

# *Flora of Australia*

***Brief description of the flora***

# General characteristics

- *The flora of Australia comprises a vast assemblage of plant species estimated to over 20,000 vascular and 14,000 non-vascular plants, 250,000 species of fungi and over 3,000 lichens. The flora has strong affinities with the flora of Gondwana, and below the family level has a highly endemic angiosperm flora whose diversity was shaped by the effects of continental drift and climate change since the Cretaceous. Prominent features of the Australian flora are adaptations to aridity and fire which include scleromorphy and serotiny. These adaptations are common in species from the large and well-known families Proteaceae (Banksia), Myrtaceae (Eucalyptus - gum trees), and Fabaceae (Acacia- wattle).*

# Natural history of Australia

- *Australia was part of the southern supercontinent Gondwana, which also included South America, Africa, India and Antarctica. Most of the modern Australian flora had their origin in Gondwana during the Cretaceous when Australia was covered in subtropical rainforest. Australian ferns and gymnosperm bear strong resemblance to their Gondwanan ancestors, and prominent members of the early Gondwanan angiosperm flora such as the Nothofagus, Myrtaceae and Proteaceae were also present in Australia.*
- *Scrubland with Xanthorrhoea following bushfire.*
- *Gondwana began to break up 140 million years ago (MYA); 50 MYA during the Eocene Australia separated from Antarctica, and was relatively isolated until the collision of the Indo-Australian Plate with Asia in the Miocene era 5.3 MYA. As Australia drifted, local and global climate change had a significant and lasting effect: a circumpolar oceanic current developed, atmospheric circulation increased as Australia moved away from Antarctica, precipitation fell, there was a slow warming of the continent and arid conditions started to develop. These conditions of geographic isolation and aridity led to the development of a more complex flora. From 25-10 MYA pollen records suggest the rapid radiation of species like Eucalyptus, Casuarina, Allocasuarina, Banksia and the pea-flowered legumes, and the development of open forest; grasslands started to develop from the Eocene. Collision with the Eurasian Plate also led to additional South-east Asian and cosmopolitan elements entering the flora like the Lepidium and Chenopodioideae.*
- *The development of aridity and the old and nutrient poor soils of the continent led to some unique adaptations in the Australian flora and evolutionary radiation of genera – like Acacia and Eucalyptus – that adapted to those conditions. Hard leaves with a thick outer layer, a condition known as scleromorphy, and C4 and CAM carbon fixation which reduce water loss during photosynthesis are two common adaptations in Australian arid-adapted dicot and monocot species respectively. Rising aridity also increased the frequency of fires in Australia. Fire is thought to have played a role in the development and distribution of fire-adapted species from the Late Pleistocene. An increase in charcoal in sediment around 38,000 years ago coincides with dates for the inhabitation of Australia by the Indigenous Australians and suggests that man-made fires, from practices like fire-stick farming, have played an important role in the establishment and maintenance of sclerophyll forest, especially on the east coast of Australia. Adaptations to fire include lignotubers and epicormic buds in Eucalyptus and Banksia species that allow fast regeneration following fire. Some genera also exhibit serotiny, the release of seed only in response to heat and/or smoke. Xanthorrhoea grass trees and some species of orchids only flower after fire.*

# Vascular plants

- Australia has over 30,000 described species of vascular plants, these include the angiosperms, seed-bearing non-angiosperms (like the conifers and cycads), and the spore-bearing ferns and fern allies. Of these about 11% are naturalised species; the remainder are native or endemic. The vascular plant flora has been extensively catalogued, the work being published in the ongoing Flora of Australia series. A list of vascular plant families represented in Australia using the Cronquist system is also available.
- At the higher taxonomic levels the Australian flora is similar to that of the rest of the world; most vascular plant families are represented within the native flora, with the exception of the cacti, birch and a few others, while 9 families occur only in Australia. Australia's vascular flora is estimated to be 85% endemic; this high level of vascular plant endemism is largely attributable to the radiation of some families like the Proteaceae, Myrtaceae, and Fabaceae.

# Non-vascular plants

- The algae are a large and diverse group of photosynthetic organisms. Many studies of algae include the cyanobacteria, in addition to micro and macro eukaryotic types that inhabit both fresh and saltwater. Currently, about 10,000 to 12,000 species of algae are known for Australia. The algal flora of Australia is unevenly documented: northern Australia remains largely uncollected for seaweeds and marine phytoplankton, descriptions of freshwater algae are patchy, and the collection of terrestrial algae has been almost completely neglected.
- The bryophytes – mosses, liverworts and hornworts – are primitive, usually terrestrial, plants that inhabit the tropics, cool-temperate regions and montane areas; there are some specialised members that are adapted to semi-arid and arid Australia. There are slightly fewer than 1,000 recognised species of moss in Australia. The five largest genera are the Fissidens, Bryum, Campylopus, Macromitrium and Andreaea. There are also over 800 species of liver- and horn-worts in 148 genera in Australia.

# Use by humans

- The first Australian plants recognised and classified in Linnaean taxonomy were a species of *Acacia* and *Synaphea* in 1768 as *Adiantum truncatum* and *Polypodium spinulosum* respectively by Dutch philologist Pieter Burman the Younger, who stated they were from Java. Later, both were found to be from Western Australia, likely to have been collected near the Swan River, possibly on a 1697 visit there of fellow Dutchman Willem de Vlamingh. This was followed by Cook's expedition making landfall at what is now Botany Bay in April 1770, and the early work of Banks, Solander and Parkinson. Botanical exploration was enabled by the founding of the permanent colony at Port Jackson in 1788, and the subsequent expeditions along Australia's coastline.
- The Australian flora was utilised by the Indigenous inhabitants of Australia. Indigenous Australian's used hundreds of species for food, medicine, shelter, tools and weapons. For example, the starchy roots of *Clematis microphylla* were used in western Victoria to make a dough that was baked, and the leaves of the plant were used as a poultice applied to skin irritations and blisters.

# Since European colonisation

- Economic exploitation of the flora by settlers since 1788 has not been extensive. Forestry species include a number of eucalypts used for paper and timber, huon pine, hoop pine, cypress pine, Australian Blackwood, and sandalwood from *Santalum spicatum* and *S. lanceolatum* are also timber producing species . A significant area used by the pastoral industry is based on native pasture species including Mitchell grass, saltbush, bluebush, wallaby grass, spear grass, tussock grasses and kangaroo grass.

# Commercial use

- Until recently the macadamia nut and *Tetragonia tetragonoides* were the only Australian food plant species widely cultivated. Although commercial cultivation of macadamia started in Australia in the 1880s, it became an established large-scale crop in Hawaii. The development of a range of native food crops began in the late 1970s with the assessment of species for commercial potential. In the mid-1980s restaurants and wholesalers started to market various native food plant products. These included wattles for their edible seeds; Davidson's Plum, desert lime, finger lime, quandong, riberry, Kakadu plum, muntries, bush tomato, Illawarra plum for fruit; warrigal greens as a leaf vegetable; and, lemon aspen, lemon myrtle, mountain pepper as spices. A few Australian native plants are used by the pharmaceutical industry, such as two scopolamine and hyoscyamine producing *Duboisia* species and *Solanum aviculare* and *S. laciniatum* for the steroid solasodine. Essential oils from *Melaleuca*, *Callitris*, *Prostanthera*, *Eucalyptus* and *Eremophila* are also used medicinally. Due to the wide variety of flowers and foliage, Australian plant species are also popular for floriculture internationally.