



Featuring ferns

Australian Plants

Spring 2014
Vol 27 No 220



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Cover: Hopetoun Falls, Otway Ranges, Victoria. Photographer Dwayne Stocks

This issue has been compiled with the valuable assistance of Kylie Stocks and members of the ANPSA Fern Study Group: Peter Bostock (Study Group Leader), Dot Camp and Nada Sankowsky.

Australian Plants articles

Australian Plants is published quarterly to promote knowledge of Australian plants. Contributions and offers to produce an issue are welcome. Please contact:

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Australian Plants No. 220 Issue of Volume 27, which comprises issues 214–221. Published quarterly and available nationally in 3000 copies by the Australian Plants Society NSW Ltd

© Australian Plants Society NSW Ltd 2014 ABN 87002680408 ISSN 0005-0008

Printed by Elect Printing, Fyshwick, ACT Print post approved PP226253/00017

Editorial

Kylie Stocks and Merle Thompson

When dinosaurs roamed the earth, ferns were the dominant overstorey plants. As angiosperms (flowering plants) evolved, ferns adapted and become mostly part of the understorey. Ferns as a group have been successfully adapting for more than 400 million years. The fact that they still exist as a group while many others have become extinct is witness to this fact. Ferns are tougher than most people credit.

With the exception of mosses, no plant group is as widely distributed as ferns. Ferns can be found in every environment from well above the Arctic circle to the tropics, from deserts to swamps. There are aquatic ferns, ferns that live in the ground (terrestrial), ferns that live on rocks (lithophytes) and ferns that live on other ferns and trees (epiphytes).

Australia has more than 460 distinct ferns and fern allies. The number of species increases towards the tropics, but there remain many attractive species that you can grow no matter where you live.

As some readers' interests are in learning about ferns in their natural occurrence while others are more interested in their use in horticulture, the articles in this issue deal with both these aspects.

To set the scene Kylie Stocks provides basic information on different Australian fern species and how to care for them.

From the horticultural aspect we have two contrasting articles on the use of ferns in very different situations. John and Elizabeth Aitken share with us how ferns are a major aspect of their garden in a southern suburb of Sydney while Jamie North describes his use of ferns in sculptures. This will be an eye-opener to most readers.

While many gardeners find they do not have many pests and diseases to contend with when growing ferns, Kylie Stocks describes the potential difficulties which can arise and how to deal with them.

In this issue we are featuring the natural occurrence of ferns from the fern-rich area of tropical north Queensland which Nada Sankowsky knows and loves. She describes three groups of ferns: those that are rare, tree ferns and species in the genus *Blechnum*. We hope to have a future issue in which we can feature the ferns of more southerly and drier areas, although some described species extend to these areas.

From a different perspective Barry White describes toxicity in ferns and the problems which some ferns can cause to humans.

We hope these articles help you appreciate and grow ferns.



Introduction to Ferns – what you need to know

Kylie Stocks

Kylie and Dwayne Stocks own and operate Verdigris, a specialist fern nursery, located at the bottom of the Clyde Mountain range on the south coast of New South Wales.

Ferns have a wonderful variety of shapes and forms, while some produce magnificent colour. Although they do not flower, most are evergreen and contribute a cool, calming lushness to the environment that other plants cannot match.

There is a popular misconception that in order to successfully grow ferns, you must have a shady, damp position in your garden. Whilst it is certainly true that some fern species prefer that type of location, there are many others that do not.

To work out which ferns will best meet your needs, you first need to be able to tell the difference between them.

Below are some common fern genera found in Australia. This information is designed to provide some general advice on how to identify, select and grow ferns that are suitable for your garden.



Adiantum: Commonly known as maidenhair ferns, *Adiantum* species are terrestrial plants whose fronds divide into small leaflets.

Despite their delicate appearance, they are often quite hardy, and some are drought tolerant. They prefer a humid environment, with adequate moisture in the soil, but they like to be well drained. They do not like wet foliage, so no misting them in the bathroom! This genus likes a well lit growing area with exposure to morning sun. Plants also like air movement, but need to be protected from wind.

Adiantum species grow well in pots in good quality, well drained potting mix. A wick pot is ideal. Larger specimens are happy in the ground, as long as they have access to soil moisture. Some *Adiantum* species produce pretty pink/reddish new foliage. As specimens, they may be upright or weeping.



Adiantum species are easily identified by their spore pattern which is located around the edge of their pinnae (leaflets). Commonly grown species include *Adiantum aethiopicum* and *A. hispidulum*.

Asplenium: Also known as spleenwort ferns, this genus includes the popular Bird's Nest Fern and the Hen and Chicken Fern.



Generally *Asplenium* are terrestrial species (growing in the ground), but some are epiphytic (growing on a host), and some are lithophytic (growing on rocks). *Asplenium* species like to be well lit but protected from sun. Although

they need air movement they need protection from wind. Some of the hardier species are frost tolerant.

Asplenium species make excellent pot or tub specimens, and those with weeping fronds look great in a basket. They prefer a well drained, open potting mix. Epiphytic species prefer to be kept drier than terrestrial species. Their distinctive spore pattern follows the veins on the frond, radiating outwards from the mid-rib (see image). Commonly grown species include *Asplenium australasicum* (Bird's Nest), *A. aethiopicum* (Shredded Spleenwort), *A. bulbiferum* (Hen and Chicken Fern).





Blechnum: Commonly known as the water ferns, this genus often inhabits the damper, darker areas of the forest.

Blechnum species tend to be terrestrial, but there are one or two which climb. They can be cold hardy, but generally require plentiful moisture. There are a few *Blechnum* species which grow in dry situations, so it is important to know which species you are growing. If *Blechnum* species are overwatered, their fronds may turn dark.

Many *Blechnum* species are dimorphic, meaning their fertile, spore producing fronds have a different appearance from their sterile fronds. Many grow as a single tufted trunk, while others spread via underground rhizomes and form colonies.

Some *Blechnum* species (and closely related *Doodia* species) produce magnificent red colour on their juvenile foliage. *Doodia* species tend to be hardier than *Blechnum* and are often used in open landscape design.

Cheilanthes: Also known as resurrection ferns.

Cheilanthes are the ultimate in drought resistant ferns. They are terrestrial plants which during times of drought shrivel up and turn brown. After rainfall, they return to their normal form and become green again.



They tend to be small plants, with short-creeping rhizomes, depending on their situation. Commonly grown species include *Cheilanthes sieberi*, *C. distans* and *C. austrotenuifolia*.

Cyathea / Dicksonia: These two genera have been placed together as they represent the majority of tree ferns found in Australia. There are a number of different species, but their predominant feature is an erect rhizome. This forms a trunk which may reach 20 m (depending on the species).



Advanced *Dicksonia antarctica* species may sometimes be purchased from nurseries after being cut off at the base. If planted and provided with plentiful moisture at both the base and crown, these will develop new roots and re-establish. It is very difficult to do this with other tree ferns, so these should not be purchased in this state.

Cyathea can generally be distinguished from *Dicksonia* species as they have scales on the crown, rather than hair. *Cyathea* species also have a distinctive spore pattern (below left) as opposed to the covered spore found on *Dicksonia* species (below right).





Cyathea species are variable in terms of the type of environment in which they grow. Some will tolerate considerable dryness. By contrast, *Dicksonia* species tend to be understorey plants, and live in damp, still rainforest stands.



Davallia: Also known as the Hare's Foot or Rabbit's Foot Fern.

Davallia species have a hairy, creeping rhizome. They tend to be epiphytic, lithophytic or climbing plants. Because of this, they often prefer a drier environment. They are often grown in baskets, and will do best in those lined with coconut fibre as this helps to keep the roots drier, as well as providing a structure to which the rhizomes can attach.



Davallia species prefer filtered light, air movement and humidity.

However, some species will endure full sunlight for most of the day. Water regularly during summer, but keep drier during winter as excess moisture can cause rhizomes to rot. *Davallia* species have a distinctive cup-shaped spore pattern.



Microsorium: common species include Kangaroo Fern, Pimple Fern and Strap Fern.

Microsorium species occupy a range of habitats, from dry to tropical rainforest. They can be epiphytic (growing on a host), lithophytic (growing on rocks) or terrestrial (growing in the ground). Many are hardy and cold tolerant. Although the genus name implies small sori (spore) there are a number



of plants in this category which have large prominent spore. These are particularly obvious in *Microsorium pustulatum* (Pimple Fern) where the spores form swellings on the upper side of the frond (hence the common name)!



Because of its largely epiphytic nature, this genus needs an open, coarse growing media, and prefers to be kept on the dry side, particularly over winter.

Nephrolepis: also known as Boston, Sword or Fishbone Fern.

Nephrolepis species are terrestrial or epiphytic ferns. They tend to be adaptable, tolerant plants which grow in a wide variety of habitats from shade to full sun.

Some are coarse and erect, while others have lovely soft drooping fronds. They respond to grooming but will tolerate some neglect. *Nephrolepis* species prefer partial sun or filtered light – generally less light than *Adiantum* species

– and need protection from wind. *Nephrolepis* like plenty of water in summer, but prefer to be drier in winter. As with *Adiantum*, they don't like to have wet foliage, and should be watered from below if possible. The native *Nephrolepis cordifolia* is a vigorous grower, and may be weedy.

Pellaea: The Sickle Fern, *Pellaea falcata* is possibly the most common Australian *Pellaea* species.

Pellaea are terrestrial ferns with creeping rhizomes. They are often found in exposed areas, and may curl up if they become too dry, only to rehydrate at a later time.

Pellaea species tend to inhabit drier areas, often amongst rocks, or in clumps on the forest floor.





Pellaea species are easy to grow, and make an attractive basket or container plant. They have a distinctive spore pattern, which follows the margin of the frond.

***Platycerium*:** also known as Stag or Elk Ferns. There are four species of *Platycerium* which grow in Australia. They are either epiphytic or lithophytic.



All *Platycerium* species like brightly lit humid conditions. They should be protected from excessive sun. *Platycerium* species are not suitable to grow in the ground, but smaller specimens can be grown in hanging baskets. Many are long-lived.

Platycerium species live high in trees in the rainforest. They receive their nutrition in nature from forest litter, so instead of fertiliser you can fill their baskets with good quality leaf mulch from the garden. Alternatively, a good quality slow release fertiliser is ideal.

Platycerium species are grown on mounts, or attached to walls or trees using sphagnum moss as backing. Plants should be watered regularly during summer, but less often during winter. Excess moisture can cause plants to rot.

***Polystichum*:** Also known as shield ferns.

Polystichum species are terrestrial ferns which grow either as a tuft or a short-creeping rhizome. They tend to be quite cold hardy, and some



species are known to grow in alpine areas. Plants tend to have dark, glossy green fronds which are often arching. They make attractive container or garden plants and are easy to grow.

Plants should be protected from wind, and prefer filtered sunlight. Use plenty of compost and a well-drained soil.

***Pteris*:** Commonly known as brake ferns.

Pteris species are terrestrial ferns. They may be erect or creeping, depending on the species. They are often quite a tall genus, and are generally hardy and easy to grow. They prefer to grow in moist, sheltered positions.



Pteris species have a distinctive spore pattern which is close to the margin on the frond. Common *Pteris* species include *P. tremula*, *P. umbrosa* and *P. ensiformis*.

This information is intended to be a general guide. There are, of course, exceptions to all of the above. For more information, there are many excellent reference books, and an ever increasing supply of information on the internet.

In general, ferns like regular watering in summer, but less in winter when growth is slow or absent. They should be fertilised in small doses at half strength fortnightly or monthly during the growing seasons (spring and autumn). Half-strength seaweed tonic is also helpful to keep your plants healthy. Most ferns prefer to be under-potted, rather than over-potted. And most ferns will tolerate morning sun or filtered light. But there are ferns that like full sun, and/or considerable dryness. And there are many that are cold hardy, to which the ferny forests in Tasmania can attest.

The most important factor when choosing a fern for your garden is identifying what sort of conditions you can offer.

The Fern Study Group is an excellent resource, and provides like-minded individuals with the opportunity to see ferns in their natural environment, as well as learn more about this fabulous group of plants. New members are always welcome.





Growing ferns in the garden

John and Elizabeth Aitken.

John is past President of APS NSW and is a member of the ANPSA Fern Study Group. Their home is in the southern suburbs of Sydney.

Our garden is located on the south side of a steep hill overlooking the Woronora River at Bonnet Bay. When we bought the land, it was a beautiful, relatively undisturbed bush block, with wonderful stands of macrozamia and gum trees. We wanted minimum disturbance to the natural vegetation during the building, however we did not anticipate that the bulldozer driver, who cleared a space for our home, did not have the same appreciation for the natural vegetation as we did. Consequently, much of the existing vegetation was destroyed by the bulldozer either removing it or covering it with spoil. When the house was finally completed, we were faced with a fairly devastated block. In order to create our garden, we had to build a number of retaining walls, paths and steps to access the different levels.

When designing the garden we were faced with a number of problems. The southerly aspect meant that the plants received reduced light, which was further exacerbated by the shadow cast by our newly built home. This resulted in a major part of the garden being in part shade for a lot of the day. Another problem was that in summer part of the



Steps allow easy access from one level to the next in the garden.



Clockwise from bottom left: *Pyrrosia rupestris* (Rock Felt Fern), *Dicksonia antactica* (Soft Tree Fern), *Asplenium australasicum* (Birds Nest ferns), *Pteris umbrosa*, (Jungle Brake) and *Blechnum* species happily growing on the western side of our home which receives the full intensity of the sun in summer.

proposed garden area received the full blast of the western sun. In addition, the soil consisted of a mixture of spoil created by the clearing of the site and the accumulation of a vast assortment of building rubble.

The challenge was to create a garden that would cope with the shade, especially in winter, and the western sun in summer as well as the poor soil with which we were left. We wanted to create a garden that would provide a tranquil, cool and inviting environment to complement our home. We wanted also to be able to wander around it and to be able to relax from the tensions of everyday life.

As we are passionate about Australian native plants and were members of the Australian Plants Society NSW (APS NSW), we wanted to create a garden consisting of mainly Australian native plants. We were given advice and guidance from fellow members of our local APS group, ideas from visits to members' gardens and inspiration from the local Joseph Banks Native Plants Reserve at Kareela. After pooling all these ideas and support, we decided to create a rainforest garden with ferns as the understory.

We felt that ferns would create the lush, tranquil and luxuriant environment that we wanted. After much terracing, retaining and building of walkways, we set about preparing the soil for planting. As





it was too big a task to remove the building rubble we dug it in, spread the area with a good dose of blood and bone and covered it with a 125 mm depth of eucalypt leaf mulch. The mulch eventually broke down to provide nutrients to the soil. We have topped up the leaf mulch every 3-4 years and now have a lovely rich layer of black loam, which provides an ideal environment for plants to grow in. Every six months we spread a 50% mixture of blood and bone, as fertiliser, and Saturaid to increase the moisture retention of the soil, followed by a good watering.

After we had finished the initial mulching, we immediately began the task of choosing and planting a variety of suitable native rainforest trees to provide a canopy to protect the understory plants. These included Bangalow Palms (*Archontophoenix cunninghamiana*), Cabbage tree Palms (*Livistona australis*), Native Frangipani (*Hymenosporum flavum*), a Sandpaper Fig (*Ficus coronata*), and Foam Bark (*Jagera psedorhus*). For the understory plants we chose a large variety of native ferns, native cordylines, Gynea Lilies and other shade tolerant plants.

Despite the fact that there was little canopy initially to protect the ferns they grew extremely well and survived the harsh conditions with minimal watering. The initial layer of leaf mulch was sufficient to retain the necessary moisture they required, however the tree fern fronds of *Dicksonia antarctica* did suffer from burn off on very hot summer days. Over the years we have added a large variety of ferns and have collected a number of mature *Dicksonia* ferns, many of which we bought quite cheaply on eBay, or found dumped on nature strips during council clean ups. Most of the garden relies on natural rainfall, however, we installed watering systems to ensure that the *Dicksonia* ferns don't dry



Mass plantings of Birds nest ferns, *Cyathea cooperi*, *C. australis*, *Dicksonia antarctica*, *Blechnum* sp., and *Microsorium scandens* (Fragrant Fern) have given the garden a variety of colours, textures and shapes.



Clockwise from left to right: *Asplenium australasicum*, Elkhorn on *Jagera pseudorhus*, *Dicksonia antarctica*, *Microsorium scandens* growing on rocks and *Pteris umbrosa*. A self germinated *A. australasicum* is growing on the rock in the centre.

out as they have a high demand for moisture. The *Cyatheas*, on the other hand, are much more tolerant and rely on rainfall.

In the design of our garden we mass planted the understory plants in clumps in order to give repetition and provide a unity to the garden which in turn created a harmonious feel in the garden.

Our garden has now been established for 35 years and has matured into a relaxing and tranquil rainforest garden with a very tropical feel. Whilst parts of the garden are very shady, they are full of foliage contrast, which gives an extra dimension to the garden.

Over the years, we have developed a great passion for ferns for a number of reasons:

1. They provide a tranquil, cool, tropical inviting aspect to any garden. The majestic tree ferns *Cyathea australis*, *C. cooperi* and *Dicksonia antarctica* add a soft, cool charm to the garden, whereas other ferns, such as the *Asplenium*, *Blechnum*, and *Pteris* species add variety and interest.
2. They are very easy to relocate if they outgrow their position in the garden. Over the years a large number of the ferns in our garden have been moved to other positions. You can't do this with many other native plants.

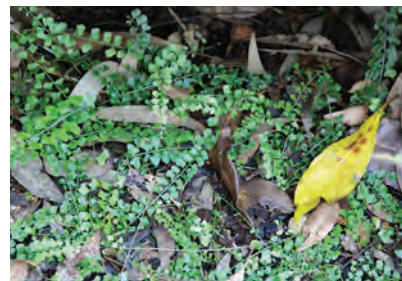




3. Whilst ferns look remarkably gentle and fragile, they are very forgiving plants and most are easy to grow in the garden. While they are generally associated with moist areas, we have found them to be able to withstand long periods of dry weather, with only the occasional watering during summer.
4. In our experience, pests rarely affect them. The only pest that we have come across is with some of the bird's nest ferns that may be attacked by scale. This indicates that the plants are under stress, which is generally due to a lack of water.
5. They readily self propagate by spores in the garden. Birds nest ferns and trees ferns regularly pop up throughout the garden. We will collect them, pot them up and grow them on to either plant in the garden or give to friends.
6. They are also easy to propagate by division, from spores (all ferns), stolens (*Blechnum* and *Microsorium* spp.) or by taking or pegging down bulbils (plantlets) from the 'hen and chicken' ferns such as (*Asplenium bulbiferum*)
7. There is a fern for every situation.



Tiny bulbils growing on *Asplenium bulbiferum* can be easily removed and potted on to grow a new plant.



Asplenium flabellifolium (Necklace fern) left – and *Pellaea nana* (Dwarf Sickle Fern) right – provide attractive groundcovers in shady areas of the garden.

8. Within the same genus, there is incredible variety of form, such as the *Aspleniums*.

We have been very fortunate to share our garden with family and friends and with members of the public. These visits have been organised by the Sutherland Group of the Australian Plants Society and the Australian Open Garden Scheme. We have also been fortunate to have media coverage through *Gardening Australia* and *Better Homes and Gardens*. The latter provide a wonderful opportunity, not only to share our garden with others, but also to promote the joy of growing Australian plants in the garden.



Epiphytic ferns such as *M. scandens* growing on a Bangalow Palm (*A. cunninghamiana*) (left) and *Asplenium australasicum* and *Platycerium superbum* (Staghorn fern) (right) growing on *Jagera pseudorhus* give an extra dimension to a garden.





Fern pests and how to deal with them

Kylie Stocks and Steve Lamont

Kylie and Steve are members of the ANPSA Fern Study Group and keen fern collectors.

Ferns in general tend to suffer from few pests. If a plant is healthy, it will have a natural resistance to pests. Stressed plants are much more likely to suffer pest infestation. Prevention of pest attack by keeping plants well fed and watered is preferable to dealing with pest attacks once they occur. Check any new plants you introduce into your garden to make sure that they are free of pests. Treat any pests before planting.

In the event that a pest attack occurs, and in order to achieve the best looking plants, here are a few tips on how to deal with it:

Sap sucking insects: Ferns are susceptible to hard and soft scale, white scale, mealy bugs and black aphids, all of which are sap sucking insects.



Possibly the nastiest of these is white fern scale, also known as coconut scale or white fern louse. This pest is particularly fond of *Asplenium* species, and is common in birds nest ferns. The white scale is the male of the species, whilst the female is brown and oyster shaped. This pest can cause plant fronds to have a mottled appearance, with fronds seeming to be covered in desiccated coconut.

If your infestation is small, the best, and most environmentally friendly treatment, is to remove and destroy the infested frond.

Mealy bugs can often be removed by dabbing with methylated spirits on the end of a cotton tip. Black aphids can be removed by brushing them off with small, stiff paintbrush, or by a burst of water from the tap. Washing scale off with mild soapy water is also an effective treatment. This treatment is also effective for other types of scale.

If your infestation is severe, you may require a more radical treatment. The normal treatment for a scale infestation is Eco-oil or Pest oil.

However, some ferns, particularly *Asplenium* species, are very intolerant of oil treatments. It is a good idea to test a small area of the affected frond with oil prior to treating the whole plant to avoid frond and/or plant death.

The other common treatment for sap sucking insects is by the use of a systemic insecticide. This type of insecticide is taken up by the plant roots, so that when the insect taps into the plant sap it consumes the poison. Confidor is effective as a systemic insecticide when used as a drench, that is, if the chemical is watered into the roots. It is not effective as a spray.



Members of the Fern Study Group are currently testing the use of Confidor tablets, which can be purchased from the supermarket or horticultural suppliers. It should be noted that while use of a systemic insecticide should kill the pests, it will not remove them. This can be done by hand using soapy water.

Slugs and Snails

Because they are often grown in damp places, ferns sometimes suffer from slug and snail attack. Snails and slugs move using a kind of wave motion on their muscular foot which is lubricated with mucus. This method of travel works most efficiently on smooth, non-porous surfaces. Rough or porous surfaces tend to slow or to stop progress.

A number of different materials can be used as snail barriers. Some of these work because they are rough or porous, (slower snails can do less damage) while others work because their smell or some other property bothers or deters snails and slugs. Porous or rough materials that can be used as a snail barrier include crushed eggshells, moss, bark and leaf litter mulch.



Coffee grounds and citrus peel could also be effective. Beer traps consisting of a small container of beer work too. Apparently slugs and snails are attracted to the smell and can drown in the beer.

Small lizards and frogs can help in controlling slugs and snails.





Possums, chickens, ducks, turtles, tortoises, rats, some birds and snakes also eat slugs and snails.

Agricultural trials show that commercial snail baits are only about sixty percent effective, though the results do not distinguish between bait types. Most commercial baits use either iron phosphate or metaldehyde.

Metaldehyde baits work by dehydrating snails and slugs. Metaldehyde is toxic and can be hazardous around children, pets and even edible plants. It is also harmful to the frogs that tend to co-habit with ferns. It tends to be a little less effective than iron phosphate and its effectiveness can be further reduced by water.

Snail and slug baits containing iron phosphate are less likely to cause problems with pets or worms and can be used near edible plants. They work by interfering with the snail's calcium metabolism. These baits tend to be more expensive but more effective and longer-lasting than metaldehyde and are less susceptible to water damage. They can, however, have a gradual effect upon the mineral content of your soil.

Physical methods such as blocking access to the garden by using porous mulch and planting *Microsorium scandens* have proven successful. Encouraging frogs and lizards has also led to a significant reduction in slugs and snails.

Caterpillars

Caterpillars generally target crosiers and young fronds. Running a finger along the lower midrib of a frond or crozier can help reveal a caterpillar, leading to it dropping from its feeding location on a fine silk.

Caterpillars seem able to work more quickly than snails and missing just one caterpillar for a night or two can lead to significant damage to your ferns.

Because caterpillars can do a lot of damage in a relatively short time, you may want to do something to protect your ferns before caterpillars can be found and identified. For most common caterpillar problems, try *Bacillus thuringiensis*, carbaryl and/or pyrethrum. According to one manufacturer, *Bacillus thuringiensis* (B.t.) is "a naturally occurring bacteria". It controls many leaf-eating caterpillars of moths and butterflies, and does not harm other insects, birds, fish or warm blooded



animal. B.t. can also be used on or near edible plants and seems to have low toxicity for humans. There are many products that contain B.t. Most require re-spraying each five to seven days. It provides a successful treatment for caterpillars on plants in the garden.

Companion planting ferns with *Chrysanthemum cinerariifolium* and *C. coccineum* may provide some protection without the need for regular spraying.

For your own safety, always read the directions carefully and follow the instructions for safe use of insecticides. The use of any type of artificial insecticide can also negatively affect populations of beneficial organisms, e.g. ladybird beetles (useful for controlling aphids)

Grasshoppers

Grasshoppers tend not to eat the blades of fern fronds. They will occasionally nibble at the rachis of an emerging (or other) frond and cause the death of the frond. If you have ever noticed the top part of a new frond dangling from a damaged point on the rachis, this was probably caused by a grasshopper.

Both frogs and lizards will eat grasshoppers (depending upon relative size and species).

Co-planting ferns with horehound (*Marrubium vulgare*), coriander (*Coriandrum sativum*) and marigold (*Calendula*) will deter grasshoppers. *Zinnias* can be planted to attract grasshoppers away from your ferns and other valuable plants. Traps similar to the beer trap above, filled with a mixture of ten parts water to one part molasses can be used to remove grasshoppers (refer: www.ghorganics.com/page12.html).





Ferns as living art

Jamie North with Kylie Stocks and Dot Camp

Jamie North is a Sculptural Artist based in Sydney. He uses ferns (and other native species) in his designs. He responded to questions posed by Kylie Stocks and Dot Camp on his use of ferns within his sculptures.

Sculptor Jamie North creates concrete sculptures in which indigenous plants become an integral part of the sculpture. In his very large sculpture at 70 Queens Road, Melbourne, Jamie has used ferns.

What role do the plants play in your sculptures?

Plants activate the sculpture and give it the chance to become something more than a static object.

Why did you choose ferns for your sculpture in Melbourne?

I work mostly with plants that are lithophytic and indigenous to the area in which the work will be sited. In the Melbourne context, the species that meet these two criteria consist mostly of ferns. I want plants that are going to colonise and explore the structures via roots or rhizomes so ferns were an obvious choice.



Have the ferns achieved your expectations?

The site is very difficult so establishment was always going to be tough. A combination of an incredibly hot summer and a fault with mains supply to the irrigation meant that some of the species have not done as well as hoped, as they were without water at the most critical time.

Do you find some species to be more resilient than others?

Yes. Even with the severity of the conditions described some ferns have showed incredible resilience. To generalise, those ferns that have survived and done well are those spread via rhizomes. *Davallia solida* var. *pyxidata* is an obvious standout, though *Pyrrosia rupestris* and *Microsorium scandens* have also fared well.

What type of environment do you provide them with: media, light, fertiliser, water etc?

It depends on the sculpture and species selection, though I tend to use various grades of coconut fibre with added inorganic matter, such as vermiculite, perlite, dolomite and charcoal. I will sometimes use grow wool (spun granite) though mostly to hold the growing medium in place.

How do they cope with the environment?

It depends largely on the environment and the level of care applied during the establishment phase.

What sort of maintenance regime do you have in place for pest control, pruning etc? or do you let nature take over and do its thing?

I wouldn't describe it as a regime as such. I do recommend that those who intend on owning the work have a connection to plants. Like any success in gardening, one has to be able to observe and read plants as to their requirements in order to look after them. In terms of pruning, I prefer to keep the plants compact though the work is equally valid (and maybe more exciting) if the plants take over the structures. I've not experienced any problems with pests, apart from scale on *Ficus* sp., where nothing beats removal by hand backed up by an application of a seaweed based nutrient solution.

You can view Jamie's work online at jamienorth.com, or at Sarah Cottier Gallery: www.sarahcottiergallery.com





Blechnum ferns of North Queensland

Nada Sankowsky

Nada has spent thirty years in North Queensland studying and growing the native ferns of the area. This has involved many trips to fern areas from central Queensland to the top of Cape York Peninsula to observe and identify the ferns and recognise their growing requirements.

Of the eighteen species of this genus in Australia, eight are found in North Queensland with three of these endemic to the region. The three endemic species are *Blechnum articulatum*, *B. whelanii*, and *B. wurunuran*.

Blechnum articulatum is a beautiful fern of the high mountain areas from the Annan River to the Kurrima Range. It grows in rainforest along the banks of creeks or on the rocks in the water courses.

It forms a small erect trunk to about 40 cm with pinnate fronds which can reach 1.5 m. The fronds are dimorphic with the pinnae jointed to the rachis, hence the specific name. The stipe is about the same length as the lamina and is mostly glabrous except for some scales at the base. New plants often arise from the base of the parent plant.

The new growth of this fern is, like that of many of the *Blechnum* ferns, eye-catching. New fronds are a bright red, becoming pink before turning to green.



Photographs by Garry Sankowsky

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Blechnum whelanii grows in the rainforests of the mountains of North Queensland from the Daintree area to Eungella. It occurs close to streams, usually on the slopes above them.

An erect rhizome to about 15 cm carries fronds that can reach almost a metre in length. The lamina is pinnate, dark green, with the lower pinnae being stalked; stalks become progressively shorter towards the apex. Pinnae of the fertile lamina are similar to those of the sterile lamina. The spectacular new growth is salmon coloured.





Blechnum wurunuran is a terrestrial fern of the mountain top rainforests of North Queensland where it occurs from Mt Finnigan to the Paluma Range. It grows close to, or in, water along streams, sometimes on rocks.

This large fern proliferates by stolons and can develop into a sizeable colony. The rhizome is short-creeping to erect and holds its dimorphic, metre long fronds in a very erect manner. The pinnate fronds are leathery in texture and have up to about 30 pairs of pinnae. The unfurling scaly crozier makes an interesting sight.

Blechnum cartilagineum has two distinct forms in North Queensland; the most commonly occurring form is referred to here as 'var. *tropicum*'. This fern does not proliferate by stolons but grows as a discrete entity. It has a short, woody rhizome to about 30 cm high. The leathery lamina is mostly pinnate with sometimes more than 30 pairs of pinnae to the frond.

It occurs in rainforest from the Claudie River on Cape York Peninsula to Eungella; this very common, widespread fern grows from the lowlands to the mountain tops.

In response to good rain it produces flushes of stunning pink new growth that gradually changes to glowing bronze before eventually becoming a shining green. At times of optimum growth, in areas where this fern is abundant, the roadsides in the rainforest are lit up with the delightful splashes of reds, pinks and bronze-greens of its pristine fronds.





The second form of this fern is *Blechnum cartilagineum* var. *cartilagineum* which occurs from the Atherton Tablelands to Victoria in eucalypt-casuarina forest and edges of rainforest. This fern proliferates by stolons and can eventually densely cover a considerable area.

Superficially it resembles *B. cartilagineum* var. *tropicum*, but as well as the growth habit being so different, it does not produce the vivid colours of the latter.



Blechnum indicum grows in swamps and other wet places, often forming dense stands, usually in full sun but sometimes in filtered shade. It occurs from Cape York in various suitable patches all along the east coast of Queensland and as far south as southern New South Wales. It is also in northern Western Australia and the Northern Territory. It is a fern of the lowland and is most often found close to the coast.

The rhizome is long-creeping and deep with fronds to over a metre long. The pinnate lamina is thin-textured, smooth and shiny, and somewhat leathery; the lateral pinnae are jointed to the rachis. Margins of the pinnae are finely toothed.





Blechnum nudum is a wide-spread fern endemic in eastern Australia, being most abundant in the southern coastal areas, into Tasmania and the Mt Lofty Ranges of South Australia. In North Queensland it occurs from the Daintree area to Eungella.

This is a fern mainly of the rainforests but can sometimes be found in open eucalypt forest. It grows along rainforest creek banks and in very wet areas in the highland, as well as on rocks in the water courses.

The rhizome forms a trunk as it ages, and in optimum conditions can reach a height of a metre after a decade or more. Although generally a fern of shade it can tolerate full sun for a period during the day provided it is in a moist situation. The light and dark green fronds form a perfect rosette.



Blechnum orientale is a large fern with an erect bulky rhizome bearing weeping fronds up to 2 metres long. The lamina is pinnate and can have more than thirty pinnae per frond. A distinctive feature of the stipe is the presence of pinna stubs (sometimes known as auricles), that is, very reduced pinnae along its length.

B. orientale occurs from Central Queensland to Cape York, usually near the coast, but also in sandstone gorges in the inland. It is also found in northern Western Australia and the Northern Territory. It prefers exposed, sunny positions in various habitats and is often found on cuttings along roadsides in rainforest areas from the coast to the tablelands.





Blechnum patersonii, of which there are two difficult to distinguish subspecies occurs from the Big Tableland near Cooktown to north-eastern New South Wales, in very wet rainforest, usually at high altitude, especially in the tropics. This is a common fern in the tropics where it can be seen hanging over water ways and along wet road banks in very wet, mountain rainforests. It requires high levels of humidity to look its best.



The rhizome is shortly erect bearing a number of dark green, very brittle fronds to 30 cm, often longer in optimum conditions. The dimorphic fronds produce lovely colour in the new growth. In some plants the fronds are simple while others produce lobed fronds with as many as ten lobes.



Some rare ferns of North Queensland

Nada Sankowsky

Photographs by Garry Sankowsky

North Queensland is home to a number of ferns which, although not all are endemic, are rare and unusual. Most of them occur in limited locations in the tropical rainforest of north east Queensland.

Plesioneuron tuberculatum is confined to north eastern Queensland although it also occurs in the Moluccas and New Guinea. In Australia it is a lowland species where it occurs as a terrestrial along creek banks in the rainforest between Babinda Creek and the North Johnstone River. It is extremely rare in Australia.

Plesioneuron tuberculatum has an erect rhizome and fronds to about two metres. The lamina is glossy dark green above and paler beneath. It forms an upright habit. The developing fronds are unusual in the way they unfurl; the soft green stipe droops over and the laminal segment hangs down until the stipe becomes firm and brown, then the lamina unrolls and becomes upright. The blackish sporangia is presented densely along both sides of the mid-vein of the pinna and very close to it. Shiny red glands are dotted among the sporangia.





Another rare north Queensland fern is *Chingia australis*. It is known from only three localities south of Cairns and one in the Daintree area. It tends to favour newly disturbed areas, such as land slips, in rainforest on slopes above creeks, always in well-lit areas. If it becomes overgrown it will die out in that spot.

The rhizome of *Chingia australis* forms a small trunk and the bright green fronds are up to two and a half metres long. The stipes bear obvious scales; the lower surfaces of the pinnae are covered with capitate hairs. Immature fronds are sticky with a distinctive spicy odour. Care should be taken after touching the fronds as they cause irritations to the skin.



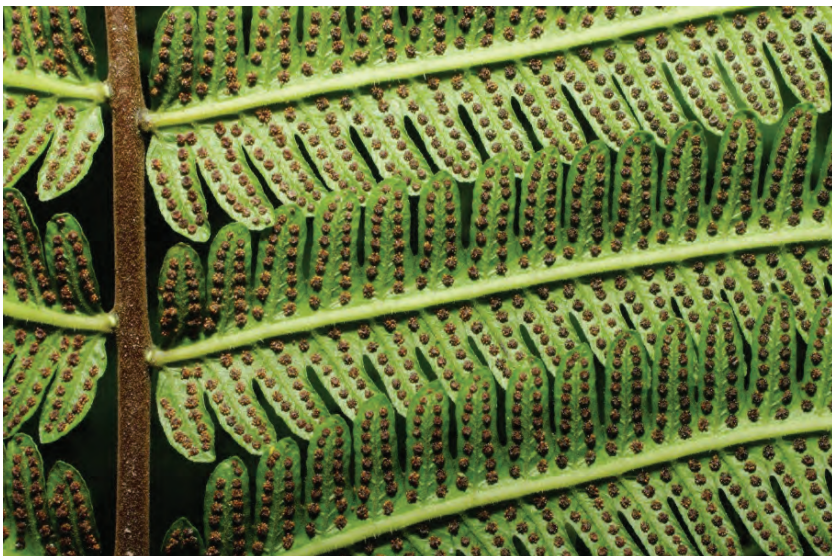
Pneumatopteris costata is known only from a restricted area south of Cairns and one isolated spot on the Atherton Tablelands. It prefers situations of high light and very wet ground. It grows along stream banks, even in the water at the edges, or on seeping slopes.

The rhizome makes an erect trunk which can become 40 cm tall; it holds its metre plus long dark green fronds in a very upright position. The stipes are shiny brown and have many auricles right to the base. Although rare in the wild it volunteers readily in a bush house situation.





Uncommon in Australia, occurring only in the Northern Territory and on the Atherton Tablelands of north eastern Queensland, *Sphaerostephanos unitus* var. *unitus* grows in swamps in full sun. It has a long creeping rhizome and fronds to a metre. However, when growing exposed in full sun the fronds can be much reduced, whereas in a situation where the plants are getting relief from the full force of the sun the fronds can be even longer than a metre. Pinnae are dark, shiny green with a delicate pattern on the upper side which is produced by the fine venation. The long stipe has a number of small auricles (reduced stub-like pinnae) characteristic of the genus.



Pteridoblechnum acuminatum is a rare fern endemic to the high mountain area of north eastern Queensland. It is found on the slopes above creeks in very wet rainforest situations.

This fern has a short-creeping rhizome with densely tufted fronds. The lamina is pinnate with up to five pairs of lateral pinnae and a terminal one. The fertile fronds, although similar in height to the sterile ones, have very much narrower pinnae. Bulbils are often present in the pinna-axils.



Epiphytic or lithophytic in rainforest, *Davallia solida* is rare in Australia and is known from only a few sites in the McIlwraith Range and Mt Tozer.

This is a very robust climbing fern with wide lacy fronds that are deciduous in





the dry season; the plant produces beautiful shiny bronze fronds with the onset of the wet season. As the fronds age they become a dark green. The rhizome, which is over 1 cm thick, is densely scaly when young and clings tightly to the host.

Revwattsia fragilis has recently had its name changed to *Dryopteris wattsii*. It is an extremely rare endemic in north-eastern Queensland where it is known from only two sites. It grows in clumps of large



epiphytes or in rotting tree hollows at mid to high altitudes in very wet area of the rainforest.

It has a most unusual thick lump of a rhizome completely covered in soft brown scales. The graceful dark green fronds are up to 2 metres long with the lamina reaching 120 cm in width.





Endemic tree ferns of North Queensland

Nada Sankowsky

Five tree ferns are endemic to North Queensland; four belong to the genus *Cyathea* and the other species is in the genus *Dicksonia*. Three of these ferns are commonly seen in the Atherton Tablelands area, a fourth one is much less common, while the fifth species (*Cyathea exilis*) is restricted to one isolated location on Cape York Peninsula.

Dicksonia herbertii occurs in the high mountain areas between the McLeod and Johnstone Rivers and also in the ranges at Eungella. This is a rare tree fern even in these areas and requires situations of very high humidity and constantly wet soil.



The trunk of this species reaches 4 metres tall with reddish-brown irritant hairs; it supports fronds in a spreading crown with the stipes of the fronds also covered in irritant hairs. The lamina is pale, dull green on both surfaces.

Another north Queensland endemic tree fern is *Cyathea woollsiana* which inhabits the rainforests between the



Photographs by Garry Sankowsky



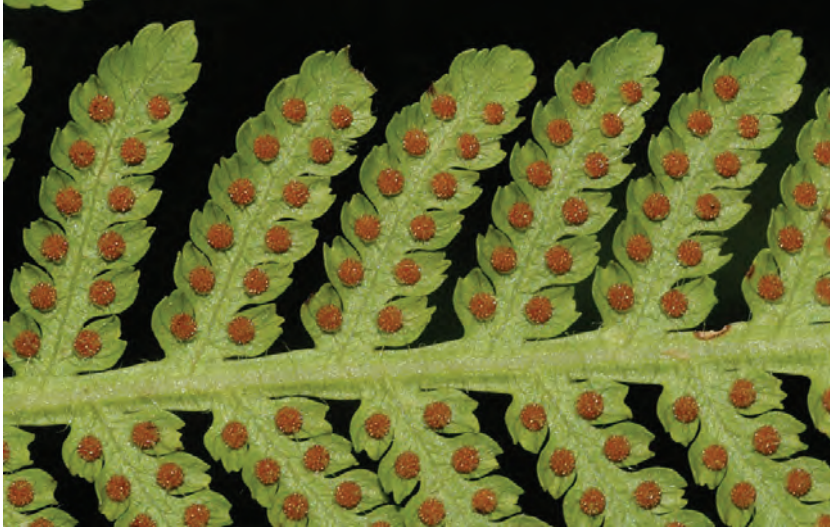
Herbert and Bloomfield Rivers to an altitude of 1200 m. This is a large fern growing to 6 m with a substantial trunk. It is often mistaken for the very common *C. cooperi* which it superficially resembles. However, they differ in a number of ways. One distinguishing feature of *C. woollsiana* is in the colour of the rachis which is light brown. The plant tends to

hold its old fronds even when these hang down around the trunk like a grass skirt. This gives it a rather untidy appearance.

C. woollsiana likes an open situation with good light and permanent humidity.

Cyathea robertsiana is a fern of high mountain areas between the Herbert and Daintree Rivers; it also occurs in the Eungella Range. This fern proliferates in areas that have been cleared by human activities (road works) or by land slips. It grows well only with good light on its





crown and very wet soil for its roots. When it is overshadowed by the surrounding plants of the forest it will decline and eventually disappear from that situation.

C. robertsiana is one of several very thin-trunked Cyatheas; the trunk is very woody and can reach 7 metres. The long slender trunk supports a spreading crown of delicate, soft lacy fronds of light green; it is unique in that the fronds do not arise from a crown but in a loose spiral up the trunk below the mainly bald apex. This is a very distinguishing feature of this tree fern.

Cyathea baileyana is also a slender-trunked tree fern but is much less common than *C. robertsiana*. *C. baileyana* also inhabits the high mountain areas but prefers a shady, under canopy situation in very wet to swampy conditions. It occurs in the mountains from the Windsor Tableland to the southern end of the Atherton Tablelands.

The slender trunk grows to 5 metres and is topped by a crown of glossy, dark green bipinnate fronds up to 3 m long. These fronds are very similar to those of another northern tree fern (*C. rebeccae*) but *C. baileyana* is readily distinguished from it by the curious, wig-like growth on the top of the trunk. When young this wig is a bright green but becomes reddish brown as it ages. As with *C. rebeccae*, small offshoots are produced from underground stolons close to the main trunk.



The rarest of all these tree ferns is *Cyathea exilis*. It also is one of the slender-trunked tree ferns. This fern produces buds on the trunk, one bud associated with each stipe base. Sometimes, smaller plants are produced at the base of the main trunk, forming a clump, or buds higher up the trunk will develop into new plants when the main trunk reaches the end of its life and falls over.

This dainty tree fern is quite hardy when given its preferred conditions. It has similar requirements to *C. baileyana*, that is, it prefers an under canopy situation in a very wet area. This is the smallest of the Australian tree ferns.





Toxicity in Australian Ferns

Barry White

Barry is a long-term member of the Fern Study Group and manages its spore bank. He has been a member of the Fern Society of Victoria for 25 years, is a past-president and has been secretary for the last 12 years. He has also been a member of the Keilor Plains Group of APS Victoria in which he has been president, secretary and newsletter editor.

At least three Australian ferns exhibit some level of toxicity: *Pteridium esculentum* (Bracken), *Marsilea spp* (Nardoo) and *Cheilanthes sieberi* (Narrow Rock Fern).

Pteridium esculentum (Bracken Fern) is well known as a poisonous fern; however the rhizomes were eaten by the Aborigines and therefore the epithet “esculentum” meaning edible was bestowed on the fern.

Presumably the Aborigines treated the fern in some special manner before eating it as the fern has quite potent poisons. The young croziers can have a depressing effect on the bone marrow. This may firstly result in acute and fatal haemorrhages in cattle and sheep due to the interference with the production of thrombocytes which are essential in the blood clotting process. Secondly, longer term exposure predisposes to infections due to the suppression of the production of white blood cells in the bone marrow.



Pteridium esculentum six weeks after Kinglake Black Saturday bushfire. Photo: Barry White

Bracken also has a carcinogenic effect and can cause cancerous type growths in the bladder and gut of cattle. Bracken poisoning has been attributed chiefly to ptaquiloside, a norsesqui-terpene glycoside which is also a potent carcinogen inducing various malignancies in laboratory animals.

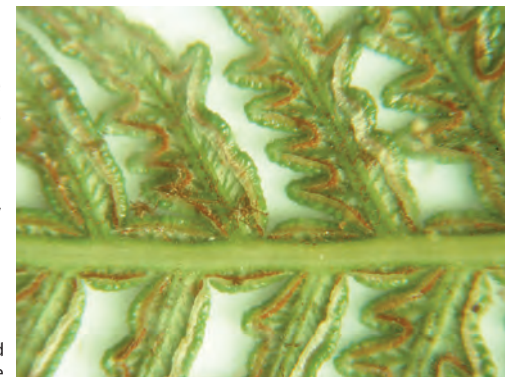
Concern has been expressed that the active principle may be present in milk and affect humans. Some human populations eat young bracken shoots, and epidemiological studies in Japan and Brazil have shown a close association between bracken consumption and cancers of the upper alimentary tract.

Robbin Moran in his book *A Natural History of Ferns* reports that eating the fiddleheads is popular in Japan and in Korean families around Los Angeles. Because of its possible implication in stomach cancer, warnings are issued to avoid eating too much for long periods. Other studies have revealed that the presence of Bracken swards presents a greater risk of dying of gastric adenocarcinoma for people who live more than 20 years in such areas or are exposed in childhood.

More recently, the carcinogenic effect of the spores of Bracken has also been recognized. Both vegetative tissues and spores of bracken can induce changes in DNA in animal cells. In laboratory trials spore extracts of other fern species including *Dicksonia antarctica* and *Pteris vittata* have also induced significantly more DNA strand breaks than in control groups. As there is a strong correlation between DNA damage and carcinogenic events, there may well be some implications for human health.

The evidence for bracken and its spores causing cancer in humans is still circumstantial, and while eating fiddleheads is not common in Australia the wearing of a mask if regularly handling bracken and possibly other fern spores is worth consideration.

Finally the fronds and the rhizomes of bracken contain a thiaminase which inactivates thiamine (Vitamin B) and can cause fatal Vitamin B1 deficiency, particularly in pigs and horses that, unlike ruminants,



Pteridium esculentum fertile frond
Photo: Barry White





Marsilea drummondii Central Australia.
Photo: Barry White

do not synthesise thiamine within the bowel. In conclusion “Esculentum” is probably not the most appropriate epithet to describe bracken.

Marsilea spp. (Nardoo) is commonly implicated as playing a significant role in the death of the explorers Burke and Wills. Nardoo is an aquatic fern,

resembling a four-leaf clover, and there are 65 different species in the *Marsileaceae* family. The Nardoo that Burke and Wills ate was *Marsilea drummondii*. The spores of the plant are contained in a small, hard sporocarp, which is the part eaten by Aborigines (not the leaves). The sporocarp is ground to a flour and then mixed with a little water to form a dough which is then cooked in the ashes, or it is mixed with a larger quantity of water and drunk as a thin porridge or gruel.

Many people are aware that Burke and Wills were supplied by the Aborigines with fish and Nardoo cake or Nardoo gruel during their last days in Central Australia. Professor Ewart states of Nardoo: “In time of scarcity the sporocarps of *Marsilea* are ground into a yellowish powder by the Aborigines. Cakes made from it are astringent, contain tannin, and are highly indigestible”.¹

Wills, who studied medicine for a period, wrote a note to his father a few days before he died: “My dear father, these are probably the last lines you will ever get from me. We are on the point of starvation, not so much from absolute want of food, but from want of nutrient in what we can get”.

Dr. Beckler, the medical officer with the expedition, told the subsequent Royal Commission that scurvy was the major factor in the deaths. However he added that the scurvy was not typical, the usual skin and gum sores were absent. Instead the main symptoms were weakness, difficulty in walking, swollen legs, anaemia and frequent fainting. The symptoms are typical (except perhaps the slow heart rate) of a Vitamin B1 (thiamine) deficiency, often known as beriberi.

Beriberi was not known as a disease entity in Australia at that time and a means of preventing it was not discovered until 20 years after the Burke and Wills expedition.

The food used on the expedition was generally poor in thiamine and it is likely that thiamine deficiency caused many of the medical problems

encountered on the journey. However, in the final few weeks at Cooper’s Creek, their diet included regular amounts of fish and Nardoo cake initially supplied by the local Aborigines. The explorers, however, subsequently had collected the sporocarps themselves and prepared the cake or gruel. The method of preparation may have well differed.

Moreover, it is also possible that they may have consumed the more toxic leaves of the green plant, as it was a regular practice for them to eat green native plants, such as portulaca, as they were aware of the value of green plants in preventing scurvy.

The *Marsilea* has a very high level of thiaminase, an enzyme which destroys thiamine. The level of this chemical is about 100 times the level in bracken fern which is sufficient to kill horses and pigs. *Marsilea* periodically causes mass poisoning of sheep. In one incident on the Gwydir River in NSW some years ago about 2,000 sheep died. The sheep graze the *Marsilea* which grows rapidly on the flood plains. The thiaminase level in the green leaves is much higher than in the sporocarps. The toxic activity is high enough to kill sheep in spite of the sheep’s ability to synthesise its own thiamine requirements in its rumen.

Cheilanthes sieberi (Narrow Rock Fern) has been associated with significant disease in both cattle and sheep. It contains poisons similar to Bracken with similar results; i.e. acute fatal haemorrhages, cancer of the bladder, and symptoms of brain damage. The other species of Australian *Cheilanthes* do not seem to be involved but overseas species have been incriminated. Care in handling of spores is worthy of consideration.

1. Prof Alfred Ewart, Foundation Chair of Botany, University of Melbourne and Government Botanist from 1906.

Cheilanthes sieberi in Winmalee, NSW.
Photo: Mark Baker



