FLORA
of
SINGAPORE

Volume 13

FLORA OF SINGAPORE

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FLORA of SINGAPORE

Volume 13

GENTIANALES

RUBIACEAE (K.M. Wong et al.)
GENTIANACEAE (K.M. Wong & M. Sugumaran)
LOGANIACEAE (C. Puglisi)
GELSEMIACEAE (D.J. Middleton)
APOCYNACEAE (D.J. Middleton & M. Rodda)

Edited by

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

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Front cover: *Cyrtophyllum fragrans* (Roxb.) DC.
Back cover: *Hoya latifolia* G.Don (above); *Singaporandia macrophylla* (R.Br. ex Hook.f.) K.M.Wong (below)
Spine: *Schradera membranacea* (King) Puff et al.

All painted by Waiwai Hove. Funding for the artwork is made possible 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.

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David J. Middleton
Jana Leong-Škorničková
Stuart Lindsay

INTRODUCTION

Volume 13 of the Flora of Singapore includes only one order of plants – the Gentianales. The order has five families: Rubiaceae, Gentianaceae, Loganiaceae, Gelsemiaceae and Apocynaceae. The Loganiaceae and Gelsemiaceae are more or less exclusively tropical and subtropical; the Rubiaceae and Apocynaceae are primarily tropical and subtropical but have small numbers of species in temperate regions; and the Gentianaceae is most diverse in the tropics but also has very large numbers of species in the temperate-alpine regions. In Singapore, they are primarily woody plants and range from subshrubs and epiphytes to large lianas and emergent trees.

Globally, the Gentianales has about 1110 genera and about 20,725 species (Bittrich & Kadereit, Fam. Gen. Vasc. Pl. 15 (2018) 5). In Singapore, where all five families are present, there are 93 genera, of which 5 are known only from introduced species, and 253 species, of which 15 are casual or naturalised introduced species. At 6% of the total, this is a fairly low percentage of introduced species compared to many other orders.

The Gentianales, as now defined, has been recognised as a natural group since the early 1990s, although a close relationship between the included families except for the Rubiaceae had been suggested long before that (Bittrich & Kadereit, Fam. Gen. Vasc. Pl. 15 (2018) 5). With the establishment of the current circumscription of the order, many of the genera previously included were moved to other families and orders, particularly from the Loganiaceae to the Lamiales and Asterales. Except for the Rubiaceae, the delimitation of families within the order has been very changeable, especially since the widespread adoption of molecular phylogenetic data in family delimitations. The limits of the Rubiaceae remains largely unchanged from how it was defined in the nineteenth century. The Gentianaceae was formerly rather small in the Southeast Asian tropics and entirely absent in Singapore. However, a number of woody families formerly in the Loganiaceae have been moved into the Gentianaceae. With the removal of many genera of Loganiaceae out of the Gentianales altogether, and others into the Gentianaceae, the Loganiaceae is now rather small in Singapore. The Gelsemiaceae was only described as a family fairly recently to accommodate the genus *Gelsemium* Juss., also removed from Loganiaceae. As such, the family did not occur in Singapore. Recently, however, the genus *Pteleocarpa* Oliv. has been moved from Boraginaceae to Gelsemiaceae. Another significant change within the order has been the synonymisation of the family Asclepiadaceae under Apocynaceae. The close relationship between the two families was already well understood and molecular data only served to support conclusions already suggested from morphological data.

The order Gentianales contains large numbers of culturally and economically important species. Internationally the most economically important genus is *Coffea* L. of which two species are the source of commercial coffee beans. In Singapore, of particular renown is a fine specimen of *Cyrtophyllum fragrans* (Roxb.) DC., locally known as tembusu, in the Botanic Gardens. With its distinctive long, horizontal branch, a painting of this tree by Mr Eng Siak Loy appears on Singapore's $5 banknote. Very many species in the families of Gentianales are important in the horticultural trade and are to be seen almost ubiquitously in Singapore's streetscape and parks. Although many of these are exotic species (for example *Allamanda cathartica* L., *Hoya* spp., *Plumeria rubra* L., *Tabernaemontana divaricata* (L.)

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Roem. & Schult., *Wrightia antidysenterica* R.Br., *Gardenia* spp., *Ixora* spp., *Mussaenda* spp. and *Rondeletia* spp.), many native species are also grown (for example *Kopsia singapurensis* Ridl., *Strophanthus caudatus* (L.) Kurz, *Gardenia tubifera* Wall. and *Pteleocarpa lamponga* (Miq.) Bakh. ex K.Heyne). In the nineteenth century, *Uncaria gambir* (W.Hunter) Roxb. in the Rubiaceae was widely cultivated to be chewed with betelnut and as a tanning agent for leather. It became an important economic plant but had a particularly detrimental effect on Singapore's environment due to deforestation when land was cleared for cultivation and due to the gathering of firewood, which was used in the process of extracting the active ingredients from the *Uncaria gambir*. A number of species have local and commercial medicinal uses, particularly from the Apocynaceae and Rubiaceae (e.g. quinine), and *Strychnos* in the Loganiaceae is notoriously poisonous as the source of strychnine.

We have been fortunate to have particular expertise on the families in this order in Singapore Botanic Gardens. The Gardens' staff have, therefore, been able to completely revise four of the five families and have been able to complete the Rubiaceae with collaboration from botanists from the South China Botanical Garden, Herbarium Bogoriense, the Forest Herbarium Bangkok and the Royal Botanic Gardens Kew.

David J. Middleton
Jana Leong-Škorničková
Stuart Lindsay