

Cyathea and *Dicksonia*, Tree Ferns



Dicksonia antarctica at beginning of John Raddenberry Fern Garden, GBG, Photo: Cherry Collins

Australian Tree Ferns at the GBG:

1. *Cyathea cooperi*, 2. *Cyathea cunninghamii*, 3. *Dicksonia antarctica*

This Plant in Focus looks at our tree ferns in the GBG and particularly at three Australian tree ferns that are labelled in the John Raddenberry Fern Garden: *Cyathea cooperi*, *Cyathea cunninghamii* and *Dicksonia antarctica*. David Johnson talked to us a few years back about the reproductive cycle of ferns, including tree ferns, so this PIF won't focus heavily on botanical details. Rather it is aimed at helping us to recognise these three distinctive tree ferns, each an important part of our Australian botanical heritage.

Tree Ferns

Ferns are among the most ancient terrestrial plants on planet Earth. The first ferns emerged in the Devonian period, 360 million years ago, before there was Gondwana, indeed before the coming together of Pangaea. They predate Ginkgos and Cycads and hugely predate conifers and the flowering plant late-comers.

The *Cyathea* genus of tree ferns belongs to the Family Cyatheaceae. Indeed, the genus lends its name to the Family and to the whole Order (Cyatheaales). *Dicksonia* belong to the Family Dicksoniaceae, another Family in the Order Cyatheaales. There are two other orders of tree ferns (Eusporangiate and Polypodales) in the fossil record, but these are now extinct. The Cyatheas evolved in Gondwana, originating in the late Jurassic period (around 200 million years ago) in either South America or Australasia (both then areas of Gondwana). The Cyatheas are the largest extant family of tree ferns with around 640 species. There are some 20 to 25 species of Dicksonias, a genus related to the Cyatheas but retaining more primitive traits.

It is important to note that there are no surviving tree fern families in the northern hemisphere (outside the tropics), so our beautiful and ancient-lineage tree ferns of the order Cyatheaales are a wonder to northern hemisphere visitors to our Gardens.



Sori on leaflets, from the left: *Dicksonia antarctica*, *Cyanthea cooperi*, *Cyathea cunninghamii*.

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Tree Fern Vocabulary

Rhizome The word 'rhizome' will be familiar to those who have had dealings with perennials such as dahlias and bearded irises. It refers to the underground (or just at surface) tubers which are food storing and root bearing. **The trunk of a tree fern is, in fact, a rhizome.** On some tree fern rhizomes, particularly on *Dicksonia antarctica*, aerial roots are evident matting around the trunk.

Meristem or Apex These are interchangeable terms for the top of the tree fern rhizome (or trunk) which is the developing part of the rhizome from which the tree fern grows slowly upwards and from which the fronds unfurl.

Frond The leaf of a fern.

Stipe The stalk of the frond.

Stipe scars On many *Cyathea*s the dead fronds break away cleanly from the trunk (rhizome) leaving distinctive scar patterns on the trunk. This is true of *Cyathea cooperi* and *Cyathea cunninghamii*.

Rachis The midrib of the frond including the stipe.

Crown The 'umbrella' of fronds stemming from the meristem.

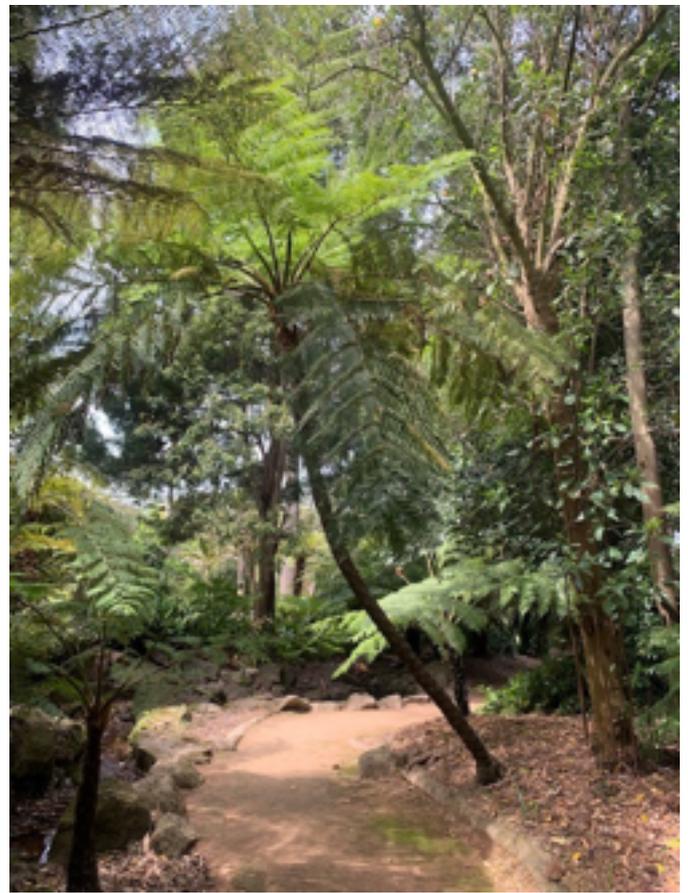
Tubercles Warty outgrowths on the rhizome or the stipes

Spores The reproductive system of tree ferns predates pollen-bearing conifers and flowering plants with their stamens, style and ovaries. Tree ferns reproduce in a two-stage cycle which begins with **spores** (the sporophyte stage) on the underside of the fronds.

Sori Distinct groups of spores on the underside of a frond.

Indusia Indusia are covers for the spores on the underside of the fronds. They are outgrowths of the frond. They can be cup-shaped or hood-shaped.

Scales and Hairs Some tree ferns have hairy trunks, meristems and stipes (eg *Dicksonia antarctica*). Other tree ferns have scales on their trunks, meristems and/or stipes. (eg *Cyathea cooperi* and *Cyathea cunninghamii*).



Left: *Cyathea cooperi* with oval stipe scars. *Dicksonia antarctica* behind with untidy old stipe ends. Right: Slender Tree Fern *Cyathea cunninghamii*. Photos: GBG, Cherry Collins.

***Cyathea cooperi* (Lacy Tree Fern, sometimes Australian Tree Fern)**

This tree fern is often sold as *Cyathea* ‘australis’. It is also sometimes called the Scaly Tree Fern or even ‘Rough’ tree fern, a term used more broadly for all *Cyatheae*. It is native to New South Wales and Queensland rain forest areas.

The trunk of *Cyathea cooperi* is up to 30cm in diameter and it can grow to 15 metres in height. The crown is widely spread with pale green fronds up to 6 metres long.

The trunk (rhizome) is beautifully patterned with large, oval, cleanly detached stipe scars.

The base of the living stipe is brown, tuberculate and covered with long white and short red-brown scales. The sori are orbicular and are surrounded by circular indusia, made up of scales.

Distinguishing features:

- Beautiful pattern of oval stipe scars on the trunk.
- Two types of scales on the stipe base: long white scales and short red-brown scales.

***Cyathea cunninghamii* (Slender Tree Fern)**

Cyathea cunninghamii well earns its common name of ‘slender’ tree fern. It grows to over 20 metres tall on a trunk of 15 cm diameter.

Its Gondwana heritage is evident in its range which extends beyond Australia (Victoria, NSW, Queensland, Tasmania) to the North and South Islands of New Zealand and to the Chatham Islands. It is relatively uncommon, needing damp forest to survive.

It has a slender rachis (central rib of the frond), which is black-brown and covered in brown scales and tubercles.

The fronds are dark green above, pale green on the underside and soft in texture.

The sori are covered by cup-shaped, well developed indusia.

Jones and Clemesha (1980, p. 36) claim that stipe bases persist on the upper part of the trunk ‘black, roughened with round tubercles and bearing thin papery brown scales’. However, the labelled *Cyathea cunninghamii* in the GBG is distinguished by its oval stipe scars extending far up the trunk.

Distinguishing features of *Cyathea cunninghamii*:

- Slender trunk and small crown
- Soft fronds.
- Well developed indusiums
- Like other *Cyatheas* – but distinguishing it from *Dicksonias* -- it has scales and not hairs.



Flush of croziers on *Dicksonia antarctica*. Photo: GBG, Cherry Collins.

***Dicksonia antarctica* (Soft Tree Fern)**

Dicksonia antarctica is our local, common Victorian tree fern and the majority of the tree ferns in the John Raddenberry Fern Garden are this species. Its range is the sheltered and damp gullies of southern Queensland, NSW, Victoria and Tasmania. Its rhizome (trunk) is covered in matted adventitious roots. It tends to have a thick trunk, which can be up to 2 metres in diameter in extreme cases, and it is therefore an excellent host for epiphytes. It grows to over 15 metres tall and is sometimes buttressed at the base.

The stipes persist on the trunk after the frond dies and breaks off, so the upper trunk has untidy old stipes sticking out rather than a beautiful pattern of stipe scars. Living stipes have shiny brown hairs (not scales) at the very hairy base of the stipe (adjoining the trunk).

Fronds are up to 4.5 metres long, relatively narrow, and are dark, glossy green on the upper side. The fronds unfurl in spectacular flushes of ‘croziers’.

The sori, when present, are conspicuous.

Distinguishing features:

- The soft fibrous trunk (rhizome) with its matted root cover.
- The smooth, hairy (not scaly) stipes
- The sori covered by a 2-lobed indusium about 1cm across.

In Brief: 2 New Zealand Tree Ferns (no name tags) in the John Raddenberry Fern Garden

1. ***Cyathea dealbata* (Silver Tree Fern)**. This is an emblem of New Zealand. We have one directly behind the Tea House. It is about 150 cm tall and is recognisable by the silvery underside of the fronds.

2. ***Cyathea medullaris* (Black Tree Fern)**. This is another New Zealand tree fern though its range extends to some Pacific Islands (Tahiti, Fiji, Pitcairn). There are 3 young (and therefore low) black tree ferns at the end of the John Raddenberry Fern Garden on the right as one walks to the new toilet block. They are easily recognised by the black trunk and black rachis (stalk and mid-rib of the frond).

Tree Fern Reproduction

Like all ferns, tree ferns reproduce through a 2-phase cycle with alternation of generations:

1. The sporophyte stage (diploid) produces spores on the underside of the tree fern fronds. These drop to the ground and give rise to:
2. The gametophyte stage (haploid). The tiny gametophyte 'plants' are 4mm in size. They are bisexual and it is they that engender the new sporophyte fern.

Tree Fern Uses

As someone who does not believe that the natural world was created to be useful to people, I am delighted to report that our beautiful tree ferns are largely useless to human beings. The meristems (apexes) are popular with possums and parrots. Some of our First Nations did eat some of the fleshy inner stem of some tree ferns.



Above: *Cyathea medullaris* Black Tree Fern, Photo: Muriel Bendel, Wikimedia Commons CC BY-SA 4.0

Location of Fernery in the Geelong Botanic Gardens.



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Cyathea dealbata Silver Tree Fern:

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Right: Brian Gratwicke, Flickr CC BY 2.0.