Ferns of the Wellington Region

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INTRODUCTION

Life Cycle of Ferns

Ferns form a distinctive group of plants somewhat intermediate between the flowering plants and gymnosperms on one hand, and the so-called "lower" plants such as mosses, liverworts, lichens and algae on the other. They are similar to flowering plants in that they are generally upright, leafy plants with specialised internal water-conducting (vascular) tissue; but, like the lower plants, they lack both flowers and multicellular seeds, reproducing instead by means of tiny unicellular spores which are produced in large numbers in simple spore cases (sporangia) on the underside of the fronds.

A characteristic feature of all ferns is that they have two quite separate and free-living stages in their life-history. The typical fern plant seen in any piece of bush or forest is only one of the stages of the life-cycle of that particular species. What is not generally appreciated is that the spores from that plant do not germinate directly into new ferns, but give rise, instead, to tiny, flat, green, heart-shaped structures about 5 mm long. These are called prothalli and are very hard to find in the wild because of their small size. Occasionally they can be found on open clay banks or on recently disturbed soil, but they are much more readily observed in cultivation by sowing spores onto sterile soil where they will grow into maturity within a few weeks. As the prothalli develop they give rise to tiny outgrowths on their undersides which produce the male and female sex organs of the fern (equivalent to the stamens and ovaries of a flower), which in turn produce sperm and egg cells (the pollen and ovules of a flower). Sperm and egg cells are often produced at different times on any one prothallus, or, in some species, may be produced on separate prothalli, thus promoting cross-fertilisation and outbreeding rather than self-fertilisation. The sperm cells are like miniature corkscrews with a pair of beating hairs for propulsion. They may swim to nearby prothalli in a film of water, or may be forcibly transferred by rain drops, but in either event are chemically attracted to the egg cells which they eventually fertilise. The fertilised egg cell then develops into a new fern plant. The prothallus of most species subsequently dies, but in a few species may continue to grow and produce several crops of new fern plants before it becomes senescent. Thus, there is a continual two-stage cycle in the life of every fern, alternating between the sporophyte generation, or typical spore-bearing fern plant, and the gametophyte generation, or gamete-producing prothallus.

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Hybridisation

It is at the prothallus or sexual stage of the life history that the opportunity for hybridisation occurs, something which is particularly prevalent among such fern genera as *Asplenium* and *Blechnum*. If prothalli from two different species germinate very close to one another, there is always the possibility that sperm from one will swim to, and fertilise, an egg cell from the other. However, it is probable that successful fertilisation and the production of a viable hybrid can only be achieved if the parent prothalli are from closely related species. If the parent species are only distantly related, fertilisation is likely to fail.

Even when fertilisation succeeds and a viable hybrid develops, it is very often sterile and incapable of giving rise to a second generation. An important point to remember, however, is that hybrids can only be produced from prothalli that germinate virtually side by side. This, in turn, almost always means that the parental species must also be growing in close proximity.

Nomenclature and Further Information

In the interests of simplicity the term "fern" is used here in the broad sense to include not only the true ferns, but also two other evolutionary more primitive and quite distinct groups, the lycopods and the psilophytes (normally known as fern allies).

Lycopods, or club mosses, represented today primarily by the genus *Lycopodium*, are the evolutionary remnant of a group of plants which dominated the Earth's vegetation in the Carboniferous period that began some 345 million years ago and whose dead remains have been transformed into the vast reserves of coal now found all over the world. They are distinguished from true ferns by having very small, undivided leaves rather than large spreading fronds, and by having their spore-bearing capsules on the upper rather than the lower side of the leaf, and often by having the spore capsules aggregated together into cones. Psilophytes are an even more primitive group related to some of the earliest known vascular plants that inhabited the Earth over 400 million years ago. They exist today only as the genera *Psilotum* and *Tmesipteris* and are characterised by lacking any true leaves or roots, and having their spore-bearing capsules fused into groups of two or three on simple branching stems (Fig. 1).

Fig. 1. *Tmesipteris tannensis* is a descendant of some of the earliest known vascular plants that first evolved over 400 million years ago.

English or Maori names for ferns are relatively rare, but where they are well established they have been used in this account. Otherwise Latin names have been used routinely. Further information on New Zealand ferns, including nomenclature, descriptions, illustrations, distributions and tips on cultivation can be found in *New Zealand ferns and allied plants* by Brownsey and Smith-Dodsworth (1989).

DISTRIBUTION OF FERNS IN THE WELLINGTON REGION

The Wellington region is not particularly remarkable for its fern flora. There are no ferns endemic to the region, and perhaps only one, *Asplenium terrestre* subsp. *maritimum*, that could be regarded as being more common there than anywhere else. Of the 28 species that have distributions confined to the North Island, including many of the most interesting New Zealand genera such as *Psilotum*, *Phylloglossum*, *Marattia*, *Lygodium*, *Dicranopteris*, and *Loxsoma*, only two reach as far south as Wellington. Conversely, many of the 35 species that occur throughout the South Island, but which have limited distributions in the North Island, are found only in mountainous districts and are either absent from, or impinge on, the Wellington region only in the southern Tararua Ranges. In addition, a further 14 New Zealand species occur nowhere near Wellington, being confined either to the Kermadec Islands or to Fiordland and the subantarctic islands.

This leaves about 126 species (60% of the total fern flora) which have been reported from the Wellington region, but at least 20 of these are known from only one or two localities, or are adventives recorded as occasional garden escapes. The best represented group, and probably the highlight of the area, is the filmy fern family, of which 24 out of 29 species can be found, if the two *Leptopteris* species are included (Fig. 2).

Another well represented group is the Dennstaedtiaceae with all the genera (*Histiopteris*, *Hypolepis*, *Leptolepia*, *Lindsaea*, *Paesia*, and *Pteridium*) present as well as all but two of the 14 species. A very good range of tree ferns and *Blechnum* species can also be seen.

Even in a relatively confined area such as the Wellington, the species are by no means evenly spread. Each different ecological habitat has its own characteristic fern flora, and these habitats will now be considered in turn. More general information on the ecology and geographical distribution of New Zealand ferns on a country-wide basis can be found in the paper by Parris (1976).

Open Coastal Communities

Ferns are rather scarce in open coastal situations – indeed, none are regularly found on sand dunes, but a few are characteristic of the exposed greywacke coastal cliffs in the Cook Strait region. All have to be tolerant of sun, salt spray, and desiccation, and most, therefore, have thick fleshy fronds.

Fig. 2. Filmy ferns are well represented in the Wellington area. *Leptopteris superba* (Prince of Wales feathers) grows luxuriantly in dark, wet forest at higher altitudes.

Growing closest to the high tide mark, where it is subject to considerable salt spray, but also capable of penetrating a little way inland along rocky stream banks at water level is *Blechnum banksii*, a plant that needs to be permanently damp. Also near high tide, but rarer in this region, is the coastal spleenwort (*Asplenium obtusatum* subsp. *obtusatum*) which grows abundantly around the southern coasts of the South Island, but which in Cook Strait is confined to a few damp seepages. On drier, almost bare rock, growing anywhere its roots can penetrate a crack or crevice, will be found *Asplenium terrestre* subsp. *maritimum*, a plant very characteristic of Cook Strait, but uncommon elsewhere in New Zealand. Its ground-dwelling inland relative, subsp. *terrestre*, is rare in the region. *Pyrrosia eleagnifolia*, typically a forest epiphyte, climbs over the drier rocks by means of its long creeping rhizomes. It is well adapted to coastal conditions with a thick, fleshy, undivided frond, protected from drying out by a dense covering of scales.

On cliffs where more soil or humus has accumulated are found a very sharply pointed form of shield fern (*Polystichum richardii*), hound's tongue (*Phymatosorus pustulatus),* shining spleenwort (*Asplenium oblongifolium*) and necklace fern (*A. flabellifolium*). The latter is one of the few coastal ferns not to produce a fleshy frond, and one that is immediately recognisable by its habit of producing fronds that loop along the ground rooting at the tips to produce new plants.

Higher on exposed cliffs, away from the immediate influence of salt spray, but often on bare rock, are three ferns, C*heilanthes distans*, *C. sieberi*, and *Pellaea calidirupium* which occur together more commonly in the drier parts of inland South Island, but which can be found in a few places around the Wellington coastline, such as above Red Rocks and at Pukerua Bay.

Two uncommon plants in the Cook Strait region are the Green Bay kiokio (*Blechnum* sp.) found on rocky banks just behind the Pukerua coast, and *Hymenophyllum minimum* which occurs on bare rock outcrops in a few gullies leading inland from the Wellington south coast. The latter is unusual for a filmy fern in being able to tolerate exposed coastal conditions. Another plant rare around Wellington is *Anogramma leptophylla*, known until recently from one site in Miramar and another on Mana Island where it grows under scrub on more shady banks. A plant which, according to Given (1972), was first recorded in New Zealand from the cliffs of Cook Strait around Cape Terawhiti is *Pleurosorus rutifolius*. This is a species which has recently been found on the Cape Palliser coast, but it has not been seen again on Cape Terawhiti since the original collection sometime prior to 1855.

Coastal Forest

Many of the ferns capable of tolerating the open cliff environment, such as *Pyrrosia eleagnifolia*, shield fern (Fig. 3), hound's tongue fern, and shining spleenwort grow more luxuriantly in the comparative shelter of coastal forest;

Fig. 3. *Polystichum richardii* (shield fern) is an adaptable species growing on exposed coastal cliffs as well as in both native and introduced lowland forest.

but here, where salt spray, wind, and exposure to sunlight are reduced, another characteristic group of ferns can be found for the first time. Some such as *Adiantum diaphanum*, *A. fulvum*, *A. hispidulum*, *A. viridescens*, *Diplazium australe*, and *Doodia media* are plants more abundant in northern regions and are uncommon in the Wellington region, but others such as *Adiantum cunninghamii*, *Lastreopsis microsora*, *L. velutina*, *Pteris macilenta*, and *P. tremula* are more widespread. All are typically plants of the forest floor or of clay banks and many of them extend also into lowland forest, but few of this group with northern affinities extend to higher elevations. One of the few epiphytes to grow in coastal forest is *Arthropteris tenella*, but it is usually found scrambling over rocks. *Blechnum filiforme*, one of a small number of climbing ferns in New Zealand, is also common in coastal forest where it frequently festoons the trunks of trees. Another coastal plant that appears to be extinct in the region is *Asplenium lyallii*, recorded from sites around Wellington Harbour but not collected for over 100 years.

Lowland Forest

Once away from the immediate coastal fringe, the lowland forest becomes denser, more sheltered and much richer in species, particularly epiphytes. In the Wellington region lowland forest extends up to about 250 m and good examples can be seen at Butterfly Creek, Wilton Bush, and in the Catchpool Stream area.

In lowland forest tree ferns are found commonly for the first time. Mamaku (*Cyathea medullaris*) is the tallest species emerging above the canopy with its characteristic spreading crown, thick black frond stems and hexagonal markings on the trunk. Gully fern (*Cyathea cunninghamii*) is another emergent species, but with a smaller, more open crown, much thinner frond stems, and no hexagonal markings on the trunk. It is an uncommon tree fern, found only in a few damp gullies around Wellington, and perhaps seen most clearly at the slightly higher altitude of Kaitoke. Ponga (*Cyathea dealbata*) is a subcanopy species instantly recognised by the white undersides of its fronds, whilst wheki (*Dicksonia squarrosa*) inhabits poorly drained or swampy soils where numerous plants often grow together in colonies producing blackish trunks and very rough fronds that characteristically turn orange-brown as they die. A much rarer tree fern in the region is wheki-ponga (*D. fibrosa*), seen only in a few places in the Hutt Valley, the Catchpool Valley and on river flats in the Tararua and Akatarawa Ranges. It is easily recognised by its full skirt of dead fronds and very thick trunk.

The common forest floor species are hen and chickens fern (*Asplenium bulbiferum*), shining spleenwort, *Lastreopsis hispida*, *Pneumatopteris pennigera*, shield fern, and, in more open areas, hound's tongue fern, and kiokio (*Blechnum* sp. aff. *capense*). Between the roots of large trees and on rocky or disturbed ground will be found *Asplenium hookerianum*, *Lastreopsis glabella*, and *Pellaea rotundifolia*. On the banks of watercourses *Blechnum chambersii* is a common

species, whilst on flatter, damp areas *B. fluviatile*, *Leptopteris hymenophylloides*, and the most common of the terrestrial filmy ferns, *Hymenophyllum demissum* and *H. revolutum*, grow luxuriantly. *Hymenophyllum flexuosum*, with its very crinkly frond, *Blechnum membranaceum*, and *Trichomanes elongata* are less common ground ferns. The beautiful, endemic kidney fern (*T. reniforme*) often occurs around trunk bases and on rotten logs. Growing as low epiphytes or on fallen trunks are such species as *Asplenium polyodon*, *Grammitis billardierei*, and *Phymatosorus scandens*. Tree fern trunks with their protruding leaf bases and fibrous covering provide an ideal environment for epiphytes, and a rich assemblage of species including the filmy ferns *Hymenophyllum dilatatum*, *H. flabellatum*, *H. scabrum*, and *Trichomanes venosum*, two of the primitive psilophytes, *Tmesipteris elongata* and *T. tannensis*, and the climbing fern *Rumohra adiantiformis* can almost invariably be found on them. The smaller branches of other forest trees are more usually the home of *Hymenophyllum multifidum* and *H. sanguinolentum*, whilst high in the crowns of large trees, often growing from clumps of *Astelia* or *Collospermum*, are such species as hanging spleenwort (*Asplenium flaccidum*), *A. polyodon*, and the clubmoss *Lycopodium varium*, although, interestingly, all three of these species can also be found growing on the ground.

Tall manuka or kanuka forest often contains a few fern species not commonly seen elsewhere, notably *Grammitis ciliata* and *Lindsaea linearis*, both of which grow on clay soil, usually beside tracks or on faces of cuttings. *Lycopodium volubile* is frequently seen scrambling through bush in similar habitats. *Schizaea bifida* has also been reported once from manuka scrub growing in an area behind Days Bay – an unsubstantiated record that would be interesting to confirm.

Upland Forest

Lowland forest merges gradually into upland forest which continues up to about 750 m, increased rainfall and cooler temperatures being the only significant differences. Good examples of this forest type are seen at Kaitoke and in the Akatarawa Range. Not surprisingly, many of the same species that occur in lowland forest can be found in upland forest, but with increasing altitude come new ferns rarely seen at the lower levels. The soft tree fern (*Cyathea smithii*) is one such plant, occurring only in higher, wetter forests as a subcanopy species where it tends to replace the ponga. On the floor in drier forest, crown fern (*Blechnum discolor*), *B. procerum*, Hymenophyllum *bivalve*, *Lindsaea trichomanoides*, and the umbrella fern (*Sticherus cunninghamii*) are ferns which become more common at higher elevations (Fig. 4), whilst on drier ridges *Asplenium bulbiferum* subsp. *gracillimum* replaces the lowland hen and chickens fern. In wetter forests, especially along water courses, *Blechnum colensoi*, *Leptolepia novae-zelandiae*, *Polystichum silvaticum* and the magnificent Prince of Wales feathers (*Leptopteris superba*) can all be found, the latter frequently hybridising with its relative *L. hymenophylloides*, which tends to grow on drier

Fig. 4. The very distinctive umbrella fern (*Sticherus cunninghamii*).

slopes. *Blechnum nigrum*, with its peculiar lyre-shaped fronds, thrives in really dark situations. Less common filmy ferns such as *Trichomanes colensoi* and *T. endlicherianum* can sometimes be found growing on shaded rock in wet gullies, whilst *Hymenophyllum atrovirens* is a rare species found on rock beside waterfalls and streams, and *Trichomanes strictum* is a plant of wet banks. On disturbed soils, particularly near streams, *Hypolepis rufobarbata* will sometimes be seen, recognised by its red-brown stems and sticky glandular hairs all over the frond. *Hymenophyllum ferrugineum* with its profuse covering of rusty-brown hairs is a common and attractive epiphyte on tree fern trunks at higher altitudes whilst *H. rarum*, *Anarthropteris lanceolata*, *Ctenopteris heterophylla*, and *Grammitis pseudociliata* prefer trunks and branches of other forest trees.

Montane Forest

Montane forest, such as occurs in the southern Tararua Range, extends up to the tree line and includes far fewer ferns than can be seen in lowland or upland forest. Many of the typical upland forest species are still present, but rather few from the lowland forest survive at these altitudes. Soft tree fern is the only common tree fern and is associated with *C. colensoi,* a curious relative that lacks a trunk, and which extends right up into subalpine forest. The major forest floor species are *Blechnum procerum*, *Leptopteris hymenophylloides*, and prickly shield fern (*Polystichum vestitum*), whilst the epiphytes are dominated by many different species of filmy fern, amongst which *Hymenophyllum peltatum*, the tufted *H. pulcherrimum*, and the minute *H. armstrongii* occur for the first time.

The common epiphytes, *Ctenopteris heterophylla* and *Grammitis billardierei* are joined for the first time by *G. magellanica* subsp. *nothofageti*. *Phymatosorus novae-zelandiae*, a montane relative of the two lowland species, distinguished by its large, orange-brown scales, can also be found climbing on tree trunks in a few localities. In degraded beech forest such as on Renata Ridge, or in burnt forest, such as on Mount Climie, *Schizaea australis* can be found in open areas.

Subalpine Scrub

Areas above the tree line in the Wellington region are confined to a few places in the southern Tararua Range. Most of the ferns in montane forest do not persist far into subalpine scrub and are replaced by high-altitude species such as *Hypolepis millefolium*, *Lycopodium fastigiatum*, mountain kiokio, and *Blechnum penna-marina*, although the latter species occurs in scrub at much lower elevations as well. Two of the clubmosses, *Lycopodium australianum* and *L. laterale*, are rare in the region, being found only in one or two snow-tussock clearings in the Rimutaka Range well below the tree line on thin, poorly drained soil.

Disturbed and Cleared Areas

Many ferns are characteristic of, or may only occur in, disturbed areas. The best example is probably bracken (*Pteridium esculentum*) which invades and rapidly occupies areas that have been cleared of forest. Several other ferns closely related to bracken are colonisers or invaders of disturbed areas but they are gradually replaced by other plants as the habitat returns to forest or some other stable vegetation type. *Paesia scaberula*, *Histiopteris incisa*, *Hypolepis ambigua*, *H. rufobarbata*, and *H. lactea* (Fig. 5) are all members of the bracken family which occur commonly in clearings, ditches, forest margins, and in burned, cleared or damaged vegetation. Kiokio and, at higher elevations, crown fern, umbrella fern, *Blechnum vulcanicum*, *Lycopodium scariosum*, and *L. volubile* are commonly found on road cuttings or clay banks in open forest situations, whilst bush margins and reverting pasture are often occupied by kiokio, prickly shield fern, *Hypolepis ambigua*, and occasionally by *H. dicksonioides*, although the latter is frost tender and more common further north. *Gleichenia microphylla* is an uncommon fern of open areas in the Wellington region. Adder's tongue (*Ophioglossum coriaceum*) is a plant often found in open pasture, although it also occurs in grassy places under open or grazed forest, and along river flats. The two closely related species of parsley fern (*Botrychium australe* and *B. biforme*) are much less common in the region, and are only occasionally found on forest margins, in clearings, or along tracks. *Deparia petersenii* can be found in a few places on banks and under scrub in poor pasture around Paraparaumu, but it is much more common in the northern half of the North Island.

A few ferns have been introduced to New Zealand and are now established in the wild. Around Wellington these are mostly garden escapes such as *Adiantum capillus-veneris*, *A. raddianum*, *Cystopteris fragilis*, *Dryopteris affinis*, *D. filix-*

Fig. 5. *Hypolepis lactea* is a member of the bracken family that occupies areas of disturbed vegetation.

mas, and *Pteris cretica* that occur on road banks or other sites near cultivation. However, one species, *Selaginella kraussiana*, is more widespread and is a potentially serious weed in damp, shaded forest.

Wetlands

Few ferns are confined to wetland habitats and only one, *Azolla filiculoides*, which floats on the surface of ponds and slow-moving water, forming dense red "carpets" of vegetation, is common in the Wellington region. *Blechnum minus* occurs on swampy ground, sometimes accompanied by *Hypolepis lactea* and *Gleichenia dicarpa*, whilst *Hypolepis distans* is occasionally found on peaty soil especially along the sides of ditches, but this is another species that is more commonly found in the north of the country.

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