flora of Singapore* because, 1) any mistakes and misapplications from the past would be difficult to check and would be perpetuated, 2) the broad regional approach of sources of vernacular names means that many names not used in Singapore would be included, and 3) local names only used in Singapore could have been missed. The authors of accounts published in the *Flora of Singapore* are scientists with expertise on plant diversity and, through no fault of their own, often lack the cultural and linguistic knowledge to evaluate and include vernacular names of the species they treat in their accounts. The approach we have, therefore, decided to adopt is to only present the vernacular names listed by NParks' Flora & Fauna Web (FFW) which is an online resource on native, naturalised and cultivated plants in Singapore. Although many of the problems already highlighted equally apply to FFW, the website does at least set a benchmark for these names in Singapore and nearby countries in 2026 and they can be updated as needs be. We acknowledge that not all of the vernacular names presented in FFW and hence in the *Flora of Singapore* (including spelling variants of the same name) are necessarily in current use in Singapore.

Since their family accounts were submitted for this volume, Dr Ruth Kiew and Dr Willem de Wilde have passed away. They were both giants of Malesian botany and will be greatly missed. More about their lives and achievements can be found for Ruth in Leong-Škorničková (Gardenwise 66 (2026) 32–33) and for Willem in van Welzen & Baas (Blumea 66 (2021) i–vi).

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